
CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

With Assistance from the
National Flood Insurance Program

A Manual for North Carolina Community Officials



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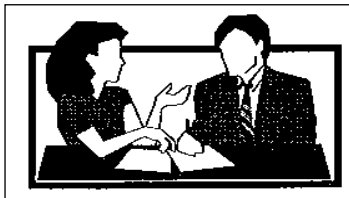
A Manual for North Carolina Community Officials

*To achieve the goals of floodplain management, the nation must adopt a
New approach—one that takes full advantage of all methods available to
Reduce vulnerabilities to damage and to protect and
Enhance the natural resources and functions of the floodplain.*

FEMA-Mitigation, www.fema.gov

Floodplain Management Summary

Course-Related Assistance



Assistance in understanding any of the course content is available by contacting the North Carolina Division of Emergency Management or the FEMA Region IV office:

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Acknowledgments

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This home-study course is based on a resident course offered at the Emergency Management Institute in Emmitsburg, Maryland, E-273, Managing Floodplain Development through the National Flood Insurance Program. It was commissioned, at the request of the State of North Carolina, by Todd Davison, Mitigation Division Director of FEMA Region IV, as part of the response to Hurricane Fran.

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1.1 Introduction

This chapter lays the groundwork for the course. It focuses on the concept of floodplain management, the evolution of floodplain management, and the strategies and tools for managing floodplains and reducing flood losses. It also introduces some basic terms used throughout the course.

Historically, people have been attracted to bodies of water as places for living, industry, commerce, and recreation. During the early settlement and development of the United States, locations near water were necessary for transportation, water supply, and waterpower. These areas also contained fertile soils, making them prime lands for agricultural use. This pattern of development continued as communities grew to their present form. More recently, development along waterways and shorelines has been spurred by the aesthetic and recreational values that these sites offer.

Flooding is the most common natural hazard in the United States, affecting over 20,000 local jurisdictions and representing more than 70 percent of Presidential Disaster Declarations. Several evaluations have estimated that up to 10 percent of the Nation's land area is subject to flooding. Some communities have very little land that is identified as exposed to flooding, although others lie entirely within the floodplain.

Flooding is a natural process that may manifest in a variety of forms: long-duration flooding along rivers that drain large watersheds; flash floods that

send a devastating wall of water down a mountain canyon; coastal flooding that accompanies high tides and on-shore winds, hurricanes, and Nor'easters; and localized and repetitive flooding which results from inadequate drainage or storm sewer systems. When the natural process is unaltered by human activity, flooding is not a problem. In fact, species of plants and animals that live adjacent to bodies of water are adapted to a regimen of periodic flooding.

Flooding is only considered a problem when human development is located in flood-prone areas. Problems can result, not only exposing people to dangerous situations and property to damage, but also disrupting the natural functions of floodplains and redirecting surface flows onto lands that are not normally subject to flooding.

However, communities do not have to endure the dangers and damages that have resulted from unwise use of floodplains. There are many things that can be done to protect people and property from flooding. These can include guiding development to less hazard-prone areas; requiring flood protection and control features in new developments; requiring flood-resistant construction; establishing flood warning and emergency response programs; undertaking mitigation projects to deal with older development; and building flood control projects, such as levees and reservoirs.

Guiding and regulating development activities in flood-prone areas are done through a set of actions known as floodplain management. Good floodplain management entails "wise use" of flood-prone areas consistent with the risk of social and economic losses and the loss of natural and beneficial floodplain resources. Where floodplain development is regulated, it results in development and construction measures that minimize the risk to life and property from floods and the risk to the floodplain's natural functions posed by human development.

1.2 Floods and Floodplains

Flooding is part of the earth's natural hydrologic cycle. The cycle circulates water throughout the environment (Figure 1-1). This process maintains an overall balance between water in the air, on the surface, and in the ground. Sometimes this system has local and temporary imbalances that send more water to an area than it can normally handle – resulting in flooding.

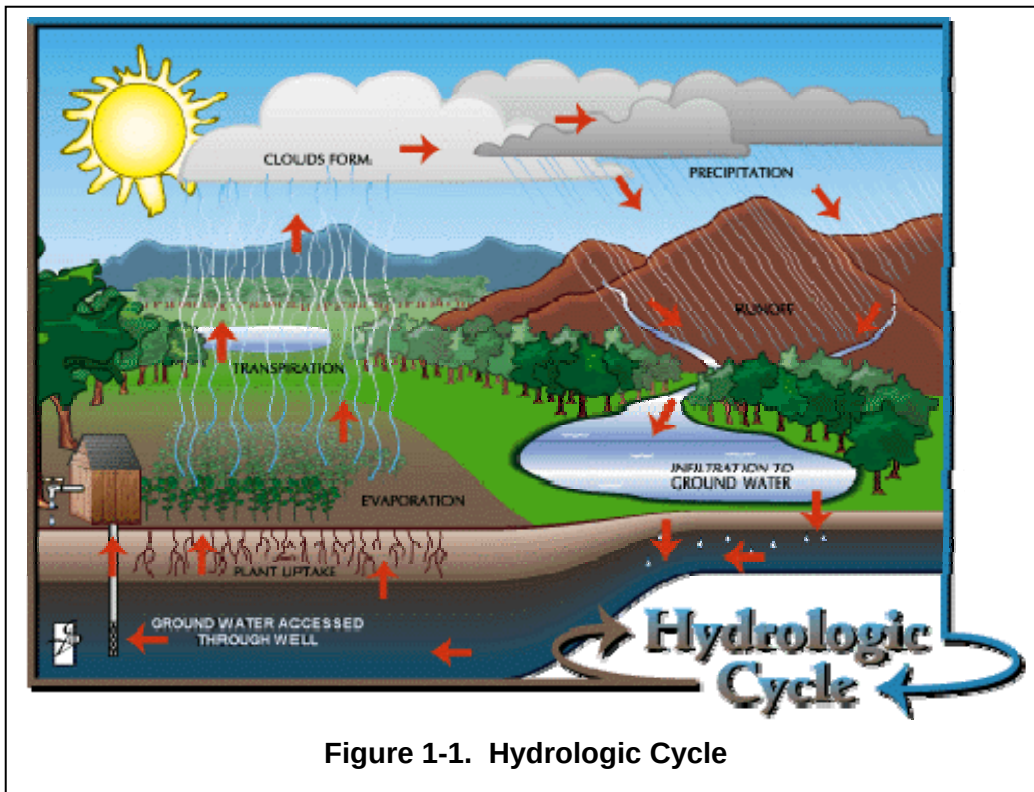


Figure 1-1. Hydrologic Cycle

Floodplains are those normally dry areas commonly inundated by flooding. Flooding along waterways normally occurs as a result of excessive rainfall or snowmelt that creates flood flows that exceed the capacity of channels. Flooding along shorelines is usually due to coastal storms that generate storm surges or waves above normal tidal fluctuations. Factors that can affect the frequency and severity of flooding and the resultant types of damage include:

- Channel obstructions due to fallen trees, accumulated debris, beavers and ice jams
- Channel obstructions due to road and railroad crossings where the bridge or culvert openings are insufficient to convey floodwaters
- Erosion of shorelines and stream banks, often with episodic collapse of large areas of land
- Deposition of sediment that settles out of floodwaters or is carried inland by wave action
- Failure of dams (whether due to seismic activity, lack of maintenance, flows that exceed the design, or destructive acts) may suddenly and unexpectedly release large volumes of water

- Failure of levees (whether associated with flows that exceed the design, weakening by seismic activity, lack of maintenance, or destructive acts) may result in sudden flooding of areas thought to be protected

Characteristics of Flooding. Flooding can be characterized by a number of factors that influence consideration of development activities and the nature and severity of damage. Characteristics of flooding – and how they contribute to damage – include:

- **Depth.** The most obvious characteristic of any flood is the depth of water. Depending on many factors, such as the shape of a river valley or the presence of obstructing bridges, riverine flooding may rise just a few feet or tens of feet above normal. The depth of coastal flooding is influenced by such factors as the tidal cycle, the duration of the storm, the elevation of the land, and the presence of high winds and waves. In planning and designing developments, depth is a critical factor because the hydrostatic forces that are exerted on a vertical surface (such as a foundation wall) are directly related to depth and because costs associated with protecting buildings from flooding significantly increase with depth.
- **Duration.** Duration is the measure of how long the water remains above normal levels. The duration of riverine flooding is primarily a function of watershed size and the longitudinal slope (which influences how fast water drains away). Small watersheds are more likely to be “flashy,” which refers to the rapidity with which floodwaters rise and fall. Areas adjacent to large rivers may stay flooded for weeks or months. Long duration flooding causes saturated ground, which can lead to “floating” buildings and tanks out of the ground or structural damage of below-grade spaces (see Figure 1-2). Most coastal flooding is influenced by the normal tidal cycle, as well as how fast coastal storms move out of the area. Areas subject to coastal flooding can experience long duration flooding where drainage is slow, or may be impacted on the order of 12-24 hours if storms move rapidly. Flooding of large lakes, including those behind dams, can be of very long duration because of the sheer volume of water that must flow past a control point. For buildings, duration is important because it affects access, building usability, saturation and stability of soils, and building materials. There is no ready source of information about flood duration.



Figure 1-2. This basement floor broke from hydrostatic pressure

- Velocity.** The rates at which floodwaters move range from extremely rapid (associated with flash floods) to nearly stagnant (in backwater areas and expansive floodplains). Velocities faster than 5 feet per second are considered “high velocity” and special design considerations should be incorporated. Velocity is important in site planning because of the potential for erosion and scour. In structural design, velocity is a factor in hydrodynamic loads, including impact loads and drag forces (see Figure 1-3). With respect to public safety, even shallow high velocity water poses threats to pedestrians and vehicles. Accurate estimates of velocities are difficult to make, although limited information may be found in floodplain studies.
- Wave action.** Waves contribute to erosion and scour, and also contribute significantly to loads on buildings. The magnitude of wave forces can be 10 or more times higher than wind and other design loads. Waves must be accounted for along coastal shorelines, in flood hazard areas that are inland of open

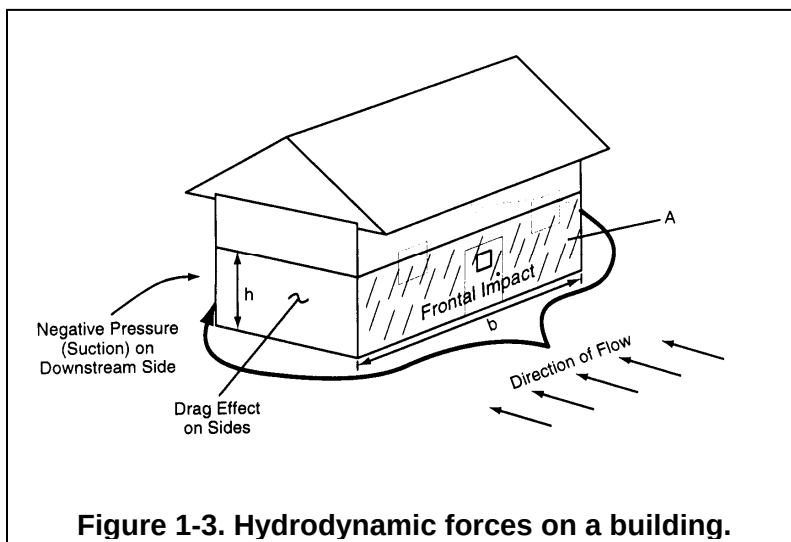


Figure 1-3. Hydrodynamic forces on a building.

coasts, and other areas subject to waves, including areas with sufficient fetch that winds generate waves (such as large lakes and expansive riverine floodplains).

- **Impacts from debris and ice.** Floating debris and ice contribute to loads that must be accounted for in design. Debris may include trees, brush, damaged buildings, items swept out of yards, loose propane tanks, and a myriad of other items. The methods and models used to predict and delineate flood hazard areas do not specifically incorporate debris, thus there are few sources to characterize potential impacts other than past observations. In some areas, debris and ice impacts may be too severe to adequately address through design (see Figure 1-4)



Figure 1-4. Ice floes and large debris can crush a house

- **Erosion and scour.** Erosion refers to a lowering of the ground surface in response to a flood event or the gradual recession of a shoreline due to long-term coastal processes. Scour refers to a localized lowering of the ground surface during a flood due to the interaction of currents and/or waves with structural elements, such as pilings. Erosion and scour may affect the stability of foundations and filled areas, and can cause extensive site damage. Soil characteristics influence susceptibility to scour.
- **Saturation of Materials.** When soaked, many building materials change shape or deteriorate unless specifically intended to be used in locations subject to saturation. Wetted wood swells and, if dried too rapidly, will crack, split or warp. Plywood may delaminate and wood composites may become unstable. Gypsum wall board can fall apart or deform; insulation can become saturated and separate; and wiring can become unsafe.

Health and Safety Hazards. Floods pose a variety of hazards as they build, crest and subside. At different times in the duration of a flood, people are displaced, search and rescue is undertaken, damage occurs, and cleanup and recovery can begin. Disruption of normal public utilities and the presence of flood debris and damage can produce health and safety hazards.

Electrocution is the second most frequent cause of flood deaths – lives are lost when live current is carried through flooded areas when electrical components short. Floods also can damage gas lines, floors and stairs, creating secondary hazards such as gas leaks and unsafe structures. If the public water system loses pressure, a boil order may be issued to protect people and animals from contamination.

Fire can be a result of too much water: floods can break gas lines, float gas-fired appliances off their connections, extinguish pilot lights, and short circuit electrical wiring – causing conditions ripe for a fire. Fire and rescue equipment may not be able reach burning buildings during high water.

Floods can create health hazards in the form of animal and human carcasses and/or wastes, garbage, and standing water (breeding grounds for germs and mosquitoes). Flooded items that come in close contact with people must be thrown out, including food, cosmetics, medicines, stuffed animals and baby toys. Clothes and dishes need to be washed thoroughly.

Mold, mildew and bacteria grow in damp, flooded areas. One health hazard occurs when heating and air conditioning ductwork is not properly cleaned or replaced, allowing contamination to circulate throughout the building. The adverse health consequences of mold are well-documented.

Flooding, especially catastrophic or repetitive flooding, takes a toll on people's mental health. Stress comes from facing the loss of time, money, property, loved ones, pets and personal possessions. The consequences are aggravated by fatigue during cleanup and anxiety of the duration and uncertainty of recovery. Children and the elderly are especially susceptible to stress from the disruption of their daily routines.

1.3 Types of Floods and Flood Hazards

There are several types of floods and floodplains, although most communities have only one or two types. The major types are riverine, coastal, and local drainage. Each type of flooding has characteristics that are important aspects of the hazard and that must be considered when development is proposed.

Riverine Flooding. Riverine flooding is associated with rivers, creeks, streams, or depressions that flow under the force of gravity and carry or store the runoff from rain or snowmelt in the watershed. Riverine flooding results when water runoff from rain or snowmelt exceeds the capacity of channels or depressions and water overflows onto the adjacent low-lying areas called floodplains. Its depth, duration, and velocity are functions of many factors, including watershed size and slope, degree of upstream development, soil types and nature of vegetation, steepness of the topography, and characteristics of storms (or depth of snowpack and rapidity of melting). Riverine flooding can also occur when there is an obstruction or blockage in a channel, such as bridges, floodplain fill, beaver dams, ice jams or debris. Figure 1-5 shows a riverine watershed.

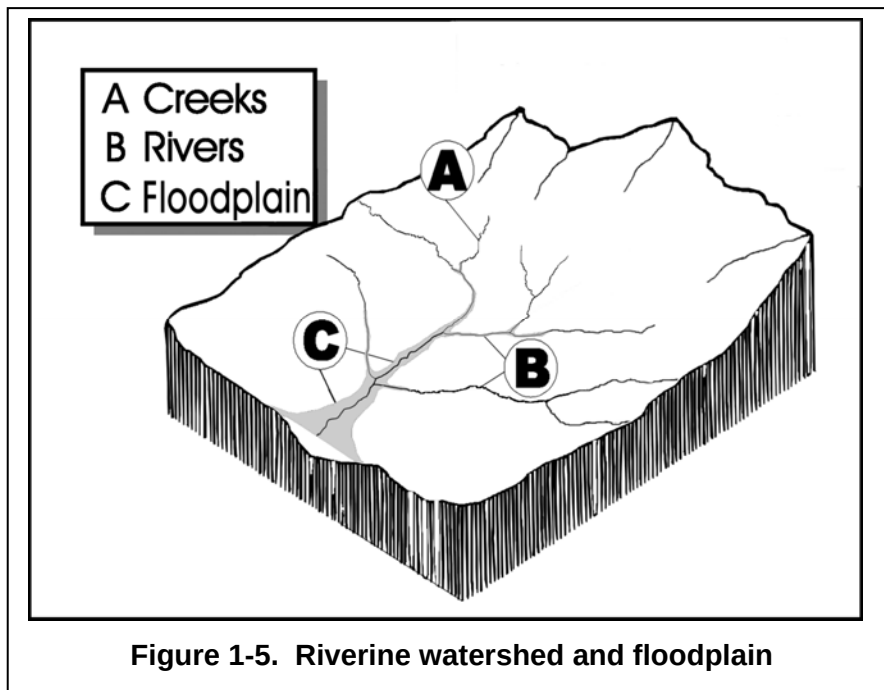


Figure 1-5. Riverine watershed and floodplain

The dynamics of riverine flooding vary with terrain. In relatively flat areas, land may stay covered with shallow, slow-moving floodwater for days or even weeks. In large river basins, it may take several days or even weeks before the lower areas of the basin are flooded thus allowing advanced warnings. In hilly and mountainous areas, floods may come minutes after a heavy rain. The short notice, large depths, and high velocities of flash floods make these types of floods particularly dangerous. Among the common types of riverine flooding are:

- **Overbank flooding** occurs when excess water leaves a defined channel, such as a river, stream or ditch; rising above the normal bank and spreading over adjacent normally dry lands.
- **Sheet flow**, where there are no defined channels and excess rainfall-runoff spreads out over a large area at a somewhat uniform depth. Sheet flow is common in flat areas (for example, on the coastal plain in pine “flatwoods”) following intense or prolonged rainfall.
- **Ponding** in flat areas where excess runoff collects in depressions and cannot drain out.
- **Overwash** is the flow of water and sediment over a beach crest or roadway that

does not directly return to the water source leaving a low lying area of flooding. This occurs at the Outer Banks of North Carolina. For more information see the section on Coastal Flooding and Erosion in this chapter.

Flash Floods. Flash floods occur in all fifty states and are usually the result of severe localized weather systems that deposit a significant amount of rainfall in a very short period of time. Areas with steep slopes and narrow stream valleys are particularly vulnerable to these events, as are small tributary streams. Dam failure, release of ice jams, and collapse of debris dams also can cause flash floods.

For these reasons, flash floods are hazardous and very destructive and rank as the most significant cause of flood-related deaths in the United States. The National Weather Service (NWS) has identified 2,000 communities across the country with potential flash-flood problems.

More than 800 localities nationwide have adopted flash flood warning, evacuation planning, or other mitigation efforts to deal with flash flooding.

Table 1-1 lists some of the recent flash flood disasters.

In response to the Hurricane Floyd flooding in September 1999, the North Carolina Inundation Mapping and Alert Network (FIMAN) was created to provide real-time flood forecast maps. The FIMAN maps reflect areas of inundation and flood forecast maps using the best available elevation and engineering data methods from the NC Floodplain Mapping Program. This program works in conjunction with the U.S. Geological Survey and the National Weather Service. The pilot program has focused on the Tar River Basin and there are plans to expand to the other river basins in North Carolina.

In seven Appalachian states including North Carolina, the Integrated Flood Warning and Observing Program (IFLOWS) through the National Oceanic and Atmospheric Administration's (NOAA's) Advance Flood Warning System (AFWS) to provide grants to purchase precipitation gauges, computers, and communications hardware, and agreed to operate and maintain their gauge networks with non-NOAA funds. NOAA provides no direct funding for state and county operational and maintenance positions and contracts. This technology has expanded beyond the original IFLOWS program. Now many new systems have been built throughout the country entirely with local funds, and with various enhancements.

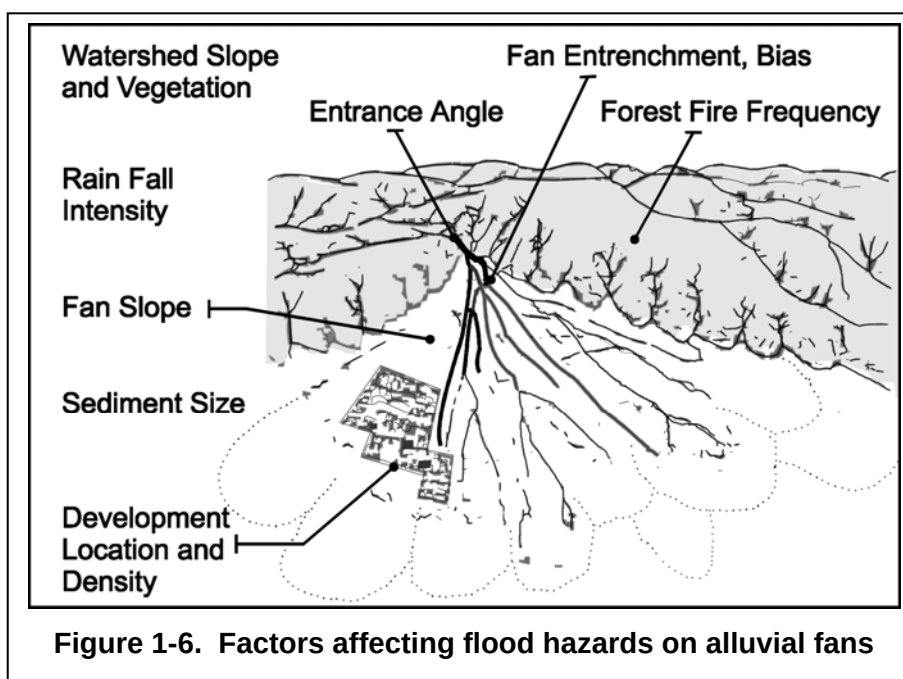
Table 1-1. Recent Flash Flood Disasters	
1972	Buffalo Creek, West Virginia: 118 dead • <i>Washout of coal refuse embankment</i> • 546 houses destroyed, 538 houses damaged
1972	Rapid City, South Dakota: 236 dead • <i>Heavy rain, dam failure</i> • \$100 million in property damage
1976	Big Thompson Canyon, Colorado: 139 dead • <i>Heavy rains</i> •
1977	Johnstown, Pennsylvania: 77 dead • <i>Heavy rain, dam failure</i> • \$200 million in property damage
1990	Shady Side, Ohio: 25 dead

A flash flood occurred in September 1992, near Cherokee, North Carolina. Light rainfall in the immediate area provided no indication of what was to suddenly occur. Runoff from a storm in the adjacent Great Smoky Mountain National Park roared down Raven Fork. Several thousand inhabitants in campgrounds along the stream were evacuated just before the flood arrived. Miraculously, no lives were lost. The crest of the flood was measured at *ten feet* above the calculated 100-year flood for this area.



Alluvial Fan Flooding. In mountainous areas, high velocity floodwaters pick up large quantities of sediment and rock. At the base of the valley where the slope flattens out, the floodwater decreases in speed and spreads out, dropping sediment and rock over a fan-shaped area called an alluvial fan.

Alluvial fan floods are not as predictable as riverine floods. An often-overlooked hazard is the tendency to underestimate both the potential and severity of alluvial fan flood events. Figure 1-6 illustrates factors affecting flood hazards on alluvial fans.



Ice Jam Flooding. Ice jams occur in parts of the country where long, cold winters lead to formation of river ice that lasts for weeks or months. The ice can pile up at constriction points in river valleys. These jams can cause flooding beyond expected levels, and the ice can spread out into the floodplain, damaging or destroying buildings and structures. Ice jam flooding generally occurs when warm weather and rain break up frozen rivers or any time there is a rapid freeze-thaw cycle. The broken ice floats downriver until it is blocked by an obstruction such as a bridge or shallow area (see Figure 1-7). An ice dam then forms and blocks the channel, causing flooding upstream. In North Carolina, ice jam flooding is rare, but more likely to occur only in the western mountains during especially hard winters.

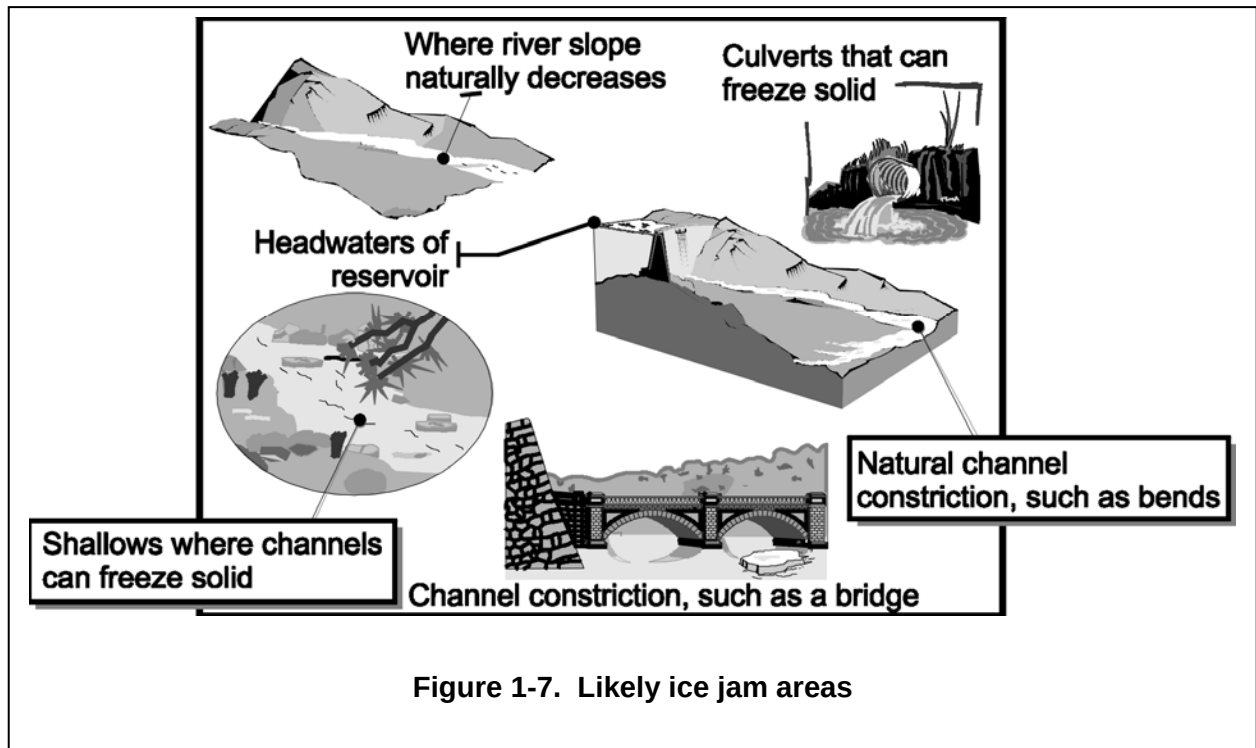
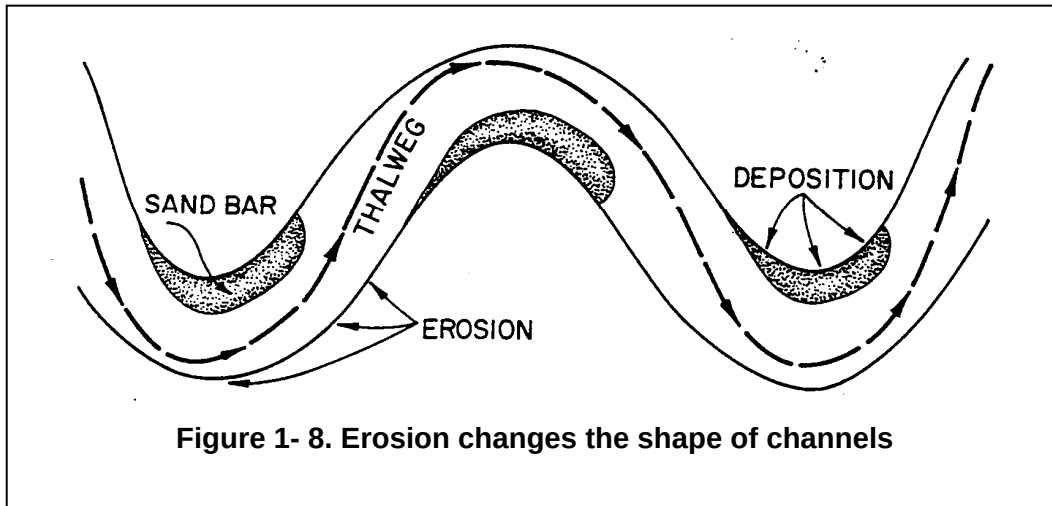


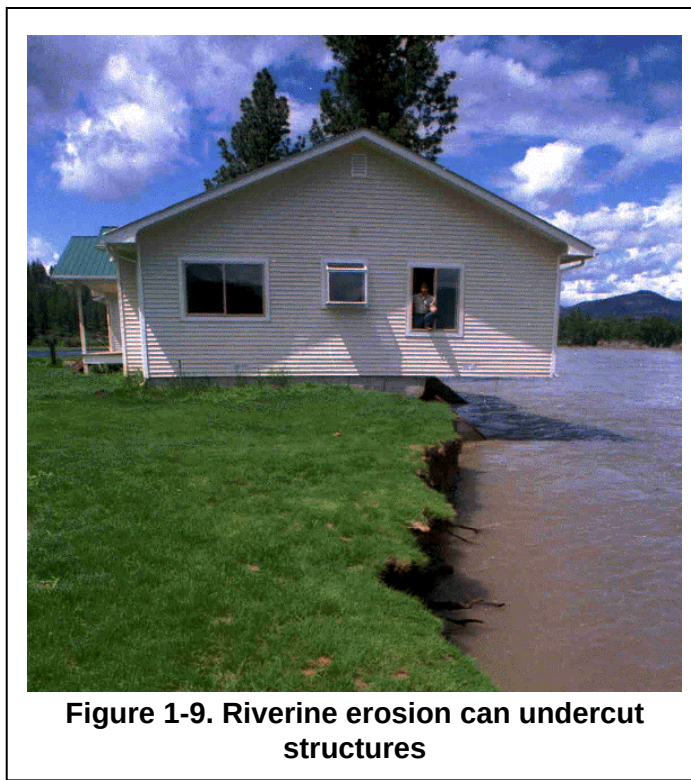
Figure 1-7. Likely ice jam areas

Riverine Erosion. River and stream channels change as water moves downstream, acting on the channel banks and on the channel bottom – generally referred to as riverine erosion. This force is made more potent during a flood, when velocities increase.

Several features along a riverine waterway are affected by this flow of water in different ways (Figure 1-8) and, in general, these effects are accelerated when flood flows occur. The thalweg is the line defining the lowest points along the length of a river bed, generally considered to be where the majority of flow occurs. A meander is a curve in the channel. On the outside of a meander, the banks are more likely to experience erosion as the water scours against them. On the other hand, areas on the inside of meanders tend to receive deposits of sand and sediment transferred from upstream eroded sites.



Land on the outside of meander curves may face threats of both inundation and undercutting from riverine erosion (Figure 1-9). In addition, meanders do not stay in the same place – over time they migrate slowly downstream and across the floodplain, reworking the shape of the channel within the floodplain.



Moveable Bed Streams. Rapid lateral movement of streambeds is most common where steep slopes and the lack of vegetation result in a lot of erosion. During a flood, a new channel may be created by erosion or an existing channel may fill in with sediment. Moveable bed streams are most common in mountainous areas.

Surface Water Runoff. Locally heavy rainfall may produce flooding in areas other than along waterways where overbank flooding is expected. If local drainage conditions are inadequate to accommodate rainfall through a combination of infiltration into the ground and surface water runoff, accumulation of water in certain areas may cause flooding problems. During winter and spring, accumulations of snow may contribute to inadequate drainage and localized ponding of runoff generated by precipitation and snowmelt. Flooding problems resulting from runoff of surface water generally increase as areas become more urbanized.

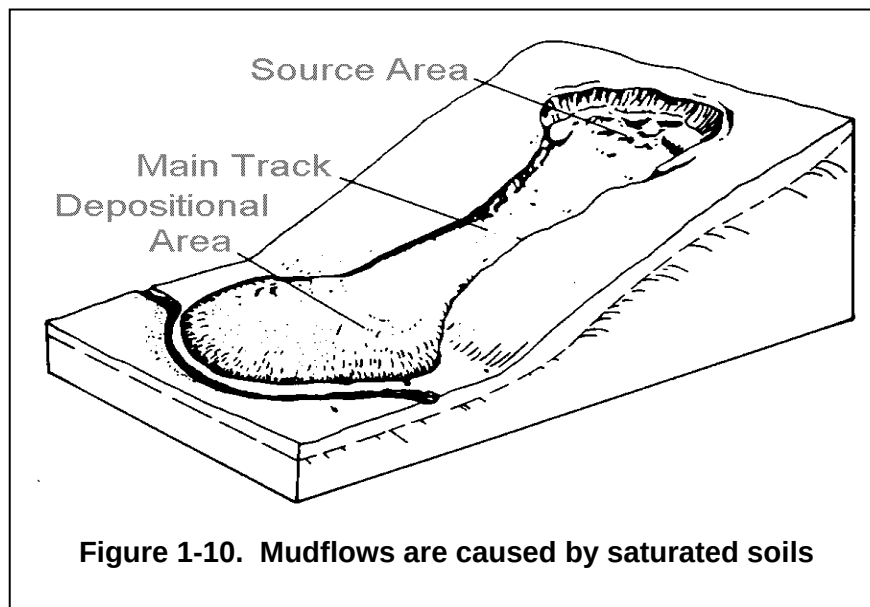
Increasing population density generally leads to increases in the amount of impervious area, e.g., pavement and buildings. This reduction in the amount of natural ground that can absorb rainfall results in an increase in the amount of surface runoff generated. Uncontrolled, this runoff may be channeled to areas that cause flooding of structures and roadways. This may be especially true where the predevelopment land surface had a gently sloping surface with no defined channels. Such areas are subject to shallow sheet flooding during storms, but urbanization and other development speeds the accumulation of floodwater which can overwhelm local storm drainage systems.

Urban Drainage. A second major change that occurs as a result of urbanization is the manmade development of urban drainage networks to control the increased runoff. The straightening and lining of channels, and the construction of sewers, culverts, and other means of controlling runoff, result in improved hydraulic efficiency of the local drainage network. In other words, the time required for surface runoff to reach a stream channel is reduced. Unless the drainage network is specifically designed to counteract this increase in rate of runoff from the watershed, the result is likely to be an increase in flood peaks. Thus, flooding will happen more quickly and usually to greater depths than before urban development occurred.

Controlling and regulating urban runoff as part of the development cycle is called stormwater management. While managing stormwater increases due to development is part of floodplain management, this course does not specifically address this topic. Stormwater management in North Carolina is handled through the NC Department of Environmental and Natural Resources' (DENR's) Land Quality Section.

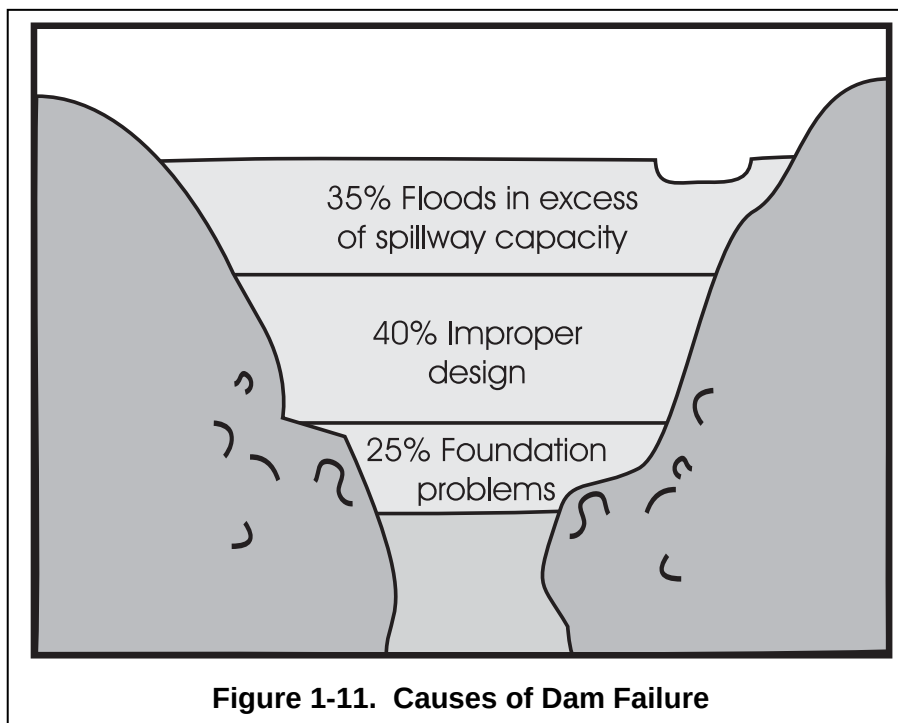
Mudflood and Mudflows. Mudflow and mudfloods, also referred to as debris flows, are types of landslides affecting many of the nation's floodplains. They may occur when runoff saturates the ground which then becomes liquified. Most mudflows do not originate along natural waterway channels, but are associated with unstable soils on sloped land (Figure 1-10). Mudflows typically cause more damage than clear-water flooding due to the combination of debris and sediment, and the force of the debris-filled water.

The National Flood Insurance Program officially defines a "mudslide (i.e., mudflow)" as "a condition where there is a river, flow or inundation of liquid mud down a hillside usually as a result of a dual condition of loss of brush cover, and the subsequent accumulation of water on the ground preceded by a period of unusually heavy or sustained rain." The NFIP provides flood insurance coverage for mudslides that meet this definition, but does not map or require floodplain management measures in these areas. What many people consider mudfloods are actually a form of landslide which is not covered by NFIP insurance.



Dam and Levee Failures. Dams and levees are specifically designed to hold back water or to keep rising floodwaters away from developed areas. When such flood control structures fail, extremely dangerous flooding results due to high velocities, large volumes of water, and generally unprepared people. Dam and levee failures may be due to poor design, inadequate maintenance, or flood events that exceed the design capacity of the structure. Many dams and levees were built long before upstream communities were established and expanded, changing runoff characteristics that increase flood discharges.

Dam failure can often be traced either to a poor decision made during design and construction and or to inadequate maintenance or operational mismanagement. Failure may also result from natural hazards, such as earthquakes, or from flow volumes that exceed capacity (Figure 1-11). Damage from dam failure is especially severe because of the sudden onset and high velocity of floodwater to areas that were not protected otherwise by floodplain management regulations and most likely were uninsured for flood related damages. Breaching often occurs within hours after the first visible signs of dam failure, leaving little or no time for evacuation.



Coastal Flooding and Erosion. Coastal flooding is experienced along the Atlantic, Gulf, and Pacific coasts and bays, and along the shores of many larger lakes, including the Great Lakes. Coastal flooding is influenced by storm surges associated with tropical cyclonic weather systems (hurricanes, tropical storms, tropical depressions, typhoons), extratropical systems (Nor'easters), and tsunamis (surge induced by seismic activity). Coastal flooding is generally accompanied by wind-driven waves on top of rising waters.

The Great Lakes shorelines also are affected by wind-driven waves, where winds blowing across the broad expanses of water generate wind-driven waves that can rival those experienced along other coastal shorelines. In North Carolina, such coastal flooding occurs on the northwest shorelines of Lake Mattamuskeet in Hyde County, North Carolina. Some Great Lakes shore erosion is associated with long-term fluctuations in water levels.

Overwash is the flow of water and sand over a beach crest that does not directly return to the water source such as the ocean. An example in North Carolina would be where overwash occurs over roadways along the Outer Banks leaving low lying area of ponding. In the United States, overwash occurs mostly around barrier islands of the Atlantic Ocean, Gulf of Mexico, and the Great Lakes. Overwash begins when a steady sheet of flow crests beach dunes or roadways. Overwash brings sediment far into a bay, lagoon or estuary.

The effects of coastal flooding can vary with the tides. An increase in the level of the ocean during high tide can exacerbate flooding of large areas where the lands are low-lying. Waves can be very destructive as they batter beach structures and undermine them by eroding the sand.

On sandy shorelines, coastal storms create their own landforms. Sand dunes, bluffs, and barrier islands are produced by the action of wind and waves. They are also moved and reshaped by subsequent storms, making sandy coastal floodplains particularly unstable places to develop. On the other hand, sand dunes, bluffs, and barrier islands provide natural buffers that moderate the effects of a storm, so their preservation is important to the protection of inland development.

Coastal erosion, the removal of sand from some areas, and accretion, deposition in others, is also a natural process. Coastal erosion can be accelerated by:

- Hurricanes

- Winter storms
- Rising sea levels
- Human intervention, such as construction of groins or seawalls, the dredging of channels, and placement of sandbags – all of which can alter natural sand transport systems

Beach and dune erosion is most serious along portions of the eastern seaboard (see Figure 1-12). Learn more about coastal erosion in North Carolina by contacting NC Division of Coastal Management (NC DCM).

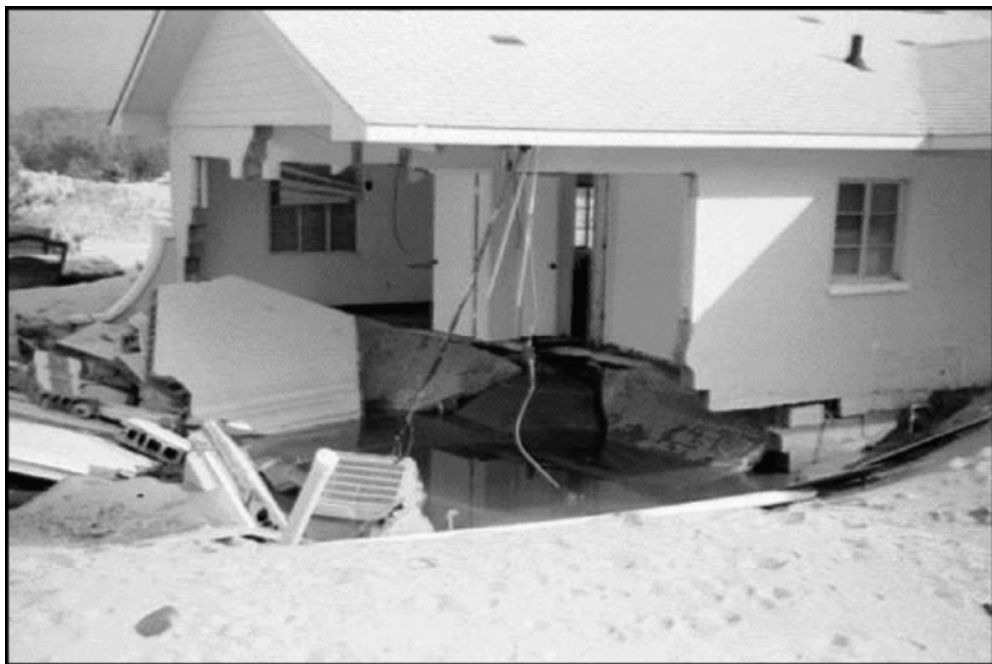


Figure 1-12. Beach erosion threatens thousands of coastal homes

1.4 Natural and Beneficial Floodplain Functions

Floodplain lands and adjacent waters combine to form a complex, dynamic physical and biological system. When portions of floodplains are preserved in their natural state, or restored to provide natural functions, they provide many benefits to both human and natural systems.

Some benefits are static conditions – such as providing aesthetic pleasure and wildlife habitat – and some are active processes, such as absorbing runoff to help reduce the number and severity of floods, helping to handle stormwater runoff and minimizing non-point water pollution. By allowing floodwater to

slow down, sediments settle out and vegetation can take up nutrients and impurities, thus improving downstream water quality. Experiences across the country suggest that maximizing natural processes can reduce the costs to build treatment plants to improve water quality.

Natural resources found in floodplains fall into three categories: water resources, living resources, and societal resources. In this section, natural and beneficial floodplain functions are described. Within each category are a number of natural and beneficial functions, as illustrated in Table 1-2. For additional information, a good resource is No Adverse Impact (NAI) publications including *No Adverse Impact, A Toolkit for Common Sense Floodplain Management* and other publications available from www.floods.org.

Table 1-2. Natural Resources of Floodplains.
Water Resources and Functions
<i>Natural Flood and Erosion Control</i> • Provide flood storage and conveyance • Reduce flood velocities • Reduce flood peaks • Reduce sedimentation
<i>Water Quality Maintenance</i> • Filter nutrients and impurities from runoff • Process organic wastes • Moderate temperature fluctuations
<i>Groundwater Recharge</i> • Promote infiltration and aquifer recharge • Reduce frequency and duration of low surface flows
Biologic Resources and Functions
<i>Biological Productivity</i> • Support a high rate of plant growth in floodplains • Maintain biodiversity • Maintain integrity of ecosystems
<i>Fish and Wildlife Habitats</i> • Provide breeding and feeding grounds • Create and enhance waterfowl habitats • Protect habitats for rare and endangered species
Societal Resources and Functions
<i>Harvest of Wild and Cultivated Products</i> • Enhance agricultural lands • Provide open space • Restore and enhance forest lands
<i>Recreational Opportunities</i> • Provide areas for active and passive uses • Provide open space

- Provide aesthetic pleasure

Areas for Scientific Study and Outdoor Education

- Contain cultural resources (historic, archeological sites)
- Provide opportunities for environmental, other studies

Natural Flood and Erosion Control. Undisturbed watersheds and their floodplains handle flooding and erosion with natural features that provide floodwater storage and conveyance, moderate flood velocities and flood peaks, and maintain a balanced erosion and sedimentation cycle. Replicating these natural controls can help to maintain water quality by filtering nutrients and impurities from runoff, processing organic wastes and moderating temperature fluctuations. Natural controls also contribute to recharging groundwater by promoting infiltration and refreshing aquifers, and by reducing the frequency and duration of low surface flows.

Biologic Resources and Functions. Floodplains enhance biological productivity by supporting a high rate of plant growth which helps to maintain biodiversity and the integrity of ecosystems. Floodplains also provide excellent habitats for fish and wildlife by serving as breeding and feeding grounds. They also create and enhance waterfowl habitats and help to protect habitats for rare and endangered species.

Societal Resources and Functions. People benefit from floodplains through the food they provide, the recreational opportunities they afford, and the scientific knowledge gained in studying them. Wild and cultivated products are harvested in floodplains which usually are valuable agricultural land made rich by sediment deposits. Floodplains provide open space, which may be used to restore and enhance forest lands, or for recreational opportunities or simple enjoyment of their aesthetic beauty.

Floodplains provide areas for scientific study and outdoor education. They contain cultural resources such as historic or archaeological sites, and thus provide opportunities for environmental and other kinds of studies.

These natural resources and functions can contribute positively to a community's overall quality of life, a role that often has been undervalued. Quality can be protected by preserving natural floodplains or restored by



transforming degraded areas into value-added assets. Water oriented parks, bike paths, open spaces, wildlife conservation areas and aesthetic features are important to citizens. These environmental or “green infrastructure” have been shown to make communities more appealing to potential employers, investors, residents, property owners and tourists.

The use of stream and river corridors as greenways or greenbelts may have been first applied, in an extensive fashion, in North Carolina. In Raleigh, some 3,500 acres and sixty-three miles of pathways have been developed along waterways in 1974. The Capital Area Greenway has become the model for over thirty-five other local greenway systems in localities such as City of Asheville, Town of Cary, City of Charlotte, and Guilford County, plus in an untold number of other places throughout the nation.

Too little attention has been given to integrating measures to protect floodplain resources and functions with those designed to reduce economic losses as a consequence of flooding. Such actions can contribute to a number of community goals and needs, and build public and political interest and support for flood damage reduction measures that would otherwise not exist (refer to *Using Multi-Objective Management to Reduce Flood Losses in Your Watershed*, ASFPM, 1996).

Remember that there are two ways of looking at floodplains. As areas of land that are periodically covered by water, they can be dangerous to people and property when developed. On the other hand, in their natural state floodplains help people and support certain types of human enterprises, such as tourism, commerce, and agriculture. Unwise development can alter the floodplain and the dynamics of flooding. An overview of floodplain development and managing floodplains is the theme of the next part of this chapter.

1.5 Floodplain Development

Throughout time, floods have altered the floodplain landscape. These areas are continuously shaped by the forces of water – either eroded or built up through deposit of sediment. More recently, the landscape has been altered by human development, affecting the immediate area around developments as well as the dynamics downstream.

People have always been attracted to bodies of water as places for living, industry, commerce and recreation. Water offers transportation, food, water supply, disposal of wastes, and water power. In addition, these areas had

fertile soils, making them prime agricultural lands. In recent decades, development along waterways and shorelines has been spurred by the aesthetic and recreational values of these locations.

A substantial portion of this country's development is subject to flooding. Floodplains account for 7 to 10 percent of the nation's total land area. However, they contain a tremendous amount of property value. It is estimated that there are 8 to 10 million households and nonresidential buildings in floodplains throughout the country.

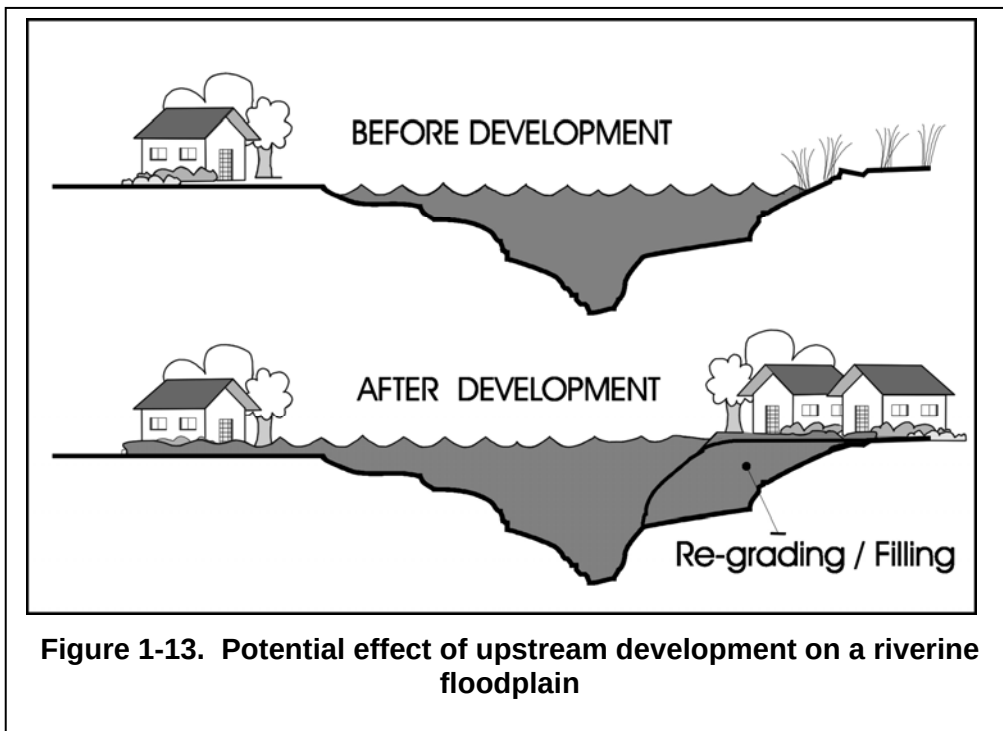
Two problems result from floodplain development:

- Development alters and expands the floodplain and the dynamics of flooding
- Buildings and infrastructure are damaged by periodic flooding and people are placed at risk of death or injury due to flooding.

Development Dynamics. Riverine floodplain development has a direct impact on the dynamics of flooding. Construction in, and re-grading of, the floodplain can obstruct or divert water to other areas. Filling can reduce the floodplain's ability to store excess water, sending more floodwater downstream and causing floodwater to rise to higher levels. Floodplain development may increase velocity of floodwater – another factor that may exacerbate downstream problems. As illustrated in Figure 1-13, flood depths or frequencies can increase because of unwise development.

Development in riverine watersheds affects the runoff of stormwater and snowmelt. Buildings and parking lots over the soil and replacing vegetation reduces infiltration and absorption of rainfall and runoff. In an undisturbed area, as much as ninety percent of the rain will infiltrate the ground; in an urbanized area, as much as ninety percent will run off (Figure 1-14).

Runoff is speeded by storm sewers and more efficient flow paths that come with urban drainage systems (curb & gutter, ditches, channels) that are not designed to mimic the natural system's ability to attenuate flows. The overall result of urbanization is more runoff that moves to the stream network faster, resulting in increased flows and flooding downstream. For example, in an urbanized watershed a 10-year storm may produce the runoff equivalent of a 25-year storm, overloading the man-made drainage system.



Natural ground cover, 0% impervious surface



15% of the rainwater runs off the land

Rural development, 10% - 20% impervious surface



23% of the rainwater runs off the land

Single family homes, 35% - 50% impervious surface



35% of the rainwater runs off the land

Full urbanization, 75% - 100% impervious surface



61% of the rainwater runs off the land

**Figure 1-14. Effects of development on stormwater runoff.
(Data for Northeastern Illinois)**

Coastal development also impacts the dynamics of the coastal environment, including coastal flooding. Removing sand from beaches and dunes, especially vegetated dunes, removes the natural barrier built up by wind and flood forces over the years and exposes inland areas to increased risk of flooding. Construction of navigation channels, buildings and stabilization measures (breakwaters, jetties, seawalls and groins) can have an adverse impact on the severity of coastal flooding over the long run. These stationary elements may disturb the shoreline's natural dynamic system so the water and sand can no longer move the way they would normally move. While sand may build up around stabilization measures, other areas may become "starved" and experience accelerated erosion (Figure 1-15).



Figure 1-15. Jetties to protect a navigation inlet affect sand accumulation and erosion.

1.6 A Brief History of Floodplain Management

Before examining the tools used to manage flood hazard areas, it is worthwhile to look at some brief background. The history of government flood programs reflects an evolution in policy regarding flood control in general, as well as an evolution in the roles of federal, state, and local governments in identifying flood hazards, managing flood risks, and reducing flood losses.

The Evolution of Floodplain Management. In the United States, the federal government's involvement in floodplain management began in the late 1800s, with an interest in maintaining the navigability of rivers to facilitate interstate commerce. In the mid-twentieth century, structural flood control projects were seen as the primary way to reduce flood losses by attempting to control floodwater with dams, levees, and floodwalls.

Following the "Great Flood of 1927" on the Mississippi River, the federal government became a major player in flood control as outlined in the Flood Control Acts of 1928 and 1936. The 1936 Act alone authorized construction of some 250 projects for both flood control and relief work. The role of

government agencies was to build massive flood control structures to control the great rivers, protect coastal areas, and prevent flash flooding.

After many years of this limited approach, people began to question its effectiveness. Studies during the 1960s concluded that flood losses were increasing in spite of the number of flood control structures that had been built. Disaster relief expenses were going up, making all taxpayers pay more to provide relief to those with property in floodplains. One of the main reasons for this was that people continued to build in floodplains. As a result, federal, state, and local agencies began to develop policies and programs with a “nonstructural” emphasis, rather than attempt to control or redirect the path of floods.

The history of floodplain management since the 1960s has been one of moving from heavy reliance on flood control, or structural measures, to one using a combination of many different tools including nonstructural flood protection measures that include regulation of development, requiring flood-resistant construction, acquisition and relocation of buildings in high hazard areas, flood warning systems, control of stormwater runoff, comprehensive coastal zone management programs, and self-help advice to property owners.

The National Flood Insurance Program. The creation of the National Flood Insurance Program (NFIP) in 1968 was a landmark step in the evolution of U.S. floodplain management policy. It established both an insurance program (as an alternative to disaster relief) and a national standard for regulating new development in floodplains. The NFIP also began a comprehensive floodplain mapping program and the start of a shared responsibility for floodplain management at all government levels and in the private sector.

Concurrently, during the 1960s and 1970s, interest increased in protecting and restoring the environment, including the natural resources and functions of floodplains. Coordinating flood-loss reduction programs with environmental protection and watershed management programs has since become a major goal of federal, state, and local programs.

As a result of this evolution, we no longer depend solely on structural projects to control floodwater. Our floodplain policies are now multi-purpose and result in different solutions for different situations.

1.7 Concepts of Floodplain Management

Floodplain management can be described as “a continuous process of making decisions about whether and how floodplain lands and waters are to be used” (Federal Interagency Floodplain Management Task Force 1994). The ideal result of good floodplain management will be the wise use of floodplains, in terms of both reduced flood losses and protection of the natural resources and beneficial functions of floodplains.

Floodplain Management. To be successful, floodplain management involves the cooperation and participation of all levels of government, the private sector, and the affected individuals. Many factors need to be considered, including regional needs, acceptable risk levels, degree of protection, environmental quality, and economic efficiency. The process is continual: floodplain management activities need to be continuously evaluated and adjusted to meet changing conditions.

Strategies and Tools. Four basic strategies have been identified to achieve the goals of floodplain management to reduce economic losses from flooding and reduce the losses of natural and beneficial floodplain resources. Each strategy is supported by an array of tools.

In most cases, a combination of these tools is needed. Ideally, the process of establishing a floodplain management program will result in the best mix of tools that are appropriate for each floodplain, the community, and the capabilities and resources of the implementing agencies.

Because floodplain management is a process, there is no one “best” set of tools or one single blueprint for “wise use” of the floodplain. The important message is the value of considering all the options before developing or implementing an action that will change the floodplain.

Modify human susceptibility to flood damage and disruption by avoiding hazardous, uneconomic, or unwise use of floodplains. Tools include:

- Floodplain regulations (e.g., zoning to guide development away from high-hazard areas or natural areas deserving preservation; subdivision regulations; and building, health and sanitary codes)
- Development and redevelopment policies on the design and location of public services, utilities, and critical facilities; land acquisition; open space preservation; and permanent relocation of buildings
- Elevating or floodproofing of new buildings and retrofitting of existing ones

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

- Flood forecasting, warning systems, and emergency plans that prepare people and property for flooding
- Preservation and restoration of the natural resources and functions of floodplain.

Modify the impact of flooding by assisting individuals, industries, businesses, and communities to prepare for, respond to, and recover from floods. Tools include:

- Information and education to assist self-help and protection measures
- Emergency measures designed to protect people and property during a flood
- Disaster assistance, flood insurance, and tax adjustments to reduce the financial impact of flooding
- Post-flood recovery plans and programs to help people rebuild and implement mitigation measures to protect against future floods

Modify flooding and flood sources through construction projects that control floodwater. Tools include:

- Dams and reservoirs that store excess waters upstream of development
- Dikes, levees, dune systems, and floodwalls that keep water away from developed areas
- Channel alterations that make the channel more efficient, so overbank flooding will be less frequent;
- High flow diversions that direct excess water around developed areas
- Land treatment to hold as much rain as possible where it falls, so it can infiltrate instead of running off
- On-site detention measures to store excess runoff
- Shoreline protection measures that protect inland development and account for the natural movement of shoreline features
- Measures to control runoff from developing areas outside the floodplain.

Preserve and restore the natural resources and beneficial functions of floodplains by maintaining and reestablishing floodplain environments in their natural state. Tools include:

- Floodplain, wetlands, building and Coastal Area Management Agency (CAMA) rules, e.g., land use regulations, such as local zoning, to guide development away from high-hazard or sensitive areas or natural areas deserving preservation
- Development and redevelopment policies on the design and location of public services, utilities, and critical facilities; land acquisition; open space preservation; permanent relocation of buildings; restoration of floodplains and wetlands; and preservation of natural functions and habitats
- Information and education to make people aware of natural floodplain resources and beneficial functions and how to protect them
- Tax adjustments to provide a financial initiative for preserving lands or restoring lands to their natural state
- Beach nourishment and dune building to protect inland development by maintaining the natural flood protection features

1.8 A Few Notes about Risk

Flooded Roads are Dangerous. The National Weather Service launched a public awareness campaign, Turn Around Don't Drown™, because more deaths occur due to flooding than from any other severe weather related hazard with the exception of heat related fatalities. Many deaths occur in automobiles that are swept downstream. Not only do drivers underestimate the force and power of water (just 18 inches can float the average car), but they do not realize that the road under the water may have been washed away. Many of these drownings are preventable, but too many people continue to drive around the barriers that warn of road flooding. The campaign urges people to think carefully if they come to a flooded road. Whether driving or walking, the key message is: Turn Around Don't Drown™ (www.tadd.weather.gov).



Here are some facts related to flash floods:

- Just six inches of fast-moving flood water can knock you off your feet.
- Nearly half of all flash flood fatalities are vehicle-related,
- The majority of victims are males, and
- Flood deaths affect all age groups.

Comparing Risks. The public generally becomes aware of local hazards in a number of ways, notable when an event has occurred recently. Unfortunately, all too often people think that just because a flood that might be called a “100-year flood” has occurred recently, another won’t happen for another 99 years! Risk is poorly understood by most people (see *Comparing Risks* below). Public awareness of flood hazards is enhanced when:

- People apply for a loan from a federally insured or regulated lender to buy or refinance property in a floodplain, triggering the federal requirement to obtain flood insurance. Federally insured and regulated mortgage lenders are required to make homebuyers purchase flood insurance if the building is located in a mapped flood hazard area (see Chapter 12). Buyers are supposed to be notified well in advance of closing.
- Newly effective flood maps will also trigger lenders to reevaluate their loan portfolios. Then, in turn, they will send notification letters to the floodplain property owners stating they are now placed into a floodplain and mandating that they purchase a flood insurance policy by a specified date.
- Property owners and developers apply for permits, the community determines whether the property or construction site is within a mapped floodplain and therefore subject to the local floodplain management ordinance.
- Local public awareness messages focus attention on local risks.
- Flood warnings are issued, whether as regional warnings from the National Weather Service or through community-based flood monitoring and public notification efforts.

Comparing Risks

*What's the chance that in the next year, a person whose house is **in** the floodplain will:*

- *Be involved car accident? 3 chances in 100*
- *Be in 100-year flood? 1 chance in 100*
- *Have a car stolen? 1 chance in 300*
- *Be a victim of robbery? 1 chance in 1,000*
- *Have a residential fire? 4 chances in 10,000*

www.floodsafety.com

a project of the Texas Environmental Center

CHAPTER 2 THE NATIONAL FLOOD INSURANCE PROGRAM: ROLES AND RESPONSIBILITIES

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2.1 The National Flood Insurance Program (NFIP)

During the 1960s, Congress became concerned with problems related to the traditional methods of dealing with flood damage and the fact that flood losses continued to rise in the face of continued investment in structural projects. During the 1920s, the insurance industry determined that flood insurance would not be profitable because the risk could not be spread sufficiently, i.e., only those at high risk would buy policies. Congress concluded in the 1960s that:

- Flood protection structures paid with federal dollars were expensive and could only protect some floodplain occupants.
- People were still building in floodplains and, therefore, risking disaster.
- Disaster relief was inadequate and expensive to the general taxpayer.
- The private insurance industry could not sell affordable flood insurance because only those at high risk would buy it.
- Federal flood programs were funded by all taxpayers but they primarily helped only those who live in the floodplains.



**National Flood
Insurance
Program**

In 1968, Congress passed the National Flood Insurance Act to correct some of the shortcomings of the traditional flood control and flood relief programs. The Act created the National Flood Insurance Program (NFIP) to:

- Guide future development away from flood hazard areas.
- Require that new and substantially improved buildings be constructed to minimize or eliminate flood damage.
- Provide floodplain residents and owners with financial assistance after floods, especially after smaller floods that do not warrant federal disaster aid.
- Transfer most of the costs of private property flood losses from the taxpayers and the U.S. Treasury to floodplain property owners and occupants through flood insurance premiums.

Congress charged the U.S. Department of Housing and Urban Development's Federal Insurance Administration with responsibility for the program. In 1979, the Federal Insurance Administration (FIA) and the NFIP were transferred to the newly created Federal Emergency Management Agency (FEMA). In 2003, FEMA was incorporated into the U.S. Department of Homeland Security and continues to administer the NFIP.

Participation in the NFIP grew slowly. In 1972, Hurricane Agnes devastated a wide area of the eastern United States. Disaster assistance costs were the highest ever, leading Congress to examine why the NFIP was so little used. Investigators found that few communities had joined the NFIP and there were fewer than 100,000 flood insurance policies in force nationwide. The availability of flood insurance alone had not been enough to motivate communities to join the NFIP or individuals to purchase flood insurance.

To remedy this, the Flood Disaster Protection Act was passed in 1973. This Act prohibited most types of Federal assistance for acquisition or construction of buildings in the floodplains of non-participating communities. It also required that buildings located in identified flood hazard areas have flood insurance coverage as a condition of receiving Federal financial assistance or loans from federally insured or regulated lenders, and as a condition for receiving federal disaster assistance. These "sanctions" for non-participation, which are detailed later in this chapter, make it hard for any community that wants federal assistance for public and private properties in floodplains to avoid joining the NFIP.

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

The 1973 Act spurred participation in the program dramatically. By the end of the decade, more than 15,000 communities had signed on and about two million flood insurance policies were in effect.

In 1979, the Federal Insurance Administration (FIA) and the NFIP were transferred to the newly created Federal Emergency Management Agency (FEMA). During the early 1980s, FIA worked to reduce the program's dependence on its authority to borrow from the Federal Treasury. Through a series of rate increases and other adjustments, the program has been self-supporting since 1986. The NFIP is funded primarily through premium income, which pays nearly all administrative costs (salaries and expenses) and mapping costs, as well as claims. In recent years the NFIP has received supplemental funding from Congress to accelerate its Map Modernization program.

Since 1973, the program has been amended several times. The most important changes came under the National Flood Insurance Reform Act of 1994 which fine tuned various aspects such as authorizing the Community Rating System, increasing the maximum amount of flood insurance coverage, strengthening the mandatory purchase requirement, and establishing a grant program for mitigation plans and projects.

The Reform Act of 1994 and the initiation of a flood insurance advertising campaigns boosted sales of flood insurance policies again. By August of 2003, there were nearly 4.4 million flood insurance policies in force. As of December 30, 2004, nearly 4.6 million policies were in effect. Statistics on policies and claims, by state and by community, can be found at <http://www.fema.gov/nfip/pcstat.shtm>.

In North Carolina, 542 communities participate in the NFIP (as of August 2010), including cities, towns, the Eastern Band of the Cherokee Indian Nation, and all 100 counties. Six communities are suspended and sixty-nine communities have been identified as having some flood risk but do not participate in the NFIP (see below for an explanation of the consequences of not participating). Non-participating communities should contact the North Carolina Floodplain Management Branch directly for assistance in considering their options. Congress again amended the NFIP in 2004. The key changes addressed, among other matters, the



expansion of existing NFIP-funded mitigation programs and emphasized the importance of consumer information and insurance agent training.

NC Senate Bill 300 effective July 1, 2001, requires communities to be participating in the NFIP by August 1, 2002 in order to receive State disaster assistance in the form of public grants for flooding damage. Public assistance grants will include debris clearance, emergency protective measures, and assistance with public transportation needs.

2.2 How the NFIP Works

The NFIP is a voluntary program based on a mutual agreement between the federal government and individual local jurisdictions, commonly referred to as “communities.” Federally-backed flood insurance coverage is available to any property owner in a participating community regardless of whether or not the property is located within a floodplain in return for community-based regulation of floodplain development to recognize and mitigate flood risks.

For more information on the NFIP, please refer to the publication *Answers to Questions About the NFIP (F-084(5/04))*. This booklet has more than 100 answers to commonly asked questions. Topics covered include:

- Introduction to the NFIP
- Flood Insurance for Prospective Buyers
- Coverage (available under NFIP policies)
- Filing a Flood Insurance Claim
- Floodplain Management Requirements
- Flood Hazard Assessment and Mapping
- Repetitive Loss Strategy
- Presidential Disaster Declarations and the NFIP
- Contacts (federal and state)
- Suggested Additional Reading

The availability of other types of federal financial assistance, such as mortgage loans and grants for property in floodplains, is affected by whether

communities participate in the NFIP. Flood insurance coverage is also a condition for receiving state and federal disaster assistance for buildings located in identified special flood hazard areas. States are responsible for ensuring that state construction in special flood hazard areas meets minimum requirements of the NFIP under NC Executive Order 123. All federal agencies must comply with NFIP standards and provisions under Executive Order 11988, Floodplain Management.

The NFIP has three basic components that are briefly overviewed here and covered in more detail in subsequent sections: flood hazard mapping; flood insurance; and floodplain regulations.

Flood Hazard Mapping. FEMA has published a flood hazard map of some type for most communities in the country (and has embarked on a national initiative to revise and modernize the maps). The NFIP's maps and flood studies are covered in more detail in Chapter 3 and Chapter 4.

Flood maps and the data on which they are based are used for several purposes, including regulating development activities, identifying at-risk buildings and writing flood insurance policies.

Flood Insurance. Federal flood insurance is available on any insurable building that is located in a community that participates in the NFIP regardless of whether or not it is located within a floodplain. This insurance provides some financial compensation when damage results from qualifying floods of any size, including those that are not large enough or severe enough to warrant federal disaster aid. Flood insurance also means that owners of flood-prone properties pay more of their share toward flood relief. The insurance aspects of the NFIP are discussed in Chapter 12.

Floodplain Regulations. The NFIP initially published floodplain management regulations in 1976 and those regulations have since been incorporated into state and local regulations. The regulations focus on all forms of development, including buildings, infrastructure, and physical modification of the floodplain itself, such as through construction of bridges, fills, excavation, and flood control works. For buildings, the requirements address design and construction to minimize damage



when flood conditions occur. The regulations and local responsibilities for administration are the primary focus of the remainder of this chapter.

2.3 Roles and Responsibilities

Meeting the goals and objectives of the National Flood Insurance Program successfully requires a sharing of roles and responsibilities among the Federal government, State agencies, local jurisdictions, and professional engineers and surveyors, as well as private insurance companies that write and service nearly all NFIP policies and claims just to name a few.

The Community Role. A “community” is a governmental body with the statutory authority to enact and enforce development (land use) regulations. The authority of each unit of government varies by state. Eligible communities can include cities, town, villages, townships, counties, parishes, special districts, states, and Indian nations.

The community’s role in the National Flood Insurance Program is of *paramount importance*. The floodplain management regulations are adopted and administered by the community. These regulations must, at a minimum, meet NFIP criteria and state requirements. The community:

- Issues or denies floodplain development permits
- Inspects all floodplain development to assure compliance
- Maintains permanent floodplain development records
- Assists in preparing and revising flood maps
- Helps citizens obtain information about flood hazards, proper construction techniques, and measures to minimize future damage.

Extra-Territorial Jurisdiction in North Carolina.

Municipalities in North Carolina have the option to exercise land use and building permit jurisdiction over certain “extra-territorial” areas outside their corporate boundaries. The distance that this area extends from the boundary varies according to population, and the community must take formal council action to create the boundaries of this extra-territorial jurisdiction (ETJ).



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The NFIP recognizes that when a community establishes an ETJ, it also assumes floodplain management responsibilities for the ETJ. The authority in ETJs and annexed areas have been serious issues in North Carolina, since there are a number of municipalities that do not participate in the NFIP or for which FEMA has not issued flood maps. If a community that is not in the NFIP chooses to exercise its authority to establish an ETJ or annexes land, then property owners in that area lose their NFIP benefits immediately and are treated as though their communities do not participate.

The best remedy is for the non-participating community to join the NFIP which:

- Allows county residents and property owners in the ETJ and/or annexed areas to continue to purchase and renew existing flood insurance policies
- Allows residents and property owners in flood-prone, but unmapped, areas to purchase federally-backed flood insurance
- Ensures that adequate floodplain management regulations are maintained for the SFHAs over which the community now has jurisdiction
- Avoids sanctions regarding state and federal disaster assistance and federal loans and grants for activities in the identified SFHAs, and
- Ensures that residents and property owners in the SFHAs are still able to maintain or secure mortgage loans and home-equity loans and to refinance existing loans, all of which would be limited if the community did not join the NFIP.

The State Role. The governor of each state is responsible for identifying a state coordinating agency for the NFIP. Funds from the NFIP are available to each state on a 75/25 percent cost-share through the Community Assistance Program (CAP) to help operate a state office to coordinate with communities. The role of the designated state agency varies from state to state. It usually includes:

- Regulating floodplain development or providing local governments with the authority to do so
- Providing floodplain management-related technical and specialized assistance to local governments



North Carolina's Division of Emergency Management coordinates the NFIP and is the local official's primary source for information and technical assistance.

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- Coordinating the activities of various state agencies that affect the NFIP and state activities that take place in floodplains

In North Carolina, the governor has designated the Division of Emergency Management as the state coordinating agency for the NFIP. The state NFIP assistance office is housed in the Geospatial and Technology Management Section as a Floodplain Management Branch. North Carolina's Floodplain Management Branch coordinates the duties listed above as well as many others including monitoring visits with NFIP participating communities to ensure their compliancy in implementing their local floodplain regulations and coordinating NC mapping program activities. The NC State Construction Office is directed under NC Executive Order 123 and by direction of the State NFIP Coordinator to regulate state floodplain activities.

The State of North Carolina Division of Emergency Management Floodplain Management Branch is responsible for conducting CACs/CAVs in accordance with prioritization plan.

The Federal Role. The NFIP is administered by a directorate in the U.S. Department of Homeland Security, formerly the Federal Emergency Management Agency and still referred to as FEMA.



Three components of FEMA are involved in the NFIP:

The Mitigation Division's Risk Identification Branch and Risk Assessment Branch, located in Washington, D.C., set national policy for floodplain regulations, researches floodplain construction practices, and administers the flood hazard mapping program.

The Mitigation Division's Risk Insurance Branch, located in Washington, D.C., administers the insurance portion of the NFIP. It sets flood insurance rates, establishes coverage, and monitors applications and claims. Through an arrangement with the NFIP called the Write-Your-Own Program, private insurance companies conduct most of the work of processing applications and claims. A number of major functions are carried out under contractual arrangements with the private sector.

The FEMA Regional Offices assist state coordinating agencies and communities, assess community compliance with the minimum NFIP criteria, advise and assist local officials responsible for administering the ordinance, answer

questions from design professionals and the general public, and help in the review and adoption of new maps and data. These offices provide information, training, and interpretation for writing flood insurance policies, lender compliance, and federal mandatory flood insurance purchase requirements. Each FEMA regional office covers four to eight states and territories. FEMA Region IV, located in Atlanta, GA, is responsible for working with North Carolina communities.

FEMA automatically suspends communities that fail to adopt new effective FIRMs or to modify ordinances when necessitated by a map revision.

2.4 NFIP Sanctions

Local floodplain management programs, floodplain development permit records, and field conditions are reviewed periodically by FEMA and/or the State. Detailed, on-site reviews are called Community Assistance Visits (CAV). Less detailed telephone contacts or visits are called Community Assistance Contacts (CAC).

If it is found that a community has performed poorly and failed to adequately administer and enforce its regulations, and if it fails to cure the identified problems, FEMA may impose sanctions, including probation and suspension. And if the community participates in the Community Rating System (CRS) (see Chapter 13), FEMA may reclassify the community, reducing or eliminating the discount on insurance premiums enjoyed by policyholders.

Probation. Probation is a formal notification to the community and its NFIP flood insurance policyholders that their community's floodplain management program is not compliant with the minimum requirements of the NFIP and/or state floodplain management regulations. Probation results in the assessment of a surcharge of \$50 per policy that is sold or renewed during the probation period.

Generally, conditions of non-compliance are identified during an on-site Community Assistance Visit during which steps that must be taken to resolve the non-compliance are discussed. Prior to imposing probation, FEMA issues a formal written notice that lists specific deficiencies and/or violations which must be resolved and provides a maximum of 90 days for resolution by the community. If satisfactory performance and correction of violations has not been achieved within the provided timeframe, then a probation period of up to one year may be imposed. The resolution and/or probation period may be

extended if the community provides evidence that it is making progress toward achieving compliance.

Suspension. If a community on probation fails to remedy its violations and program deficiencies, it may be suspended from the NFIP. Suspension is preceded with the opportunity to justify why the community should not be suspended and a written or oral hearing may be held. Suspension means the community is no longer participating in the NFIP. Flood insurance policy holders are notified of the suspension, flood insurance policies will not be sold or renewed, mortgages may default and/or be difficult to obtain, and certain state and federal disaster assistance will not be provided.

A community will also be suspended if, following due notice, it fails to adopt revisions to its floodplain ordinance in response to flood map revisions or amended minimum NFIP criteria at the state or federal level. Communities are given a 6 month period after a new or revised map is issued to update their floodplain management regulations to incorporate the new data and make any other necessary changes. If at the end of the 6 months the community has not adopted a compliant ordinance, it is automatically and immediately suspended without any probation period.

It is not uncommon for communities to be suspended for failure to adopt compliant ordinances when mandated by FEMA and/or the state. Sometimes communities get a late start revising their ordinance and cannot complete the ordinance review and adoption process in the allotted 6 months. See Chapter 7 for more information on the flood ordinance and the adoption process. These communities are reinstated into the NFIP upon proof of adoption of the ordinance provided non-compliant development has not taken place during the suspension. A state and/or FEMA representative may need to conduct a field inspection of the community's floodplains to ensure compliancy prior to reinstatement.

Suspended communities that wish to be reinstated in the NFIP should contact the NFIP State Coordinator's office for assistance. They must make formal application and provide evidence that deficiencies have been corrected and violations remedied. FEMA also requires the community to reaffirm its intent to adequately administer and enforce its revised floodplain management regulations. Based on recommendations made by the FEMA Regional Office, the community may be reinstated fully, reinstated on probation, or continued on suspension. The consequences of not participating are summarized below.

CRS Reclassification. Some communities gain recognition of their floodplain management programs that exceed the NFIP's minimums through a program called the Community Rating System (see Chapter 13). The CRS offers an opportunity to have the cost of flood insurance discounted by at least 5% on every policy within their jurisdiction. If poor performance is found, or if deficiencies and violations are not immediately resolved, then FEMA may reclassify a community to remove the discount in addition to any sanctioning discussed above.

Summary of Non-Participation. Communities that have been identified and mapped as having special flood hazard areas may elect not to participate in the NFIP, may withdraw from the program at any time, or may be suspended. The following sanctions flow from non-participation:

- Federal flood insurance is not available; in communities that withdraw or are suspended, existing policies will not be renewed.
- No Federal grants or loans for acquisition or construction of buildings in mapped flood hazard areas may be made under programs administered by Federal agencies such as Federal Housing Administration (FHA), Housing and Urban Development (HUD), Environmental Protection Agency (EPA), Small Business Administration (SBA), and Health and Human Services.
- No State or Federal disaster assistance may be provided for permanent restorative construction or grants to repair insurable buildings located in mapped flood hazard areas for damage caused by flooding.
- No Federal mortgage insurance or loan guarantees may be provided in identified flood hazard areas, including policies written by the Veteran's Administration (VA), FHA, and others.
- Federally insured or regulated lending institutions such as banks and credit unions must notify applicants seeking loans for insurable buildings in mapped flood hazard areas that the property is at-risk and that it is not eligible for Federal flood insurance.
- When FEMA provides a non-participating community with an FHBM or a FIRM delineating its floodprone areas, the community is allowed 1 year in which to join the NFIP. If the community chooses not to participate in the NFIP, flood insurance is not available.
- Structures in SFHAs would be actuarially rated if, in the future, the community decides to join the NFIP. At that time, Flood Insurance Rate Map and appropriate actuarial flood insurance rates go into effect. This

could lead to expensive insurance. Please note that only private insurance is available.

- The local governing body may be held liable for any structural flood losses within mapped floodplains for not participating in the NFIP because the action denies citizens the opportunity to purchase flood insurance to protect their own property, and does not take positive steps to reduce the exposure of life and property in the face of authoritative scientific and technical data.

2.5 Joining the NFIP

Participation in the NFIP is voluntary. There is no Federal law that requires a community to join, although some states have requirements. North Carolina Senate Bill 300 requires participation in order to receive state disaster assistance. However, a non-participating community faces sanctions, such as loss of State and Federal aid for insurable buildings in the floodplain. These make participation a very important decision for most communities. Non-participating communities should contact the North Carolina Floodplain Management Branch or view its Website www.nccrimecontrol.org/NFIP for assistance, model ordinances, sample resolutions, and NFIP forms.

To join, a community must adopt a resolution of intent to participate and cooperate with State and FEMA. The community agrees to “maintain in force...adequate land use and control measures consistent with the [NFIP] criteria” and to:

- (i) Assist the Floodplain Administrator in the delineation of the floodplain,
- (ii) Provide information concerning present uses and occupancy of the floodplain,
- (iii) Maintain for public inspection and furnish upon request, for the determination of applicable flood insurance risk premium rates within all areas having special flood hazards, elevation and floodproofing records on new construction,
- (iv) Cooperate with agencies and firms which undertake to study, survey, map, and identify floodplain areas, and cooperate with neighboring communities with respect to the management of adjoining floodplain areas in order to prevent aggravation of existing hazards;
- (v) Notify the Floodplain Administrator whenever the boundaries of the community have been modified by annexation or the community has otherwise

assumed or no longer has authority to adopt and enforce floodplain management regulations for a particular area.

If no Flood Insurance Rate Map (FIRM) is currently published for the new NFIP community, FEMA may enter them into what is called an “Emergency Phase” of the NFIP until such time FEMA is able to publish the FIRM for that community. Participating communities that are not already mapped should receive a Flood Insurance Rate Map (FIRM) and most get a Flood Insurance Study with more detailed history and flood hazard data from FEMA. After an official 90-day period to review, appeal and protest, the preliminary map and study, the community is given a mandatory six month compliance period to adopt the new data in a more comprehensive ordinance. This is also the time period that FEMA finalizes any appeals or protests submitted and then forwards the maps onto their Map Service Center for printing and distribution to affected communities.

The FIRM takes effect at the end of the six month compliance period as set by FEMA in a Letter of Final Determination. If a compliant floodplain ordinance has been adopted in time, the community is automatically converted to the “Regular Phase” of the NFIP on that effective date. That is also the date that differentiates “pre-FIRM” buildings from “post-FIRM buildings.” See Chapter 12 for more information on “pre-FIRM” versus “post-FIRM” buildings. If the ordinance is not adopted in time, the community is suspended from the NFIP. The FIRM still goes into effect on the same date as set in FEMA’s Letter of Final Determination and is used by lenders and Federal agencies for determining where loans can be issued and federal assistance can be provided as well as all other professionals such as surveyors and engineers.

2.6 Community Administrative Responsibilities

No higher duty can devolve upon the city authorities than that of protecting the property, health, and lives of the people; this is their permanent duty—a duty which cannot be evaded, nor can their right to do so be lost by neglect or bartered away.

City of Welch v. Mitchell, 121 SE 165 (1924)
(The first case involving floodplain regulations)

The NFIP requires that each community designate a local office or official to be responsible for administration and enforcement of the floodplain management

ordinance. The State of North Carolina grants local units of government the police powers and the duty to adopt, administer, and enforce local codes and regulations controlling uses of land, including floodplain management regulations. Generally, elected officials delegate authority for ordinance administration and enforcement to a subordinate agency or officer, referred to as the local Floodplain Administrator. As such, each community is required to designate a Floodplain Administrator within their local floodplain ordinance.

A local Floodplain Administrator might be an existing staff position, such as the building inspector, community zoning official, engineer, or planner. A small community might contract to have the work performed by the county, another jurisdiction or authority, or a private firm – however, the final responsibility remains with the community.

As the local Floodplain Administrator, this official has many responsibilities. While certain tasks may be delegated to other staff, such as permit clerks or inspectors, it is up to the local Floodplain Administrator to make it all happen the right way. The responsibilities outlined below are common to all who administer local floodplain management ordinances (additional detail related to review of development proposals and administration as well as higher standards is covered in later chapters).

Understand the Regulations. A sound working knowledge of the general and technical provisions of the various local regulations is essential to enable the Floodplain Administrator to explain them to others, to review floodplain development permit applications for compliance, and to provide adequate interpretations. Note: Floodplain ordinances, although based on minimum state and federal requirements, are a local regulation.

Advise Elected Officials and the Public on Floodplain Management. As a Floodplain Administrator learns more and more about avoiding flood hazards, they become a valuable community resource for floodplain management issues. A Floodplain Administrator should become familiar with the ordinance requirements, general information about flood insurance policies, the use of the flood maps, and mitigation programs.

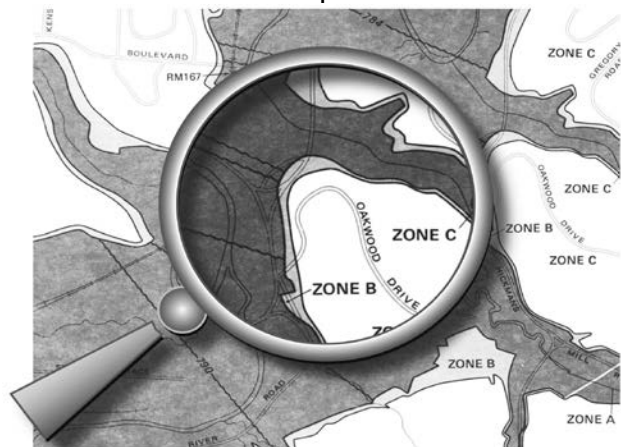
Ensure that Property Owners Apply for Floodplain Development Permits. Sometimes people do not realize that they need to apply for a floodplain development permit for a project when it is located in the floodplain – often they

Activities and buildings built by your own community have to meet the NFIP requirements.

don't even know the floodplain affects their land. A Floodplain Administrator needs to ensure that the public is informed as to when floodplain development permits are required and how they are obtained. Anyone engaged in a development project without a floodplain development permit must be told to stop and apply for one.

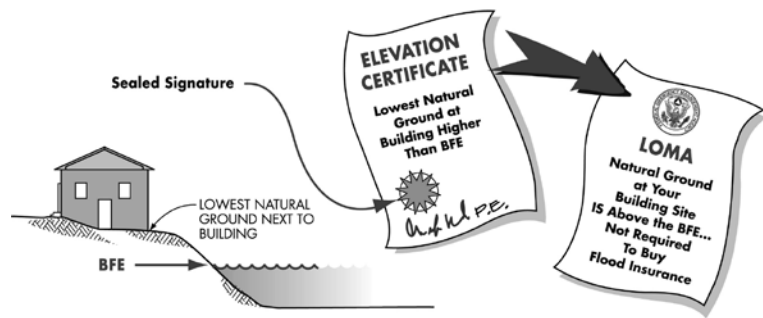
Interpret Floodplain Boundaries and Provide Base Flood Elevation

Data, if Available. Communities that participate in the NFIP agree to keep, and make available to the public, the Flood Insurance Rate Maps, Flood Hazard Boundary Maps, Flood Boundary Floodway maps, and Flood Insurance Study report if published for their community. The base flood elevation is a critical parameter for any proposed development within the SFHA. The BFE is the elevation of the base flood (or wavecrest of the base flood) having a 1%-chance of being equaled or exceeded in any given year, commonly, but erroneously, called the “100-year” flood[†]. Non-residential structures have the option of being elevated or made watertight (floodproofed) to meet this standard. Using the flood maps for their community, the Floodplain Administrator determines the BFE for the site of the proposed development and either provides this data to the applicant or reviews the floodplain development permit application and/or preliminary elevation certificate to determine if the owner or the owner's representative is using the correct data.



[†] More precisely, it is the “1%-annual chance flood.” The common term “100-year flood” is often mis-understood because it conveys the impression that a flood of that magnitude will occur only once every 100 years. Statistically, the 1%-annual chance flood has one chance in 100 of occurring in any given year. The fact that a 1%-annual chance flood is experienced at a specific location does not alter the probability that a comparable flood will occur at the same location in the next year, or even twice in one year.

Not surprisingly, sometimes a proposed building site or piece of land appears to be within the mapped special flood hazard area based on the FIRM, but ground survey or topographic maps may reveal that the actual ground elevations are higher than the BFE. In these cases, the Floodplain



Administrator will still need to issue a floodplain development permit and a final Elevation Certificate but you may suggest to the owner that they may apply to FEMA to try to obtain a Letter of Map Amendment (see Chapter 4). It is important to understand that only with the LOMA can the owner prove to a bank or lender that flood insurance is not required.

Where base flood elevations are not specified on the FIRM (unnumbered zones), be sure to check Chapter 4 for options you have to identify or develop a BFE. Some communities are hesitant to provide statements concerning whether a structure is in or out of the floodplain, which might be requested by homeowners, but this is one of your duties as Floodplain Administrator. You do have the right to request from the applicant any further data that may assist you in making this determination such as a survey plat, elevation certificate or spot elevations. But there is no reason to not help people read and interpret flood hazard information. You do not assume more liability, as long as you do the best you can. If you prefer, you may add a disclaimer statement on any floodplain determinations you provide in writing.

Review Floodplain Development Permit Applications, Plans and Specifications for NFIP Compliance. The Floodplain Administrator's primary role is to review floodplain development permit applications for compliance with applicable regulations. In performing this duty, the Floodplain Administrator must be able to assess the accuracy and completeness of the application package and to evaluate site plans, topographic data, flood hazard maps and studies, building design plans, and other technical data. Later chapters of this manual cover these responsibilities in greater detail.

The Floodplain Administrator determines if the provisions of the community's floodplain management ordinance apply by determining whether the proposed

development is in a Special Flood Hazard Area (SFHA), and if in, also determine the elevation requirements, shown on the community's adopted flood hazard maps such as the Flood Insurance Rate Maps and supporting technical information in the Flood Insurance Study. If the development is located in the stream setback, Floodway or Non-Encroachment Area portion of a riverine flood hazard area – or in the V Zone (coastal high hazard area subject to high velocity wave action) – then additional more restrictive ordinance provisions will have to be met as well as engineered certification required before any permits can issued – No-Impact/No-Rise Certification or V-Zone Certification, respectively. If any portion of the property is within a designated CoBRA Zone or OPA, advise the applicant of restrictions on federal assistance.

The Floodplain Administrator reviews the plans, specifications and other supporting documents to assure that the requirements of the ordinance are met, including the proposed location of the structure, paving, accessory structures, well, septic system, tanks, etc., in relation to the regulated special flood hazard areas. The Floodplain Administrator also checks to see that the foundation is designed to meet the regulatory requirements, that mechanical, electrical and other attendant utility equipment are elevated or floodproofed, and other specific requirements are met. According to the Flood Damage Prevention Ordinance Non-Coastal Model, the application for the floodplain development permit will include the following:

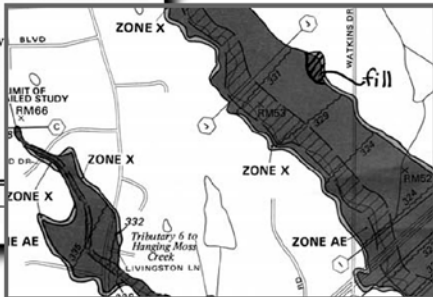
- A plot plan drawn to scale
- Proposed elevation, and method thereof, of all development within a Special Flood Hazard Area
- If floodproofing, a Floodproofing Certificate (FEMA Form 81-65) with supporting data, an operational plan, and an inspection and maintenance plan that include, but are not limited to, installation, exercise, and maintenance of floodproofing measures.
- A Foundation Plan, drawn to scale, which shall include details of the proposed foundation system to ensure all provisions of this ordinance are met.
- Usage details of any enclosed areas below the lowest floor.
- Plans and/or details for the protection of public utilities and facilities such as sewer, gas, electrical, and water systems to be located and constructed to minimize flood damage.
- Certification that all other Local, State and Federal permits required prior to floodplain development permit issuance have been received.

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- Documentation for placement of Recreational Vehicles and/or Temporary Structures, when applicable, to ensure that the provisions of Article 5, Section B, subsections (6) and (7) of this ordinance are met.
- A description of proposed watercourse alteration or relocation, when applicable, including an engineering report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map (if not shown on plot plan) showing the location of the proposed watercourse alteration or relocation.

A checklist that is keyed to your ordinance helps ensure that each floodplain development permit application is reviewed in the same manner, even if you have more than one reviewer. Make sure that applications are required for all proposed floodplain development and that each floodplain development permit application is checked against the adopted flood hazard map for your community.

FLOODPLAIN DEVELOPMENT PERMIT (partial)	
New House Number <u>781</u>	Street <u>WATKINS DR</u> Apt. _____
Owner Name <u>DAVID & SALLY BROWN</u>	
Flood Map Panel <u>15G</u> Zone <u>AE</u>	
TYPE OF DEVELOPMENT: <u>Buildings</u> EXCAVATION: _____ FILL: ☒ GRADING: ☒	
Buildings or other structures: <u>TWO-FAMILY HOME, TWO DETACHED GARAGES</u>	
LOCATION IN FLOODPLAIN:	
a. _____ Inside regulatory floodway limits.	c. _____ Inside floodplain-no regulatory floodway limits.
b. ☒ Outside floodway limits.	d. _____ Outside floodplain
DEVELOPMENT STANDARDS DATA:	
1. If a or c above is checked, attached engineering certification and supporting data as required.	
2. Required lowest floor elevation <u>330</u> MSL (NFVD).	
Approved for Compliance: <u>Rebecca Rouvieu</u> Plans Examiner	



Determine Compliance/Noncompliance. The Floodplain Administrator must evaluate the floodplain development permit application information in relation to the technical requirements of the ordinance in order to determine whether to deny, recommend modification, or approve the floodplain

development permit application. Identifying deficiencies and formulating corrective strategies are important functions to insure NFIP compliancy.

Substantial Damage/Substantial Improvements. The Floodplain Administrator must make the determination as to whether a structure has substantial damage or substantial improvements. Refer to Chapter 9 for further information on substantial damage and substantial improvement requirements.

Notify of Watercourse Alterations. The Floodplain Administrator must notify (or require the applicant to notify) adjacent communities and the North Carolina Floodplain Management Branch prior to approving any proposed alteration or relocation of a watercourse. Evidence of such notification must also be submitted to the FEMA regional office.

You should not approve a permit for a watercourse alteration until after you get a copy of FEMA's Conditional Letter of Map Revision.

Review Revisions to Flood Maps. If an applicant prepares new technical information or floodplain studies that are submitted to FEMA for a map revision, the local Floodplain Administrator is charged with reviewing the revision request to ensure that it is reasonably safe from flooding and may submit comments for FEMA's consideration. FEMA's *Technical Bulletin 10-01* can be of assistance to the local Floodplain Administrator when making this determination.

Ensure that All Other Permits Are Obtained. The Floodplain Administrator is required to advise the applicant of the need for any additional local, state, or federal permits for the proposed floodplain development prior to issuance of a floodplain development permit. The Floodplain Administrator may have copies of the other permit application forms or may know whom to contact. In particular, permits may be required from the U.S. Army Corps of Engineers. Under Section 404 of PL 92-500 (Water Pollution Control Act of 1972), permits are required if the proposed development involves the placement of any fill material into bodies of water or wetlands, or if it affects a navigable body of water. The Endangered Species Act 16 U.S.C. §1531 et seq. (1973) requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.

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The following summarizes the responsibilities of FEMA and the applicant under the Endangered Species Act.

- Ensure its activities do not jeopardize protected species.
- Review project area/action and determine level of effect.
- Conduct an informal or formal consultation, as required.
- Complete a biological assessment, if required.
- Ensure that all parties abide by the decisions and conditions resulting from consultations.

In North Carolina, other permits may also be required through:

- **NC Department of Insurance (NCDOI)** for NC State Building Codes or NC Manufactured Housing Codes. These codes also include some floodplain related regulations such as:
 - o **NC State Building Codes** – primarily Residential Code – Please note that since this is a statewide building code, this applies to all special flood hazard areas not just in communities participating in the NFIP.
 - All materials below Design Flood Elevation (DFE), which is the Base Flood Elevation plus any locally adopted freeboard, are required to be flood resistant
 - Residential structures must be elevated to at least DFE
 - All utilities including ductwork must be elevated at least to DFE – Note that this becomes more stringent than NFIP regulations for less than 50% damages or improvements
 - Coastal High Hazard Areas
 - Flood Loads
 - o **NC Manufactured Housing Code**
 - Appendix B - Elevated Homes has Engineered Flood Zone Setup Designs to state

- More floodplain regulations are planned to be incorporated into this state code in the next revision in coordination with the new upcoming release of FEMA's rewrite of FEMA-85 Manufactured Homes Setup Guide.
- NC Department of Environment and Natural Resources (NC DENR) – Listed below are the different division of NC DENR and which types of development they regulate. References should be made to specific divisions for related permits as needed.
 - o Division of Coastal Management (NC DCM) or a Local Permitting Officer (LPO) for a CAMA permit under the Coastal Area Management Act of 1974 which covers the eastern part of the state along the coastline and the sounds. There are 20 counties covered by CAMA.
 - Development in Areas of Environmental Concern (AECs) - permits
 - Setbacks based on erosion rates
 - Coastal High Hazard Area foundations
 - o **Division of Environmental Health, On-Site Wastewater Branch**
 - Septic systems not permitted in areas having a 10% annual chance of flooding unless watertight and to remain operable during a ten-year storm
 - Mechanical and electrical components of treatment systems located above 1% annual chance
 - o **Division of Land Resources**
 - Regulates mining, erosion and sediment control, and dam safety
 - Erosion and sedimentation control measures must provide protection from peak rate of runoff from 10% annual chance rainfall. Note that many communities may run this program at the local level.

- Permit required for construction, repair, modification, or removal of a high hazard dam (15' or higher or 10-acre feet)
- o **Division of Water Quality**
 - Prohibits wells in an area generally subject to flooding
 - Wetlands standards and 401 Water Quality Certification process
 - Riparian Buffer Protection Rules
 - Stormwater Management - Federal NPDES Stormwater Permitting Programs
- o **Division of Waste Management**
 - Underground Storage Tanks
 - Solid Waste Management
- **NC Department of Agriculture** regulates the anchoring of propane tanks where necessary to prevent flotation due to possible high waters around above-ground or mounded containers therefore they need to know that the tanks are located within a special flood hazard area.

In addition, other local permits may be required – health department and zoning permits are among just a few.

Coordinate Permit Application Review with Other Community

Officials. Portions of the community NFIP responsibilities may reside in different administrative offices, such as public works, planning and zoning, engineering, code enforcement, or housing departments. For consistency and to assure NFIP compliance, the Floodplain Administrator should be involved in the coordination of all application reviews to ensure a proposed project is compliant prior to issuance of a floodplain development permit.

Issue or Deny Permits. The Floodplain Administrator issues a floodplain development permit if all provisions of the floodplain management ordinance and other local ordinances are met. The floodplain development permit is denied if the proposed development or use is not allowed by the ordinance or cannot be modified to comply.

Conduct Inspections. The Floodplain Administrator or a designated community official must perform periodic and timely on-site inspections to confirm visually that development is taking place according to the approved plans and permit requirements. It is important to verify that:

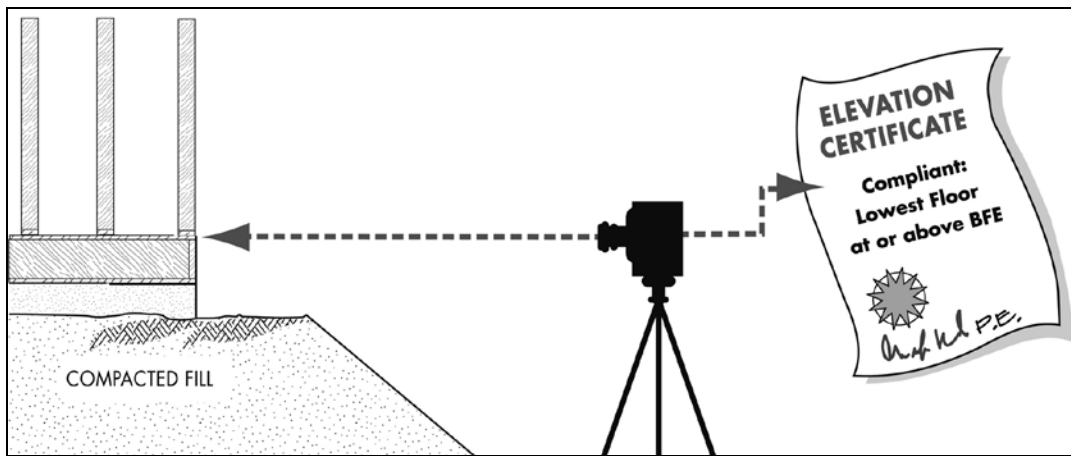
- The development is taking place in the location shown on the approved site plan
- The lowest floor or other reference level and all attendant utilities are at or above the elevation specified on the floodplain development permit or that a non-residential structure is floodproofed to at least this same elevation.
- Any portion of the structure or other development below the required elevation is constructed of flood-resistant materials
- Verify proper foundation construction whether on piles or columns or whether on a solid perimeter foundation wall requiring proper hydrostatic openings commonly referred to as flood vents.
- Verify that all materials used below the required elevation are all flood resistant.
- Verify that no development, materials or equipment encroaches into restricted areas such as stream setbacks, floodways or non-encroachment areas

In addition, inspections are to be made periodically throughout the community's floodplains to ensure compliancy is maintained. If any compliancy problems are spotted, the Floodplain Administrator must immediately utilize the corrective actions in accordance with the community's flood ordinance.

Collect and Review Final Elevation Data. The best time to verify the lowest floor elevation is during the foundation inspection when the lowest floor level is in place – but before further vertical construction takes place. Requiring certified elevation/floodproofing data at this time is very advisable but not mandatory unless this requirement is adopted into the community's flood ordinance.

Certified final as-built elevation or floodproofing data must be collected when all construction including utilities and grading is complete and prior to issuance of the Certificate of Occupancy. The local Floodplain Administrator must

review the certified final elevation data for completeness and reasonable accuracy and, if it is incomplete or obviously in error, require the permittee or their representative to provide an acceptable document. Remember that certified elevation/floodproofing data is required as part of the NFIP but the use of FEMA's Elevation Certificate form (FEMA form 81-31) and Floodproofing Certificate form (FEMA form 81-65) are not unless locally adopted in the community's flood ordinance. This Elevation Certificate is a very useful form for regulatory purposes and its use is mandatory for all CRS communities as well as for obtaining flood insurance policies. Therefore, the State of North Carolina's Floodplain Management Branch strongly encourages its use for regulatory purposes.



Take Enforcement Actions. The Floodplain Administrator must evaluate complaints, conduct necessary investigations, and act upon them. When non-compliant and unpermitted activities are discovered, the Floodplain Administrator must take the necessary actions to resolve the situation. This may involve the issuance of stop-work orders or other violation notices as outlined in the community's flood ordinance, the coordination of enforcement procedures with the community's attorney, or, on rare occasion, appearing in court.

Investigate and Remedy Violations. If the local Floodplain Administrator becomes aware that development is occurring in the floodplain without a floodplain development permit or contrary to the floodplain development permit requirements, it

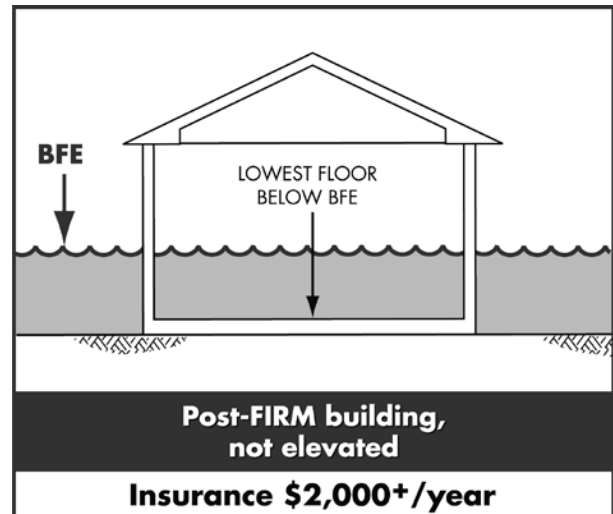
Not many communities know about Sec. 1316. If you're having difficulty getting compliance, check with the State NFIP Coordinator about this option. The threat of no flood insurance and no disaster assistance, even for future buyers, sometimes prompts cooperation.

is necessary to take steps to bring the development or use into compliance with the floodplain management ordinance. *Enforcement responsibilities must not be taken lightly.* Proper enforcement sends a message that the community is serious in its implementation of flood protective and other floodplain management objectives and towards its agreement to participate in the National Flood Insurance Program.

Often, a letter to the property owner identifying the infraction and describing alternative ways to alleviate the problem will help. Sometimes a letter outlining the civil or misdemeanor penalties is required. In extreme cases, you may need to pursue sanctions under Section 1316 of the NFIP regulations, which denies flood insurance coverage and disaster assistance to the individual property in lieu of sanctioning the entire community. Chapter 10 contains additional guidance for enforcing the ordinance and remedying violations.

Counsel Applicants and the Variance Board about Variance Criteria.

You have the responsibility to ensure that the ordinance is enforced. If a variance is requested, you should be able to explain to the applicant the data that are necessary to justify a variance – and the often significant financial implications if the variance results in a lowest floor that is below the BFE. In addition, you should explain to the Variance Board the review criteria that are outlined in your



community's flood ordinance and in Chapter 11 to guide its decision process. It is always important to prepare a staff report, which should be kept in the permanent file. FEMA and/or the State will check variances during Community Assistance Visits.

Keep Records. Floodplain development permit information on properties, findings of fact relative to appeals and variances, correspondence, review notes, studies, data, and other information pertaining to the issuance of floodplain development permits and handling of violations must be PERMANENTLY maintained by the local Floodplain Administrator – DO NOT PURGE with your other building records.

Record keeping is an extremely important part of the ordinance administration process. A project file should be kept for each floodplain development permit application containing, but not limited to, the following:

- A copy of the floodplain development permit application and all supporting plans such as plot plans and foundation plans, specifications and other documents copy of all the review notes and findings to back up compliancy decisions made
- A copy of the floodplain development permit
- Copies of all pertinent correspondence
- Copies of Letters of Map Change, if applicable to project
- Documentation of inspections
- Certification forms for lowest floor elevations (and/or floodproofing measures, if applicable)
- If in the stream setback, floodway or non-encroachment area, a no-impact/no-rise certification along with back-up documentation
- Certification of engineered openings, if applicable
- V-Zone Certification, if applicable
- Copies of other required permits
- Copies of water course alterations and supporting documents. Also include documentation that verifies this data was provided to the State and FEMA as required.
- If a variance was applied for, copy of application and all supporting documentation of community actions

Communities must also maintain a permanent flood file for public utilities, public facilities, recreational vehicles and temporary structures if not already in individual project files.

Many communities keep a special record or log of floodplain development permits issued so that they can readily report on activities. This activity is not mandatory but strongly advised and because of its benefit will receive CRS credit if participating.

The Floodplain Administrator should have access to a Geographic Information System (GIS) with appropriate digital information, including flood hazards (or

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

maintain an adequate supply of flood maps) for administrative purposes and for use by the public. NC communities should at least have internet access to view the NC digital FIRMs online as they are released across the state. All map corrections and notices of map revisions should be recorded and denoted on the administrative set of flood maps, with the details kept close-by in an indexed file. Be sure to keep old FIRMs or other flood maps and studies after revisions or restudies – this history is important because regulatory compliancy and flood insurance rates are based on the flood map, flood zone, base flood elevation and community floodplain regulations at the time of floodplain development permit issuance until they hit the fifty percent threshold causing substantial damage and/or substantial improvement. At this point, the structure or other development will lose its grandfathering.

Table 2-1. Sample Log for Floodplain Development Permits

Permit No./Date	Address	Description of Use or Building Type	Base Flood Elevation	Lowest Floor Elevation	Date Constructed

Maintain and Update Administrative Forms. Floodplain Development permit applications, permit forms, variance requests, and other administrative forms should be kept current and in sufficient supply.

Notify State and FEMA of changes in corporate limits affecting SFHAs.

Most older FIRMs show only the area within the community limits. Newer FIRMs are countywide, showing both incorporated and unincorporated areas as well as North Carolina's ETJs where applicable. When boundaries change due to annexation or ETJ expansion, you need to formally advise FEMA and the

State within six (6) months of changes. Send a copy of the legal document granting such jurisdictional expansion and attach a map with the revised boundaries.

Coordinate with the NC Floodplain Management Branch and/or FEMA.

From time to time, FEMA or State personnel conduct Community Assistance Visits (or make Community Assistance Contact telephone calls). The local Floodplain Administrator is charged with preparing for and participating in these reviews which look at how the ordinance is administered, floodplain development permit records, and field conditions. This is also a chance for you to ask questions or request training or information on specific issues of interest to you and your duties as Floodplain Administrator.

Maintain and Update Flood Data and Maps. Your community should maintain an adequate supply of maps showing the regulatory floodplain for your office and the public to use. All map corrections and notices of map revisions should be recorded and denoted on administrative maps, with the details kept in an indexed file.

You should also cooperate with federal, state and local agencies, and private firms, undertaking flood studies. You must submit any new floodplain data to the FEMA Regional Office within six months of their development. Community staff should review revisions to maps (including Conditional Letters of Map Revision (LOMR), Letters of Map Amendment (LOMA) and Letters of Map Revision) to ensure they meet your community floodplain management regulations. In addition, community officials should also assist the State and FEMA in obtaining data needed to periodically update or revise the official flood maps for each community which is commonly referred to as “Scoping”.

You must notify the FEMA Regional Office and the State NFIP Coordinator within six (6) months of an annexation or ETJ expansion, or when your community has assumed or relinquished authority to adopt or enforce floodplain management regulations for a particular area. The NFIP has special procedures that need to be followed to ensure that these areas are properly mapped and regulated and remain eligible for flood insurance. [44 CFR 59.22(a)(9)(v)]

You must notify the FEMA Regional Office and the State NFIP Coordinator within six months of physical changes that can affect flooding conditions, such as channel modifications or upstream detention. [44 CFR 65.3]

Update the Ordinance. If your community is notified of changes in federal or state laws and/or regulations that would require changing your floodplain management ordinance, you must revise your ordinance within six months.

Similarly, if you are given new flood data by FEMA, you have six months to update your ordinance to adopt the flood insurance study and accompanying flood maps and the regulatory requirements appropriate for that level of flood hazard data (Chapter 7 relates the level of data to the regulatory requirements).

A certified copy of each flood ordinance revision should be submitted to the FEMA Regional Office and to the state NFIP coordinating agency promptly after adoption.



2.7 Contacts for North Carolina

Please refer to Appendix A for a full list of North Carolina Agencies and staff contacts and pertinent Website information.

Chapter 3 NFIP Flood Studies and Flood Hazard Maps

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3.1 Introduction and Background

The planning and implementation of floodplain management measures require a solid technical basis in order to effectively reduce flood damage and to ensure equitable treatment of all citizens. Information is needed on the magnitude and frequency of flooding for specific sites or areas, i.e., which areas are subject to flooding, to what depth for Zones AO and VO, and how often do floods occur. The National Flood Insurance Act of 1968 directed the Federal Insurance Administration (now part of the FEMA Mitigation Division) to:

- Identify all flood-prone areas within the United States

This chapter describes flood hazard studies and maps that pre-date Map Modernization and North Carolina's flood hazard mapping initiative.

- Establish flood risk zones within flood-prone areas

The flood hazard studies and maps prepared by the National Flood Insurance Program provide the minimum technical basis for floodplain management. The studies and maps provide sufficient technical information to:

- Enable communities to identify flood-prone areas within which they must administer the floodplain management measures required to participate in the NFIP
- Enable the NFIP to establish flood risk zones and set flood insurance premiums within each of these different flood risk zones

This chapter is valuable because even if your community has new maps, the old maps should be retained and may be needed for grandfathered development and to research earlier decisions.

Flood maps are one of the most vital parts of a floodplain management program, so it is important to understand how the flood maps were created and to be familiar with the information that is available within the accompanying flood study.

A Very Brief History of Flood Hazard Mapping. In keeping with the directive of the National Flood Insurance Act of 1968, initial flood study and mapping efforts of the NFIP were focused on identifying all flood-prone areas within the United States. Flood data and floodplain information from many sources, such as soils mapping, actual high water profiles, aerial photographs of previous floods, topographic maps, etc., were used to overlay the approximate outline of the base (100-year/1%-annual chance) floodplain for specific stream reaches on available community maps, usually U. S. Geological Survey topographic quadrangle maps. These documents were referred to as Flood Hazard Boundary Maps and were based on approximate studies. Most communities used a Flood Hazard Boundary Map when they first joined the NFIP. These approximate study maps assisted communities in the protection of floodprone development during the Emergency Phase of their NFIP participation until FEMA was able to publish a more detailed flood map to allow them to shift into the Regular Phase of the NFIP.

As the program grew and more funding was appropriated by Congress, FEMA performed studies that included more engineering analyses and detail for many communities, resulting in the publication of Flood Insurance Study (FIS) reports and Flood Insurance Rate Maps (FIRMs). In addition, many communities also

received Flood Boundary and Floodway Maps (FBFMs) along with their FIRMs. In these instances, the FIRM was primarily utilized for flood insurance purposes and the FBFMs were primarily utilized by local officials for floodplain management purposes. These detailed flood maps and studies provide communities with data needed to adopt and implement more comprehensive floodplain management measures and to enter the Regular Phase of the NFIP. FISs, also referred to as detailed studies, were prepared primarily for developed communities and for those areas experiencing rapid growth.

Today, almost every community in the NFIP has a FIRM which may contain approximate and/or detailed flood hazard analyses. The areas mapped with approximate studies are areas where, initially, there was little or no development or little expectation of development. However, development in these areas over the last couple decades has created a need for detailed studies which has driven many map revisions and helped fuel the need for North Carolina's mapping program.

While Congress appropriated general taxpayer funds for the development of flood studies in the 1970s and 1980s, during the 1990s most flood hazard area mapping activities were funded out of NFIP insurance policy service fees paid by flood insurance policyholders. Funds allocated annually for mapping were very limited and for many years very few new studies or significant revisions were funded each year. While FEMA's Map Modernization Program (Map Mod) transformed the majority of the flood hazard mapping inventory to new digital technology, the recent transition from Map Mod to Risk Mapping, Assessment, and Planning (Risk MAP) will address gaps in flood hazard data to form a solid foundation for flood risk assessments, floodplain management, and actuarial soundness of the NFIP.

After Hurricane Floyd, the State of North Carolina, through the Federal Emergency Management Agency's (FEMA's) Cooperating Technical Community partnership initiative, was designated as the first Cooperating Technical State (CTS). As a CTS, the State assumes primary ownership and responsibility of the Flood Insurance Rate Maps (FIRMs) for all North Carolina communities with the exception of Mecklenburg County as part of the National Flood Insurance Program (NFIP). Mecklenburg County is a separate Cooperating Technical Partner (CTP) with FEMA. This project includes conducting flood hazard analyses and producing updated, digital FIRMs (DFIRMs) for all 17 river basins in the state.

3.2 Basic Flood Study Terminology

Some of the common terms used in floodplain analysis and in the National Flood Insurance Program (NFIP) need to be explained before learning more about flood studies and maps.

Floods come in many sizes — with varying degrees of magnitude and frequency — and all bodies of water have floodplains. However, each body of water has its own flooding characteristics that are a function of several variables. Probability is a statistical term having to do with the size of a flood and the odds of that size of flood occurring in any year.

The term "100-year flood" has caused much confusion for people who are not familiar with statistics. Another way to look at flood risk is to think of the odds that a 100-year flood will happen during a specific period of time, such as during the life of a 30-year mortgage. There is at least a 26% chance that floodwaters will reach the BFE and cover the entire floodplain during any 30-year period while impacting structures in the SFHA.

Chance of Flooding over a Period of Years

Time Period	10-year	25-year	50-year	100-year
1 year	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%

Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is located close to the water it may be exposed to frequent flooding as well as low probability events. For example, the odds are 96% (nearly guaranteed) that a house in the 10-year floodplain will be hit by a 10-year flood during a 30-year period. Compare those odds to the only 5 to 6% chance that the house will catch fire during the same 30-year period!

Table 3-1. WHAT ARE THE ODDS OF BEING FLOODED?

Base Flood. In order to have common standards necessary for assessing risk on a uniform basis and to establish flood insurance rates, the NFIP adopted a baseline probability called the base flood, defined as "the flood having a one percent chance of being equaled or exceeded in any given year." The base flood is also called the 1%-annual chance flood. It is the national standard used by the NFIP and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating development.

The base flood is a statistical concept denoting the average length of time between floods of this magnitude. The term **does not** mean that this flood will occur only once every 100 years. It is a flood which, over a very long period of time, can be expected to occur, on an average, once in each 100 years, although the flood may occur in any given year. As North Carolinians should be well aware of, the 100-year flood could conceivably occur more than once in a year, two or three years in a row, or it may not occur for several hundred years. Because this can be confusing, the NFIP program uses the terms “base flood” and “1%-annual chance flood”. The elevation to which floodwater is anticipated to rise during the base flood is the base flood elevation (BFE).

The 1%-annual chance flood was chosen as a compromise between a more frequent flood (such as a 10%-annual percent chance flood – 10-year flood), which would permit excessive exposure to flood risk, and a more infrequent flood (say a 0.1%-annual chance flood – 1000-year flood), which would be considered an excessive and unreasonable standard for the purposes of regulating new development and requiring flood insurance.

100-Year Flood. The 1%-annual chance flood is also called the 100-year flood because the inverse of one percent (one divided by one percent or 0.01) equals 100. This calculation gives us the flood's recurrence interval, in terms of probability, which is 100 years.

The term “100-year flood” is often misconstrued. Many people interpret the 100-year flood definition to mean “once every 100 years.” This is wrong. You could experience a 100-year flood two times in the same year, two years in a row, or four times over the course of 100 years. You could also not experience a 100-year flood over the course of 100 years, 200 years, or an even longer period of time. To restate, “100-year flood” and “base flood” both refer to a flood that has a 1% chance (one out of 100) of occurring in any given year. The terms are often used interchangeably.

Special Flood Hazard Area. The land area covered by the floodwaters of the base flood is shown on the NFIP maps as the Special Flood Hazard Area (SFHA). The SFHA is designated as Zone A, AE, A1-30, AO, AH, AR, A99, V, VE, VO or V1-30 on a community's flood map(s) depending on the amount of flood data available, the type or severity of the flood hazard, or the age of the flood map (see the discussion of flood zones later in this chapter and in Table 3-2 for more information). The SFHA is the area within which floodplain management regulations must be enforced by the community as a condition of participation in the NFIP. In addition, these areas are where the mandatory

flood insurance purchase requirement applies regardless of the community's participation in the NFIP.

Base Flood Elevation. The computed elevation to which floodwater is anticipated to rise during the base flood is the Base Flood Elevation (BFE).

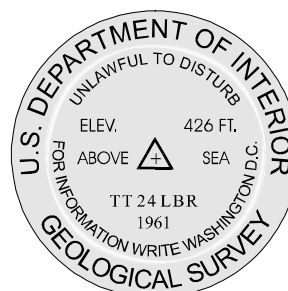
Table 3-2. Flood Zones that may appear on FIRMs.

Zone	Description
Zone A and AE	The 100-year or base floodplain. There are six types of A Zones: A The base floodplain mapped by approximate methods, <i>i.e.</i>, BFEs and floodways are not determined. This is often called an unnumbered A Zone or an approximate A Zone. A1-30 These are known as numbered A Zones (<i>e.g.</i>, A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format) and floodway if applicable and if studied. AE The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones and floodway if applicable and if studied. AO The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided. Depth is 2 ft if not provided on flood map. AH Shallow flooding base floodplain. BFEs are provided. A99 Area to be protected from base flood by levees or Federal Flood Protection Systems under construction. BFEs are not determined. AR The base floodplain that results from the decertification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection.
Zone V and VE	V The coastal area subject to a velocity hazard (wave action) where BFEs are not determined on the FIRM. VO The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided. Depth is 2 ft if not provided on flood map. VE The coastal area subject to a velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and	Area of moderate flood hazard, usually the area between the

Zone X (shaded)	limits of the 100-year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile. <u>B Zones are no longer used in NC.</u>
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood. <u>C Zones are no longer used in NC.</u>
Zone D	Area of undetermined but possible flood hazards. <u>D Zones are no longer used in NC.</u>

About Datums and Elevations. During the 1920s, the U.S. government created a network of 21 tidal gages in the U.S. and five in Canada to provide a fixed continental datum that would bring a consistent relationship to all vertical elevation determinations in the U.S. This datum was known as the Mean Sea Level (MSL) Datum of 1929 and was the base elevation to which all relief features and elevation data were referenced in the contiguous United States. In 1973, to avoid confusion in many communities that used a local mean sea level datum, the name was changed to the National Geodetic Vertical Datum (NGVD) of 1929. NGVD is also the datum of reference for the vast majority of older FISs.

Most permanent elevation reference marks (or bench marks) are referenced to the NGVD (see graphic). For many purposes, including the preparation of FISs, additional benchmarks may be set. Benchmarks are not always brass caps; they can be chiseled squares or other designated markers left by surveyors. Lists of benchmarks may be available in the local public works or



engineer's office or by contacting the North Carolina Geodetic Survey or the National Geodetic Survey. Eventually the NFIP will convert all FISs to a newer standard called the North American Vertical Datum (NAVD) of 1988 which will eliminate inconsistencies caused when the NGVD is not consistent at all 26 tidal stations. **All flood maps produced under the North Carolina's floodplain mapping program are referenced to NAVD 1988.**

When reporting elevations for structures, cross sections, or topographic mapping, it is very important to note the datum to which the survey is referenced. Differences between NAVD 88 and NGVD 29 vary by as much as – 1.5 feet along the east coast of southern Florida to + 4.9 feet in the Rocky Mountains of Colorado. In North Carolina, this datum conversion difference is about a foot at the coast and it zeros out in the mountains. Software for converting between NAVD 88 and NGVD 29 is available from the NC Geodetic Survey or the National Geodetic Survey.

There are now 15, 434 benchmarks associated with the NAVD of 1988 (see *Flood Insurance Study: Guidelines and Specifications for Study Contractors*, FEMA 37). Refer to <http://www.ncgs.state.nc.us/> for more information on North Carolina benchmarks.

DATUM INFORMATION

The **projection** used in the preparation of this map was the North Carolina State Plane (FIPZONE 3200). The **horizontal datum** was the North American Datum of 1983, GRS80 ellipsoid. Differences in datum, ellipsoid, projection, or Universal Transverse Mercator zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdictional boundaries. These differences do not affect the accuracy of this FIRM. All coordinates on this map are in U.S. Survey Feet, where 1 U.S. Survey Foot = 1200/3937 Meters.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. An average offset between NAVD 88 and the National Geodetic Vertical Datum of 1929 (NGVD 29) has been computed for each North Carolina county. This offset was then applied to the NGVD 29 flood elevations that were not revised during the creation of this statewide format FIRM. The offsets for each county shown on this FIRM panel are shown in the vertical datum offset table below. Where a county boundary and a flooding source with unrevised NGVD 29 flood elevations are coincident, an individual offset has been calculated and applied during the creation of this statewide format FIRM. See Section 6.1 of the accompanying Flood Insurance Study report to obtain further information on the conversion of elevations between NAVD 88 and NGVD 29. To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the North Carolina Geodetic Survey at the address shown below. You may also contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at www.ngs.noaa.gov.

North Carolina Geodetic Survey
121 West Jones Street
Raleigh, NC 27601
(919) 733-3836
www.ncgs.state.nc.us

County Average Vertical Datum Offset Table

County	Vertical Datum Offset (ft)
Harnett	– 0.82
Wake	– 0.88

Example: NAVD 88 = NGVD 29 + (–0.82)

Figure 3-1. Example of North Carolina Datum Conversion on Located on FIRM Panels in the Upper Left Corner

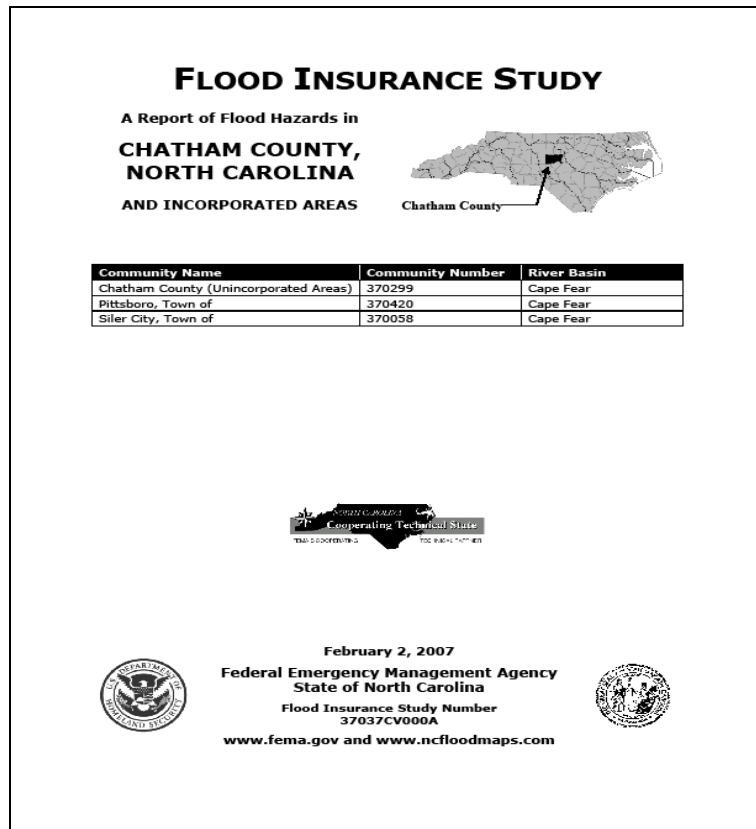
BM5510	×	North Carolina Geodetic Survey bench mark
BM5510	⊗	National Geodetic Survey bench mark
BM5510	◊	Contractor bench mark (approved by NCGS)

Figure 3-2. Example of NC Benchmark Information Located on the Legend on the FIRM Panel

3.3 The NFIP Flood Insurance Study (FIS)

When a flood study is completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). The FIS is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas. The FIS report and associated maps delineate the SFHA, designate flood risk zones, and establish base flood elevations. They serve as the basis for rating flood insurance and for regulating floodplain development and carrying out other floodplain management measures.

The FIS reports prepared by the NFIP include:



- An appraisal of the community's flood problems in a narrative that describes:
 - the purpose of the study,
 - historic floods,
 - the area and flooding sources studied, and
 - the engineering methods employed.
- A vicinity map of the community and, occasionally, photographs of historic floods.
- Tables summarizing various flood hazard data.
- For riverine bodies of water, computed and graphed flood profiles for various recurrence probabilities, usually the 10%-annual, 2%-annual, 1% annual, and 0.2%-annual chance floods
- For coastal bodies of water, tables of flood elevations for various recurrence probabilities.

3.4 Types of Flood Studies

As noted in Section 1.3, there are different types of flood hazards. Consequently, there are different types of flood studies and different types of analyses are used for different types of flooding:

- Riverine flooding of rivers, streams or other waterways that flow under the influence of gravity,
- Lacustrine flooding of lakes and ponds,
- Coastal flooding caused by hurricanes or severe storms, and
- Shallow flooding, ponding, and sheet flow.

There are other types of flooding, such as alluvial fans, ice jams, and mudflows. This chapter does not cover how areas subject to these flood hazards are studied because each situation is unique. If your community is exposed to these unusual hazards, please refer to FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners* Appendix F for ice jams and Appendix G for alluvial fans. See the Code of Federal Regulations (CFR) Appendix E of the NFIP Regulations for information on mudflows.

3.5 Riverine Flood Studies

Riverine flooding occurs in waterways that are subject to overbank flooding, flash floods, and urban drainage system flooding. Riverine studies involve,

among other factors, the collection and analysis of information about the waterway's watershed and precipitation regime, the many variables that influence the volume of runoff from the land (hydrology) and the characteristics of the waterway and the topography of the land along the waterway that affect how high floodwaters will rise as reflected in surveyed cross sections (hydraulics).

Hydrology. Hydrology is the science dealing with the distribution and circulation of water in the atmosphere, on land surfaces and underground. Rainfall that eventually reaches a waterway is called "runoff." Hydrologic studies are used to determine the amount of runoff that flows down a waterway from a specific magnitude rainfall event (10-year, 100-year , etc) This amount of runoff is then input into the *Hydraulic* model (below) to determine the height and width of the floodwaters which are eventually shown on the FIRMs.

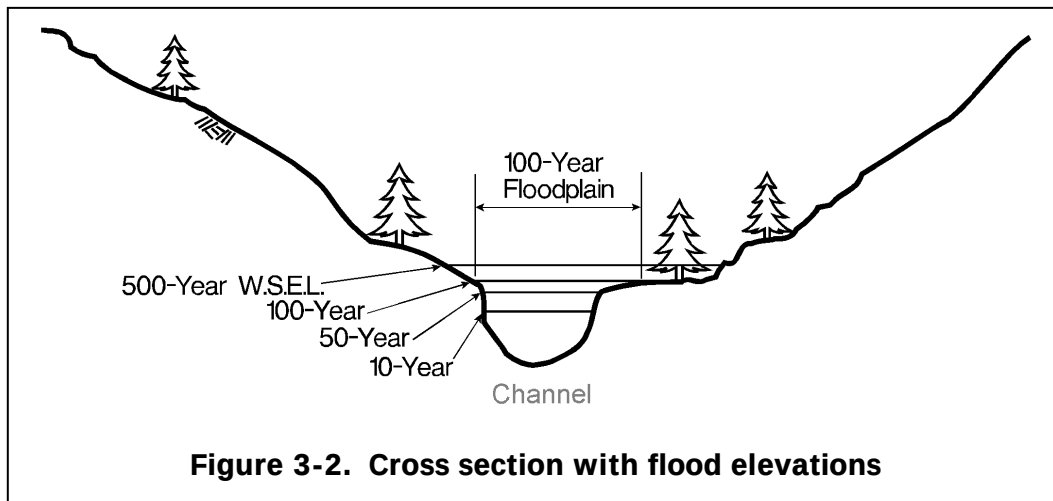
Runoff that collects in the waterway and flows downstream is called "discharge" and is measured in cubic feet per second (cfs). A cubic foot of water is approximately 7.5 gallons.

Flood discharges are calculated by utilizing hydrologic computer programs that perform hydrological analysis utilizing information from historical stream records, rainfall and snowmelt data, ground cover, topography, and slope. Runoff varies depending on the ground characteristics. For example, more runoff flows off of steeply sloped lands, from unforested land, and from paved and built-on urban lands.

In areas where measurements of stream flows have been taken at stream gages over long periods of time, those records may be used to statistically predict flood discharges.

Hydraulics. Hydraulics is the study of moving fluids. Hydraulic analysis combines the flood hydrology (discharge) and the shape of the land along the waterway (see Cross Section, below in Figure 3-2) to estimate how fast the floodwaters will move downstream and how high the water will rise at any given point. The data are usually processed using a computer model, most commonly HEC-2 or HEC-RAS, which were developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center.

The result of the hydraulic analysis is the determination of the elevation of one or more flood levels (Figure 3-2). Most riverine Flood Insurance Studies (FISs) include information for the 10-(10%-annual), 50-(2%-annual), 100-(1%-annual), and 500-year (0.2%-annual) floods. Some Flood Insurance Studies also include the 100-year (0.1% annual) Future conditions floods.



Changes in hydraulic conditions of a waterway usually occur where bridges and culverts are constructed, and when there are changes in the physical characteristics of the waterway. Upstream flood levels can be impacted by structures during storm events exceeding the structure's design parameters. Although most bridge openings and culverts are designed to allow stream flows associated with smaller, frequent storm events to pass without such backwater effects, they may still cause increases in flood levels for larger, infrequent events. Therefore, bridges and culverts constructed after the analyses for the effective FIS and FIRM were completed should be evaluated for their potential effect on the base flood and the associated floodway or non-encroachment area. In addition, any significant changes in the stream channel or floodplain

geometry (e.g., channel relocation or large fills or excavations) could affect the floodplain and floodway or non-encroachment area.

The hydraulic analysis requires that cross sections (depicting the floodplain geometry) be included in the model at certain intervals along the stream reach (see below). The hydraulic analyses produce determinations of flood elevations, velocities, and floodplain widths at each of these cross section for a range of flood flow frequencies. These elevations are the primary source of data used to map the floodplain.

A FIS prepared for the NFIP typically produced elevations for the 10%-annual, 2%-annual, 1%-annual, and 0.2%-annual floods. While the elevation of the base flood is used to regulate development, elevations for other flood frequencies may be used for other floodplain management purposes. For example, the 10%-annual flood data may be used for locating septic systems, the 2%-annual flood for placing bridges and culverts, and the 0.2%-annual flood for siting critical facilities, such as hospitals or emergency operation facilities.

Cross Section. The surveyed cross sections and other survey and field information are the building blocks of the hydraulic analysis and mapping efforts. All detailed riverine flood studies examine the areas through which floodwaters will flow. This requires a determination of ground elevations and obstructions to flow (such as vegetation, buildings, bridges, culverts, and other development). Accurate data on the channel geometry, channel and overbank roughnesses, slope of the channel, and changes in the floodplain are obtained from ground surveys, aerial photography, or topographic maps.

To determine the elevations at a site referenced to a vertical datum, a cross section is surveyed. A cross section is a graphical depiction of the waterway and the adjacent land at a particular point along the stream. It is taken at right angles to the anticipated direction of flow. At each cross section, the engineer has accurate information on the size and geometry of the channel, the shape of the floodplain, and the changes in the elevation of the ground. A typical surveyed cross section is shown above in Figure 3-2.

Cross sections are taken at locations along the waterway to capture data that are representative of local conditions. Cross sections are taken at each bridge or other major obstruction and at other locations, depending on how much the stream or adjacent floodplain conditions change (Figure 3-3a and 3.3b). The more changes there are in topography the more cross sections are needed to define the floodplain with sufficient detail. The surveyors and engineers also

estimate the roughness factors along the floodplain to determine how fast floodwater will flow through the area. Roughness factors are related to ground surface conditions, and they reflect changes in floodwater velocity due to ground friction. For example, water will flow faster over mowed grass and pavement than it will over an area covered in bushes and trees.

Numerous cross sections that are surveyed along a waterway are used in the hydraulic models to compute the anticipate water surface elevations for different frequency flood discharges. Taken together, those elevations are used to produce the flood profile (see Figure 3-4).

Older cross sections have typically been reference alphabetically from the mouth of a stream continuing upstream. The NCFMP has taken this a step further by numbering these cross sections with numbers that represent the number of hundreds of feet from the mouth or confluence of the stream, river or other watercourse. This numbering system assists the readers in interpreting the flood map data provided.

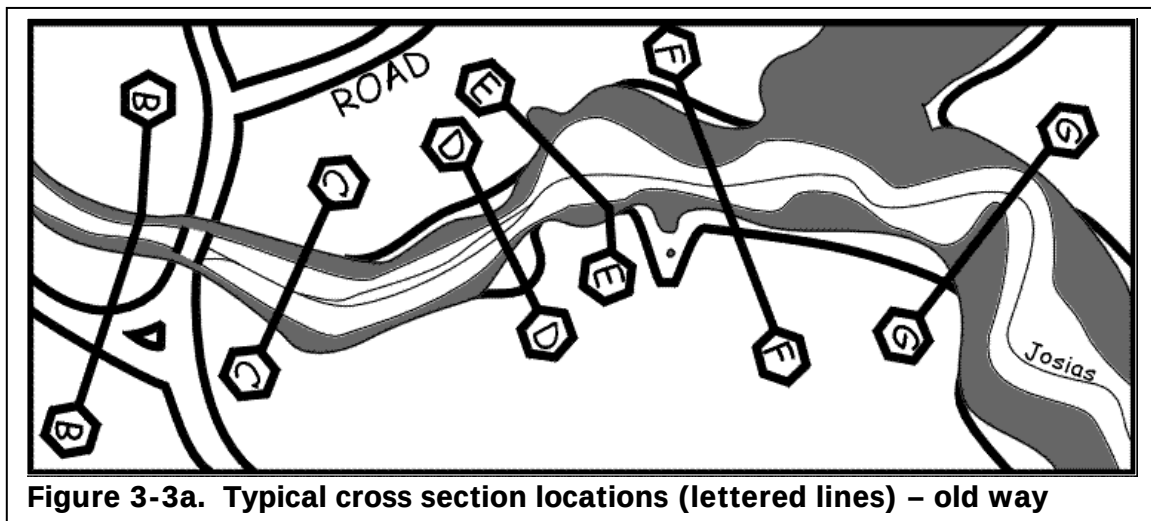


Figure 3-3a. Typical cross section locations (lettered lines) – old way

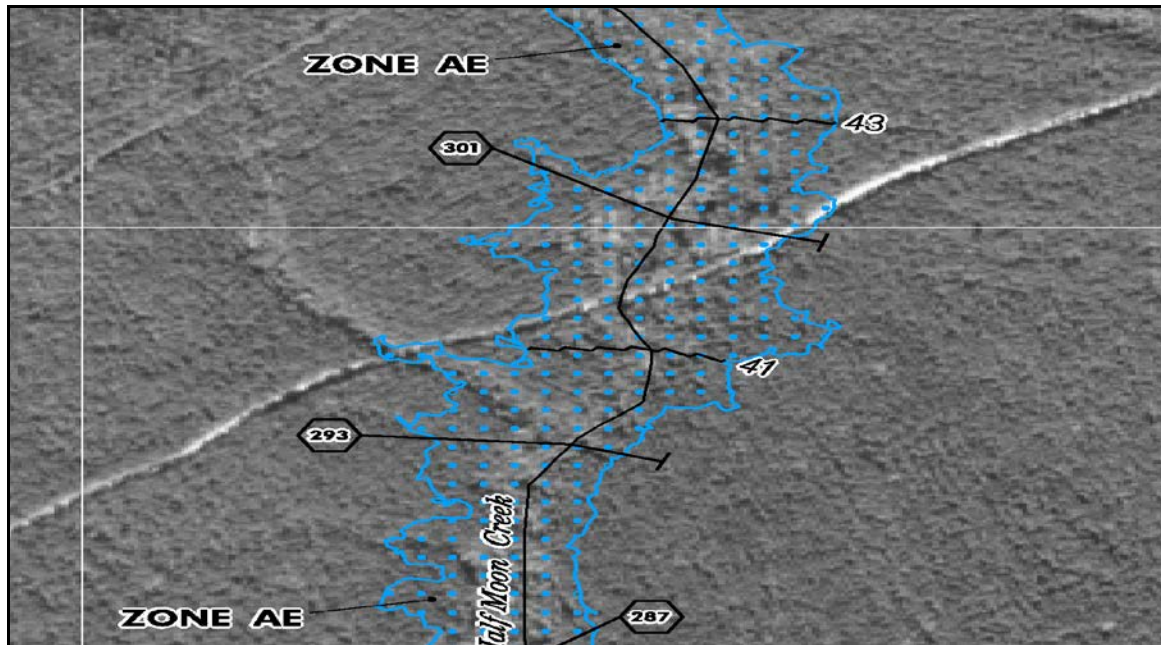


Figure 3-3b. Typical cross section locations (numbered lines) – new way

Flood Profile. Hydraulic computer programs generate anticipated water surface elevations at each cross section. To draw the boundaries of the flood hazard area, those elevations are plotted on a topographic map and connected using interpolation (Figure 3-3c). For floodplain management purposes, water surface elevations at locations between the cross sections need to be determined as well. This is facilitated by plotting the elevations at the cross sections on a graph and connecting the plotted points, this graph is called a flood profile. Figure 3-4 shows a portion of an example flood profile. Similar profiles are found in the back of riverine FISs.

The bottom of the graph (the horizontal axis or x-axis) shows the distance along the waterway (commonly called stationing). To assign stationing, you start at the mouth or confluence of a stream (its point of discharge into a larger body of water) and look upstream. When profiles are plotted on the graph the slope of the streambed rises from left to right.

River distances are measured in either feet or miles (1 mile = 5,280 feet), or meters and kilometers (1 kilometer = 1000 meters). For most profiles, the distance is measured above the mouth of the waterway, above its confluence (where it meets with another waterway), or above the boundary of the community.

The left and right sides of the graph (the vertical axis or y-axis) show elevations in feet referencing a vertical datum such as NGVD 1929 in older

studies and NAVD 1988 in newer NC studies. The legend at the bottom right corner shows the symbol for each flood profile plotted. Bridges are indicated with an “I” shaped symbol where the bottom of the “I” represents the bridge’s low chord (lowest beam) and the top of the “I” represents the top of the roadway or the top of a solid bridge railing.

Additional information is provided on the profiles, such as corporate limits, major roadways and confluences of smaller streams. Profiles also provide information about other waterway characteristics, such as steep sections of the streambed and where restrictive bridge openings cause floodwaters to back up (see Creek Ridge Road and Randleman Road in Figure 3-4).

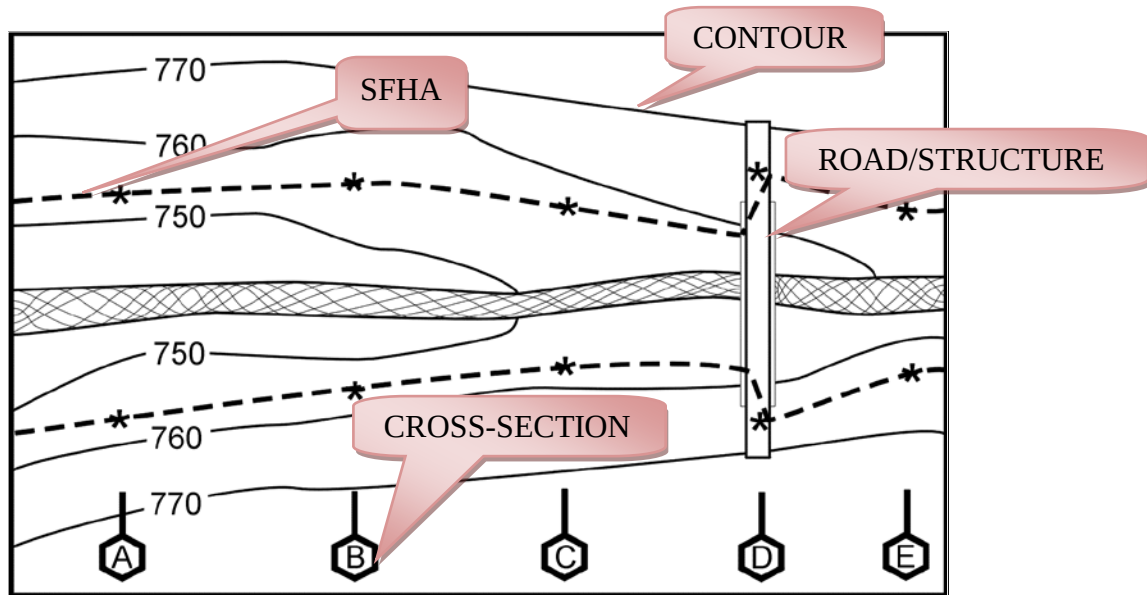


Figure 3-3c. Interpolating flood elevations between cross sections

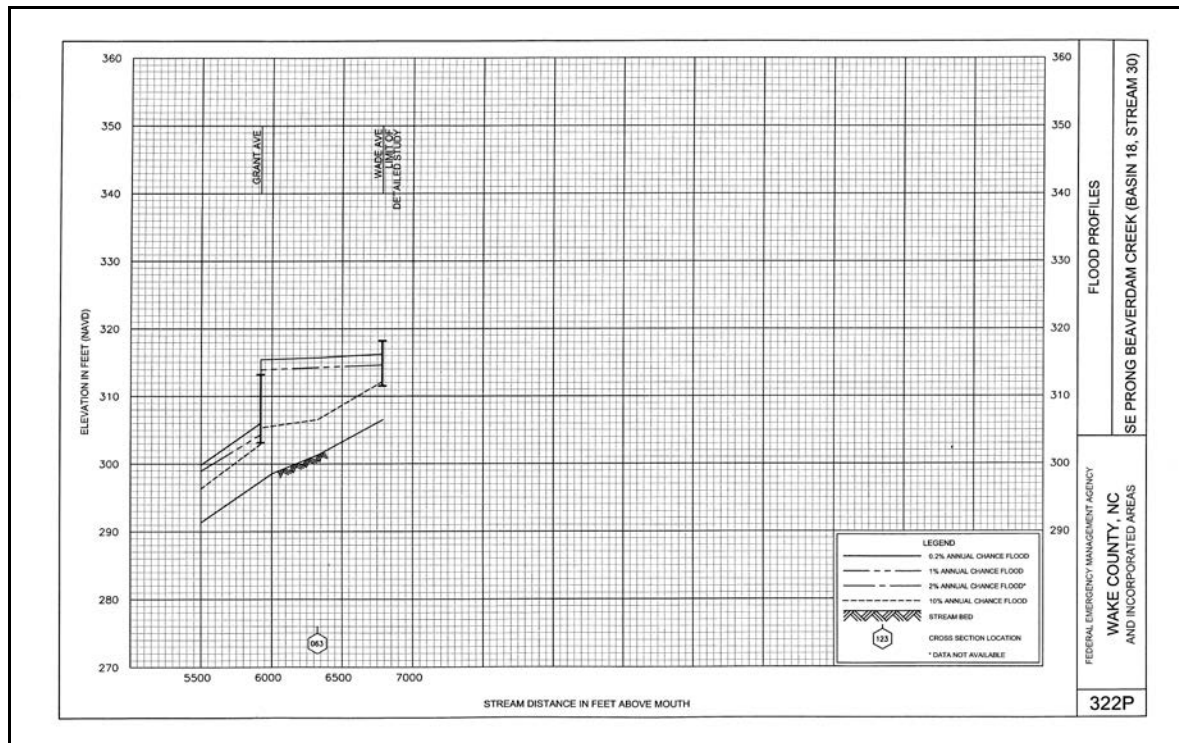


Figure 3-4. Example of North Carolina Flood Profile

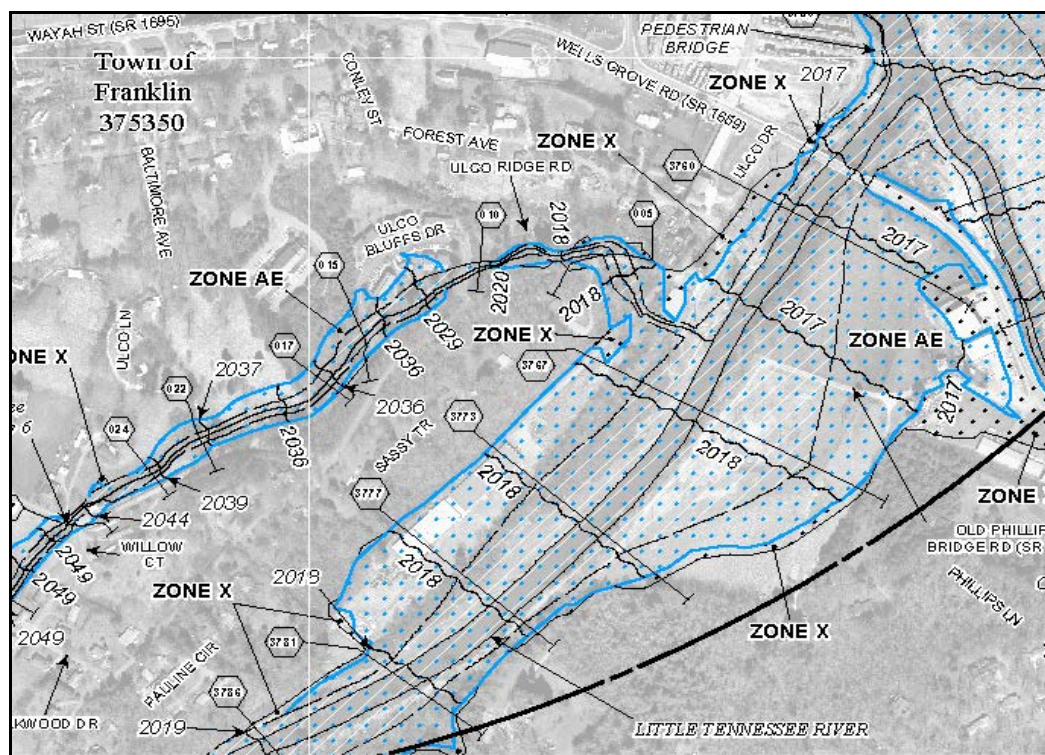
Flood Hazard Map. The next step in the mapping process is to transfer the flood elevation data onto a base topographic or contour map that shows ground elevation data. For most older-style flood hazard maps prepared for the NFIP, the most commonly used topographic maps were produced by the U.S. Geological Survey. Some communities prepared their own topographic maps and provided them to FEMA during the study process to improve the accuracy of their floodplain maps.

Since 2000, North Carolina has been using Light Detection and Ranging (LiDAR) in their mapping process. LiDAR uses a laser range finder in specially equipped aircraft to develop 3D coordinate points that is converted into topographic data used by the mapping process. For more information on LiDAR for North Carolina mapping, please refer to the Issue Papers at this link: http://www.ncfloodmaps.com/issue_papers.htm.

Some newer techniques to enhance the mapping process for North Carolina include 3D Triangular Irregular Networks (TINs). TINs are vector-based representations of the ground or surface used in the Geographic Information System (GIS) process. For more

information on TINs used for North Carolina mapping, please refer to the Issue Papers at this link: http://www.ncfloodmaps.com/issue_papers.htm.

The base flood elevations from the hydraulic models computed at the cross sections are plotted on the topographic map. Floodplain boundary lines are drawn by connecting these plotted points using the contour lines as a guide. The completed map shows the Special Flood Hazard Area (Figure 3-5).



flood profile to resolve the matter by locating the flood elevation on the ground via an elevation survey. If the ground elevation is higher than the BFE, then it may meet the requirements of the local Flood Damage Prevention Ordinance (FDPO) without a LOMA. The LOMR may be required by the lending institution if the owner wants the mandatory purchase requirement lifted.

Floodway/Non-encroachment Analysis. An important part of the detailed study process for riverine waterways is preparation of the floodway analysis which identifies where encroachment by development will increase flood elevations more than a specified amount, worsening the effects of flooding. This specified amount, called a surcharge, cannot be greater than one foot. A surcharge of one foot is typically utilized unless the community decides on a more restrictive surcharge value such as 0.5' or 0.1'. In addition to the normal floodway analysis, many streams in North Carolina include rough estimate floodways which are called **non-encroachment areas**. These non-encroachment areas are not fine tuned (or optimized) to reach the maximum one foot surcharge allowed so they are often wider than a more detailed floodway would show. **Floodplain maps and studies in other states do not include non-encroachment areas.**

The floodway or non-encroachment area is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood. Floodwaters generally are deepest and swiftest in the floodway, and anything in this area is likely to be exposed to the most significant flood forces.

A floodway analysis determines the boundaries of the floodway or non-encroachment area using these floodplain management concepts:

- Continued development in the floodplain will likely further obstruct flood flows, which will back water up or divert it to other properties.
- Properties on both sides of a waterway and upstream and downstream of a site should be treated equitably – the degree of encroachment permitted for one property should be permitted for others.
- Property owners should be allowed to develop their land, provided they do not obstruct flood flows, do not increase base flood depths by more than one foot over the effective value per FEMA requirements, and do not increase damage or create a nuisance to others. Some local communities in North Carolina enforce stricter surcharge requirements.

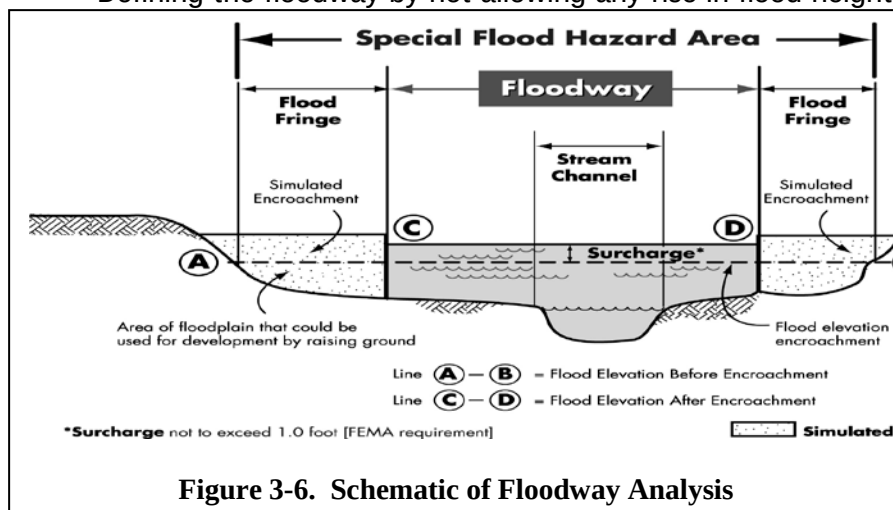
When floodway analyses are prepared, a community may request that a more restrictive standard be applied, such as 0.5-foot or 0.1-foot surcharge, resulting in wider floodways and less area in the flood fringe.

A floodway analysis is done with a computer modeling program that can make the necessary calculations of the effects of incremental encroachment or development (Figure 3-6). Beginning at both edges of the floodplain, the computer model starts incrementally “filling” the floodplain. This “squeezes” the floodwater toward the channel and causes the flood level to rise. The NFIP requires that at the point where this process produces not more than a one-foot rise or surcharge at any point along a reach, the floodway boundaries are drawn. The floodway boundaries at each cross section are transferred to the topographic or contour map based on data obtained from the hydraulic model showing the left and right distances from stream centerline to locate the floodway. Floodways boundaries are to be located inside the SFHA boundaries. Not every cross section will show a one-foot rise. Topographic conditions and the need to “smooth out” the floodway line will result in some cross sections having increases of less than one foot.

Non-encroachment areas in NC, they are not fine tuned to reach the maximum one foot surcharge allowed so they are often wider than a typical detailed floodway. These non-encroachment areas are regulated the same as floodways but they are not mapped graphically on the flood maps. Instead, the study information for these non-encroachment areas is provided in the FIS in a table providing offset distances left and right of the stream centerline at each cross section. Since non-encroachment areas are produced by the same methodology as floodways, they are upgradeable products. Therefore, non-encroachment areas may be fine tuned by an engineer or through a map maintenance process to show full detailed floodways on a map revision in the future.

Allowing flood heights to rise up to one foot is a compromise standard.

Defining the floodway by not allowing any rise in flood heights would result in

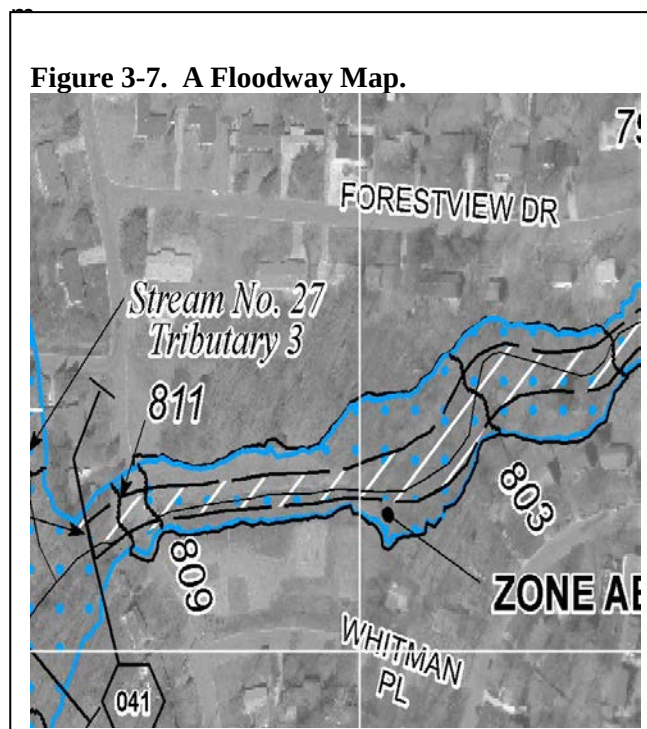


very broad floodways encompassing the entire floodplain leaving no flood fringe areas for development which will significantly limit most

types of new development or redevelopment. On the other hand, allowing development to cause significant increases in flood heights can cause great problems for others in the future, as well as increase the potential financial burden on the insurance side of the NFIP.

A floodway analysis should be prepared with close coordination between the modeling engineer and those who are responsible for community planning and floodplain management. The number of possible floodway or non-encroachment area configurations is almost limitless – the line on one side of the waterway may be determined in advance while the line on the other side is set by the modeling routine. Therefore, in choosing a regulatory configuration, the interests of individual property owners and the community as a whole must be weighed.

The area of the floodplain outside of the floodway or non-encroachment area is called the **flood fringe**, where flood waters may be shallower and slower. The floodway or non-encroachment area and the flood fringe together comprise the base floodplain or special flood hazard area (Figure 3-7). On the flood map these special flood hazard areas will be designated as Zone AE. NFIP minimum standards provide that flood fringe areas outside the boundaries of the floodway or non-encroachment area can be developed without further analysis provided they meet all the community's floodplain regulations. Although many communities elect to prohibit or limit the types of development in floodways or non-encroachment area, the NFIP specifies that development



the applicant certifies and demonstrates through engineering analyses that no impact in the base flood elevation will occur.

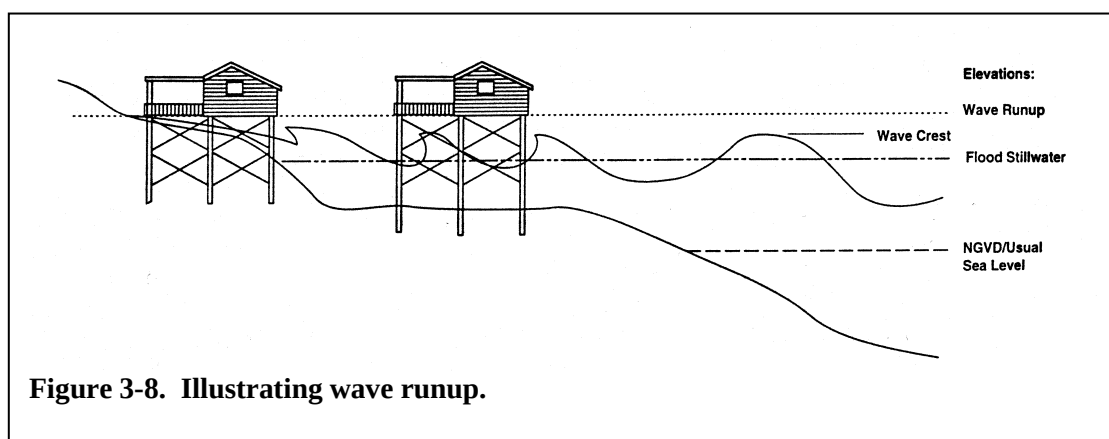
3.6 Coastal Flood Studies

Coastal flood studies are conducted for communities where the source of flooding is a tidally-influenced body of water such as the Atlantic and Pacific Oceans, Coastal Sounds, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea. Coastal studies are used to establish a base flood and a SFHA, but they may also designate a coastal high hazard area that is subject to high velocity wave action (V Zone). Many coastal communities, particularly counties, may also have riverine floodplains (with or without designated floodways or non-encroachment areas).

Storm Surge. Most coastal floods are caused by coastal storms such as tropical cyclones (tropical depressions, tropical storms, and hurricanes) and Nor'easters. Such storms bring air pressure changes and strong winds that "pile" water up against the shore in what is called a storm surge. Computer simulations of coastal storms are developed based on data from past storms, including wind speeds, wind direction, and air pressure from historical hurricanes and Nor'easters. The resulting surge elevations are then calibrated using historical information so the probabilities for each event can be determined. The coastal storm surge computer program produces stillwater flood elevations and anticipated wave heights.

Waves. In addition to storm surge, wave action is an important aspect of coastal storms. Wind-driven waves produce velocities and impacts that may cause significant structural damage, shoreline erosion, and local scour. The coastal flood study analyzes how high the wave crest elevation will be above the stillwater elevation as water is driven onshore.

When waves hit the shore, water is moving with such force that it keeps traveling inland, called wave runup. Wave runup occurs when land areas that are higher than the stillwater elevation are flooded (Figure 3-8). Wave setup is defined as the additional elevation of the water surface over normal surge elevation caused by onshore mass transport of the water by wave action. Wave setup is a function of deepwater wave height and duration.



Hydraulic Analysis. The coastal hydraulic analysis determines where moving water goes. Transects are surveyed along the coastline to determine the land contour (example of transect locations is shown in Figure 3-9). Coastal transects serve a similar function to riverine cross sections in the hydraulic model, however, where cross sections are surveyed perpendicular to the flow of water, transects are surveyed perpendicular to the shoreline (general parallel to the flow of water). A transect shows the elevation of the ground both onshore and offshore. The elevation data are used by computer programs to determine the expected height of the wave crests and runup above the storm surge. A transect schematic is shown in Figure 3-10.

Underwater topography, called bathymetry, and the shapes and locations of coastal islands, headlands, estuaries, harbors, and other coastal features are also taken into consideration in determining flood elevations. The official BFE is the stillwater elevation plus wave runup, or the wave crest elevation, whichever is greater. The resulting BFE can be many feet higher than the stillwater elevation. Obstructions such as dunes or buildings break the waves, dissipating wave energy so that wave height and BFEs are reduced inland. Figure 3-10 shows that as water moves inland, the waves break and the base flood elevation (including wave effects) is reduced while the stillwater elevation stays the same.

It is important to remember that there is nothing magic about a flood boundary or flood zone line that is drawn on a map. Most storms differ from the base flood in many respects. When a storm comes onshore, the waves will not stop where the V Zone line is drawn. Indeed, inland of the V Zone boundary waves less than 3-feet are expected. Recent laboratory research and post-hurricane field investigations indicate that considerable damage is caused by waves of just 1.5-feet. The flood hazard area between the V Zone and the inland extent where waves drop below 1.5-feet is called the "Coastal A Zone." Coastal A

Zones not only have waves, but often have fast moving water that can cause considerable transport of sand or scour.

Other commonly used models include Wave Height Analysis for Flood Insurance Studies (WHAFIS) and the Coastal Hazard Analysis Modeling Program (CHAMP). WHAFIS is a DOS-based program that used representative transects to compute wave crest elevations in a given study area. CHAMP is a Windows-interfaced Wave Runup Analysis program.

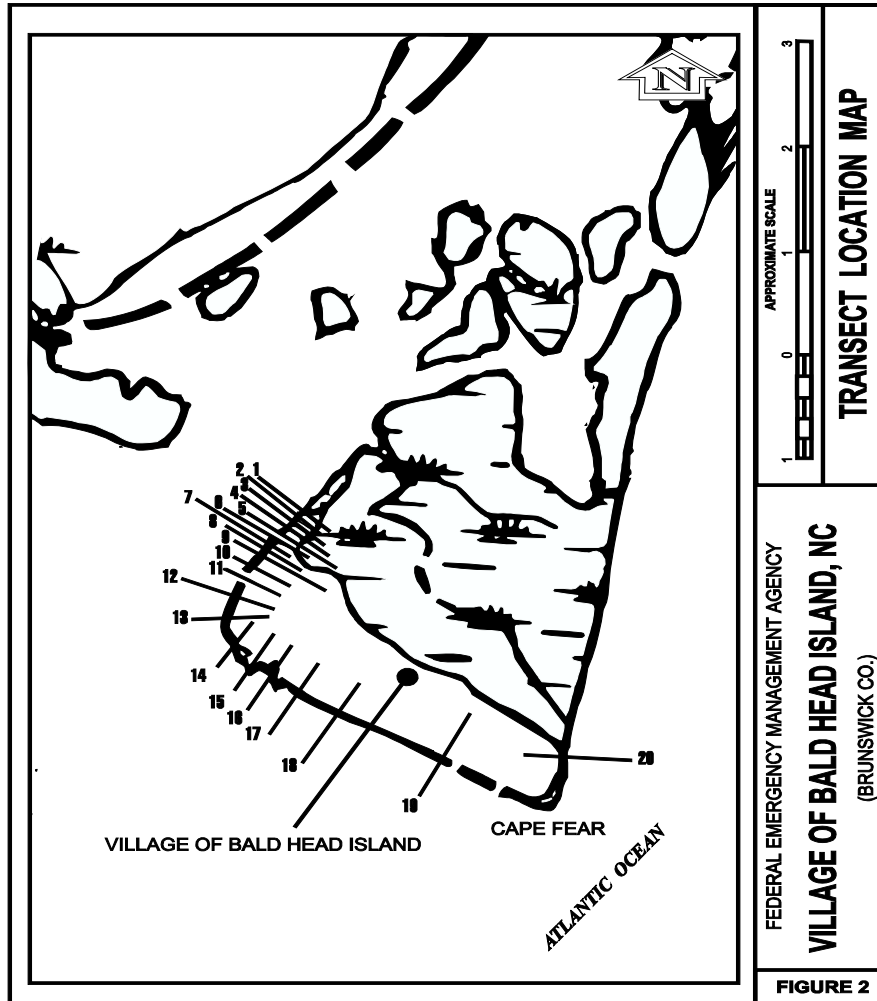
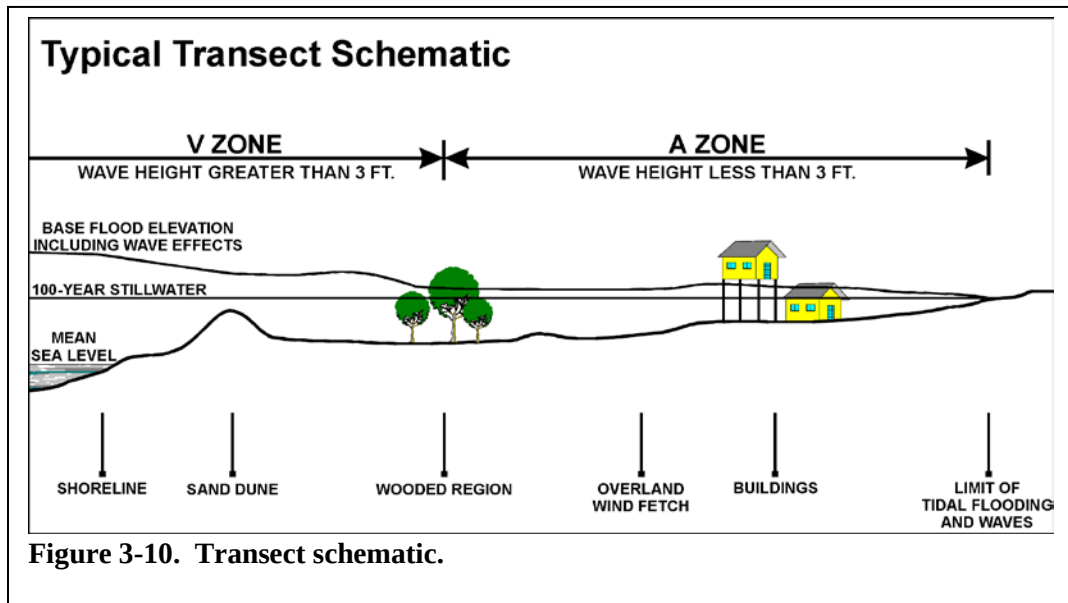


Figure 3-10. Transect Location Map.



Coastal High Hazard Area (V-Zone). Waves pack a lot of power. Much more destructive than standing water or slow-moving water, the force of waves increases dramatically with height. For the purposes of the NFIP, the flood study identifies the coastal high hazard area as that most hazardous part of the coastal floodplain, due to its exposure to wave effects. This is typically the area between the shoreline and the most landward of the following points:

- Where the computed wave heights for the base flood are three feet or more,
- The inland limit of the primary frontal dune, or
- Where the eroded ground profile is three feet below the computed runup elevation.

The three-foot wave height threshold was selected because a three-foot wave generally carries enough energy to break a wall panel away from a floor to which it has been nailed. Recent research and post-hurricane inspections suggest that waves of just 1.5-feet cause significant damage – see Chapter 5 to learn more about the Coastal A Zone.

Coastal high hazard areas are designated on the FIRM as V Zones, where the “V” stands for “velocity wave action.” V Zones are subject to more stringent regulatory requirements and a different flood insurance rate structure because they are exposed to an increased degree of risk. Coastal flood hazard areas not within the coastal high hazard area are mapped as A Zones (see Figure 3-11).

Flood Hazard Map. The next step in the mapping process is to transfer the flood elevation data and zones onto a base topographic or contour map that shows ground elevation data. Flood elevations are interpolated between

transects and floodplain boundary lines are drawn by connecting these plotted points using the contour lines as a guide. The completed map illustrates the Special Flood Hazard Area (Figure 3-11). For most older flood hazard maps prepared for the NFIP, the most commonly used topographic maps were produced by the U.S. Geological Survey. Some communities prepared their own topographic maps and provided them to FEMA during the study process to improve the accuracy of their floodplain maps.

Since 2000, North Carolina has been using Light Detection and Ranging (LiDAR) in their mapping process. LiDAR uses a laser range finder in specially equipped aircraft to develop 3D coordinate points that is converted into topographic data used by the mapping process. For more information on LiDAR for North Carolina mapping, please refer to the Issue Papers at this link: http://www.ncfloodmaps.com/issue_papers.htm.

It is important to remember that precision of the flood hazard map boundaries is dependent upon the topographic map on which they are drawn. Since the USGS topographic quadrangle maps have such a small scale, the SFHA boundaries plotted on them have considerable error that is a direct function of the topography. This is important to remember when determining if a building location or proposed building site is in or out of the floodplain. It may be important to use other information, such as a locally prepared topographic map.

There are times when the mapping does not represent the true ground surface. The local Floodplain Administrator needs to use elevation data from the Stillwater Table to determine a solution by locating the flood elevation on the ground via an elevation survey. However, caution is necessary if it is a shaded SFHA area and ground survey show it above the BFE, then it still must be permitted and all other requirements must be followed until a LOMR-F is issued by FEMA. When the mapped boundary meets the ground, then the Floodplain Administrator can make the decision using spot elevations, if needed.



Figure 3-11. Coastal Flood Map.

3.7 Shallow Flooding Studies

For the NFIP, shallow flooding is defined as flooding associated with the base flood that has an average depth of one to three feet in areas where a clearly defined channel or flow path does not exist. Shallow flooding can exist in any of the following situations:

- Ponding – in flat areas, water collects or “ponds” in depressions.
- Sheet flow – in steeper areas where there are no defined channels or on flat plains, where water spreads out over the land surface.

- Urban drainage – local drainage problems can be caused where runoff collects in yards or swales or when storm sewers back up.
- Coastal flooding – in areas where wave runup sends water inland over flat areas or over dunes, often collecting or ponding behind an obstruction which keeps it from draining back into the ocean.

Shallow flooding is mapped based on historic flood experiences and a study of the topography. In some areas, the techniques used for riverine studies are used. The result will either be a shallow flooding zone with a BFE shown (Zone AH) or a shallow flooding area with a base flood depth (expressed in feet above the ground) shown (Zone AO). A shallow flooding study usually produces data for the base flood, but not for other frequency floods. Figure 3-12 shows a portion of a coastal FIRM where the shallow flooding is designated “Zone AO” and the base flood depth is 2 feet. North Carolina maps do not include Zone AH.

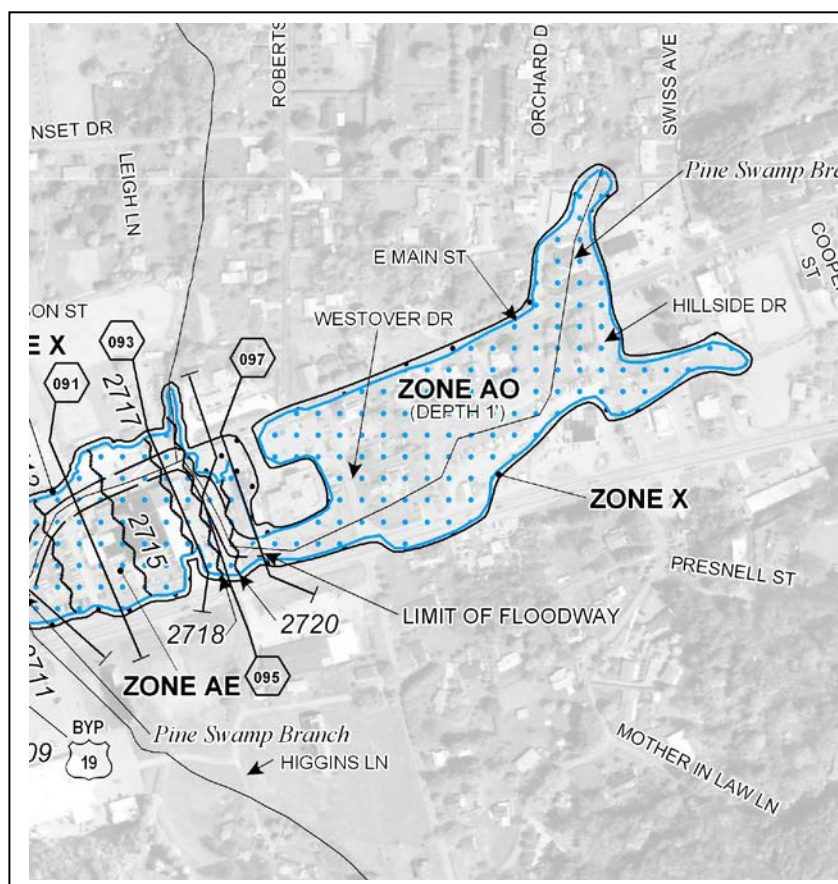


Figure 3-12. Coastal FIRM with shallow flooding area (Zone AO).

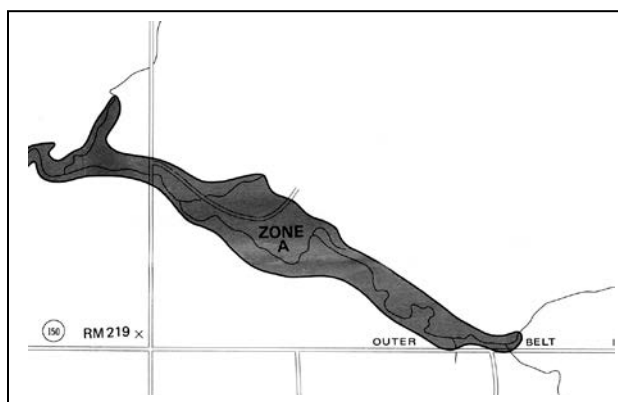
3.8 Approximate Studies

Detailed studies are very expensive. The NFIP may determine that it is not cost effective to perform a detailed study in watersheds where there is little or no development and where no development is anticipated, such as in very rural areas. Therefore, some NFIP maps show floodplains that were mapped using approximate study methods. Flood data and floodplain information from a variety of sources – such as soils mapping, actual high water profiles, aerial photographs of previous floods, and topographic maps – were used to overlay

the approximate outline of the base floodplain for specific stream reaches on available community maps, usually U.S. Geological Survey topographic quadrangle maps.

In addition, many flooding sources have been studied by other Federal, State, or local agencies. Some of these studies do not meet the NFIP standards for a FIS, but often contain valuable flood hazard information, which may be incorporated into the NFIP maps as “existing data studies” or “approximate studies”. Those types of studies typically cover developed or developing areas. They often contain flood elevation profiles that can be used as “best available data” for floodplain management purposes.

An approximate study shows the estimated boundary of the Special Flood Hazard Area. It does not show a BFE or any floodway data and there are no



data published in the FIS report.

The boundary was drawn on the best available topographic map based on knowledge of past floods and the judgment of experienced engineers and cartographers. Figure 3-13 and Figure 3-14 are examples of approximate flood hazard areas (often called “unnumbered A Zones” or “approximate A Zones” because

they do not have BFEs or floodway data).

According to NFIP requirements, Federal, State, and other sources of flood

data are to be obtained, when possible, in determining BFEs and floodways in approximate floodplain areas. For example, US Army Corps of Engineers' studies, preliminary flood maps, large development studies are all excellent sources of BFE and/or floodway data and must be utilized if available. See *Managing Floodplain Development in Approximate A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations* (FEMA-265, 1995) and *Using Data from*

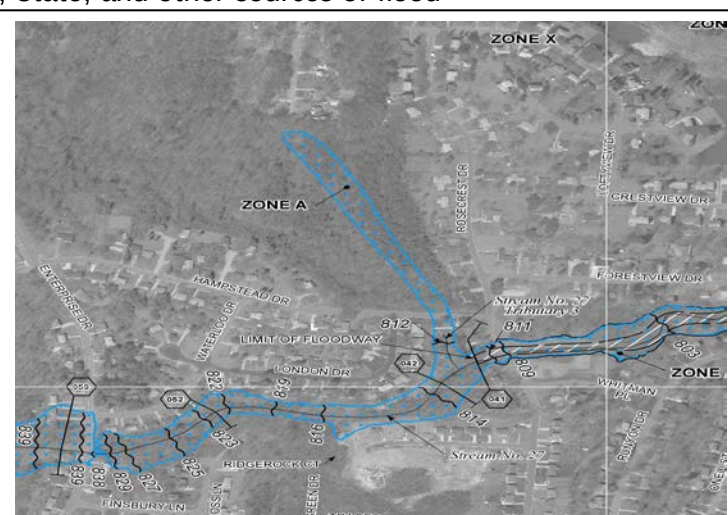


Figure 3-14. Another example of Approximate A Zone.

Preliminary Flood Maps (NCFMP Fact Sheet, June 2007).

3.9 NFIP Maps

The NFIP flood maps and supporting Flood Insurance Study data allow you to identify SFHAs, determine the location of a specific property in relation to the SFHA, determine the BFE at a specific site, locate floodways or non-encroachment areas, and identify undeveloped coastal barriers. Undeveloped coastal barriers are identified in the Coastal Barriers Resources Act of 1982 where federally-backed (or NFIP) flood insurance is not available, but may be available through a private insurance firm (see Chapter 12 for more information). This section will cover how flood hazards and flood insurance zones are depicted on NFIP maps:

- The Flood Hazard Boundary Map (the FHBM), which is published with only approximate A or V zones.
- The Flood Insurance Rate Map (the FIRM), which is published in an old format in studies prepared before 1986 and a new format in studies prepared after 1986.
- The Flood Boundary and Floodway Map (the FBFM or Floodway Map), which was included in studies prepared before 1986.

The flood maps, particularly the FIRMs, come in a number of formats because of the mapping of additional hazards, the need for more regional flood maps, and the increased use of computer generated maps. Several general features are included on all maps. Originally, the FIRMs were designed for use by insurance agents and lenders. The Floodway Maps were created for use by local floodplain administrators. For all studies conducted since 1986, the FIRM combines all data into one map including both the flood insurance rate zones and floodways. Refer to Chapter 4 for more information on the countywide North Carolina maps.

3.10 General Map Features

Flood maps are either flat or Z-fold. Flat maps are on 11-inch-by-17-inch “ledger” size paper. Z-fold maps are on larger pages and get their name from the way they are folded.

All flood maps are prepared with general features that may include an index, a legend (or key to what is shown on the map), a title block, community name(s) and identification number information, panel or map number information, a north arrow indicating directional information for the map, and effective date or revision date information. This section describes the map index, elevation reference marks/benchmarks, map scales and direction. Other map features will be presented in the discussions on FIRMs and Floodway Maps in Chapter 4.

Map Index. Many communities, especially counties and larger cities, are geographically too large to fit on one map or panel at a usable scale. Maps for these communities are divided into two or more panels with unique panel numbers. Whenever a community requires more than one panel, a Map Index for both the FIRM and Floodway Map, if published, is prepared (Figure 3-15). The Floodway Map index notes only the panels printed that contain waterways with delineated floodways. The Map Index shows the community's boundaries and highlights prominent features such as major highways, railroads, and streams. When unfolded the Map Index shows how the community is displayed on the various panels.

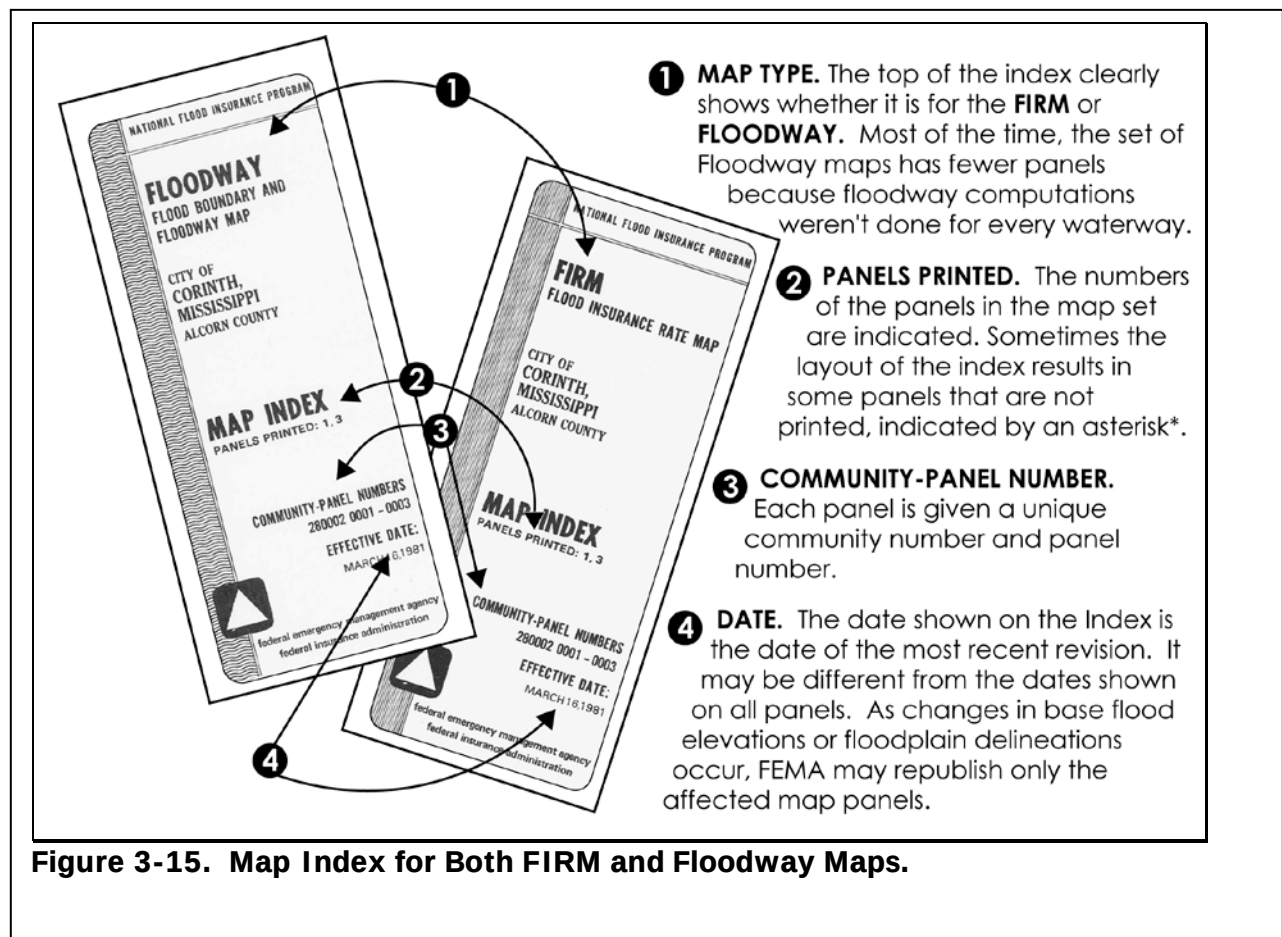


Figure 3-15. Map Index for Both FIRM and Floodway Maps.

Title Block. The title block is the lower right portion of the opened map for both the Map Index and the FIRM panels. The FIRM panel title block includes:

- The community's name for each community represented on that panel
- The six-digit community identification (CID) number, such as 370013 for each community represented on that panel. The first two digits represent the state id number such as 37 for NC. The next four digits represent the Federal Information Processing System (FIPS) code for the community.
- The panel number, such as "0025," "0038," or "0040"
- The map number which in old format contained the six-digit (CID) number and the four digit panel number. Please note that the map number may or may not include the six-digit (CID) number. In NC, the NC FIRMs map numbers (which include the four digit panel number) are based on NC State Plane Coordinate System and therefore, do not contain the six-digit (CID) number.
- A map panel letter suffix (if the panel has been revised and republished). Please note that all NC FIRMs start with suffixes that are letter "J" or later.
- The effective or revision date

NFIP NATIONAL FLOOD INSURANCE PROGRAM	PANEL 3562J			
	FIRM			
	FLOOD INSURANCE RATE MAP			
	NORTH CAROLINA			
	PANEL 3562			
	(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)			
	<u>CONTAINS:</u>			
	<u>COMMUNITY</u>	<u>NUMBER</u>	<u>PANEL</u>	<u>SUFFIX</u>
	LENOIR COUNTY	370144	3562	J
	Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.			
EFFECTIVE DATE JULY 2, 2004		MAP NUMBER 3720356200J		
				
State of North Carolina Federal Emergency Management Agency				

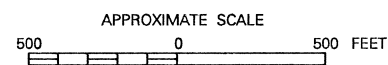
- Statewide FIRM
- 4-digit panel number
- Community names and 6-digit CID numbers
- 10-digit map numbering system with a suffix of “J” or “K” for newer maps
- State of NC and FEMA Seals

Map Revision Date. The date in the title block shows the map’s most recent revision. As changes occur that prompt changes in flood elevations or floodplain delineations, FEMA republishes *only the Map Index and the changed map panels*. The Map Index panel and any revised panels are given a new map revision date and a new suffix letter.

Once the panels are issued, the date on the panel is referred to as the “effective date.” Some communities have map panels with different effective dates. The Map Index lists the current effective date for the most recently revised panel of a FIRM (or the revision date of the FIRM itself, if all panels were revised). With each revision comes a new panel suffix; the suffix for a panel that has been published four times is “D” (current NC maps start with a suffix of “J”). The map index will show the current map panel suffix for each of the printed panels. This is very important to ensure that you are using the most current flood map data published.



North Arrow and Map Scale. An arrow pointing north is shown on all published flood maps, including the map index. For FIRMs and Floodway Maps, the north direction arrow is located near the map scale just above the title block. The north direction on the maps may be “turned” to maximize the mapped area that can be shown on a panel and to minimize the number of panels. To ensure correct orientation and accurate use of the FIRM, it is very important to pay attention to the direction of the north arrow on the panel. For North Carolina, all panels are oriented in the same direction with north to the top to follow the statewide paneling scheme.



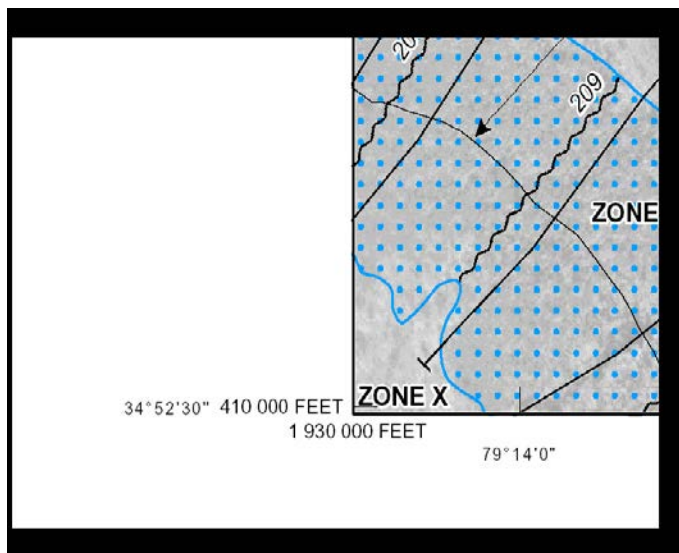
The scale (“feet per inch”) is shown on the Map Index and each panel. When using more than one map be careful to check scale. Different scales may be used within a single community and for communities that share a boundary. In

addition, different scales may be used on FIRM and Floodway Maps, depending on the size of the mapped area and the extent of waterways that have delineated floodways.

- All digital FIRM panels mapped at either:
 - 1" = 500 feet (1 : 6,000) , or
 - 1" = 1,000 feet (1 : 12,000)
- Consistent with FEMA graphic specifications for digital FIRMs

Other New Features. There are several new features to the NC maps including:

- Panel Locator Diagram located in the upper left corner of the FIRM panel showing location and panel number for all panels in the county.
- For Detailed Studied streams in North Carolina, the Flood Hazard Data Table has been added to the left collar of the FIRM panels showing:
 - Cross Section ID No.
 - Stream Station
 - Base Flood Discharge (cfs)
 - Base Flood WSEL
 - Floodway Widths (left and right of stream centerline)

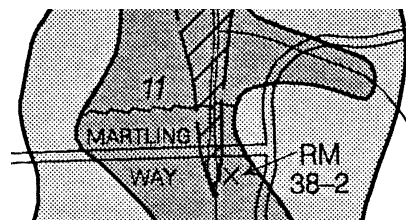


Another new feature of the NC maps is the reference to the northing and easting in State Plane coordinates located in the corners of the panel.

FLOOD HAZARD DATA TABLE				Floodway Width (feet)
Cross Section	Stream Station	Flood Discharge (CFS)	1% Annual Chance (100 yr) Water Surface Elevation (feet NAVD 88)	Left/Right Distance From The Center of Stream to Encroachment Boundary (Looking Downstream) or Total Floodway Width
CARTOOGEC HAYE CREEK				
003	256'	6,660	2023.7 ²	66 / 144
019	1,929'	6,660	2023.7 ²	193 / 52
027	2,696'	6,660	2023.7 ²	59 / 95
CRAWFORD BRANCH				
024	2,434'	2,020	2021.2	80 / 75
028	2,803'	2,020	2023.0	48 / 126
030	2,988'	2,020	2023.0	62 / 47
037	3,704'	2,020	2026.4	87 / 43
041	4,079'	2,020	2026.6	115 / 27
045	4,522'	1,810	2031.4	86 / 20
047	4,708'	1,810	2031.9	52 / 15
051	5,094'	1,810	2032.5	45 / 24
055	5,455'	1,810	2045.7	18 / 97

Elevation Reference Marks/Benchmarks. A common reference (benchmark or elevation reference mark) is needed when referring to topography and flood elevations to ensure uniformity and to avoid confusion. A datum is a reference surface from which elevations are measured. Originally, mean sea level (MSL) was the accepted elevation reference datum. Because this datum is local in nature, it was not ideal for a nationwide program for flood insurance.

A long-term goal of the NFIP is to convert all FISs to a newer standard called the North American Vertical Datum of 1988 (NAVD). This standard eliminates inconsistencies caused by the assumption in NGVD that "elevation zero" is the same as mean sea level at all 26 tidal stations. All flood maps produced under NC's floodplain mapping program are referenced to NAVD 1988. There are currently 15,434 NAVD benchmarks in North Carolina (3,447 1st order, 10,898 2nd order and 1,089 3rd order). See *Flood Insurance Study: Guidelines and Specifications for Study Contractors*, FEMA-37 (1995), for further information.

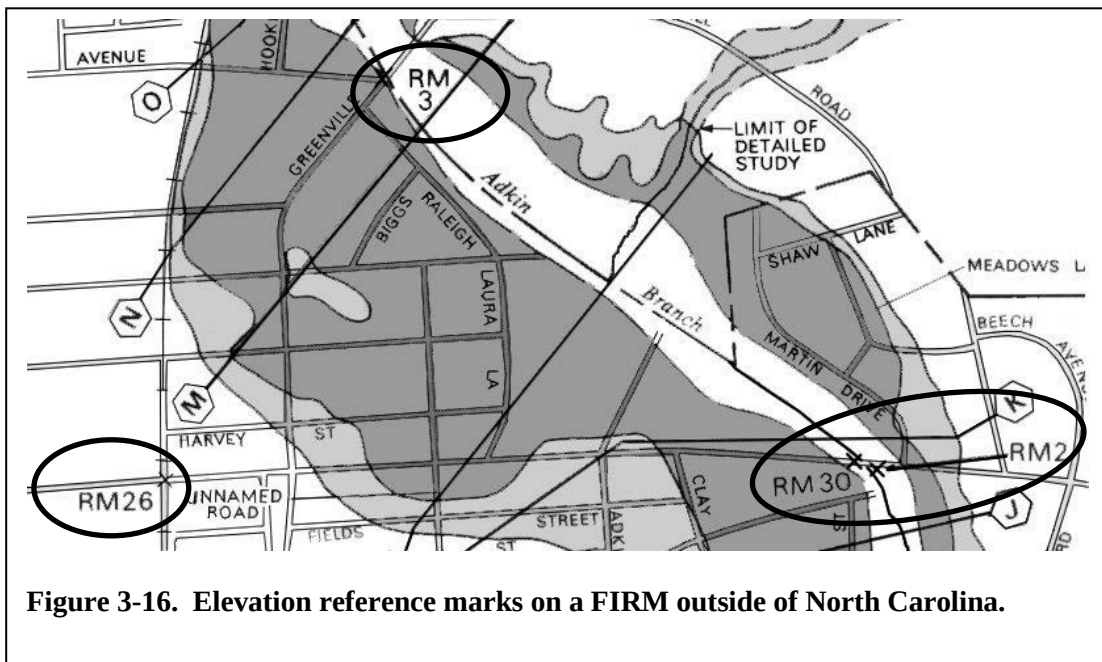


Most permanent elevation reference marks (benchmarks) are referenced to the NGVD 29. Their locations are identified on older flood maps with a small "x" and the designation "ERM" or "RM" followed by a number (see Figure 3-16). Descriptions of the marks, including their elevations, appear on the older flood maps either on the FIRM panel, on the FIRM index, or in the Flood Insurance Study report. On the newer Digital FIRMs (DFIRMs), locations are identified with one of three small symbols and the name of the benchmark. Reference marks/benchmarks are not always brass caps; they can be chiseled squares or other designated markers. The North Carolina Geodetic Survey has a

comprehensive inventory of all benchmarks along with both NAVD 88 and NGVD 29 data. For more information on North Carolina benchmarks go to <http://www.ncgs.state.nc.us/> and <http://portal.ncdenr.org/web/lr/geodetic> or www.ngs.noaa.gov.

Also noted on older FIRMs are reference marks that were established as part of the hydraulic study; most are not permanent and most likely cannot be recovered.

Surveyors and engineers familiar with an area know the locations of bench marks and reference marks. Many communities maintain records of reference marks and make the information available upon request (see Chapter 13 for CRS credit).



FIRM Zones. FIRMs show different types of floodplains with different zone designations. These are primarily for insurance rating purposes, but the zone differentiation can be very helpful for other floodplain management purposes. The more common zones are listed in Table 3-2.

3.11 Flood Hazard Boundary Map (FHBM)

FHBMs were initially prepared to provide flood maps to many communities in a short period of time. They were made in the 1970s and early 1980s without benefit of

detailed studies or hydraulic analyses for nearly all flood-prone communities in the nation (over 20,000). These maps were usually presented to communities in the Emergency Phase of the NFIP. The community was converted to the Regular Phase, once the flood study was complete and/or the maps were converted to FIRMs.

FHBMs are still being used where detailed Flood Insurance Studies have not been prepared or cannot be justified as cost-effective (primarily in very rural areas that are highly unlikely to experience development pressure). In some cases, FEMA simply converted the FHBM to a FIRM by issuing a letter to the community stating that the FHBM shall be considered a FIRM. In those cases, the community was instructed to line out FHBM on the map's title box and write in FIRM.

On the FHBM, the SFHA is designated as a shaded area labeled "Zone A," and no base flood elevations or floodway data are given (see Figure 3-17).

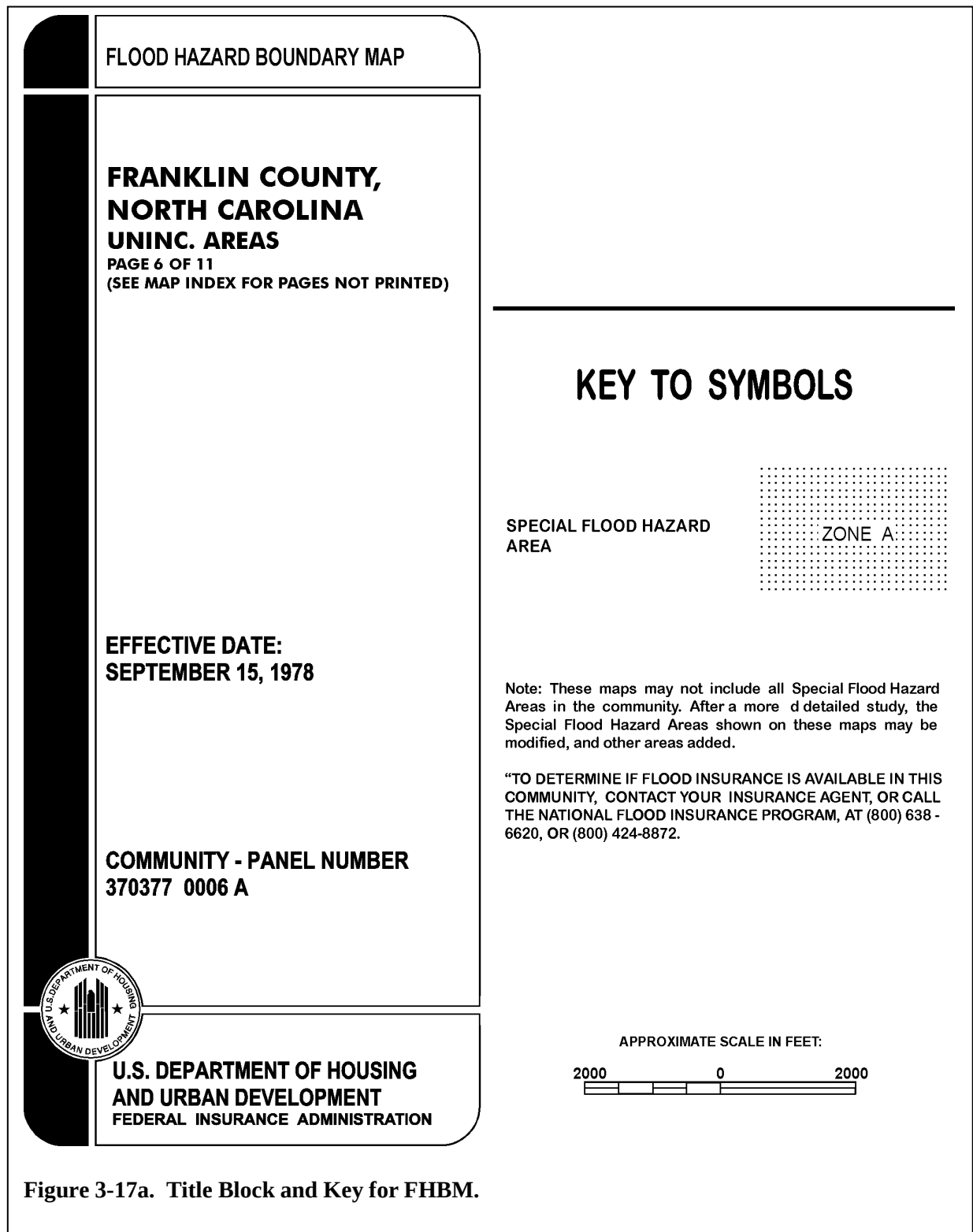
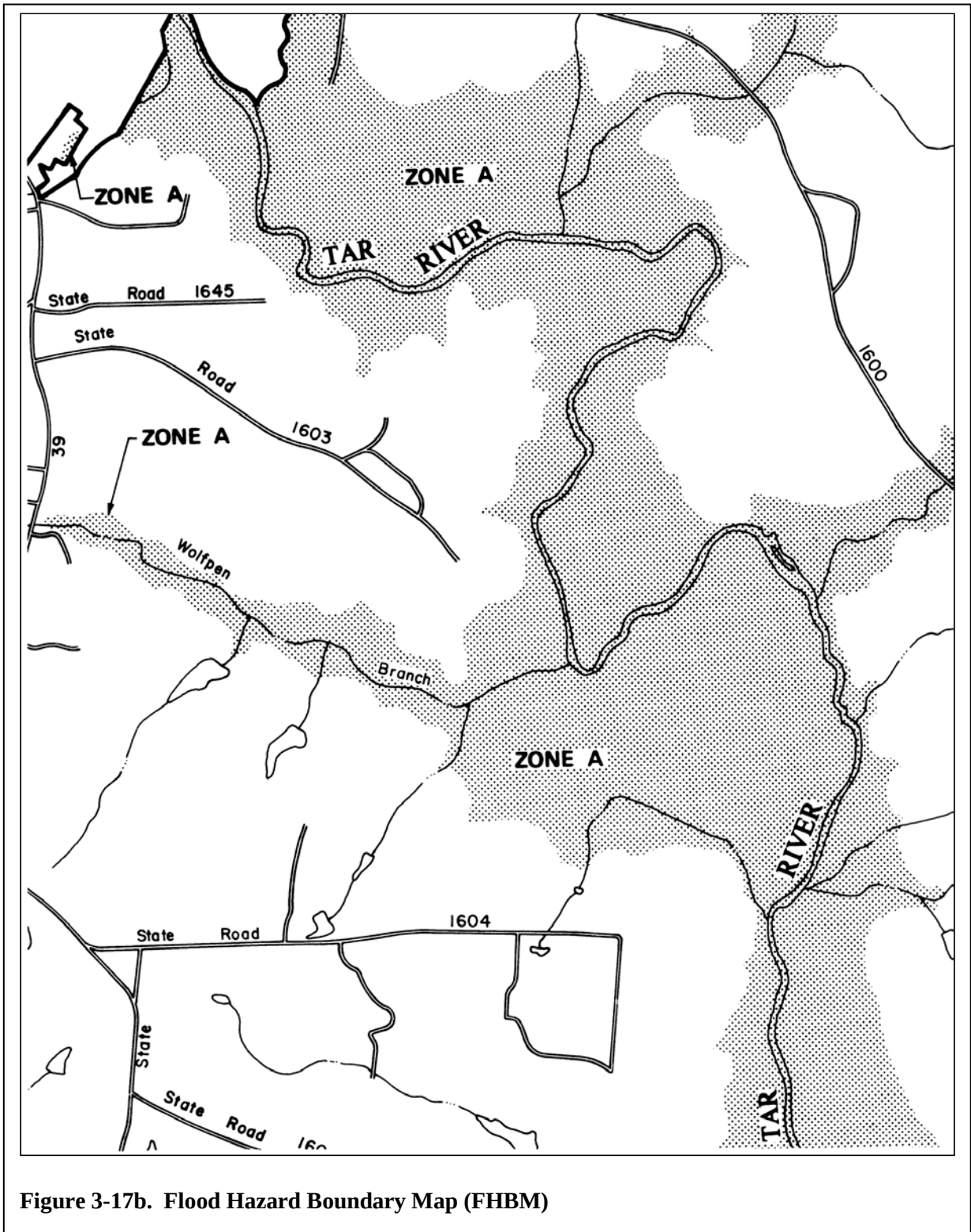


Figure 3-17a. Title Block and Key for FHB.



3.12 Flood Insurance Rate Map (FIRM) – old format (Pre-1986)

The FIRM is used to generally determine whether or not a property is in the floodplain, the flood insurance zone(s) that apply to properties, and the approximate base flood elevation (BFE) at specific sites. Essentially these maps provided all the data that was required to write a Flood Insurance Policy under the NFIP. Figure 3-18a shows the title block and key for an old format FIRM. Figure 3-18b shows an example of an old format FIRM. The old format FIRM has the following features:

- **Date:** Several important historical dates may be listed in the FIRM legend, including:
 - Initial Identification – date of the first Flood Hazard Boundary Map (FHBM).
 - Any dates of revisions to the FHBM that have occurred since the initial identification.
 - Flood Insurance Rate Map Effective – the date of the initial or first FIRM. This is the date used to determine whether a building or other development is “pre-FIRM” or “post-FIRM.”
 - Flood Insurance Rate Map Revisions – dates of subsequent revisions to the FIRM.
- **Base (1 % -annual chance) floodplain or SFHA:** Designated by the dark-shaded areas (Insurance Zones A, A1–A30, A99, AO, AH, AR, V, V1–V30).
- **500-year (0.2 % -annual chance) floodplain:** Designated by the lighter-shaded areas (Insurance Zone B).
- **Base Flood Elevation (BFE):** The water surface elevation of the base flood at that point of the stream is denoted in whole numbers by wavy lines running across the floodplain. Coastal Zones within the area of 100-year tidal flooding, as well as some AH Zones, may have BFE lines, and some lake AE Zones have the base flood elevation noted in parentheses beneath the zone designations.
- **Zone break line (Gutter line):** The thin white line separates flood insurance rate zones within the 100-year floodplain.
- **Approximate floodplain areas:** The 100-year floodplain areas delineated using approximate methods (BFEs are not determined); these areas are classified as (unnumbered) A Zones.

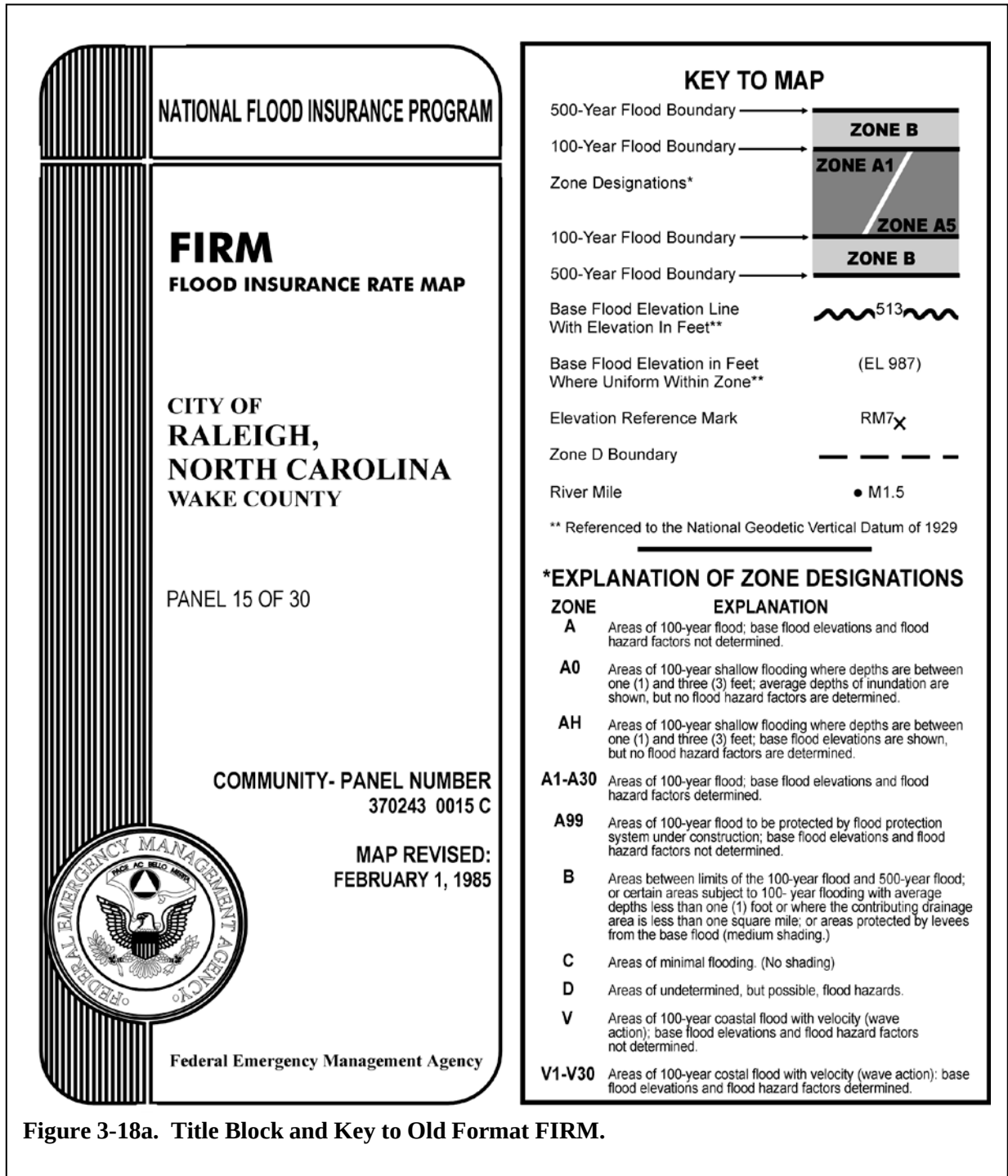


Figure 3-18a. Title Block and Key to Old Format FIRM.

3.13 Flood Boundary and Floodway Map (Floodway Map or FBFM) – old format (Pre-1986)

The Flood Boundary and Floodway Map (FBFM) is more commonly called the Floodway Map. Where waterways have been studied using detailed methods the Floodway Map shows how the floodplain is divided into the floodway and flood fringe. They also show areas where floodplains have been studied by approximate methods.

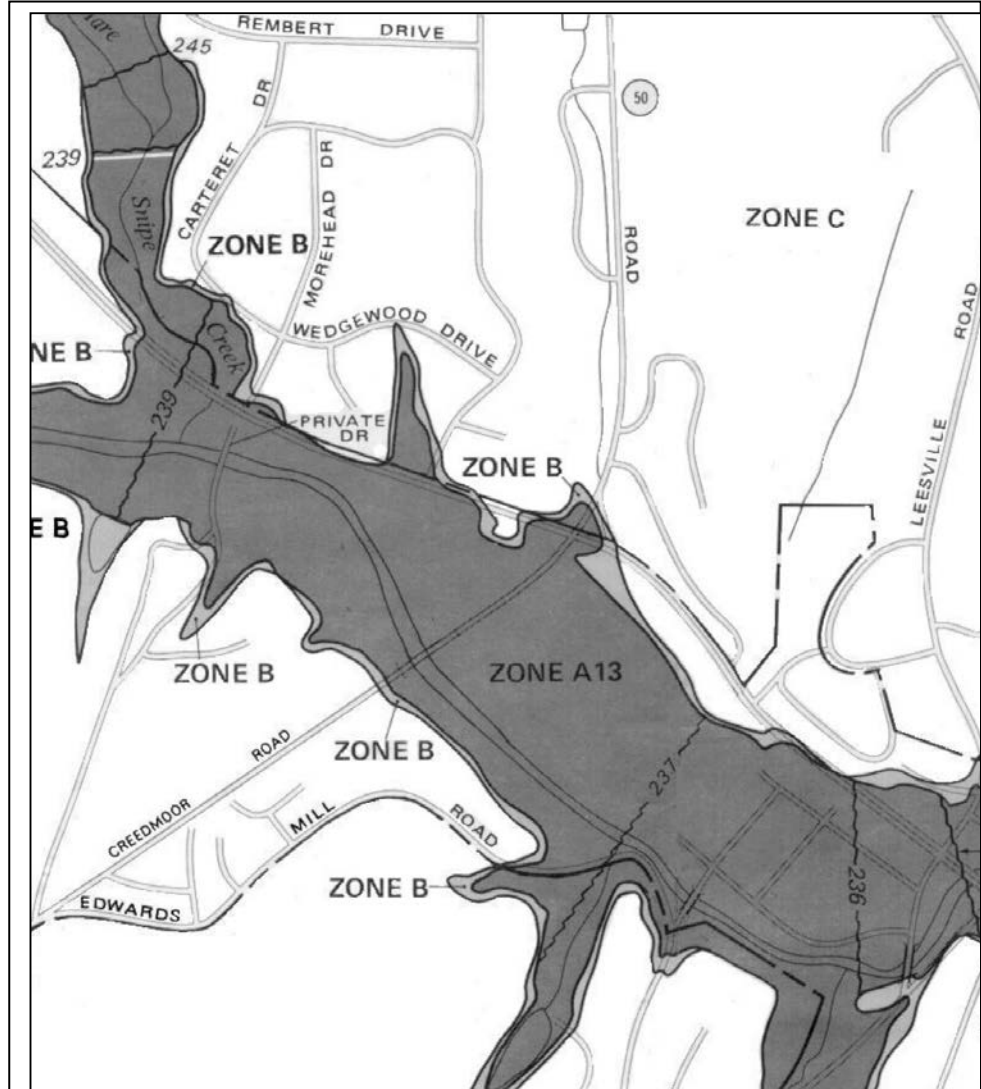


Figure 3-18b. Portion of Old Form FIRM.

Note that BFEs and flood zone designations are not shown on the Floodway Map. Figure 3-19a shows the title block and key for a FBFM. Figure 3-19b shows an example FBFM. Floodway Maps have these features:

- **Title block:** Includes the community name, state name, county name, panel number, community identification (CID) number, and the map date; the FBFM panel numbers may be different from the FIRM panel numbers.
- **Map scale:** The Floodway Map may have the same or a different scale than its companion FIRM.

- **Panels printed:** Only panels that have waterways with designated floodways will be printed.
- **Cross section line:** These lines represent the location of some of the surveyed cross sections used in the computer model of the stream for calculating 100-year flood elevations. These cross sections can be used to relate a specific point on the Floodway Map to the flood profile and floodway data table.
- **Floodway:** The Special Flood Hazard Area has been divided into two areas, the floodway and the flood fringe; the white area adjacent to and including the channel is the floodway, the shaded area is the fringe.

One problem with this pre-1986 method of delineating floodways is that sometimes people confuse the white floodway with the white area representing land that is free from flooding. Also, because the floodway is shown on a separate map, often property owners, lenders, real estate agents, and others do not have easy access to the Floodway Maps and do not know of the presence of this severe flood hazard and restricted development regulations.

Most of the FISs published since 1986 have corrected this problem, they do not have separate FIRM and Floodway Maps – floodways are delineated on the newer FIRMs as a diagonally hatched area.

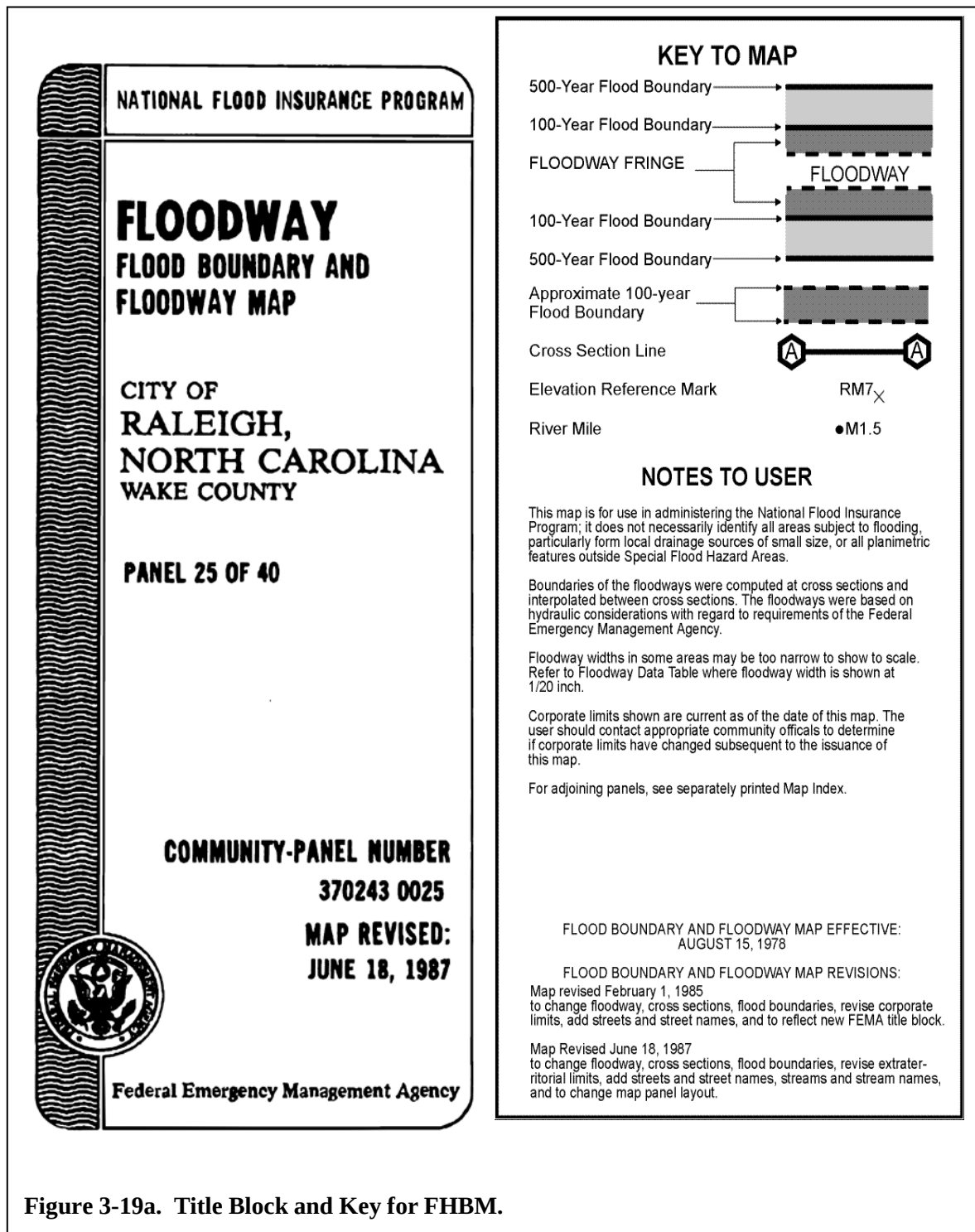


Figure 3-19a. Title Block and Key for FFBM.

3.14 Flood Insurance Rate Map (FIRM) – new format (Since 1986)

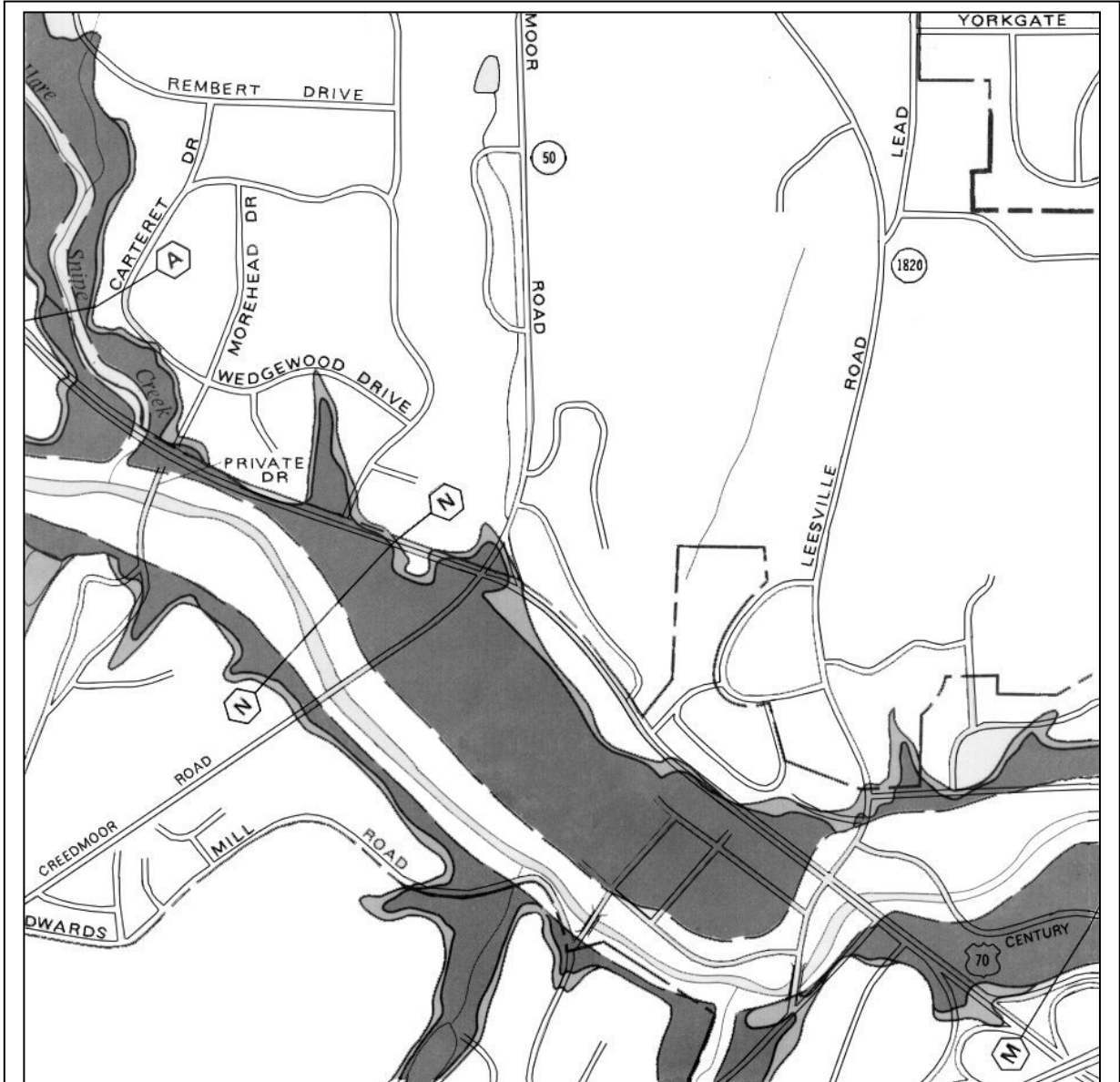


Figure 3-19b. Flood Boundary and Floodway Map (FBFM).

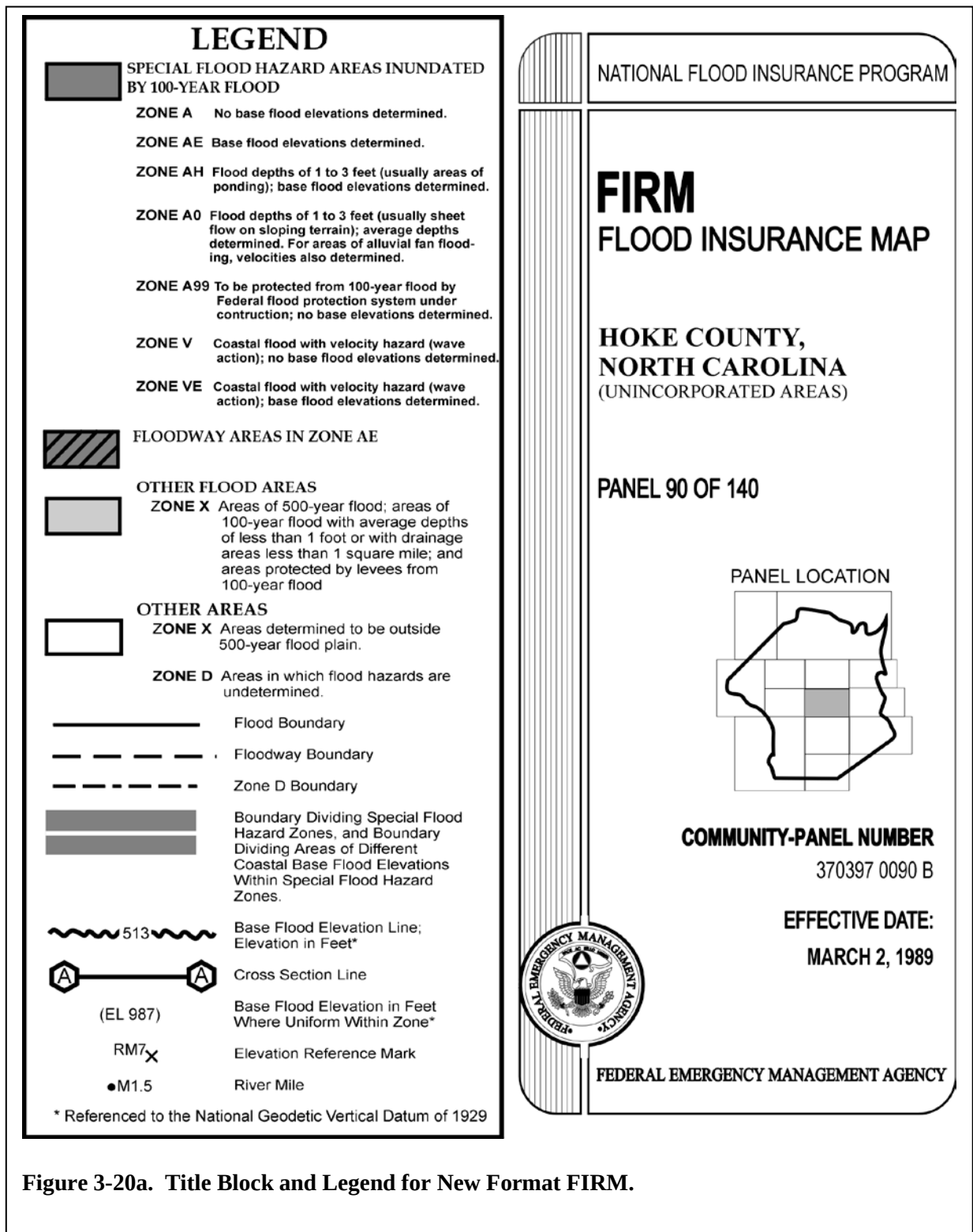
Flood maps have been redesigned over the years, making them easier to use. A new format for FIRMs was introduced in 1986. The new format eliminates the separate Floodway Map and shows everything on one map:

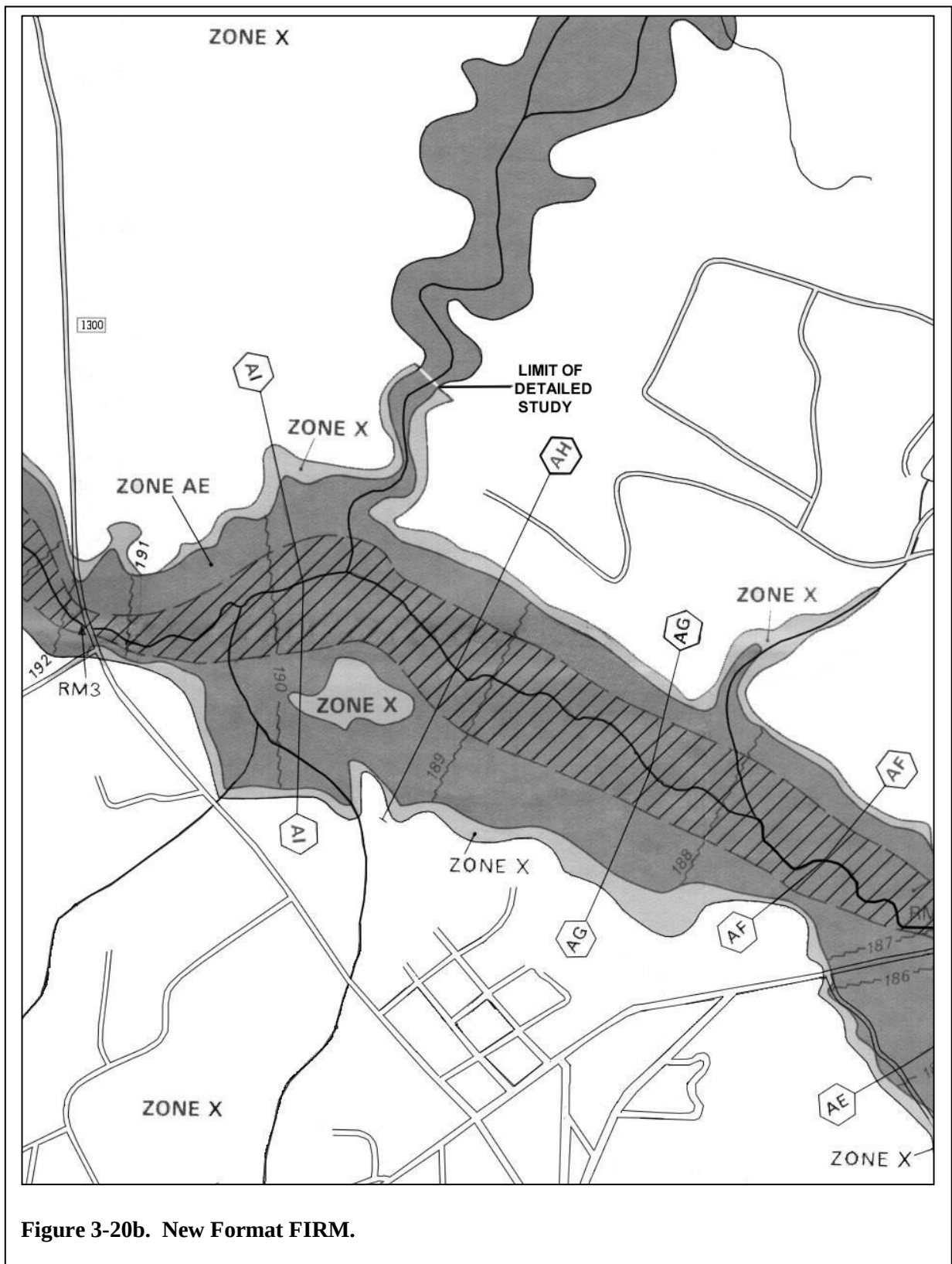
- Floodways and other floodplain management information, such as cross sections and benchmark locations.
- Simplified flood insurance zone designations: Zones A1-A30 and V1-V30 were replaced by the designations AE and VE (meaning elevation

information is provided); also, Zone B is replaced by shaded Zone X (500-year) and Zone C is replaced by unshaded Zone X (all other minimal risk areas).

Figure 3-20a shows the title block and legend and Figure 3-20b shows an example of a new format FIRM with hatched floodway. With these improvements, the FIRMs are more easily used by community officials for floodplain management purposes, by lenders to determine the need for flood insurance, by insurance agents to rate flood insurance policy applications, and by land surveyors, engineers, property owners and others to determine flood hazards in a given location.

In 2000, the NCFMP and FEMA began producing an updated mapping product which is currently effective throughout the entire State of North Carolina.





3.15 Coastal (and Lake) Flood Hazard Areas

Coastal areas include the shores of the Atlantic and Pacific Oceans, Coastal Sounds, the Gulf of Mexico and the Caribbean Sea, and back bays and estuaries subject to tides. The shorelines of the Great Lakes are mapped using methods developed for coastal areas, as are some large inland lakes such as Lake Mattamuskeet in Hyde County, North Carolina.

Coastal high hazard areas subject to flooding and wave action of three feet or more are designated as VE Zones. Inland of VE Zones are typically AE Zones with wave action of less than three feet: the number in parentheses after or below the coastal flood Zone designation is the BFE.

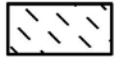
Coastal Barrier Resources System. Undeveloped and environmentally fragile portions of coastal barrier islands and similar land forms may be designated as units in the Coastal Barrier Resources System (CBRS). Another designation is “Otherwise Protected Areas” or OPAs. These areas, commonly called CBRA or “CoBRA” areas, are identified on applicable map panels (Figure 3-21). They are established by Congress through the Coastal Barrier Resources Act of 1982 and the Coastal Barrier Improvement Act of 1990. These Acts provide protection to CBRA areas by prohibiting expenditures of most federal funds including most forms of disaster assistance and the provision of NFIP flood insurance for new and substantially improved buildings in designated units on or after the designation date. The restrictions are covered in more detail in Chapter 12.

Permits for floodplain development are required in CBRA and OPAs of participating communities, even if flood insurance cannot be purchased from the NFIP.

The designations for these undeveloped coastal barrier units depend on when they were designated by Congress; therefore, not all CBRA areas have the same date of designation and three different hatched patterns are used to show these areas on FIRMs. The designation date is indicated on the FIRM. It should be noted that although FEMA shows CBRA/OPA areas on its FIRMs, only Congress can authorize a revision to their boundaries.



COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS



OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

COASTAL BARRIER LEGEND

10-01-83 Coastal Barrier

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER OCTOBER 1, 1983, IN DESIGNATED COASTAL BARRIERS.

11-16-90 Coastal Barrier

FLOOD INSURANCE NOT AVAILABLE FOR NEW CONSTRUCTION OR SUBSTANTIALLY IMPROVED STRUCTURES ON OR AFTER NOVEMBER 16, 1990, IN DESIGNATED COASTAL BARRIERS.

10-18-04 Otherwise Protected Area

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES - NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER OCTOBER 18, 2004 - NOT USED IN A MANNER CONSISTENT WITH THE PURPOSE OF THE OTHERWISE PROTECTED AREAS.

Comments or concerns regarding the Coastal Barrier Resources System or Otherwise Protected Areas should be directed to the Coastal Barrier Coordinator at the U.S. Fish and Wildlife Service; (404) 679-7106.

Figure 3-21. Coastal Barrier Resource System Areas.

Lakes. Most lakes have a BFE, shown in parentheses below the flood zone (rounded to the nearest whole number) similar to the coastal flood zones discussed earlier in this chapter. The actual BFE, to the nearest tenth of a foot, can be obtained from the FIS report same as nearly all other floodplains with BFEs. Many long lakes have a higher BFE at the upstream end than at the outfall. These types of lakes and reservoirs have BFEs shown with wavy lines, the same as riverine BFEs. They also appear on the stream profiles in the FIS report.

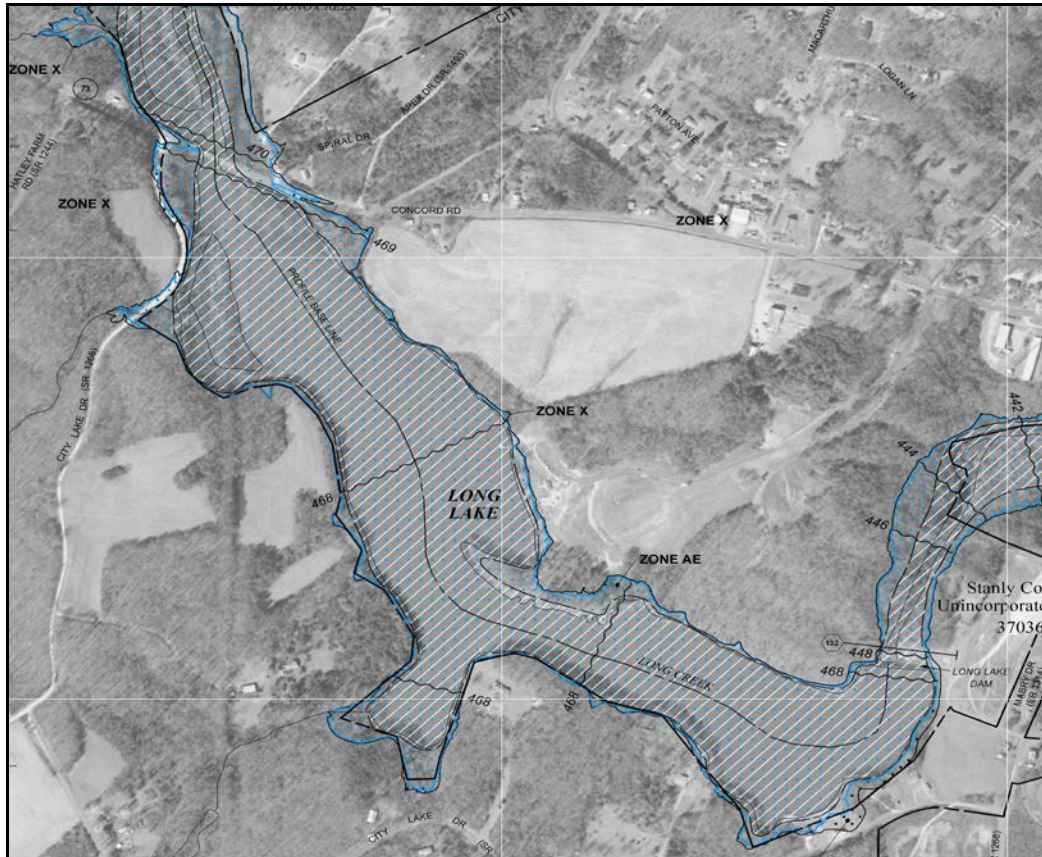


Figure 3-22. FIRM with Stillwater (Lake) Flood Hazard Area.

3.16 FIRMs with Flood Protection Projects

Some FIRMs may show areas protected from flooding by the base flood because of the presence of a levee, concrete dike, floodwall, seawall, or other flood control structure. These areas are usually designated as shaded Zone X (old Zone B or 0.2% annual chance flood zone) and marked with the following note: "This area protected from the 100-year flood from (*Flooding Source Name*) by LEVEE, DIKE, or other structure subject to failure or overtopping during larger floods."

This is an indication that the flood protection structure has either been evaluated and found to meet all of the NFIP requirements for flood control structures, or has been certified by a Federal agency with levee design

responsibility as having been adequately designed and constructed to provide protection from the 1%-annual chance flood.

A flood control structure that provides a lower level of protection (or that is not certified or does not meet the requirements for levees) may be shown on the FIRM, and flood elevations are computed as if the structure did not exist.

3.17 Countywide and Statewide FIRMs

Since the late 1980s many studies have been produced as a countywide FIS report and FIRM that covers both the unincorporated areas and all incorporated areas in a county. These FIRMs show flood hazard information for all geographic areas, including other municipalities such as villages, towns, and cities. This makes it easier for administration because the SFHAs outside a municipal boundary or extraterritorial jurisdiction (ETJ) are also shown. Thus, the municipality knows what SFHAs are being included in any annexation or extension of the ETJ.

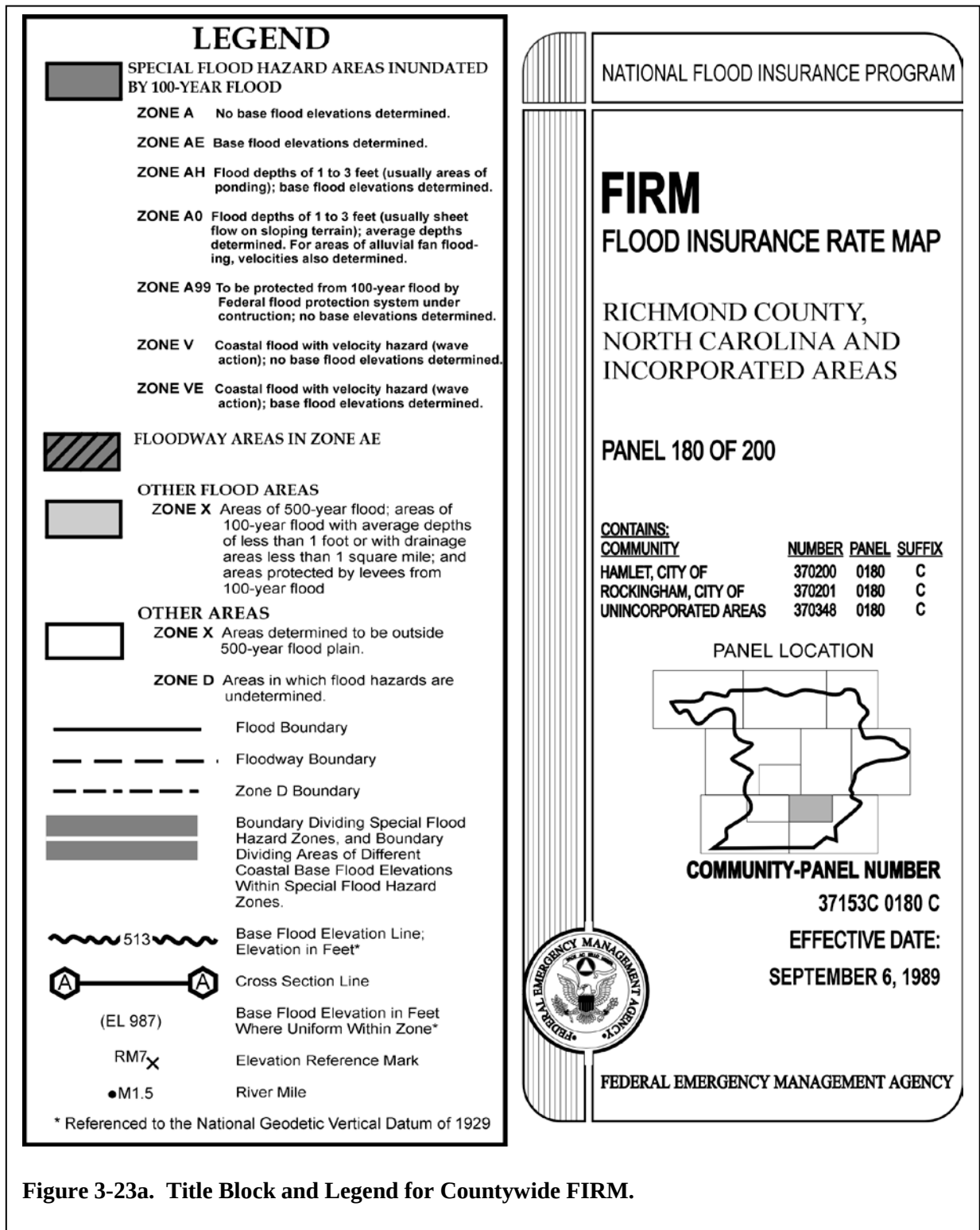
Most FHBM, FIRM and FBFM maps were prepared separately for each jurisdiction. FIRMs for a county show the flood hazards identified only in the unincorporated areas of the county and do not show flood information inside the corporate limits of a municipality. In countywide mapping all of the identified flood hazard areas are shown on one set of maps, using the new format layout. In addition, the State of North Carolina has taken this concept one step further by partnering with FEMA and producing Statewide FIRMs which are studied by river basin so as to incorporate all flooding impacts basinwide.

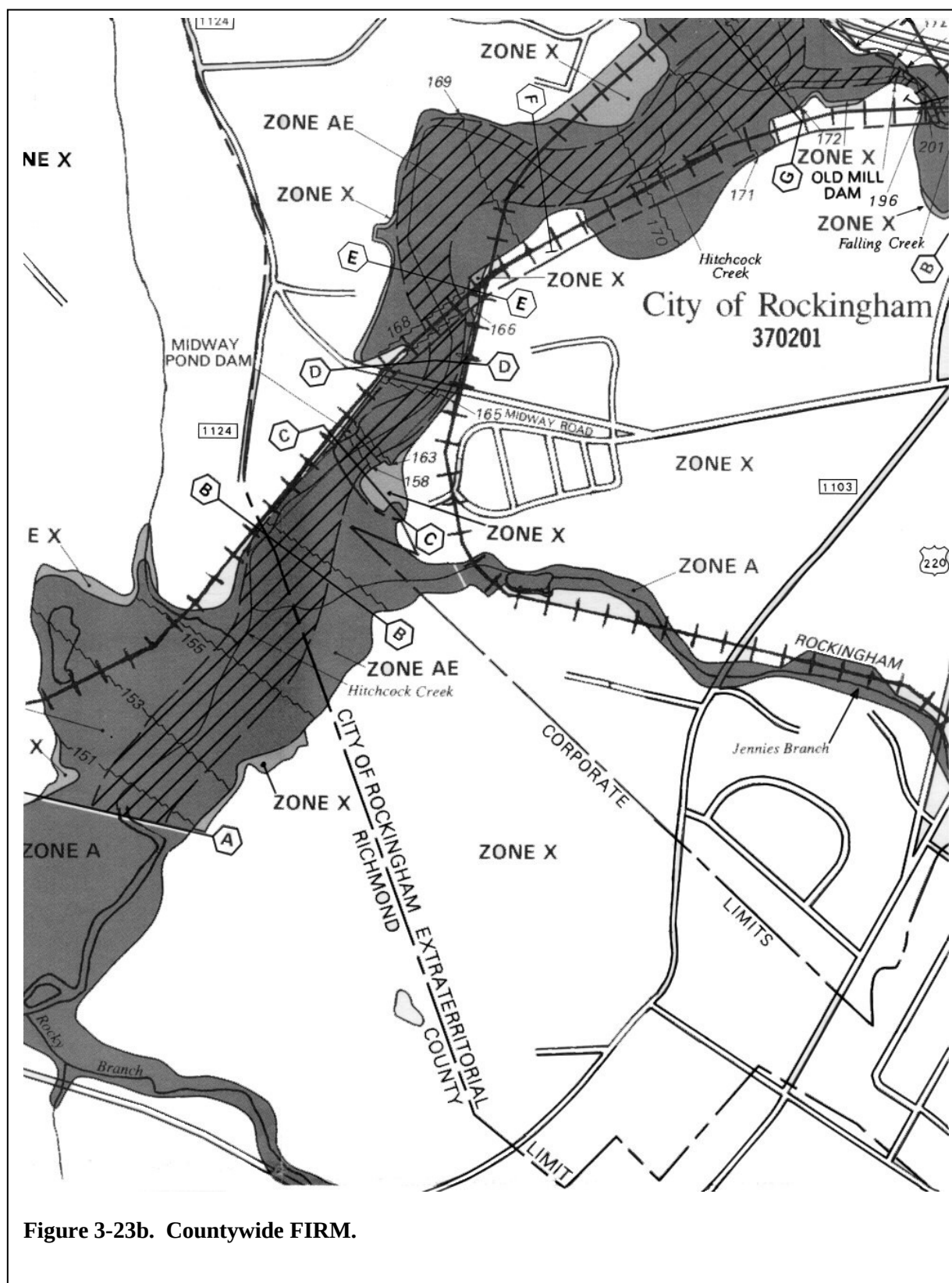
The countywide or statewide FIRM format has a number of advantages, and one in particular is that the user can see the relationship and simultaneous effect of each floodplain on a number of communities. A downside is that many smaller communities may have been mapped at easier-to-read scales, such as 1" = 500', and when combined with the unincorporated areas may be remapped at a different scale. In NC though, all FIRMs are being produced at either 1" = 500' or 1" = 1000' scale with all municipal communities at 1" = 500' scale.

Figure 3-23a shows the title block and legend and Figure 3-23b shows a sample portion of a countywide FIRM. You can visit www.ncfloodmaps.com to view any of North Carolina's statewide FIRMs. The title block lists the communities mapped on that panel and their six-digit NFIP community identification (CID) numbers. The FIRM panel has a map number with five

digits consisting of the NFIP-assigned state number as the first two digits and the NFIP-assigned county number as the next three digits followed by the letter “C,” which stands for “countywide,” and then the four digit panel number and suffix. Be careful not to confuse the map panel number with the community number. In NC, the NC FIRMs map numbers (which include the four digit panel number) are based on NC State Plane Coordinate System and therefore, do not contain the six-digit (CID) number of any county or municipality. Also, please note that all NC FIRMs end with suffixes that are lettered “J” or later.

All previous map dates for each flood-prone community in a countywide FIS are located on the community map history table in the FIS which shows the initial FIRM date for each community. These are the “post-FIRM” dates for insurance rating. Don’t confuse them with the effective date of the latest FIRM panel, which is shown in the title block.





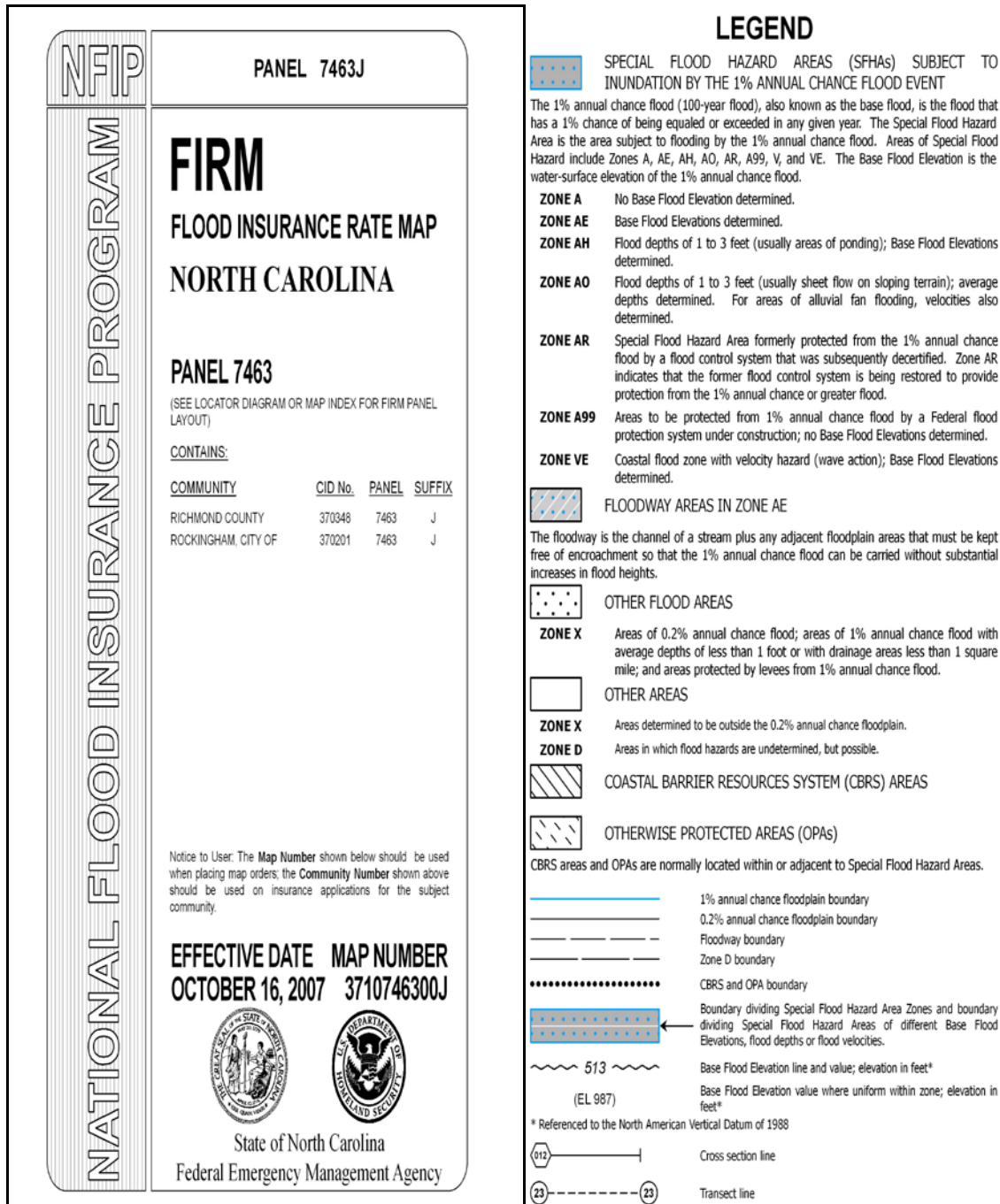


Figure 3-23c. New Countywide FIRM.

97°07'30", 32°22'30"

4275⁰⁰⁰ M

1 477 500 FEET

BM5510^x

BM5510^o

BM5510^o

• M1.5

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 17

2500-foot grid values: North Carolina State Plane coordinate system (FIPSZONE 3200, State Plane NAD 83 feet)

North Carolina Geodetic Survey bench mark (for more information visit <http://www.ncgs.state.nc.us>)

National Geodetic Survey bench mark (for more information visit <http://www.ngs.noaa.gov>)

NGS-58 GPS 2-5 cm Vertical Control Marks or Contractor-Established NCMP Bench Marks (for more information visit <http://www.ncgs.state.nc.us>)

River Mile

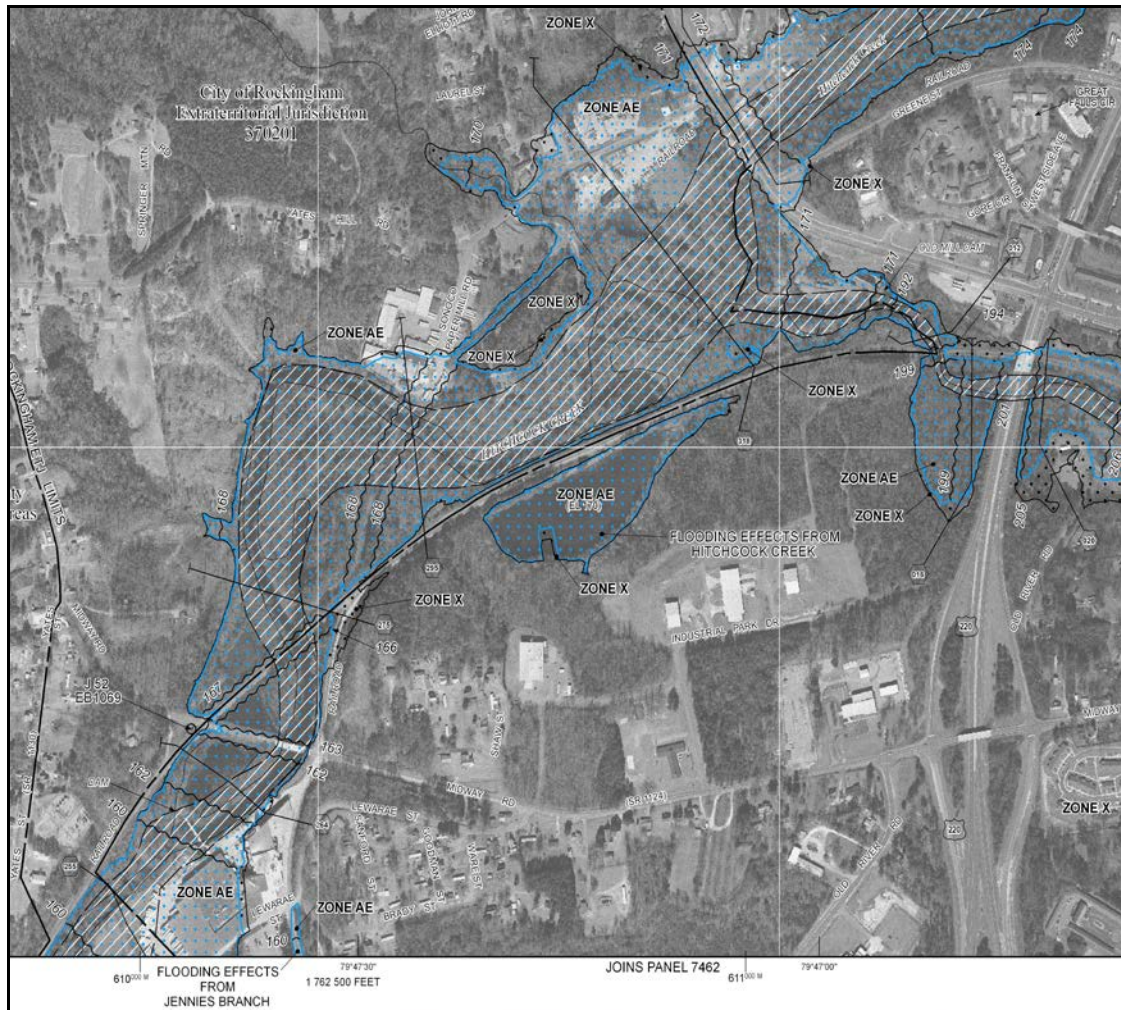


Figure 3-23c. New Countywide FIRM.

3.18 Digital FIRMs

The conversion of FIRMs to a digital format has many benefits. For example, they can be revised and updated more easily and they can be tied in with other geographic information such as zoning maps through a Geographic Information System (GIS).

The DFIRM is comprised of digitally converted data that were required to create the hardcopy FIRM, including base map information, graphics, text, shading, and other geographic and graphic data. Both the hardcopy and the electronic version have the same legal standing for floodplain management purposes. If discrepancies between these products arise, then a request for a ruling must be submitted

Users must bear in mind that the simple conversion of FIRMs to a digital format does not inherently improve the engineering quality of the product. Many of the same difficulties with interpretation of flood risk data – and the requirement that users apply sound judgment in methods selected for decision making and map interpretation – remain unchanged.

to the NCFMP to work with FEMA to resolve this discrepancy.

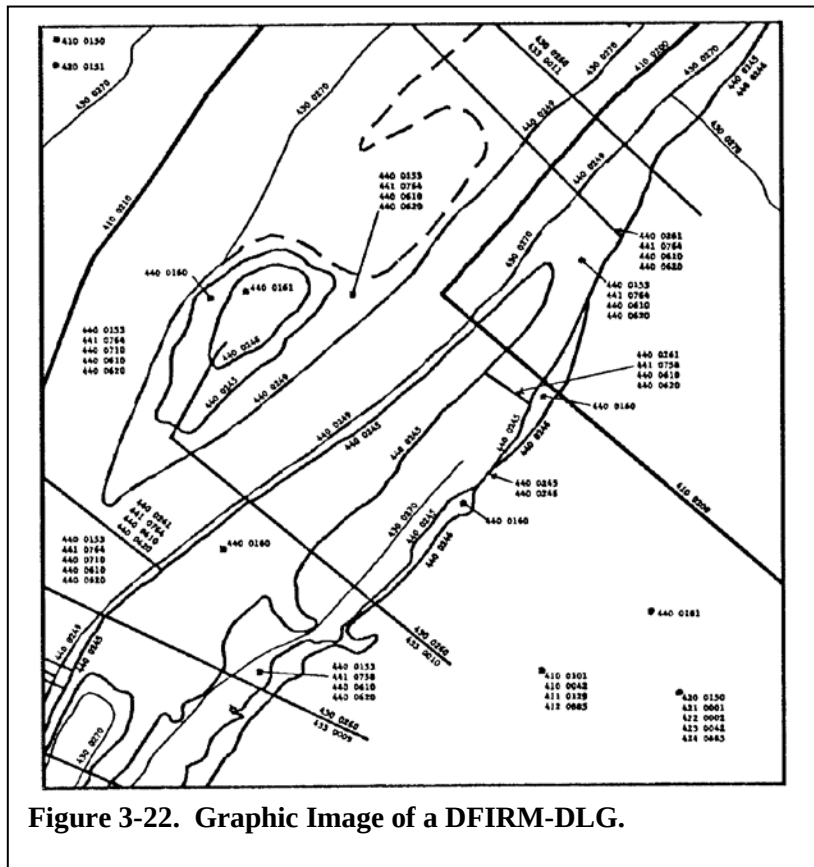
The majority of DFIRMs are produced in a countywide or statewide format, where all flood hazards for the county or state and incorporated communities are shown on one set of maps. It can be used for floodplain management purposes in a manner similar to other flood maps, but it can also be combined with other digital map information to create new information for planning purposes.

DFIRM – Digital Line Graph. The Digital Flood Insurance Rate Map - Digital Line Graph (DFIRM-DLG) is a database created by extracting certain flood risk data from the DFIRM. According to FEMA, the Digital Line Graph is no longer used and has been replaced with Q3 data available on the Map Service Center website. The digital data captured from the hardcopy DFIRM consists of location of water bodies, flood hazard zones, BFEs, cross-section locations, and elevation reference marks. The DFIRM-DLG does not include base map information, nor does it include graphic data required to create a hardcopy FIRM. The (DFIRM-DLG) is intended to be the primary means of transferring flood-risk data depicted on FIRMs to Geographic Information Systems. GISs are computer-based map systems that allow the user to keep a map updated easily and to correlate geographic information with other data, such as tax records and permit histories.

Communities whose digital base mapping files were used as the base map for the DFIRM will find that they may easily use the DFIRM-DLG files to determine flood zones and to administer regulations. A graphic image of a DFIRM-DLG is shown in Figure 3-22.

All lines and area features in DLG files are encoded with one or more seven-digit attribute codes that provide the user with detailed information about the features. With many commercially available GIS software packages, DLG data can be directly converted into vector data usable within the GIS environment. Third-party conversion software is also available that will convert DLG data to other proprietary GIS formats. FEMA intends to make the DFIRM-DLG available on CD-ROM compatible with ISO 9660 standards.

The DFIRM-DLG, when coupled with digital base maps, can be used in a GIS to determine whether a structure is located within a Special Flood Hazard Area. It should be noted that if a structure is determined to be within or near the area by using a GIS, and a different base map source was used to generate the hardcopy DFIRM, this determination should be confirmed by referencing the printed hardcopy DFIRM because the paper FIRM is still what is adopted by the community in their flood ordinance and therefore is the official map for regulatory purposes. The DFIRM-DLG may also be used for engineering and planning studies.



3.19 Q3 Flood Data.

In the Q3 Flood Data Product, FEMA has developed a graphical representation of certain features of the FIRM. The Q3 Flood Data are in three formats that are usable with desktop mapping and GIS software packages. These formats are Digital Line Graph, ARC/INFO, and MapInfo. North Carolina Q3 data is available from the FEMA Map Service Center. However, North Carolina recommends that stakeholders refer to the NCFLOODMAPS.com Website for newer FIRM data products.



3.20 Overview of the Digital Display Environment (D²E)

As part of Map Modernization under Risk MAP, FEMA and the NCFMP have created a new cost-savings breakthrough to take North Carolina mapping to a new phase of development. The new Digital Display Environment (D²E) is currently in process and will

be phased into North Carolina mapping over the next few years. Some advantages of this new process are presented below.

The key attributes of D²E are:

- Geospatially aware,
- Database driven,
- Allows on-demand products, and
- Operates without the constraints of cartographic rules.

Regulatory NFIP products which are currently provided to local communities and stakeholders in a hard copy format will be digitally accessible via a website interface and/or via print on demand.

During the first phase of the rollout for D2E, there will be 42 counties in North Carolina produced as part of the new process.

Chapter 4 Using NFIP Studies and Maps

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4.1 Introduction

The North Carolina Association of Floodplain Managers, Inc. is a non-profit organization which was organized in 1989. Its membership consists of Planners, Engineers, Land Surveyors, Building Inspectors, Zoning Officials, Emergency Management Coordinators, and private sector individuals and companies with an interest in floodplain management and the National Flood Insurance Program. The Association has over 335 members and is a chapter member of the National Association of State Floodplain Managers. The Association is dedicated to receiving issues and providing educational opportunities for local administrators of the National Flood Insurance Program (NFIP).

In September, 2000, North Carolina, in partnership with the Federal Emergency Management Agency, began remapping the state's floodplains using advanced digital floodplain mapping technology. Flood study reports, hydrologic and hydraulic models and data, and maps that show areas subject to flooding from the base flood, provide the technical basis for implementation of local floodplain management programs. The local Floodplain Administrator needs to understand, be able to use, and explain the use of these data to others.

In most communities, flood hazard data is provided in a Flood Insurance Study (FIS) report published by the Federal Emergency Management Agency (FEMA). The FIS is a summary of the detailed engineering analysis of the flood hazards in a community. The engineering report itself is very lengthy and is not published; the data are maintained by State of NC's and/or FEMA's contractors. The purpose of the FIS is to delineate flood hazard areas, identify flood risk zones, and establish flood elevations, thereby serving as a basis for flood insurance and regulating floodplain development. The FIS also contains other information and data that may be needed by the Floodplain Administrator and other local officials.

The FIS data provide the basis for preparation of the flood maps. The local Floodplain Administrator should know which maps to use; the map features; and how to use maps to locate development sites, flood boundaries, flood insurance risk zones; and to determine flood elevations. This understanding should also include being able to relate information on the maps to that found on computed flood profiles, tables, and figures contained in the FIS report. Base flood and other elevation data can be determined from use of the profiles and tables within the FIS report.

It may be helpful to have your community's FIS and maps with you as you read through this chapter, although not every community has an FIS nor do all FISs include every aspect that will be described.

4.2 Adoption of Maps and Studies

A community must adopt and enforce floodplain management regulations based on minimum data provided by FEMA (44 CFR 60.2(h)) and the State. The data include the Flood Insurance Study and the special flood hazard area boundaries, base flood elevations, FIRM zones and floodway boundaries shown on the effective Flood Insurance Rate Map and Flood Boundary Floodway Map (if published). Other data are not to be used without approval from the NFIP. However, this requirement does not prevent use of flood hazard data that are more restrictive than that provided by FEMA. For example, a community may want to regulate to a historical flood which was higher than the BFEs provided in the FIS. A more common approach is to regulate the flood hazard area that is defined by assuming build-out of the upstream drainage area. Using more restrictive data is acceptable, with explicit approval from the State and FEMA Regional Office.

44 CFR 60.2(h) The community shall adopt and enforce floodplain management regulations based on data provided by the Administrator. Without prior approval of the Administrator, the community shall not adopt and enforce flood plain management regulations based upon modified data reflecting natural or man-made physical changes.

This requirement to use the NFIP's maps and data also does not prevent a community from using other technical data to identify and regulate flood-prone areas not shown on FEMA maps and areas for which FEMA has not provided detailed data (unnumbered A Zones). Many cities and urban counties produce studies and maps in order to regulate areas on small tributary streams that are not shown on the FIRM.

Communities must also adopt map revisions issued by FEMA. The process FEMA follows to review and issue map revisions provide the opportunity for input. FEMA sends proposed revisions to the community and provides a formal period of review and submission of comments before the changes are finalized and published. Also, there is a formal 30-day comment period if no BFEs are changed or if there is a change in BFE data, a full 90-day appeal period will be provided during which the public has the opportunity to review and submit appeals and protests before BFEs and other changes are made final. At any time the community or an applicant/property owner disagrees with FEMA's maps and data, scientific or technical data can be submitted to request a map amendment or revision. See Section 4.11 of this chapter for more information on map revisions.

4.3 Using Data From Other Sources

The basic requirement to use the NFIP's data and maps does not cover every situation. Additionally, a community may NOT vary from the effective FHBM, FIRM and/or FBFM unless other data is more stringent than the currently effective flood maps for the community AND it is locally adopted in the community's flood ordinance.

Using data from other sources only applies to administration of your ordinance. Unless the effective FIRM is revised or amended to incorporate other data, insurance agents and lenders must use the current FIRM when determining insurance rates and whether flood insurance is required.

When FIRM and Ground Data Disagree. The BFEs published in the Flood Insurance Study set the level for flood protection purposes and the maps are a graphic portrayal of that information. Since FEMA usually does not have detailed topographic mapping to use in preparing

the flood maps, the flood boundaries are interpolated between cross sections using whatever topographical information is available at that time. This can result in inaccuracies in drawing the boundaries on the map. These inaccuracies can be corrected through FEMA's Letter of Map Amendment processes and are typically free.

When ground surveys show that a development site is above the BFE, the Floodplain Administrator can suggest the LOMA process. If the applicant wishes to go ahead with the proposed development, the Floodplain Administrator shall follow through with the floodplain development application review and issue the permit if compliant. This process would include issuance of a floodplain development permit denoting any other restrictive criteria such as protection of any basement or other materials reaching below BFE. The elevation and V zone certifications are still required to verify compliancy. A map amendment is necessary in order to correct (or remove) the Special Flood Hazard Area designation and the floodplain management regulations cannot be lifted until FEMA officially approves the amendment through a letter or physical map change.

Conversely, if ground surveys show that areas shown to be outside the boundaries of the Special Flood Hazard Area on the FIRM are in fact below the BFE, the area should be regulated as SFHA and proposed development is subject to the requirements of the community's flood ordinance. Even though a site appears to be outside the mapped SFHA, you are not doing future occupants any favors by ignoring the known flood hazard.

Approximate A Zones. Approximate A Zones (also called “unnumbered A Zones”) are those areas not studied by the detailed hydrologic/hydraulic methods. These areas are shown as “unnumbered A zones” on the FBFM and the FIRM and “approximate 100-year flood zones” on the Flood Boundary Floodway Map (FBFM). The maps and the FIS do not provide BFEs, the Floodway Map does not show the floodway/fringe delineations, and the FIS does not provide any non-encroachment data. Almost all riverine flooding sources that are shown on older North Carolina FIRMS with Approximate A Zones or Unnumbered A Zones have been studied by the Limited Detailed Study method and remapped as AE Zones with BFE's on the new North Carolina DFIRMs.

Regulating development in approximate or unnumbered A Zones is one of the more difficult aspects of administering floodplain management ordinances. The NFIP regulations require that the local Floodplain Administrator make every effort to locate and use any flood data available in order to achieve a reasonable measure of flood protection (44 CFR Section 60.3(b)(4)). Furthermore, many states and local ordinances require a BFE to be determined before a permit can be issued for any development. North Carolina does not require this except for large developments (see next section) as required under 44 CFR Section 60.3(b)(3).

44 CFR 60.3(b) When the Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:...

(3) Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;

(4) Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards ...

Below are some suggestions for obtaining data needed for unnumbered A Zones. BFEs obtained should be used as long as they reasonably reflect flooding conditions expected during the base flood, are not known to be technically incorrect, and represent the best data available. Whichever approach you use, be sure to record it in the permit file to justify your decisions with respect to proposed development. It also is a good idea to record the data on the master copy of your FIRM so that you and others in the permit office can be consistent when other applications are received for development in the same area.

- If a body of water forms a boundary between two communities, the community on the other side may have a detailed study; the BFE data are valid for both sides of a body of water.

- Ask the U.S. Army Corps of Engineers, U.S. Department of Agriculture/Natural Resources Conservation Service, or U.S. Geological Survey if they have knowledge of any flood studies, unpublished reports, or any data that may pertain to the area in question.
- If the property is along a waterway that is near a State highway structure such as a bridge or culvert, the NC Department of Transportation/State Highway may have done a flood study to properly size the structure.
- Check with local flood control, sanitary or watershed districts; some may have developed flood data to support other activities.
- If the property is on a river with a power-generating dam, the dam owner may have had to conduct a study for federal licensing.
- You may require the developer to have a qualified water resources engineer develop BFEs, perhaps by conducting hydrologic and hydraulic analyses or by applying simplified methods (see below).
- For single lot developments, the city engineer or public works department may be able to develop BFEs using simplified methods (see below). Also, in NC, the U.S. Army Corps of Engineers (contact their Wilmington District office or Nashville TN District office for Western NC) will also determine BFE data for single lots and other small developments for a minimal fee. There is also a small area of eastern North Carolina covered in the Norfolk Virginia District office.

The FEMA publication *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations* describes a number of methodologies for developing BFEs in approximate A zones. These methods range from detailed methods that produce BFEs and perform floodway analyses similar to those used for FISs, to simplified methods that can be used in isolated areas where more costly studies cannot be justified.

If your community has approximate A Zones that are likely to be developed, you should get a copy of this document and have your engineer review it. You can also download FEMA's Quick-2 software for computing flood elevations.

Approximate A Zones: Subdivisions and Larger Developments.

The NFIP regulation cited above (44 CFR 60.3(b)(3)) clearly provides the basis for a community to require that a subdivision developer determine the BFE where it is not provided by the NFIP. Assuming you have no reason to believe the unnumbered A Zone shown on the FIRM is grossly in error, it can be used to avoid placing buildings in the SFHA. By laying out lots so that the SFHA is avoided, the developer can avoid a costly flood study and future owners will not be exposed to flooding associated with the base flood.

Any subdivision or manufactured home park with more than 50 lots or five acres or any single-lot development of more than five acres, must be evaluated to determine if the proposed development falls within an approximate A Zone. If such a large development does fall into such an approximate or unnumbered A zone, BFE data must be determined. If BFEs are required, the developer must obtain the required study. While the study must provide BFEs, you may want to require a floodway delineation and inclusion of other data needed to ensure that the building sites will be reasonably safe from flooding. It is important to advise the developer to follow the NFIP's guidance for studies so that the results will be accepted for a map revision.

BFE data are required for the subdivision shown in Figure 4-1a because it has more than 50 lots regardless of how many lots are actually located within the floodplain. The key here is that it all produces runoff into the same watercourse. BFE data are required for the subdivision shown in Figure 4-1b because it is larger than five acres again regardless of how much acreage is actually located within the floodplain. Figure 4-1c shows a subdivision with more than 50 lots, but the cul-de-sac is within the approximate Zone A area left as open space; therefore in this case a detailed study is necessary since there is road development in the floodplain. If the cul-de-sac was not located in the floodplain, then the subdivision would not have required a detailed study.

When a developer prepares a detailed flood study in an approximate A Zone, the community must require that it be submitted to FEMA within six months. In some cases, it is advised to require that the developer obtain a Conditional Letter of Map Revision as a condition of approving the subdivision plat. See Section 4.11 of this chapter for more information on map revisions.



Activity 410 in the Community Rating System provides credit if the community provides (or requires) BFEs, floodways and related regulatory data in areas not mapped by the NFIP. See the *CRS Coordinator's Manual* or the *CRS Application*.

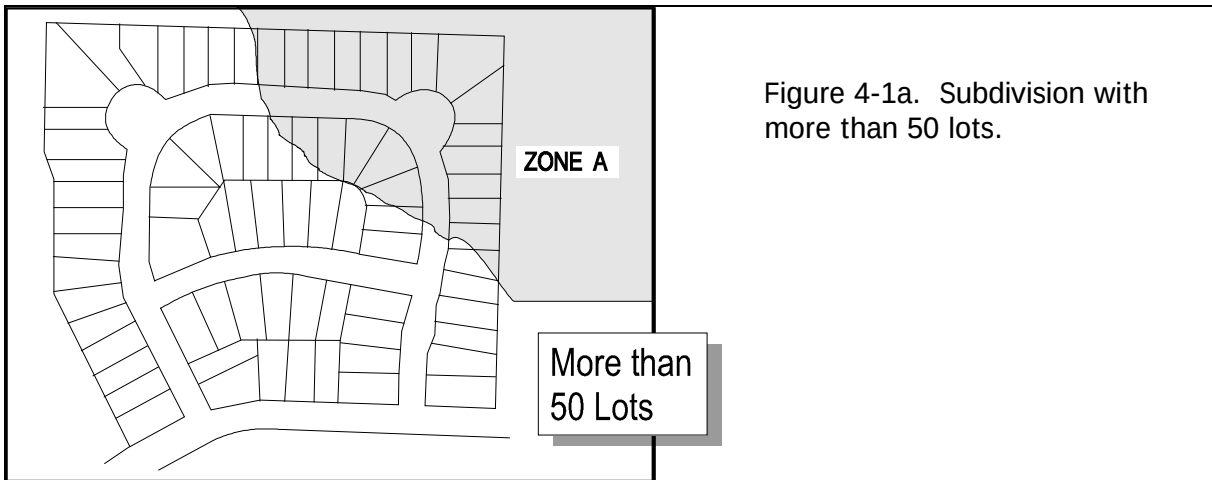
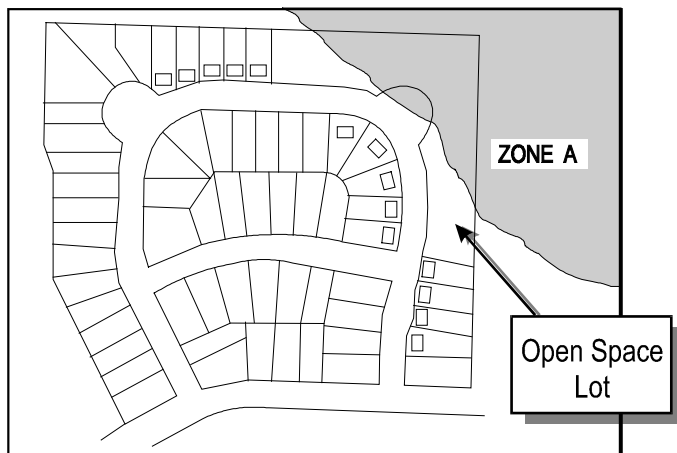
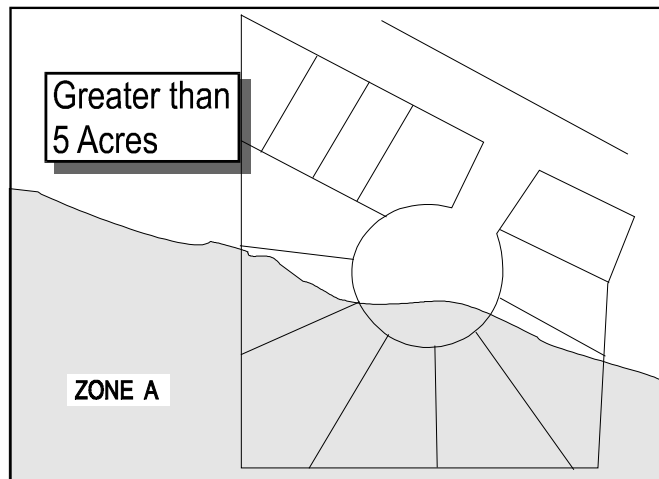


Figure 4-1b. Subdivision larger than 5 acres.



Approximate A Zones: Small Developments. Even if a proposed development activity does not involve more than 50 lots or more than five acres, it is still the responsibility of the community's Floodplain Administrator to apply the requirements of their flood ordinance. The NFIP regulation at 44 CFR 60.3(a) (3) requires you to determine if the site is reasonably safe from flooding and, if it is in the SFHA, to issue a floodplain development permit pursuant to the flood ordinance. In nearly all cases, the only way to do this is to require that the building be elevated to above a base flood elevation that must be determined. There are at least four ways to establish this elevation:

- Walk the site with the property owner and see if the building can be sited on high ground. Particularly near smaller waterways, this can establish a safe building elevation.
- Use historical records or the flood of record (the highest known flood level for the area). If records of the recent flood are used, add a foot or two to provide a margin of safety. Before using recent flood levels, get a second opinion from the NC NFIP State Coordinator, the FEMA Regional Office, the U.S. Army Corps of Engineers, or the Natural Resources Conservation Service.
- Require the permit applicant to develop a BFE or develop one yourself using one of the methods in the FEMA publication *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations*. This will usually require the services of an engineer, but will be worth the additional expense if it is the only way to make sure the building is protected from flood damage. The document outlines several methods with varying costs and levels of detail.
- Require protection to a set elevation such as at least 5-feet above grade. Only use this approach if you are confident that the selected height will provide adequate flood protection to the building. While this approach may be less risky in the floodplain of smaller waterway, it is the least preferred approach as waterways get larger and floodplains get wider and deeper.
- In North Carolina, there is a default standard of 2-feet above highest adjacent grade at the building location. This requirement is for all structures and attendant utilities. This default is only after searching for any other available data. NC also has a setback rule that has been in place for many years that is also only to be utilized in cases where there is no other floodway or non-

encroachment area data available. This setback is determined as 20-feet or 5 times the width of the stream from top of bank to top of bank, whichever is larger. This setback becomes the equivalent of a floodway measured from the top of the bank. No development is permitted within this setback area unless it meets the same provisions as a floodway or non-encroachment area.

Draft Revised NFIP Data. When FEMA or the State of NC is processing a map revision and has provided preliminary data to the community for review, this preliminary data must be utilized starting immediately for determining the BFE and floodway or non-encroachment area for the approximate A zone areas as well as for determining the floodway or non-encroachment area for areas within AE zones that have BFEs but no effective floodways or non-encroachment areas. Otherwise, all the remaining preliminary data is only advisable until it goes effective. For more information on this issue, see *Use of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98. This more stringent preliminary data should strongly be advised for best floodplain protection but is not mandatory unless adopted by the community. Communities have the option to adopt the preliminary maps as official flood maps prior to going effective if they restrict their usage to only where they are more restrictive than the currently effective flood maps.

Similarly for a Conditional Letter of Map Revision (CLOMR), a CLOMR provides that *if* a project is constructed as designed, then the BFEs can be revised or modified (or the property in question can be removed from the SFHA) *AFTER* the as-built specifications are submitted *AND AFTER* the final LOMR is issued. A permit cannot be issued based on a lower BFE proposed by a CLOMR until the final LOMR is issued. However, you can issue a permit for that part of the work not dependent on the changes that will result from the LOMR and condition the full permit upon receipt of the final LOMR. See Section 4.11 of this chapter for more information on map revisions.

Advisory Flood Hazard Data. Sometimes FEMA issues advisory data after a major flood where it was found that the FIRM and/or the FIS underestimate the hazard. Advisory Flood Hazard Data are provided so that recovery and reconstruction is undertaken with the best available information. After Hurricane Floyd hit eastern North Carolina in

September 1999, FEMA had Flood Recovery Maps produced under contract for several of the hardest hit areas. These communities were required to adopt these maps and utilize them where they were more stringent than the effective flood maps for the community. Other community's contracted with this same contractor to produce the same type of recovery maps for the community's recovery activities. Again, remember that the community must adopt these maps for them to be enforceable and even then, only where they are more stringent than the currently effective flood maps.

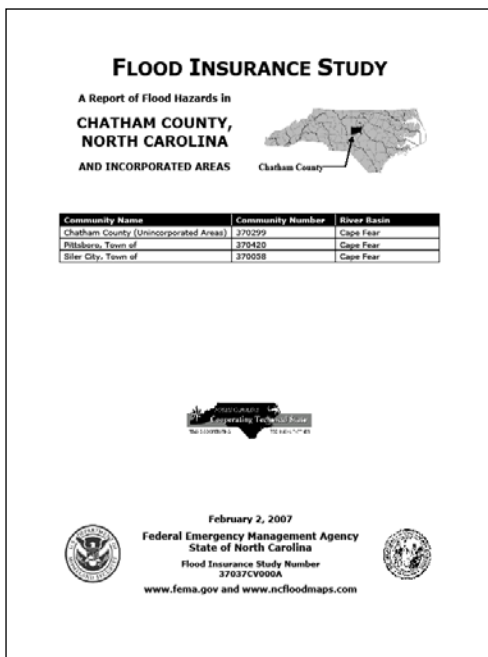
So, when you receive such advisory information, you should “reasonably utilize” it. If your community agrees with the information, the ordinance should be revised to adopt it. If you disagree with the post-disaster data, you should be ready to explain the State and/or FEMA why you're not requiring construction and reconstruction to be protected in accordance with the advisory data. For more information on this issue, see *Use of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98.

4.4 FIS Reports

The majority of FIS reports utilize the same outline and chapter/section numbering system, summarize data in tables, include profiles for riverine waterways, and describe how this information is related to the Flood Insurance Rate Map (FIRM) and Floodway Map. The most important reasons to use the FIS report, in conjunction with the maps,

is to determine whether a site is located in a Special Flood Hazard Area (SFHA), CoBRA or OPA, and/or a floodway or non-encroachment area, and to determine the Base Flood Elevation (BFE).

Because flood elevation determinations are used to establish flood elevations for development location decisions, construction in SFHAs, and other purposes, accuracy is critical. It is important to check – and double check – your flood zone and elevation



determinations.

Report Contents. The FIS report cover has an outline map of the state and the location of the community is highlighted. The date of the FIS and the community identification (CID) numbers are also indicated on the cover. All FIS reports follow a similar outline; the sections in NC's FISs include:

- **Section 1.0 – Introduction:** describes the NFIP, states the purpose of the FIS and the components thereof.
- **Section 2.0 – Floodplain Management Applications:** describes the floodplain management applications with relation to the floodplains, floodways, non-encroachment areas, BFEs and watershed characteristics.
- **Section 3.0 – Insurance Applications:** covers flood zone definitions and other data related to flood insurance, some of which is not directly used for ordinance administration; this section is a useful reference as it describes the flood insurance zones identified on the map.
- **Section 4.0 – Area Studied:** describes the characteristics of each river basin as well as the community's principal and historic flood problems. This section also discusses flood protection measures and the scope of the study performed.
- **Section 5.0 – Engineering Methods:** discusses the engineering methods used. Section 5.1 covers the hydrologic analysis (how much water), while Section 5.2 describes the hydraulic analysis (how high the water will get). And, Section 5.3 describes the coastal analysis. The Summary of Coastal Stillwater Elevation tables, Transect Location Map and the Limited Detailed Flood Hazard Data tables are all found in this section of the FIS report.
- **Section 6.0 – Mapping Methods:** discusses the vertical and horizontal datums, base map information, and the delineation of floodplains and floodways. The Floodway Data tables are included in this section of the FIS report.
- **Section 7.0 Revising the FIS:** discusses both the physical and the letters of map change processes. This section also provides map history for each community covered by the FIS report.

- **Section 8.0 – Study Contracting and Community Coordination:** provides authority and acknowledgements and consultation coordination officer's meetings/scoping meetings.
- **Section 9.0 – Guide to Additional Data:**
- **Section 10.0 – Bibliography and References:**
- **Flood Profiles:** located at end of report for detailed riverine floodplains

4.5 Flood Data Tables

Flood Discharges. An excerpt from a flood discharges table is shown in Table 4-1. This table, prepared for riverine waterways studied using detailed methods, summarizes the peak discharge (volume of water in cubic feet per second) for various flood frequencies at locations within the study area. A discharge of 33,300 cfs means that during the peak of the base flood (100-year), 33,300 cubic feet of water will pass the USGS gage at Kinston each second. The size of the drainage areas (watersheds) contributing to the water runoff producing the floods are also shown in the table.

Table 4-1. City Of Kinston, NC, Flood Discharges (excerpt)					
FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. mi.)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100- YEAR	500- YEAR
NEUSE RIVER USGS gage at Kinston	2,690.0	19,000	27,900	33,300	54,000
SOUTHWEST CREEK					
At mouth	67.5	2,520	4,610	5,800	9,410
Below Mill Branch	61.0	2,370	4,360	5,500	8,940
Above Mill Branch	56.7	2,270	4,190	5,280	8,610
Below Strawberry Branch	54.9	2,230	4,120	5,190	8,470
Above Strawberry Branch	50.8	2,130	3,940	4,980	8,130
At NC Highway 58	49.5	2,100	3,890	4,910	8,030

Floodway Data Table. The Floodway Data Table presents data from the hydraulic analysis; an example of an old format Floodway Data Table is shown in Table 4-2. All numbers in the table are calculated at each cross section. In comparison, a new Floodway Data Table for the same stream reach is shown in Table 4-3. The first two columns (under “Flooding Source”) identify the waterway name and the cross sections used in the FIS, and the distance of the given cross section from some reference point, usually the mouth or confluence of the flooding source, a corporate limit, or a county boundary. The footnotes at the bottom of the Floodway Data Table identify this reference point.

The locations of the cross sections are shown on the accompanying FIRM or Floodway map and in the Flood Profile (unless otherwise indicated on the Floodway Data Table). Cross section A is the line that crosses the waterway on the map and has the letter “A” in a hexagon at each end of the line. The cross sections are label alphabetically on older flood maps and are numbered on NC’s new FIRMs with numbers representing the number of hundreds of feet above the mouth or confluence of the watercourse. The new number methodology has additional advantage by assisting the reader in knowing whether they are looking upstream or downstream. This provides great assistance in determining the new floodway widths and non-encroachment areas as discussed a little further into this chapter.

The width of a floodway usually is not symmetrical; it varies left and right of stream centerline with the topography at each cross section. The next three columns (under “Floodway”) provide specific data for each cross section. For example, at cross section D on Southwest Creek:

- The floodway is 550 feet wide. This means that from the floodway boundary on one side of the waterway to the floodway boundary on the other side of the waterway is 550 feet. This is useful for double-checking the width and scale of the floodway portrayed on the map. The newer NC FIRMs include a Flood Hazard Data Table (shown on the FIRM) showing the distances left and right of stream centerline to the floodway line.
- The cross sectional area of the floodway is 5,650 square feet. This is the cross sectional area of the floodway below the elevation of the base flood at this location which is available to carry the base flood downstream during a base flood event.

- The average or mean velocity of the base flood in the floodway is 0.9 feet per second (velocities will generally be higher in the channel than in the over bank areas).

Of the last four columns (under “Base Flood Water Surface Elevation”), the first one is the BFE referencing NGVD 1929 for regulatory purposes. The other columns depict the increase in water-surface elevation if the floodplain is encroached by the computer model such that the elevation increases no more than 1 foot along a reach and another without such encroachment. This amount of encroachment is used to define the floodway width. Notice that no cross section has an increase of more than 1.0 foot.

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Table 4-2. City of Kinston, NC, Old Floodway Data Table

FLOODING SOURCE			FLOODWAY		BASE FLOOD			
CROSS SECTION	DISTANCE ¹	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WATER SURFACE ELEVATION			
					REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Neuse River								
A	434,100	2,500	12,830	2.6	31.2	31.2	31.8	0.6
B	451,850	740	9,330	4.0	35.5	35.5	36.2	0.7
C	454,480	1,265	18,520	1.8	36.5	36.5	37.1	0.6
D	466,150	2,000	21,885	1.5	37.4	37.4	38.3	0.9
E	475,390	2,100	37,475	0.9	38.1	38.1	39.1	1.0
Southwest Creek								
A	16,040	600/550 ²	2,981	1.9	32.4	32.4	33.1	0.7
B	17,060	600/560 ²	3,975	1.4	33.0	33.0	33.6	0.6
C	18,790	550/190 ²	5,418	1.0	34.6	34.6	35.0	0.4
D	21,060	550	5,650	0.9	34.9	34.9	35.4	0.5
E	23,230	350	2,284	2.3	35.7	35.7	36.2	0.5
F	24,120	1,430	20,669	0.3	39.8	39.8	39.9	0.1
G	25,600	735	8,895	0.6	39.9	39.9	40.0	0.1
H	26,350	640	7,056	0.7	39.9	39.9	40.0	0.1
I	27,445	1,280	1,690	3.1	40.2	40.2	40.2	0.0
J	30,900	700	4,327	1.1	44.1	44.1	44.8	0.7
K	33,400	720	6,031	0.8	44.8	44.8	45.5	0.7
L	36,410	800	3,458	1.4	45.9	45.9	46.6	0.7
M	38,530	1,030	4,634	1.1	47.0	47.0	47.9	0.9

¹ Feet above mouth

² Total width/width within extraterritorial jurisdictional limits

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Southwest Creek								
085	8,510	700	2,603	2.2	33.0	25.8 ²	26.1	0.3
128	12,800	700	5,920	0.9	33.6	27.8 ²	28.5	0.7
160	16,040	600	2,981	1.9	33.8	31.3 ²	32.0	0.7
171	17,060	600	3,975	1.4	33.8	31.9 ²	32.5	0.6
188	18,790	550	5,481	1.0	33.8	33.5 ²	33.9	0.4
211	21,060	550	5,650	0.9	33.8	33.8	34.3	0.5
232	23,230	350	2,284	2.3	34.6	34.6	35.1	0.5
241	24,120	1,430	20,669	0.3	38.7	38.7	38.8	0.1
256	25,600	735	8,895	0.6	38.8	38.8	38.9	0.1
264	26,350	640	7,056	0.7	38.8	38.8	38.9	0.1
274	27,445	1,280	1,690	3.1	39.1	39.1	39.1	0.0
309	30,900	700	4,327	1.1	43.0	43.0	43.7	0.7
334	33,400	720	6,031	0.8	43.7	43.7	44.4	0.7
364	36,410	800	3,458	1.4	44.8	44.8	45.5	0.7
385	38,530	1,030	4,634	1.1	45.9	45.9	46.8	0.9
415	41,520	840	5,179	0.9	47.4	47.4	48.0	0.6
449	44,890	970	5,039	0.9	48.5	48.5	49.1	0.6
498	49,780	980	6,357	0.7	49.8	49.8	50.6	0.8
505	50,480	1,050	4,202	1.1	50.4	50.4	51.2	0.8
548	54,750	1,100	4,071	1.1	52.7	52.7	53.6	0.9
586	58,560	980	3,957	1.1	54.7	54.7	55.6	0.9
601	60,070	640	4,064	1.1	55.8	55.8	56.6	0.8

¹Feet above mouth
²Water-surface elevation computed without consideration of flooding from Neuse River

TABLE 14	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	LENOIR COUNTY, NC AND INCORPORATED AREAS	SOUTHWEST CREEK

Table 4-3. New Floodway Data Table.

Here is the current Floodway data table for the same area. Here it is Cross Section 211 which equates to the same area as Cross Section D above which are both located at a distance of 21060 feet from the mouth. This is all the same data because no new study was conducted --just a change in cross section format and vertical datum conversion.

FLOOD HAZARD DATA TABLE				Floodway Width (feet)
Cross Section	Stream Station	Flood Discharge (CFS)	1% Annual Chance (100 yr) Water Surface Elevation (feet NAVD 88)	Left/Right Distance From The Center of Stream to Encroachment Boundary (Looking Downstream) or Total Floodway Width
CARTOOGEC HAYE CREEK				
003	256'	6,660	2,023.7 ²	66 / 144
019	1,929'	6,660	2,023.7 ²	193 / 52
027	2,656'	6,660	2,023.1 ²	59 / 95
CRAWFORD BRANCH				
024	2,434'	2,020	2,021.2	80 / 75
028	2,803'	2,020	2,023.0	48 / 126
030	2,988'	2,020	2,023.0	62 / 47
037	3,704'	2,020	2,026.4	87 / 43
041	4,079'	2,020	2,026.6	115 / 27
045	4,522'	1,810	2,031.4	86 / 20
047	4,708'	1,810	2,031.9	52 / 15
051	5,094'	1,810	2,032.5	45 / 24
055	5,495'	1,810	2,045.7	18 / 97

Figure 4-4. Flood Hazard Data Table.

Here is the abbreviate version of the Floodway data table portion applicable for this FIRM panel which is placed on the FIRM panel for easy reference.

Table 12—Limited Detailed Flood Hazard Data

Cross Section ¹	Stream Station ²	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width ³ (feet)
WHEAT SWAMP (continued)				
588	58,793	1,238	74.4	120 / 40
595	59,497	1,238	75.5	81 / 106
603	60,328	1,148	77.0	213 / 17
WHEAT SWAMP TRIBUTARY				
006	592	1,011	40.3	98 / 74
012	1,177	1,011	40.9	15 / 154
018	1,838	1,011	41.6	23 / 133
024	2,380	1,011	42.2	15 / 110
029	2,894	1,011	42.9	102 / 103
034	3,404	1,011	43.4	35 / 110
046	4,564	443	50.4	11 / 68
051	5,109	443	53.0	69 / 52
056	5,646	443	53.9	97 / 36
062	6,155	443	55.6	78 / 11

¹This table reflects all modeled cross sections. Some cross sections shown in this table may not appear on map.

²Feet above mouth.

³Left/right distance from the mapped center of stream to encroachment boundary based on a 1.0 foot or less surcharge (looking downstream).

⁴Elevation includes backwater effects.

Above is an example of a Limited Detailed Flood Hazard Data Table as used to represent the non-encroachment area data for limited detailed studies in North Carolina.

Coastal Flood Elevations. Table 4-3 shows example stillwater elevations and the maximum wave crest elevations of 100-year flood events along the coast. The regulatory BFE is shown on the FIRM – do not use the stillwater elevations to administer the ordinance. So, when do you use the FIRM and when do you use the stillwater table to determine a BFE? When the FIRM BFE is higher (more than just rounding to the nearest foot) than the stillwater BFE, the FIRM BFE must be used because this would indicate wave action is included. This wave action is easily apparent in VE zones because by definition, VE zones include at least 3 feet of wave action but much harder to determine in the coastal A zones.

At South shore from Oyster Catcher Court Extended to Cape Fear, the 100-year stillwater elevation is 10.1 ft., and the wave crest elevation is

11.9ft. For the FIRM panel, the BFE of 11.9 will be rounded to 12. The latter is the BFE shown on the FIRM.

Table 4-3. Village of Bald Head Island, NC, Summary of Stillwater Elevations				
FLOODING SOURCE AND LOCATION	ELEVATION (feet NGVD) ¹			
	10- YEAR	50-YEAR	100-YEAR	500- YEAR
ATLANTIC OCEAN				
West shore from Bald Head Creek to Horsemint Trail Extended	5.8	8.7	10.1/10.6 ²	13.3
West shore from Horsemint Trail extended to Oyster Catcher Court Extended	5.8	8.7	10.1/11.0 ²	13.3
South shore from Oyster Catcher Court Extended to Cape Fear	5.8	8.7	10.1/11.9 ²	13.3
East shore, north of Cape Fear	5.8	8.7	8.9/10.7 ²	13.3

1 National Geodetic Vertical Datum of 1929

2 Includes wave setup

Lake Flood Elevations. On inland lakes and reservoirs, the FIS generally does not include the effects of waves. For these areas, information on BFEs is contained in Section 5.0 of the FIS report, and data are presented in a table summarizing stillwater elevations (similar to Table 4-3, above). Note that in this table the BFE is shown to the nearest one-tenth of a foot, but the BFE shown in parentheses on the FIRM is rounded to the nearest whole number. For most lakes and reservoirs, use the base flood elevation from the table, not the FIRM same as in coastal areas without wave action. In North Carolina, the main exception to this rule is on Lake Mattamuskeet in Hyde County, North Carolina which is so large that significant wave action is produced during a base flood event similar to the Great Lakes.

Where studies have been carried out for lakes and reservoirs, information on BFEs is contained in the FIS report in a *Summary of Stillwater Elevations* table. Note that the actual BFEs to the nearest one-tenth of a foot appear in the table, but the BFE on the FIRM is shown in parentheses rounded to the nearest whole number. For the most accurate BFE, use the “100-year flood elevation” from the stillwater table in the FIS, not the rounded BFE on the FIRM. For a

conservative method, you can add 0.4 foot to the elevation shown on the FIRM. This will get you an elevation at least as high as the highest number shown in the table.

4.6 Relating Report Data to Maps and Profiles

Chapter 3 described the data that are developed and used in preparing an FIS. The data from the models that are summarized in the FIS report are consistent with those found on the accompanying profiles and FIRM. For example, the base flood water-surface elevations at each identified cross section of a riverine floodplain can be found in the Floodway Data Table or Limited Detailed Flood Hazard Table, read from the flood profiles, and interpolated from the FIRM. Within the limits of map accuracy, you should obtain the same answer regardless of which source you use.

In the same way, the distances between cross sections, or their distance from some reference, can be found using the tables; flood profiles, or measured from the FIRM or Floodway Map. Again, the answers should be about the same.

The elevations of the computed water surface profiles contained in the FIS report are used with ground elevation data to determine the limits of the various zones shown on the FIRM. Again, flood elevations can be determined at any location along the studied riverine waterway using either the flood profiles or the FIRM. All the data are consistent – if obvious mistakes are found, please advise the State or FEMA Regional Office.

A reminder is in order. Due to the limited detail and large scale of the base maps used for most older FIRMs (USGS topographic maps) and the new DFIRMs using LiDAR both of which may still be less accurate than field surveys, considerable interpolation between contour lines is done in mapping the floodplain boundaries. Significant discrepancies should be rare. This is a significant reason why discrepancies are found when actual ground elevations are surveyed: the maps are just the best available graphic representations of the BFEs.

There is a preferred order of precedence for identifying the BFE at a particular location:

- For riverine waterways, the most accurate BFEs are found in the Floodway Data Table or Limited Detailed Flood Hazard Table; these BFEs are listed to 0.1 foot. However, because of sloping water surfaces, the Floodway Data Table or Limited Detailed Flood Hazard Table is only good for sites on or close to a cross section.
- For coastal areas and lakes, the most accurate BFEs are found in the Summary of Stillwater Elevations table; these BFEs are listed to 0.1 foot when there is no wave action. For areas closer to the coastline such as VE zones and adjacent coastal AE zones, the BFE on the FIRM should be used if greater (more than just rounding) than the BFEs found in the Summary of Stillwater Elevations table.
- For riverine waterways, the next most accurate source of elevation data is the flood profile.
- The least accurate source of elevation data for a riverine floodplain is the FIRM which shows BFEs rounded to the nearest whole foot. The FIRM is the only source of BFEs (or flood depths) for AO and AH Zones.
- As for unnumbered or approximate A zones as discussed in early sections, two feet above highest grade is required in NC communities when BFE data is not available from any other reliable source.

Only FEMA can amend or correct the maps. Discrepancies should be brought to FEMA's attention through a request for a map change, such as a Letter of Map Amendment (LOMA) (see Section 4.11). Starting July 1, 2006, the State of NC was granted the authority to process Letters of Map Changes for Letters of Map Revision (LOMR) and Conditional Letters of Map Revision (CLOMR). At this time, LOMAs continue to be processed by FEMA. FEMA now provides an interactive online determination tool for MT-1 requests called eLOMA which is a web-based application within the Mapping Information Platform (MIP) that provides licensed land surveyors and professional engineers (Licensed Professionals) with a system to submit simple Letter of Map Amendment (LOMA) requests to FEMA with a format to generate a determination from FEMA in minutes. Historically, the manual process for a LOMA took up to 60 days.

4.7 Certified Floodplain Surveyor Training.

In addition, North Carolina has the Certified Floodplain Surveyor (CFS) Pilot Program to expedite determinations from the Federal Emergency Management Agency (FEMA). Licensed surveyors in North Carolina can attend the CFS training sessions and pass the CFS exam to become registered through this program allowing them to submit for Letters of Map Change (LOMCs), namely Letters of Map Amendment (LOMAs) and Letters of Revision – based on Fill (LOMR-Fs) through an expedited process. These submittals result in expedited issuance of LOMAs and LOMR-Fs with fast-tracked determinations from FEMA within 5 business days instead of the 45 to 60 days typically needed to process LOMCs through traditional processes. For more information on the CFS Program, please go to <http://www.ncsurveyors.com/>.

4.8 Using Flood Maps

This section describes how to use flood maps and supporting information in the FIS, specifically flood profiles.

Select the Panel and Locate the Site. How easily you can locate a site on an NFIP map will depend both on your familiarity with the community and the scale of the flood maps. To locate a site, follow these steps:

- If your community has more than one map panel, use the current map index to determine which panel to use. This map index should be dated the same date as listed in FEMA's Community Status Book published on FEMA's website [www.fema.gov/cis/NC.pdf]. This Community Status Book is updated nearly daily tracking all NFIP communities effective dates and most current map index dates. Use map landmarks – highways, streets, waterways – to find the site on the map index. Be sure the map panel is the most recent one — compare its suffix letter with the suffix letter for that panel on the current Map Index. Remember, in many communities, panels will have different effective dates due to revisions that do not affect the whole community. If there are one or more asterisks on the panel number shown on the map index, then this panel was not printed. See the notes for what the asterisk(s) mean. Typically the panel has either

no flood hazard identified in that area, is entirely over water or it is entirely one flood zone with one uniform BFE.

- Find the general area of the site on the map panel and locate the site as closely as possible. Use a detailed street or road map as well as the tax appraiser's plat map to identify the property boundaries, if necessary. You will probably have to obtain the distance on the ground between the site and one or more identifiable points, such as the centerline of a road or street, a bridge, or some other feature on the map. Locate these points on the flood map.
- Convert the distance to the map scale and plot the site on the map.

Reading BFEs on Maps. BFEs are shown on the FIRMs as whole rounded numbers:

- AE Zones and A1-30 Zones, use the BFE printed in or above the wavy line (refer to the map legend or key if you are unsure of the line markings) and then go to the FIS and fine tune this BFE to the nearest tenth of a foot using the data tables and/or profiles as applicable.
- AE Zones on lakes, typically use the BFE printed in parentheses under the zone designation unless there is wave action on the lake.
- AH Zones, use the whole number BFE from the FIRM.
- AO Zones do not have BFEs; instead, the equivalent flood protection level is the depth number (the number of feet shown in parentheses after the "Zone AO" label). The depth number is not an elevation above sea level; it is the depth of flooding measured above ground level. When no depth is provided on the FIRM, a default of two feet must be used.
- Unnumbered A Zone areas indicate approximate floodplain boundaries on waterways where no detailed study has been performed. Determining the BFEs in these areas is one of the biggest challenges (see Section XX).
- VE Zones and V1-30 Zones, use the whole rounded BFE printed in parentheses under the zone designation because wave action is included and therefore is higher than the stillwater elevations for this floodplain.

Determining Stream Distance or Stationing (Riverine). Stream distance or stationing refers to a distance above a reference point – the distance may be shown in feet or miles. In order to use the flood profile to identify the BFE at a particular site, the stream stationing must be determined (see Figure 4-2):

- Locate the site on the FIRM or Floodway Map that shows cross sections and draw a perpendicular line to the channel. Identify which labeled cross sections are nearest to your site, both upstream and downstream.
- Check the map scale used for the panel (see the map legend or key) and the stationing on the horizontal axis of the flood profile. Be sure to use appropriate conversions, e.g., if you measure in miles, multiply by 5,280 to convert to feet; if you measure in feet, divide by 5,280 to convert to miles.
- Use an engineer's scale or wheel to measure the distance along the waterway from the nearest cross section to the point on the waterway that is perpendicular to the site, *following all bends and curves of the waterway centerline*. It is important to measure the distances to both upstream and downstream cross sections to improve accuracy.

Also measure distances to nearby bridges, culverts or confluences with another waterway; those features are shown on the flood profile. This will also improve accuracy.

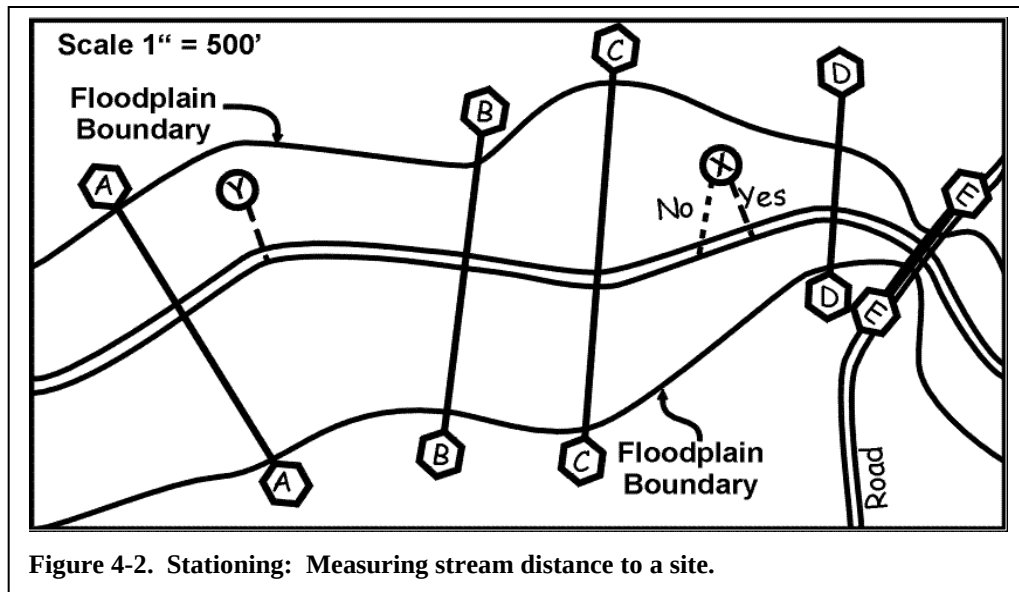


Figure 4-2. Stationing: Measuring stream distance to a site.

Locating the Floodway Boundary. Use measurements from the Floodway Map or FIRM and data from the Floodway Data Table to determine if a site falls partially or wholly in the floodway. The Floodway Map and the FIRM are both officially adopted by the community. Because the floodway boundaries are drawn using data that are in the table, then the table data will yield a more accurate measure than map measurements for sites on or close to a cross section. Remember that the width listed in the table is not necessarily centered over the center of the waterway; it is the total distance from the floodway boundary on one side of the waterway to the floodway boundary on the other side of the waterway. In newer studies, this width is broken down to two distances, measuring left and right of the centerline of the waterway looking downstream. This is where the NC cross section numbering system really helps. If the cross section numbers are going down, then you are looking downstream and you can accurately determine which side is left and which right of centerline.

Most sites will not fall conveniently on or very close to a cross section. The steps for using the map to determine whether a site is affected by the floodway include:

- Determine the scale used on the Floodway Map (which may not be the same used on the FIRM) or the FIRM if floodway data is provided on the FIRM.
- Locate the floodway boundary on the map using an engineer's scale to measure from a map feature (bridge, centerline of a road, road intersection, etc.).
- Transpose the floodway boundary to the site map; if any portion of the proposed development activities fall within the floodway, the floodway provisions of the ordinance apply.

As an added reminder, floodway boundaries do not follow contour lines because the floodway is designed based on a cross sectional area not an elevation.

Locating the Non-Encroachment Area Boundary. Use the Limited Detailed Flood Hazard Tables located in Section 5 of your FIS. Find the table for your particular watercourse. The far right hand column of this table provides you with offset distances both left and right of the centerline of the watercourse at that specific cross section looking

downstream. Again, this is where the NC cross section numbering system really helps. If the cross section numbers are going down, then you are looking downstream and you can accurately determine which side is left and which right of centerline. These non-encroachment areas are not shown graphically on the published FIRMs so more work is required in determining these boundaries than a plotted floodway. These distances can be provided on your floodplain development permit as non-encroachment area setbacks when the proposed development is right at a cross-section. When a proposed development site is between cross-sections, this non-encroachment area boundary determination is a bit more difficult because you should interpolate these distance between the distances provided at the cross sections on either side of the proposed site. A guidance document entitled *Limited Detailed Studies* has been published to assist with these non-encroachment areas as part of the NC floodplain mapping efforts and it can be found at the following direct weblink - http://www.ncfloodmaps.com/pubdocs/issue_papers/IP17-lods.pdf . Essentially you have 3 methods to choose from:

1. Use the larger of the two distances from the cross sections both upstream and downstream of the property and use the distance measurement that is on the same side as the property. Determine if the property is on the left side or right side looking downstream. Then go to the Limited Detailed Flood Hazard Tables in Section 5 of your FIS. This is the engineering section that holds these tables. Say your property is on the left side of the stream looking downstream. You would pull out the left side distance from the far right column for both nearby cross section and use the larger of the two distances for your permitting purposes. This is a quick and rough determination and is usually more conservative but be careful if the stream meanders a lot between the cross section. If so, you may wish to use a more precise methodology like the 3rd method listed below.
2. Transfer the distances from the far right hand column of the Limited Detailed Flood Hazard Tables located in Section 5 of your FIS for each watercourse being developed to the appropriate cross section on your record set of FIRMs in your office or on your GIS system. Once these distances are marked, you can roughly connect the dots from cross section to cross section to get an idea of where the non-encroachment areas

extend to but this again is just a rough estimate of the non-encroachment area boundary. If the watercourse meanders much, you again should try to do the next method.

3. As the most precise method of determining a non-encroachment area is by mathematical interpolation using the distances from the far right hand column of the Limited Detailed Flood Hazard Tables located in Section 5 of your FIS for each cross section on either side of the proposed project. The guidance sheet reference above will assist you in the mathematical formulas in doing this calculation. Once you determine the non-encroachment area setback distance through this formula, then you can provide this distance on your floodplain development permit as a restrictive setback to be measured from the centerline of the waterway. For additional help, you may want to measure this distance onto the FIRM so as to find out it's relation to other mapped features such as road intersections or the like that may be more easily measurable landmarks than the centerline of a waterway.

Other flood frequencies shown on the profile are useful for other applications, such as septic system design and location, bridge and culvert design, urban storm-water management, selecting sites for critical facilities, and estimating how frequently a site or facility is predicted to flood.

The non-encroachment areas are buildable products and may be upgraded to a full floodway in the future either through FEMA and/or State map maintenance processes or through local engineers. As a general rule, just remember that the non-encroachment area, same as a floodway, cannot extend beyond the AE zone boundary. As an added reminder, the non-encroachment areas are to be enforced identically to the floodway provisions.

4.9 Using Flood Profiles

The flood profile is a graph of computed flood elevations at the cross section locations. It can be used to determine elevations of floods of various frequencies at any location along the studied waterway, especially at sites that fall between cross sections. Flood profiles are found at the back of Flood Insurance Studies; most are "fold out" sheets that measure 11"x17".

Profile Features. Typically, water surface elevations are shown for four flood levels: the 10-, 50-, 100-, and 500-year (10%, 2%, 1%, and

0.2%) floods. Only the BFE (100-year) is required for compliance with NFIP standards. In addition, the profile sheets contain:

- A plot of the waterway bed elevation,
The locations of the cross sections used in the FIS and shown on the FIRM (a letter or number within a hexagon), railroads, community boundaries and stream confluences,
- the locations of some roads, and
- Culverts and bridges (usually depicted as a large “I”).

The water surface elevation data are plotted on a grid to facilitate interpretation. With few exceptions, the large grid squares are one inch on each side and are divided into tenth-inch increments in both directions (see Figure 4-3). The bottom, or x-axis, shows the distance along the waterway in feet or miles upstream of the confluence with the next larger body of water. The left side, or y-axis, shows the elevation in feet above the vertical datum used to prepare the FIS.

4.10 Determining BFEs

The BFE determination is the duty and responsibility of the community Floodplain Administrator. If the Floodplain Administrator requires a preliminary elevation certificate from the applicant, the surveyor or engineer should follow these same procedures as provided in this section in determining the BFE but the Floodplain Administrator must agree with their determination before accepting the certification and issuing a floodplain development permit.

Using Flood Profiles. Following these steps to determine the BFE using the flood profile (see Figure 4-3):

- Using the FIRM, locate features near the site that appear on the profile, such as a bridge or cross section.
- Follow the stationing procedures described above to determine the site's distance from a cross section or other feature that appears on the profile.
- Find the feature(s) on the flood profile for the applicable reach of waterway.
- Check the scale used for the profile, and, using an engineer's scale or wheel, measure the distance from the feature(s) to the

site. Remember to follow the centerline of the watercourse through all the bends and curves to obtain stream distance.

- Find the site's location on the appropriate flood profile line across the bottom and read the flood elevation up on the y-axis (count squares or use the engineer's scale). Remember, the scale on the y-axis is different from the x-axis scale.
- Find where the site intersects the profile for the specific flood level you desire. Draw a straight line to the left or right edge of the graph or use your scale.
- A surveyor can then establish this flood elevation you determined at the site with a temporary benchmark with PK nail or the like so the owner/builder will know how high above grade the BFE is predicted to be.

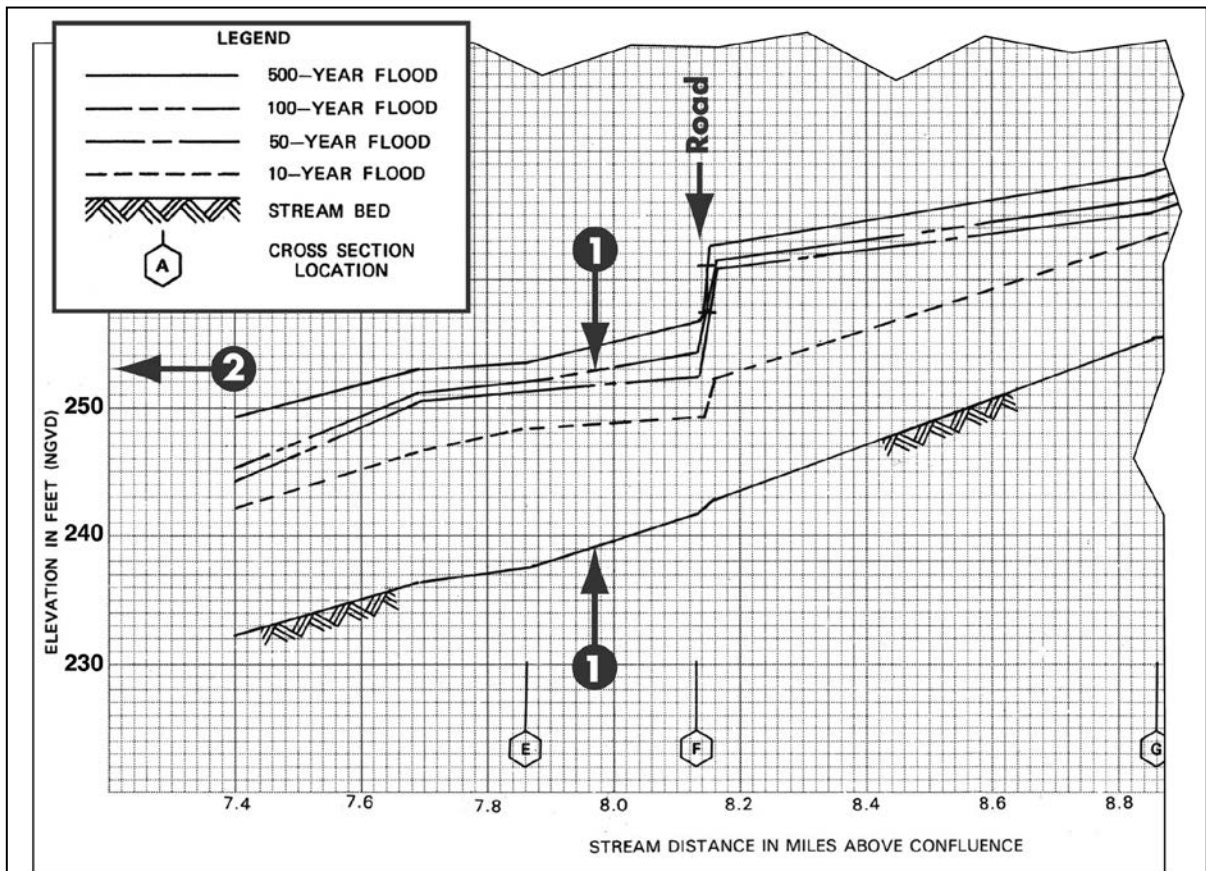


Figure 4-3. Use the Profile to Determine the BFE.

To determine the BFE at a site, locate the site on the effective FIRM. Measure the distance along the meandering centerline of the channel from the nearest cross sections or road to a point that is perpendicular to the site (see Figure 4-2). Scale that distance onto the Flood Profile (at ❶ above) and read up to the profile of interest – in this case, the water surface profile for the “100-year flood” is identified.. Then read across to determine the Elevation in Feet (at ❷ above).

Shallow Flooding. In areas of shallow flooding (AH and AO Zones), the base flood elevation or depth number is listed in parentheses below the zone designation on the FIRM. This elevation is used directly from the FIRM, without reference to the FIS (these zones don't have flood profiles). When the FIRM does not provide a depth for an AO zone, it is defaulted to a depth of 2 feet above grade.

Coastal Flooding. A VE Zone has coastal high hazard areas subject to flooding and wave action of three feet or more. For a VO Zone, the base floodplain with sheet flow, ponding, or shallow flooding is shown on the flood map. Base flood depths (feet above ground) are provided. Depth is 2 ft if not provided on flood map. Coastal A Zone (CAZ) is the area within a mapped special flood hazard area that is landward of a V/VE Zone or landward of an open coast without a mapped V/VE Zone. Note that FEMA uses a 3-foot breaking wave to delineate the inland extent of the VE Zone, thus waves between 3- and 1.5-feet are expected in Coastal A Zones. A V Zone is the coastal area subject to a velocity hazard (wave action) where BFEs are not determined on the FIRM.

Relating Flood Elevations to the Ground. If a site is clearly outside the boundary of the SFHA then the floodplain regulations do not apply. If a site is clearly inside the SFHA, then the floodplain regulations do apply.

If using the maps and profiles does not yield a definitive determination or if a site is adjacent to the SHFA, then, additional information and/or investigation will be needed, specifically a more detailed contour map or surveyed ground elevations. A field visit by the local Floodplain Administrator and measurements on the ground may also be appropriate.

Due to the scale of the base topographic maps used for most older FIRMs, it is common for locally high spots and locally low areas to not be shown on the maps. This makes it very important to require that a contour map be provided, especially for development activities that propose significant changes to the shape of the land (such as filling or excavation). If the actual ground elevation is below the BFE, then the ground should be regulated as SFHA regardless of whether the site is mapped as SFHA. But, if the actual ground is higher than the BFE then the site must be regulated until such time as the applicant/owner obtains a Letter of Map Amendment from FEMA (see Chapter 8). Only

upon receipt of a Letter of Map Amendment may the floodplain regulations be lifted.

Relating BFE data to Maps. Base flood elevations shown on the FIRM are directly related to elevation data shown on the flood profiles or in the data tables. Within the limits of map accuracy, you should obtain the same elevation whether you use the map, a data table or profile. Keep in mind that the BFEs shown on the FIRM are whole numbers and include rounding. The flood profiles should always be used to determine exact BFEs to a tenth of a foot accuracy along riverine waterways, especially for locations that are not on or immediately adjacent to a cross section. Floodway, Limited Detailed Flood Hazard Data tables can be used for sites at or very near a cross section since they provide BFE data to the tenth of a foot as required. As for shallow flooding areas, the only BFE data available is on the FIRM so it must be utilized in its rounded form. In coastal areas, the rounded BFE from the FIRM must also be used in VE zones due to the wave action associated with these high hazard areas. But, the coastal AE zones are a bit more difficult. A comparison must be made between the coastal stillwater table in the FIS and the rounded BFE on the FIRM. The higher of the two figures must be used if difference is more than just a fact of rounding. When the FIRM BFE is higher, most likely there is wave action included and this BFE must prevail.

4.11 BFEs in Unnumbered A Zones

In unnumbered or approximate A zones, just remember that the Floodplain Administrator must try to locate BFE data from any other reliable source before defaulting to the NC standard of 2-feet above highest adjacent grade. Same goes for floodway data, the Floodplain Administrator must try to locate floodway data from any other reliable source before defaulting to the setback rule of 20-feet or 5 times the width of the stream from top of bank to top of bank, whichever is larger. Review section 4.3 of this chapter for much more detail on obtaining and utilizing such BFEs.

4.12 Maintaining and Revising NFIP Maps

The flood risk information that is shown on the NFIP flood maps and found in the Flood Insurance Study forms the technical basis for administration of local flood ordinances. Current maps also are important so that property owners get appropriate flood insurance rates

and fair determinations of the requirement to purchase flood insurance as part of a mortgage transaction.

Care is exercised to ensure that the analytical methods are scientifically and technically correct, that the engineering procedures meet professional standards, and ultimately, that the results of the FIS are as accurate as possible.

Although rigorous technical standards are followed, FEMA recognizes that changes may be necessary. Some reasons for change include improvements in the techniques used to assess flood risks, permitted or natural changes in the physical condition of floodplains or watersheds, and the availability of new scientific or technical data. In addition, because many maps are printed at scales of one-inch to 500, 1,000 or 2,000 feet, there isn't enough detail to show every change in the ground. This means what look like "mistakes" may be found, that is, some individual properties may be shown as in the SFHA when they really are on high ground. But remember, the same "mistake" may mean that some properties are shown as out of the SFHA when they really are below the BFE.

FEMA can revise and amend maps and reports at any time. Some revisions are made when FEMA receives requests from community officials, developers, and individual property owners. The technical data used to prepare the initial study and maps must be used as the basis of a request that will change the boundaries of the flood hazard area, the boundaries of the floodway, or the base flood elevations. Data requests may be submitted through FEMA's web page or by contacting FEMA Region IV. See Appendix A for contact information.

Communities are the primary repository for NFIP maps that are accessible to the public. Therefore, it is important for communities to maintain a sufficient number of copies and to keep them updated. It is recommended that the permit office have at least one master set of FIRMs on which all changes are noted. Changes include everything from mistakes in street names to annexations, community determined BFE data, notes referencing effective LOMCs, the results of new studies prepared by developers, and issued permits (especially those involving fill or channel modifications).

It is also important that you keep copies of all old flood maps because they provide a historical record, assist in verifying grandfathering issues

and the basis of what was required in the past. For example, a property may not have been shown in the SFHA on an old FIRM, so floodplain management requirements were not imposed at the time of construction/permit. If that property is later flooded, you may need to show the old map as the basis for the community's action.

Similarly, people who purchased flood insurance based on the FIRM zone in effect at the time are entitled to keep that FIRM zone as the basis for their rates if they wish even if the FIRM is revised and replaced. You will be doing your citizens a valuable service if you have copies of all previous FIRMs and other flood maps and studies.

Ordering Maps and Studies. Maps are provided at no charge to local government officials. Only the FIRMs will be sent unless the FIS report and Floodway Maps are specifically requested. Copies of FIS reports, FIRMs, Floodway Maps and other effective flood maps published by FEMA can all be ordered by calling 1-877-336-2627 or by visiting www.msc.fema.gov/. Requests may be faxed to 1-800-358-9620, or mailed to:

FEMA Map Service Center

P.O. Box 1038

Jessup, MD 20794-1038

Changing NFIP Maps. No map is perfect and no flood situation is static. From time to time, FEMA, communities, or individuals may find it necessary for a FIRM or Floodway Map to be updated, corrected, or changed. Common reasons why a map may need to be changed include:

- **To correct non-flood-related features**, such as a change in the community's corporate or extraterritorial jurisdictional (ETJ) limits. The local government should send the correct information to the state and to FEMA Region IV Office. Since it is expensive to reprint and redistribute flood maps, corporate and ETJ boundary changes are usually made only when maps are revised for new or better flood data. One way to minimize the need for such changes is for a municipality to adopt the adjacent community's FIRM if not part of a countywide or not yet part of the NC statewide map. This would clarify the regulatory flood data for newly annexed

properties and areas in the community's extraterritorial jurisdiction but just be cautious of possible Elevation Certificate errors and insurance issues until corrected on a revised flood map.

- **To include better ground elevation data.** Because most older FIRMs used USGS topographic maps as the base map, many FIRMs do not adequately capture local and site-specific ground elevations. If there is better information on natural ground elevations for a lot or multiple lots, the applicant may apply to have the map reflect the better topographic information through FEMA's Letter of Map Amendment process. If available for larger areas, better elevation data can also be submitted through this same process but may result in a physical map revision if large enough to remap.

- **To reflect changes in ground elevations in the floodplain.** If there has been a substantial change in ground elevation, for example if fill has been placed to raise building sites above the BFE, then the applicant may request a map change to reflect the new ground information if it is a compliant project that was properly permitted through the community's Floodplain Administrator.

- **To revise flood data.** A request may be made to the NC Office of Geospatial Technology Management of the North Carolina Floodplain Mapping Program to revise the existing study of a waterway based on a new flood study. The applicant must demonstrate that the original study was in error or that the new study is based on more accurate or better technical data.

- **To submit new flood data.** When a flood study is prepared for a development in an unnumbered A Zone, the data can be submitted to FEMA for later incorporation into the FIS or revised FIRM.

- **To reflect a flood control project.** If a new levee, reservoir, or channel modification affects the flow of the base flood, the community must meet certain requirements in order to request that the map be revised to reflect the new conditions or new BFEs. The map cannot be changed until the project is constructed and/or operating.

It is important to note that many small permitted floodplain projects, such as channel clearing or retention basins in new subdivisions, do not have a measurable effect on the base flood and, therefore, do not warrant a map change. The request for a change needs to be carefully prepared by an engineer who knows FEMA's flood study guidelines. Please remember that even small projects need to be permitted and No-Rise Certifications will most likely still be required.

It must be remembered that a community participating in the NFIP is obligated by its agreement with FEMA to submit new or revised map information when it becomes available. Section 65.3 of the NFIP regulations states that "a community's base flood elevations may increase or decrease resulting from physical changes affecting flood conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify [FEMA] of the changes by submitting technical or scientific data . . ." With NC's partnership with FEMA on mapping efforts across the state, these changes should be submitted to the state as well.

Another point to keep in mind is that lenders, insurance agents, real estate agents, surveyors, engineers and communities must use the published flood maps. Lenders are affected by changes to FIRMs as they enforce the mandatory flood insurance purchase requirements. Communities are affected by changes to FIRMs and Floodway Maps as they enforce floodplain management regulations. Property owners are affected both when obtaining flood insurance and permits and hiring professionals to conduct development activities. FEMA has established procedures for requesting and administering map changes.

Types of Map Changes. FEMA has four types of map changes: restudies, limited map maintenance projects, revisions, and amendments. Most requests must be approved by or made by the community because the changes affect the local floodplain management program:

- A **restudy** is a new Flood Insurance Study for some or all of the community. For example, FEMA or the State of NC may decide to conduct a restudy where upland development has substantially changed runoff conditions over the 15 or 20 years since the original FIS was completed. Or a restudy may be needed where growth is occurring along streams that did not have detailed studies with BFEs and floodways or where floodplain changes that require

engineering analyses are proposed, including bridges, culverts, channel changes, flood control measures, and large fills.

- A **limited map maintenance project** (LMMP) is a small-scale restudy that is limited in size and cost. It is frequently used for studies in unnumbered A Zones.
- A **revision** is used for other cases, including:
 - To incorporate scientifically based challenges to the flood elevations,
 - To incorporate new data that become effective after the construction of a flood control project,
 - To reflect fill placed in the SFHA,
 - To change the floodplain or floodway boundaries, and
 - To include new flood data.

Note: Revisions can only be processed for compliant projects that were properly permitted through the community's floodplain management program.

- An **amendment** is used to remove an area that was inadvertently included in the SFHA. Sometimes the actual ground elevation is higher than depicted on the base map used for the FIRM. This must be based on the same natural ground that was in place at the time the flood study was conducted for that area. For example, more detailed ground elevation data can be used to amend a FIRM to show a structure and/or property that is higher than the BFE to be outside the SFHA. Unlike the other types of map changes, an amendment doesn't challenge the FIS or FIRM nor does it require the community's acknowledgement; it simply improves the FIRM by removing certain areas from the SFHA because they are shown to be higher than the BFE.

Maps and Letters. FEMA uses two methods to make flood map changes. The first is to physically change and re-publish the map, in which case the effective date of the map is changed. A restudy or limited map maintenance project will generally result in a new map. Sometimes revisions and amendments result in a reprinted map. However, republishing the map can be expensive and is done only if the change affects a large area.

The other method is to issue a Letter of Map Change (LOMC) that describes the map change. FEMA does this when the revision can be adequately described in writing or through use of a small, annotated map panel. Because LOMCs officially amend or revise the effective FIRM (and Floodway Map, if applicable), they are public records that the community must maintain. LOMCs should be noted on the community's master flood maps and filed by panel number in an accessible location. LOMCs revisions issued by FEMA include:

- **Letter of Map Revision (LOMR)**, an official revision to an effective FIRM that may be issued to change flood insurance risk zones, floodplain and floodway boundary delineations, BFEs and/or other map features due to compliant post-FIRM development.
- **Letter of Map Amendment (LOMA)**, an official amendment to an effective FIRM that may be issued when a property owner provides technical information from a surveyor (ground elevations relative to the BFE) that shows that a building or building site is higher than the BFE naturally without any post-FIRM development. This process is used to correct small errors in effective flood maps.
- **Letter of Map Revision Based on Fill (LOMR-F)** is an official revision to an effective FIRM that is issued to document FEMA's determination that a structure or parcel of land has been elevated by fill above the BFE, and therefore is no longer exposed to flooding associated with the base flood. This fill must be permitted and placed compliantly in accordance with the community's floodplain management program.

NFIP maps are not changed based on *proposed* projects. However, an applicant may request a Conditional Letter of Map Revision (CLOMR) or a Conditional Letter of Map Revision based on Fill (CLOMR-F). A Conditional Letter of Map Amendment (CLOMA) may be requested for a vacant lot. As of October 1, 2010 FEMA now requires all conditional Letters of Map Change requests to meet the Endangered Species Act requirements before approval. More information can be found at http://www.ncfloodmaps.com/lomc/pdf/documents/pl_memo64.pdf. These conditional letters inform the builder and others (such as the bank financing the project) that when the project is completed, it should qualify for a LOMR, LOMR-F, or LOMA. When "as-built" information is submitted and found to conform to the proposed plans, a

LOMR, LOMR-F, or LOMA will be issued to officially change the NFIP map.

An example of a LOMA is in Figure 4-4. The owner supplied the survey data needed to show that the lowest grade adjacent to his house was higher than the base flood elevation. Because the request affects only one structure, a letter was issued to describe the structure and the type of map change (“This letter amends the above-referenced NFIP map to remove the structure from the SFHA.”). Note that when a structure only is removed from the floodplain, any addition or substantial improvements would be required to go through the floodplain management permit application process to ensure compliancy beyond the footprint of that original structure.



Federal Emergency Management Agency
Washington, D.C. 20472

FEB 23 1999

LETTER OF MAP AMENDMENT
218-70-RS

IN REPLY REFER TO CASE NO.: 99-04-1816A

Community: Town of Plymouth,
Washington County, North Carolina
Community No.: 370249
Map Panel Affected: 0003 C
Map Effective Date: May 2, 1995

We reviewed a request dated January 4, 1999, for a Letter of Map Amendment (LOMA). All required information for this request was received on February 1, 1999. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we determined that a portion of the property described below is located in the Special Flood Hazard Area (SFHA), an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood); however, the structure on the property is not in the SFHA.

Property Description:	Lot 103, Liverman Heights, as described and recorded in a General Warranty Deed, Book 274, Pages 513 and 514, on August 21, 1979, by the Washington County Register of Deeds
Street Address:	109 Ida Street
Flooding Source:	Conaby Creek

This letter amends the above-referenced NFIP map to remove the structure from the SFHA. The structure is now located in Zone X (unshaded), an area above the 0.2-percent-annual-chance flood level. Flood insurance coverage for the structure may be available under a low-cost policy (see enclosed document). Because portions of the property remain in the SFHA, any future construction or substantial improvement on the property remains subject to Federal, State, and local regulations for floodplain management.

An additional enclosed document provides information about LOMAs. If you have any questions about this letter, please contact Helen Cohn of our staff in Washington, D.C., either by telephone at (202) 646-3457 or by facsimile at (202) 646-4596.

Sincerely,

A handwritten signature in black ink, reading "Matthew B. Miller".

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosures

cc: State Coordinator (w/o enclosures)
Region (w/o enclosures)
Community Map Repository

Figure 4-4. First page from a Letter of Map Amendment.

Requesting Map Changes. To help applicants gather and complete the data necessary for map changes, FEMA has developed application and certification forms. Copies can be ordered from FEMA or downloaded from FEMA's website at www.fema.gov. Additional detailed guidance on all the map change processes is found in FIA-12, *Appeals, Revisions, and Amendments to NFIP Maps: A Guide for Community Officials*, which can be downloaded from FEMA's web page at <http://www.fema.gov/library/viewRecord.do?id=3448>.



- **MT-1: Letter of Map Amendment (LOMA)**

Conditional Letter of Map Amendment (CLOMA)

Letter of Map Revision (Based on Fill) (LOMR-F)

Conditional Letter of Map Revision (Based on Fill) (CLOMR-F)

- **MT-2: Letter of Map Revision (LOMR)**

Conditional Letter of Map Revision (CLOMR)

Physical Map Revision

- **MT-EZ: Letter of Map Amendment (LOMA)** for a single lot/single structure or Letter of Map Revision (Based on Fill) (LOMR-F) for a single lot/single structure

The MT-EZ is the shortest and simplest of the three forms. It is the form used by individual property owners to request a LOMA such as the one in Figure 4-4. A land surveyor must prepare and certify the surveyed elevation data. The elevation certification form in MT-EZ requires some information not normally required on a FEMA Elevation Certificate, specifically, the lowest elevation on the parcel if the entire parcel is requested to be removed from the SFHA. This is in addition to the lowest grade adjacent to the structure (including attached decks) and the lowest floor elevation (including the garage, crawlspace, or basement). If the garage, crawlspace, or basement floor is below the BFE OR the building was built on fill that was placed in an identified SFHA, FEMA cannot issue a LOMA or LOMR even though the post-fill lowest adjacent grade is above BFE.

Unimproved land that has been filled can be removed from SFHA using this MT-EZ form as well but only on the basis of the filled elevation, provided no construction of a structure has begun when the request is submitted to FEMA. Effective June 4, 2001, FEMA revised the process for issuing LOMR-Fs to require assurances from the community that all requirements of 44 CFR 60.3 have been met and that any existing or proposed structures in that area will be “reasonably safe from flooding.” If the community cannot make these assurances, the LOMR-F will not be processed. Further guidance on the community’s responsibility for making these assurances can be found in the MT-1 instructions, and Technical Bulletin 10-01 *Ensuring That Structures Built on Fill in or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding*.

Additional information on map changes can be found in *Answers to Questions About the National Flood Insurance Program* or by contacting FEMA’s technical assistance hotline – 1.877.FEMA.MAP (1.877.336.2627).

A processing fee is charged for LOMRs, CLOMRs, LOMR-Fs, CLOMR-Fs multi-structure/multi-lot LOMAs and CLOMAs. There is no fee for requesting a single lot/single structure LOMA.

Fees for Map Changes. Congress has directed that FEMA is to recover the cost of some types of map changes, and a fee schedule is published in the Code of Federal Regulations (44 CFR 72.3). If a map is found to be in error, for example when an Elevation Certificate shows that a building site is above (or below) the BFE, there is no fee for FEMA to prepare a Letter of Map Change. However, when a developer proposes changing the floodplain by grading or filling, or if a new study is prepared to contest FEMA’s information, then a fee is charged. Access the current fee schedule at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm#2.

Effect of Map Revisions in Flood Insurance Rates. The NFIP applies “grandfather rules” to situations where the FIRM is revised and republished for both regulatory and flood insurance purposes. These rules recognize two situations for flood insurance policyholders who have maintained continuous NFIP flood insurance coverage:

- Those whose buildings were built in compliance with a previous FIRM, and
- Those whose buildings were built before the original FIRM (pre-FIRM).

For such properties, the insured has the option of using the rating criteria based on the revised map or the map that was in effect when the building was originally constructed (for those built in compliance) or when coverage was first obtained (for those with continuous coverage). If the new FIRM data results in a higher premium rate, it is to the insured's advantage to use the grandfather rules to have rates determined using the older map.

If a new policy is applied for (rather than continuing an existing policy), the rates can be based on the FIRM zone on the old map and the BFE on the old map or in the old study in effect on the date the building was originally constructed *if* proper documentation is submitted. The documentation must show that the building was built before the original FIRM date OR in compliance with the FIRM map in effect at the time of original construction. It must also show that the building has not been altered in any way that results in a reference level lower than the BFE on that FIRM (such as enclosing the area below an elevated building). This is the same as outlined in community flood ordinances whereby a structure cannot make any alterations causing the structure to be any more non-conforming. If such alteration has occurred, then the new FIRM map must be used for insurance rating and grandfathering provisions no longer apply.

If a building is substantially improved and/or substantially damaged (50% rule), the building is then considered new construction and therefore must be re-rated using the FIRM in effect at the time that the substantial improvement occurred. A newer FIRM can always be used if it will result in a more favorable rating. Please also refer to "Saving Money in the Wake of Changing Flood Maps" a fact sheet providing more information on "grandfathered" or Pre-FIRM structures at http://www.ncfloodmaps.com/fact_sheets.htm. This link is a resource the North Carolina Floodplain Mapping Program's fact sheets.

Lenders and LOMAs and LOMR-Fs. As part of their responsibilities to review their portfolios and require flood insurance on federally backed mortgages, lenders receive notices of map changes, including LOMAs and LOMR-Fs. Although LOMAs and LOMR-Fs officially "remove" the SFHA designation from a parcel or building, lenders still have the prerogative to require the purchase of a flood insurance policy as a condition of the loan. For example, many lenders in North Carolina still

require flood insurance coverage for structures determined to be in Zones B, C or X. It is just that the map changes lift the federal mandate to carry the flood insurance. As lenders review their portfolios, they then notify all their clients that are newly placed into a SFHA to require them to purchase flood insurance or they will have to force place a flood insurance policy for them. If flood insurance is force placed, it will be much more expensive to the homeowner. The problem is that they do not notify the clients that are no longer mandated to carry flood insurance. These citizens need to know their option to rerate their flood insurance policy to a Zone B, C or X policy or possibly a preferred risk policy. Please also refer to "Saving Money in the Wake of Changing Flood Maps" a fact sheet providing more information on "grandfathered" or Pre-FIRM structures at http://www.ncfloodmaps.com/fact_sheets.htm. Also refer to Chapter 12 for more information on insurance and types of policies available. This link is a resource the North Carolina Floodplain Mapping Program's fact sheets.

Send Requests, Including Review and Processing Fees, for CLOMRs and LOMCs in North Carolina (outside of Mecklenburg County) to:

Using U.S. Postal Service:
North Carolina MT-2 LOMC Depot
P.O. Box 300025
Raleigh, North Carolina 27622-0025

Using Overnight Service:
NC MT-2 LOMC – Collection System Administrator
c/o Dewberry & Davis, Inc.
2301 Rexwoods Drive, Suite 200
Raleigh, North Carolina 27607

All requests for CLOMRs and LOMRs within the City of Charlotte and Mecklenburg County, North Carolina should be mailed to:

Charlotte-Mecklenburg County Storm Water Services
700 N. Tryon Street
Charlotte, NC 28202
Attention: David Love, P.E. CFM, Project Manager

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5.1 Introduction

This chapter covers the minimum requirements for participation in the NFIP. These requirements are intended to minimize flood risk by reducing loss of life and injury, by providing for more flood-resistant construction practices, and by lessening the economic and social hardships that result from flooding. The NFIP requirements work; each year more than \$1 billion in flood damage is avoided because communities administer ordinances and construction occurs in ways that reduce the potential for damage.

In addition to the NFIP minimum requirements, the State of North Carolina has certain requirements that are higher floodplain management standards. Communities must administer those higher state standards and are also encouraged to enact other regulatory standards that exceed these minimums and that are more appropriate for local conditions (see Chapter 6 for more information about improving local programs).

A Note About Unusual Situations. This chapter is written to cover most of the normal situations that Floodplain Administrators are likely to see as they process floodplain development permits. Understandably, FEMA and the State have encountered many unusual and complicated variations that are not covered in this handbook. In some cases, policy papers have been

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written, worksheets developed, or case histories documented. When a proposal doesn't neatly fit the rules, more detail and more help is available – all it takes is a telephone call to the State NFIP Coordinator.

5.2 The NFIP's Regulations

All across the country many communities guide development to areas that are not subject to flood hazards. But when development in the SFHA does occur, there are ways to locate buildings on sites and to construct them to minimize the potential for damage. The NFIP minimum standards for new construction and substantial improvement of existing structures in SFHA are designed to achieve this goal.

The NFIP requirements can be found in Chapter 44 of the Code of Federal Regulations (44 CFR). Revisions to these requirements are first published in the Federal Register, a publication the Federal Government uses to disseminate rules, regulations and announcements. Most of the requirements related to your community's ordinance are in Parts 59 and 60. These are included in Appendix B along with the mapping regulations of Parts 65 and 70. Table 5-1 shows how the regulations are organized.

Check the Federal Register often for updates to the NFIP requirements.

Table 5-1. Outline of NFIP Regulations (44 CFR Parts 59 and 60)

Part 59—General Provisions

Subpart A—General

- 59.1 Definitions
- 59.2 Description of program
- 59.3 Emergency program
- 59.4 References

Subpart B—Eligibility Requirements

- 59.21 Purpose of subpart
- 59.22 Prerequisites for the sale of flood insurance
- 59.23 Priorities for the sale of flood insurance under the regular program
- 59.24 Suspension of community eligibility

Part 60—Criteria for Land Management and Use

Subpart A—Requirements for Flood Plain Management Regulations

- 60.1 Purpose of subpart
- 60.2 Minimum compliance with floodplain management criteria
- 60.3 Floodplain management criteria for flood-prone areas
 - (a) When there is no floodplain map
 - (b) When there is a map, but not flood elevations

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- (c) When there are flood elevations
- (d) When there is a floodway mapped
- (e) When there is a map with coastal high hazard areas

60.4 Floodplain management criteria for mudslide (i.e., mudflow)-prone areas

60.5 Floodplain management criteria for flood-related erosion-prone areas

60.6 Variances and exceptions

60.7 Revisions of criteria for flood plain management regulations

60.8 Definitions

Subpart B—Requirements for State Flood Plain Management Regulations

Subpart C—Additional Considerations in Managing Flood-Prone, Mudslide (i.e., Mudflow)-Prone, and Flood-Related Erosion-Prone Areas

NFIP Resources and References. A list of many good resource and reference documents can be found in Appendix A. Many FEMA publications are designed to help communities understand floodplain requirements, to administer ordinances, and to handle permitting responsibilities (check under preparation and prevention of the Library Section at **www.fema.gov**). Of particular importance are the NFIP Technical Bulletins:

- TB Guide-01 *User's Guide to Technical Bulletins.*
- TB 1-08 *Openings in Foundation Walls for Buildings Located in Special Flood Hazard Areas.*
- TB 2-08 *Flood-Resistant Material Requirements for Buildings Located in Special Flood Hazard Areas.*
- TB 3-93 *Non-Residential Floodproofing – Requirements and Certification for Buildings Located in Special Flood Hazard Areas.*
- TB 4-10 *Elevator Installation for Buildings Located in Special Flood Hazard Areas.*
- TB 5-08 *Free of Obstruction Requirements for Buildings Located in Coastal High Hazard Areas.*
- TB 6-93 *Below Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas.*
- TB 7-93 *Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas.*
- TB 8-96 *Corrosion Protection for Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas.*

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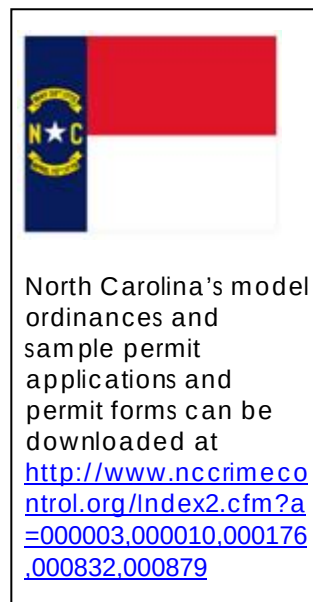
- TB 9-08 *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings.*
- TB 10-01 *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding.*
- TB 11-01. *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas.*

These Technical Bulletins are FEMA's official guidance on how specific areas of the minimum NFIP regulations are to be implemented.

5.3 Floodplain Management Ordinances

To participate in the NFIP, the minimum development standards must be adopted by local jurisdictions that have land use authority. Federal regulations at Subpart B, Section 59.22(a)(3) require, as a condition for participation, that communities adopt the minimum provisions in Section 60.3. Ordinances generally lay out the objectives to be achieved, administrative and enforcement provisions, development activities that are subject to the requirements, and specific requirements. Objectives usually include:

- To protect human life, health, and property
- To minimize expenditure of public money for costly flood control projects
- To minimize the need for rescue and relief efforts associated with flooding and usually undertaken at the expense of the general public
- To minimize prolonged business interruptions and disruption of family life caused by flooding
- To minimize damage to public facilities and utilities such as water and gas mains; electric, telephone and sewer lines; streets; and bridges located in floodplains
- To help maintain a stable tax base by providing for sound use and development of flood hazard areas in such a manner as to minimize flood blight areas
- To prevent victimization by ensuring that potential land, home, and business buyers are notified that



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property is located in an identified flood hazard area

- To prevent increased flood levels caused by unwise floodplain development

The North Carolina Division of Emergency Management has prepared models of local flood damage prevention ordinances for non-coastal and coastal flood hazard areas. Table 5-2 shows the table of contents of the non-coastal ordinance (not all subsections shown).

Table 5-2. Table of Contents, Non-Coastal Flood Damage Prevention Ordinance
ARTICLE 1. STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE AND OBJECTIVES Section A. Statutory Authorization Section B. Findings of Fact Section C. Statement of Purpose Section D. Objectives
ARTICLE 2. DEFINITIONS
ARTICLE 3. GENERAL PROVISIONS Section A. Lands to which this Ordinance Applies Section B. Basis for Establishing the Special Flood Hazard Areas Section C. Establishment of Floodplain Development Permit Section D. Compliance Section E. Abrogation and Greater Restrictions Section F. Interpretation Section G. Warning and Disclaimer of Liability Section H. Penalties for Violation
ARTICLE 4. ADMINISTRATION Section A. Designation of Floodplain Administrator Section B. Floodplain Development Application, Permit and Certification Requirements Section C. Duties and Responsibilities of the Floodplain Administrator Section D. Corrective Procedures Section E. Variance Procedures
ARTICLE 5. PROVISIONS FOR FLOOD HAZARD REDUCTION Section A. General Standards Section B. Specific Standards 1. Residential Construction 2. Non-Residential Construction 3. Manufactured Homes 4. Elevated Buildings 5. Additions/Improvements 6. Recreational Vehicles

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7. Temporary Non-Residential Structures
8. Accessory Structures
Section C. Reserved
Section D. Standards for Floodplains without Established Base Flood Elevations
Section E. Standards for Floodplains with BFE but without Established Floodways or Non-Encroachment Areas
Section F. Floodways and Non-Encroachment Areas
Section G. Standards for Areas of Shallow Flooding (AO Zones)
ARTICLE 6. LEGAL STATUS PROVISIONS
Section A. Effect on Rights and Liabilities under the Existing Flood Damage Prevention Ordinance
Section B. Effect upon Outstanding Building Permits
Section C. Severability
Section D. Effective Date
Section E. Adoption Certification

5.4 Purpose of the NFIP Standards

The NFIP's floodplain management standards are intended to prevent loss of life and property, as well as reduce economic and social hardships resulting from flooding.

Flood insurance premiums for new buildings are based on actuarial flood risk, which is determined by the elevation of the lowest floor of the building relative to the elevation of the base flood at the site. The base flood, sometimes referred to as the 100-year flood or 1%-annual chance flood, has a one percent chance of occurring in any given year. The NFIP uses the 100-year flood as the standard for floodplain management for all development including residential and non-residential structures. However, critical facilities such as schools, hospitals, police stations, jails, fire stations, nursing homes, storage of irretrievable records, toxic or water-reactive materials, wastewater or water treatment facilities, cemeteries, etc., should be located outside of both the 100-year (1%- annual chance) and the 500-year (0.2%- annual chance) floodplain whenever possible, as provided under Executive Order 11988. However, this is not mandatory by local floodplain management regulations; it is a condition of federal funding for such critical facilities. Knowing this up front can save a lot of time and money planning future critical facilities.

Before proceeding to the discussion on standards and requirements, it is important to look at some key terms and to restate the relationship of the NFIP's maps to the NFIP standards and requirements.

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5.5 Key Terms

The importance of having clear, concise definitions to aid in the interpretation and understanding of local floodplain management regulations cannot be overemphasized. The following describe some of the important terms (see the NFIP regulations for exact definitions).

Base Flood. A term used in the National Flood Insurance Program to indicate the minimum size flood to be used by a community as a basis for its floodplain management regulations. The base flood is defined by regulation to be that flood which has a one percent chance of being equaled or exceeded in any given year, also known as a 100-year flood or one-percent-chance flood.

Base Flood Elevation (BFE). The elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM) for zones AE, AH, A1-A30, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO, V1-V30, and VE.

Basement. Any area of the building having its floor subgrade (below ground level) on all sides. Note that “daylight basements”, “walkout levels” or “terrace levels” are usually subgrade on only three sides but are at or above grade on the downhill side. Thus, they are not considered basements for either floodplain management or flood insurance rating purposes.

Coastal A Zone. The area within a mapped special flood hazard area that is landward of a V/VE Zone or landward of an open coast without a mapped V/VE Zone. In a Coastal A Zone, the principal source of flooding must be astronomical tides, storm surges, seiches, or tsunamis, not riverine flooding although slow rising floods do occur. To be a Coastal A Zone, during the base flood conditions there must be the potential for breaking wave heights greater than or equal to 1.5 feet. Note that FEMA uses a 3-foot breaking wave to delineate the inland extent of the VE Zone, thus waves between 3- and 1.5-feet are expected in Coastal A Zones.

Development. Any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, drilling operations, and storage of equipment or materials. This definition of development:

- Applies to the entire floodplain, not just the floodway
- Includes activities that might not otherwise be regulated by some communities

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- Includes activities that may be exempt from other codes like NC Building Code and local community codes or other programs such as the many sections under NC DENR like CAMA, Erosion & Sedimentation Control, and Riparian Buffers to name a few.
- Is designed to give a municipality maximum opportunity to review for flood impacts
- Includes outside storage of equipment or materials

Elevated Building. An elevated building is a structure without a basement which meets the following standards: within an A zone, the building is elevated above the ground by means of fill, stem walls, crawlspaces, pilings, piers, posts or columns, such that the top of the floor is at or above BFE. If there is an enclosed area below the elevated floor that is subject to flooding, it must be constructed of flood-resistant materials and provided with hydrostatic openings. Note that if the enclosed area is above BFE, the hydrostatic openings are not required under the community's floodplain regulations but may be needed in order to obtain a proper flood insurance rating. If ductwork for the heating and air conditioning is installed below the floor, it must be further elevated so that the bottom of the ductwork, along with all other utility units, is at or above the BFE. In a V1-V30 or VE Zone, the building is elevated above ground level by use of pilings or columns, such that the bottom of the lowest horizontal structural member supporting the lowest floor is at or above BFE. With referencing the lowest horizontal structural member, this means all ductwork will be above this level as well as required. Only non-supporting breakaway wall panels, lattice, or screening may be used to enclose an area below BFE. These standards raise the elevated floors above the wave crest of a base flood and comply with the "free of obstruction" standard below BFE (see FEMA Technical Bulletin 5-93). To summarize, an elevated building should have:

- Top of lowest floor at or above the BFE in A/AE Zones
- Bottom of lowest horizontal structural member at BFE in V/VE Zones
- Only pilings or columns for foundation in V/VE Zones
- If the community has adopted a freeboard (see Chapter 6 for discussion on higher standards), then the community must enforce this higher elevation standard the same as they would a BFE.

Existing Construction. The term existing construction or existing structure refers to buildings, structures and other development that existed

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before the effective date of the community's first FIRM or before the first flood hazard identification for the area if after the first FIRM was published. The term pre-FIRM refers to these older buildings. Many of these older existing structures are non-conforming, which means they do not meet the minimum NFIP requirements. However, they are legal and grandfathered until and unless they undergo substantial improvement and/or incur substantial damage. Requirements pertaining to substantial improvement and substantial damage are described in Chapter 9.

For insurance purposes, the cost of NFIP flood insurance for pre-FIRM buildings is determined using rates that do not account for the full risk and do not require an elevation certificate, but are cross-subsidized by other policies.

Lowest Floor. The “lowest floor” means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area is not considered a building's lowest floor provided that such enclosure constructed of flood resistant materials is designed to automatically allow for entry or exit of floodwater in A Zones. This means that parking areas do not have to be elevated to BFE if they meet the specific criteria. However, parking areas in V/VE Zones must meet criteria for breakaway walls or obstruction-free areas. To summarize, the definition of lowest floor is:

- The basement, if one exists
- Top of lowest floor in A Zones – typically the top of the slab, subfloor or even the ground in crawl spaces if not properly vented
- Bottom of lowest horizontal structural member supporting the lowest floor in V/VE Zones
- The elevated floor of a building, not the ground floor, provided the ground floor is only used for parking, limited storage, or building access and meets other ordinance criteria such as flood resistant materials, proper venting and no utilities.

New Construction. NFIP definition of new construction refers to buildings and structures for which the “start of construction” commenced on or after the effective date of the original version of the community's floodplain management regulation (i.e., post-FIRM); the term includes any subsequent improvements to such structures. In North Carolina, this definition may not be accurate with regards to communities recently incorporated, annexed, or

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part of an Extra-Territorial Jurisdiction (ETJ). Some communities have been recently mapped and now show structures in the floodplain which were not previously in the regulatory floodplain. Therefore, new construction would need to be referenced to this map revision date.

For flood insurance rating purposes, the applicable date is December 31, 1974, or the effective date of the first FIRM that included the area, whichever is later. This means that buildings built after the first FIRM is issued but before the community joins the NFIP, are still subject to post-FIRM rating. If they were built below BFE, the rates will be very expensive. The term “new construction” includes:

- Substantial improvements to structures built before ordinance adoption.
- All additions onto post-FIRM structures
- Reconstruction of pre-FIRM structures

Non-Residential. See Residential. All buildings that are not residential buildings are non-residential buildings. Non-residential buildings are regulated identically to residential buildings with one exception, non-residential structures do have an additional option to floodproof in lieu of elevating in A zone. Note that a non-residential building may have residential spaces. This is an important fine point because the residential spaces/uses in a non-residential building must be handled like residential buildings. The most important consideration is that residential spaces may not be floodproofed. Note also that the reverse may occur – for example, an apartment building may have storage and utility rooms below-grade; those areas may be floodproofed.

Residential and Non-Residential. Your ordinance outlines some requirements that are different for residential and non-residential buildings. To properly apply the requirements, you need to distinguish between the two occupancies. The NFIP does not define the terms “residential” and “non-residential.” However, the following definition of ‘residential’ is taken from ASCE 24, *Flood Resistant Design and Construction*, which then defines ‘non-residential’ as any uses that are not residential:

- Buildings and structures and portions of buildings and structures where people live, or that are used for sleeping purposes, including one- and two-family dwellings and multifamily dwellings;
- Buildings and structures or portions thereof that are used for residential purposes, including but not necessarily limited to boarding,

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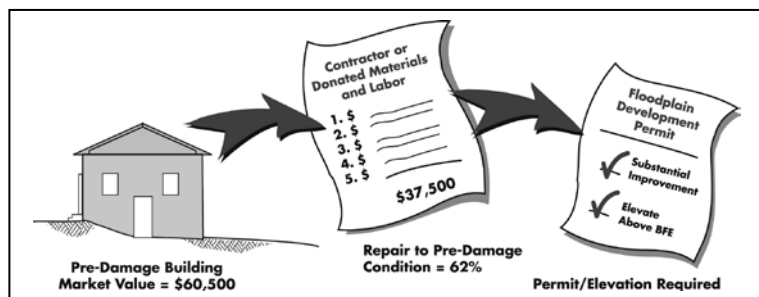
lodging or rooming houses, hotels and motels, apartment buildings, convents and monasteries, dormitories, fraternity and sorority houses, vacation timeshare properties; and

- Residential board and care facilities that are occupied on a 24-hour basis, including assisted living facilities, halfway houses, group homes, congregate care facilities, social rehabilitation facilities, alcohol and drug centers, convalescent facilities, hospitals, nursing homes, mental hospitals, detoxification facilities, prisons, jails, reformatories, detention centers, correctional centers, prerelease centers, and other such uses.

Structure. A structure is a walled and roofed building that is principally above ground and affixed to a permanent site; the definition includes a gas or liquid storage tank, as well as a manufactured home. For insurance purposes, the definition also includes buildings under construction. To summarize, a structure:

- Is a walled and roofed building
- More than 50 percent above ground
- Affixed to a permanent foundation
- Includes manufactured homes and gas or liquid fuel tanks
- Not over water
- Includes buildings under construction (for insurance purposes)

Substantial Improvement. A substantial improvement is any reconstruction, rehabilitation, addition, or other improvement to a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either: (1) any project for improvements of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or (2) Any alteration of a



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“historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.” To summarize, the definition for substantial improvement:

- Includes improvements equal to or exceeding 50 percent of the market value of the structure
- Includes substantial damage
- Includes any combination of damage and/or improvements within a one year period that may equal or exceed 50 percent of the market value of the structure. Note, communities may regulate a wider time frame as a higher standard but one year is minimum. See Chapter 6 for more information on higher standards.
- Excludes corrective actions for code violations and historic structures

5.6 Relationship of Floodplain Maps to the NFIP

FEMA publishes maps indicating communities' flood hazard areas and the degree of flood risk in those areas. Since the inception of the NFIP, FEMA has mapped more than 100 million acres of flood-hazard areas nationwide and has designated some six million acres of floodways along 40,000 miles of streams and rivers. North Carolina continues to map flood-hazard areas and floodways through their map maintenance programs for streams and river through both Detailed and Limited Detailed studies. The maps are the direct bridge linking floodplain management regulations with the issuance of flood insurance. 44 CFR 60.2(h)

states that “*the community shall adopt and enforce floodplain management regulations based on the data provided by the [Federal Insurance] Administrator. Without prior approval of the Administrator, the community shall not adopt and enforce floodplain management regulations based upon modified data reflecting natural or man-made physical changes*”

Check to make sure you have the latest flood maps and data published by FEMA. You must use the latest maps to administer your floodplain management ordinance. See Chapter 4 on how to ensure that you are using the most current map data.

There are several reasons for this requirement, including:

- Flood data prepared by FEMA is used not only by communities participating in the NFIP, but also by other government agencies, bankers, realtors, insurance agents, surveyors, engineers and property owners. The consistency of data is important in the administration of all facets of the NFIP.

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- Various designations shown on the maps are keyed to specific floodplain management ordinance criteria contained in 44 CFR §60.3. As a result, the proper application of the regulation is dependent on the use of the flood data provided by FEMA.
- The validity of local floodplain management regulations hinges on the identification of the flood-prone areas to be regulated and the specific reference to the official map in the ordinance.
- Without a map, there is no basis for regulation.
- It is important to understand that if detailed topographic mapping or surveying shows that a building site in close proximity to the SFHA is below the BFE, it must be regulated by the community as being flood-prone, even if not shown within the boundaries of the SFHA shown on the FIRM. For regulatory purposes, flood elevations are the ruling guideline where more stringent. For instance, if the opposite were the case and a high area was found within a FEMA mapped floodplain, the community's floodplain regulations cannot be lifted until FEMA officially changes the map either through a letter of map change (LOMC) or a physical map revision. This is where the last statement of the above referenced regulation comes into play... *"Without prior approval of the Administrator, the community shall not adopt and enforce floodplain management regulations based upon modified data reflecting natural or man-made physical changes"*

The requirement does not mean that a community is prohibited from using other technical data to identify and regulate flood-prone areas not identified by FEMA. For example, many cities and urban counties map and regulate areas on small tributary streams and/or soils survey maps indicating the hydric soils that are not included in NFIP mapping criteria; some communities elect to regulate based on a flood of record that was higher than the BFE. Use of these other maps or data are higher standards and must be locally adopted within the community's flood ordinance in order to be enforceable and they must be enforced uniformly, as any other special flood hazard area adopted. An added benefit for these additionally regulated areas is that they will be constructed to minimize their flood risk yet they will still receive the flood insurance benefits of not being located within a FEMA published floodplain. Learn more about using NFIP maps and data in Chapter 4.

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5.7 Requirements Based on Flood Hazard Data Provided

NFIP regulations identify minimum requirements that communities must fulfill to join and stay in the program (see Appendix B for the complete regulations). The requirements that apply to a particular community depend on its flood hazard and the level of detail of the data FEMA provides to the community. The specific requirements are in sub-sections of Section 60.3, they are cumulative and apply to communities as follows:

- 60.3(a) – FEMA has not provided any maps or flood hazard data. The requirements in 60.3(a) must be administered by all communities in the NFIP. See Table 5-3.
- 60.3(b) – FEMA has provided a map with approximate A Zones. A 60.3(b) community must comply with all appropriate requirements of Sections 60.3(a) and (b). See Table 5-4.
- 60.3(c) – FEMA has provided a FIRM with base flood elevations. A 60.3(c) community must use the base flood elevations provided on the FIRM; if the FIRM also has approximate A Zones (without BFEs), the requirements of Sections 60.3(b) must be applied in those areas. A 60.3(c) community must comply with all appropriate requirements of Sections 60.3(a), (b), and (c). See Table 5-5.
- 60.3(d) – FEMA has provided a FIRM with base flood elevations and a map that shows a floodway. A 60.3(d) community must comply with all appropriate requirements of Sections 60.3(a), (b), (c), and (d). See Table 5-6. *The NC model non-coastal Flood Damage Prevention Ordinance* is based on these level “D” regulations.
- 60.3(e) – FEMA has provided a FIRM that shows coastal high hazard areas (V/VE Zones). A 60.3(e) community must comply with all appropriate requirements of Sections 60.3(a), (b), (c), (d), and (e). See Table 5-7. *The NC model coastal Flood Damage Prevention Ordinance* is based on these level “E” regulations.

The regulations that pertain to administration, such as requiring permits and reviewing applications for completeness, are covered in Chapter 8. The remainder of this chapter will describe specific requirements applicable to types of development, including buildings, floodway and non-encroachment area encroachments, and water supply and wastewater installations, and subdivisions.

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5.8 Permits for Development

The NFIP requirements are keyed to “development” in the floodplain, where the term means “any man-made change to improved or unimproved real estate.” You must review each project’s location to determine if it has a flood risk. Development includes, but is not limited to:

- Construction of new buildings and structures
- Modifications or improvements to existing buildings and structures
- Underground and above-ground tanks
- Filling and/or excavation
- Paving
- Drilling
- Driving of piles
- Mining and/or dredging
- Land clearing and/or grading
- Storage of materials and/or equipment
- Temporary stream crossings
- Public utilities (see allowances or standards)
- Agriculture/silviculture crop cultivation
- Roads, bridges and culverts (NCDOT MOA Program)

A permit is required for ALL development in the mapped special flood hazard area.



All North Carolina communities already require building permits for construction projects and manufactured homes by means of the state building code and manufactured housing code.

Note: This NCFMP-North Carolina Department of Transportation (NCDOT) Memorandum of Agreement (MOA Program) is to ensure that the NCDOT is 100% compliant with FEMA guidelines and regulatory requirements. The MOA Program requires that any new structure, replacement structure, or removal of stream crossing structures or alterations to roadway embankments be considered for compliance with 44CFS, Sections 60 and 65 prior to commencement of construction.

Building Permits. In North Carolina, most communities have long had a system for issuing building permits, but did not have a permit system for other types of development until required as a condition of participating in the NFIP. Regulating all development in floodplains is essential because fill or other material can obstruct flood flows just as structures can.

Because a “building permit” often covers only construction or modifications of buildings and even then, there are some exemptions such as small accessory buildings or agricultural buildings which are not exempt from

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floodplain regulations. A broader term such as “development permit” may be appropriate, especially if your community implements floodplain management provisions as part of its zoning regulations or as a stand-alone permit. You should check your permit system to ensure that in the floodplain, permits are being required for all projects that meet the definition of development, not just “building” projects, and that these floodplain management records shall NOT be purged with other building records but maintained permanently as required under the NFIP.

5.9 Reasonably Safe From Flooding

A fundamental requirement of the NFIP is that development in mapped flood hazard areas is to be undertaken in ways that will reasonably protect it from flooding. Section 60.3(a) contains the overarching performance standards applicable to buildings: that they are designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. The regulations also address construction materials and utilities.

Location on the Lot. An effective means of reducing flood risk is to locate the building footprint on the highest available ground. If the highest ground is still within the SFHA, there is still a benefit because the total height above grade (as well as the flood risk) will be somewhat less than if the building was sited at a lower elevation on the property. Some communities are willing to grant variances to property line setbacks if the result will avoid SFHA construction or wetlands but of course, this is a community’s decision.

Withstand Flood Loads. Foundation designs must provide for a stable structure when exposed to reasonably anticipated flood forces (hydrodynamic and hydrostatic loads, including the effects of buoyancy) and buildings must be anchored to the foundations. Additional anchoring measures are necessary where flood velocities are high (e.g., faster than five feet per second) and where waves are anticipated. Remember that waves occur in riverine floodplains too where velocities are high or where the floodplain is wide and exposed to wind.

Consider the nature of flooding that you’ve experienced or that has occurred in your region. Keep in mind that floods can often exceed the BFE and so it is important to make sure that foundations and anchoring measures will withstand water that rises higher than the lowest floor. You may decide to require that all foundations be designed and certified by an engineer or architect.

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Manufactured homes must also be adequately anchored to a permanent foundation (see the North Carolina Manufactured Home Code Appendix B for sample setup designs that may be utilized and *Manufactured Home Installation in Flood Hazard Areas*, FEMA-85). Because different soils provide different holding strengths, the same type of anchor may not perform uniformly in all situations. For example, a six-inch-diameter screw auger, which might withstand a pull of 5,000 pounds in stiff clay, may withstand only 2,500 pounds in sandy clay.

Flood-Resistant Materials. Building materials capable of withstanding direct and prolonged contact with floodwater without sustaining *significant damage* are acceptable. The term “prolonged contact” means at least 72 hours, and the term “significant damage” means any damage requiring more than low-cost cosmetic repair (such as painting). For further details on flood-resistant material requirements, refer to FEMA Technical Bulletin 2-08, *Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*.

Utility Systems. Utility systems that serve buildings include but are not limited to mechanical (heating and air conditioning) and plumbing. These building elements must be installed and/or designed to withstand flood damage. The most common approach is to elevate equipment. For further details on elevating equipment, refer to FEMA 348 – *Protecting Building Utilities from Flood Damage*.

5.10 Floodway and Non-Encroachment Area Encroachments

The floodway and non-encroachment areas are developed in order to “pre-engineer” the impacts of flooding in the floodplain (see Chapter 3). Any proposal that will be wholly or partially in a floodway or non-encroachment area must be carefully examined to determine whether it will increase flooding on other properties. For waterways for which FEMA has provided BFEs but floodways have not been designated, the community must review developments cumulatively on a case-by-case basis to ensure that these increases do not occur.

The floodway or non-encroachment area is usually the central portion of a riverine floodplain needed to carry the deeper, faster moving water. Buildings, structures and other development activities – such as fill – placed within the floodway are more likely to obstruct flood flows, causing the water to slow down and back up, resulting in higher flood elevations.

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Encroachment Review. All projects in the regulatory floodway or non-encroachment area must undergo an encroachment review to determine their effect on flood flows and ensure that they do not increase the water surface elevation during the base flood upstream, downstream and across the stream. Development projects in the flood fringe by definition do not increase flood heights above the allowable level, so encroachment reviews are not needed for developments not in the floodway or non-encroachment area.

The objective of this requirement is to ensure that the floodway or non-encroachment area can do its natural job: carrying floodwater. The ideal approach is to avoid all development in floodways or non-encroachment areas.

Note that the NFIP regulation 44 CFR 60.3(d)(3) calls for preventing **ANY** increase in flood heights. This doesn't mean you can allow a small increase of a foot or a tenth of a foot – it means zero increase. If you do not limit the increase to zero, small increases in flood heights from individual developments will cumulatively have significant impacts over time on flood stages and flood damages. Under NFIP minimum requirements, it is assumed that there will be no cumulative effects since the permissible rise for any single encroachment is zero.

Projects in the floodway or non-encroachment area involving grading, large excavations, channel improvements, and bridges and culverts (including replacements) must be reviewed to determine whether they will increase flood elevations. Removing obstructions (such as enlarging a bridge or culvert) may eliminate a backwater, but may also cause increases in peak in flood flows downstream, thus increasing the BFEs.

Your community may conduct the encroachment review if they have an engineer on staff to verify the study, or you may require the developer to conduct it. Many local floodplain administrators are not qualified to make an encroachment review, so most require that this be done by a qualified engineer at the developer's expense, in which case a certification that the proposal will not result in any increases is required (next subsection).

Encroachment Certification. To ensure that the encroachment review is done right, you must require the developer to provide an encroachment certification. This is often called a "no-rise" certification because it certifies that the development project will not affect flood heights. An example of a

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form developed by the North Carolina NFIP State coordinating agency is shown in Figure 5-1.

The certification must be supported by technical data, which should be based on the same computer model used to develop the floodway shown on the community's map or the non-encroachment area published in the FIS.

Although your community is required to review and approve the encroachment review, you may request technical assistance and review from the State NFIP Coordinator. If this alternative is chosen, it is recommended that you review the technical submittal package and verify that all supporting data are included in the package before sending it to the State.

Figure 5-1. Encroachment or No-Rise Certification.

“NO-RISE” CERTIFICATION This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of North Carolina. It is further to certify that the attached technical data supports the fact that proposed _____ (Name of Development) will not impact the 100-year flood elevations, floodway elevations, or floodway widths on _____ (Name of Stream) at published Sections in the Flood Insurance Study for _____ (Name of Community) dated _____ (Study Date) and will not impact the 100-year flood elevations, floodway elevations, or floodway widths at unpublished cross-Sections in the vicinity of the proposed development. Attached are the following documents that support my findings: _____ _____ Date: _____ Signature: _____ Title: _____ {SEAL}
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Streams without Floodways. If your community has a FIRM with base flood elevations along rivers or streams, but no mapped floodway, you must evaluate all development to ensure that it will not increase flood stages by more than one foot.

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For the purposes of administering your ordinance, you should treat the entire riverine floodplain as a floodway. You should require the same encroachment certification to ensure that a development project will not obstruct flood flows and cause increased flooding on other property. This approach is recommended for all other riverine floodplains without a mapped floodway.

In riverine floodplains where no floodway has been designated, the review must demonstrate 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 per 44 CFR 60.3(c)(10), and
- Is consistent with the technical criteria contained in Volume 1 of the *Guidelines and Specifications for Flood Hazard Mapping*

This review must be required for all development projects. You should pay particular attention to developments that may create a greater than one-foot increase in flood stages, such as bridges, road embankments, buildings and large fills.

Note: Some communities map floodways with a higher standard, requiring flood heights increase by less than one foot, such as a 0.5 foot increase. In those communities, the encroachment certification must be based on that more restrictive community standard, not the FEMA standard that allows a one-foot rise. See Chapter 6 for more on such higher standards.

Allowable Increases in Flood Heights. In some situations it may be in the public interest to allow increase in flood heights greater than those allowed under the NFIP regulations.

For example, it would be hard to build a flood control reservoir without affecting flood heights. Because a dam would have a major impact on pre-dam flood heights, there needs to be a way to permit such projects, especially those that are intended to reduce overall flood risk. When a project will change the flood level, maps must be changed to illustrate the new flood risk.

If your community proposes to permit an encroachment in the floodway or non-encroachment area that will raise flood elevations, or permit an encroachment in the floodplain without a floodway or non-encroachment

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area that will cause increases in the BFE in excess of the one-foot allowable level, you must require the applicant (even if the community is proposing the development) to apply for *conditional* approval, known as a Conditional Letter of Map Revision (CLOMR) of such action prior to permitting the project to occur (see Chapter 4 for more on CLOMRs). As part of the application for conditional approval, the applicant must submit:

- A complete application and letter of request for conditional approval of a change in the FIRM for a Conditional Letter of Map Revision (CLOMR), along with the appropriate fee for the change (contact the FEMA Regional Office or the NCFPM for the fee amount).
- An evaluation of alternatives which, if carried out, would not result in an increase in the BFE more than allowed, along with documentation as to why these alternatives are not feasible.
- Documentation of individual legal notice to all affected property owners (i.e., anyone affected by the increased flood elevations, within and outside of the community) explaining the impact of the proposed action on their properties.
- Concurrence, in writing, from the chief executive officer of any other communities affected by the proposed actions.
- Certification that no structures are located in areas which would be affected by the increased BFE (unless they have been purchased for relocation or demolition).
- A request for revision of BFE determinations in accordance with the provisions of 44 CFR 65.6 of the FEMA regulations.

§ 65.6 Revision of base flood elevation determinations.

(a) General conditions and data requirements.

(1) The supporting data must include all the information FEMA needs to review and evaluate the request. This may involve the requestor's performing new hydrologic and hydraulic analysis and delineation of new flood plain boundaries and floodways, as necessary.

(2) To avoid discontinuities between the revised and unrevised flood data, the necessary hydrologic and hydraulic analyses submitted by the map revision requestor must be extensive enough to ensure that a logical transition can be shown between the revised flood elevations, flood plain boundaries, and floodways and those developed previously for areas not affected by the revision. Unless it is demonstrated that it would not be appropriate, the revised and unrevised base flood elevations must match within one-half foot where such transitions occur.

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(3) Revisions cannot be made based on the effects of proposed projects or future conditions. Section 65.8 of this subchapter contains provisions for obtaining conditional approval of proposed projects that may effect map changes when they are completed.

(4) The datum and date of releveled of benchmarks, if any, to which the elevations are referenced must be indicated.

(5) Maps will not be revised when discharges change as a result of the use of an alternative methodology or data for computing flood discharges unless the change is statistically significant as measured by a confidence limits analysis of the new discharge estimates.

(6) Any computer program used to perform hydrologic or hydraulic analyses in support of a flood insurance map revision must meet all of the following criteria:

(i) It must have been reviewed and accepted by a governmental agency responsible for the implementation of programs for flood control and/or the regulation of flood plain lands. For computer programs adopted by non-Federal agencies, certification by a responsible agency official must be provided which states that the program has been reviewed, tested, and accepted by that agency for purposes of design of flood control structures or flood plain land use regulation.

(ii) It must be well-documented including source codes and user's manuals.

(iii) It must be available to FEMA and all present and future parties impacted by flood insurance mapping developed or amended through the use of the program. For programs not generally available from a Federal agency, the source code and user's manuals must be sent to FEMA free of charge, with fully-documented permission from the owner that FEMA may release the code and user's manuals to such impacted parties.

(7) A revised hydrologic analysis for flooding sources with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood discharges.

(8) A revised hydraulic analysis for a flooding source with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood elevations, and of the floodway. Unless the basis of the request is the use of an alternative hydraulic methodology or the requestor can demonstrate that the data of the original hydraulic computer model is unavailable or its use is inappropriate, the analysis shall be made using the same hydraulic computer model used to develop the base flood elevations shown on the effective Flood Insurance Rate Map and updated to show present conditions in the flood plain. Copies of the input and output data from the original and revised hydraulic analyses shall be submitted.

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(9) A hydrologic or hydraulic analysis for a flooding source without established base flood elevations may be performed for only the 100-year flood.

(10) A revision of flood plain delineations based on topographic changes must demonstrate that any topographic changes have not resulted in a floodway encroachment.

(11) Delineations of flood plain boundaries for a flooding source with established base flood elevations must provide both the 100- and 500-year flood plain boundaries. For flooding sources without established base flood elevations, only 100-year flood plain boundaries need be submitted. These boundaries should be shown on a topographic map of suitable scale and contour interval.

(12) If a community or other party seeks recognition from FEMA, on its FHBM or FIRM, that an altered or relocated portion of a watercourse provides protection from, or mitigates potential hazards of, the base flood, the Administrator may request specific documentation from the community certifying that, and describing how, the provisions of § 60.3(b)(7) of this subchapter will be met for the particular watercourse involved. This documentation, which may be in the form of a written statement from the Community Chief Executive Officer, an ordinance, or other legislative action, shall describe the nature of the maintenance activities to be performed, the frequency with which they will be performed, and the title of the local community official who will be responsible for assuring that the maintenance activities are accomplished.

(13) Notwithstanding any other provisions of § 65.6, a community may submit, in lieu of the documentation specified in § 65.6(a)(12), certification by a registered professional engineer that the project has been designed to retain its flood carrying capacity without periodic maintenance.

(14) The participating community must provide written assurance that they have complied with the appropriate minimum floodplain management requirements under § 60.3 of this chapter. This includes the requirements that:

(i) Existing residential structures built in the SFHA have their lowest floor elevated to or above the base flood;

(ii) The participating community has determined that the land and any existing or proposed structures to be removed from the SFHA are "reasonably safe from flooding," and that they have on file, available upon request by FEMA, all supporting analyses and documentation used to make that determination;

(iii) The participating community has issued permits for all existing and proposed construction or other development; and

(iv) All necessary permits have been received from those governmental agencies where approval is required by Federal, State, or local law.

(15) If the community cannot assure that it has complied with the appropriate minimum floodplain management requirements under § 60.3, of this chapter the map

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revision request will be deferred until the community remedies all violations to the maximum extent possible through coordination with FEMA. Once the remedies are in place, and the community assures that the land and structures are "reasonably safe from flooding," we will process a revision to the SFHA using the criteria set forth under § 65.6. The community must maintain on file, and make available upon request by FEMA, all supporting analyses and documentation used in determining that the land or structures are "reasonably safe from flooding."

In areas with approximate A Zones, the NFIP requires applicants for subdivisions and developments with more than 50 lots or 5 acres to provide detailed engineering studies to determine the BFEs. See Section 4-3.

(b) Data requirements for correcting map errors. To correct errors in the original flood analysis, technical data submissions shall include the following:

- (1) Data identifying mathematical errors.*
- (2) Data identifying measurement errors and providing correct measurements.*

(c) Data requirements for changed physical conditions. Revisions based on the effects of physical changes that have occurred in the flood plain shall include:

- (1) Changes affecting hydrologic conditions. The following data must be submitted:*
 - (i) General description of the changes (e.g., dam, diversion channel, or detention basin).*
 - (ii) Construction plans for as-built conditions, if applicable.*
 - (iii) New hydrologic analysis accounting for the effects of the changes.*
 - (iv) New hydraulic analysis and profiles using the new flood discharge values resulting from the hydrologic analysis.*
 - (v) Revised delineations of the flood plain boundaries and floodway.*
- (2) Changes affecting hydraulic conditions. The following data shall be submitted:*
 - (i) General description of the changes (e.g., channelization or new bridge, culvert, or levee).*
 - (ii) Construction plans for as-built conditions.*
 - (iii) New hydraulic analysis and flood elevation profiles accounting for the effects of the changes and using the original flood discharge values upon which the original map is based.*
 - (iv) Revised delineations of the flood plain boundaries and floodway.*
- (3) Changes involving topographic conditions. The following data shall be submitted:*
 - (i) General description of the changes (e.g., grading or filling).*
 - (ii) New topographic information, such as spot elevations, cross sections grading plans, or contour maps.*
 - (iii) Revised delineations of the flood plain boundaries and, if necessary, floodway.*

(d) Data requirements for incorporating improved data. Requests for revisions based on the use of improved hydrologic, hydraulic, or topographic data shall include the following data:

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- (1) Data that are believed to be better than those used in the original analysis (such as additional years of stream gage data).*
 - (2) Documentation of the source of the data.*
 - (3) Explanation as to why the use of the new data will improve the results of the original analysis.*
 - (4) Revised hydrologic analysis where hydrologic data are being incorporated.*
 - (5) Revised hydraulic analysis and flood elevation profiles where new hydrologic or hydraulic data are being incorporated.*
 - (6) Revised delineations of the flood plain boundaries and floodway where new hydrologic, hydraulic, or topographic data are being incorporated.*
- (e) Data requirements for incorporating improved methods. Requests for revisions based on the use of improved hydrologic or hydraulic methodology shall include the following data:*
- (1) New hydrologic analysis when an alternative hydrologic methodology is being proposed.*
 - (2) New hydraulic analysis and flood elevation profiles when an alternative hydrologic or hydraulic methodology is being proposed.*
 - (3) Explanation as to why the alternative methodologies are superior to the original methodologies.*
 - (4) Revised delineations of the flood plain boundaries and floodway based on the new analysis(es).*
- (f) Certification requirements. All analysis and data submitted by the requester shall be certified by a registered professional engineer or licensed land surveyor, as appropriate, subject to the definition of "certification" given at § 65.2 of this subchapter.*
- (g) Submission procedures. All requests shall be submitted to the FEMA Regional Office servicing the community's geographic area or to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72. [51 FR 30314, Aug. 25, 1986, as amended at 53 FR 16279, May 6, 1988; 54 FR 33550, Aug. 15, 1989; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997; 66 FR 22442, May 4, 2001]*

If you do process an application for a floodway proposal that could cause an increase the BFE, a Conditional Letter of Map Revision(CLOMR) and floodway or non-encroachment area revision must be reviewed and issued by FEMA prior to you issuing the permit." When FEMA grants conditional approval of the map change, the community must provide evidence to FEMA that the ordinance incorporates the post-project condition BFEs prior to approving the proposed encroachments.

If a proposal is approved by CLOMR, be sure to require the applicant to provide as-builts or other documentation to FEMA so your FIRM and Floodway Maps can be revised.

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Public Works and Road Crossings. Developments that have to cross streams, such as bridges, roads, driveways, and utility crossings, frequently can't avoid the floodway or non-encroachment area. But you can still require designs that minimize encroachment, which must be supported by an engineering analysis and a certification to verify no rise. Where floodways or non-encroachment areas are fairly narrow, the best approach is to have bridges and culverts sized to horizontally span the entire floodway or non-encroachment area width and keep the lowest chord above the surcharge elevation.

Waste water treatment plants are almost always located in low areas to take advantage of gravity flow. Water supply plants that draw from surface water also tend to be located near rivers or lakes. When new facilities are planned, you should require consideration of alternatives that avoid the floodway or non-encroachment area entirely. If they must be located in the floodway, an analysis of impacts must be prepared, and of course, the facilities must be floodproofed to prevent damage, interruption of service, and health hazards during flooding.

5.11 Subdivision of Land

Your community has an important role in promoting good floodplain management through the review and approval of subdivision plans. Prior to approving the subdivision of land, make sure the SFHA, BFE, and floodway or non-encroachment area boundaries are shown on the plat. If you already require a topographic map, it's easy to show the SFHA if the waterway has been studied in detail. Make sure the lines match the mapped boundary as adopted by the community and published by FEMA on your flood maps – not the BFE contour surveyed in the field. Although the field survey is much more likely to be accurate, it must be presented to FEMA to change the maps before you can remove any floodplain regulations on areas above BFE shown within the floodplain. More than likely, the plat is prepared with topography that has more detail than what was used to prepare the FIRM, so you should use the plat topography to define areas below BFE.

Consider requiring an alternative location analysis for floodway or non-encroachment area development. Even fences, which may trap debris and cause water backup, should be considered carefully.

You have to issue permits for public works projects. If they get damaged by flood, vital services will be interrupted and your community's budget may be strained by the costs of repair.

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SECTION B. FLOODPLAIN DEVELOPMENT APPLICATION, PERMIT AND CERTIFICATION REQUIREMENTS.

See below for the items needed to apply for a flood permit in North Carolina based on the Flood Damage Prevention Ordinance - Non-Coastal Regular Phase under Article 4, Section B.

- (1) Application Requirements. Application for a Floodplain Development Permit shall be made to the Floodplain Administrator prior to any development activities located within Special Flood Hazard Areas. The following items shall be presented to the Floodplain Administrator to apply for a floodplain development permit:
 - (a) A plot plan drawn to scale which shall include, but shall not be limited to, the following specific details of the proposed floodplain development:
 - (i) the nature, location, dimensions, and elevations of the area of development/disturbance; existing and proposed structures, utility systems, grading/pavement areas, fill materials, storage areas, drainage facilities, and other development;
 - (ii) the boundary of the Special Flood Hazard Area as delineated on the FIRM or other flood map as determined in Article 3, Section B, or a statement that the entire lot is within the Special Flood Hazard Area;
 - (iii) flood zone(s) designation of the proposed development area as determined on the FIRM or other flood map as determined in Article 3, Section B;
 - (iv) the boundary of the floodway(s) or non-encroachment area(s) as determined in Article 3, Section B;
 - (v) the Base Flood Elevation (BFE) where provided as set forth in Article 3, Section B; Article 4, Section C; or Article 5, Section D;
 - (vi) the old and new location of any watercourse that will be altered or relocated as a result of proposed development; and
 - (vii) *the certification of the plot plan by a registered land surveyor or professional engineer. (OPTIONAL)*
 - (b) Proposed elevation, and method thereof, of all development within a Special Flood Hazard Area including but not limited to:
 - (i) Elevation in relation to mean sea level of the proposed reference level (including basement) of all structures;
 - (ii) Elevation in relation to mean sea level to which any non-residential structure in Zone AE, A or AO will be floodproofed; and

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- (iii) Elevation in relation to mean sea level to which any proposed utility systems will be elevated or floodproofed.
- (c) If floodproofing, a Floodproofing Certificate (FEMA Form 81-65) with supporting data, an operational plan, and an inspection and maintenance plan that include, but are not limited to, installation, exercise, and maintenance of floodproofing measures.
- (d) A Foundation Plan, drawn to scale, which shall include details of the proposed foundation system to ensure all provisions of this ordinance are met. These details include but are not limited to:
 - (i) The proposed method of elevation, if applicable (i.e., fill, solid foundation perimeter wall, solid backfilled foundation, open foundation on columns/posts/piers/piles/shear walls); and
 - (ii) Openings to facilitate automatic equalization of hydrostatic flood forces on walls in accordance with Article 5, Section B(4)(c) when solid foundation perimeter walls are used in Zones A, AO, AE, and A1-30.
- (e) Usage details of any enclosed areas below the lowest floor.
- (f) Plans and/or details for the protection of public utilities and facilities such as sewer, gas, electrical, and water systems to be located and constructed to minimize flood damage.
- (g) Certification that all other Local, State and Federal permits required prior to floodplain development permit issuance have been received.
- (h) Documentation for placement of Recreational Vehicles and/or Temporary Structures, when applicable, to ensure that the provisions of Article 5, Section B, subsections (6) and (7) of this ordinance are met.
- (i) A description of proposed watercourse alteration or relocation, when applicable, including an engineering report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map (if not shown on plot plan) showing the location of the proposed watercourse alteration or relocation.

If a portion of a proposed subdivision falls within the SFHA, the applicant should minimize impacts by arranging lot lines and potential building sites to either avoid putting buildings in the SFHA entirely or to place them on the highest available ground. See Chapter 6 for suggestions related to density and “greenlining” to protect floodplain and wetland resources. Reminder that any subdivision or manufactured home park with more than 50 lots or five acres or any single-lot development of more than five acres, must include within such proposal base flood elevations if the proposed development falls within an approximate A Zone.

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Subdivision Access. Because evacuation is critical to public safety, even when buildings are elevated above the BFE, your community may be concerned with safe access to new subdivisions. The safety of both residents and emergency personnel is of concern. A good rule of thumb is to try to keep access roads flood-free. When not feasible, access roads should be no more than 12"-18" below the water surface of the base flood. Deeper water can float or flood out the average car (see the Flood Hazard Charts in Chapter 6). It's a good idea to get comments from your county emergency manager before you issue plat approval on a subdivision that will be isolated by flooded roads.

Open Space. Many subdivision ordinances are written to avoid flood-prone development, where possible, and to always minimize the impacts. During subdivision approvals, avoidance and minimization of flood risk areas are important because larger areas of land provide ample opportunities to cluster development to preserve the SFHA as open space. Sometimes it's cheaper and faster to get approvals if floodplain impacts are avoided. In addition, siting buildings outside of the SFHA will promote safer construction and save owners hundreds of dollars each year because they will not be required to purchase federal flood insurance.



5.12 Coastal High Hazard Areas

Coastal High Hazard Areas (V/VE Zones) are where coastal flooding is likely to be deeper and the additional forces of waves in the flood can cause more damage. If your FIRM shows V/VE Zones, your library should include FEMA's *Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas* (3rd ed.) (FEMA 55CD). Another valuable resource is FEMA 499, *Home Builder's Guide to Coastal Construction*. FEMA 499 is a series of "technical fact sheets" that are designed to help home builders improve the performance of buildings subject to coastal flood, wave and wind forces. The fact sheets make extensive use of drawings and photographs to illustrate the NFIP requirements.

Along many reaches of shoreline, coastal storms and associated flooding can increase erosion. In extreme situations, erosion can alter the ground surface to the extent that the current FIRM no longer accurately reflects flood hazards.

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If the shoreline recedes or if dunes are overtopped, it may be advisable to regulate areas outside the mapped SFHA by extrapolating the Base Flood Elevation to surrounding areas. If you ignore actual conditions beyond the mapped floodplain, it could be interpreted as a failure to use the best available information and your community could be held liable for development that sustains damage in the future. In this chapter, Section 5-20 addresses methods to elevate in V/VE Zones and Sections 5-34 and 5-35 outlines requirements for enclosures below those buildings.

Mean High Tide. The NFIP regulations require that all new construction, in order to be insurable, in V/VE Zones must be located landward of the reach of mean high tide - they cannot be built over water. This includes marinas, piers, etc.

Public Works and Roads. Although the NFIP doesn't have specific criteria for roads and underground utilities lines in V/VE Zones, past damage experience suggests that areas subject to waves and erosion are not good locations for public infrastructure. Check with the North Carolina Division of Coastal Management to find out about long-term erosion rates.

Modification of Dunes. The NFIP regulations prohibit man-made alteration of sand dunes in V/VE Zones if such alterations would increase potential flood damage. Dunes are natural barriers to flooding, so it is difficult to alter a dune without increasing potential flood damage. The burden is on the applicant to demonstrate with an analysis that addresses the potential to increase flood damage.

Structural Fill is Prohibited. Buildings in V/VE Zones, including substantial improvements, must be elevated on properly designed foundation systems which allow unobstructed flow of velocity waters (see Technical Bulletin 5-08). The NFIP regulations prohibit the use of fill to support buildings because fill and sandy soils are easily eroded. Nonstructural fill, such as might be used for landscaping, should be placed so that it does not divert waves and surging floodwaters onto other structures.

5.13 Coastal A Zones

Coastal A Zones (CAZs) traditionally have not been delineated on Flood Insurance Rate Maps. The concept of the CAZ is based on observed damage and laboratory damage to conventional light frame construction when exposed to breaking waves less than 3-feet (used to delineate the inland extent of VE Zones). Recent building sciences studies have

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demonstrated that waves as low as 1.5-feet cause damage. To address and minimize the potential for damage, it is highly recommended that V Zone standards should be applied in the CAZ in addition to the already mandatory A zone standards. This approach is reflected in:

- FEMA's *Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas* (3rd ed.) (FEMA 55CD)
- The *International Building Code* (2006 and later editions) through reference to ASCE Standard ASCE/SEI 24-05
- ASCE Standard ASCE/SEI 24-05 *Flood Resistant Design and Construction*



Activity 430 in the Community Rating System provides significant credit points for adoption of a Coastal A Zone.

5.14 Watercourse Alterations

Projects that involve altering a waterway must be handled carefully. You are required to notify (or require the applicant to notify) adjacent communities, the North Carolina Division of Emergency Management, and FEMA prior to approving a project that involves altering or relocating any river, stream or other watercourse. Check to see if any Federal and state permits are required for any alteration or relocation activity. Agency involvement could include NC DENR and CAMA.

Alterations or relocations of a watercourse should not increase flood risks. Flood risks may be increased if the watercourse's capacity to carry flood flow is reduced if a smaller or less-efficient channel is created, if the floodway or non-encroachment area is altered, or if the floodplain boundaries are shifted onto areas that were not previously located by the floodplain.

Communities must ensure that the altered or relocated channel has at least the capacity as that of the old channel to convey the flow of the base flood. Refer to 44 CFR 60.3(b)(7). For any watercourse alteration or relocation, you shall require the applicant to have an engineer certify that the flood-flow carrying capacity is maintained and that there will be no increase in flood flows downstream. In most cases it is appropriate to require the applicant to submit and obtain approval of a Conditional Letter of Map Revision from FEMA before issuing any permits. Although FEMA may issue

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the CLOMR, the effective map will not be formally revised until after as-built certifications are submitted and a LOMR has been approved that reflects the new conditions.

After altering a watercourse, the developer has created an artificial situation and must assume responsibility for maintaining the capacity of the modified channel in the future. Otherwise, flooding is likely to increase if the channel silts in, meanders or tries to go back to its old location.

5.15 Protecting Utilities

A good resource publication is *Protecting Building Utilities from Flood Damage* (FEMA 348).

Public Utilities. Because of high replacement costs and potential health risks, the NFIP requires that all new and replacement utility service lines be located and constructed to minimize or eliminate flood damage. Utilities include sewage, gas, electrical, and water systems. Therefore, they are all subject to your community's floodplain management regulations and permitting procedures.

In riverine floodplains, most flood damage to public utility lines occurs where they cross under waterways, or if they are parallel to waterways but too close to eroding stream banks. A good rule of thumb for most waterways is to require the top of utility crossings, including casements, to be at least 3' beneath the lowest part of the streambed. In areas with very erodible soils, it is advisable to be even deeper. Utility lines that parallel waterways should be at least 25' back from the top of bank (even further in areas with highly erodible soils). Stream bank protection such as riprap or gabion (rock filled wire baskets) may be required if flood flow velocities are expected to be erosive.

In coastal flood hazard areas, utility damage is associated with line breakage due to undermining by scour and erosion.

Buildings associated with utilities, such as treatment plants, pump/lift stations, or other installations, must comply with the NFIP regulations. Your community would be wise to consider requiring at least one foot of freeboard (preferably 3 feet) for construction of new buildings that provide critical utility service. Remember, when a water treatment plant goes off-line, everyone is impacted, including businesses that depend on water. Some communities even regulate these as critical utilities similarly to critical

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facilities which requires them to meet the 0.2%-annual chance flood elevation or more commonly referred to as the 500-year flood elevation.

New and replacement water distribution systems must be designed and constructed to minimize or eliminate the infiltration of flood waters. Sewage collection lines and manhole covers must be sealed to prevent leakage under flood conditions; manholes can be raised to be above the BFE. Usually, these standards are satisfied without special materials or construction techniques.

Private On-Site Utilities. On-site waste disposal systems such as septic tanks and septic fields must be located to avoid impairment or contamination during flooding. The best way to minimize impaired functioning is to locate them outside of the SFHA or at a minimum outside of the 10%-annual chance flood. If unavoidable, you must require that tanks be anchored adequately to prevent flotation or shifting that could damage pipe connections. Septic-tank inlets and outlets must be elevated above the BFE or sealed to prevent inflow/outflow under flood conditions. In some areas, installing a mound system may work, although surrounding saturated ground will still complicate drainage (remember that mound systems are fill and should not be located in floodways or non-encroachment areas).



Local health departments regulate placement of on-site septic in areas subject to frequent flooding (areas inundated at a 10-year flood or less frequency). Systems must be designed and installed to be watertight and remain operable during such flooding.

According to the North Carolina Department of Environmental, Health, and Natural Resources, septic tanks, lift stations, wastewater treatment plants, sand filters, and other pretreatment systems shall not be located in areas subject to frequent flooding (areas inundated at a ten-year or less frequency) unless designed and installed to be watertight and to remain operable during a ten-year storm. Mechanical or electrical components of treatment systems shall be above the 100-year flood level or otherwise protected against a 100-year flood.

Private water supply wells are very susceptible to contamination during flooding. If possible, wells should be located outside of the SFHA. If that's not feasible, consider requiring a sealed system. The homeowner will need to be prepared to purify their wells and distribution systems when contaminated by floodwaters.

For insurance purposes, utilities or appliances below the BFE changes the determination of the lowest floor – leading to mean very high flood insurance rates.

Utility Service in Buildings. All plumbing, mechanical, and heating and air conditioning components must be elevated to or above the BFE, including toilets, sinks, showers, water heaters, furnaces, heat pumps, air conditioners, air distribution systems, generators, water softener units,

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ductwork, electric/gas meter panels/boxes, utility/cable boxes, appliances (washers, dryers, refrigerators, freezers, etc.), hot water heaters, and electric outlets/switches and other permanent plumbing, mechanical, and electrical installations. Only under unusual circumstances and with great difficulty can these components be sealed against the infiltration of water.

Backflow into homes from sewer lines can be caused by rising flood water.

Not only does this cause water damage, but the contamination poses a serious health threat. The easiest way to minimize this damage is to require installation of backflow valves (Figure 5-2). Each home can have its own backflow valve, or a larger system can be installed to serve several homes in a subdivision. Obviously, water inside the building cannot be used until after the flood recedes.

Appliances and machinery can be located in enclosures below BFE, but only if a watertight enclosure is built around them (Figure 5-3) essentially floodproofing them. Remember, heat pumps outside of the building must also be elevated above the BFE. This is most easily done by building a platform (Figure 5-4) to at least BFE, although sometimes a small deck is cantilevered off of the building, which is an especially effective method in areas subject to wave action (Figure 5-5). Although a platform may be used, the appliances will still need to be anchored to the platform or deck to prevent flotation, collapse or lateral movement. The platform or deck must be sturdy enough to help the unit withstand these movements.

Vents and heating/air conditioning duct work are often installed incorrectly in buildings in the SFHA. The most common reason is because the minimum elevation requirement for buildings within A Zones calls for the walking surface of the lowest floor to be at the BFE. When the BFE is not available, then the walking surface to be located two-feet above highest adjacent grade. Since duct work usually is installed between the joists under the floor, it can end up being below the two-feet above highest adjacent grade (or the BFE, if known). Even when floodwaters just touch the duct insulation, costly damage results. If you see duct work below the

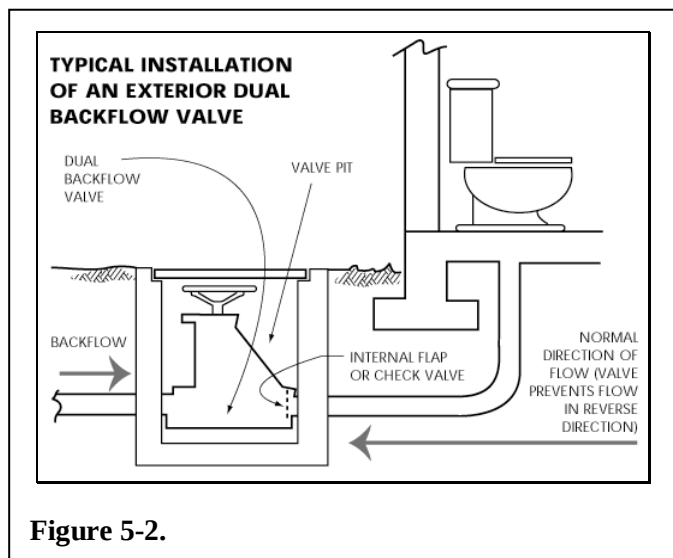


Figure 5-2.

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BFE, it is a violation of your community's flood ordinance and corrective actions must be taken.

Electrical equipment, switches, and outlets on the building side of the meter must be elevated. The meter itself must also be elevated. Since a specialty contractor usually handles the electrical work, be sure the plans show the required elevation. You may allow one light switch or outlet below the BFE that is ground faulted for safe access to the building, in which case you should check that the plans call for materials designed for wet locations.

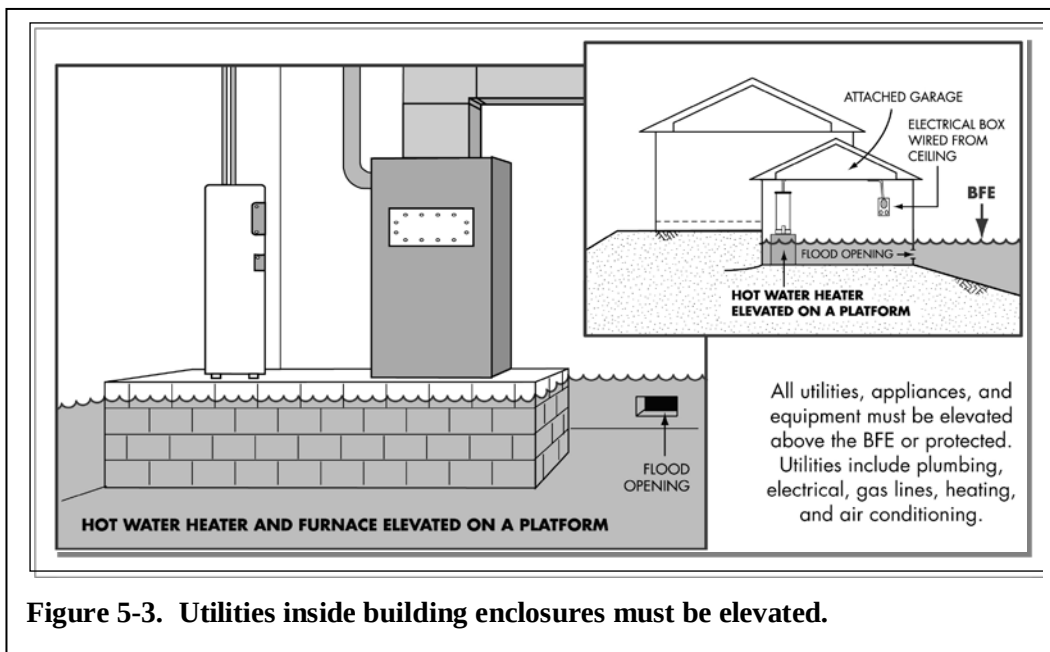


Figure 5-3. Utilities inside building enclosures must be elevated.

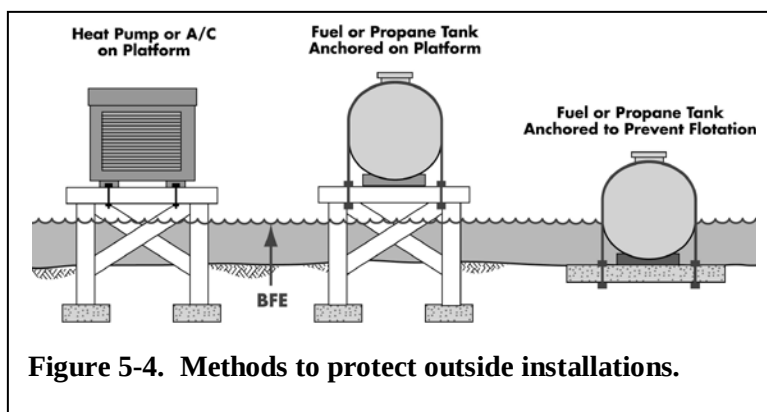


Figure 5-4. Methods to protect outside installations.

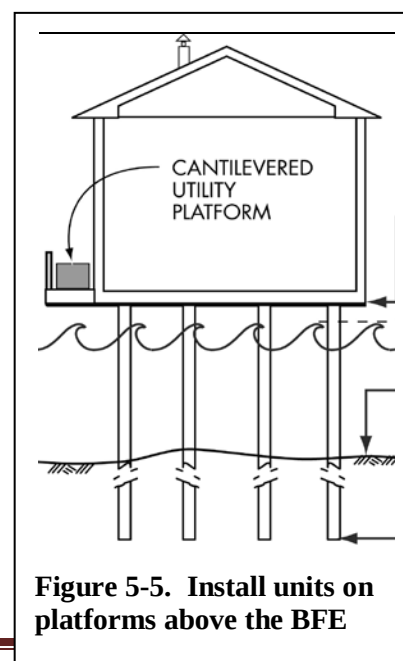


Figure 5-5. Install units on platforms above the BFE

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Electric and Gas Meters. Electric and gas companies control the placement of electrical and gas meters, which are outside of the building. This means meters may not be fully elevated, which could hamper restoration of service. A good thing to do is to contact the companies that serve your community and ask them to consider installing meters and transformers at least one-foot above the BFE. In order to get around this requirements for North Carolina communities with BFEs far above grade, an agreement would need to be entered into with FEMA stating that the community will not request federal assistance to restore service after a flood event, but will be dedicated to restoring such service promptly. Also, generally utility companies want the meter located close to the ground so it is readily accessible for their inspection. Consult the local electrical and gas utility company to determine if they will permit the meter to be elevated above the DFE (Design Flood Elevation) with access provided by a stairway and platform. If the company does not permit this, the meter can be located below the DFE, but must be elevated as high as the company permits. The problem in North Carolina is that for the most part, the ownership of electric meter panel box is turned over to the homeowner once the CO (Certificate of Occupancy) is issued. It then becomes part of the structure which means it falls under the NFIP flood insurance policy and it must be surveyed as the lowest equipment and referenced as such on the EC forms. The utility company still maintains ownership of the parts of the unit within the meter panel box. All public utilities must be protected to BFE, too. We understand the problems they have with access to the meters for reading purposes but emerging technology has been developed that allows that the meters that can be read at any height with a laser reader.

Elevators. Elevators may be installed in elevated buildings, and clearly they must be accessible from ground level, but they are still subject to floodplain ordinance requirements. They must have their equipment elevated above BFE and have the resting floor set to a floor level above BFE and it must have the portions below BFE constructed of flood resistant materials. For more, see the NFIP Technical Bulletin 4-93 *Elevator Installation*.

Free of Obstruction. In V/VE Zones, the NFIP regulations require that the space below the lowest floor be free of obstruction or any enclosure must be built with non-supporting breakaway walls. Obstructions such as utility closets or cabinets that are attached to the supporting

In V/VE Zones, enclosures below BFE are obstructions, even those with breakaway walls; buildings with obstructions have higher flood insurance rates.

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columns or piers will be subject to flood and wave forces, and those forces can exert damaging stresses on the building. Utility components, piping and wires must not be attached to or penetrate through breakaway walls. If tool sheds and storage units are attached to the supporting foundation of the building, they will be considered obstructions and therefore are not permissible.

5.16 New Buildings in A/AE, AO and AH Zones

Once a decision has been made to build a new building (or to substantially improve a pre-FIRM building) in an unnumbered A Zone or an AE Zone, several requirements related to reducing exposure to flood forces must be taken into consideration during design and planning:

- How high to elevate the lowest floor (Section 5.19 for lowest floor in A/AE Zones, Section 5.18 for AO/AH Zones, and Section 4.10 for determining BFEs in unnumbered A Zones)
- Method of elevation or foundation type (Section 5.19)
- Enclosures under the elevated building (Section 5.35)
- Special notes about basements (Section 5.21))
- Utilities (Section 5.35)
- Flood-resistant materials (Section 5.35)
- Accessory structures (Section 5.27)
- Manufactured homes (Section 5.24)
- Piers and docks (Section 5.40)
- Other development such as grading, filling, excavating, paving or graveling driveways and walkways.
- Other permits that may be required
- Special certifications and documents needed at make application for a floodplain development permit

5.17 New Buildings in V/VE Zones and Coastal A Zones

Once a decision has been made to build a new building (or to substantially improve a pre-FIRM building) in a V/VE Zone or a Coastal A Zone, several requirements related to reducing exposure to flood forces must be taken into consideration during design and planning:

- Locating the building on the site landward of the reach of mean high tide

Due to wave impacts, V/VE Zones have special building protection standards in addition to the basic requirements applied in A/AE Zones.

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- How high to elevate the lowest floor (lowest horizontal structural member) (Section 5.20)
- Method of elevation or foundation type (Section 5.20)
- Enclosures under the elevated building and breakaway walls (Sections 5.34 and 5.35)
- Utilities (Section 5.35)
- Flood-resistant materials (Section 5.33)
- Accessory structures (Section 5.27)
- Manufactured homes (Section 5.24)
- Piers and docks (Section 5.40)
- Pools (Section 5.44)

The best reference for design and construction requirements in V/VE Zones is FEMA's *Coastal Construction Manual* (FEMA 55, available on CD-ROM). Another reference, designed for builders, is FEMA 499, *Home Builder's Guide to Coastal Construction*.

5.18 Setting the Lowest Floor Elevation

NFIP regulations require that the lowest floor of a building must be elevated above the BFE. Note three things about this minimum requirement:

- The term "lowest floor" includes a basement because all usable portions of a building must be protected from flood damage. The NFIP does not use the concept of "habitable" space.
- The minimum requirement is to elevate to the BFE. Your ordinance may require freeboard, an extra margin of protection that requires the lowest floors to be one or more feet above the BFE.
- In A/AE Zones, the lowest floor is measured from the top of the floor (Figure 5-6). However, all portions of the building below the BFE must be constructed with flood resistant materials, and building utility systems (including ductwork) must be elevated above the BFE or floodproofed (made watertight) to that elevation. To meet these requirements, it is recommended that you require that the bottom of the lowest horizontal structural member be at or above the BFE. This

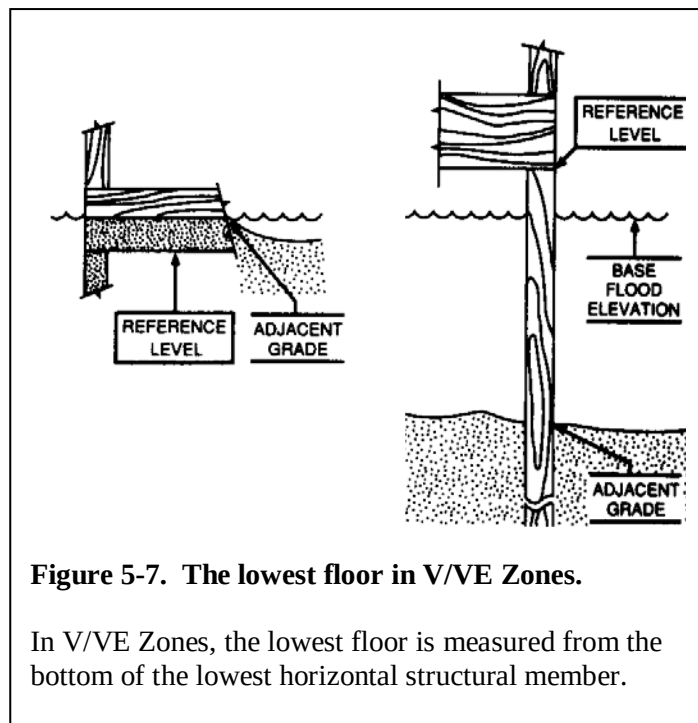
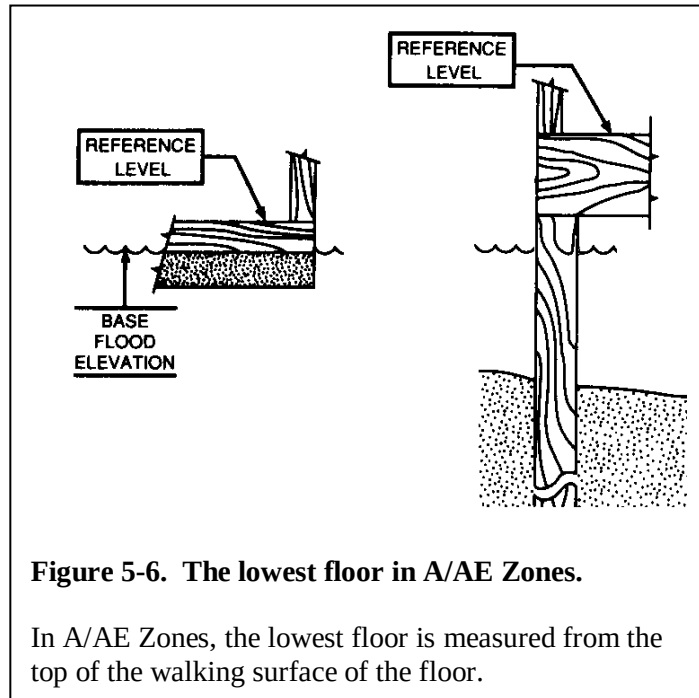
44 CFR 59.1. "**Lowest Floor**" means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of Section 60.3.

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is generally easier than using flood resistant materials for floor support systems. Keep in mind that ductwork below the lowest floor must also be elevated, another reason to require the actual walking surface to be higher.

- In V Zones, the lowest floor is measured from the bottom of the lowest horizontal structural member

(Figure 5-7). This is to keep the entire building above the anticipated breaking wave height of a base flood storm surge.



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5.19 Elevations in AO/AH and A99/AR Zones

AO Zones. AO Zones are areas subject to inundation by 1%-annual chance shallow flooding (usually sheet flow on sloping terrain) where average water depths are estimated to be between 1 and 3 feet. Average flood depths derived from detailed hydraulic analyses, rather than the BFEs, are shown on the FIRM. In shallow flooding areas, particular attention should be paid to providing adequate drainage paths around buildings to guide floodwater around and away. Because there is no BFE, the rules read a little differently.

All new construction and substantial improvements of residential structures shall have the lowest floor (including basement) elevated above the highest adjacent grade:

- At least as high as the depth number specified in feet on the community's FIRM, or
- At least two feet if no depth number is specified.

All new construction or substantial improvements of nonresidential structures shall meet the above requirements or, together with attendant utility and sanitary facilities, be floodproofed to the same elevation.

AH Zones. AH Zones are areas subject to inundation by 1%-annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. BFEs derived from detailed hydraulic analyses are shown on the FIRM. Buildings in AH zones must meet the same requirements as in AE zones. In shallow flooding areas, particular attention should be paid to providing adequate drainage paths around buildings to guide floodwater around and away.

AR and A99 Zones. An AR Zone is an area that results from the decertification of a previously accredited flood protection system that has been determined to be in the process of being restored to provide adequate protection during conditions of the base flood. An A99 Zone is an area subject to inundation by the 1%-annual chance flood, but which will ultimately be protected upon completion of an "under construction" levee or Federal flood protection system. A99 Zones are designated where enough progress has been made on the construction to consider it complete for insurance rating purposes.

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When the construction on the flood protection system is completed or restored, the areas designated as A99 Zones and AR Zones are expected to be remapped and shown outside of the SFHA. Until then, they are treated as situated within a SFHA for insurance purposes and there are some floodplain management requirements. Very few A99 and AR Zones are shown on FIRMs. If your maps show these one of these zones, contact the NFIP State Coordinator for guidance on regulatory requirements.

5.20 Methods to Elevate Buildings – A/AE Zones

When buildings can't be located outside of the SFHA, they have to be elevated so that the **lowest floor** is at or above the BFE. The most common ways to elevate buildings are on fill, on solid foundation walls surrounding crawlspaces or compacted earth (stem walls), or on posts, pilings, or columns.

Remember that during the base flood elevated buildings will be surrounded by water. Before approving large flood-prone subdivisions, you might want to check with your local emergency management agency or the police and fire departments. They will be the ones who have to evacuate threatened areas, so you may want your file to include their comments.

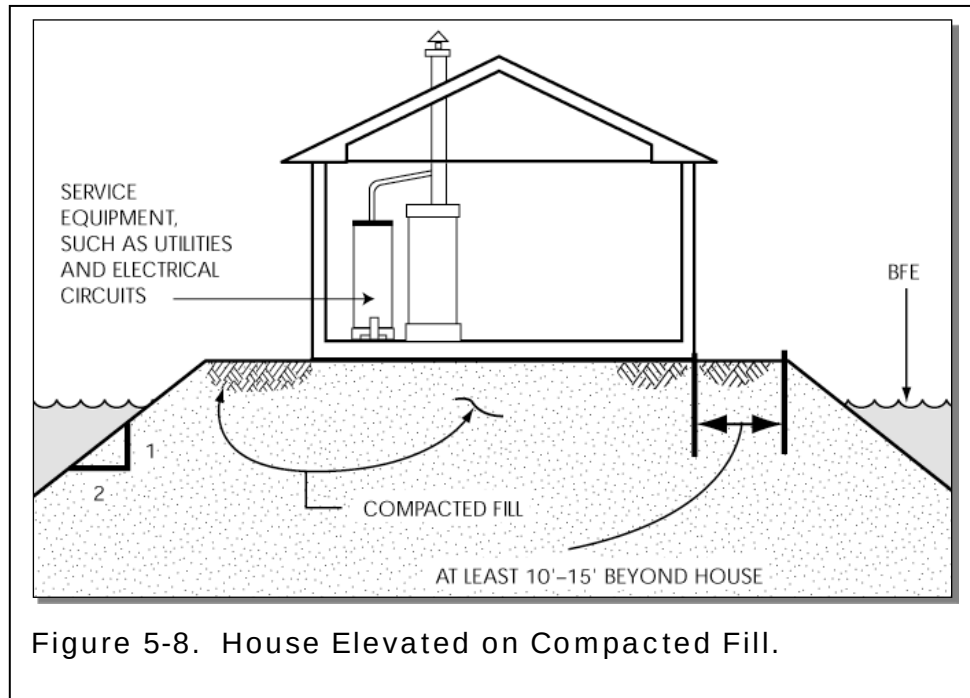
Some owners will be unhappy about being surrounded by flood waters during the base flood event, even though they may have been told about the likelihood of flooding when they built or purchased the home. Although the NFIP allows enclosures below BFE to be used for "limited storage," most homeowners do not understand that this means that whatever they store will, eventually, be inundated.

Elevation on Fill. Compacted fill can be placed to raise a building pad above the BFE or fill may be used in combination with other elevation methods (Figure 5-8). The best way to assure that fill is properly placed is to condition the permit so that the owner/developer is required to submit an "as-built" certification that the filled site is "reasonably protected from flooding." The NFIP Technical Bulletin TB 10-08 *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding* includes a sample certification form.

Good fill material must be used, and the fill must be compacted to reduce the chances that floodwaters will cause saturated soils to slump and fail when water recedes. Graded side slopes typically should be no steeper than 2:1 (two feet of horizontal for every one foot of vertical height), and planted

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with tightly growing vegetation. Compacted fill should extend 10-15 feet around the building.



Before allowing floodplain fill, you need to be sure it will not be located in the mapped floodway or in the non-encroachment areas listed in the FIS, and that it will not increase flooding and/or cause drainage problems on neighboring properties. In areas with known drainage problems, you may want to ask for an engineering analysis in order to protect adjacent property owners, even if the NFIP minimum regulations do not require such an analysis.

Remember that fill in the floodway cannot be approved if it increases flood elevation! Check the requirements for a “no-rise” certification.

Remember, your community issues the permits, not FEMA. This means that if people claim that off-site fill has increased flood levels to their property, they might view your actions as contributing to their problems.

Most buildings on fill use slab-on-grade foundations. The typical slab-on-grade foundations do not provide any significant height above the ground surface of the fill. You need to make sure that the lowest floor is at or above the BFE – and adding another foot is always a good idea.

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One way to reduce the impact of fill is to use it in combination with other elevation methods. For example, in a floodplain where the water depth is 6 feet, fill could be placed to raise the site 3 feet, and the building could have a 3-foot crawlspace.

Sometimes an applicant proposes placing floodplain fill in order to excavate a basement into it at a later date. A basement is any area, regardless of how it is used, that is below grade on all sides. **The NFIP standards do not allow basements below the BFE and you should not approve permits for basements in fill.** Even when excavated into fill, basements may be subject to damage, especially in floodplains where waters remain high for more than a few days. Damage may also occur when fill materials become saturated and inadequately support the building or water pressure collapses basement walls.



Be careful about issuing permits for fill only. In the future, someone could get a LOMR-F from FEMA and then excavate a basement.

Sometimes people want to obtain from FEMA a Letter of Map Revision based on Fill (LOMR-F) in order to remove the flood insurance requirement. The LOMR-F is the only way to officially remove a filled-site property from the mapped flood hazard areas. To qualify, the fill must be adequately compacted and otherwise determined to provide adequate protection so that the building on the fill can be certified a “reasonably protected from flooding” (see NFIP Technical Bulletin 10-01). The “as-built” certification is required by FEMA as part of supporting documentation for a LOMR-F.

Elevation on Solid Foundation Walls. Solid foundation/perimeter walls forming a crawlspace may be made of poured concrete, pre-fabricated concrete slabs, or reinforced or unreinforced masonry block or brick construction (Figure 5-9). Solid foundation walls extend around all sides of the building and walls must have flood openings (for details and specific requirements, see Section 5.35 and 5.36). To avoid being a basement per the NFIP definition (below grade on all sides), the interior grade of a crawlspace must be at or above the exterior grade.

It is best to avoid using solid foundation walls to enclose spaces higher than 6-feet. Owners may be tempted to illegally convert such enclosures to uses other than those allowed: parking, building access, and limited storage.

Elevation on Filled Stem Walls. To avoid moisture problems associated with crawlspaces many designers and contractors are electing to backfill solid perimeter walls with compacted earth topped with a poured reinforced concrete slab. There is no need to install flood openings because there will not be differential hydrostatic forces impacting the walls as floodwaters rise and fall.

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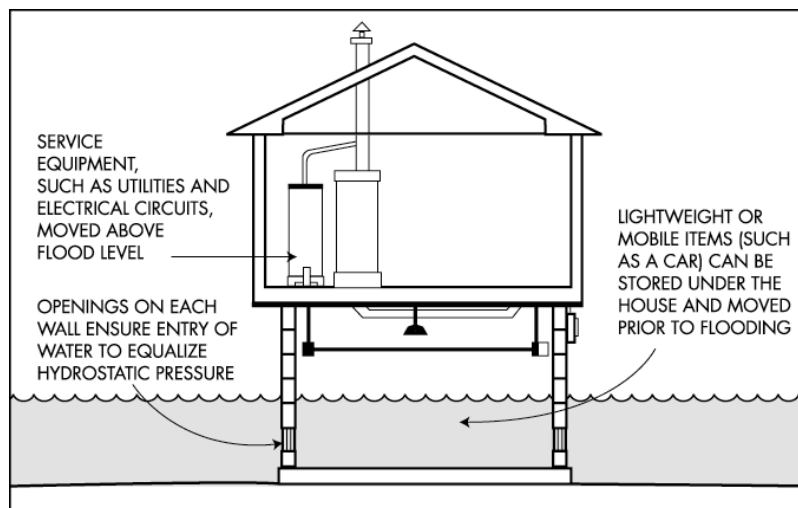


Figure 5-9. Typical Cross-Section of an A/AE Zone House Elevated on Solid Foundation Walls.

Elevation on Posts, Columns, Piers or Pilings. These elevation methods are appropriate where flooding is deep, where fill is not feasible or not allowed, and areas where velocities are anticipated to be high (Figures 5-10 and 5-11). Open foundations present less obstruction and typically sustain less damage.

Posts or columns are usually wood, steel, or prefabricated concrete/masonry supports that are placed on footers in pre-dug holes and backfilled with compacted material (see Sections on V/VE Zone foundations). Piers are usually constructed in-place of reinforced masonry block or brick. Pilings are usually long and slender in shape and are driven or jetted into the ground by mechanical means. They often appear similar to telephone poles or may be small-diameter concrete poles or steel members, and are used primarily in coastal areas where soils are sandy.

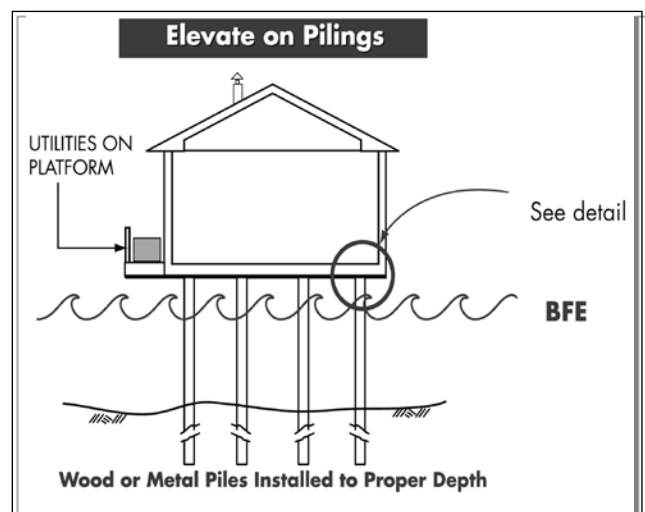
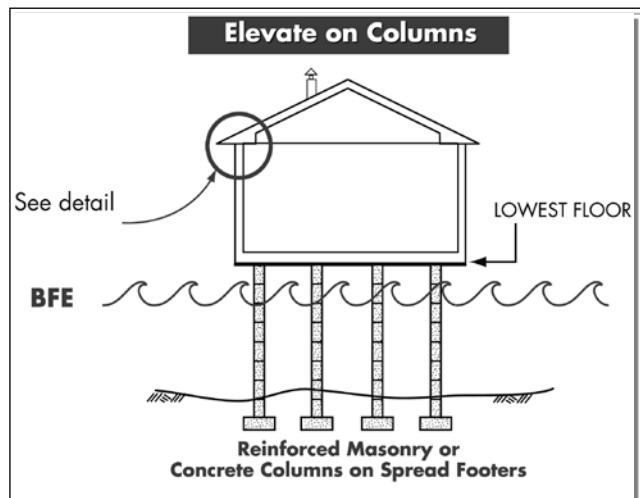
Parallel Shear Walls. Often seen for large buildings (Figure 5-12), parallel shear walls are a reasonable alternative for floodplains. They are especially applicable where easy-access parking under a building is a plus. They should be constructed parallel to the expected flow of water to minimize obstruction. Parallel shear walls are one-sided, they do not enclose an area and they do not “turn corners.”

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5.21 Methods to Elevate Buildings – V/VE Zones

In coastal high hazard areas, new and substantially improved buildings have to be elevated so that the bottom of the lowest horizontal structural member (excluding pilings and columns) is at or above the BFE. The NFIP regulations require foundations in V/VE zones to be pilings or columns. The force of breaking waves and the likelihood of local scour and erosion are such that other types of foundations are not allowed. Specifically, use of fill for structural support of buildings in V/VE Zones is prohibited. Limited fill is allowed only for landscaping and to smooth out a site for a frangible concrete parking pad.

See Section 5.34 for very specific requirements and limitations that apply to areas below elevated buildings, including “breakaway walls.”



Figures 5-10 and 5-11. Elevating on Column or Piling.

Design Certification. A certificate of the design for buildings in V/VE Zones is required to be submitted prior to issuance of a permit (see V Zone Certification, on the next page). A registered professional engineer or architect shall develop or review the structural design, specifications and plans for construction and shall certify that the design and methods of construction are in accordance with accepted standards of practice. The design must be site-specific with respect to the depth of embedment, which must account for potential scour and erosion (Figure 5-12). Further, certification is required to assure that the foundation and structure attached to it is anchored to resist flotation, collapse, and lateral movement due to the effects of wind and water loads acting simultaneously on all building components (Figure 5-13). Water loading values are associated with the

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base flood; wind loading values shall be those required by State or local codes and standards.

Non-residential buildings, especially larger structures, are often supported on parallel shear wall foundations (Figure 5-14). This method is especially applicable when parking is proposed for the area under the elevated building. The Structural walls must be oriented parallel to the expected flow of water, which often – but not always – is at right angles to the shoreline. Check with long-term residents to find out if there is a prevailing direction from which flooding waves arrive. Parallel shear walls are one-dimensional, they do not enclose an area and they do not “turn corners.”

V-Zone Certification				
Property Information			For Insurance Company Use	
Name of Building Owner			Policy Number	
Building Address or Other Description				
City	State		Zip Code	
SECTION I: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION				
<i>Note: to be obtained from appropriate FIRMs</i>				
Community Number	Panel Number	Suffix	Date of FIRM Index	FIRM Zone
SECTION II: ELEVATION INFORMATION				
<i>Note: This form is not a substitute for an Elevation Certificate. Elevations should be rounded to nearest tenth of a foot.</i>				
1.	Elevation of the Bottom of Lowest Horizontal Structure Member			feet
2.	Base Flood Elevation			feet
3.	Elevation of Lowest Adjacent Grade			feet
4.	Approximate Depth of Anticipated Scour/Erosion Used for Foundation Design			feet
5.	Embedment Depth of Pilings or Foundation Below Lowest Adjacent Grade			feet
6.	Datum Used: _____ NGVD '29 _____ NAVD '88 _____ Other _____			
SECTION III: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION				
<i>Note: This section must be certified by a registered professional engineer or architect</i>				
I certify that I have developed or reviewed the structural design, plans and specifications for construction and that the methods of construction to be used are in accordance with accepted standards of practice for meeting the following provisions:				
a) The bottom of the lowest horizontal structure member of the lowest floor (excluding the pilings or columns) is elevated to or above the BFE; and,				
b) The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of the wind and water loads acting simultaneously on all building components. Water loading values used are those associated with the base flood including wave action. Wind loading values used are those required by the applicable State or local building code. The potential for scour and erosion at the foundation has been anticipated for conditions associated with the flood, including wave action.				
SECTION IV: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION				
<i>Note: This section must be certified by a registered professional engineer or architect</i>				
I certify that I have developed or reviewed the structural design, plans and specifications for construction and that the design and methods of construction to be used for the breakaway walls are in accordance with accepted standards of practice for meeting the following provisions:				
c) Breakaway collapse shall result from water load less than that which would occur during the base flood; and,				
d) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (wind and water loading values defined in Section III)..				
SECTION V: CERTIFICATION				
<i>(Check: Section III _____ and/or Section IV _____)</i>				
Name of Certifier		Title		
Firm Name		License Number		
Street Address		Phone Number ()		
City	State		Zip Code	
Signature		Date		

Sample V Zone Design Certificate.

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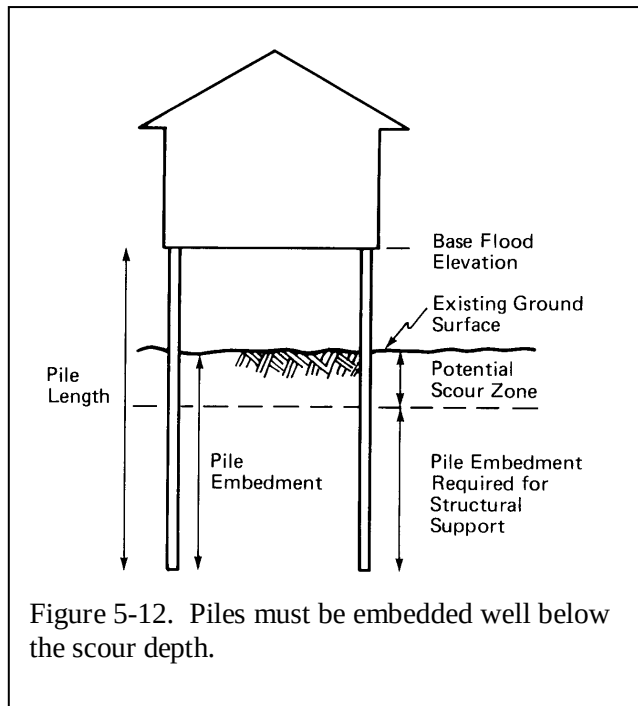


Figure 5-13. Consequences of inadequate pile embedment and cross bracing.

Figure 5-14. Building elevated on parallel stem walls.

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Connecting the Load Path. To meet the requirements outlined above, the building must be connected fully, from roof to walls to foundation (called the “load path”). See Figure 5-15. Air-borne salts in coastal environments can jeopardize connections due to corrosion. Builders should use materials that resist deterioration over time. For more information, see the NFIP Technical Bulletin 8-96 *Corrosion Protection for Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas*.

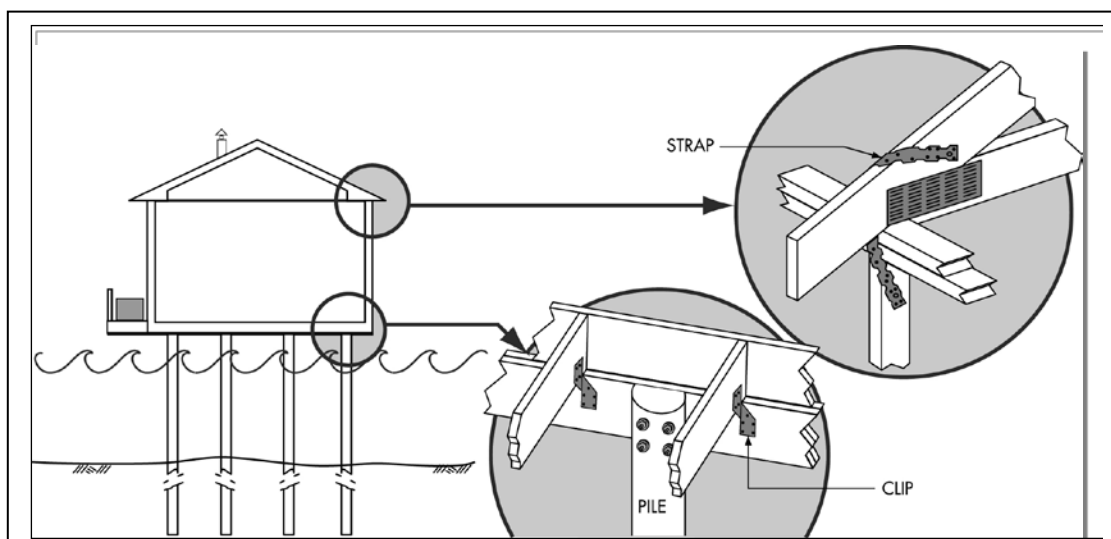


Figure 5-15. Connecting the Load Path.

Free of Obstruction. The NFIP regulations require that the space below the lowest floor be free of obstruction or built with breakaway walls. Obstructions that are attached to the supporting columns or piers will be subject to flood and wave forces, and those forces can exert damaging stresses on the building. Enclosed utility cabinets, tool sheds, and storage units are obstructions. For more information, see the NFIP Technical Bulletin 5-08 *Free-of-Obstruction Requirements*.

A **basement** is any area of a building having its floor subgrade (below ground level) on all sides.

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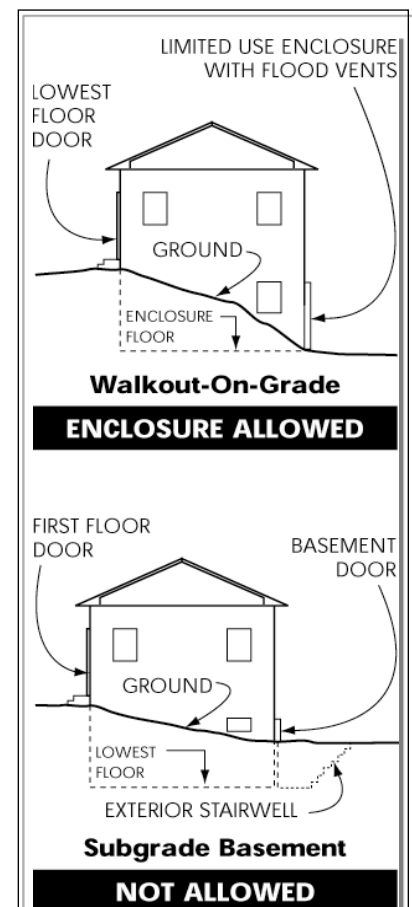
5.22 Special Notes About Basements

Basements are very susceptible to flood damage. Unequal hydrostatic pressure often collapses basement walls, and even water that is shallow around the building can quickly fill up a basement. Also contributing to damage is the fact that many people pump out flooded basements too fast, which also results in collapsed walls because the saturated ground presses inward.

The NFIP defines a basement as any area that is below grade on all sides. It doesn't matter what you call the area – if it is below the ground level on all sides, then it is a basement. It also doesn't matter if the floor level is only inches below the ground, technically it is a "basement".

You need to pay extra attention to crawlspaces. If the ground surface inside the foundation walls is below the outside ground level, then the crawlspace is considered a basement.

Especially in hilly areas, buildings may have "walk-out" basements (perhaps called "daylight basements" or "terrace levels"), where at least one side is at or above grade. While not technically a basement, such areas will be considered enclosures if they the floor is below BFE, and your ordinance requires that they have adequate flood opening, be constructed with flood-resistant materials, and have uses limited at parking, storage, building access. Otherwise, not only is the "walk-out" area likely to sustain more flood damage, but for insurance purposes it is the lowest floor and the cost of coverage will be very high.



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5.23 Basements and LOMR-F Areas

It has become a common practice in some areas of the country to fill an area to above the BFE and then obtain a Letter of Map Revision based on fill (LOMR-F) to remove the land from the floodplain. Once the land is no longer in the floodplain, the builder obtains permits to build residences with basements below the BFE; obviously a very bad idea, because of a number of issues and concerns:

Post-FIRM insurance is very expensive if a building has a “basement,” even if the area is only a few inches below grade.

- The procedure was being used to get around community floodplain management ordinances.
- Buildings with basements below BFE were being built too close to the edges of these fills that could be subject to severe flood damage if the basement walls are subjected to hydrostatic pressure from surface water or groundwater during flooding.
- LOMR-Fs for nearly identical buildings were being granted or not granted based on the date the LOMR was applied for and not on the risk to the building.

FEMA issued a final rule on May 4, 2001 revising LOMR-F procedures to address these issues. The new procedure places responsibility back in the hands of the community. FEMA will not act on a LOMR-F request until the community signs an acknowledgement form (or require the applicant to obtain an acknowledgement from a registered professional) and make findings that:

- The project, including any buildings, meets all the requirements of the community’s floodplain management ordinance, and
- Any existing or future development on the filled area is “reasonably safe from flooding”.

FEMA issued Technical Bulletin 10-01 *Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding* to provide guidance on how to make the determination that an area is “reasonably safe from flooding”. The risk to buildings built in these areas will vary depending on soil conditions, the location of the building relative to the edge of the fill, and whether the building will have a basement below the BFE.

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Communities have asked for guidance on how it can ensure that future buildings placed on the property will be “reasonably safe from flooding” since, once the LOMR-F is issued, the land is no longer in the SFHA and generally is not subject to their floodplain management ordinance.

Communities have several options:

- Withhold signing the acknowledgement until the LOMR-F applicant provides sufficient information on the location and type of proposed buildings to evaluate those building sites against the criteria in Technical Bulletin 10-01. For example, the community could require submission of a subdivision plat or grading plan showing future building locations.
- Adopt or use other requirements that allow them to ensure any future buildings on the filled property remains reasonably safe from flooding. For example, a community may have building code requirements to ensure that any future basements are properly constructed to resist damage from groundwater.
- Look at Technical Bulletin 10-01 for other alternatives for ensuring that unimproved land is “reasonably safe from flooding” and stays that way. Communities have the option of requiring that the applicant submit any engineering information necessary to make the determination.

5.24 Special Notes About Foundation Design

Foundations in A/AE Zones do not have to be designed by a structural engineer to be acceptable under the NFIP. However, in some areas it is a good idea for you to require this added level of protection. High-risk areas include those floodplains where velocities are likely to be high, where debris impacts may increase danger, and where floodwaters are expected to be very deep and of prolonged duration.

Two standards, developed by the American Society of Civil Engineers, have design information that is especially useful for non-residential buildings and for structures in high-risk areas (including V/VE Zones).

- ASCE 7, *Minimum Design Loads for Buildings and Other Structures* SEI/ASCE7-05 including flood load computation methodologies.
- ASCE 24-05, *Flood Resistant Design and Construction*, addresses design requirements for most development; this standard is referenced by the International Building Code.

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5.25 Manufactured Homes

Manufactured homes (MFH) placed or substantially improved on sites within the SFHA must meet the same requirements as site-built buildings. Because this type of housing is extremely vulnerable to flood damage, it is very important that the units are anchored to a permanent foundation to resist flotation, collapse, and lateral movement as required under the NFIP.

MFHs can be placed on prepared sites in manufactured home parks or subdivisions, or they may be placed on individually owned parcels of land. In a MFH park, the pads and utility hookups are not owned by the unit owner, but are rented. Just like a regular subdivision, a MFH subdivision is developed by a single developer and the lots are then sold.

If you see many applications to place manufactured homes in SFHAs, then your reference library should include FEMA-85, *Protecting Manufactured Homes from Floods and Other Hazards*.



MFH installations must conform to the North Carolina Manufactured Home Code.

FEMA Region IV has a guidance memorandum on manufactured homes to address questions about permanent foundations, substantial damage, and certain replacements.

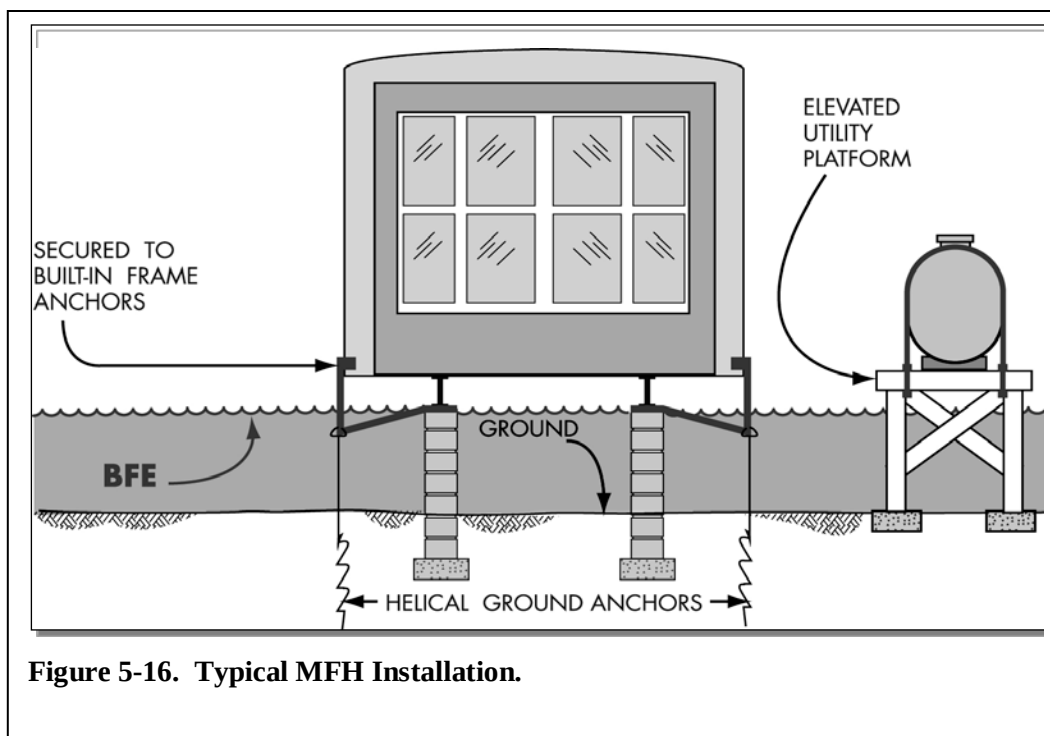


Figure 5-16. Typical MFH Installation.

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MFH Elevation Requirements. Manufactured homes that are installed or substantially improved on individually-owned parcels of land (outside of a MFH park or subdivision), or in a new expansion of an existing park or subdivision, must be fully elevated. In A/AE Zones, the “lowest floor” must be at or above the BFE. In V/VE Zones, the bottom of the lowest horizontal structural member supporting the lowest floor must be at or above the BFE and it must be supported on a pile or column foundation. To minimize forces on the unit, it is strongly recommended that the bottom of the lowest horizontal chassis member be used as the reference point or lowest floor to ensure the ductwork and floor system are properly protected because these pre-manufactured systems are not constructed of entirely flood resistant materials as required if located below BFE.

Even though they are extremely vulnerable, the NFIP regulations allow for installation at a lower elevation under a very specific circumstance – if a unit is placed or substantially improved on a pad that is in an existing MFH park or subdivision. In these cases, the MFH chassis must be supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than thirty-six (36) inches high. The anchoring and tie-down requirements are the same. There is one very important exception: if the unit is replacing one that was substantially damaged by flood, then the full elevation to BFE is required. Don't be confused about MFH elevation requirements. **Make it easy – require all units to be at or above the BFE! The State of North Carolina has Made it Easy by omitting this option in the NC model flood ordinances. NC's standard is that all MHs should be protected by elevation to at least the BFE regardless but the cover memo with the NC model ordinances does notify communities and other readers that this is a higher standard and they have the option of diverting back to the CFR provisions.**

MFH Foundation & Anchoring Requirements. A permanent foundation under a manufactured home includes all of the following features:

- A below-grade footing capable of providing resistance against overturning.
- The footing depth has to be below the frost line.
- Permanent foundation systems include reinforced piers, post-tensioned piers, posts on footing, driven pilings, embedded posts, and



Because of high velocities and generally deeper water, some communities prohibit new placement or replacement of manufactured homes in the floodway. If that's not possible, you may require a foundation system that is engineered for the site-specific conditions.

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poured concrete or reinforced block foundation walls.

- Dry stacked concrete block is not acceptable in the Outer Banks in Exposure “D” or within 500 feet of any body of water which is influenced by flooding or is subject to wave action. An anchoring system capable of resisting uplift and overturning due to flood and wind forces, and able to maintain the required pullout resistance in saturated soil conditions. A complete anchoring system includes a combination of ties, anchors, and anchoring equipment.

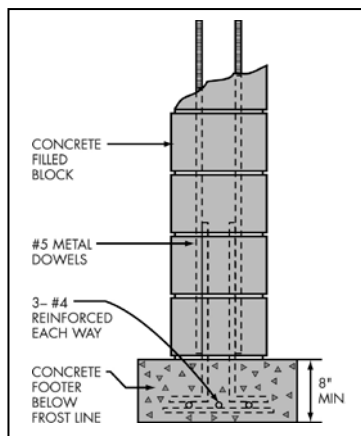


Figure 5-17. Foundation Connection.

- Connections between the foundation and the manufactured unit so that it acts as a cohesive unit when resisting flood and wind forces. The size, strength, and configuration of the connections, such as straps and anchor bolts, should be selected to resist forces anticipated under base flood conditions. The NFIP requires over-the-top or frame ties to ground anchors to connect the permanent foundation. Please refer to the State of North Carolina Regulations for Manufactured Homes for more information on anchors, etc.

Utilities and Connections. Service equipment that is exterior to the MFH unit must be elevated on platforms or piers to at least BFE. Remember, the MFH most likely needs to be elevated even further in order to raise the ductwork, even the crossover duct, above the BFE.

Evacuation. An evacuation plan must be developed for evacuation of all residents of all new, substantially improved or substantially damaged manufactured home parks or subdivisions located within flood prone areas. This plan shall be filed with and approved by the floodplain administrator and the local Emergency Management coordinator.

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5.26 Floodproofing Residential Buildings Does Not Meet Code

For new or substantially improved homes, apartments and other residential structures, the lowest floor (including basement), must be elevated to or above the BFE. Even though homeowners may floodproof their homes, floodproofing is not an option for meeting the regulatory requirements of the community's floodplain management ordinance due to the significant risk that may threaten residents if floodproofing measures fail under extreme conditions. Residential structures in the floodplain, by regulation, must be elevated to the BFE, or to the local freeboard standard.

Note that a non-residential building may have residential spaces. This is an important fine point because the residential spaces/uses in a non-residential building must be handled like residential buildings. The most important consideration is that floodproofing a residential space does not override or remove the requirement for the first floor elevation to be at least to BFE or any freeboard elevation, if locally adopted.”. Note also that the reverse may occur – for example, an apartment building may have storage and utility rooms below-grade; those areas may be floodproofed.

5.27 Non-Residential Structures – Dry Floodproofing

Where development is proposed in SFHAs the best way to minimize damage is to elevate all buildings so that all useable areas are at or above the BFE. However, the NFIP allows use of dry floodproofing measures in lieu of elevation to BFE and freeboard for non-residential buildings in A zones only. It will generally prove to be less expensive to elevate most non-residential buildings than to dry floodproof them. However, sometimes floodproofing offers the only feasible option (especially for substantially improved or water-dependant non-residential buildings).

The best sources of information are the ASCE design documents referred to above, and FEMA's Technical Bulletin 3-93 *Non-Residential Floodproofing - Requirements and Certification*. This document has some good advice about warning time, safety and access, emergency operation plans, and maintenance plans. For below-grade parking under non-residential buildings, reference Technical Bulletin 5-93 *Free of Obstruction Requirements*.

Designs and plans for dry floodproofing must be certified by a registered professional engineer or architect. Because the potential for damage is great if floodproofing measures fail, it is very important to have

For insurance purposes, the NFIP requires dry floodproofing (non-residential buildings only) to extend at least one foot above the BFE to obtain a rating at BFE.

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an experienced professional prepare the documents. Floodproofing should extend at least one-foot, and preferably two-feet, above the BFE as a factor of safety and for a proper flood insurance rating. Regulatorily, floodproofing is only mandatory to the BFE unless the community has adopted an additional freeboard.

Dry floodproofing consists of a combination of structural and nonstructural building components to make it resistant to damage. Typically, floodproofing includes strengthening foundation walls against the hydrostatic and hydrodynamic flood forces and sealing the foundation walls and all openings against the penetration of water so that they are substantially impermeable to the passage of water. The effect of buoyancy must be considered because “tight” buildings can “float” when the ground around them becomes saturated during floods. All utilities must be protected.

All floodproofing proposals must include a plan for periodic inspections. It is critical that you require a periodic maintenance plan to ensure that all components will operate when a flood occurs. Sometimes people stay inside floodproofed buildings – this is an unsafe practice. Improper maintenance of floodproofing components might threaten more than just the property – people could be injured or killed.

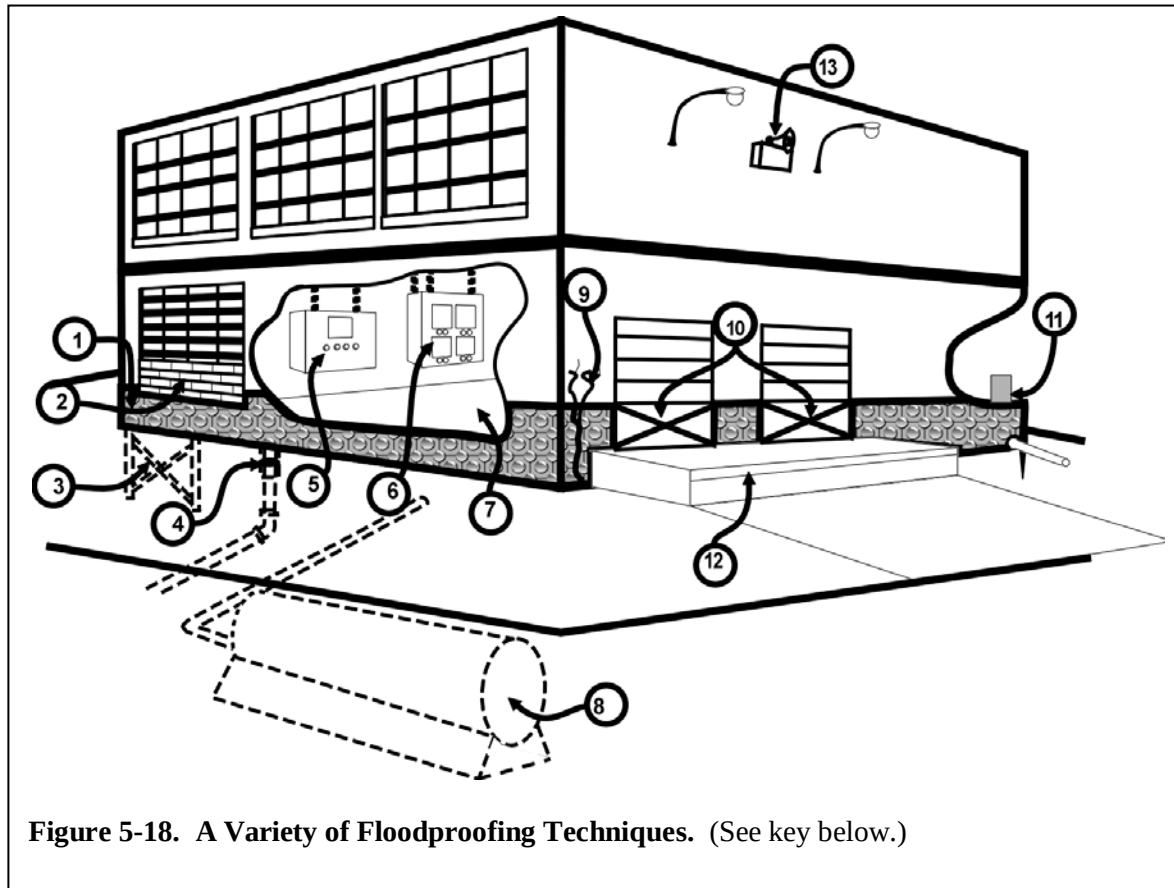
Floodproofing designs must be certified by registered professional engineer or architect and preferably submitted on FEMA's *Floodproofing Certificate for Nonresidential Structures* (FEMA Form 81-65) form. The certified floodproofing designs must be maintained permanently in the jurisdiction's floodplain development permit file.

Dry floodproofing is a very technical matter. If you need help to review a permit application for dry floodproofing, you can ask the State NFIP Coordinator or FEMA Region IV staff for review by experienced professionals.

The specifics of a floodproofing design must be inspected during construction. As community floodplain administrator, you should require a checklist from the design engineer or architect so the builder and your inspector know the critical elements that require particular attention.

Floodproofing measures that rely on people taking action are not specifically addressed by NFIP regulations. These measures may be used to retrofit some older buildings, but should be used only when there is adequate warning time to install such devices as water-tight shields for doors and

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windows. These devices generally are effective only in relatively shallow flooding, e.g., less than 3-feet deep. Deeper water is more likely to exert extreme pressures on walls, leading to collapse.

Figure 5-18 shows a variety of techniques that are often used to floodproof an industrial structure. Most of these techniques are only appropriate where floodwater is less than three feet deep since walls and floors may collapse under higher water levels. A professional engineer or architect must be consulted when considering dry floodproofing.

Key to Figure 5-18.

1. Waterproof coating to reduce seepage	7. Floor has been reinforced to withstand uplift pressure
2. Permanent closure of opening with masonry	8. Underground storage tank properly anchored
3. Underpinning of structure to resist hydrostatic pressure	9. Cracks sealed with hydraulic element
4. Valve on sewer line to prevent backflow	10. Steel bulkheads for doorways
5. Instrument panel raised above expected flood level	11. Sump pump and drain to eject seepage
	12. Rescheduling has emptied the

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6. Major equipment installed with quick-disconnects and elevated above flood level with overhead hoist	loading dock 13. Audible alarm installed as part of area-wide flood warning system (optional)
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5.28 Accessory Structures

Accessory structures are also considered 'development' and must be handled by issuance of a floodplain development permit, even if a building permit is not required.

An accessory structure is a separate building (usually representing a minimal investment) that is located on the same parcel of land as a principal building, and its use is incidental to the use of the principal building. Accessory structures include detached garages, private boathouses, home greenhouses, tool and garden sheds, and pole barns. Confined animal buildings, crop storage bins, farm machine shops, and milking parlors cannot be treated as accessory structures; they must meet the elevation requirements.

Those requirements include anchoring, elevation of utilities and equipment, use of flood-resistant materials, and proper installation of flood openings. A good reference is the NFIP Technical Bulletin 7-93 *Wet Floodproofing Requirements*.

Because accessory buildings are enclosed areas below BFE, only two acceptable uses are permitted – parking of vehicles and limited storage. An accessory structure may not be used for business purposes. FEMA Region IV advises that the typical accessory structure represents "minimal" investment and is not "habitable." You can use the Non-Conversion Agreement sample in Section 5.20.

Certain accessory structures are not buildings under the NFIP definition in that they don't have enclosing walls, but are open structures such as carports, gazebos and picnic pavilions. These types of structures do not need to be elevated or treated as enclosures, but they must be constructed and anchored to withstand damage.

All accessory structures must be anchored to prevent



To be treated as an accessory structure under The North Carolina Model Ordinance, a building must be less than 150 square feet.

Note: Unanchored, unvented sheds can easily be swept into other buildings or block culverts and bridges, causing increased flooding and damages.

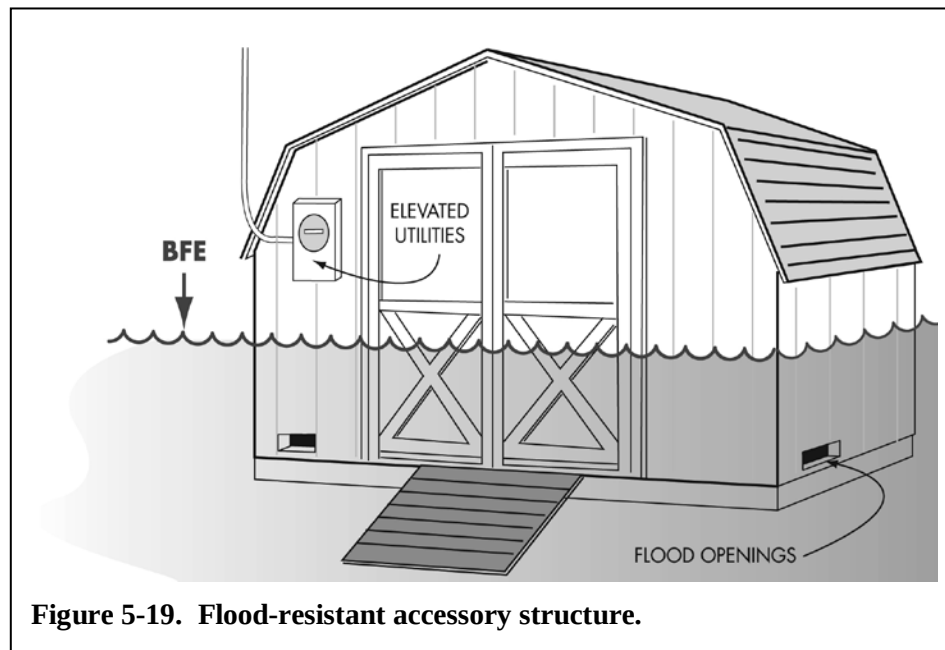


CAMA regulations may require that accessory structures conform to the setback requirements.

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flotation, collapse and lateral movement. Over-the-top ties to ground anchors or bolts embedded in a concrete pad will work. To minimize damage due to hydrostatic pressure, even small sheds must have flood openings if located below BFE.

Note that a flood insurance policy for the principal building does not cover an accessory structure. If insurance is desired, a separate policy can be purchased.



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5.29 Agricultural Structures

Agricultural structures are not exempt from floodplain management regulations. Many are exempt from most building permits and some other permits if they are associated with bona fide farms, but they are not exempt from floodplain development permits. There are two options for allowing agricultural structures in SFHAs. They may be elevated just like other structures, or they may be allowed below BFE (wet floodproofed) under certain conditions, but only after the granting of a variance. Each community should carefully consider whether it wants to allow – or prohibit – new and replacement agricultural structures. When someone wants to build a new farm structure, it may seem like a good idea; however, in light of all the structural damage suffered by farmers during past floods, it may need closer consideration. Review the variance section of your community's floodplain management ordinance or call the State NFIP Coordinator for assistance if you decide to handle these development proposals by variance.

Farm houses are not agricultural structures.

Including specific variance provisions in your ordinance does not give your community freedom to permit any and all agricultural structures, nor can you waive all the other NFIP requirements when a variance is granted. Each proposal must be reviewed, and if appropriate, an individual variance hearing must be conducted. These variances must be handled in accordance with the variance section of your community's floodplain management ordinance and the same manner outlined in Chapter 9, including notification of the increased risk and increases in flood insurance premium costs.

FEMA has outlined seven conditions that must be met when reviewing and

The National Flood Insurance Reform Act of 1994 contained a specific provision for agricultural structures

Variances are allowed for:

Pole frame buildings
Steel grain bins
Steel frame corn cribs
General purpose feeding barns open on one side

If they meet the variance provisions outlined in the community's floodplain management ordinance.

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granting variances for wet floodproofed agricultural structures. These conditions, summarized below, help to avoid significant damage during the base flood:

- Use of the structure is limited to agricultural purposes,
- Use of flood-resistant materials below the BFE is mandatory,
- The structure must be anchored to resist flotation, collapse, or lateral movement; all structure components must be resistant to flood-related forces, including debris impact,
- The hydrostatic venting (flood opening) requirement applies,
- Mechanical, electrical, or other utility equipment must be elevated or floodproofed,
- The floodway encroachment provisions cannot be waived [same would apply to non-encroachment areas], and
- Major equipment, machinery, or other contents must be protected through relocation or removal to a site out of the SFHA prior to a flood.

Because granting variances for wet floodproofed agricultural structures is a serious matter, FEMA recommends careful consideration of the following:

- Is the proposed site in a wide, expansive floodplain area where there is no other reasonable location, for example is the entire farm acreage in the SFHA?
- Is it possible to impose a size limit, and perhaps a maximum number of wet floodproofed structures on a single farm, in order to limit financial losses?
- Check carefully to see if the proposed building is near an uncertified levee – levee failure can cause very high velocity waters.
- Remember to look at combinations of elevation and wet floodproofing so that the variance is, indeed, the minimum necessary.

5.30 Temporary Structures

The NFIP regulations do not specifically address temporary structures in flood-prone areas. FEMA Region IV suggests that certain conditions be imposed when permitting temporary structures. At a minimum, they must be anchored to resist flotation, collapse and lateral movement so that they do not float downstream and cause damage to other buildings or bridges.

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The most common temporary structures are construction trailers, portable bathroom facilities, and large trash receptacles. Sometimes applicants want to place small structures for such uses as roadside stands or information kiosks. You should get additional guidance from the State NFIP Coordinator when you get an unusual request.

The following should be considered:

- Is use of the temporary structure unique to the land being developed? Can the structure be placed outside of the SFHA? Can the structure meet NFIP design standards?
- Will denial of a special use permit create an undue hardship on the property owner?
- Do you have sufficient staff to monitor the placement, use, and removal of the temporary structure throughout the duration of the permit?

Additional things you may consider for temporary structures:

- Require a bond.
- Establish a fixed time for removal.
- Add special conditions.
- Do not allow transfer of the permit.
- Do not allow time extensions or renewals.
- For seasonal structures, require removal each year.
- Electric service must be above the BFE.

5.31 Recreational Vehicles and RV Parks

Recreational vehicles are specifically defined in the floodplain management ordinance. If they meet all of the following criteria, then individual RV units may be placed in the SFHA without elevation:

- On site for fewer than 180 consecutive days,
- Built on a single chassis and is on its wheels or jacking system,
- Attached to a site only by quick-disconnect utility service and security devices,
- 400 square feet or less when measured at the largest horizontal projection and has no permanently attached additions,
- Fully licensed and ready for highway use as a self-propelled vehicle, or permanently towable by a light duty truck, and
- Designed primarily not for use as a permanent dwelling, but as temporary living quarters for recreational, camping, travel, or seasonal use.

Proposals for new RV parks need to be reviewed to make sure water and sewer services meet the requirements to prevent inflow and outflow during flood conditions (Section 5.14). There are no special rules for buildings in RV parks, such as offices, convenience stores, shower and laundry buildings,

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maintenance facilities, and other structures. They must be elevated and meet all the criteria for buildings in SFHAs.

5.32 Functionally Dependent Use/Building

Construction of a new functionally dependent use or building, or the substantial improvement of an existing functionally dependent use or building, may be approved only by variance. When a building is determined to meet the definition, it need not be designed and constructed in full conformance with the NFIP minimum requirements. In addition, as part of the variance consideration, you need to review the proposal to make sure it meets all the criteria outlined in the community's floodplain management ordinance and especially that it doesn't create additional threats to public safety.

The functionally dependent designation does not relieve the applicant or the community of the responsibility to incorporate measures to reduce the potential for damage to the extent practicable. The best way to do this is to treat the building as an enclosure below the BFE (Section 5.34, 5.35).



Functionally dependent use means a use that cannot perform its intended purpose unless it is located or carried out in close proximity to water. It includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing, sales or service facilities.

5.33 Storage Tanks

Above-ground tanks may be elevated on platforms above the BFE or installed at-grade, provided they are anchored. Underground tanks must also be anchored. And in both cases, fill openings or vents must be elevated above the BFE to minimize water entry and to minimize loss of contents during flooding. Since these structures are non-residential, they are required to be permitted and obtain elevation and/or floodproofing certification under the NFIP. The North Carolina Department of Agriculture is responsible for inspecting proper anchoring of storage tanks. Anchoring is required to prevent hydrodynamic and buoyant forces from moving structures off foundations or off-site. To design an anchoring system for above-ground tanks, an engineer needs to know the anticipated velocity and depth of flood water. Depth is needed because the pressure of the water is a function of depth. Velocity is needed because the force that tries to wash things away increases as the flow velocity increases.

Anchoring must be designed assuming a tank is empty, which is when it will have the greatest tendency to float. Empty or partially full tanks are subject

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to significant forces when floodwaters rise. They can exert tremendous forces and may pull what appear to be good anchors out of the ground. Floating tanks can block or impede flood flows, and also become projectiles that damage other buildings, or may be damaged and explode.

NFPA 58, Liquefied Petroleum Gas Code, allows domestic, residential and commercial tanks of less than 2,000 gallons to be elevated a maximum of 5-feet above the ground.

Above-Ground Tanks. Above-ground tanks must be elevated above BFE and/or anchored. Elevation is the safest way choice , because even a solidly anchored tank can be damaged or punctured by floating debris. Damaged tanks may leak, causing contamination. More significantly, tanks that hold flammable or explosive materials may explode and cause significant damage to surrounding buildings.

Underground Tanks. Underground tanks can also cause problems, especially in areas where flooding lasts more than one or two days. When the ground gets saturated, tanks can actually become so buoyant they “float” out of the ground. Therefore, require an engineered plan for installation of underground tanks, especially those that contain fuels which will pollute the water or create a fire hazard.

5.34 Flood-Resistant Materials

All materials below the BFE must be resistant to damage by contact with floodwaters. Even in areas where floods rise and fall rapidly, wood and finishing materials may be damaged enough to require replacement.

The NFIP regulations do not define or list materials that are flood-resistant. The best source of information is FEMA's Technical Bulletin 2-08 *Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*, but this bulletin does not address many materials that will work in coastal areas due to the corrosion issues. FEMA does have another bulletin that may assist – FEMA's Technical Bulletin 8-96 *Corrosion Protection for Metal connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program*.

Flood-resistant material is defined as any building material capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. In this definition:

- *Prolonged contact* means at least 72 hours.
- *Significant damage* means any damage requiring more than low-cost, cosmetic repair.

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Materials necessary to meet applicable fire safety building codes are allowed, even if they're not considered to be flood-resistant.

5.35 Enclosures Below BFE – General

Areas below BFE may be enclosed provided they are constructed and used as allowed by the NFIP. If they do not meet the design and use standards, then the enclosure's floor becomes the lowest floor for insurance and regulatory purposes. This can mean very high insurance rates (see graphic in Section 12.2 to see how insurance costs are affected by the lowest floor elevation) as well as a violation to the community's floodplain management ordinance. Alternatively, if the lowest floor is elevated higher than the minimum, for example to provide for vehicle parking below the lowest floor for living purposes, flood insurance rates will be much lower.

The NFIP allows enclosed areas below BFE as long as they are used only for crawlspaces, limited storage, parking of vehicles, and access to the building. Any other use is a violation of the ordinance – this means even a small bathroom, workshop, utility room, or extra bedroom are not allowed. When buildings are elevated more than 6-feet above grade, owners may be tempted to illegally convert enclosures to other uses (a Non-Conversion Agreement).

Before applicants consider constructing enclosures below the BFE, they need to understand the kind of damage that may occur. Ideally, they need to take into consideration velocities, impacts by floating debris, impacts by ice, and the length of time floodwaters may be up against buildings.

For waterways studied using detailed methods, average flow velocities can be found in the Flood Insurance Study, and depth is computed by knowing the ground elevation and the BFE. In unnumbered A Zones, judgement is required to estimate velocity, while depth is determined using approximate methods.

You may want to use a *Non-Conversion Agreement* for Enclosures Below BFE (including accessory structures). This is the best way to protect your community if an owner changes the use of an enclosure without a permit. It also alerts future owners of restrictions and provides the community with additional CRS credit points toward lower flood insurance rates.

Enclosures must be designed and constructed by using flood-resistant materials and using specific techniques to minimize damage due to both hydrostatic and hydrodynamic forces. Hydrostatic forces are due to water rising and exerting unequal force on one side of a wall (Figure 5-20). Hydrodynamic forces are caused by the forces of moving water and the impact of debris.

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Hydrostatic or flood openings, also referred to as flood vents, are to be utilized in A/AE zones to allow water to freely flow in and out of an enclosure below the BFE without human intervention. Because water flows freely, unequal hydrostatic forces don't develop and walls are less likely to be damaged or collapse. See Sections 5.35 and 5.36 for specific require

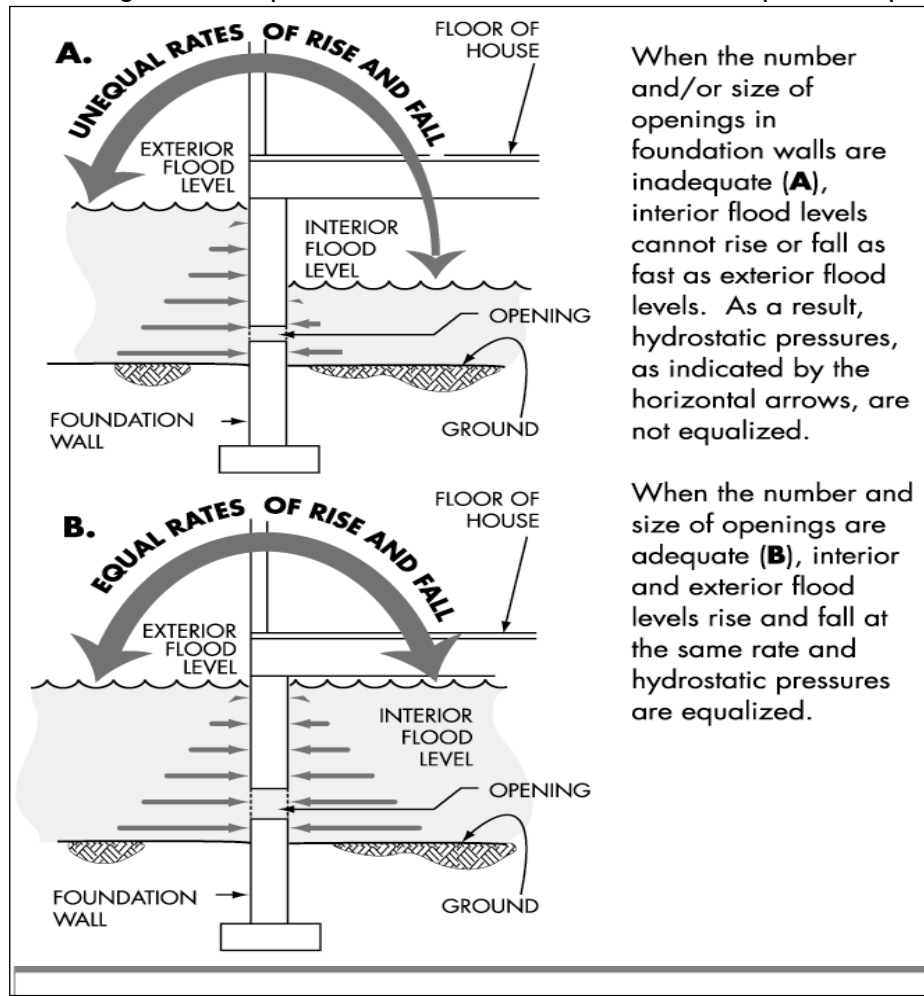


Figure 5-20.

ments for flood openings. In VE zones breakaway walls must be utilized below BFE due to impacts of high wave action.

It is difficult to build enclosures below BFE so that they don't get damaged by fast moving water. Areas where debris may slam into buildings also need special attention. The NFIP doesn't outline specific ways to build in these areas. There is no simple rule, but when velocities exceed 3-5 feet per second it would be reasonable to require design by a registered architect or engineer. If you have an area where debris is a problem,

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require the applicant to research debris impact loads outlined in ASCE 7, *Minimum Design Loads for Buildings and Other Structures* - SEI/ASCE7-05.

5.36 Enclosures Below BFE – Specifics for A/AE Zones

Basements Prohibited. Enclosed areas may not be below subgrade (below ground level) on all four sides. Technically, this would create a basement, even if it is subgrade by only a couple of inches. The NFIP offers an alternative that allows below-grade crawlspaces under very narrowly defined circumstances (see end of this Section for additional explanation). Technical Bulletin 11-01 *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas* may provide further assistance. If the basement floor is above the BFE, then it may be best to go through the LOMC process first.

Restrictions on Use. Use of enclosed areas must be strictly limited to crawlspaces, parking of vehicles, limited storage, and/or access to the building. See below for a sample Non-Conversion Agreement and see Figure 5.23 for more details.

Interior Partitions. An enclosed area below an elevated building shall not be partitioned into separate rooms except to enclose storage areas. Flood openings (see below) are required to provide for the automatic entry and exit of floodwaters into every enclosed area below BFE or locally adopted freeboard.

Non-Conversion Agreement. Especially when enclosures below elevated buildings have headroom, owners may be tempted to finish and use them for purposes other than parking, limited storage and building access. Not only is this a violation of the ordinance but a future flood insurance claim payment will be reduced or the policy re-rated to account for the noncompliance. See Figure 5-23 for a sample Non-Conversion Agreement. Some communities require the agreement to be recorded with the deed for the property so that future owners are aware of the limitations. The recording of this agreement with the deed is another activity that would be rewarded with CRS credit points toward lowering the property's flood insurance rates.

Utilities and Equipment. Electrical or mechanical equipment may not be located below the BFE. This includes but is not limited to: plumbing, mechanical, heating/cooling, and electrical service and equipment. Enclosures below BFE should not be designed for appliances because appliances are not compatible with the limited permissible uses. If

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appliances must be located in crawlspaces or garages, they must be elevated on permanent platforms or the enclosed area becomes the lowest floor for insurance and regulatory purposes.

Flood-Resistant Materials. All interior wall, floor, and ceiling materials located below the BFE must be resistant to water damage (Section 5.33). It is best to leave these areas unfinished in order to discourage uses that are not consistent with the NFIP restrictions.

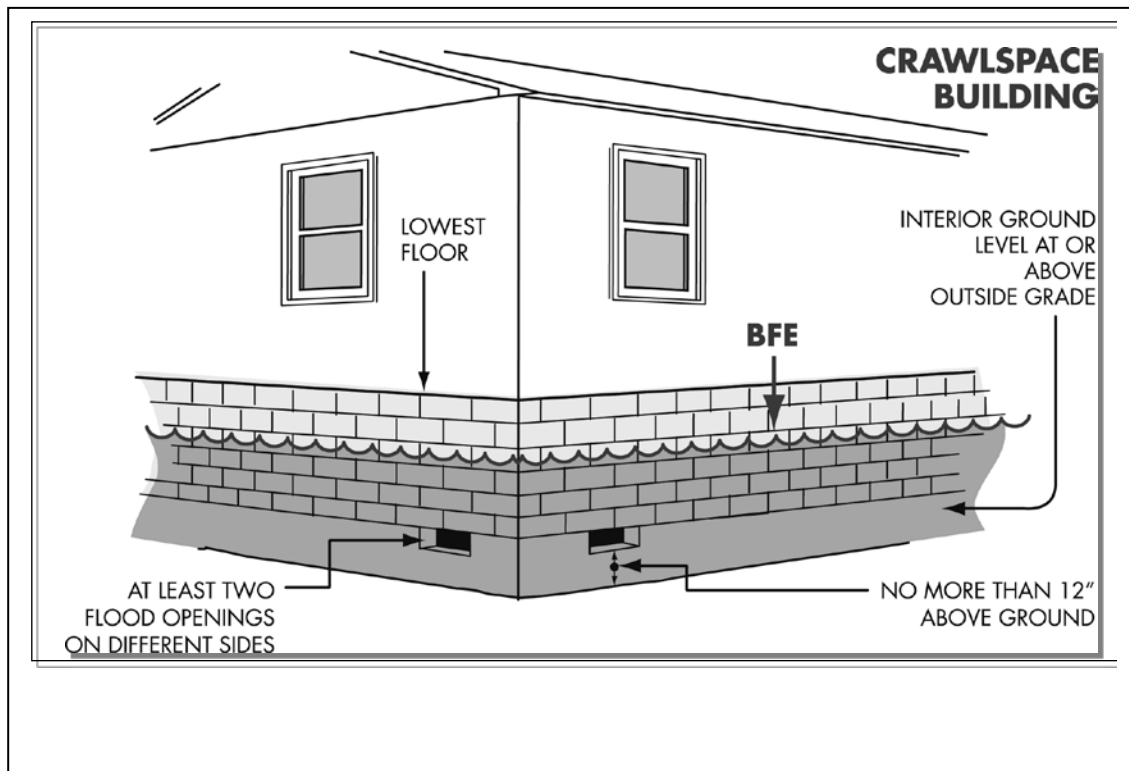


Figure 5-21. Required Openings in Foundation Walls.

FEMA's Technical Bulletin 1-08 *Openings in Foundation Walls and Walls of Enclosure* is an important resource. There are two ways to satisfy the net opening requirements:

- Prescriptive openings. The total net effective area of all flood openings must add up to one square inch for each square foot of each enclosed area subject to flooding below the BFE. Note that for flood insurance purposes, proper flood openings are required regardless of whether it is above or below BFE or lower reference level will result for rating down to the floor of the enclosure. A minimum of two flood

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openings are required on different sides of each enclosed area subject to flooding. The bottom of all required flood openings shall be no higher than one (1) foot above the adjacent grade. It is common for builders to install a typical foundation air vent – this is acceptable provided the net open area is measured and it meets the other criteria. The obstruction presented by any cover, frame, grille, stiles, or louvers (but not insect screen) must be accounted for – you cannot use 128 square inches simply because a standard air vent can be installed in an opening that measures 8" x 16". If the air vent is rated for air flow, you may use the net open area that is assigned for that rating. To satisfy the 'automatic' inflow and outflow requirements, closure devices (slides, levers, etc.) must be removed. Enclosures made of flexible skirting are not considered enclosures for regulatory purposes, and, therefore, do not require flood openings. Masonry or wood underpinning, regardless of structural status, is considered an enclosure and requires flood openings as outlined above.

- Engineered/Certified flood openings. Flood openings that are specifically designed to meet the performance requirements set forth in the Technical Bulletin are acceptable, provided the openings are certified by a registered professional engineer or architect. You should keep a copy of the certification in your permanent permit file, and the owner should keep a copy so that insurance agents know how to rate the building.



Flood Openings/Vents. At least two flood openings, also called water equalizing vents, must be installed on different walls of any enclosed area below BFE, preferably on opposite walls if possible. The bottoms of the openings may be no more than one foot above ground level at each opening. The net effective flow area is very important, as is the requirement that flood openings allow for the automatic inflow of rising floodwaters and outflow of receding floodwaters. Garage doors, by themselves, do not satisfy the flood opening requirement but an opening/vent may be installed into the door panels. In addition, locking the garage door from completely closing or permanent removal of a door does not constitute a flood opening either. Crawlspace doors on universal hinges that swing both ways are acceptable as long as the door is not latched to prevent it from opening automatically.

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From the North Carolina guidance document information:

Entering Engineered Foundation Opening/Flood Vent Data on an Elevation Certificate

FEMA Form 81-31, Elevation Certificate, requires permanent openings (flood vents) data in Item A8. & A9. *Technical Bulletin 1-08, Openings in Foundation Walls*, provides guidance for “non-engineered” foundation openings, requiring a minimum of 2 openings on different sides of the structure, a total net free area of all openings of 1 square inch for each square foot of enclosed area subject to flooding, the bottom of each opening no more than 1 foot above the adjacent grade at the vent location, and the flow of floodwaters not be impeded by screens or louvers.

In situations where it is not feasible or desirable to meet the non-engineered openings criteria, a registered engineer or architect may design and certify openings to meet the hydrostatic design equivalency to the non-engineered criteria. As with all other floodplain development records, such certification must be submitted to, and kept on file permanently by, the community.

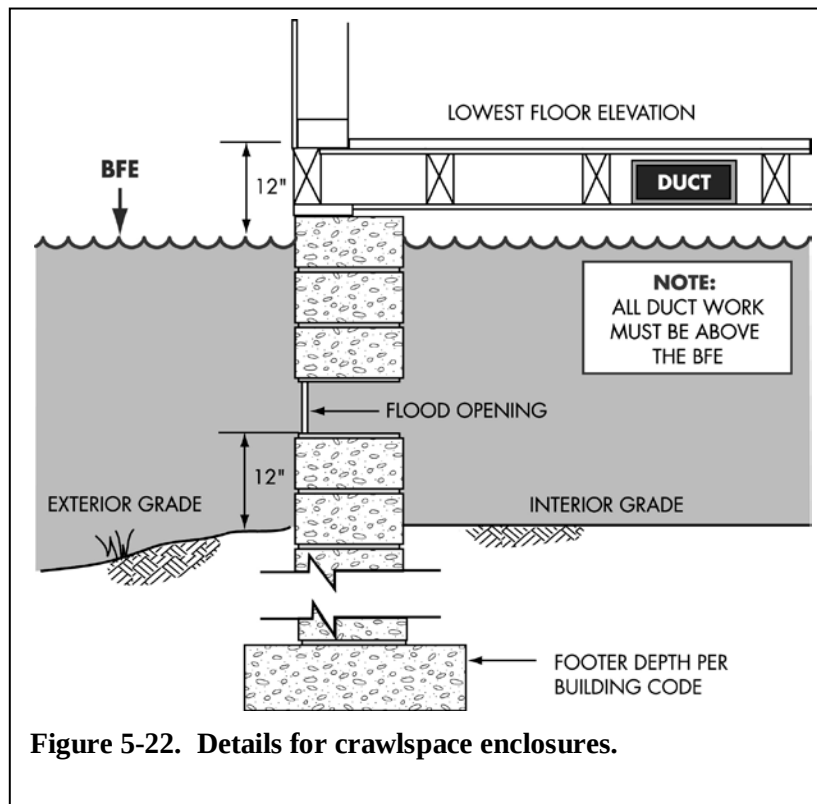
Surveyors completing an Elevation Certificate for a building with engineered openings should enter the actual net free area of the flood vents in A8.c & A9.c, check ‘Yes’ in A8.d & A9.d (for Engineered Flood Openings) and note in Section D. Comments “The engineered equivalent area of each of the openings is ___ square inches based on the attached certification. (___ openings x ___ equivalent vent area = _____ total square inches)”

Community officials and flood insurance agents will need to review the comments, calculations, and certifications on the elevation certificate to verify compliance with flood venting requirements. Community officials and flood insurance agents will also need to make site visits to ensure compliance for distribution of venting for each enclosed sub area and location of flood vents on different walls of each enclosed area.

Example:

- A crawlspace under a 25' x 45' building encloses 1,125 square feet.
- Using the prescriptive approach of 1 sq in for every square foot of enclosure, a total of 1,125 square inches is required.
- If an 8x16" concrete block is omitted, leaving a 128 sq in void, then 10 openings would be needed.
- If standard air vent units rated to provide 60 sq inches of opening are used, then 19 vents would be required.

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This DECLARATION made this ____ day of _____, 20__, by _____
("Owner") having an address at _____

WITNESSETH:

WHEREAS, the Owner is the record owner of all that real property located at _____
in the City of _____ in the County of _____,
designated in the Tax Records as _____.

WHEREAS, the Owner has applied for a permit or variance to place a structure on that property that either (1) does not conform, or (2) may be noncompliant by later conversion, to the strict elevation requirements of Article _____ Section _____ of the Floodplain Management Ordinance of _____ ("Ordinance") and under Permit Number _____ ("Permit").

WHEREAS, the Owner agrees to record this DECLARATION and certifies and declares that the following covenants, conditions and restrictions are placed on the affected property as a condition of granting the Permit, and affects rights and obligations of the Owner and shall be binding on the Owner, his heirs, personal representatives, successors and assigns.

UPON THE TERMS AND SUBJECT TO THE CONDITIONS, as follows:

1. The structure or part thereof to which these conditions apply is: _____

2. At this site, the Base Flood Elevation is _____ feet above mean sea level, North American Vertical Datum.

3. Enclosed areas below the Base Flood Elevation shall be used solely for parking of vehicles, limited storage, or access to the building. All interior walls, ceilings and floors below the Base Flood Elevation shall be unfinished or constructed of flood resistant materials. Mechanical, electrical or plumbing devices shall not be installed below the Base Flood Elevation.

4. The walls of the enclosed areas below the Base Flood Elevation shall be equipped and remain equipped with vents as shown on the Permit.

5. Any alterations or changes from these conditions constitute a violation of the Permit and may render the structure uninsurable or increase the cost for flood insurance. The jurisdiction issuing the Permit and enforcing the Ordinance may take any appropriate legal action to correct any violation.

6. Other conditions: _____

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In witness whereof the undersigned set their hands and seals this _____ day of _____, 20 __.	
_____	_____ (Seal)
Owner	
_____	_____ (Seal)
Witness	

Figure 5-23. Example Non-Conversion agreement

5.37 Enclosures Below BFE – Specifics for V/VE Zones

The NFIP does not limit the size of breakaway enclosures below elevated buildings in V/VE Zones. However, you should know that there are some financial implications for owners. Enclosures that are larger than 299 square feet are rated by the NFIP using very high flood insurance rates. Remember that enclosed areas are limited in use – rarely do those uses require enclosures that are as large as 299 square feet, much less larger ones. Limiting the size of these below BFE enclosures is a wise choice as a regulatory higher standard if the community wishes to do so because it deters potential future violations by conversion to prohibited living space and it is another activity that would be rewarded with CRS credit points toward lowering the citizens flood insurance rates.

Basements Prohibited. In V/VE Zones enclosed areas may not be subgrade (below ground level) on all sides. Technically, this would create a basement, even if it is subgrade by only an inch or two. In sandy areas where wave energy is high, elements below-grade may increase scour which undermines the building. Technical Bulletin 11-01 *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas* may provide further assistance,

Breakaway Walls. In coastal high hazard areas where wave energy is high, elevated buildings must be designed to minimize the combined forces or loads of wind and water energies that act on the foundation. Any building elements below the base flood elevation will be subject to these forces, so it is important to minimize all obstructions.

The preferred approach is to leave the area under the elevated building entirely free of enclosures and obstructions so that waves and water can move freely and there is

Breakaway wall is a wall that is not part of the structural support of the building. By design and construction, it is intended to collapse under specific lateral loading forces without damaging the building or its foundation.

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lessened likelihood of local scour and erosion. The concept behind non-supporting, breakaway walls is that under certain wave/flood conditions the walls will collapse to prevent transferring forces to the foundation.

The NFIP regulations specify that breakaway walls must be intended to collapse under wind and water loads without causing damage to the building or supporting foundation system. Specifically, the minimum standard requires collapse under a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Walls with higher resistance must be certified by a registered professional engineer or architect that the design meets certain conditions (NFIP regulations at 60.3(e)(5)). For more information, see the NFIP Technical Bulletin 9-08 *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings*.

Restrictions on Use. See text above under Enclosures Below BFE – Specifics for A Zones.

Interior Partitions. An enclosed area below an elevated building shall not be partitioned into separate rooms except to enclose storage areas. Interior walls must also be designed as breakaway walls.

Utilities and Equipment. Do not allow utilities to be attached to or pass through breakaway walls. Post-flood investigations show that such utility line penetrations can cause undesired forces and contribute to damage. See text above under Enclosures Below BFE – Specifics for A Zones.

Flood-Resistant Materials. See text above under Enclosures Below BFE – Specifics for A Zones.

Flood Openings/Vents. Flood openings are not normally specified for enclosures in V/VE Zones. If you adopt the Coastal A Zone approach, you will have to mandate flood openings in breakaway walls for enclosures under buildings in those areas because these areas are also subject to slow rising floods similar to riverine flooding. As an added note, Elevation Certificates will indicate non-compliance in areas that are still shown as A/AE Zones on the FIRMs if you don't have proper flood openings.

5.38 Use of Enclosed Areas Below BFE

Garage/Parking. An attached garage can be below BFE as long as it meets the criteria for allowable enclosures. Remember that electrical service, even for

Parking beneath residential buildings must not extend below grade. Any area that is below grade on all sides becomes a basement, and basements are prohibited. TB 6-93 covers below-grade parking requirements for non-residential buildings.

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tool benches, must be elevated above BFE or hung from the ceiling. Also, appliances and fixtures such as sinks installed in the garage must be elevated on platforms to be at or above BFE. Detached garages should be issued a separate permit, but they may be at-grade as long as they meet the criteria for enclosures below BFE. Remember, detached garages are separate buildings so they will also need a separate elevation certificate and can obtain a separate flood insurance policy. Understory parking areas, such as may be provided in large non-residential buildings, may be permitted as long as they meet the same criteria.

Limited Storage. The NFIP does not specify what can be stored in areas below BFE, although it makes sense that the floodplain is a bad place to store hazardous chemicals. The idea behind limited storage is to try to minimize the amount of damage but still allow use of the space to maintain your property such as yard tools, mowers, etc. Because enclosures below BFE are designed to flood, everything stored in them will, at some time, be subject to, and damaged by flood waters. To help meet the intent of limited storage, a local ordinance can require that enclosures, including accessory structures, are limited in size.

Building Access. Getting into buildings that are not elevated on fill may appear to be a problem, especially if they're more than four or five feet above the ground. If exterior steps are not provided, the NFIP allows enclosure of small areas for entrance foyers and stairwells. These enclosures, which are common along coastal areas, must have flood openings in A/AE zones or be breakaway if in VE zones and must be constructed with flood resistant materials.

Bathrooms, laundry rooms, and extra bedrooms are not allowed uses for enclosures below BFE.

Crawlspace. Crawlspaces are common in areas where groundwater is high or the soils remain saturated in the spring. The typical crawlspace is about 3 feet high, just enough room to allow workmen to get to utilities that are run between the joists under the floor. However, in SFHAs, elevating buildings on crawlspaces is a good method – just make sure the floor is high enough to keep the utility lines and insulation above the BFE. Some owners use crawlspaces for storage of yard and garden equipment which is fine since it is just limited storage.

5.39 Storage of Equipment and Dangerous Materials

Anything stored below the BFE will be damaged when the water rises. Where practical, such items should be anchored or moved to safer areas if

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there is sufficient warning time. This is especially important for high-cost equipment.

Hazardous, flammable, or explosive materials and chemicals, such as pool cleaning chemicals, agricultural chemicals, paint removers, fuels, and similar materials should not be stored below the BFE. Some chemicals are highly reactive when they come in contact with water. Others could cause health hazards if they are washed downstream.

5.40 Bridges and Culverts

Bridge, culvert, railroad and other transportation development must also be regulated under the NFIP and the community's floodplain management ordinance as other development when it disturbs floodplain property. Although most of such development is conducted through NC's Department of Transportation (NCDOT) or the Community itself, they still must abide by NFIP regulations. Whether such development is proposed by NCDOT, the community or by an individual developer, any such development in the floodplain must be permitted in accordance with the community's floodplain management ordinance and permitting processes. There may not be any certifications required after the permit issuance if there is no structure involved but the inspections must be carried out until at least project completion to ensure compliancy with the community's floodplain regulations.

In most such cases, transportation development must encroach into floodways and non-encroachment areas and sometimes even the coastal high hazard areas (VE zones). Such encroachments will require special engineering analyses depending on the location. Often there is a rise or at least some change in the floodway, non-encroachment area, floodplain boundary, or possibly even a watercourse channel which will require the development to go through the CLOMR process. See Section 4.12 for further information on this process. Remember, if these developments do impact the flood elevations or change any of these significant boundaries, this map change application must come through the community for acknowledgement and signature. This is the community's opportunity to voice it's opinion on such development and requirements thereof.

5.41 Piers and Docks

There are many other developments that may affect waterways too, such as piers, docks, boardwalks, stairways over the dunes, etc. Again, all these are developments that may encroach and impact not just floodplains but

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often those high hazard areas such floodways, non-encroachment areas and VE zones and, as mentioned in the previous section, and require special engineering analyses depending on the location if they encroach into these high hazard areas. At minimum, with just floodplain disturbance, such waterway development in the floodplain must be permitted in accordance with the community's floodplain management ordinance and permitting processes. There may not be any certifications required after the permit issuance if there is no structure involved but the inspections must be carried out until at least project completion to ensure compliancy with the community's floodplain regulations. Remember, if the applicant encloses a shelter area on the end of the pier or dock, or encloses an area on the boardwalk, look closely at the NFIP definition for "structure" or "building" to be sure it is properly protected as such. If it is defined as a "structure" or "building" it must be developed as such and final as-built elevation or floodproofing data must be obtained and maintained in the community's flood file. Similarly should any utilities be installed in conjunction with any pier, dock, boardwalk or other waterway development, these utilities must also be permitted and protected in accordance with the community's floodplain management ordinance.

Again, there is often a rise or at least some change in the floodway, non-encroachment area, floodplain boundary, or possibly even a watercourse channel which will require the development to go through the CLOMR process. See Section 4.12 for further information on this process. Remember, if these developments do impact the flood elevations or change any of these significant boundaries, this map change application must come through the community for acknowledgement and signature. This is the community's opportunity to voice it's opinion on such development and requirements thereof.

5.42 Other Development

Other development such as grading, filling, excavating, paving or graveling driveways and walkways, mining, dredging, all defined by NFIP's definition of 'development', must all be permitted under the community's floodplain management program regardless of any other permitting procedures. As you probably are aware of, other codes and programs such as NC building code, NC Manufactured Housing Code, NC DENR programs such CAMA, Erosion and Sedimentation Control, Riparian Buffers, mining, etc., just do not cover floodplain management ordinance requirements and often exempt small projects or bona fide farms. But, this does not exempt them from floodplain management regulations. The community floodplain

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administrator must also be very cautious not to assume that if another program issues a permit, then floodplain management regulations are satisfied. This is a common error with both building code and CAMA.

5.43 Other Permits Required

There are other permits that may be required from other local, State or Federal programs depending on the type of development. Under the NFIP and the community's floodplain management regulations, one of the duties of the floodplain administrator is to assure that these other permits are obtained prior to issuing a floodplain development permit for that specific development. Review back to the middle of Section 2.6 for more specific details on types of permits that you should be aware of in planning floodplain development.

5.44 Special Certifications and Other Documents Required

Special certifications and documents may be needed when making application for a floodplain development permit. Such requirements are contained in a community's floodplain management ordinance and some of the minimum items required as per the NC model Flood Damage Prevention Ordinances from 2008 and later include but are not limited to:

- A plot plan drawn to scale which shall include, but shall not be limited to, the following specific details of the proposed floodplain development:
 - o the nature, location, dimensions, and elevations of the area of development/disturbance; existing and proposed structures, utility systems, grading/pavement areas, fill materials, storage areas, drainage facilities, and other development;
 - o the boundary of the Special Flood Hazard Area as delineated on the FIRM or other flood map as adopted by the community, or a statement that the entire lot is within the Special Flood Hazard Area;
 - o flood zone(s) designation of the proposed development area as determined on the FIRM or other adopted flood map;
 - o the boundary of the floodway(s) or non-encroachment area(s);
 - o the Base Flood Elevation (BFE) where provided on FEMA's flood maps, other community adopted flood maps, or as determined as required for large development of at least 5 acres or 50 lots;

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- o the old and new location of any watercourse that will be altered or relocated as a result of proposed development; and
 - o the boundary and designation date of the Coastal Barrier Resource System (CBRS) area or Otherwise Protected Areas (OPA), if applicable;
- Proposed elevation, and method thereof, of all development within a Special Flood Hazard Area including but not limited to:
 - o Elevation in relation to mean sea level (NAVD) of the proposed reference level (including basement) of all structures;
 - o Elevation in relation to mean sea level (NAVD) to which any non-residential structure in Zone AE, A or AO will be floodproofed; and
 - o Elevation in relation to mean sea level (NAVD) to which any proposed utility systems will be elevated or floodproofed;
- If floodproofing, a Floodproofing Certificate (*FEMA Form 81-65*) with supporting data and an operational plan that includes, but is not limited to, installation, exercise, and maintenance of floodproofing measures.
- A Foundation Plan, drawn to scale, which shall include details of the proposed foundation system to ensure all provisions of this ordinance are met. These details include but are not limited to:
 - o The proposed method of elevation, if applicable (i.e., fill, solid foundation perimeter wall, solid backfilled foundation, open foundation on columns/posts/piers/piles/shear walls);
 - o Openings to facilitate equalization of hydrostatic flood forces on walls when solid foundation perimeter walls are used in Zones A, AO, AE, and A1-30;
 - o The following, in Coastal High Hazard Areas:
 - V-Zone Certification with accompanying plans and specifications verifying the engineered structure and any breakaway wall designs;
 - Plans for open wood latticework or insect screening, if applicable;
 - Plans for non-structural fill, if applicable. If non-structural fill is proposed, it must be demonstrated through coastal engineering analysis that the proposed fill would not result in any increase in the

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Base Flood Elevation or otherwise cause adverse impacts by wave ramping and deflection on to the subject structure or adjacent properties.

- Usage details of any enclosed areas below the regulatory flood protection elevation.
- Plans and/or details for the protection of public utilities and facilities such as sewer, gas, electrical, and water systems to be located and constructed to minimize flood damage;
- Copies of all other Local, State and Federal permits required prior to floodplain development permit issuance (Wetlands, Endangered Species, Erosion and Sedimentation Control, CAMA, Riparian Buffers, Mining, etc.)
- Documentation for placement of Recreational Vehicles and/or Temporary Structures, when applicable, to ensure compliance with ordinance requirements.
- A description of proposed watercourse alteration or relocation, when applicable, including an engineering report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map (if not shown on plot plan) showing the location of the proposed watercourse alteration or relocation.

5.45 Swimming Pools and Spas

Per FEMA's Technical Bulletin 5 Free-of-Obstruction Requirements, pools and other accessory structures may adversely affect other structures due to wave or debris impact forces. Therefore, pools and spas construction are regulated under this documentation related to the limited placement of compacted fill and alternative such as frangible slabs. Placement of a swimming pools and spas is permitted by the NFIP "beneath an elevated building only if the top of pool/spa and accompanying deck or walkway are flush with the existing grade, and only if the space around the pool/spa remains unenclosed".

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6.1 Introduction

The NFIP regulatory standards are minimums and, as such, they may not adequately address the objectives of every community or address the flood hazards in all situations. Communities are encouraged to enact more restrictive requirements to better protect people and properties from flood hazards. However, when more restrictive requirements are considered, questions about “taking” may be raised, especially when regulations are so restrictive that they effectively take away the ability of property owners to reasonably use their lands. Although courts have held that the NFIP minimum regulations and local floodplain management ordinances do not constitute a taking, questions may arise as communities consider more restrictive provisions.

After a brief discussion of the “taking” issue, this chapter looks at floodplain management techniques that can go a long way towards reducing flood hazards. Some of these approaches are applied through zoning or comprehensive planning, or by defining flood hazard areas in a pro-active

matter to account for future conditions. Others, accomplished by modifying your floodplain management ordinance, offer “higher standards” that are specific to buildings. And lastly, some suggestions to incorporate safety considerations and natural resource protections are offered. If you want to learn more about how you can include some of these techniques in your ordinance, call the State NFIP Coordinator’s office.



Many of these suggestions are recognized by the Community Rating System (see Chapter 13), and you can learn more about them by checking the *CRS Coordinator’s Manual*. Additional sources for ideas to strengthen your program are available from the Association of State Floodplain Managers, Inc., (www.floods.org), including *No Adverse Impact: A Toolkit for Common Sense Floodplain Management*.

So that each community considers floodplain management in the context of its greater needs and to provide adequate authority to manage flood hazards, the NFIP encourages communities to:

- Enact more restrictive regulations in the local ordinance to meet needs and circumstances that are not met by the NFIP minimums.
- Adopt sound and workable approaches for management of “special” flood hazard areas, such as alluvial fan flooding, ice jam flooding, coastal erosion, flash flooding, areas below unsafe dams, areas behind levees and floodwalls, etc.
- Tie the need to reduce economic losses resulting from flooding with the need to protect and maintain the natural resources and functions of the floodplain, which are often an undervalued community asset.

44 CFR 60.1(d) *The criteria set forth in this subpart are minimum standards for the adoption of flood plain management regulations by flood-prone... communities. Any community may exceed the minimum criteria under this Part by adopting more comprehensive flood plain management regulations utilizing the standards such as contained in Subpart C of this part. In some instances, community officials may have access to information or knowledge of conditions that require, particularly for human safety, higher standards than the minimum criteria set forth in Subpart A of this part. Therefore, any flood plain management regulations adopted by a State or a community which are more restrictive than the criteria set forth in this part are encouraged and shall take precedence.*

6.2 The “Taking” Issue

Why not simply tell people that they can’t place any development in flood hazard areas? If we did, we wouldn’t have to worry about how buildings are built or about pushing water onto adjacent properties. The regulations would be simple to administer – just say “No.” While this approach may sound good to many people, it has a fatal legal problem – it could be a “taking.”

The Fifth Amendment to the Constitution states, “Nor shall property be taken for public use without just compensation.” The Constitution contains this provision because in England, the king could take property and use it for his own purpose—such as quartering troops or hunting— without compensating the land owner.

The term “taking” has come to mean any action by a government agency that relieves a person of his or her property without payment. Certain government agencies possess the authority to acquire privately owned land. Under the power of eminent domain, government agencies can acquire land without the owner’s agreement, provided the acquisition clearly is for a demonstrably public purpose and official condemnation proceedings are followed. Some common examples of eminent domain actions are:

- Purchase of land for roads and public works projects.
- The development of public park land.
- Acquisition of rights-of-way for utilities (water, sewer, transmission lines, etc.).

Courts have ruled that a taking may also occur when the government enacts a law, standard or regulation that limits the use of the land to the extent that the owner has been deprived of all of his or her economic interest in using the property. Thus, the government has “taken” the property under a legal provision known as inverse condemnation. In cases where a court has found an inverse condemnation or regulatory taking, the government has been required to compensate the property owner. Often, though, in individual cases, the regulations are retracted as applied to the specific property that is the subject of the suit.

When considering cases involving questions of regulatory taking, the courts usually undertake a complicated balancing of public and private interests, including such factors as:

- The objectives of the regulations.
- The harm posed by uncontrolled development in the absence of the regulations.
- Reasonableness of the regulations.
- Severity of the economic impact upon the private property owner.

Very restrictive floodplain regulations and the regulatory standards of the NFIP have been challenged as a taking in a number of cases. Table 6-1 summarizes important cases challenging the legality or constitutionality of NFIP or similar land use regulations.

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Case	Issue	Decision/Impact
Village of Euclid v. Ambler Realty Company (1926)	The use of police power to regulate land use	The court upheld the basic concept of zoning.
Turnpike Realty Co. v. Town of Dedham (1972)	Challenge to the constitutionality of the NFIP	The court upheld the floodplain management regulations.
Just v. Marienette (1972)	A wetland regulatory case	The court decided that a landowner does not have the unlimited right to use the land for a purpose which is unsuited to its natural state or that will injure the rights of others.
Texas Landowners Association v. Harris (1978)	Challenge to the validity of the NFIP and its mitigation requirements	The courts held that the NFIP was reasonable. A community could not claim a taking if insurance or disaster relief was denied for failure to comply with NFIP standards, because they are benefits, not rights.
First Evangelical Lutheran Church of Glendale v. Los Angeles County, LA (1987)	Whether a temporary building moratorium that was deemed a taking would require compensation	The U.S. Supreme Court held that temporary regulatory takings could require compensation. This case was sent back to the state to decide if a taking had occurred. The state endorsed the floodplain regulations and held that the regulations were not a taking.
Adolph v. FEMA (1988)	Whether the parish floodplain management regulations adopted constituted a taking	The court upheld that the NFIP as a whole is not a taking, nor are the parish regulations.
April v. City of Broken Arrow (1989)	Whether two Oklahoma floodplain ordinances constituted a taking (requirement for elevation of new homes to 1 foot above the 100-year flood elevation)	The courts accepted the general proposition that local public officials must be afforded reasonable <i>elasticity</i> in planning and implementing legitimate state interests and held that regulations were valid.
Lucas v. South Carolina Coastal Council (1992)	South Carolina Supreme Court—whether the South Carolina Beachfront Management Act constituted a taking. U.S. Supreme Court—whether the property owner was entitled to compensation for his alleged “total loss of value” attributed to the Beachfront Management Act	The South Carolina Supreme Court ruled that the Act did not constitute a taking and reversed the trial court's award of \$1.2 million to Lucas. The U.S. Supreme Court ruled that where the value of a property is essentially “destroyed” by regulation, compensation should be paid.
Dolan v. Tigard (1994)	Imposition of a floodplain bike path as a condition of a permit to expand commercial structures	The U.S. Supreme Court found that the business owners should not be required to construct a bike path to obtain the permit.

Table 6-1. Selected cases involving challenges to land use regulations

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Most NFIP criteria are performance standards that do not prohibit development, but simply require the landowner or developer to meet the performance standards. For example, many people think that floodway development is prohibited, while in fact, development in floodways is allowed if it can be demonstrated that it does not increase flood heights (that it meets the performance standard of no increases in BFE). Although it may be more costly to build according to the NFIP standards and, in some instances, it may not be economical, the performance standard is a valid exercise of the police power because it is based on a legitimate public purpose: preventing flood damage and protecting the public health, safety and welfare.

The NFIP's performance-oriented standards have never been ruled as a taking. This is highly significant, given the number of communities across the U.S. that administer floodplain management ordinances. The NFIP regulatory criteria have withstood challenges because they do not deny all economic use of flood-prone property. While an owner may not be able to develop the land in any fashion, some uses can be pursued, often including buildings.

Some courts have supported regulatory standards that are more restrictive than NFIP regulations, such as complete prohibitions of new buildings or new residences in the floodway. These cases tied the prohibition to the hazard and the need to protect the public from hazards created by the development.

The rationale does not always have to be tied to property damage. For example, in upholding the State's prohibition of new buildings in the floodway, the Illinois Supreme Court noted that while buildings could be protected, the residents would be surrounded by moving water during floods, preventing access by emergency vehicles. "The prohibition takes into consideration not only the concern about preventing further flooding, but also the concern about the need to provide disaster relief services and the need for the expenditure of state funds on shelters and rescue services for victims of flooding." (*Beverly Bank v. Illinois Department of Transportation*, September 19, 1991).

Regulations need to be reasonable in order to withstand challenges of taking. For example, a complete prohibition of development in a shallow flooding area or in backwater areas where there is no velocity and where increases in flood frequency or elevations will not result might not be considered as "reasonable" by a court.

The lesson to take away from this discussion is that before your community enacts a regulatory provision that could severely restrict the use of property, your community's

attorney should review the provision to determine the likelihood that it will withstand a challenge of taking. Regulatory standards that are reasonable for the circumstances, that are tied to the hazard, and that support public objectives are most likely to be upheld.

6.3 More Restrictive State and Local Regulations

FEMA has established minimum floodplain management requirements for communities participating in the NFIP. State standards also apply. However, communities should seriously consider enacting regulations that exceed the minimum state and federal criteria. In fact, the NFIP requires communities to at least consider additional measures that are found in 44 CFR §60.22, Planning Considerations for Floodprone Areas (Table 6-2). While it is most common for this to be done when a community first enters the NFIP, it is beneficial to work through these considerations every few years.

The rest of this section provides overviews of some of the more common “more restrictive” regulatory approaches. Many of these approaches may be eligible for credit under the Community Rating System (CRS), a program which provides insurance premium discounts to policyholders in communities with more restrictive floodplain management (see Chapter 13).

Table 6-2. Planning Considerations for Flood-Prone Areas (44 CFR §60.22)

(a) The floodplain management regulations adopted by a community for flood-prone areas should:

- (1) Permit only that development of flood-prone areas which (i) is appropriate in light of the probability of flood damage and the need to reduce flood losses, (ii) is an acceptable social and economic use of the land in relation to the hazards involved, and (iii) does not increase the danger to human life;
- (2) Prohibit nonessential or improper installation of public utilities and public facilities in flood-prone areas.

(b) In formulating community development goals after the occurrence of a flood disaster, each community shall consider:

- (1) Preservation of the flood-prone areas for open space purposes;
- (2) Relocation of occupants away from the most severely vulnerable flood-prone areas (floodways, coastal high hazard areas);
- (3) Acquisition of land or land development rights for public purposes consistent with a policy of minimization of future property losses;
- (4) Acquisition of frequently flood-damaged structures or substantially flood-damaged structures;

Table 6-2. Planning Considerations for Flood-Prone Areas (44 CFR §60.22)

(c) In formulating community development goals and in adopting floodplain management regulations, each community shall consider at least the following factors:

- (1) Human safety;
- (2) Diversion of development to areas safe from flooding in light of the need to reduce flood damages and in light of the need to prevent environmentally incompatible floodplain use;
- (3) Full disclosure to all prospective and interested parties (including but not limited to purchasers and renters) that (i) certain structures are located within flood-prone areas, (ii) variances have been granted for certain structures located within flood-prone areas, and (iii) premium rates applied to new structures built at elevations below the base flood substantially increase as the elevation decreases;
- (4) Adverse effects of floodplain development on existing development;
- (5) Encouragement of floodproofing to reduce flood damage;
- (6) Flood warning and emergency preparedness plans;
- (7) Provision for alternative vehicular access and escape routes when normal routes are blocked or destroyed by flooding;
- (8) Establish minimum floodproofing and access requirements for schools, hospitals, nursing homes, orphanages, police stations, communications centers, water and sewage pumping stations, and other public and quasi-public facilities already located in the flood-prone area, to enable to withstand flood damage, and to facilitate emergency operations;
- (9) Improvement of local drainage to control increased runoff that might increase the danger of flooding to other properties;
- (10) Coordination of plans with neighboring community's floodplain management programs;
- (11) The requirement that all new construction and substantial improvements in areas subject to subsidence be elevated above the base flood level equal to expected subsidence for at least a ten year period;
- (12) For riverine areas, requiring subdividers to furnish delineations for floodways before approving a subdivision;
- (13) Prohibition of any alteration or relocation of a watercourse, except as part of an overall drainage basin plan. In the event of an overall drainage basin plan, provide that the flood carrying capacity within the altered or relocated portion of the watercourse is maintained;
- (14) Requirement of setbacks for new construction within Zones V1-30, VE, and V on a community's FIRM;
- (15) Requirement of additional elevation above the base flood level for all new construction and substantial improvements within Zones A1-30, AE, V1-30, and VE on the community's FIRM to protect against such occurrences as wave wash and floating debris, to provide an added margin of safety against floods having a magnitude greater than the base flood, or to compensate for further urban development;
- (16) Requirement of consistency between state, regional and local comprehensive

Table 6-2. Planning Considerations for Flood-Prone Areas (44 CFR §60.22)

plans and floodplain management programs;
(17) Requirement of pilings or columns rather than fill for the elevation of structures within flood-prone areas, in order to maintain the storage capacity of the floodplain and to minimize the potential for negative impacts to sensitive ecological areas;
(18) Prohibition, within any floodway or coastal high hazard area, of manufacturing plants or facilities in which hazardous substances are manufactured;
(19) Requirement that a plan for evacuating residents of all manufactured home parks or subdivisions located within flood prone areas be developed and filed with and approved by appropriate community emergency management authorities.

6.4 Planning & Zoning Tools

The best time to achieve one of the goals of the NFIP – guide development to less flood-prone areas – is before you have a building permit application on your desk. And the best way to influence where people build is through application of your planning and zoning ordinances.

Prohibiting Development. Some communities prohibit some types or all development in floodplain areas. While regulatory standards, including the prohibition of floodplain development, may prove to be legal and proper, whether this approach is desirable or practical is another question.

A common approach is to prohibit most development or particular types of vulnerable structures in the identified floodway, regardless of whether or not an impact on flood heights would result. This may be the most appropriate approach where floodways run fast and deep, or on waterways susceptible to destructive flash flooding.

Zoning; Low Density Zoning. Zoning is used to designate allowable uses. When a community prepares its land use plan and zoning ordinance, it should consider what uses and densities are appropriate for floodplains (including floodway and/or V Zone). If buildings are not prohibited entirely, the community can zone its floodplains for conservation, open space, agricultural or other low-density use to reduce the number of new structures. One option is to limit the number of buildings, for example instead of 4 or 5 units per acre, the floodplain could be zoned for one unit per acre.



Activity 430LD, Low Density Zoning, in the Community Rating System provides substantial credit for zoning floodplains with low-density uses, with maximum credit provided for minimum

lot sizes of 10-acres or larger. For more information, please refer to *CRS Coordinator's Manual* and the *CRS Application*.

Floodplain Density Adjustment. Density adjustment is a tool that can take into account the presence of a floodplain without overly restricting the use of a parcel of land. Strictly speaking, if an area is zoned at 4 units per acre, then someone who owns 10 acres expects to be able to subdivide and construct 40 units. But suppose 2 acres of that 10-acre parcel is in the mapped floodplain. If those 2 acres are kept as open space, then the density of the remaining non-floodplain acreage could be adjusted to 5 units per acre. Thus the developer would still achieve a total of 40 units – and in the process gain a valuable, green space asset.

Subdivision Layout. The layout of lots during subdivision design influences the amount of impervious surfaces, how natural features are incorporated, the cost of infrastructure, and access to amenities and surrounding areas. Subdivision regulations generally specify lot frontage and driveway placement, placement of on-site sewage systems (if applicable), and local drainage patterns. If not governed by zoning, the regulations also identify lot sizes and limitations.

Undeveloped land in large tracts offers the best opportunity to limit where certain types of development will be located, including siting buildings outside of the floodplain or at least in the fringe areas. This has two advantages over simply requiring the buildings to be elevated: (1) buildings are not isolated by floodwaters, putting a strain on local emergency services to guard them or evacuate or rescue their occupants, and (2) the subdivisions will have open space and recreation areas – a valuable amenity in most communities.

A housing development can be clustered, as shown in Figure 6-1, so the developer can sell the same number of home sites as a conventional subdivision. Check your state laws on whether cluster development can be mandated or just encouraged during the subdivision review process.

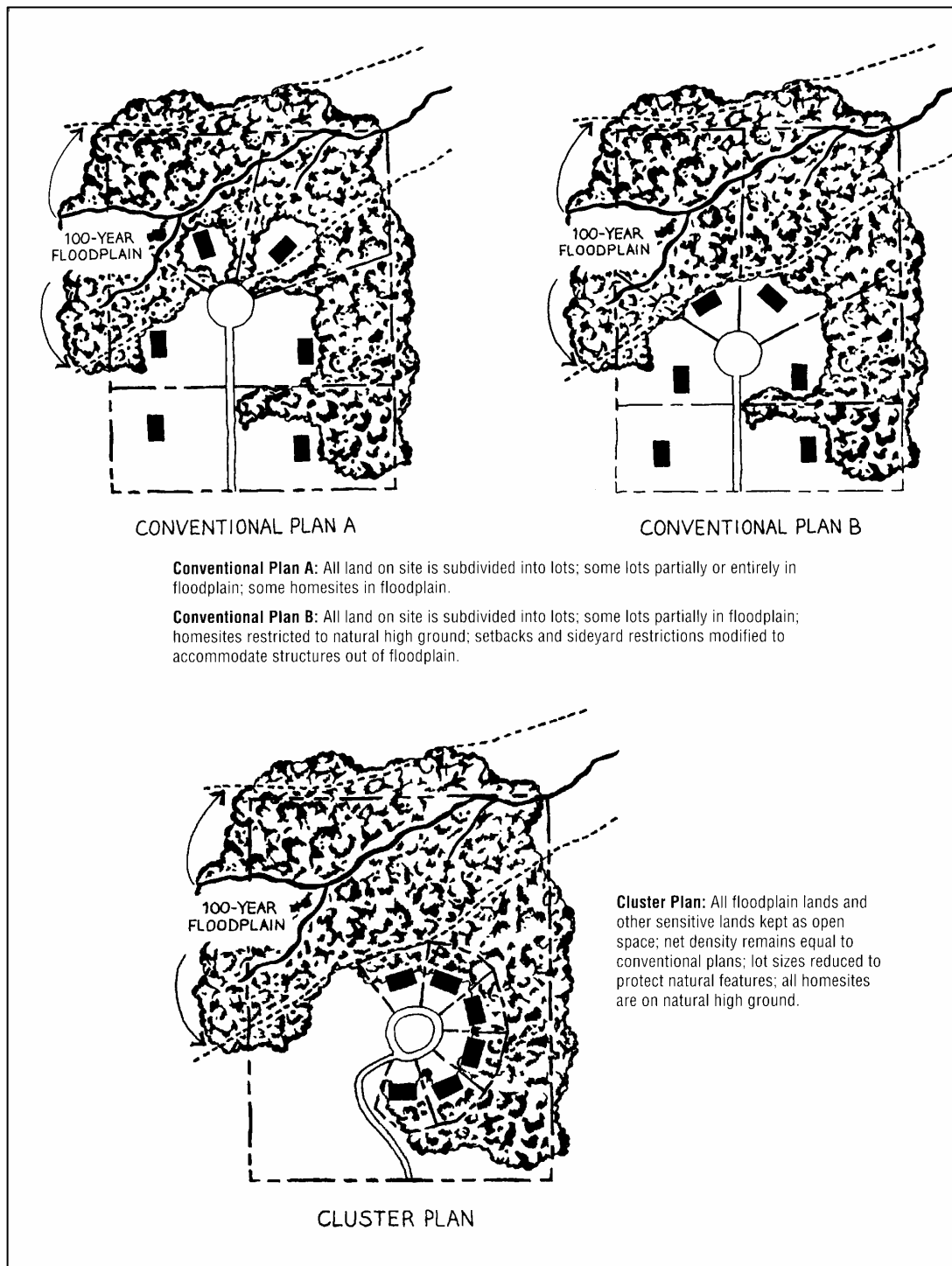


Figure 6-1. Clustering can keep buildings out of some floodplains
Subdivision Design in Flood Hazard Areas)

(Source:

Other Subdivision Tools. The planner's toolbox from the American Planning Association's *Subdivision Design in Flood Hazard Areas* provides other tools for encouraging developers to avoid floodplains. A density transfer may be used to trade development rights with a site that is not affected by mapped flood hazards. Credits or bonuses can be given to increase the allowable density if the developer puts building sites on high ground or does not disturb a wetland.

The planned unit development (PUD) approach offers developers flexibility in planning the entire area. For example, a PUD may have a cluster development with houses closer together than allowed under normal zoning lot line setbacks.

Subdivision and planning regulations also can mandate that a certain portion of a development be set aside as open space for recreation or stormwater management purposes. Developers often find that the amenity benefits of open space outweigh the costs that would be incurred if they elect to build in the floodplain. Linear parks and greenways that connect the open space areas through a community are becoming more and more popular and help sell new developments.

The practice of "greenlining," in which environmentally sensitive areas (floodplains, wetlands, habitats, tree stands, eroding shorelines, dunes) are delineated as an early step in subdivision design is an effective floodplain management tool. These areas are then avoided during lot layout, although the number and size of lots may be adjusted to maintain the number of units per acre allowed by zoning. The undeveloped areas are held in common ownership by the owners' association or conveyed to the local government, and used for recreation or conservation.



Activity 430LD in the Community Rating System credits land development criteria that discourage development in floodplains. See *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Location of Public Services and Utilities. In addition to the use of regulatory methods to control development in floodplains, local governments may establish policies and directives that discourage vulnerable uses of the floodplain. Typically these types of policies require the local governing body to take action rather than impose requirements on private property owners. One

such effective action that may be undertaken involves the location of public services and public utilities.

The design of public services and utilities can have both direct and indirect impacts on future floodplain development and flood losses. If roads, bridges, sewer and water lines, and other utilities are constructed in flood-prone areas, these services and utilities may be vulnerable to flood damage. In addition to directly suffering flood losses, services and utilities located in or through flood-prone areas can indirectly attract other development. For example, placement of a sanitary sewer line in a floodplain may create additional pressure to allow development and connections to the sewer line. On the other hand, little development is likely to take place if the locality has an official policy prohibiting the extension of services and utilities into flood-prone areas or denying hookups for new development in these areas.

Hazardous Materials. Prohibiting facilities that manufacture or use hazardous materials from the floodplain makes sense in many respects, but you may want to have specific standards in your ordinance in order to make it happen. Table 6-3 lists chemicals that should be avoided.

Table 6-3. Hazardous Materials to Avoid Subjecting to Flooding (from U.S. Army Corps of Engineers' Flood Proofing Regulations).	
Extremely hazardous or vulnerable to flood conditions – recommended to be prohibited from the SFHA and the 500-year floodplain	
Acetone Ammonia Benzene Calcium carbide Carbon disulfide Celluloid Chlorine Hydrochloric acid	Prussic acid Magnesium Nitric acid Oxides of nitrogen Phosphorus Potassium Sodium Sulfur
Sufficiently hazardous in larger quantities – recommended to be prohibited in any space below the BFE	
Acetylene gas containers Storage tanks Lumber /buoyant items	Gasoline Charcoal/coal dust Petroleum products

Larger quantities of the following items should be prohibited in any space below the base flood elevation.	
Drugs Food products Matches/sulfur products	Soaps/detergents Tires

6.5 Administrative Tools

There are a number of tools you might consider to help alleviate the burden that floodplain development places on your community.

Floodplain Permit Fees. Some communities charge an additional fee to review applications for floodplain development and to perform the special inspections. The collected fees help offset additional staff work required. Different fees can be charged for different types of proposals, with higher fees for activities that require engineering review, such as floodway encroachments or floodproofing designs for non-residential buildings.

Floodplain Property Assessments. Although not widely used, a number of communities in other states assess an annual "impact" fee on floodplain properties. The fee can be used to support flood mitigation and response activities, including flood warning systems.

One community that has a floodplain impact fee has a successful program to remove very vulnerable homes from the floodplain. A reserve fund is used to collect annual fees that are assessed on every floodplain property (vacant and developed). When federal funds become available for buyouts, the reserve fund is used to provide the required non-federal cost share. When the fee is assessed on improved lots, property owners are advised to buy flood insurance. This way, if they get damaged, the insurance pays for the structural damage, and the reserve fund only has to pay for the land. This approach can reduce criticism for using public funds to solve what some people consider to be a private problem.

Non-Conversion Agreement for Enclosures Below BFE. In 1996 FEMA began to notice a growing problem with enclosures below BFE. NFIP regulations allow enclosures, but only for building access, parking, and limited storage, and then only if adequate water-equalizing openings are installed. Conversion of enclosures to habitable space is a growing concern. The value of the NFIP restrictions on enclosures is apparent after floods. One recent investigation, conducted after a major hurricane, examined post-FIRM

buildings in a coastal community. Almost without exception, damage to post-FIRM homes was due to non-compliant conversions of enclosures.

A Non-Conversion Agreement is one way to help address the problem (sample in Chapter 5). By signing this Agreement, homeowners agree to maintain the flood openings and to limit the use of such areas to parking, access, and limited storage. Copies are kept in permanent records and may be useful to document compliance in the future, especially after a flood. Some communities require that the Non-Conversion Agreement be recorded as a deed restriction. Doing so will help ensure that future buyers are aware of the ordinance standards, which may reduce non-compliant conversions.

Rebuilding Moratoria. The prohibition of floodplain development in the form of a temporary rebuilding moratorium has been used by a number of communities following flood disasters. Temporary measures may be put in place after a flood to allow time for the preparation of relocation actions, the installation of flood control projects, or the formulation of comprehensive redevelopment or floodplain management plans. A temporary moratorium should specify when it will be lifted, such as “within three months or when the plan is completed, whichever is sooner.” An open ended moratorium may be viewed by a court as a taking, since the owner has no idea when he or she will be allowed to build or rebuild.

Some communities that have instituted moratoria after flood events are Larimer County, CO; San Bernardino and Lake Elsinore, CA; and Cowlitz County, WA. Los Angeles County, CA, is perhaps the most widely known community to have exercised this approach.

Charlotte-Mecklenburg County, a rapidly growing area in the western piedmont of North Carolina, investigated future conditions hydrology. They determined that flood depths could increase as much as 5-feet if they ignored the impacts of planned watershed

7.6 Options for Defining Flood Hazard Areas

The flood hazard maps prepared by FEMA show the area that must be regulated in order for your community to participate in the NFIP. However, there are always limitations associated with those maps. You might consider adopting a map that more accurately reflects your community’s flood-prone areas and the flood and flood-related risks you will face in the future.

Adopt a Zero Rise or 0.5-Foot Rise Floodway. FEMA’s standard method for determining the floodway is to model potential encroachments into the

flood fringe until a “surcharge” or increase in water surface elevation of no more than 1 foot is predicted. The effect of this is that, as the flood fringe is developed over time, the base flood elevation will increase. If a higher standard requires a zero surcharge (or a smaller allowable surcharge) when flood hazard maps and map revisions are prepared, then such increases are prevented, and wider floodways result.

Use Future Conditions Hydrology. FEMA’s Flood Insurance Rate Maps are prepared based on “current” watershed conditions and hydrology. Of course, many maps are quite old. This means that years – sometimes decades – of watershed development are not adequately reflected in the hydrology (volume of water that drains to the waterway after a storm). Especially in areas that have urbanized significantly in the last 10 to 20 years, the amount of added impervious area (roofs, roads, parking lots) can be significant. This means your FIRMs might significantly underestimate today’s flood risk. And they definitely do not give you a good picture of what the flood risk will be in the future.

Models of watershed hydrology can be developed to show the effects of future development, usually called “future conditions hydrology.” You can then use the results to delineate the floodplain that is reasonably expected in the future based on protected development.

Map All Waterways. The maps prepared by the Federal Emergency Management Agency (FEMA) often have limitations and do not show flood hazard areas on all waterways. Of course, all bodies of water have adjacent land areas that are subject to flooding even if those areas are not shown on the Flood Insurance Rate Map. For example, the mapped flood hazard area usually does not extend up streams with drainage areas of less than one square mile. And in many rural areas entire streams have not had flood hazard areas delineated because a determination may have been made 20 or 30 years ago that development pressures were unlikely in those areas.

Delineate Coastal A Zones. Certain coastal flood hazard areas are designated as A Zone, and yet waves are present and contribute to damage. The waves experienced in these areas, called “Coastal A Zones,” are not as large as those in V Zones (also called coastal high hazard areas or areas subject to high velocity wave action). In general, Coastal A Zones are where flooding is due to astronomical tides, storm surges, seiches, or tsunamis, not riverine flooding, and the potential for breaking wave heights greater than or

equal to 1.5 feet exists during the base flood conditions. A greater degree of protection, and thus damage avoidance, is achieved when V Zone standards are applied within Coastal A Zones.

Redelineate Your Floodway. FEMA has delineated floodways along many waterways where detailed studies were performed to predict the base flood elevations. A simple explanation of how computer models are used to delineate the floodway is described in Chapter 3.

Many floodplain management professionals are concerned about the fact that the BFEs shown on the FIRM are those without the flood fringe encroachment (i.e., as much as one foot lower than the with-encroachment floodway). What this means is that if you allow the fringe to be fully developed – effectively producing conditions that are shown on the Floodway Map – you are virtually assuring that flood depths will go up about one-foot.

FEMA now allows communities to select a more restrictive floodway – something you might consider when your FIRMs are revised. Here are three more restrictive ways you might choose to have your floodways delineated:

- When running the computer model, set the allowable increase in water surface elevation to be no more than 0.5-foot increase (rather than the standard 1-foot increase);
- Set the allowable increase to zero; or
- Treat the entire floodplain as a floodway by adopting a requirement that every proposal be individually analyzed to determine its impact on the flood depth and velocity.

According to Issue Paper 17: *Floodways for Limited Detailed Studies*, the following process has been implemented. The mapping contractors will be tasked to develop an Option 4 (equal conveyance loss) HEC-RAS run with a low target surcharge value (0.7 to 0.9 feet). Refer to http://www.ncfloodmaps.com/pubdocs/issue_papers/IP17-lods.pdf for more information.

Designate Erosion-Prone Areas. Flood-related erosion is not specifically recognized in the NFIP minimum standards. However, your floodplain management ordinance is a good tool to regulate development in erosion-prone areas. The first step is to designate the areas so that it is clear what

development is subject to specific requirements designed to minimize future erosion-related damage.

Riverine erosion is more difficult to predict. It is best to look at the behavior of waterways in your area to learn whether they have experienced significant bank erosion and shifting of channels.

Typical measures to manage erosion-prone areas include:

- Along coastal shorelines, require buildings to be set back a certain distance from a reference feature. It is common for the distance to be determined based on the long-term erosion rate, for example, the setback area may be the area called the 30- or 60-year erosion zone. It is determined by multiplying the long-term erosion rate by 30 or 60.
- Require newly-platted lots to be extra deep so that even after 60-years there is adequate land on which to physically move the building back from the eroding edge.
- Require that buildings be readily moveable. This will lead to pile, pier and crawlspace foundation and preclude slab-on-grade foundations. In addition, it may prompt architects to design large buildings to be separated easily into two or more parts to facilitate relocation.
- Setbacks from banks are less effective in areas prone to riverine erosion, especially if channels are known to shift locations significantly. One management approach is to look at the river as a geomorphic system and draw the potential "meander belt" based on the existing meanders. This is the area within which the channel is most likely to move back and forth and where regulations should be most restrictive.

6.7 Reduced Exposure Through Site Utilization

More than 30 years ago Congress established goals for the NFIP. One of those goals is "guide development away from high risk areas." Simply applying regulations that govern how to build in the floodplain does little to achieve that goal. There are a number of ways that you can encourage exposure to flooding by looking at the site.

Require Alternative Analyses for Floodplain Development. Some people think that requiring an alternative analysis is an effective approach. It involves requiring the applicant to evaluate alternate locations for proposed buildings or fills. Specifically, applicants should show that there are no other

places to put buildings than to put them in the floodplain. And, if there are no flood-free sites, then it should be shown that buildings will be put on the highest available ground in order to minimize flood risks. Communities can exercise some flexibility to facilitate reducing floodplain impacts. For example, you can waive a lot line setback that allows a building to be on higher ground.

Preserve Floodplains as Open Space. Regulations can be written to require that floodplain areas be preserved during the subdivision process or as large, single lot developments are designed. This works as long as there is non-floodplain land available. Where there are no alternative locations, it is still valuable to encourage as much open space floodplain as possible. In some parts of the country, open space along waterways and passive recreation in floodplain areas are known to enhance the value of homes in subdivisions and throughout the community.

Adopt Flood Protection Setback and/or Setup – Riverine. The NFIP minimum requirements do not address where on a lot a building is built, only how high it will be elevated or otherwise protected. Delineation of a setback is one way to achieve greater protection while acknowledging uncertainties in the flood hazard area determination and/or the topography used to delineate the floodplain boundary. A setback is usually a minimum fixed distance measured from a reference point, for example the stream bank or the floodplain boundary. The effect is to expand the footprint or area of the regulated floodplain.

Applying a “set-up,” or specific height above the base flood elevation, is similar to freeboard, but also has the effect of expanding the area of the floodplain. For example, applying a 2-foot set-up means the land area under the elevation defined as the BFE plus 2-feet becomes the area subject to floodplain management regulations.

Some communities find it valuable to adopt a flood protection setback, especially when they are trying to meet multiple objectives such as water quality or streamside habitat enhancement. Within the setback, natural vegetation should be left or replanting should be required.

On streams and rivers without a designated floodway, the North Carolina NFIP coordinating agency and FEMA regional office recommend a setback equal to



five times the bank-to-bank width of the waterway (a maximum of 500 feet on large rivers). One question usually comes up during consideration of a setback – some floodplains are narrower than the setback. The way to handle this is to craft language that says development will be set back the lesser of the setback distance or the width of the floodplain.

Another approach is to establish a 100-foot flood protection setback from the top of stream banks along smaller waterways where FEMA has mapped the SFHA. Where streams are shown and a floodplain has not been defined, then the setback may be 50- or 100-feet.

Setbacks from watercourses have been used to minimize the effect of non-point sources of pollution caused by land development activities, timber harvesting, and agricultural activities. Solid waste landfills and on-site sewage disposal systems often are restricted within certain distances of a body of water.

Set Coastal Setback from Mean High Tide or Reference

Feature. Tidal shorelines along North Carolina's coast and bays are subject to flooding from hurricanes and tropical storms. If a V Zone is identified, then two NFIP criteria affect where a building is placed on the lot. Buildings must be landward of the reach of mean high tide and dunes may not be altered unless it is demonstrated that the potential for flood damage is not increased by those alterations.

Along coastal shorelines setback distances act as buffer zones against beach erosion. North Carolina's Coastal Area Management Act (CAMA) rules address setback distances. The small-structure setback is determined by multiplying the long-term average annual erosion rate by 30, for a minimum of 60 feet. Setbacks for large structures (over 5,000 square feet of total floor area) are determined by multiplying that rate by 60. All single-family residences must meet the small-structure setback requirement regardless of total floor area. Setbacks are measured landward from the first line of stable, natural vegetation.



Activity 430 of the Community Rating System credits setbacks that prevent disruption to shorelines, stream channels and their banks under. See *CRS Credit for Higher Regulatory Standards* for example regulatory

language.

Siting of Underground Utilities. The minimum requirements for underground utilities address water supply and sanitary sewer systems and require designs to minimize or eliminate infiltration of floodwater into such systems and discharges from such systems into floodwaters. The requirements do not address where underground utilities are located, for example, with respect to eroding streambanks or underneath unstable stream channels. Higher standards address setbacks from banks or shorelines, depths below stream invert, and various measures intended to protect against flood-related damage due to undermining, rupture, and collapse.

Prohibit Floodway Development. Under NFIP minimums, development may take place in the floodway only if an engineering analysis demonstrates that there will be no rise in the water surface elevations. The analysis must be prepared by a qualified engineer and then submitted to – and approved by – FEMA. This is because the floodway is supposed to be reserved to ensure that the base flood can pass without increasing flooding.

Especially where floodways are determined to have high velocities, or very deep water, communities sometimes decide to prohibit construction of buildings or placement of fill. Landowners still have use of the land, but for purposes that do not involve adversely impacting the floodway.

Minimize Fill in the Flood Fringe. Floodplain filling reduces the storage of floodwater and tends to increase peak flows, making flooding worse. Even under the NFIP rules, placement of fill in the flood fringe is allowed, but the likelihood that flood levels will increase isn't always taken into account fully. Some communities find this paradoxical, and decide to prohibit, or at least significantly limit, fringe filling. In communities that have engineering capabilities on-staff, compensatory excavation may be required to offset filling. This approach takes careful assessment of engineering analyses to demonstrate the effects of such proposals.

Require applicants to justify the placement of fill. Otherwise, you may end up with basements sunk into fill that has been "removed" from the floodplain by a LOMR-F.

An important part of minimizing floodplain fill is to make sure every proposal to fill is justified. You should not approve fill simply because someone needs a place to dispose of excess dirt and debris. Remember too, sometimes people want to fill and then get a Letter of Map Revision based on Fill (LOMR-F) from

FEMA. What this means is the filled area may no longer be considered as subject to flooding, and they would be able to build without consideration of flood hazards. It may be risky to sink a basement into fill, which exposes the basement walls to failure when the ground becomes saturated due to high flood waters.

More Restrictive Floodway Standards. The NFIP floodway standard in 44 CFR §60.3(d) provides some protection; however, it does not specifically address the need to maintain flood storage. For this reason, communities wishing to limit any further aggravation of the flooding condition should consider adopting more restrictive floodway standards and regulating the amount of fill or buildings that can displace floodwater in the flood fringe. More restrictive state or local floodway standards provide increased opportunities to reduce flood losses as well as to protect natural and beneficial resources and functions of floodplains. The resulting protected floodway occupies most of the floodplain, leaving narrow strips of developable flood fringe.

Prohibit Manufactured Housing in Floodways. Manufactured housing is the most vulnerable form of floodplain development, even if elevated. Many communities have adopted provisions prohibiting the placement or replacement of manufactured homes in the floodway – and some go so far as to prohibit them and other habitable structures from all flood hazard areas.

Protection of Floodplain Storage Capacity and/or Compensatory Storage. The NFIP floodway standard (44 CFR 60.3(d)) restricts new development from obstructing flows and increasing flood heights. Many flood hazard areas are very sensitive to reduction in storage – the placement of fill and buildings may cause increases in the depth of flooding. Storage capacity can be protected in two ways that may be applied separately or together. A prohibition on the use of fill is the most straightforward and surest way to protect floodplain storage. Compensatory storage is more complex. The premise is that if fill is placed in the floodplain it must be accompanied by removal of an equivalent volume of earth elsewhere within the floodplain in order to compensate for any increases in flood level. In order to ensure that the compensatory storage is hydraulically equivalent, engineering evaluations of the effects are required.



Activity 430 of the Community Rating System credits prohibition of fill and compensatory storage. See *CRS*

Credit for Higher Regulatory Standards for example regulatory language.

6.8 Reduce Exposure of Existing Buildings

A key step in administering your ordinance is determining whether work proposed for existing buildings constitutes substantial improvement. This provision, sometimes called the "50% rule," was put in the NFIP as a way to deal with older, non-conforming buildings. Over time, as buildings are repaired after damage, or when owners renovate, the rule should mean that they are brought into compliance. This often means the existing building is removed from its foundation and placed on a new, elevated foundation.

Because substantial improvement, which includes repair of substantial damage, prompts bringing buildings into conformance with the regulations, modifications to substantial improvement offer opportunities to further reduce exposure of existing buildings.

Lower Substantial Improvement/Damage Threshold. Existing buildings are subject to certain requirements if they are improved (including additions) or repaired. At a minimum, existing buildings are to be brought into compliance with the floodplain management requirements if the cost of improvements or repair of damage equal or exceed 50% of the market value of the building before the improvement or damage. Lower thresholds, for example 40% or 30%, have the effect of requiring more buildings to come into compliance, leading to reduced exposure to flood damage.



Section 430 of the Community Rating System has credited dry land access provisions.

Cumulative Substantial Improvement. Over the years, a community may issue a number of permits for different repairs or improvements to a single building. If none of the work proposed in each individual permit application triggers the substantial improvement requirement to bring the building into compliance with the floodplain regulations, then the building will remain at risk. Under the higher standard known as cumulative substantial improvement, the value of all improvements and repairs that are permitted is tracked over a specific period of time and, when the cumulative value meets a

It is important to keep in mind that you will have to enforce the cumulative provision for all buildings, even those not insured and eligible for ICC. A very important consideration is the kind of record keeping that you'll need to make this work. Remember, you'll need to be prepared to keep records for years, and may have to handle situations that become complicated by changes in ownership. See Chapter 9 for more information on Substantial Improvements.



Activity 430 of the Community Rating System credits keeping track of improvements to enforce a cumulative substantial improvement requirement.

6.9 Higher Standards for Buildings

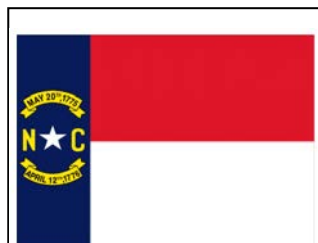
Once the decision to build in the floodplain is made, then you look to improve resistance to anticipated flood forces and conditions. There are a number of effective and proven ways to do this.

Sometimes the greatest opposition to “higher standards” comes from those who assume that it is more costly to meet such standards. Using freeboard as an example, of course it is marginally more expensive to elevate a building just one more foot higher than the minimum requirement. But when compared to the annual cost savings in flood insurance, in the long run property owners may realize some savings.

Freeboard. Freeboard is a factor of safety that results in elevating buildings above the BFE. Remember, the minimum elevation standard is based on the computed base flood elevation. There is nothing “magic” about the BFE – floodwater doesn’t stop rising just because it reaches that level. Floods can and often do rise higher. Remember too, that continuing development in upstream watersheds will, over time, cause more runoff, which may make flooding get worse. This is not taken into consideration in FEMA’s computations of the BFE.

Freeboard is the most common higher standard. Communities that adopt a freeboard usually do it to provide an inexpensive yet effective means to

Freeboard is a factor of safety that adds elevation above the BFE. Nationwide, the most common freeboard is one-foot, but some communities go as high as 3 feet.



The most common freeboard adopted by North Carolina communities is 2-feet above the BFE.

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in FEMA's computations of the BFE.

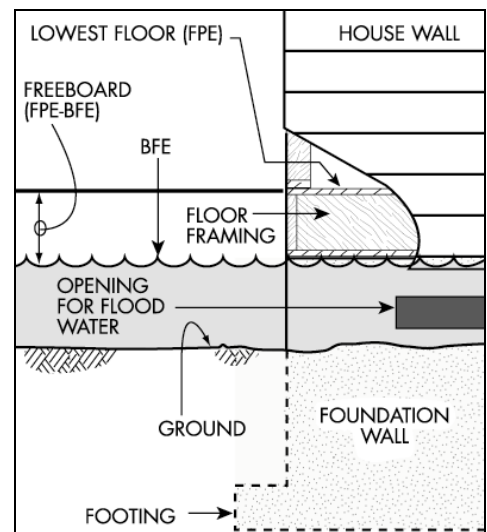
Freeboard is the most common higher standard. Communities that adopt a freeboard usually do it to provide an inexpensive yet effective means to increase protection and it is strongly recommended that at least a 1-foot freeboard be adopted to account for the one-foot rise built into the concept of designating a regulatory floodway and the requirements of 44 CFR §60.3(c)(10) where floodways are not identified. Some reasons for considering a freeboard are that it:

- Accounts for future increases in flood heights if additional development occurs in the floodplain
- Accounts for future flood increases due to upstream watershed development
- Acts as a hedge against backwater conditions caused by ice jams and debris dams
- Reflects uncertainties inherent in flood hazard modeling, topography, mapping limitations, and floodplain encroachments
- Provides added measure of safety against flooding
- Results in significantly lower flood insurance rates due to lower flood risk

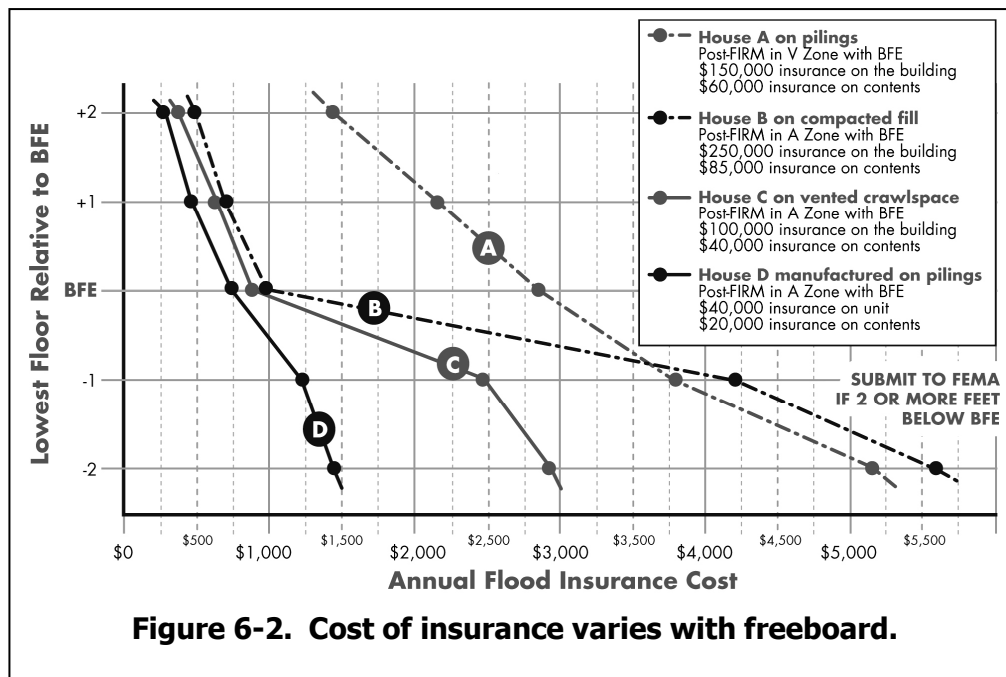
Because NFIP flood insurance premiums are rated based on the height of the lowest floor compared to the BFE, owners of buildings built above the BFE will enjoy lower cost insurance (see Figure 6-2). The one-time, up-front additional expense to build above the BFE is offset by annual savings.



Activity 430 in the Community Rating System credits freeboard. See *CRS Credit for Higher Regulatory Standards* for example regulatory language.



When at least 1 foot of freeboard is provided, only the foundation is exposed to flooding.



Require Alternative Analysis for Methods of Elevation. We're all familiar with beach houses that are elevated on pilings, but this method of elevation is not as common along many riverine waterways. All too often, without even thinking about it, we encourage fill by not suggesting that property owners consider different means of elevation.

Alternatives to filling should always be considered. Stem walls take up some floodplain volume, but less than if fill is used (stem walls involve structural foundation walls filled with earth and topped with a slab).

Solid foundation walls enclosing crawlspaces don't take up as much volume because floodwaters flow into the crawlspace area. This means crawlspace buildings in the floodplain are less likely to increase flooding. Such walls have to have the right size and number of flood openings to allow water to freely flow in and out. Also, sometimes people get upset when water surrounds their homes, even though they were designed that way.

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Non-residential building elevated on fill.



Homes elevated on prefabricated/masonry supports.



Home elevated on steel pilings.

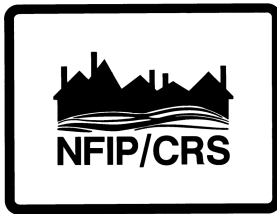
Protect Critical, Important and Vulnerable Facilities. Certain types of buildings serve critical needs on a daily basis or during the post-disaster period. Although there is no definition of which types are critical facilities, the term is generally understood to include emergency operations centers, disaster shelters, schools, fire and emergency medical stations, police stations, hospitals, water and wastewater treatment plants, power facilities, and community buildings that are occupied by important public services. Other facilities that warrant careful attention:

- Important public utility facilities, including power generating plants and transfer stations, landfills, solid waste incinerators and waste transfer stations
- Important public buildings, including, public libraries, museums, courthouses and other municipal buildings, and schools – especially those with vital records and irreplaceable collections
- Facilities that house vulnerable occupants, including nursing homes, prisons and jails, centers and group homes for the mentally and physically handicapped, and day-care centers
- Hazardous facilities, such as liquid and gas fuel tanks, petrochemical facilities, chemical manufacturing and storage facilities, research laboratories testing infectious biological agents, explosive manufacturing and warehousing, toxic waste facilities, and landfills that can present significant environmental and public health problems caused by leaks, spills, or ruptures resulting from flood damage.

Avoid Flood Hazard Areas. The best way to avoid flood damage to critical and important facilities is to avoid locating them in areas subject to flooding (whether the 1%-annual chance or a lower probability event).

Greater Level of Protection. If floodplain location is unavoidable, then an appropriate higher standard is to require location of new and substantially improved critical and important facilities outside of the 1%-annual chance floodplain or above the 500-year floodplain (or the flood hazard area based on the flood of record). Alternatively, designs for such facilities can be required to protect against damage, loss of use, and loss of access to at least the 500-year flood elevation (or to higher freeboard). Importantly, protecting the building to a higher level does not necessarily provide adequate safeguard to occupants, especially if floodproofing measures are employed. According to Executive

Order 11988, federal agencies must meet rigorous alternative site evaluations and design standards before funding, leasing, or building critical facilities in the 500-year floodplain.



Activity 430 in the Community Rating System provides credits for prohibiting critical facilities from the 100- and 500-year floodplains, or requiring them to be protected up to 500-year flood elevation. See *CRS Credit for Higher Regulatory Standards* for example regulatory language.

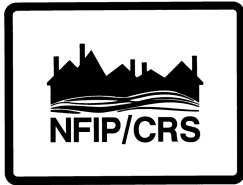
Require Designed Foundations. Historically, most attention has been paid to how high buildings are elevated, not whether they are designed and constructed to resist flood loads at specific sites. Buildings in A Zones are not required to have engineered foundations, despite the fact that many floodplains have high velocity water or other factors that may impose considerable loads.

Buildings are at higher risk of damage in floodplains where the velocities are high, or where significant amounts of floating debris may occur. A good way to deal with these situations is to require that all foundations be designed by a registered engineer or architect.

Requiring foundations to be designed and engineered for site-specific conditions will involve obtaining a design certification from a registered professional engineer or architect certifying the adequacy of all elevated building foundations and the proper placement, compaction, and protection of fill when it is used in building elevation. The drawback to this approach is the additional cost to property owners and whether it is justified given the flooding conditions anticipated.

The *International Building Code* and the *International Residential Code* have provisions applicable to foundations in flood hazard areas. The IBC refers to ASCE 7 for flood loads and combination loads (including debris impact loads). For construction in flood hazard areas, the IBC refers to ASCE 24, a standard for flood-resistant design and construction. Order these publications from www.asce.org. The IRC does not require designed foundations, although certain types of foundations in flood hazard areas have specified height limitations. The use of fill to achieve elevation is also addressed in the building code, including proper placement, compaction, and protection against erosion.

An alternative is to require a specific construction standard, such as the V Zone standard for the elevation of structures in coastal AE and AH Zones, and to allow alternative engineered designs, provided the necessary documentation is submitted to the municipality. Coastal A Zones are of particular concern since they are subject to wave actions of up to three feet in height. The NFIP Zone AE construction standards do not *yet* address this situation.



Activity 430 of the Community Rating System credits foundation protection. See *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Limit Enclosures Below BFE. When floodplain buildings are elevated, especially if more than 6-feet above grade, the area underneath may be enclosed. This is permitted, provided certain restrictions are met, including limiting the use of the space to parking, storage, building access, or a crawlspace. Experience has demonstrated that even small enclosures are likely to be modified by owners so that they are no longer compliant with one or more of the restrictions. To overcome this, communities adopt higher standards to prohibit enclosures or to limit their size.

Prohibit or Limit Enclosures Below BFE in V Zones. V Zones are areas where high velocity wave action is anticipated due to waves of 3-feet or higher. This means that considerable forces may be exerted on the foundation system and any portion of the building that extends below the BFE. Even properly designed breakaway walls do not always fail as expected, and damage can occur. Some communities may decide it is best to not allow enclosures (thus also solving the problem with illegal conversion to uses that are not allowed).

Imposing a small size limitation is another way to minimize future problems. Enclosures for building access need not be much larger than 100 square feet. Larger enclosures are the ones that tempt owners to convert an acceptable use (parking, building access or storage) to a use that is not allowable. Enclosures larger than 299 square feet in area are charged higher flood insurance rates.



Activity 430 of the Community Rating System credits limiting enclosure size or prohibiting enclosures below elevated buildings foundation protection.

Elevate All Manufactured Homes to the Same

Standard. Manufactured housing meets a significant part of the nation's demand for low- and moderately priced housing. However, it is known to be the most vulnerable type of structure in terms of the potential for flood damage. The NFIP regulations allow manufactured homes to be placed at different elevations, depending on various circumstances (such as if the unit is replacing one that was substantially damaged). When a community implements the minimum standards, it means different citizens are being protected to different levels of safety. A simple standard to implement is to require that all manufactured units be elevated to the same level as all other buildings.

Manufactured homes suffer a lot of flood damage, even when they are elevated. Consider alternative locations where possible.

Elevate Electric Service to Buildings. Electric companies are subject to the control of the state public service commission and generally are exempt from local regulations. In flood hazard areas where flood depths exceed the typical height of the electric meter, this generally means meters are not installed above the BFE. While routine meter reading and service is facilitated, it may mean longer recovery periods if meters must be replaced and electric service is delayed. Requiring or encouraging companies to install meters above the BFE facilitates recovery.

Require Minimum Height above Grade. Some areas of the state regularly experience prolonged rainfall. Where the topography is too flat to allow adequate drainage, the result can be standing water or shallow flow. Some FIRMs show these areas as AO or AH Zones, but many are not mapped as flood hazard areas. Requiring building's finished floor to be a minimum height above grade is a reasonable management standard that reduces future damage.

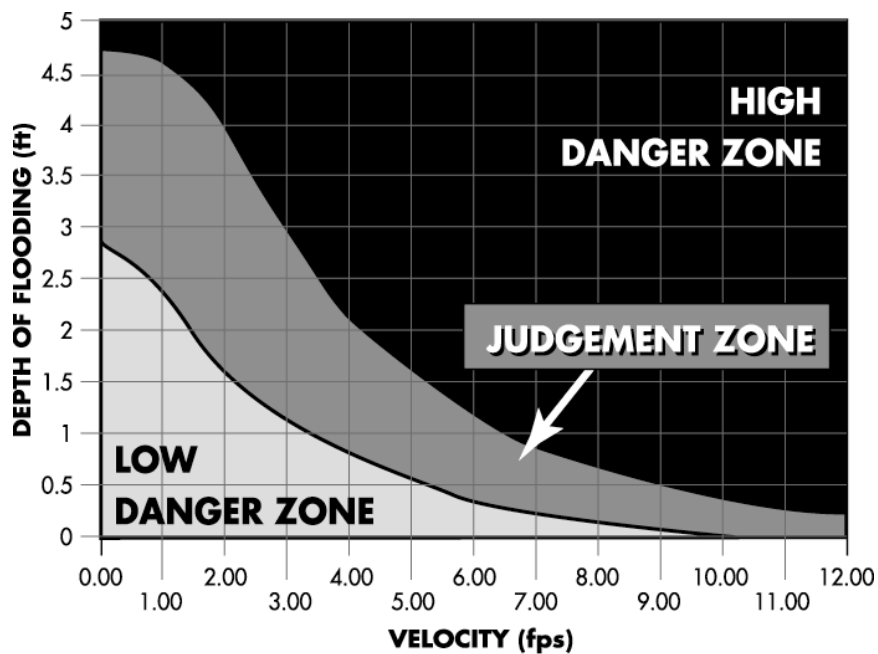
6.10 Safety Considerations

Government's authority to regulate flood hazard areas is, in part, based on protecting the public health, safety and welfare. So there are good reasons to consider evacuation safety in the development design process. One way to do this is to include your local emergency management agency in your review process, especially for large subdivisions.

Consider Evacuation Safety. Evacuation can be dangerous and complicated when water is fast-moving, but very deep water also causes problems.

To address evacuation safety concerns, you can:

- Require subdivisions to have at least one access road that is not subject to flooding;
- Require roads to be elevated to the BFE (or no more than 12" below the BFE), although as the depth of water increases this can mean a great deal of floodplain fill or obstruction of flow if not adequately accounted for in design;
- Depending on the nature of your flooding (i.e., fast onset/flashy or very frequent) consider how difficult it will be to evacuate people when homes are surrounded by more than three feet of water. Figure 6-3 illustrates how dangerous it can be for adults on foot in flooded areas: fast-moving water and deep water both present risks.



SOURCE: USBR. "Downstream Hazard Classification Guidelines." 1988

Figure 6-3. FLOOD HAZARD CHART FOR ADULTS. Depth – Velocity Danger Levels.

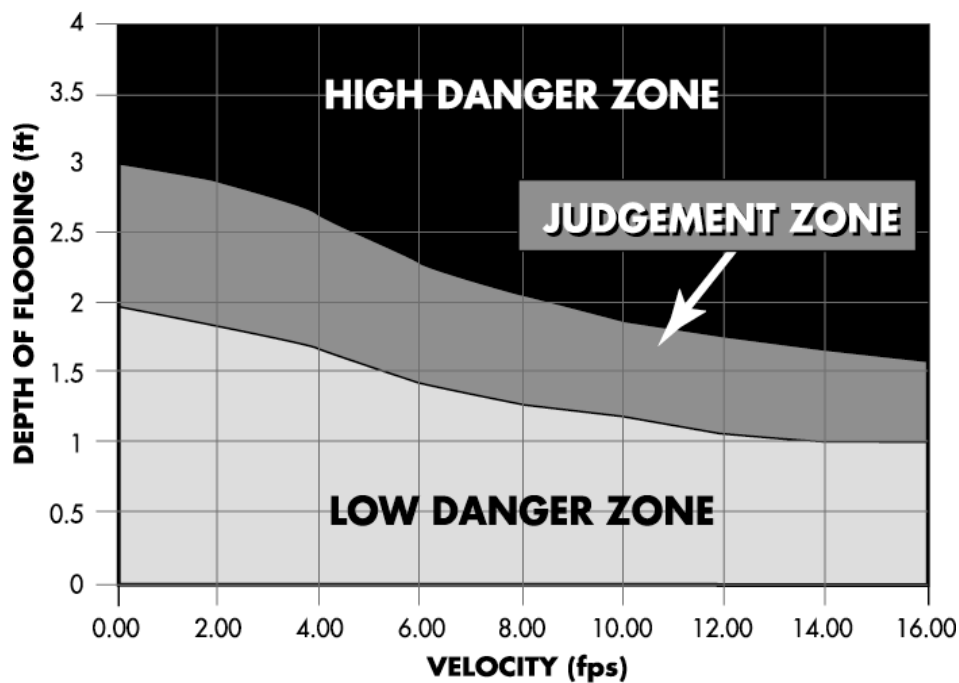
Consider Risks of Flood-Prone Roads. Remember some very important facts when it comes time to build, improve, or upgrade new roads that go through flood-prone areas and over waterways:

- The average car may float in 18–24" of water.
- Most flood-related deaths occur when cars are swept off flooded roads (Figure 6-4).
- Repairing and replacing roads, bridges, and culverts will be a costly post-flood expense that will affect your community's budget.

The NFIP does not require that roads meet specific design criteria, although when a floodway has been delineated there are some hydraulic considerations. This means it's up to each community to decide whether and how to require consideration of flood forces in road design.

Keep in mind that a flood-resistant bridge or culvert does not mean it has to remain dry during the base flood. It means it should be designed to withstand the passage of the flood – an important consideration is that erosion and scour protection of bridge abutments is provided.

One way to "withstand the passage" is to design a low spot in one of the approaches to a bridge so that floodwaters overflow at a specific point, rather than wash out the bridge. It is much cheaper to rebuild an earthen roadbed than it is to replace a bridge. In the long run, your community will save money and recovery time after the next big flood.



SOURCE: USBR, "Downstream Hazard Classification Guidelines," 1988

Figure 6-4. FLOOD HAZARD CHART FOR CARS. Depth – Velocity Danger Levels.

Dry Land Access. Fire prevention, evacuation, and rescue operations are common emergency response activities associated with flood disasters. The effectiveness and success of these efforts greatly depend on readily available access. However, streets and roads usually flood first. To improve access during floods, some communities have enacted ordinance provisions requiring dry land access during base flood conditions. In large measure, such a requirement results in buildings being located only on the very fringe or entirely outside of the floodplain.

While some local officials may feel that this approach is too restrictive, it is important to note that emergency response personnel die every year attempting to rescue flood-stranded citizens. Also, others may die or be seriously injured because they cannot be rescued in time (Figure 6-5).



Figure 6-5. Four people died in a 1978 flood when this Rochester, MN, nursing home was isolated by high velocity floodwaters, preventing firefighters from rescuing the occupants.

Naturally, there are some areas with floodplains so extensive that a developer cannot be expected to connect all lots to high ground. This is especially true in coastal areas where low-lying land allow storm surge flooding to extend inland for miles. As with all regulatory standards, you must carefully weigh the local hazard, the regulation's objectives, and the costs and benefits of meeting a higher standard.



Section 430 of the Community Rating System credits dry land access provisions.

6.11 Environmental Protection Measures

Sometimes it can be difficult to obtain the public and political support needed to plan and carry out local floodplain management measures designed solely to reduce future flood losses. Flooding may not occur often enough to be viewed as a local problem in need of a solution.

Support can often be gained by associating flood loss reduction with other broader community concerns, needs and goals. This can build a broader-based constituency for managing the community's floodplains and wetlands if other interests realize that their needs can also be met through their involvement and support. This, in turn, brings more resources and expertise into play. Then too, designing and packaging of funding proposals to meet a number of community goals can greatly enhance the likelihood of success in obtaining outside resources.

One such approach is to tie the need to manage floodplains to protect the economic well-being of the community with the need to protect and maintain the natural resources and functions floodplain areas possess. These resources and functions can be of considerable, often unrealized or underestimated, benefit to the community.

Manage Stormwater from Development. A floodplain management program in an urbanizing area must confront the increase in flood flows caused by upstream development. As forests, fields and farms are covered by impermeable surfaces like streets, rooftops and parking lots, more rain runs off at a faster rate; sometimes fivefold increases have been documented.

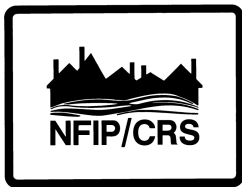
Changes in the surface drainage system compound this problem. Stormwater runoff travels faster on streets and in storm drains than it did under pre-development conditions. As a result, flooding is more frequent and more severe. Efforts to reduce the impact of increased runoff that results from new development in a watershed are known as stormwater management.

One way to reduce the impact of stormwater from new development is to require the developer to restrict the rate at which the increased runoff leaves the property. One common approach involves stormwater detention, in which the stored water is held for release at a restricted rate after the peak flows subside.

As an alternative to using a uniform standard for all areas, many communities regulate development according to a master plan that analyzes the combined

effects of existing and expected development on stormwater and flood flows in the watershed. Such watershed-specific regulations may allow different amounts of runoff for different areas in order to control the timing of increased flows into the receiving streams.

Instead of requiring developers to build stormwater facilities on-site, a plan may require them to contribute funds for a regional facility. By planning the runoff from entire watersheds, this approach can be more effective in reducing increases in downstream flooding.



Activity 450 of the Community Rating System credits both water quantity and water quality stormwater management regulations and plans. See *CRS Credit for Stormwater Management* for example regulatory language.

Strategies: Preservation and Restoration. Preservation and restoration are two basic approaches. Preservation strategies focus on strict control or prohibition of development in sensitive or highly hazardous areas (e.g., through establishment of wildlife sanctuaries), while restoration strategies focus on actions to improve the quality or functioning of degraded floodplains (e.g., by restoring damaged wetlands). It is not always possible – or necessary – to make a clear distinction between the two strategies.

Preservation and restoration of floodplain natural resources are often accomplished, either directly or indirectly, through a wide variety of development controls or by means of regulatory standards designed to protect valuable natural resources or minimize adverse impacts on those resources. These standards and controls are directed toward inland and coastal wetlands, estuarine and coastal areas, barrier beaches and sand dunes, rare and endangered species, riverine and coastal fisheries, and wild and scenic rivers. Two Federal regulations can have far-reaching effect:

- NEPA. When a federal agency proposes to fund a project located in a flood hazard area, the National Environmental Policy Act (NEPA) requires an evaluation of the project's environmental impact as part of the decision-making process.

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- Executive Order 11988. EO 11988 requires Federal agencies to check NFIP maps to determine if a proposed action is in a mapped floodplain. An eight-step process is to be followed to determine whether there are feasible alternatives to location. If there are no alternative locations, then damage reduction measures are to be implemented. In effect, Federal agencies must meet the NFIP standards.

Preserve and Restore Natural Areas. The natural functions and values of floodplains coupled with their hazardous nature have led communities to promote and guide the less intensive use and development of floodplains. More and more municipalities are requiring that important natural attributes such as wetlands, drainage ways and floodplain areas be set aside as open space as a condition to approving subdivision proposals.



Activity 420 Open Space Preservation in the Community Rating System provides substantial credit for preserving floodplain areas as open space (prohibiting buildings and fill). More credit is provided if the area has been kept in or restored to its natural state.

Wetland Protection. In many instances wetlands and floodplains are synonymous, i.e., most non-tidal wetlands are found in floodplains. Wetlands contribute to many of the natural resources of floodplains and to the natural functions they serve. When wetlands are destroyed or significantly impaired, nature's best protection against flooding is destroyed with them; wetlands naturally spread and absorb heavy rains and fast-flowing floodwaters, holding the water and releasing it slowly. This reduces the worst effects of storms and keeps nearby rivers and streams stable.

Wetlands also provide many water-quality benefits and attract wildlife. They remove sediment, nutrients and other pollutants from water before they reach streams and inlets. Studies show that wetlands can remove nearly 90 percent of the sediment and 50 percent of the nutrients from agricultural runoff. Many animals, including most fish and shellfish, depend on wetlands sometime during their life cycles. Local and migratory waterfowl also depend on wetlands for food, shelter, breeding, and wintering grounds.

For these and other reasons, all coastal states and many inland states regulate wetlands. The coastal regulatory programs of some states outline minimal

criteria for permit issuance, whereas other states consider the cumulative impacts of development during the permit review process. Inland wetlands generally receive less protection than coastal wetlands.

The desire to reduce the cumulative impacts of wetland losses has led many jurisdictions to adopt a “no net loss of wetlands” policy. No net loss is addressed either in terms of acreage or the functional value of the wetlands. Despite these programs and other such efforts, the nation loses many acres of wetlands each year, mostly in floodplains.

The major regulatory tool at the federal level for managing floodplain natural resources is the Section 404 regulatory program established by the Clean Water Act. Jointly administered by the Corps of Engineers and the U.S. Environmental Protection Agency (EPA), the Section 404 program regulates the discharge of dredged or fill material into the waters of the United States, including adjacent wetlands.

The Section 404(b)(1) guidelines provide extensive environmental criteria for judging permit applications and emphasizing the need to prevent avoidable losses of aquatic resources, as well as the need to minimize adverse environmental impacts.

In 1996, North Carolina Wetlands Restoration Program legislation was passed addressing wetland mitigation requirements of the Clean Water Act. State agencies such as the North Carolina Department of Transportation, Ecosystem Enhancement Program (EEP) have developed Memorandums of Agreement (MOAs) to address these issues.

Rare and Endangered Species. Undeveloped floodplains can contain habitat for rare and endangered plant and animal species. On the federal level, the Endangered Species Act of 1973 directs federal agencies not to undertake or assist projects that would adversely affect species listed as endangered. In North Carolina, endangered species include the Cape Fear shiner whose habitat is considered critical mostly due to dam development in the Cape Fear River system.



On-Site Sewage Disposal. Most communities regulate the design, location, and placement of on-site sewage systems (often through health regulations). Because the objective of such programs is to prevent surface and subsurface contamination, there are many limiting factors in selecting a proper site and in designing an appropriate system. Areas with the following characteristics are less than desirable for the placement of on-site systems: high groundwater tables, impervious soils, certain types of porous soils, and potential for flooding.

Non-Point Source Pollution Control. States, conservation districts, or communities may have soil erosion and sedimentation regulations in effect to curb soil displacement when a site is under development. Buffer zones or stream setbacks may apply to on-lot disposal systems, timber harvesting, tilling of soil, mining, or to development in general, to protect stream quality, especially those streams of exceptional value. These requirements are often part of, or complement stormwater management regulations.

Point Source Pollution Control. Since the enactment of the Clean Water Act and related state legislation, more care is being given to the regulation of direct discharges into waterways. The water quality of many rivers and streams has improved as a result, and the diversity and health of fish and wildlife habitats is improving as well.

Special Designations. Often stream corridors have been determined to possess special value or importance to an area, region, or state. These corridors are given special designations and afford an extra level of recognition and protection.

In North Carolina, five river segments have been given a state or federal natural, wild, or scenic river designation: the Chattooga River in Jackson County; South Fork of the New River and the New River in Watauga, Ashe and Alleghany Counties; Wilson Creek in Avery, Caldwell and Burke Counties; Horsepasture River in Transylvania County; and the Lumber River in Scotland and Robeson Counties.

Wild and scenic river programs at the federal and state levels are examples of programs designed to encourage and promote their protection. While such programs are not necessarily regulatory in nature, they do encourage proper

planning and land use control, discourage unwanted development, and guide federal and state actions, accordingly.

6.12 Flood Hazards of Special Concern

Flooding is commonly associated with the overflow of rivers or streams onto the adjacent floodplain or by coastal storms. Chapter 1 describes flood-related hazards, which may involve destructive and high-risk situations and create flood hazards of special concern. In some instances, high-risk flood areas are not identified or required to be regulated through the NFIP. For example, dam break inundation areas and extreme hurricane storm surge areas are not shown on the FIRMs.

Depending on location, a community might experience one or more flood-related hazards. Table 6-4 outlines some possible management options.



More information on these hazards and the Community Rating System credit for mapping and managing them is found in *CRS Credit for Special Hazard Areas*. Additional information is found in *Reducing Losses in High Risk Flood Hazard Areas*, FEMA-116.

Table 6-4. Reducing Flood Losses in Special Risk Areas			
Hazard	Special Risk Factors	Area of Occurrence	Management Options
<i>Alluvial Fans</i>	• Meandering drainage channels • Velocity • Sediment and debris • Erosion	Primarily mountainous areas in the west and southwest	• Prohibit development on fans or, if it is to occur, require elevation on pilings or other open foundations to protect against damage from water velocities and debris. • Identify and map fans as high-risk areas. • Develop and implement a drainage master plan if development is to occur on fans. • Limit grading, paving, and channelization unless consistent with the master plan. • Construct floodwalls, drainage

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			channels, debris basins.
<i>Areas Behind Unsafe or Inadequate Levees</i>	• Water depths • Velocity • Duration • Suddenness	Riverine areas throughout the country	• Identify and map levees and assess their adequacy. • Define inundation zones for areas behind unsafe or inadequate levees and interior drainage systems. • Require periodic inspection and maintenance of levees. • Adopt building standards based on risk of breaching or overtopping. • Require pump systems and other methods for dealing with internal drainage behind levees. • Install or require installation of warning systems and evacuation plans for areas protected by unsafe or inadequate levees.
<i>Areas Below Unsafe or Inadequate Dams</i>	• Water depths • Velocity • Suddenness • Debris in water	Riverine areas throughout the country	• Coordinate floodplain management and dam safety programs. • Identify and map dams and assess their adequacy. • Identify dam break inundation zones for inadequate or unsafe dams; determine flood heights; map floodway and flood fringe. • Abate or require abatement of unsafe or inadequate dams. • Restrict new development below unsafe or inadequate dams. • Require dam owners to prepare dam inspection schedules and maintenance plans; meet yearly with dam owners to review these schedules or plans. • Prepare or require dam owners to prepare warning systems and evacuation plans for areas below

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			unsafe or inadequate dams. • Manage reservoirs to optimize flood hazard reduction.
<i>Coastal Flooding and Erosion</i>	• Structural damage as buildings are undermined • Potential rapid land erosion from storms • Complete destruction of land (in some instances)	Barrier islands, bluff areas (Great Lakes, West Coast), beaches	• Gather existing erosion studies and historic data and prepare general or specific maps based upon these or other data. • Adopt setback lines to prohibit development on erosion-prone land and on protective land features such as dunes. • Adopt building performance standards pertaining to depth and specifications for pilings, groins, seawalls, use of septic tanks, and surface drainage. • Acquire undeveloped coastline and relocate structures. • Rebuild beaches and dunes.
<i>Flash Flooding</i>	• Rapid increase in water depths • Suddenness • Velocity • Debris (often)	Principally mountainous regions in valleys with steep slopes; also urbanizing areas where water runoff is rapid	• Collect historical data on flash flooding and use it and engineering studies to map flash flood inundation areas. • Prohibit development and other activities (e.g., campgrounds) in high-risk areas. • Require that new development in other areas be constructed consistent with water velocities and potential debris load. • Install or require developers to prepare warning systems, prepare and implement evacuation plans. • Require that subdividers install onsite flood detention and design drainage systems to reduce flash flood potential. • Mark areas. • Construct reservoirs and other

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			devices to reduce flash floods.
<i>Long-Term Fluctuation in Lake Levels</i>	• Long duration • Waves and ice • Lake quality degradation as flooded sewage systems fail • Ground water quality degradation as flooded wells act as conduit to transfer lake water to aquifers	Primarily northern states (glacially formed lakes) with water elevations dependent upon ground water levels; lakes in western states without outlets	• Map the historical bed of the lake. • Adopt floodplain, shoreland, and wetland ordinances to control development in such areas. • Require elevation of structures and public utilities on fill (not pilings). • Prohibit septic and water systems in flood areas if development is allowed to occur. • Adopt setback lines or extra freeboard to reduce damage from waves and ice damage to structures if development is to occur. • Acquire flood-prone lands and relocate threatened structures. Install pumps and other engineering works to reduce or stabilize lake levels.
<i>Mud Floods and Mudflows</i>	• Debris • Velocity (in some instances) • Suddenness	The arid and semi-arid west; Appalachia; other mountainous areas	• Gather and use available data to map mud flow areas. • Require developers in slope areas with unconsolidated soils to prepare engineering studies. • Prohibit development in high-risk areas; require that developments in other areas be constructed on compacted fill or with adequate foundations on pilings to accommodate expected water and debris. • Construct debris basins, retaining walls, and other measures.
<i>Ice Jam Flooding</i>	• Unexpected flood levels • Suddenness	Principally 35 northern states including Alaska; jams occur most often at	• Collect historical data on ice jam floods and use it or engineering studies to map ice jam inundation areas.

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	• High velocity • Debris (ice floes)	constriction point in river valleys	• Adopt setback lines. • Require additional freeboard to protect against ice. • Adopt construction standards, especially for floodproofing, that consider ice damage. • Acquire hazardous lands and relocate structures that cannot be protected. • Develop a warning system and emergency action plan. • Undertake remedial engineering measures.
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Chapter 7 The Ordinance and the Players

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7.1 Introduction

The NFIP requires that the local ordinance be legally enforceable and enforced uniformly throughout the community (44 CFR 60.1(b)). There are also some record keeping requirements that are used to help verify community and building compliance with the regulations.

Communities can establish administrative procedures that are compatible with their other regulations and ordinances. This manual refers to the local Floodplain Administrator as though a single person is responsible for the entire floodplain management program. In many communities the responsibilities are carried out in more than one agency. However, the NFIP requires that a single position be designated. The ordinance administrator's activities fall into two broad categories:

- Helping developers and property owners understand and comply with ordinances so that their projects do not endanger lives, other property or natural resources
- Providing local elected and appointed officials with facts, procedures and advice needed to make, review, and enforce decisions and to amend ordinances to accommodate changes

If FEMA finds that a community's program is not in full compliance with its NFIP obligation, then certain administrative adjustments may be required. How the program is administered, though, is dependent on the State's enabling

legislation and the administrative practices currently used or established by the community.

This chapter is a series of recommended administrative procedures; those that are NFIP requirements are highlighted in the “44 CFR” regulation boxes.

7.2 Authorities

This manual assumes that your community has a floodplain ordinance and/or other regulatory mechanisms in effect. Communities are encouraged to review their ordinances to ensure they are current, starting with the NFIP’s planning considerations outlined in Chapter 6.

Statutory Authority. As used in this manual, ordinance is the generic term for a law passed by a local government or community. As used by the NFIP, the term “community” refers to any political subdivision of a state that has land use authority, including counties, cities, towns, municipalities, villages and Indian tribes or authorized tribal organizations.

Communities are created by the state. Their powers are granted by and limited by state law or statutory authority or enabling legislation. North Carolina has a specific law Senate Bill 300 and Flood Damage Prevention Ordinances to enact and enforce floodplain regulations.:

- The purpose and limits of the regulatory authority—for example, your community may not be able to regulate development projects undertaken by state agencies or public utilities.
- Minimum regulatory standards—many states mandate a certain building code or floodway encroachment standard.
- Prerequisites for enacting or amending the ordinance—a zoning ordinance may have to be based on a comprehensive plan or be adopted only after a public hearing.
- Requirements for issuing variances or allowing special uses.
- Prerequisites for the administering official—the community may have to have a certified building official enforce its building code.



Model ordinances developed by the North Carolina NFIP State Coordinating Office are in Appendix C.

7.3 Approaches to Floodplain Management

Floodplain requirements may be are usually found in one or more types of regulations that work together in a comprehensive program. Requirements may be contained in zoning

ordinances, building codes, subdivision regulations, sanitary regulations, and “stand-alone” ordinances.

“Stand-Alone” Ordinance. Most communities in the NFIP have enacted a separate ordinance that includes all the NFIP regulatory requirements, usually based on a FEMA or state model.

Some people consider a “stand-alone” ordinance to have an advantage because all floodplain development standards are found in one place. Property owners and developers can readily see the requirements, and FEMA and the state can easily see if it contains the most current and applicable requirements.

The disadvantage to a “stand-alone” ordinance is that it may not be coordinated with other building, zoning or subdivision regulations. Lack of coordination may result in inconsistency or even contradictions with other regulations.

If you have a stand-alone ordinance, you should review its provisions with all other offices and ordinances that regulate land development and building construction. Make sure that others know the floodplain regulations and that there are no internal inconsistencies.



Building Codes. A building code establishes construction standards for new buildings and repairs, alterations, improvements and additions to existing buildings. Building codes generally do not establish site or location requirements, which usually are implemented through subdivision regulations, grading regulations, zoning ordinances, or other land development regulations.

FEMA worked closely with the International Code Council in developing the code to assure consistency with NFIP requirements¹. The requirements that relate to the actual design and construction of buildings are reflected in the bodies of the *International Building Code* and *International Residential Code* (2003 and later editions). Requirements related to building utilities are contained in the *International Plumbing Code*, *International Mechanical Code*, *International Fuel Gas Code*, and the *International Private Sewage Disposal Code*. The 2003 edition of the



Since 2001, North Carolina communities have administered the International Code Series, which includes provisions for flood-resistant design and construction.

¹ The NFPA 5000, a model building code developed by the National Fire Protection, also has been found to be consistent the NFIP.

International Existing Building Code contains requirements related to substantial improvements.

North Carolina has adopted the International Codes (I-Codes) including the Building Code, Residential Code, Fire Prevention Code, Plumbing Code, Mechanical Code and Energy Code. All are 2002 version, First Printing.

The other NFIP requirements, such as administrative provisions, and requirements that apply to floodways, subdivisions and manufactured homes are contained in Appendix G of the *International Building Code*. **Communities that adopt the I-Codes have the option of either adopting Appendix G or addressing these other NFIP requirements through other codes and regulations.**

FEMA supported incorporation of NFIP's building design requirements into the I-Codes because these requirements are be more effectively administered as part of a building code with full involvement of the community's building department. *Reducing Flood Losses Through the International Codes: Meeting the Requirements of the National Flood Insurance Program* was prepared by the International Code Council and FEMA to help communities examine coordination of building codes and other regulations that, together, form a comprehensive approach to floodplain management. Your community will need to:

- Make sure that all applicable NFIP requirements are met in the I-Codes and your other codes and ordinances.
- Make sure that amendments to the I-Codes do not make the code inconsistent with NFIP minimum requirements.
- Designate which community agencies are responsible for meeting various NFIP requirements and establish administrative procedures to assure that coordination occurs between these agencies on individual development proposals.
- If a State agency directly enforces the I-Codes for certain categories of buildings, make sure you work out similar procedures with that State agency.



Activity 430 in the Community Rating System credits adoption of the *International Building Code* and/or the *International Residential Code*.

Subdivision Regulations. Subdivision regulations govern how

land can be divided into single lots. They set construction and location standards for the infrastructure the developer will provide, including roads, sidewalks, utility lines, storm sewers and drainageways. As noted in Chapter 4, subdivision regulations offer an opportunity to keep buildings out of the floodplain entirely with cluster developments or at least in the shallower flood fringe areas.

Subdivision regulation may be written to require that every lot have a buildable area above the BFE, include dry land access, and meet other standards that provide protection through siting and location, which are not addressed in a building code.

Zoning Ordinance. A zoning ordinance regulates development by dividing the community into zones or districts and setting development criteria for each district. Two approaches have been used to address development in flood-prone areas: separate districts and overlay districts.

When identified as a separate district, the floodplain can be designated as one or more separate zoning districts. The floodway may be designated as one district, while the fringe is designated as another. The benefit of separate zoning districts is that a community can clearly identify and limit allowable uses, for example only uses that are not susceptible to flood damage (public use, conservation, agriculture, and cluster or planned unit developments that keep buildings out of the floodplain, wetlands and other areas that are not appropriate for intensive development).

Overlay zoning does not change the underlying zone, but adds special requirements in areas subject to flooding. Thus, area can be developed in accordance with the underlying zone limitations, provided the additional flood protection requirements are met. As illustrated in Figure 7-1, there may also be setbacks or buffers to protect stream banks and shorelines or to preserve the natural functions of the channels and adjacent areas.

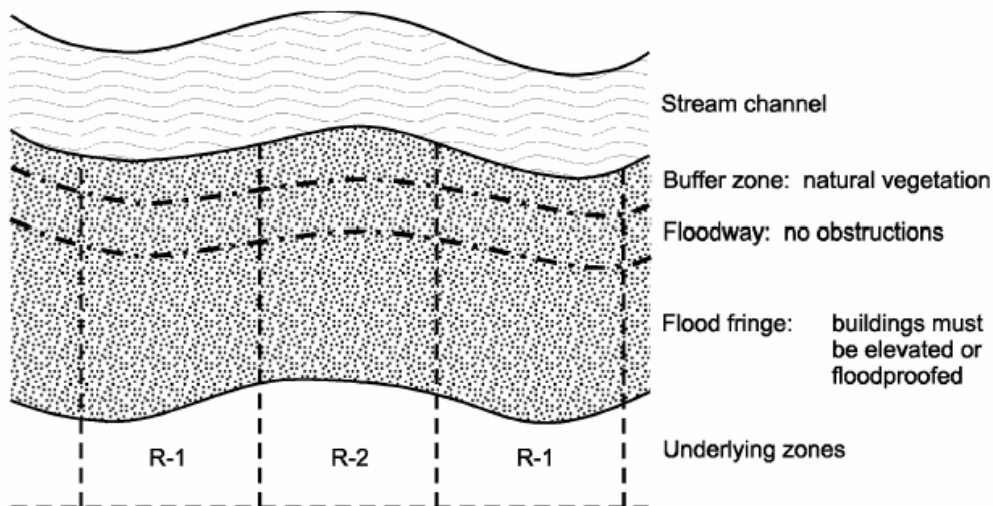


Figure 7-1. Example of overlay zoning

Sanitary Regulations. The NFIP's requirements for water and sewer system protection are sometimes located in the regulations that set the construction standards for these systems. In North Carolina, please refer to the guidance of the North Carolina Department of Environmental and Natural Resources Division of Environmental Health at http://www.deh.enr.state.nc.us/osww_new/new1/index.htm and your local community ordinances for more information.

7.4 Contents of the Ordinance

Floodplain management ordinances have these provisions:

- **Purpose:** This provision helps set the tone for regulatory standards and explain why it was adopted and its objectives. For example, if the only stated purpose of the ordinance is to meet the NFIP minimum building requirements, a court may rule that it should not have higher regulatory standards that protect life safety.
- **Definitions:** Ordinances must define technical terms like "development," "building," "base flood elevation" and "lowest floor" in order for the regulations to be clearly understood.
- **Adoption of flood data:** The ordinance (or another official act) must adopt the flood maps, profiles and other regulatory flood data. This provision may need to be amended when new studies are published or new

areas are annexed. In North Carolina, When FEMA provides an NFIP-participating community with new flood hazard information in a DFIRM and/or FIS Report, the community is required to adopt or amend its floodplain management regulations to reflect and administer based on the new data and effective date or demonstrate that it has a valid automatic adoption clause.

- Requirement for a development permit: The ordinance must have a development permit process. Relying solely on your community's building code or zoning ordinance permit process may not be sufficient because those programs may not require permits for all development, including fill, mining, etc.
- Construction standards: It should cover all of the NFIP standards discussed in Chapter 5, standards required by the State, and higher standards applicable to the community.
- Designation of Floodplain Administrator: The community must officially designate one position or office that is responsible for administering the ordinance. This provision may outline the duties of the Floodplain Administrator.
- Appeals process: The regulations need to provide a way for people to appeal or request a variance when they feel that the requirements are overly harsh or inappropriate. This process should be handled by a separate body, such as a board of appeals, the planning commission, or a committee of several department heads. Appeals must be decided by a single person, such as the administrator.
- Enforcement: The ordinance must have enforcement procedures clarifying penalties for violations, usually fines and orders.
- Abrogation and greater restriction: This is a legal provision that specifies that the ordinances take precedence over less restrictive requirements.
- Severability: This is a statement that the individual provisions are separable and if any one is ruled invalid, it does not affect the validity of the rest of the ordinance.

7.5 The Players: The Local Floodplain Administrator

Throughout this manual, the person designated as responsible for administering the floodplain management ordinance is called "the Floodplain Administrator." This manual also assumes that you are the Floodplain Administrator, so the terms "you" and "the Floodplain Administrator" are used interchangeably. The local Floodplain Administrator might be an existing local

staff person, such as the building inspector, community zoning official, engineer or planner. The community also might contract to have the job done by the county, regional planning agency, another jurisdiction or authority, or a private firm.

Chapter 2 outlines all of the responsibilities that are assigned to the local Floodplain Administrator. Some key functions include:

- Advise applicants of the ordinance provisions and development standards, issue permits allowed by the ordinance, advise applicants of appeal rights and procedures
- Interpret flood hazard information, determine when a floodplain permit is required, approve BFEs to be used
- Transmit conditional permit and appeal forms and case records to the appropriate board, committee, or commission, and provide professional testimony on the case
- Inspect development for compliance with the ordinance, or ensure the inspections are conducted and documented
- Report violations to the appropriate planning commission, zoning committee, and legal officer of the community, and following through to ensure the violation is corrected
- Keep complete records of resource data, permits issued, inspections made, Elevation Certificates submitted, and other official actions
- Notify state and federal officials of certain actions
- Maintain and update a complete set of community floodplain maps and the Flood Insurance Study for access by landowners and developers
- Cooperate with Community Assistance Visits

Qualifications. North Carolina encourages minimum qualifications for the local Floodplain Administrator by through the North Carolina Certified Floodplain Manager (CFM) program sponsored by the North Carolina Association of Floodplain Managers (www.ncafpm.org) in partnership with the Association of State Floodplain Managers, Inc., (www.floods.org).

North Carolina Association of Floodplain Managers (NCAFP) assists the North Carolina Division of Emergency Management to develop codes and standards through the Department of Insurance (DOI) for



updating the floodplain development chapter in the state building code and actively lobby the North Carolina Building Code Council to adopt such revisions. Other goals and objectives include:

Information Distribution Plan communicating floodplain management efforts among various groups (Federal, State, County, City, Consultants, Engineers, etc) including:

- **Information Network** exchange information concerning floodplain management issues.
- **Expanded Workshops** working closely with the North Carolina Division of Emergency Management to assist the Division in enhancing the quality of workshops relating to issues pertinent to the Association.
- **Certification Program** this program will work in concert with the ASFPM effort to establish a nation-wide certification program.

The Association of State Floodplain Managers, Inc., has developed a certification program to recognize professionals who demonstrate a sound working knowledge of the NFIP and its application through local permitting programs. Check **www.floods.org** to learn more about the Certified Floodplain Manager (CFM) program and to join ASFPM.

It is important that elected officials provide the opportunity for the designated local Floodplain Administrator to acquire the training and qualifications needed to do a good job. Local Floodplain Administrators, and other community staff who support the function, generally are land use planners, code officials, engineers and environmental planners. Assistance may be needed from time to time from:

- Engineers – some tasks should be conducted by an engineer experienced in hydrologic and hydraulic studies, such as reviewing a developer's flood study before you accept new flood elevations.
- Surveyors – you may need help from a registered land surveyor if you complete Elevation Certificates; while there are limited instances where a properly appointed local Floodplain Administrator can complete an Elevation Certificate, most states require that such work only be done by a registered land surveyor or civil engineer.
- Attorney – you should always consult your community's attorney before you initiate an enforcement action.

Training for Local Floodplain Administrators. As your community's local Floodplain Administrator, you will probably need to learn about the NFIP and floodplain management, including:

- The basic NFIP requirements
- How to use the NFIP maps and regulatory flood data, and how maps are reviewed and revised
- When permits are needed
- Whether a proposed project meets the standards
- How to inspect and determine whether a project complies with the approved plans
- What records must be kept
- How to deal with violations to achieve satisfactory resolution
- How floodplain development regulations and flood insurance rating are related
- Where citizens and builders can get more information or help

These topics are not taught in high school or most college programs. There are several options to get the additional training to do a good job:

- Read this manual and other basic references on floodplain management
- Spend time an experienced floodplain administrator in a neighboring community
- As for individual help from the NFIP State Coordinator as you review and issue permits for the first few applications
- Request a Community Assistance Visit to have a FEMA or state person visit you and review your procedures
- Attend a workshop put on by the NFIP State Coordinator or the North Carolina Association of Floodplain Managers
- Attend a conference of the North Carolina Association of Floodplain Managers
- Attend a training or refresher course for the Certified Floodplain Manager program
- Attend courses at FEMA's Emergency Management Institute (EMI) in Emmitsburg, MD (three pertinent courses are National Flood Insurance Program/Community Rating System, Digital Hazard Data (how to use

digital FIRMs and other data), and Retrofitting Flood-prone Residential Buildings)

Professional Liability. Local Floodplain Administrators naturally are concerned that they could be held liable if a person gets flooded or if a building that they permit is damaged by a flood. Debated nationally for some time, this issue has been studied extensively by Dr. Jon Kusler, a nationally known attorney in floodplain management law.

In 1992, Dr. Kusler summarized his findings in *Floodplain Management in the United States: An Assessment Report*, Volume 2, prepared for the Federal Interagency Floodplain Management Task Force. Excerpts from that report are quoted here. However, your community's legal department should provide more specific guidance.

- Government agencies are generally not liable for flood damage unless the flood was caused by a government action. "Except in a few instances, governments are not liable for naturally occurring flood damages. Government has, in general, no duty to construct dams, adopt regulations, or carry out other hazard reduction activities unless required to do so by a statute. It is only where a government unit causes flood damages or increases natural flood damages that liability may arise." (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1012)
- Liability is based on negligence; a community is well defended by a properly administered program. "In general, government units are not 'strictly or absolutely' responsible for increased flood damages. Liability usually results only where there is a lack of reasonable care. ... Where the standard of reasonable care is judicially applied to an activity, the seriousness of foreseeable threat to life or economic damage is an important factor in determining reasonableness of conduct. In general, the more serious the anticipated threat, the greater the care the government entity must exercise. (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1013)
- Policy or discretionary actions are more defensible than nondiscretionary, ministerial actions. It is better to have clear standards spelled out in the ordinance adopted by your governing board than to leave a lot of interpretation up to the administrator. "As a general rule, courts do not hold legislative bodies or administrative agencies liable for policy decisions or errors in judgment where the legislature or agency

exercises policymaking or discretionary powers. But they often hold agencies responsible for failure to carry out nondiscretionary duties or for negligence in carrying out ministerial actions.” (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1013)

- “... from a legal perspective it may be desirable to submit proposed standards ... to a community's legislative body (e.g., community council) for debate and approval. Due to the special way legislative decisions are treated by the courts, legislative judgments, particularly those of a discretionary nature, are less likely to result in a successful liability suit than are agency decisions. Courts generally defer to legislative judgment.” (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1017)
- Government employees are usually protected from liability suits. “Although governments may be liable for increased flood or drainage losses in a broad range of contexts, government employees are usually not personally liable for planning, permit issuance, operation of dams, adoption of regulations or other activities. ... No personal liability results where a government employee acts in good faith, within the scope of his or her job, and without malice. Successful lawsuits for hazard-related damages against government employees under common law theories or pursuant to Section 1983 of the Civil Rights Act are apparently nonexistent.” (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Pages 1013 - 1014)

Based on these findings, communities and local Floodplain Administrators can protect themselves from lawsuits by:

- Adopting sound and appropriate flood protection standards: Remember, NFIP standards are minimums. Buildings should not be allowed in a mountainous floodplain with no warning time and very high velocities, even though the NFIP minimums would allow it. If you know flooding could be or has been higher than the BFE shown on the FIRM, you are not doing your residents any favors by allowing them to build buildings exposed to a known hazard.
- Becoming technically competent in the field: You won't be sued if you have ensured that the project was properly constructed. There is no grounds for a suit if no one is damaged by flooding: “... liability can be avoided if flood damages are avoided.’ From a legal perspective, this is a

sound philosophy.” (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1017)

- Insuring the community: Your community may want to purchase liability insurance or establish a self-insurance pool or plan to protect itself.
- Encouraging property owners to buy flood insurance coverage. If people are compensated for any flood losses, they are less likely to file a lawsuit.
- Adopting an ordinance provision that exempts the community from liability. Some states have model ordinances with a disclaimer of liability. See below, the Disclaimer of Liability from the North Carolina Model Flood Damage Prevention Ordinance, Non-Coastal Regular Phase.

SECTION G. WARNING AND DISCLAIMER OF LIABILITY.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering consideration. Larger floods can and will occur. Actual flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the Special Flood Hazard Areas or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of _____ (*community*) or by any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

7.6 Other Community Players

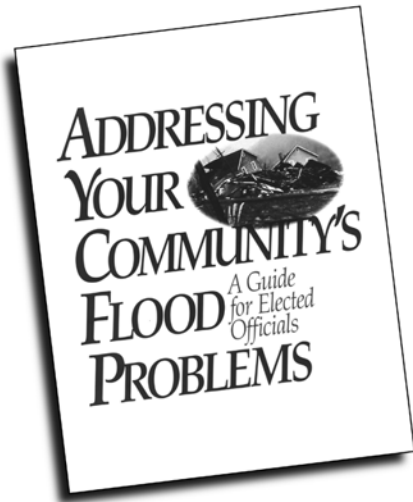
Elected Officials. Elected officials should make sure that floodplain management goals are consistent with community-wide planning and development goals and

guidelines. Lending support to the local Floodplain Administrator

will help smooth the permitting process.

Elected officials also play a key role in informing the public about flood hazards and how to obtain information on flood insurance, building permits, and ways to make homes and businesses safer.

Get your copy of the Elected Officials booklet by calling the State NFIP Coordinator or at <http://www.fema.gov/library/viewRecord.do?id=1653>.



In 1996, a joint project of the Association of State Floodplain Managers, Inc., and the Federal Interagency Floodplain Management

Task Force produced *Addressing Your Community's Flood Problems: A Guide for Elected Officials* (available at

<http://www.fema.gov/library/viewRecord.do?id=1653>). Complete with descriptions of real situations, this guide outlines how floods can affect communities, what elected officials can do before a flood, situations that come up after a flood, and resources available to help.

Planning Committee, Commission or Agency. The exact function of a planning advisory body may vary from community to community. Generally they are composed of appointed citizens and staffed by the community's planning department. These groups advise local elected bodies on community policy issues and they may prepare or approve plans based on those policies. Planning committees advise on ordinance amendments and may decide on conditional uses (special exceptions) and/or variances.

Board of Appeals/Variance Board. Zoning ordinances and floodplain management regulations cannot be written to anticipate every imaginable situation, and ambiguous language or misinterpretation can cause disagreements. This necessitates that a knowledgeable board or committee be designated to resolve appeals. Some communities have a board composed of pointed members of the public; others designate a committee of at least three department heads or senior staff.

These bodies settle land use ordinance disputes and challenges to building code interpretations. If delegated by the local governing body, they may consider conditional use permit applications. They also consider appeals (allegations of errors by the administrator), requests for variances (for unique situations pertinent to the land), and apply or interpret certain ordinance provisions:

Legal Counsel. The community's legal counsel advises local officials. They are most commonly called upon to review regulations, to advise on violations, variance requests and appeals.

Citizens. Since floodplain management programs protect public interests – lives, property, and waterways – citizens have both the right and the responsibility to become involved in program decisions. Public involvement can begin with ordinance adoption or amendment and continue through proposal and review of individual projects. Much of the time spent in early and frequent contact with citizens and local interest groups can reduce time spent in disputes later on.

Citizens are affected parties: they may comment on proposed ordinances and amendments, appeal a decision to the board of adjustment or appeals, and report violations. When ordinance changes are contemplated or required, the NFIP has a specified set of public notice procedures. These formal notices can be supplemented with press releases, radio talk shows, local workshops, and other public information activities.

7.7 State and Federal Agencies

State Assistance. North Carolina's State Coordinating Office, located in the Division of Emergency Management, is specifically charged with being a link between FEMA and communities. The State NFIP Coordinator keeps up with NFIP issues and how the specifics in the regulations have been interpreted in many situations. Other ways this office can help with floodplain management include:

- Advice on improvements to administrative procedures for issuing permits, handling variances, inspecting construction, and enforcing violations
- Review ordinance amendments to ensure NFIP compliance
- Explain how to use flood hazard maps, including how to seek revisions
- Assist with applying for the Community Rating System
- Conduct training workshops

- Perform Community Assistance Visits
- Provide reports on community compliance to FEMA



Table 7-1 lists the North Carolina state agencies have regulatory authority and those that provide planning and technical assistance, including information, data, and expertise that may not be available locally. These agencies may also help interpret and effectively utilize flood hazard data. More detail on these agencies is included in Appendix A.

DEM's Webpage. The North Carolina Division of Emergency Management's homepage is <http://www.nccrimecontrol.org/Index2.cfm?a=000003,000010>, with content specific to floodplain management at <http://www.ncfloodmaps.com/>. Through this page you have access to:

- NFIP Facts & Figures
- Training
- Local Floodplain Administrator Information
- How to Join NFIP
- NC Model Forms & Documents
- Issue Papers on Technical and Regulatory Topics
- Links to Other Resources
- Digital Flood Maps (including Terrain Data Grids and DFIRM Panel Shapefiles)
- Flood Hazard Determinations
- Regulations & Guidance

Table 7-1. State and Regional Agency Assistance		
Agency		Types of Assistance Provided
Department of Agriculture		• Storage Tank Inspections
Department of Crime Control and Public Safety	Division of Emergency Management	• National Flood Insurance Program • Community Rating System • Flood Mitigation • Hazard Mitigation Grant Program • Developing emergency action plans
Department of Commerce	Division of Community Assistance	• Land use planning and management
Department of Cultural Resources	Division of Archives and History	• Location of historic properties
Department of Environment and Natural Resources	Environmental Permit Information Center	• Single point of contact for environmental permitting information
	Division of Coastal Management	• Technical assistance for developing CAMA land use plans • Land Use Planning Grants • Land Use Planning Packets
	Division of Environmental Health	• Includes On-Site Wastewater Systems
	Division of Waste Management	• Includes Above-ground Storage Tanks
	Division of Water Quality	• Includes Waterway Pollution
	Division of Land Resources	• Includes NC Geological Survey and NC Geodetic Survey
	Division of Parks and Recreation	• Natural areas and rare species information
	Division of Soil & Water Conservation	• Technical assistance in developing flood hazard studies • PL 566 Small Watershed Programs • Production of soil maps
Department of Insurance	Services for Customers	• Assisting with complaints • Disaster and recovery information
North Carolina Sea Grant		• General advice on flood and hurricane resistant construction techniques and shoreline erosion
University of North Carolina at Chapel Hill	Institute of Government	• Training and consultation on land use planning and regulation
Regional Councils		• Technical assistance to local governments

Federal Assistance. A number of the federal agencies may also offer various forms of assistance. General descriptions of the types of assistance are summarized in Table 7-2 and more detail on each is included in Appendix A.

Table 7-2. Federal Agency Assistance		
Agency		Types of Assistance Provided
U.S. Army Corps of Engineers	Applicable District Offices	• Floodplain Management Services • Flood hazard data • Flood damage reduction studies
Natural Resources Conservation Service	Local Soil Conservation Service offices; State Conservationist	• Conservation practices • Watershed restoration of flood damage
Tennessee Valley Authority		• Provide data from past studies and planning efforts
U.S. Geological Survey	Water Resources Division	• Current and historical stream gage records
National Park Service	Rivers and Trails Conservation Assistance Program	• Greenway planning assistance • Coalition building and outreach
U.S. Department of Homeland Security/FEMA	Region IV Office	• Resolving regulatory issues, including community noncompliance • Addressing insurance issues • Cooperating with flood map revision efforts
	Mitigation Programs	• Grants for eligible flood mitigation projects
	Emergency Management Institute	• Offer courses at EMI • Develop courses for delivery by Regional Offices, states, distance learning

FEMA's Webpage. Through FEMA's homepage you have access to an online library of reference materials, publications, maps, and photographs, as well as audio and video clips. Go to www.fema.gov, at the top of the home page, click on "Frequently Asked Questions" or search the library or links to programs, many with specific publications. To find for specific publications, use the search function by typing either publication number or title.

The FEMA webpage changes from time to time, but the following should always be available:

- NFIP Technical Bulletins, NFIP Community Status Book
- Elevation Certificate on online training

- Many forms and publications related to flood hazard maps (MT-1, MT-2, compendium of flood map changes, Quick 2 computer program, and others)
- Telephone numbers, disaster facts, and acronyms
- Statistics on NFIP policies and claims, by state and by community
- Statutes and regulations
- Flood Insurance Manual for Insurance Agents
- The Map Service Center (to order flood maps & materials)
- Flood insurance marketing (www.floodsmart.gov)
- Link to the CRS Resource Center
- Frequently Asked Questions

7.8 Other Players

Professional Resources. Other valuable sources of assistance are the North Carolina Association of Floodplain Managers (www.ncafpm.org) and the National Association of State Floodplain Managers (www.floods.org). Besides opportunities to network at annual conferences and periodic technical conferences and workshops, these organizations publish newsletters that provide up-to-date information on floodplain management regulations and issues being followed in national and state legislatures.

The Natural Hazards Center at the University of Colorado in Boulder (<http://www.colorado.edu/hazards>) publishes two electronic newsletters and maintains a database of information on floodplain publications of national and international scope. It acts as a repository and information retrieval service and sponsors “quick response” research after significant events.

Private Sector Support. The private sector is an often overlooked source of support for floodplain management. This can be a serious oversight and loss of valuable resources and expertise.

Possible sources of assistance that may be offered by the private sector are listed in Appendix A. Business interests have a role, whether through organizations such as the Chamber of Commerce or individual companies. Employers, whether small or large, may see value in supporting activities that help protect property and their employees. Nonprofit organizations may be willing to join local efforts, including church groups, neighborhood associations, and clubs. The publicity generated by such cooperative efforts can be a strong incentive for private participation.

Fostering Citizen Support. Information in the hands of the public can generate support for local programs and facilitate sound floodplain development. It can also be very valuable in helping to increase the overall public understanding of why we manage flood hazard areas and the requirements imposed on development. Some suggestions for flood information programs that might be undertaken include:

- Sponsor a flood awareness week to disseminate information on flood hazards, floodplain management, and damage reduction measures (mitigation). Hold public forums and invite guest speakers.
- Offer to meet with neighborhood and environmental organizations, encourage home and business owners to identify their flood risk and develop emergency response plans. Get the media involved.
- Prepare newsletters or newspaper articles to keep the public abreast of current issues and the need for flood insurance and development permits.
- Publicize high water marks from previous floods or place regulatory flood elevation markers in prominent places.
- Prepare and disseminate a flood information directory providing information on agencies and programs that can help homeowners and business owners in their damage reduction efforts.
- Display flood hazard maps in public buildings and places. Create an online “look up” tool so owners can check their property locations relative to the mapped floodplain.
- Provide flood-related publications to public libraries.
- Encourage schools to develop environmental education programs and offer to conduct workshops on flood hazards and mitigation activities.
- Send flyers along with water and sewage, electric, or other utility bills to inform property owners about important flood information.
- Establish a hotline for residents to report flooding and drainage problems and to get the information they need.

Chapter 8 Reviewing and Issuing Permits

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8.1 Introduction

This chapter focuses on the process of administering the floodplain management ordinance and issuing permits. While some specific standards are mentioned, it is important to refer to Chapter 4 for all appropriate requirements.

To participate in the NFIP your community must establish and maintain a process to review proposed development and issue permits to regulate all development proposed in the Special Flood Hazard Area (SFHA). Every development proposal must be reviewed to determine if it is located in the SFHA. For the NFIP, the term “development” covers all activities, including subdivision of land and site work, even if no buildings are involved.

Figure 8-1 is a flow chart of the typical permit process.

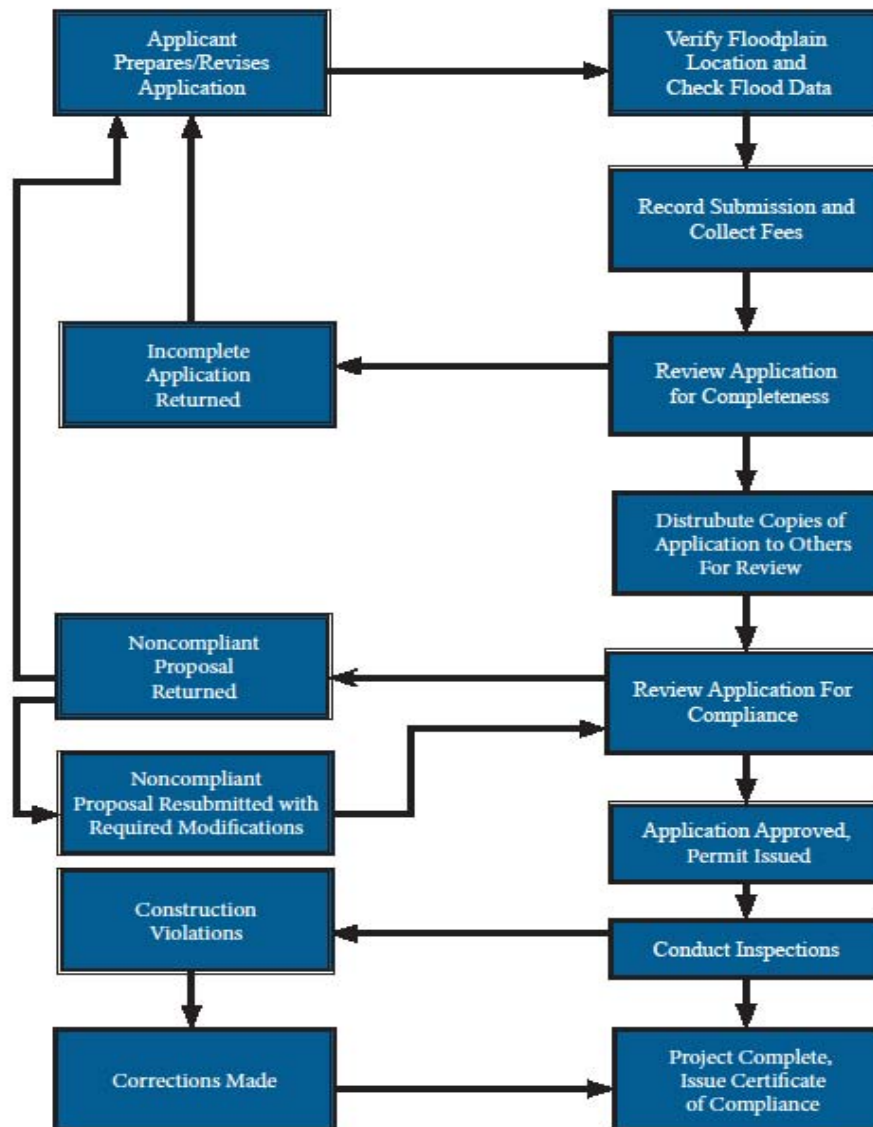
You cannot rely entirely on the building permit to satisfy the NFIP because the building code does not cover all development. Generally, building permits are issued only for certain types of structures – the floodplain development permit is issued for everything that alters the floodplain, including:

Development means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials. (44 CFR 59.1)

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- Man-made changes to improved or unimproved real estate (land), including but not limited to mining, dredging, filling, grading, paving, excavating, drilling operations, and temporary or permanent storage of equipment or materials.
- The type and placement of new buildings and other structures including tanks, accessory structures, and manufactured homes, and the methods of construction.
- Additions, repairs or renovations to existing structures, when such actions are classified as substantial improvements.
- Repair and restoration of existing buildings that have been substantially damaged by any cause (flood, fire, wind, earthquake, or other damaging events).
- Installation of water and sewer utilities, and other site improvements.
- Construction or modification of flood control works, including levees, floodwalls, and channels.
- Construction, modification or replacement of roads, bridges, and culverts.
- Any related activities that may affect the special flood hazard area, especially those activities that may increase the level of the base flood.

Figure 8-1. Permit process flow chart



8.2 Exemptions

Some development may be exempt from local regulation, including activities undertaken by federal agencies, state agencies, public utilities and on tribal lands.

You cannot exempt activities by your own community government. Projects that involve buildings generally require that a building permit be issued. Projects that do not require a building permit, such as grading or filling in the floodplain, must still be reviewed and approved pursuant to the ordinance.

Projects undertaken by State agencies may be exempt from your permit authority, but they must meet NFIP-consistent requirements through State Executive Order 123. Similarly, other states meet NFIP-consistent requirements in the form of a governor's executive order or by adopting state floodplain management regulations. Federal agency activities are subject to the provisions of Executive Order 11988 Floodplain Management that references NFIP requirements. In both situations, the State or Federal agency should be applying the same or similar requirements to their actions as would be applied through a local floodplain management ordinance. If there are activities being conducted in your floodplain by a State or Federal agency that are not meeting State floodplain management requirements or the requirements of Executive Order 11988, contact the State NFIP Coordinator or the FEMA Regional Office.

44 CFR 60.1(b) These regulations must be legally-enforceable, applied uniformly throughout the community to all privately and publicly owned land within flood-prone ... areas, and the community must provide that the regulations take precedence over any less restrictive conflicting local laws, ordinances or codes.

You do have some discretion to exempt obviously insignificant activities from the permit requirement—such as planting a garden, farming, putting up a mailbox or erecting a flagpole depending on the flood zone requirements. Other projects, such as reroofing and replacing siding, will not affect flood flows. By themselves they may not constitute substantial improvements, but if combined with other work may add up to 50% or more of the market value of the building (see Chapter 9).

Some communities specifically exempt certain types of projects in their ordinances. Check with your State NFIP Coordinator and/or FEMA Regional Office before adopting exempt activities to ensure your community remains compliant with the NFIP minimum requirements.

8.3 Floodplain Development Permit Application

Sample permit applications are shown at the end of this chapter. You can tailor these to meet your needs – just be sure to capture all of the critical information that needed to complete a thorough review for consistency with your ordinance. Also shown at the end of this chapter are two sample permit review checklists.

Remember that development activities that do not involve buildings must also be permitted. Floodplain matters must be addressed during subdivision reviews and proposals to alter waterways will require additional information from the applicant.

It is important that you identify all floodplain permit applications (and issued permits) to facilitate review, inspections, and file maintenance. One way to do this is to place an easily identified mark, such as “FP” on files and the face of issued permits; another option is to use a different color folder.

8.4 Determining When a Floodplain Permit is Required

Every permit application must provide enough detail to allow the local Floodplain Administrator to determine whether the proposed development is in or out of the Special Flood Hazard Area as shown on the FIRM. Site plans must include scaled drawings showing the location of proposed activities and distances to landmarks such as road intersections and road crossings over streams.

Avoid questions of liability. Always check the accuracy of floodplain information provided in an application BEFORE you issue the permit.

Your ordinance and the application form should clearly specify certain information that must be included in applications. Specifically, site plans should show property lines, locations of existing and proposed structures, locations of streams and bodies of water, SFHA boundaries, floodway boundaries, Base Flood Elevations, existing and proposed ground elevations, proposed building elevation (lowest floor, including basement), and existing and proposed roads. You might find it valuable to have a pre-application meeting during which you should go over all of the requirements, especially the importance of the foundation inspection and confirmation of the as-built elevation of the lowest floor as soon as it is built.

When you receive an application, even if the site plan does not include floodplain information, you should check your flood hazard maps. You might find that some properties are affected by the mapped floodplain, but the applicant was not aware of the rules. You may also find that some applicants

have misinterpreted the maps and incorrectly transferred SFHA and/or floodway boundaries or BFEs.

An Elevation Certificate is not required as part of the application unless a community participated in the CRS unless specified by the community, Flood Damage Prevention Ordinance or as needed for final as-built conditions, but you can use the application to advise the applicant that it is required when the lowest floor is built. It is good practice to have the applicant survey the lowest ground or grade next to the proposed foundation. Another good practice is to establish a temporary benchmark on the construction site so that the builder and inspectors can easily check the elevation during construction of the foundation and other components (i.e., HVAC systems).

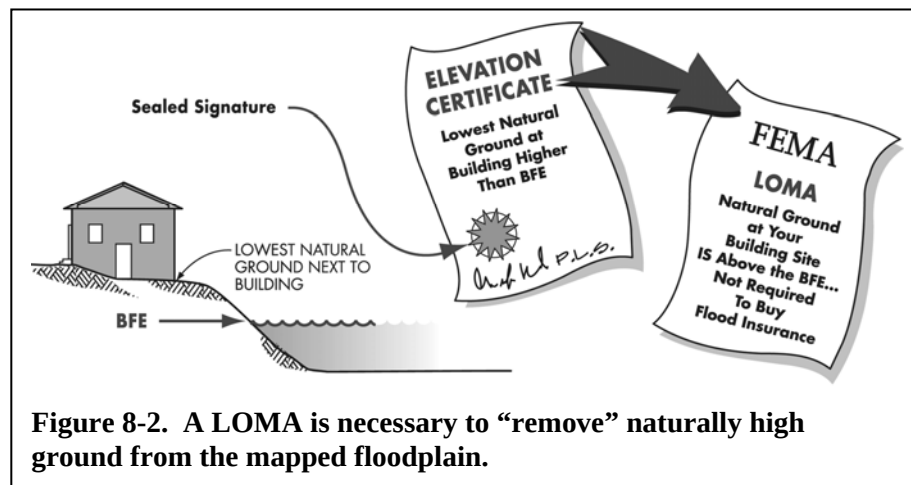
8.5 Notes on Flood Hazard Data

The requirement to adopt and enforce your ordinance based on the flood hazard data provided by FEMA does not prevent you from adopting maps and data that are more restrictive. It also does not relieve you of the responsibility to use the best available data if FEMA has not provided detailed information.

SFHA Boundary Conflicts with Field Topography. If the actual *natural* grade is below the Base Flood Elevation, the land is subject to flooding and it is reasonable for you to regulate it as SFHA.

But, if the actual ground is higher than the BFE then the site must be regulated by the local ordinance until the property is removed from the SFHA by a Letter of Map Amendment (LOMA) (see Chapter 4) or a map is revised to reflect more precise ground elevations. Only upon receipt of a Letter of Map Amendment may the floodplain regulations be lifted. However, even if the ground is high, as long as the FIRM shows the area as SFHA, then banks and lenders may require owners to buy flood insurance. A LOMA is one way to officially remove the floodplain designation from a lot that is naturally above BFE. With a LOMA, the owner may have sufficient evidence to convince lenders to not require flood insurance (Figure 8-2). The other way to officially remove the floodplain designation from a lot that is naturally above BFE would be through a LOMR provided that the change could be mapped given the scale provided.

Forms that must be used to submit LOMAs can be downloaded from the FEMA website.



FEMA Data are Insufficient (Approximate A Zones). Where BFEs and floodway boundaries are not provided you are expected to make every effort to obtain flood hazard data from other sources. Whatever approach you use, be sure to record the source of the data in the permit file. Some suggestions to obtain the data needed to regulate development in unnumbered A Zones:

- Check with the U.S. Army Corps of Engineers and the Natural Resources Conservation Service (formerly the Soil Conservation Service) to determine if they have knowledge of any flood studies, unpublished reports or other data.
- Check with the North Carolina Department of Transportation, especially if the site is located near a highway structure for which engineering analyses may have been prepared (bridge, culvert, channel alignment).
- Check with the North Carolina Floodplain Mapping Program (NCFMP) to see if they have any preliminary or effective data which could be used.
- If near the boundary with another jurisdiction that shares the same waterway, suggest checking with the neighboring jurisdiction regarding local flood studies that may become available.
- Require the applicant to perform analyses to determine the BFE (the level of detail of such analyses may range from a single point using simplified methods or a complete hydrologic and hydraulic study). Note that 44 CFR 60.3(b)(3) requires BFE to be established for all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser.

During FIRM Revision. When draft or preliminary data are available, you are required to “reasonably utilize” it for regulatory purposes. If the new data provide BFEs for Approximate A Zones, it is difficult to refute that it is better data. Another important reason you might use the new data is if it shows that BFEs will be considerably higher or the SFHA considerably larger when the revised FIRM is published. There are some questions about liability if you issue a permit using old data when you have knowledge of new data that indicate the flood risk is greater.

Post-Disaster Flood Advisory Flood Data. Post-disaster flood advisory flood data or advisory base flood elevations (ABFE) are updated base flood elevations computed from new flood frequency analysis and/or tidal and storm data developed after a local flood disaster has occurred. To date, this has only been developed as a result of Hurricanes Katrina and Rita for the Gulf Coast. When FEMA provides post-disaster advisory flood data, you should “reasonably utilize” it for regulatory purposes.

8.6 Avoiding and Minimizing Floodplain Impacts

Another important responsibility you have is to work with applicants to avoid and minimize impacts to the floodplain. Avoiding development in the floodplain simplifies the permitting process for everyone, and can save the applicant a lot of time.

Sometimes this is easy, and minor changes or shifts in where a structure will be on the site can make a big difference. For example, you may be able to encourage staying out of the floodway, or find a higher place to build. On parcels of land that are large enough to have land that is naturally higher than the BFE, encouraging construction there would mean avoiding the floodplain permit process entirely.

You may have more success finding ways to avoid and minimize floodplain impacts when you review plans for subdivisions and large developments. Residential subdivisions can be enhanced by preserving the floodplain as open space or recreational area (see Chapter 4).

8.7 Update the Log of Floodplain Permit Actions

Maintaining a readily accessible and complete log of floodplain permit actions is an important part of your responsibilities. Keeping it current will make it easier to get ready for Community Assistance Visits when the State needs to pull a sample to review. Your log should record the permit number, property

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address, flood zone (including floodway or non-encroachment area), nature of work (building, utilities, fill, etc.), and that an Elevation Certificate is on file (for buildings).

8.8 The Application Review

Use a Review Checklist. Sample permit review checklists are included at the end of this chapter (one for A Zones and one for V Zones). Using checklists can help you review each permit application the same way and help make sure details are not overlooked. Consistency is important to show that all applications are handled with the same degree of attention. Keep a copy of the checklist in the permanent permit file to document the review.

Although this section identifies some specific things to check during your review, you must be sure to rely on your ordinance and review other chapters of this manual in order to conduct a complete review for compliance with specific requirements.

Determine if Application is Complete. A complete permit application is important. It is essential to obtain correct flood hazard information from FEMA's map products. Determine whether the application is complete by checking:

- Is the project adequately described?
- If the application is for an existing building, has the applicant submitted adequate and acceptable documentation of the cost of the work and the market value of the building? Be sure to review Chapter 9 for handling substantial improvement and substantial damage.
- Has the applicant used the correct BFE and are the flood zone boundaries properly drawn on the plans (including the boundary between the floodway and flood fringe, or the V Zone and the Coastal A Zone)?
- Do the plans show ground contours, all site work and, if applicable, delineate buffers and/or setbacks?
- Are floodway/non-encroachment area analyses or other map change documentation provided and do they need to be submitted to FEMA for a Conditional Letter of Map Revision prior to making a permit decision?
- If fill is proposed to elevate a building, has the applicant acknowledged the need to provide certification of compaction?
- If development in the floodway is proposed, has the applicant provided a "no-rise" certificate and supporting analyses?
- If a building in a V Zone is proposed, has the applicant provided the foundation design certification and, if applicable, the breakaway wall design?
- If an enclosure below the elevated building is proposed, has the applicant provided a Non-Conversion Agreement if required in your local ordinance?
- If engineered openings are proposed, is the design of the openings certified to meet the performance requirements?

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- If nonresidential dry floodproofing is proposed, has the applicant provided the certification of the design?
- Has the applicant started the process to obtain other permits?
- Must the applicant notify adjacent communities, the State, and FEMA?

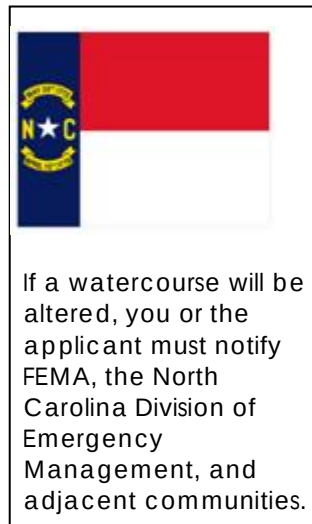
Review by Other Departments. Depending on how your community is organized the application may require review by other departments, including planning/zoning, engineering/public works (drainage, utilities, roads, floodplain studies), and health (septic). Be sure to keep track of these reviews and document the results in the permanent file.

Require Federal and State Permits. Review the application package to determine whether federal and State permits are required. Copies of permits issued by others must be included in your permit file. If you are uncertain, you can require the applicant to contact the appropriate agencies to get official determinations. Activities that generally require other permits include:

- New construction and substantial improvements of existing buildings in the coastal zone (North Carolina Division of Coastal Management)
- Construction that affects wetlands (Clean Water Act, Section 404 permits issued by the U.S. Army Corps of Engineers)
- Stream crossings (North Carolina DOT)
- Bridges, piers, and other activities that affect navigable waterways (Section 10 permits issued by the U.S. Army Corps of Engineers)
- Installation of on-site septic systems (North Carolina Department of Environment and Natural Resources)
- Public health facilities and schools (North Carolina Department of Environmental Health)
- Construction and operation of a landfill or facility that handles or stores hazardous materials (North Carolina Division of Waste Management)

Sometimes it takes a long time for applicants to receive federal and State permits. You have two options:

1. Suspend processing the local permit until the applicant provides you copies of the other permits (avoids implying that your community endorses a project that may not satisfy federal or State requirements), or



2. Issue the local permit conditioned upon satisfactory receipt of the federal or State permits (in which case you should obtain a signed statement from the applicant that the necessary permits have been applied for and that the portion of work subject to those regulatory authorities will not proceed until and unless those permits have been received and copies provided for your records).

Review Site Plan. Examine the site plan in detail to check that it shows all the site elements necessary, including: the location of waterways, drainage paths, existing and proposed structures, setbacks and buffers, ground contours or ground elevations at the building site (referenced to the datum on the FIRM), BFEs and flood zone boundaries, and areas affected by grading, fill and excavation. Pay particular attention to the BFEs and floodplain boundaries, which should agree with the site's topographic contours not simply be an overlay of the effective FIRM. However, the accuracy of the floodplain boundaries are only as good as the topographic map source or the source model. Redelineated streams can be using updated topographic data for the floodplain boundaries, but an older hydraulic model to represent the BFEs. Look at the BFEs to check the floodplain boundaries shown to confirm accuracy. This is important to remember when determining if a building is in or out of the floodplain.

On-site private sewage systems (septic) have to comply with health department requirements, but in general should be located outside of the mapped floodplain, if possible, or at least on the highest ground available to minimize inundation impacts. In North Carolina, on-site sewage systems need to be outside of the 10%-annual chance flood limits.

The North Carolina Department of Environmental Resources (DENR) Division of Water Quality regulates water supply wells. Wells must be located at least 25 horizontal feet from brooks, creeks, streams, rivers, sounds, bays and tidal estuaries. Public, semi-private and private water supply wells are regulated by the State of North Carolina and local communities; however, rules governing each type of well vary.

Determine the BFE – Zones With Elevations (Riverine). For SFHAs with BFEs, determining the BFE is relatively straightforward. See Chapter 4 for more detail. If the site is not close to a cross-section with an elevation, you can:

- Use the higher of the BFEs on either side of the proposed site, or
- Refer to the flood profile in the Flood Insurance Study report and determine the BFE by measuring the distance from a known landmark or cross-section

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along the waterway. BFEs determined this way should be rounded to the nearest one tenth of a foot.

Determine the BFE – Zones With Elevations (Coastal). Determining the BFE is straightforward in coastal floodplains (see Chapter 4). Where the BFE is the same throughout a zone it is shown in parentheses under the zone designation. Note that the line separating zones is a white line. If a proposed building is “on the line” you must require it to meet the higher of the elevations specified in one of the zones. Also, if a building straddles the line between the A Zone and the V Zone, the entire building must meet the V Zone requirements.

Determine the BFE –Approximate Zones (Riverine). Approximate or unnumbered A Zones do not have defined BFEs. Additional data on flood elevations may be available from your Public Works or Roads Department, the North Carolina Department of Transportation, the U.S. Army Corps of Engineers, the U.S. Geological Survey, Natural Resources Conservation Service or NCFMP.

If the site is near a portion of a waterway that has a detailed study it may be possible to extend the Flood Profile to approximate the BFE. The flood profile may only be extended 500 feet upstream provided that the slope of the flooding source remains constant and no hydraulic structure (bridge, culvert, etc.) is present. Local knowledge of historic high water marks may provide guidance. If all other data sources have been exhausted, review below to learn how topographic maps or simple surveys can be useful.

Some communities may choose to require that applicants have a professional engineer determine the BFE for approximate A Zones. One method available is to use FEMA's QUICK-2 software which utilizes simple cross-section information to set the BFE. This software is free when you order a copy of FEMA 265 (or via download from FEMA's website at http://www.fema.gov/plan/prevent/fhm/dl_qck22.shtm).

Simplified Methods to Determine the BFE. Per FEMA 265, the simplified methods to determine BFEs should be limited to situations such as isolated small subdivisions in rural areas falling below the threshold in Subparagraph 60.3(a)(3) and 60.3(a)(4) or single lots. One method explained in FEMA 265 is “contour interpolation,” which uses both the FIRM and available topographic or contour maps (Figure 8-2) and has an accuracy limited to one-half of the contour interval of the topographic map used. First, you need to overlay the approximate Zone A (100-year) floodplain onto the topo map, which may require resizing one or both maps to ensure both are the same scale. Next,

Additional information is available in FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-year) Flood Elevations*.

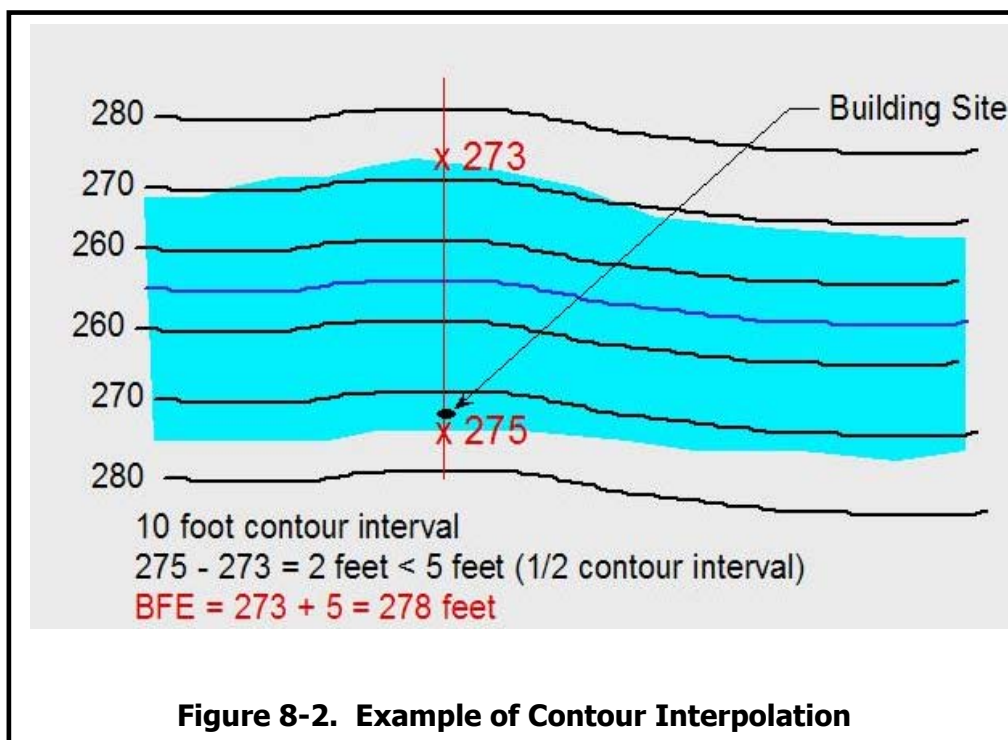
This document also is known as “The A Zone Manual.”

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determine if this method meets the accuracy requirements. The floodplain boundary must generally follow the contour lines along the river or stream. If the water surface elevations are different on the left and right sides (overbanks) of the stream, then they must be within one-half of the map contour interval. Otherwise, this method is unacceptable. Along lakes (lacustrine areas), the water surface elevation is determined by the difference between the highest and lowest water surface elevations. Again, there is a limit of one-half of the map contour interval as the accuracy limitation. The estimated BFE is the elevation of the ground indicated by the topo map. Remember, you will need to watch out for different scales and you will need to measure carefully from a reference point (such as a road crossing) to be sure you are estimating the BFE at the proposed project site. It is also important to understand that this method is only as good as the contour map. To take into account approximations that are inherent in the topo map, FEMA recommends that you add one-half of the contour interval to the lower of the two estimated base flood elevations. According to the FEMA 265, more than one method is required when simplified methods are used.

You can also require the applicant to get a “point-on-boundary” survey (Figure 8-2). This works best when the floodplain boundary crosses a road close to the proposed site. A surveyor would shoot the elevation of the point on the road, and that would become the estimated BFE. Obviously, this involves cost to the applicant, but it may give a lower BFE than contour interpolation because you

do not add one-half of the contour interval to the estimated BFE.



Review Applications for Buildings. Every permit application should be reviewed by someone who has experience reading site plans and construction drawings. Detailed building plans must show the proposed method of elevation and must specify the proposed elevation of the lowest floor (referenced to the datum on the FIRM). Pay close attention that there are NO below-grade areas (regardless of what they're called, the NFIP considers any space that is below-grade on all sides to be a basement). Proposals for nonresidential dry floodproofing must show that the floodproofing measures will extend at least one-foot above the BFE and not rely on human intervention.

It is important that the plans show that utilities will be elevated or adequately protected.

For enclosures below elevated buildings, the drawings and specifications must clearly address the following: flood openings (A Zones) or breakaway walls (V Zones); that enclosed areas below BFE are to be unfinished; that enclosed areas are designed for limited and specific uses; and that flood-resistant materials below the BFE are specified.

Commitment to Provide the Elevation Certificate. When you issue a permit to construct a building in the floodplain you should require the permittee to sign an agreement to provide the Elevation Certificate (EC) as soon as the foundation is constructed and the lowest floor elevation is established. This commitment can be included in your permit application form. Further, you should have the applicant agree that a final, as-built Elevation Certificate will be prepared prior to issuance of the occupancy certificate.

Your community's ordinance should require post-construction elevation data (or EC) prior to issuance of the Certificate of Occupancy. See the State Model Ordinance for more information of Elevation Certification guidance for your community.

Floodproofing Non-Residential Structures. Floodproofing of non-residential structures is an alternative to elevation, but it is important to think carefully about floodproofing. You must require the applicant to prepare a plan of actions to take when a flood warning is issued. Problems or confusion may arise if the developer is not the owner/occupant, if the property changes hands, or if someone is not on-site all the time. FEMA's Technical Bulletin 3-93, *Non-Residential Floodproofing Requirements and Certification for Buildings Located in Special Flood Hazard Areas*, has a detailed discussion about several other considerations.

The floodproofing design must provide protection to at least one-foot above the BFE in order to be rated as a property constructed building for insurance purposes.

The application must include a design certificate prepared by a registered professional engineer or architect. FEMA Form 81-65, *Floodproofing Certificate*

for Non-Residential Structures is recommended and can be found on FEMA's website. It must be signed and sealed by a registered design professional. This is the only way to document that the structural design, specifications and plans meet accepted standards of practice. Keep a copy in the permanent permit file; the State or FEMA will check for this form during a Community Assistance Visit.

You should advise owners to keep the *Floodproofing Certificate* with the deed to their property. In the future, it may be necessary to provide evidence to FEMA when the building is rated for insurance purposes.

V Zone/Breakaway Wall Certificate. In V Zones, the application must include designs for elevated foundations and, if present, breakaway walls that are prepared by a registered professional engineer or architect who must complete a certification that the designs comply with minimum requirements (a sample *V-Zone Building Design and Performance Certificate* is included at the end of this chapter). You must keep a copy in your permanent permit file. Advise owners to keep this form with their deed because it will be important for future owners when they obtain flood insurance. Owners should also be advised that changes to the property made after certification may invalidate the foundation and/or breakaway wall certifications. The State will check for certificates during a Community Assistance Visit.

Engineered Openings in Enclosures. If an applicant proposes to use non-standard openings that provide less than 1-square inch of net free area for each square foot of enclosed area, such openings must be certified by a licensed professional engineer practicing in the state of licensure (see Chapter 5). The permit file should contain a copy of this certification.

8.9 Special Considerations During Permit Review

Chapter 5 has more detail on most of these and other special considerations and you should check that content to make sure you understand the requirements if questions come up. Included here are some suggestions about how you can handle certain situations during the review process.

Manufactured Homes. Manufactured housing is one of the fastest growing housing type in the nation because it is more affordable than conventional construction. But manufactured homes are much more vulnerable to flood damage, even if elevated to or above the BFE. Because of the potential for damage, some communities strongly discourage placement in SFHAs, even prohibiting them in floodways and V Zones. According to the North Carolina State Model Ordinance under **Article 5, Section G(8) of the State Model Ordinance (Coastal High Hazard Areas (Zones VE))** states **"No manufactured homes shall be permitted except in an existing manufactured home park or subdivision. A replacement manufactured home**

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may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring and elevation standards of this Section have been satisfied."

Manufactured homes in floodways are extremely vulnerable and should not be allowed. You are encouraged to work with owners to find safer sites outside of the SFHA, or at least to place them where the flood hazard is reduced (shallower depths, slower velocities). You should check the Floodway Data Table in the FIS report to find an estimate of the velocity of floodwaters. Because flowing water puts greater loads on foundations, you may want to require an engineered foundation to ensure structural stability. Where placement is unavoidable, units should be installed so that they are parallel to the direction of flow to minimize obstruction of floodwaters.

Manufactured homes are so easily damaged that some communities prohibit them in any floodplain, but especially in floodways.

Permanent Foundation does **not** include dry stacked block.

The anchoring, tie-down, and permanent foundation requirements for manufactured homes must be clearly outlined in the permit. Do not rely on MFH installers to know how to place units in flood-prone areas. The method of elevation and anchoring should be described, including the materials that are approved for use. Remember, if the unit is placed on a solid perimeter foundation, flood openings must be provided. Standard skirting does not require flood openings, but it will be damaged under flood conditions.

If you see many applications to place manufactured homes in SFHAs, then your reference library should include FEMA 85, *Manufactured Home Installation in Flood Hazard Areas*. More information is available on Manufactured Home requirements in several chapters including 2, 10, and 12.

Subdivisions. In 1997, FEMA and the American Planning Association published *Subdivision Design in Flood Hazard Areas*, APA Planning Advisory Service Report Number 473.

Subdivision applications should be carefully reviewed to ensure that floodplain impacts are avoided where possible, and if unavoidable, impacts must be minimized as much as possible. One way to do this is to put building pads on high ground and keep the SFHA as open space. These days, many people think wooded streams are attractive and actually increase the value of the lots.

If a subdivision is proposed in an SFHA where BFEs are not determined (approximate Zone A), then your ordinance has another requirement. Subdivisions that are more than 50 lots or more than 5 acres in size must

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include BFEs. In these cases, the applicant is required to provide this data, developed by an engineer, and submit it as part of the permit application.

Utilities in new subdivisions are to be designed and protected, including gas lines, water lines, and sewer systems. They should either be located out of the SFHA or designed and constructed to withstand the forces of flooding, especially buoyancy or disruption due to erosion and/or infiltration of floodwaters. Due to the potential for contamination, sewer systems (especially manholes) should be sealed to prevent outflows during flooding conditions. Refer to *Protecting Building Utilities from Flood Damage*, FEMA 348, November 1999 for more information.

Drainage improvements in subdivisions must also be designed and constructed to minimize flooding and diversion of water onto building sites.

Plan reviewers should determine whether access to the subdivision is reasonably available for evacuation, rescue, fire, and emergency medical purposes. You may decide that a road has to be elevated to make sure your community can provide vital emergency services. Some communities in North Carolina have adopted dry access provisions in their Flood Damage Prevention Ordinances.

Legal concern:

Denying a floodway proposal doesn't mean the owner can't use the property for other purposes. However, you may want to offer some suggestions to reduce or eliminate the increase in flood level.

No-Rise Certification for Floodway Encroachments. Your ordinance requires that riverine floodplains be free of obstructions that will cause an increase in flood levels. Where a floodway or non-encroachment area (NEA) has been designated, construction in the flood fringe is assumed to be acceptable. Floodway/NEA development is likely to increase flooding on other properties so you need to handle them carefully. Floodway/NEA applications must have engineering data and a certification to show that the project will not cause any increase in BFEs. This is often called the “no-rise” requirement. The analysis must be based on the currently effective computer models, which can be obtained from FEMA or the North Carolina Floodplain Mapping Program (NCFMP). An example of North Carolina’s “no rise” certificate form is shown in Section 5.9 of Chapter 5.

If you need help when you review floodway data or a “no-rise” certification, check with your community’s engineer or call the State NFIP Coordinator. Remember, if the engineering data show that a development will increase the BFE, you cannot issue a permit. If you make a different decision, you are not

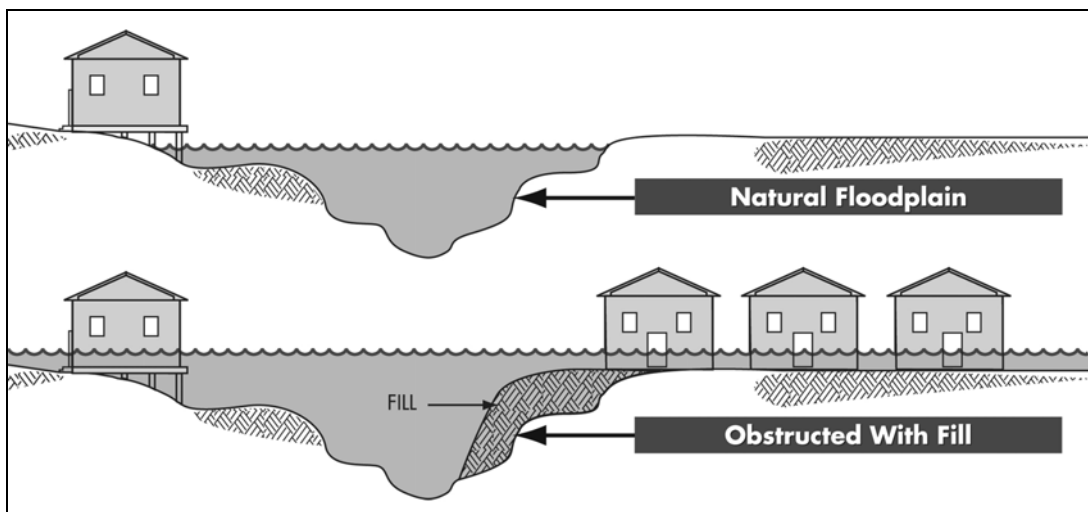
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administering the ordinance properly, and FEMA may consider it poor community performance or a violation.

Keep in mind that under 44 CFR 65.12, when a proposed project contains encroachments into the floodplain with a regulatory floodway and the BFEs exceed the requirements of 60.3(c)(10) or 60.3(d)(3), then a Conditional Letter of Map Revision (CLOMR) is required to be obtained through FEMA.

Buildings that are already located in the floodway are “grandfathered,” and may remain in the floodway. However, substantial improvement or substantial damage triggers the requirement for full compliance. When this happens, no additional engineering analysis is required if the *same building footprint* is used. But an encroachment analysis is required if the building is enlarged or if fill is to be used to achieve elevation.

Sometimes people have questions about what uses can be allowed in floodways. Any use that does not change the shape of the land is acceptable, including farming, parking, recreation, and uses incidental to residential structures such as lawns, gardens, parking areas, and play areas. However, if fill is involved in these activities, then you must require engineering analyses to see if it will meet the “no-rise” requirement.



Fill can lead to increased flood levels.

Other Encroachments. If FEMA has produced BFEs but has not delineated a Floodway, then you still need to be careful about encroachments, especially when they involve a lot of fill. To do this, you should require the applicant to

Your community and the permittee could be held liable for damages if you approve projects that will increase flooding on someone else's property.

prepare and submit an engineering analysis to evaluate the impact. The permit should be denied if flood levels will increase more than one foot. However, in accordance with the NCFMP and FEMA per 44 CFR 65.12, when a proposed project contains encroachments into the floodplain and the BFEs exceed the requirements of 60.3(c)(10) or 60.3(d)(3), then a Conditional Letter of Map Revision (CLOMR) is required to be obtained.

Most proposals can be modified to minimize impacts. In North Carolina, this area is called the non-encroachment area. This non-encroachment area is computed as a part of the hydraulic modeling during the Limited Detailed Studies associated with the State's current mapping program. North Carolina treats these non-encroachment areas the same as a Floodway area for a Detailed Study. For more information on Non-Encroachment Areas, refer several Issue Papers located on the NCFMP Website (www.ncfloodmaps.com) on this topic including Issue Paper 17 Floodways for Limited Detailed Studies at http://www.ncfloodmaps.com/pubdocs/issue_papers/IP17-lods.pdf and the Limited Detailed Studies Fact Sheet at http://www.ncfloodmaps.com/pubdocs/limited_detailed.pdf.

Altering a Watercourse. The NFIP requires that the carrying capacity of an altered watercourse be not less than that of the natural watercourse before alterations are made. What this means is that even though someone proposes changing a stream, for example by straightening it or widening the channel, the alteration may not cause an increase in flooding upstream or downstream. Permit applications must include engineering analyses to prove it. Applicants should submit a comparison of the existing and proposed channel capacities, a description of the proposed alteration, land use of the adjacent properties, information about adjacent property owners, and an assessment of the impacts that will be caused by the proposal. Check with the State NFIP Coordinator if you need help reviewing engineering analyses.

Once again, under 44 CFR 65.12, when a proposed project contains encroachments into the floodplain with a regulatory floodway or non-encroachment area (in North Carolina) and the BFEs exceed the requirements of 60.3(c)(10) or 60.3(d)(3), then a Conditional Letter of Map Revision (CLOMR) is required to be obtained. These CLOMRs are generally stream restoration projects.

V Zones and Fill. Check carefully that fill is not proposed as a method to elevate buildings in V Zones. Because waves, scour, and overwash affect

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Coastal High Hazard Areas, fill may be eroded out from under a foundation and lead to major structural damage or collapse. NFIP regulations prohibit placement of fill in V Zones as a method to remove a site from the mapped floodplain by means of a Letter of Map Amendment based on fill (LOMA-F). Non-structural fill, which may be used for landscaping purposes, must be placed so as not to divert waves and water towards any building.

Altering Sand Dunes. In V Zones, the NFIP regulations prohibit man-made alteration of sand dunes that increase potential flood damage. This is interpreted to mean any reduction in the elevation or mass of the dune, including excavating into a dune for the purpose of placing a foundation. Local governments that prohibit the alteration of sand dunes or mangrove stands within Coastal A zones may receive up to 25 CRS credit points.

Coastal Barrier Resources Areas (CBRA). In coastal areas, when you verify the flood zone and BFE, be sure to check for whether the area is shown as CBRA or Otherwise Protected Areas (see Chapter 12). By the Coastal Barriers Resources Act of 1982, NFIP flood insurance is not available for new buildings or substantial improvements of existing buildings in these areas and federal disaster assistance for individuals is limited to emergency relief. However, the construction standards of the NFIP and your floodplain management ordinance still apply and you must still review and issue permits.

AO and AH Zones. Applications for activities in AO and AH zones should be checked to be sure the applicant is using the correct elevation. FEMA does not define the BFE in AO, but uses an average flood depth. AH zones define the BFE or “depth number.” Development in these zones must have the lowest floor (including the basement) elevated above the highest adjacent grade at least as high as the depth number. Non-residential structures may be elevated or floodproofed. If a depth number is not specified, a 2-foot flood protection level is assumed. AH Zones have shallow and/or unpredictable flow paths with depths between 1 and 3 feet, and are often subject to ponding.

AO/AH zones are areas subject to shallow flooding from 1 to 3 feet deep, resulting from sheet flow or ponding conditions.

8.10 Acting on the Permit Application

After you complete the permit review and have all pertinent documentation in the file, you have three options for action:

- Approve the Permit if the application, construction plans and documents describe development that will be built in compliance with the floodplain ordinance. A sample placard is included at the end of this chapter; you should require permittees to display it on-site.

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- Suspend the Decision and continue to work with the applicant to modify the proposal so that it meets the requirements.
- Deny the Permit when a proposal is does not conform to and comply with the floodplain ordinance. The causes for denial should be explained in writing. Then the applicant has several options: withdraw the application; redesign the development; appeal the decision to the appropriate governing body; or request a variance to the ordinance. Variances are covered in Chapter 11.

The day a permit is issued is the date of the “start of construction,” provided construction begins within 180 days. This date is used for insurance purposes to determine what FIRM was in effect when the building was built, regardless of when ground was broken or construction was finished.

For regulatory purposes, a permit may be effective or valid for a certain period of time specified in your ordinance. If the project is not completed by the end of that period then technically the permit expires. However, ordinances routinely provide for the permit officer to issue written extensions.

8.11 Maintain Permanent Records

Part of your community's commitment to the NFIP is to maintain permanent records and to make those records available upon request. In addition, complete permit files should be retained because they will be researched during a Community Assistance Visit. Files also become important when making substantial improvement determinations, especially after major damage when you need to document the pre-damage conditions.

Records including electronic files show what you approved and what you told the applicant, forming a “paper trail” needed for administrative or legal proceedings related to development projects. Back-up files are a good idea. Such records are vital if problems arise during inspection and they also give future owners information about the property.

Permanent files should contain:

- The permit application (or variance request), including special notes, copy of the FIRM panel or FIRMette, determination of BFE, correspondence, and considerations during review, and the review checklist
- For variances, the staff report, documentation of the considerations of the Board of Appeals/Variance Board, and required notifications to the property owner
- Pre-construction certifications (“no-rise”, V zone, breakaway wall, non-residential floodproofing, engineered openings)

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- FEMA Letter of Map Amendment/Change (if required)
- The issued floodplain permit (and building permit, if applicable)
- Documentation of inspections
- Documentation of the “as-built” lowest floor elevation (Elevation Certificate)
- Certification of the elevation to which non-residential buildings may have been floodproofed
- Correspondence pertinent to the project
- Flood and floodway data prepared by the developer
- Engineering analyses of the floodway encroachments and watercourse alterations
- Certificates of occupancy or compliance
- Special engineering designs for enclosures below the BFE

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Application # _____
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SAMPLE FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

This form is to be filled out in duplicate.

SECTION I: GENERAL PROVISIONS (APPLICANT to read and sign):

1. No work of any kind may start until a permit is issued.
2. The permit may be revoked if any false statements are made herein.
3. If revoked, all work must cease until permit is re-issued.
4. Development shall not be used or occupied until a Certificate of Compliance is issued.
5. The permit will expire if no work is commenced within six months of issuance.
6. Applicant is hereby informed that other permits may be required to fulfill local, state, and federal regulatory requirements.
7. If application is for a building, Applicant hereby agrees to submit elevation information during the foundation inspection and prior to further vertical construction and to submit as-built elevation information, prepared by a registered surveyor or engineer, prior to issuance of the certificate of occupancy.
8. Applicant hereby gives consent to the Local Administrator or his/her representative to make reasonable inspections required to verify compliance.
9. THE APPLICANT, CERTIFY THAT ALL STATEMENTS HEREIN AND IN ATTACHMENTS TO THIS APPLICATION ARE, TO THE BEST OF MY KNOWLEDGE, TRUE AND ACCURATE.

(APPLICANT'S SIGNATURE) _____ DATE _____

SECTION 2: PROPOSED DEVELOPMENT (To be completed by APPLICANT)

NAME	ADDRESS	TELEPHONE
APPLICANT		
BUILDER		
ENGINEER		

PROJECT LOCATION:

To avoid delay in processing the application, please provide enough information to easily identify the project location. Provide the street address, lot number or legal description (attach) and, outside urban areas, the distance to the nearest intersecting road or well-known landmark. A sketch attached to this application showing the project location would be helpful.

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DESCRIPTION OF WORK (Check all applicable boxes):

Application # _____

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A. STRUCTURAL DEVELOPMENT

ACTIVITY

STRUCTURE TYPE

- ☐ New Structure
- ☐ Addition
- ☐ Alteration
- ☐ Relocation
- ☐ Demolition
- ☐ Replacement

- ☐ Residential (1-4 Family)
- ☐ Residential (More than 4 Family)
- ☐ Non-residential (Floodproofing? ☐ Yes)
- ☐ Combined Use (Residential & Commercial)
- ☐ Manufactured (Mobile) Home (In Manufactured Home Park? ☐ Yes)

ESTIMATED COST OF PROJECT \$ _____

B. OTHER DEVELOPMENT ACTIVITIES

- ☐ Clearing ☐ Fill ☐ Mining ☐ Drilling ☐ Grading
- ☐ Excavation (Except for Structural Development Checked Above)
- ☐ Watercourse Alteration (Including Dredging and Channel Modifications)
- ☐ Drainage Improvements (Including Culvert Work)
- ☐ Road, Street or Bridge Construction
- ☐ Subdivision (New or Expansion)
- ☐ Individual Water or Sewer System
- ☐ Other (Please specify) _____

After completing SECTION 2, APPLICANT should submit form to the Local Administrator for review.

SECTION 3: FLOODPLAIN DETERMINATION (To be completed by **LOCAL ADMINISTRATOR**)

The proposed development is located on FIRM Panel No. _____, Dated _____.

The Proposed Development:

- ☐ Is NOT located in a Special Flood Hazard Area (Notify the applicant that the application review is complete and NO FLOODPLAIN DEVELOPMENT PERMIT IS REQUIRED).
- ☐ Is partially located in the SFHA, but building/development is not.
- ☐ Is located in a Special Flood Hazard Area
FIRM zone designation is _____.
"100-Year" flood elevation at the site is: _____ ft. NGVD (MSL)
☐ Unavailable
- ☐ Is located in the floodway.
FBFM Panel No. _____ Dated _____
(if different from the FIRM panel and date)
- ☐ See Section 4 for additional instructions.

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Application # _____

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APPEALS: Appealed to Board of Appeals? ☐ Yes ☐ No

Hearing date: _____

Appeals Board Decision - Approved? ☐ Yes ☐ No

Reasons/Conditions: _____

SECTION 6: AS-BUILT ELEVATIONS (To be submitted by **APPLICANT** before Certification of Compliance is issued)

The following information must be provided for structures that are part of this application. This section must be completed by a registered professional engineer or a licensed land surveyor (or attach a certification to this application). Complete 1 and 2 below.

1. Actual (As-Built) Elevation of the top of the lowest floor, including basement (in Coastal High Hazard Areas, bottom of lowest horizontal structural member of the lowest floor, excluding piling(s) and columns) is: _____ ft. NGVD (MSL).
2. Actual (As-Built) Elevation of floodproofing protection is _____ ft. NGVD (MSL).

SECTION 7: COMPLIANCE ACTION (To be completed by **LOCAL ADMINISTRATOR**)

The **LOCAL ADMINISTRATOR** will complete this section as applicable based on inspection of the project to ensure compliance with the community's local law for flood damage prevention.

INSPECTIONS	DATE _____	BY _____	DEFICIENCIES?	☐ Yes	☐ No
	DATE _____	BY _____	DEFICIENCIES?	☐ Yes	☐ No
	DATE _____	BY _____	DEFICIENCIES?	☐ Yes	☐ No

SECTION 8: CERTIFICATE OF COMPLIANCE (To be completed by **LOCAL ADMINISTRATOR**)

Certificate of Compliance issued: DATE _____ BY _____

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Application #: _____

Applicant: _____

SAMPLE Plan Review Checklist **FLOOD HAZARD AREA APPLICATION REVIEW – A ZONES**

Terms: FHA = Flood Hazard Area; DFE = Design Flood Elevation

Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	Is proposed development consistent with zoning? ☐ NO. Applicant to request a zoning amendment. ☐ YES. Proceed with review.
FIRM Panel # and date _____ _____	Check FIRM, floodplain/floodway boundaries, base flood elevations, <u>and</u> map revisions and LOMRs issued by FEMA. Is proposal in the floodplain and/or floodway? ☐ NO. Sign and date this form and put in file. ☐ YES. Must meet the flood resistant provisions of the code. ☐ YES, FLOODWAY. All residential structures (including Manufactured Housing units) in floodways to comply with IBC®. ☐ YES, FLOODWAY. Require engineer's "no rise" analysis and supporting hydraulic data in file before continuing review. ☐ YES, in FHA without DFEs. Check other sources, use estimating methods, or require applicant to determine. ☐ YES, in FHA, but applicant has elevation data that shows natural site elevation above DFE. Advise applicant to obtain LOMA and submit copy for the file. ☐ YES, in Coastal A Zone; refer to V Zone Checklist if V Zone requirements are applied. ☐ YES, in 500-year floodplain. Floodplain review not required; flood-resistance encouraged.
FLOODWAY Panel # and date _____ _____	
DFE _____ _____	
	Site plan shows nature of development proposal, location, dimensions, wetlands, floodplain/floodway boundaries, and ground elevations. ☐ YES, continue review. ☐ NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid floodplain? ☐ YES. Explain flood hazards to applicant and make recommendations to minimize flood hazards and damage potential. ☐ NO, but can impacts be further minimized? Can fill be minimized? Buildings moved to higher ground?
	Has the applicant obtained and provided copies of all necessary State and federal permits, e.g., wetlands? ☐ NO, advise applicant which agencies to contact. ☐ YES, require copies for the file.
	Will a watercourse be altered? ☐ NO. Continue review.

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Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	☐ YES. Applicant to provide copies of notices to adjacent communities, federal agencies, and the NFIP State Coordinator. ☐ YES. Engineer's analysis required to show same flood carrying capacity; method of maintenance specified.
	Is fill proposed? Will fill be compacted? Side-slopes are no steeper than 2:1? Protected from erosion? ☐ NO fill. Continue review. ☐ YES, fill used to elevate building will be compacted, sloped, and stabilized. ☐ YES, but not for building elevation. Purpose for fill:
	Is the application for improvement or addition to an existing building? ☐ NO. A new structure is proposed, continue review. ☐ YES, but building is documented in file as a "historic structure" and proposed work will not change historic designation; encourage flood resistance. ☐ YES. Costs of work are documented and compared to market value. ☐ If costs equal or exceed 50% of market value of structure, provide finding to Board of Appeals for determination of Substantial Improvement. ☐ Proposed work is not a Substantial Improvement. Flood hazard review not required.
	Are new structures proposed to be elevated (new residential or non-residential buildings, storage tanks, manufactured homes)? Give applicant a blank Elevation Certificate. ☐ NO. STOP! A permit cannot be issued for non-elevated residential buildings. ☐ NO. Non-residential may be floodproofed (see design documentation requirements) ☐ YES, on fill. Basements into fill are <u>not</u> allowed. ☐ YES, on piers, pilings, or columns. ☐ YES, on solid foundation walls (see Enclosed areas below DFE).
	Check the following for Manufactured Housing units: ☐ Are flood hazards avoided as much as possible? ☐ In Floodway, refer to IBC® for foundation design. ☐ Foundation is reinforced (dry-stack block NOT allowed). ☐ Ground anchors and tie-downs shown on plans? ☐ Elevated above the DFE?
	Check the following for utility support systems: ☐ Electrical, mechanical, plumbing, heating/air conditioning components elevated? ☐ Septic designed to minimize inflow/discharge under flood conditions? ☐ On-site water supply designed to minimize inflow under flood conditions? ☐ Above-ground tanks are anchored/elevated?

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Reviewer's Initials and Date of Review	Review Steps
	<i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i> ☐ Below-ground tanks are designed to resist flotation?
	If new, non-residential structure is not elevated, will it be floodproofed? ☐ YES, non-residential building will be floodproofed to not less than 1' above DFE, and signed and sealed design documentation is in file. ☐ YES, agricultural building to be wet floodproofed. ☐ NO. Permit shall not be approved.
	Enclosed areas below DFE (stairwells, sheds, garages, storage areas, crawl spaces)? ☐ NO. Continue review. ☐ YES, number, total net open area, and location of flood openings shown on plan. ☐ YES, plan shows acceptable use (parking, limited storage, and access). ☐ YES, flood resistant materials specified. ☐ YES, utilities, if any, are all elevated above DFE.
	☐ Record permit in log of floodplain permits. ☐ Make sure that all necessary documents are in the file. ☐ Issue Permit and transfer file to Inspections.

PERMIT APPLICATION REVIEW COMPLETED BY: _____ DATE: _____

- ☐ ISSUE PERMIT approved by: _____
- ☐ DENY PERMIT approved by: _____

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Permit #: _____

Date: _____

Applicant: _____

SAMPLE Inspection Checklist

FLOOD HAZARD AREA INSPECTIONS – A ZONES

Inspector's Initials and Date of Inspection	Inspection Steps
	Before site inspection: ☐ REVIEW permit file before going in the field. ☐ ASK permit reviewer questions to understand requirements. ☐ Are other State and federal permits in the file?
	Measure stake out distances from waterway or landmark. Is development in the right place? Is fill correct distance from waterway or landmark? ☐ NO. Take enforcement action to correct problems. ☐ YES. Check fill compaction and side slopes. Basements into fill not allowed.
	Elevation of lowest floor checked during framing or foundation inspection after lowest floor is in place. Elevations checked and acceptable? ☐ YES. Maintain copy of documentation of final elevations in permanent records. ☐ NO! Take enforcement action to correct problems.
	Electrical, mechanical, plumbing, heating/air conditioning components elevated? ☐ YES. ☐ NO! Take enforcement action to correct problems.
	For enclosures below DFE (including crawl spaces): Are flood damage resistant materials used? Does use of enclosure appear to be limited to crawl space, parking, building access, or limited storage? Are flood openings no more than 12" above grade? Are there enough flood openings (based on net open area provided by the flood openings or certification of engineered openings), are they on at least two sides, and do they allow automatic entry/exit of floodwater? ☐ YES. ☐ Building does not have enclosures below DFE. ☐ NO! Take enforcement action to correct problems.
	Other Notes Based on Inspection:

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Inspector's Initials and Date of Inspection	Inspection Steps
	Issue Occupancy Certificate only if final inspection shows compliance with floodplain requirements.

FINAL INSPECTION COMPLETED BY: _____ DATE: _____

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Application #: _____

Applicant: _____

SAMPLE Plan Review Checklist **FLOOD HAZARD AREA APPLICATION REVIEW – V ZONES**

Terms: FHA = Flood Hazard Area; DFE = Design Flood Elevation

Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	Is proposed development consistent with zoning? ☐ NO. Applicant to request a zoning amendment. ☐ YES. Proceed with review.
	Is proposal in Coastal Barrier Resources Area (CoBRA) or Otherwise Protected Area? ☐ NO, continue review. ☐ YES, advise applicant that flood insurance is not available, document to file, continue review (must comply with flood provisions).
FIRM Panel # and date _____ _____ DFE _____ _____	Check FIRM, floodplain and zone boundaries, base flood elevations, <u>and</u> map revisions or LOMRs issued by FEMA. Is proposal in the Coastal Flood Hazard Area subject to high velocity wave action (V Zone)? ☐ NO, not in Flood Hazard Area; sign and date this form and put in file. ☐ NO, in "Coastal A Zone" (apply V Zone requirements). ☐ NO, in riverine A Zone. Use A Zone checklist. ☐ YES, in V Zone, must meet flood resistant provisions of the code.
	Site plan shows development proposal, location, dimensions, wetlands, FHA / V Zone boundaries, DFE, and ground elevations (NGVD or other datum on FIRM). ☐ YES, continue review. ☐ NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid FHA / V Zone? ☐ YES. Explain flood hazards to applicant and make recommendations to minimize flood hazards and damage potential. ☐ NO. Can floodplain impacts be further minimized? Maximize setback from the water? Buildings moved to higher elevation?
	Has the applicant obtained and provided copies of all necessary State and federal permits, e.g., wetlands, coastal zone consistency? ☐ NO, advise applicant which agencies to contact. ☐ YES, require copies in the file.

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	Will a dune be altered? ☐ NO, continue review. ☐ YES. Require State coastal zone approval before continuing.
	Is a pool proposed? ☐ NO. Continue review. ☐ YES, not attached to the building; continue review. ☐ YES, attached to the building. Continue review only if included in foundation design.
	Is the application for improvement or addition to an existing building? ☐ NO. A new structure is proposed, continue review. ☐ YES, but building is documented in file as a "historic structure" and proposed work will not change historic designation; encourage flood resistance. ☐ YES. Costs of improvements are documented and compared to market value. ☐ If costs of proposed addition equal or exceed 50% of market value of structure, provide finding to Board of Appeals for determination of Substantial Improvement. ☐ Proposed work is not a Substantial Improvement. Flood hazard review not required.
	Are new buildings proposed to be elevated? Give applicant a blank Elevation Certificate. ☐ NO. STOP! A permit cannot be issued for non-elevated buildings. ☐ YES, on fill. STOP! Structural fill not allowed in V Zones, require redesign. ☐ YES, on piers, pilings, or columns; signed and sealed design certification submitted? ☐ YES, on parallel shear walls (parallel to expected direction of flow?); signed and sealed design certification submitted?
	Check the following for utility support systems: ☐ Electrical, mechanical, plumbing, heating/air conditioning components elevated? ☐ Septic designed to minimize inflow/discharge under flood conditions? ☐ On-site water supply designed to minimize inflow under flood conditions? ☐ Above-ground storage tanks are anchored/elevated? ☐ Below-ground storage tanks are designed to resist flotation/erosion?
	Enclosed area below DFE proposed (stairwells, sheds, garages, storage areas)?

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	☐ NO. Continue review. ☐ YES, enclosed by insect screening or lattice. Continue review. ☐ YES, applicant has provided signed and sealed documentation of breakaway wall design. ☐ YES, design not documented. Advise applicant to obtain signed and sealed documentation of breakaway wall design from registered design professional. ☐ YES, flood resistant materials will be used. ☐ YES, utilities <u>not</u> penetrating or attached to breakaway walls.
	☐ Record permit in log of floodplain permits. ☐ Make sure that all necessary documents are in the file. ☐ Issue Permit and transfer file to Inspections.

PERMIT APPLICATION REVIEW COMPLETED BY: _____ DATE: _____

☐ ISSUE PERMIT approved by: _____

☐ DENY PERMIT approved by: _____

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Permit #: _____

Date: _____

Applicant: _____

SAMPLE Inspection Checklist **FLOOD HAZARD AREA INSPECTIONS – V ZONES**

Inspector's Initials and Date of Inspection	Inspection Steps
	Before site inspection: ☐ REVIEW permit file before going in the field. ☐ ASK permit reviewer questions to understand requirements. ☐ Are other State and federal permits in the file?
	Measure distances from landmark. Is development in the right place? ☐ NO. Take enforcement action to correct problems. ☐ YES. Continue inspection.
	Elevation of lowest floor checked during framing or foundation inspection after lowest floor is in place. Elevations checked and acceptable? ☐ YES. ☐ NO! Take enforcement action to correct problems.
	For enclosures below DFE: Are walls insect screening or lattice? Are walls breakaway, and no utilities attached to or penetrate breakaway walls? Are flood damage resistant materials used? Does use of enclosure appear to be limited to parking, building access, or limited storage? ☐ YES. ☐ Building does not have enclosures. ☐ NO! Take enforcement action to correct problems.
	Other Notes Based on Inspection:
	Issue Occupancy Certificate only if final inspection shows compliance

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

Inspector's Initials and Date of Inspection	Inspection Steps
	with floodplain requirements.

FINAL INSPECTION COMPLETED BY: _____ DATE: _____

FLOODPLAIN DEVELOPMENT PERMIT

PERMIT #: _____

DESCRIPTION: _____

ISSUED TO: _____

ADDRESS: _____

PROJECT ADDRESS: _____
(if different from permittee's address)

ISSUED BY: _____
Floodplain Management Administrator

DATE: _____

THIS PERMIT MUST BE POSTED ON THE PREMISES IN A CONSPICUOUS PLACE SO AS TO BE
SEEN FROM THE STREET OR ROAD ON WHICH THE STRUCTURE FACES.

Chapter 9 Substantial Improvement & Substantial Damage

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9.1 Introduction

Pre-FIRM structures are nonconforming uses. Compliance with the floodplain management ordinance is triggered only when such buildings are substantially improved (including repairs due to substantial damage). The NFIP concept of substantial improvement is a compromise between two extremes: one that prohibits all improvements that do not meet minimum floodplain management standards and the other that allows existing structures to be improved in any fashion without meeting any regulatory standards. Prohibiting all improvements has associated with it the potential for causing hardship because it would even block repairs needed due to damage or aging. However, allowing existing structures to be improved without meeting any regulatory standards is also impractical because of the exposure of increased investments.

Chapter 5 focuses on the requirements for new construction. But what happens when the owner of an existing building wishes to make an improvement, such as an addition or major remodeling? What if a building is damaged by a fire, flood or other cause? The NFIP regulations, as reflected in local floodplain management ordinances, apply to existing buildings under certain circumstances. Those circumstances are when improvements constitute “substantial improvement” and when damage constitutes “substantial damage.”

People who own existing buildings that are being substantially improved will be required to make a major investment in them in order to bring them into compliance with the law – they will not be happy. If the buildings have just

Who makes the determination of substantial improvement? The local Floodplain Administrator is charged with making a finding. Applicants and contractors must provide estimates of the cost of proposed work (or required repairs). After damage, insurance claims information may help screen for substantially damaged buildings, but the claim amount is not an estimate of the total costs of repair.

been damaged, they will be financially strapped and your elected officials will want to help them, not make life harder for them.

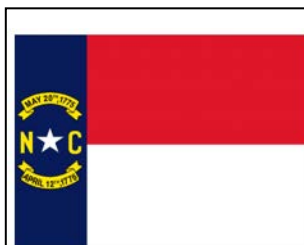
For these reasons, it is easy to see that this requirement can be difficult to administer. However, dealing with both circumstances offers a significant opportunity to reduce future flood damage through your regulations and building codes.

9.2 Substantial Improvements and Substantial Damage

The NFIP defines **substantial improvement** as any reconstruction, addition, repair of damage, rehabilitation, or other improvement to a building, the cost of which equals or exceeds 50% of the market value of the building (not including land) before the start of construction of the improvement. Substantial improvement also includes buildings that have suffered **substantial damage** from any cause. Damage is considered to be substantial if the cost to repair and restore the building to its pre-damage condition equals or exceeds 50% of the market value before the damage occurred.

What does all that really mean? It means that buildings that are substantially improved, **including those that are substantially damaged by any cause** must be brought into full compliance with the community's floodplain ordinance requirements. In most instances, this means that existing buildings must be elevated so that the lowest floor (including basement) is elevated to or above the base flood elevation. Figure 9-1 shows the typical process to elevate a crawlspace home. If determined to be feasible (usually by a structural engineering evaluation), non-residential buildings may be retrofit with floodproofing techniques in order to be deemed "in full compliance."

Full compliance can mean several things; most of them have considerable consequences and costs for the property owners. But remember the alternative – allowing significant financial investment in a building that likely will suffer flood damage again and again.



To help you deal with substantial improvement, FEMA has prepared several publications, explanations, worksheets, and affidavits. Consider copying handouts to give property owners, especially after damage by any cause. And as always, call the State NFIP Coordinator's Office for help.



In North Carolina's coastal counties, substantially damaged building must also meet CAMA rules. However, there are differences between how the two programs treat costs. Check with DEM and the Department of Coastal Management for more information.

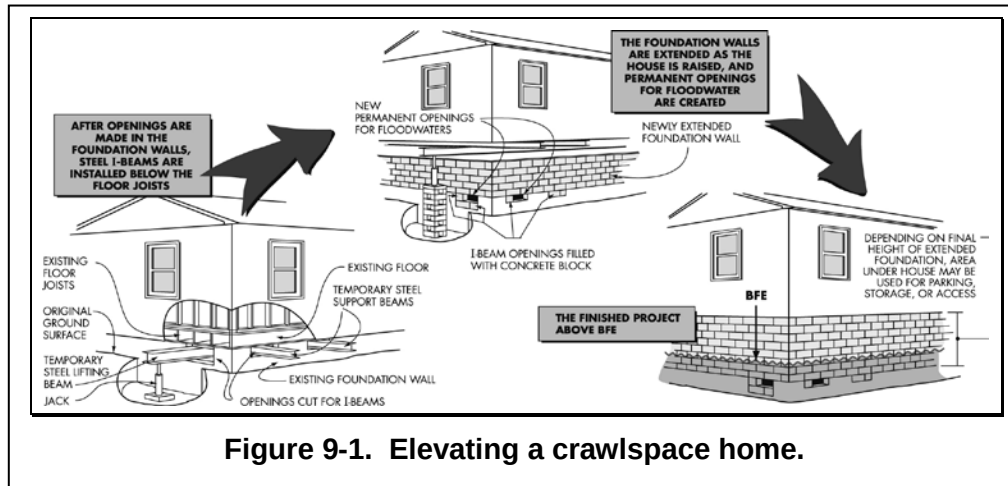


Figure 9-1. Elevating a crawlspace home.

Explaining Improvements. There are many different types of improvements, such as additions, remodeling, reconstruction, rehabilitation, and combinations of these improvements.

Think carefully about each type of improvement and how exposure to flood damage will be affected. Even proposals that involve only interior renovations should be carefully reviewed, because major work is likely to trigger the 50% rule. Additions can be more straightforward, but even then there are some permutations that you need to know about.

There is a fine line between an improvement and routine maintenance. If your community has many existing buildings in the floodplain, you should decide ahead of time what elements will be considered routine maintenance.

Routine Maintenance. The substantial improvement rule isn't meant to prevent routine maintenance, such as re-roofing, re-siding, new paint, new windows, or fire safety upgrades. If your community has a building code, a rule-of-thumb is that any activity that requires a permit requires consideration of floodplain requirements.

Sequential Projects. One problem you may face is a builder or owner who tries to avoid the substantial improvement requirement by applying for a permit for only part of the job and then later applying for another permit to

A good resource to help you and your citizens with all aspects of substantial improvement is FEMA 213, *Answers to Questions About Substantially Damaged Buildings*.



A small number of property owners may try to get around the substantial improvement rule by deliberately phasing improvements. It is recommended that you decide (and put in your ordinance) the period of time over which sequential projects will be counted as one within a ten year period, and be considered a single action.

finish the work. If both applications are together worth more than 50% of the value of the building, the combined project should be considered a substantial improvement and subject to the rules.

FEMA requires that the entire improvement project be counted as one. In order to help you enforce this, you may want to count as one project all applications submitted over a specific period of time, such as one year. Check with the NC-DEM about ordinance language and be sure to spell it out in the permit application materials given to the applicant.

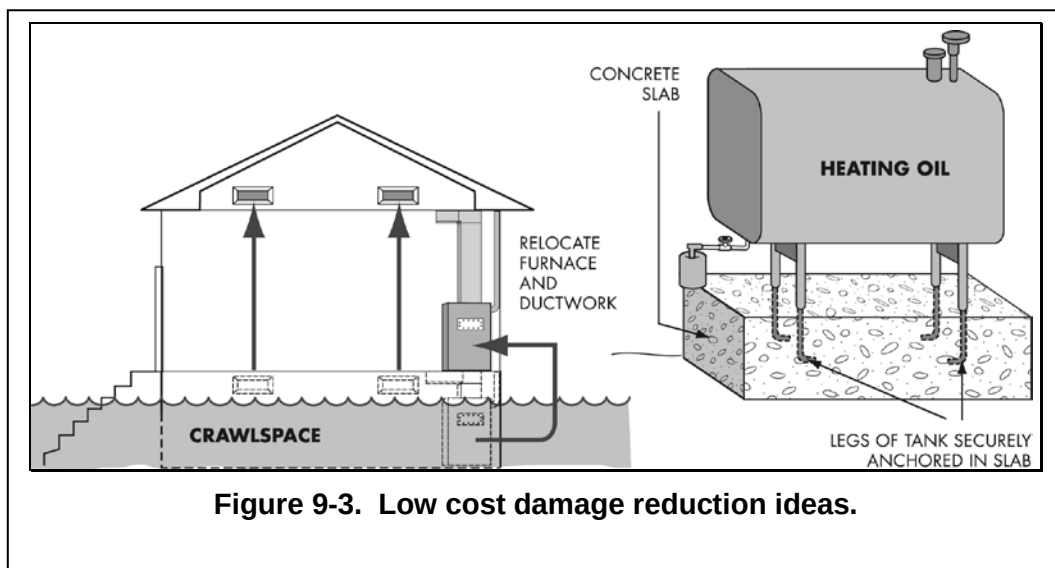
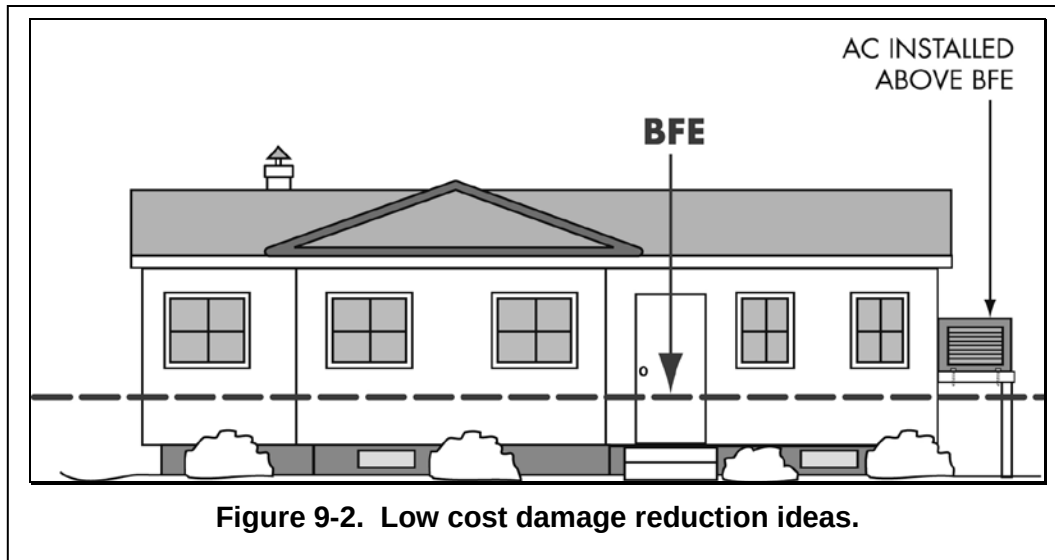
Some communities require that improvements be calculated cumulatively over several years. All improvement and repair projects undertaken over a period of time are added up; the period of time may be 5 years, 10 years or the life of the structure are added up. When they total 50 percent, the building must be brought into compliance as if it were new construction.



Activity 430 of the Community Rating System credits keeping track of improvements to enforce a cumulative substantial improvement requirement. It also credits using a lower threshold than 50 percent. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Non-Substantial Improvements. Improvements are “non-substantial” if the costs of the work proposed are less than 50% of the market value of the building (or the percent specified in the ordinance). Although the owner is not required to bring the building into compliance, there are many things that can be done to reduce future flood damage. You should encourage the owner to consider:

- Use flood-resistant materials below the BFE, such as closed-cell wall insulation and polyvinyl wall coverings.
- Raise air conditioning equipment, heat pump, furnace, hot water heater and other appliances on platforms; even if a small addition needs to be built to house service equipment (Figure 9-2 and Figure 9-3).
- Install electric outlets higher above the floor.
- Move ductwork out of crawlspaces.
- Retrofit crawlspaces with flood openings.
- Fill in below-grade crawlspaces or utility areas.



Lateral/Horizontal Additions (without Structural Modification of Common Wall). Any time a lateral/horizontal addition is proposed there is an opportunity to minimize future flood damage. The existing building is not required to be brought into compliance if three conditions are met: (1) the work involves ONLY the addition (that is, work is not proposed for any portion of the existing building); (2) the addition will be elevated to or above the base flood elevation; and (3) there are no structural modifications to the common wall (other than a connecting door).

You must carefully examine the application to make sure that nothing triggers the requirement to bring the existing building into compliance. As always, seek advice from the State NFIP Coordinator.

Lateral/Horizontal Additions (with Structural Modification of Common Wall). When a lateral/horizontal addition involves structural modification of the original building, an evaluation of the cost of the all proposed work must be made in order to determine if the work constitutes substantial improvement. If the cost exceeds the 50% threshold, then the entire building must be brought into compliance.

Vertical Additions (New Story or New Foundation). Second-story additions modify the structure of the original building, and almost always trigger the 50% rule. While it may be possible to raise a building on a new foundation without triggering substantial improvement, it only makes sense to fully elevate the building to or above the BFE, in part because insurance premiums will be considerably lower.

Reconstruction. Reconstruction or rebuilding occurs when an existing structure that has been partially or completely destroyed by any cause (e.g., fire, tornado, demolition, etc.) is rebuilt. If totally destroyed, the reconstruction is treated a new construction and must fully comply with all requirements.

If a partially destroyed building is reconstructed and the cost of the work equals or exceeds 50% of the market value before the damage, then the work is considered substantial improvement and the building must be brought into compliance with the NFIP requirements. The cost of the work includes the cost to repair all damage to pre-damage condition, regardless of the amount of work the owner proposes (i.e., work cannot be phased in order to avoid the substantial improvement requirements).

Rehabilitation. Rehabilitation occurs when improvements and repairs are made to the interior and/or exterior, but there is no increase in floor area. Rehabilitation may or may not involve structural modifications to the load-bearing components of the building. If the cost of the rehabilitation work equals or exceeds 50% of the market value before the work begins, then the work is considered substantial improvement and the building must be brought into compliance.

Non-Residential Buildings. The only differences between residential and non-residential buildings, when considering substantial improvement, are the options available to bring them into compliance. A structural engineering

analysis may determine that it is feasible to retrofit a non-residential building with floodproofing techniques in order for it to be deemed “in full compliance.” There are many factors to be considered, especially if the measures proposed involve any sort of human intervention.

Post-FIRM Buildings. The substantial improvement requirements do not apply only to pre-FIRM buildings – they cover all buildings, including those built post-FIRM. In most cases, a post-FIRM building will be properly elevated or otherwise compliant with the regulations for new construction. However, sometimes a change in maps or map changes results in a higher BFE or change in FIRM zone. In these cases, a substantial improvement of a post-FIRM building may prompt a requirement to bring the building into compliance with the new BFE or zone.

The building code requires that all additions be treated as new construction, thus there should be no question about elevation. All additions to post-FIRM buildings must be elevated at least as high as the BFE in effect when the building was built (i.e., you can’t allow a compliant building to become noncompliant by allowing additions at grade.) If a new, higher BFE has been adopted since the building was built, additions that are substantial improvements must be elevated to the new BFE.

What Compliance Means. For buildings that do not conform with the NFIP rules, which includes pre-FIRM buildings with the lowest floor below BFE, the 50% rule means the original buildings have to be brought into compliance. This usually means the original building has to be elevated – lifted off its foundation and raised above the BFE. It also means that basements have to be filled, crawl space foundations must be retrofit with flood openings, and electrical and mechanical service equipment must be elevated. Non-residential buildings can be retrofit with floodproofing measures, but be extra careful and require certified designs by qualified architects and engineers.

Record Keeping is Very Important. Some communities use a valuation worksheet for every permit for improvements, additions, and repairs. This way, a record of good practice is established. Remember, it is just as important to show you determined that an improvement or repair is less than substantial. You should make the determination for every permit for existing buildings in the SFHA and keep copies with permanent permit records.

Historic Structures. Improvements and repairs to historic structures may be granted variances and are exempt from the substantial improvement and substantial damage requirement as long as the structures continue to be designated as historic. You can require owners to get comments from the appropriate historic commission or agency. Remember, this does not apply to buildings that are simply located in historic districts. To qualify, each building must be individually listed or eligible for listing as a historic structure.

9.3 Determining Substantial Improvement:

The Formula. The formula for determining if a proposed project is a substantial improvement uses the cost of the project and the value of the building before the project is undertaken. These two numbers must be reviewed in detail. A project is a substantial improvement if the ratio of the cost of the project over the market value of the building equals or exceeds 50 percent.

Substantial Improvement:

$$\frac{\text{Cost of improvement project}}{\text{Market value of the building}} \geq 50\%$$

For example, if a proposed improvement project will cost \$30,000 and the market value of the building is \$50,000, then the ratio is 0.6 or 60 percent. This project would constitute a substantial improvement and the existing building would have to be brought into compliance.

Determining Building Value. The market value of the building is not the “sales price” of a property, because that value includes the value of the land. In common parlance, “market value” is the price a willing buyer and a willing seller agree upon. The market value of a building reflects its age, quality and condition at the time the determination is made.

FEMA’s rules require that the building value be the “market” value before the improvement or before damage occurred. You can require the applicant/owner to obtain a professional market appraisal. As a screening tool only, you can estimate the market value by using tax assessment values, if adjusted to current value. You should pick an approach and consistently apply it. Owners who contest your determination may obtain an independent appraisal, but you must be sure that the instructions to the appraiser appropriately reflect the requirements, i.e., building only, and value associated with location should be attributed to the land not the building.

Some estimates of market value are used only as screening tools (i.e., NFIP claims data and property appraisals for tax assessment purposes) to identify those structures where the substantial improvement ratios are obviously less than or obviously greater than 50 percent (i.e., less than 40 percent or greater than 60 percent). For structures that fall in the 40 to 60 percent range, more precise market value estimates are sometimes necessary. Acceptable estimates of market value can be obtained from these sources:

- An independent appraisal by a professional appraiser. The appraisal must exclude the value of the land and not use the “income capitalization approach” which bases value on the use of the property, not the structure.
- Detailed estimates of the structure's actual cash value – the replacement cost for a building, minus a depreciation percentage based on age and condition. For most situations, the building's actual cash value should approximate its market value. Your community may prefer to use actual cash value as a substitute for market value, especially where there is not sufficient data or enough comparable sales.
- Property values used for tax assessment purposes with an adjustment recommended by the tax appraiser to reflect current market conditions (adjusted assessed value).
- The value of buildings taken from NFIP claims data (usually actual cash value).
- Qualified estimates based on sound professional judgment made by the staff of the local building department or tax assessor's office.

Calculating Improvement Costs. You have several options to determine the cost of improvements. The most straightforward is to have the applicant get an estimate from a reputable contractor. You have to include all design and construction costs (Table 9-1), including structural building parts, utility and service equipment, finish materials and appliances, and labor, overhead and profit. Finish materials include lighting fixtures, built-in appliances and cabinets, interior moldings, tiling, installed carpet, and other similar items are also included. Another way to estimate costs is to use regionalized construction costs based on the square footage of the proposed work.

Substantial improvement/damage does not include certain costs to bring standard homes into compliance with cited safety code violations.

There are only a few costs that are not included: plans and specifications, survey costs, and permit fees, debris removal, landscaping, accessory

structures, swimming pools, and fences. Also, do not include costs to correct previously identified violations of health, sanitary, or safety code that are the minimum necessary to assure safe living conditions.

Table 9-1. Calculating Project Costs	
Items to be Included • All structural elements, including: • Spread or continuous foundation footings and pilings • Monolithic or other types of concrete slabs • Bearing walls, tie beams and trusses • Floors and ceilings • Attached decks and porches • Interior partition walls • Exterior wall finishes (brick, stucco, siding) including painting and moldings • Windows and doors • Reshingling or retiling a roof • Hardware • All interior finishing elements, including: • Tiling, linoleum, stone, or carpet over subflooring • Bathroom tiling and fixtures • Wall finishes (drywall, painting, stucco, plaster, paneling, marble, etc.) • Kitchen, utility and bathroom cabinets • Built-in bookcases, cabinets, and furniture • Hardware	All utility and service equipment, including: • HVAC equipment Plumbing and electrical services • Light fixtures and ceiling fans • Security systems • Built-in kitchen appliances • Central vacuum systems • Water filtration, conditioning, or recirculation systems • Cost to demolish storm-damaged building components • Labor and other costs associated with moving or altering undamaged building components to accommodate improvements or additions • Overhead and profits Items to be Excluded • Plans and specifications • Survey costs • Permit fees • Post-storm debris removal and clean up • Landscaping • Sidewalks • Fences • Yard lights • Swimming pools • Screened pool enclosures • Detached structures (including garages, sheds and gazebos) • Landscape irrigation systems

9.4 Determining Substantial Damage

Getting Ready for After the Flood. Many communities have first-hand knowledge of how difficult it can be to do a good job after a big flood, when many people are damaged and anxious to get back to normal. FEMA knows this is a difficult period and has prepared software and a manual to help:

Guide on Estimating Substantial Damage Using the NFIP Residential Substantial Damage Estimator (FEMA 311). Remember too, you can ask the State to help identify and review buildings that need permits to repair. FEMA's RSDE packet includes damage level descriptions, an inspection report form, and placards to post buildings. Order the CD-ROMS with the RSDE program by calling (800) 480-2520.

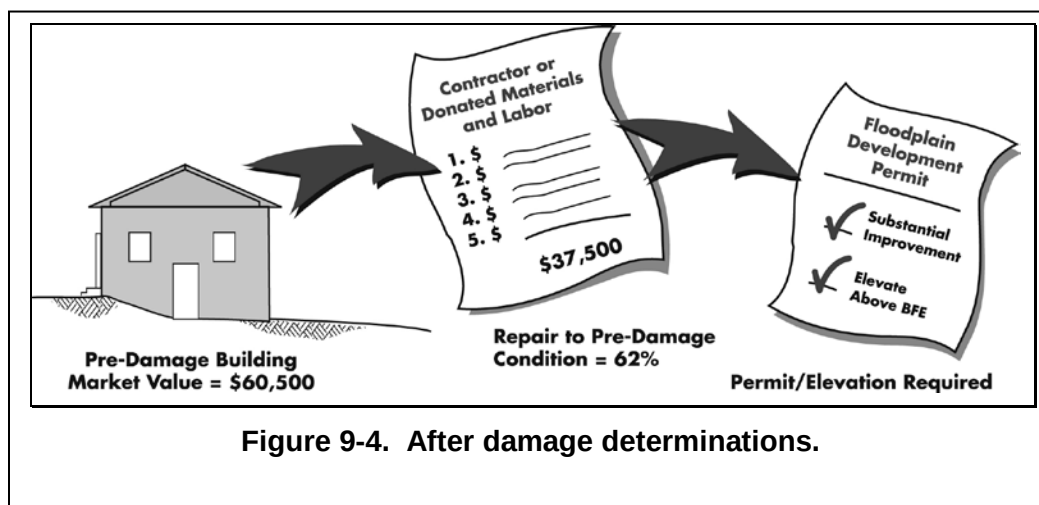
Costs of Repair. Local Floodplain Administrators must make substantial damage determinations when floodplain buildings are damaged by any cause (Figure 9-4). This is a special case of improvement and communities with experience know that dealing with permits after major damage can be tricky. Download or order materials developed to help you deal with substantial improvement/substantial damage, including FEMA's

Residential Substantial Damage Estimator. Communities that are exposed to repetitive flooding should develop handouts designed to help property owners.

FEMA's *Residential Substantial Damage Estimator* (RSDE) is a valuable resource, including software and guidance. Learn more by visiting www.fema.gov.

When you're estimating the cost to repair substantially damaged buildings, you can use the approaches outlined above. In a pinch, you can request a copy of the insurance adjuster's worksheets or Proof of Loss Statement. The actual cost of repairs may not be less than the amount of damage claimed. A note of caution: the adjuster may not include all costs to fully repair, because NFIP flood insurance doesn't cover all elements of a building that may be damaged.

Sometimes homeowners want to perform some of the repairs themselves. The NFIP requires that you estimate the fair market value of the labor and material, even donated materials, and include them in the cost of repairs.



Money to Help Flood-Damaged Property Owners. When flood victims are faced with bringing their damaged buildings into compliance, one of the first things they ask is “How can I afford the additional cost?”

Every NFIP flood insurance policy includes coverage for Increased Cost of Compliance, called ICC (see Section 9.5). After a flood that causes certain levels of damage, policyholders may be reimbursed up to \$30,000 (as of May 1, 2003) to bring substantially damaged buildings into compliance. If you have a cumulative or repetitive loss ordinance, then people who suffer repetitive flood damage may also qualify. Check with the State NFIP Coordinator for the details.

Remember! Compliance may be triggered by damage from any cause, including flood, earthquake, fire, tornado, or unusual events. ICC claims are paid only after qualifying flood damage.

FEMA's materials to help local officials, property owners, and insurance adjusters handle ICC can be found on FEMA's webpage. Call the State NFIP Coordinator for specific materials, which can be ordered from FEMA.

Some Other Thoughts. FEMA has done a number of post-flood investigations to check on how well communities handle these requirements. In most communities, they found that the substantial improvement and substantial damage rules were poorly understood not only by permit officials but more so by property owners. Many citizens don't realize that permits are needed to improve or repair existing buildings. So you need to be ready to act quickly after a damaging event. Otherwise, your community's flood risks will continue and FEMA may impose sanctions for failure to properly implement your ordinance. Your post-damage duties are outlined in your ordinance in the section that describes the Floodplain Administrator's powers, duties and responsibilities.

Other Triggers – Higher Standards. Some communities adopt different substantial improvement/damage thresholds. For example, some CRS communities use 40% or 30% rather than 50% to trigger compliance. FEMA supports higher standards because in the long run it means that flood hazards and potential damage will be reduced.

Another higher standard is a cumulative substantial improvement regulation. This means you would have to track permits over time and require compliance when 50% of market value is achieved. Check with the State NFIP Coordinator to learn more.

9.5 Increased Cost of Compliance

Beginning June 1, 1997, the additional coverage was added to all NFIP flood insurance policies on structures. The purpose of the coverage, called “Increased Cost of Compliance” (ICC) is to assist with the added costs of meeting building code requirements that take effect after a home or business becomes flood damaged. The coverage is automatically included in all policies except for contents-only or individually-owned-condominium-unit policies. Although all flood insurance policyholders pay for the coverage, only those in special flood hazard areas (Zones A and V) can file and receive payment for ICC claims (because buildings not in the SFHA are not required to comply with the ordinance.)

The Flood Insurance Reform Act of 2004 changed ICC. As of late 2005 FEMA was developing regulations and guidance to reflect those changes. Because ICC is part of the insurance policy, a contract, any change in the statute must be reflected by a change in the policy.

The National Flood Insurance Reform Act of 1994 authorized ICC to address the common financial problems experienced by owners of substantially damaged property in making their buildings flood resistant. As of the end of 2005, the maximum claim amount is limited to \$30,000 per structure, in addition to policy limits for direct, physical damage from flooding (but the combined payments may not exceed the statutory limit of \$250,000 for residential property).

ICC claims can be filed if the community determines that a building is substantially damaged (i.e., the cost to repair the building to its pre-damage condition equals or exceeds 50 percent of the building's market value). If a community has adopted an ordinance provision related to repetitive damage, an ICC claim may be available. To qualify under this provision, insured properties must be “repetitive loss properties,” which means flood insurance claims have been paid on two occasions in ten years with the damage equaling or exceeding 25 percent of the structure's market value at the time of each flood.

ICC claims may be used as part of the non-federal match for FEMA-funded mitigation projects. For acquisition projects the claim may be assigned to the community; for elevation and relocation projects, the owner uses the claim payment as the match. If your community is contemplating a flood mitigation project, you should encourage all affected owners to purchase flood insurance (some grant programs place a priority on helping owners who have helped themselves). You should also contact the North Carolina Division of Emergency Management to learn more about how ICC can support your efforts.

To receive a claim payment under ICC, the measures to bring a building into compliance must be completed within two years after the damage occurs, less FEMA explicitly allows an extension (such as if the claim will be used as the non-federal match for a mitigation grant, because such projects often take longer than two years). The mitigation options that a policyholder can use to comply with the community's floodplain management ordinance are:

- Elevation-in-place
- Relocation to higher ground
- Demolition (as part of a buyout project)
- Demolition and reconstruction
- Floodproofing for non-residential buildings

For more information about ICC, get a copy of *National Flood Insurance Program's Increased Cost of Compliance Coverage: Guidance for State and Local Officials (FEMA 301)*. Brochures that explain the roles of the local Floodplain Administrator, the insurance adjuster, and the property owner also are available.

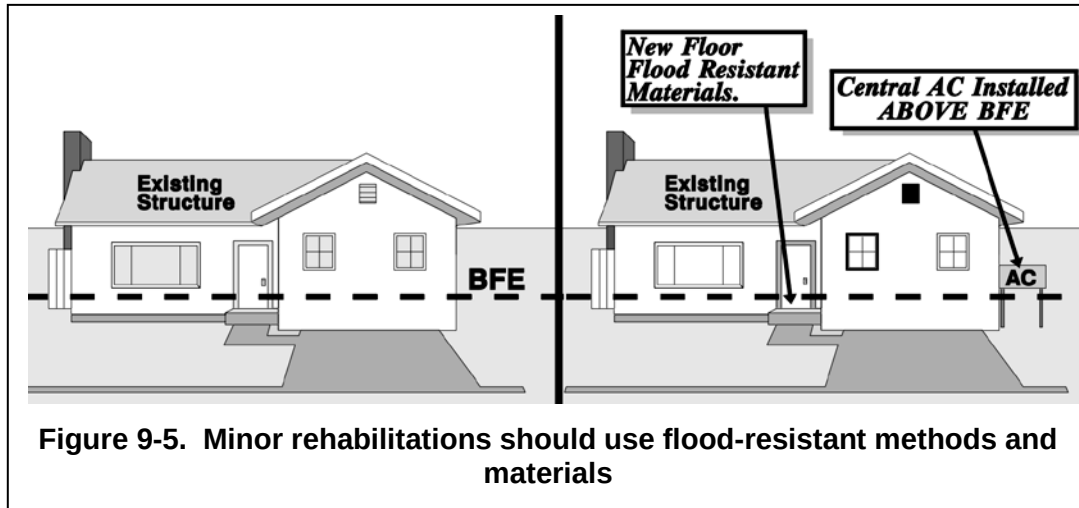
9.6 Examples of Substantial Improvement

Example 1 – Minor Rehabilitation. An application for an improvement of an existing structure is received; the proposed work involves a new central air conditioning system and upgrades to the electrical system (Figure 9-5). No changes are proposed to the external dimensions of the structure (no additions). If the cost of the rehabilitation is less than 50 percent of the structure's market value, the building does not have to be elevated or otherwise brought into compliance. Because the building is in the SFHA the local Floodplain Administrator examined the cost of the proposed work (estimated by the contractor to be \$12,000) and compared it to the market

Minor rehabilitation:

<u>Project cost</u>	< 50%
Market value	

value of the building (\$60,000). The proposed work is not a substantial improvement. However, the local Floodplain Administrator advised the owner to reduce the potential for future flood damage by using flood-resistant materials and installation of electrical, heating and air conditioning units above the BFE.

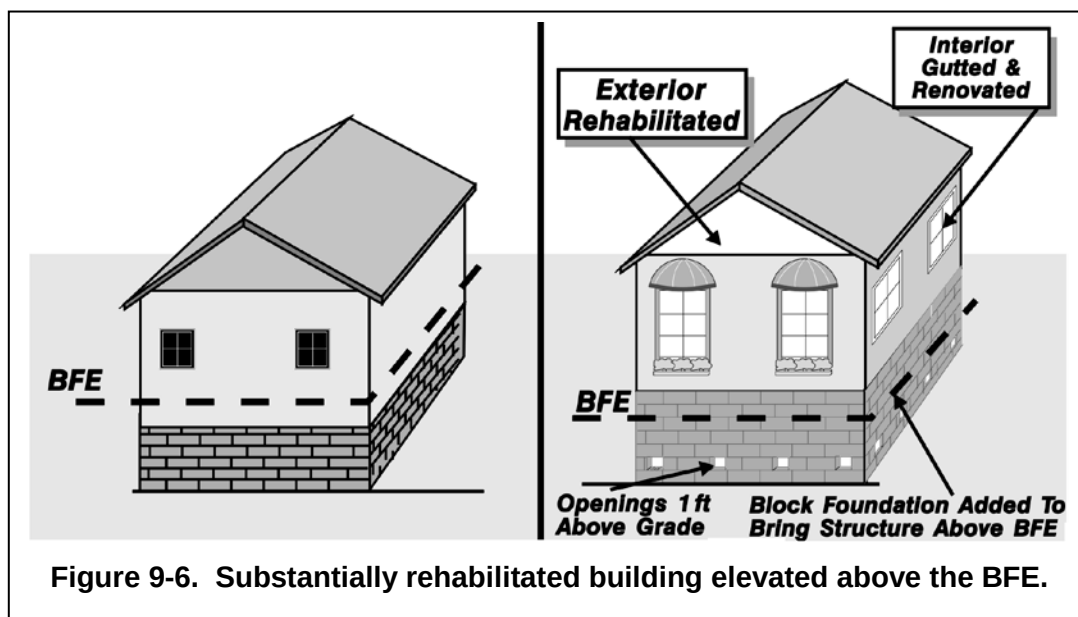


Example 2 – Substantial Rehabilitation. An application is received for rehabilitation of a house in a floodplain that has been in disrepair for several years. The work required to make it habitable involves gutting the interior and replacing all walls and flooring, new windows and exterior siding, a new roof, new kitchen cabinets and bathroom fixtures, and a new furnace and electric wiring. The local Floodplain Administrator examines the cost of the proposed work (estimated by the contractor to be \$35,000) and compared it to the tax assessment value of the building (\$25,000). Even when an adjustment factor, provided by the Assessor's Office, is applied to the tax value, the assumed market value is found to be \$33,250.

Substantial rehabilitation:

$\frac{\text{Project cost}}{\text{Market value}} > 50\%$

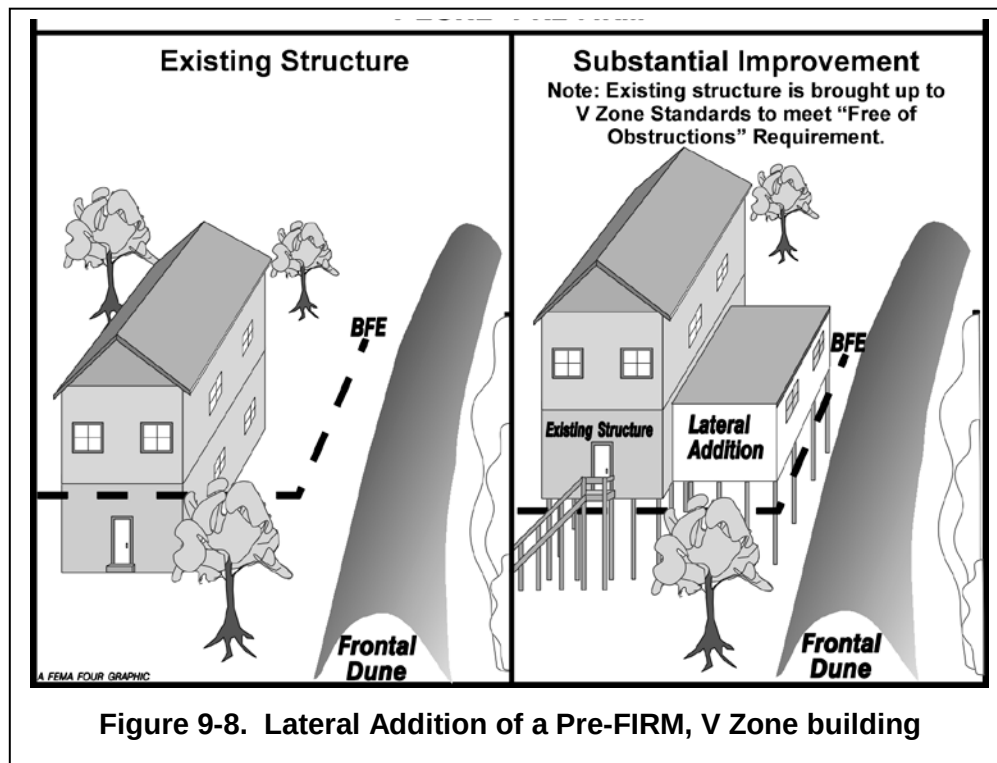
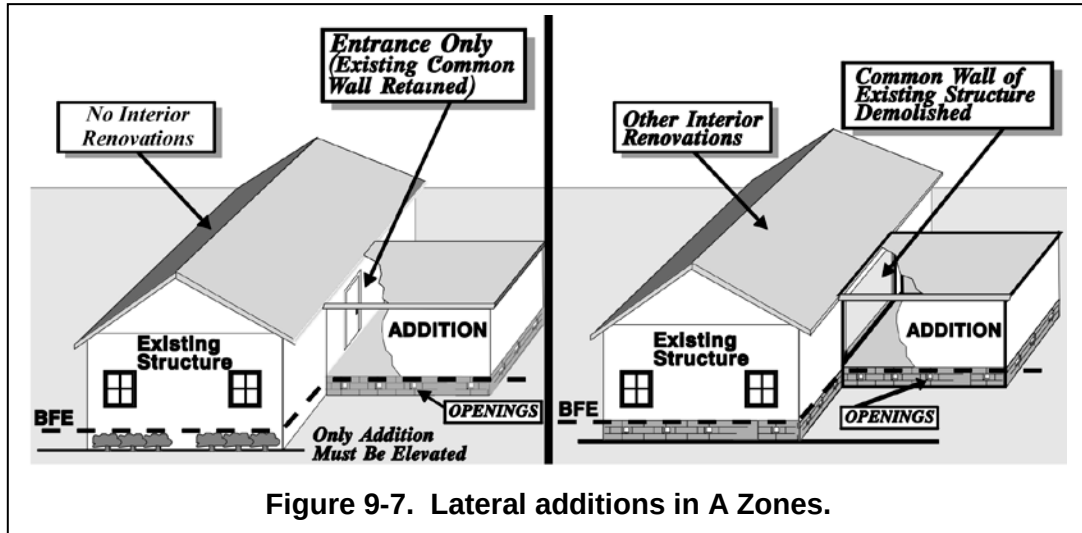
Because the cost of the rehabilitation is more than 50 percent of the structure's market value, it is a substantial improvement and the building must be brought into compliance with the floodplain management ordinance (Figure 9-6). The house has a partial basement and an elevation survey reveals that the next higher floor is about 2 feet below the BFE. To bring it into compliance, the local Floodplain Administrator advises the owner that the building must be elevated and the basement must be filled in so that the interior grade is at or above the exterior grade and the remaining walls must be retrofit with flood openings; the new furnace cannot be installed in what is now a crawlspace.



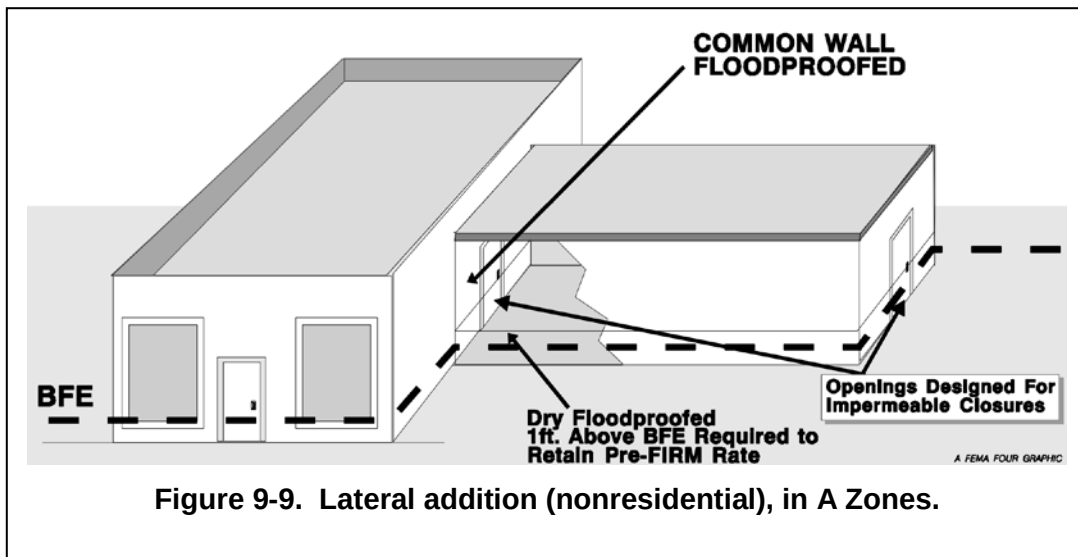
Example 3 – Lateral Addition (Residential). Additions are improvements that increase the square footage of a structure and often involve structural modification of the existing building. Note that if one building is attached to another through a covered breezeway or similar connection, it is a separate building and not an addition.

When an addition is a substantial improvement, the addition must be elevated. Depending on the flood zone and details of the project, the existing building may not have to be elevated. The determining factors are the common wall and what improvements are made to the existing structure. If the common wall is demolished or structurally modified, then the entire structure must be elevated. If only a doorway is cut through and only minimal finishing is done, then only the addition has to be elevated. Two examples of lateral additions are shown in Figure 9-7. Also, depending on the flood zone:

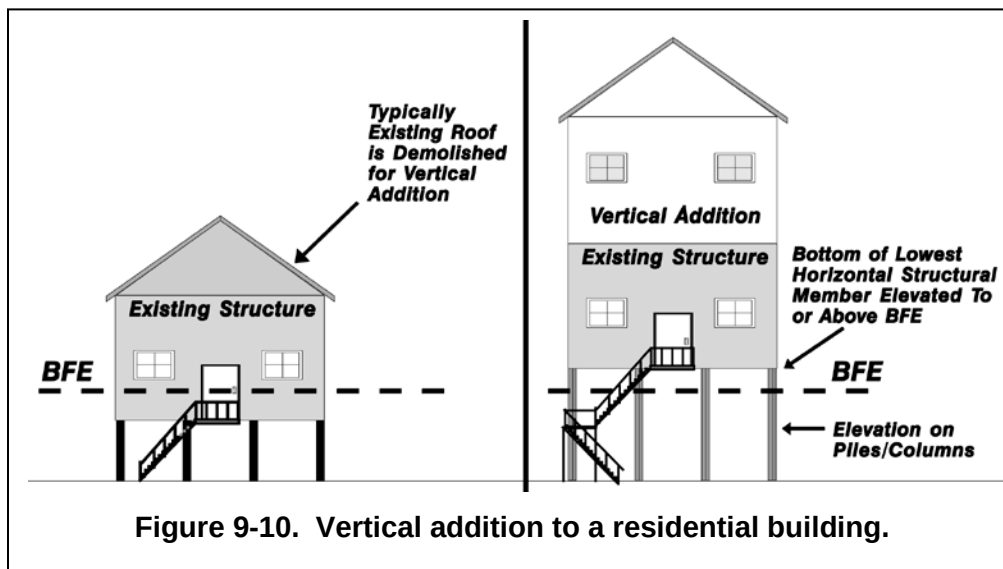
- In A Zones only, if improvements are made to the existing structure (such as a kitchen makeover), both it and the addition must be elevated and otherwise brought into compliance.
- In V Zones when an addition constitutes a substantial improvement, then the existing structure always has to be elevated on a compliant, engineered foundation system. This is due to the “free-of obstruction” requirement whereby the existing structure below BFE would obstruct the storm surge, causing damage to the addition (Figure 9-8).

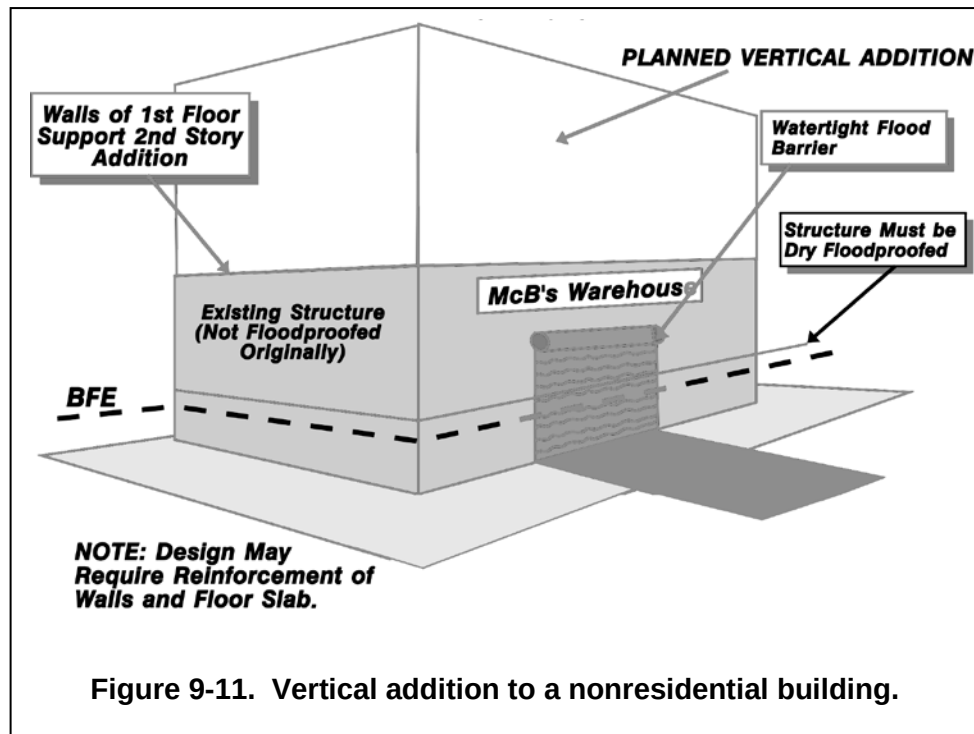


Example 4 – Lateral Addition (Nonresidential). An addition to a non-residential building may be either elevated or floodproofed (Figure 9-9). If it will be elevated, see Example 3. If it will be floodproofed, the designer and builder must ensure that the wall between the addition and the original building is floodproofed. Floodproofing is not allowed as a construction measure in V Zones.

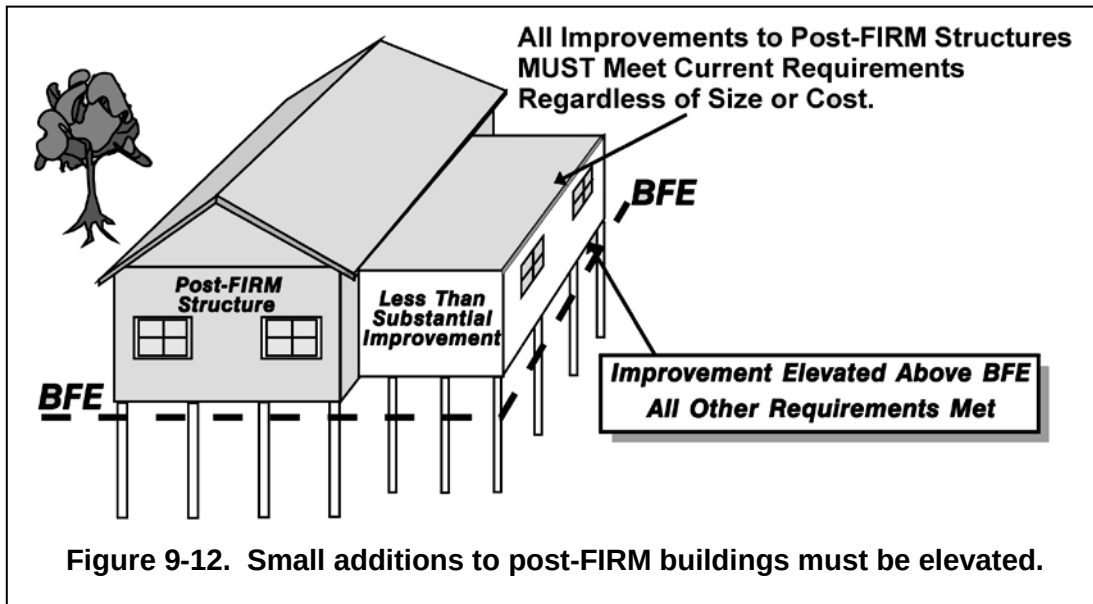


Example 5 – Vertical Additions. When the proposed substantial improvement is a full or partial second floor, the entire structure must be elevated (Figure 9-10). In this instance, the existing building is the supporting “foundation” for the addition. Failure of the existing building would result in failure of the addition. If a vertical addition is proposed for a nonresidential building, the original building either must be elevated or designed and certified to be dry floodproofed (Figure 9-11).

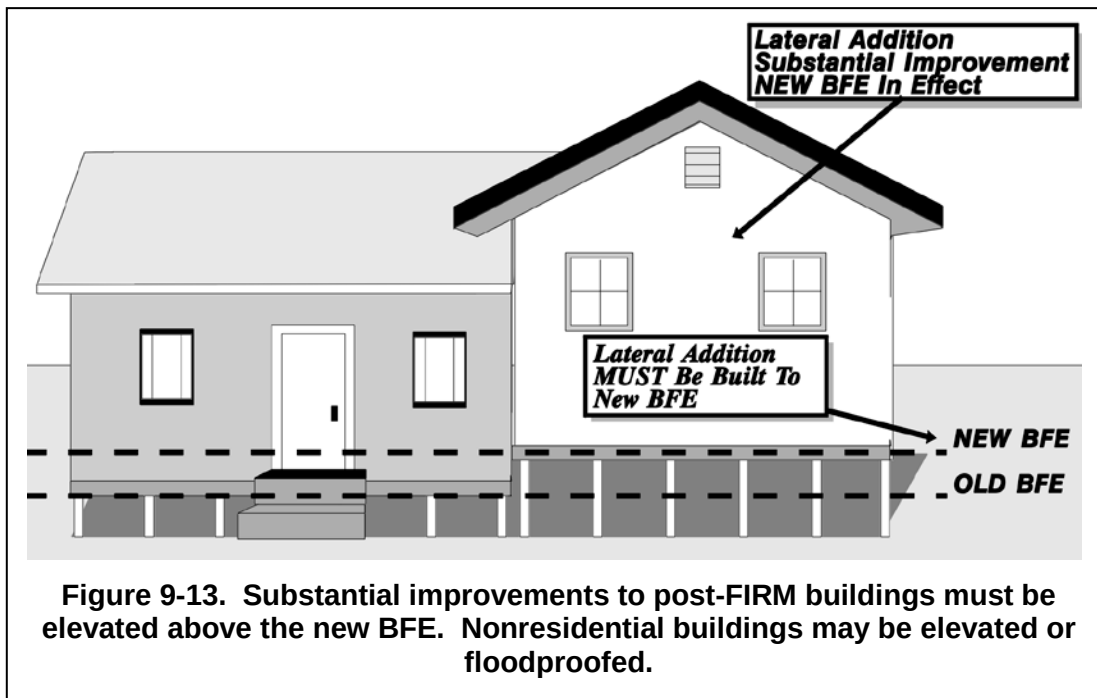




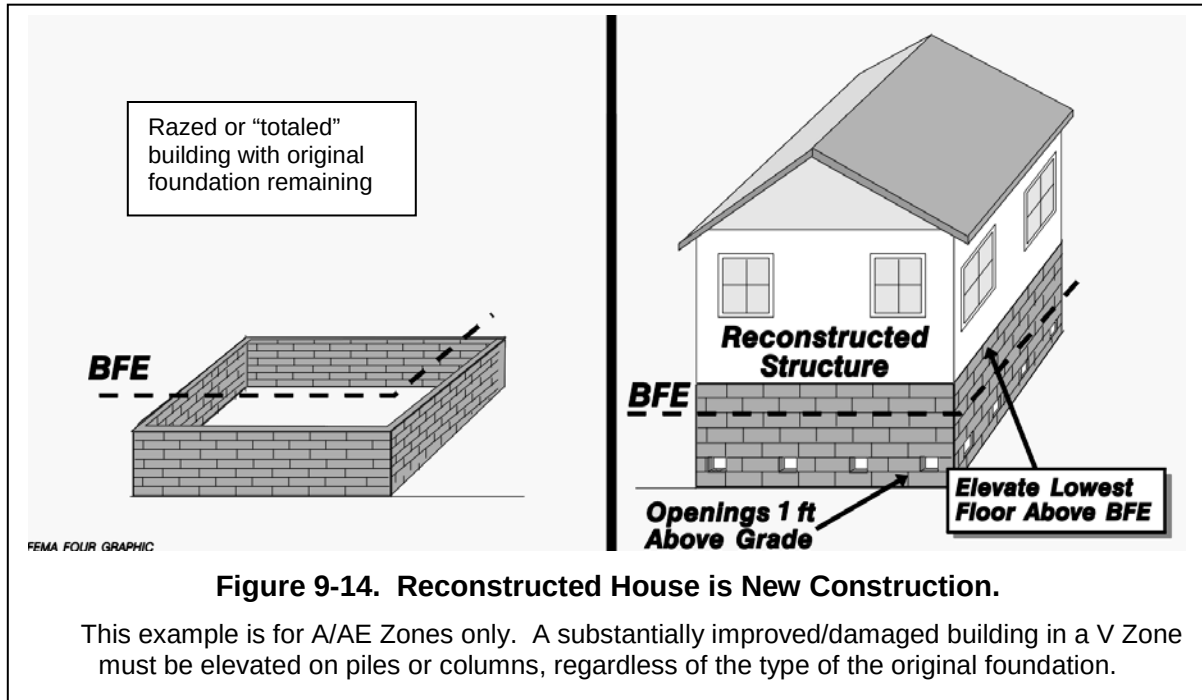
Example 6 – Post-FIRM Building (Minor Addition). All additions to post-FIRM buildings are new construction and must meet the requirements of your floodplain management ordinance regardless of the size or cost of the addition (Figure 9-12). A small addition to a residential structure, even if the cost is less than 50 percent of the market value, must be elevated at least as high as the BFE in effect when the building was built. Minor additions to nonresidential structures can be elevated or floodproofed. If a map revision has taken place and the BFE has increased, only additions that are substantial improvements have to be elevated to the new BFE or floodproofed (nonresidential buildings only).



Example 7 – Post-FIRM Building, Substantial Improvement. Substantial improvements made to a post-FIRM structure must meet the requirements of the current ordinance, including when the effective FIRM has a higher BFE. Figure 9-13 shows a lateral addition made after a map revision took place and the BFE was increased.



Example 8 – Reconstruction. Reconstruction is the term used when an entire structure is destroyed, damaged, or purposefully demolished or razed, and a new structure is built on the old foundation or slab. Reconstructions are, quite simply, “new construction” and they must be treated as new



buildings (Figure 9-14).

Example 9 – Damage due to Long-Duration Flooding. Flooding does not need to structurally damage a building to cause costly repairs (see Figure 9-15). The cost to repair after a flood that simply soaked a building for a long time will typically include the following:

- Remove all wallboard and insulation and install new
- Apply wall finishes (paint, wallpaper)
- Remove carpeting and vinyl flooring, dry floor, replace warped flooring
- Replace cabinets in the kitchen and bathroom
- Replace built-in appliances
- Replace hollow-core interior doors
- Replace furnace and water heater
- Clean and disinfect duct work
- Repair porch, deck or steps

- Clean and test plumbing (licensed plumber may be required)
- Replace outlets and switches, clean and test wiring (licensed electrician may be required)



Figure 9-15. Even slow-moving floodwaters can cause substantial damage

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

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10.1 Introduction

Land use regulations, including flood management ordinances, can be contentious. Owners have expectations, sometimes unrealistic, as to how they may use their properties. Because floods occur infrequently in some areas, citizens often do not perceive the need for special controls to deal with flood hazards. These expectations can make it difficult to enforce your requirements, whether through inspection of issued floodplain development permits or taking action on unpermitted activities.

This chapter covers matters related to inspection and enforcement. Adequate, uniform and fair enforcement means two things: all development in the floodplain must have floodplain development permits; and all development with floodplain development permits must be conducted according to the approved plans. Importantly, good enforcement means that violations are handled quickly.

An important part of your floodplain management program is the inspection of development and construction activities that you have permitted. No matter how careful you are when you issue floodplain development permits, good inspection and enforcement procedures are vital to ensure that permittees adhere to the requirements of approved floodplain development permits.

Building inspectors need to understand the requirements in your ordinance. If deviations from the conditions of the floodplain development permit are found early during construction, it is easier to work with the owner and builder to

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achieve compliance. A series of inspections is best, and the occupancy certificate must be withheld until the “as-built” Elevation Certificate is submitted.

10.2 Inspection of Development

You must inspect development to determine compliance with the specific requirements of the floodplain development permit. Inspectors should review this manual to understand why certain construction elements that they don't normally see are required. Documentation of inspections is an important part of your permanent floodplain development permit records, especially to demonstrate your community's commitment to floodplain management and its good standing in the NFIP.

It is best to do several inspections during construction — don't wait until the roof is on to check the lowest floor elevation.

Elevation Benchmarks. The best way to check that the lowest floor is properly elevated is by survey. This is easiest if there is a nearby permanent elevation benchmark or reference mark. Even if one of the benchmarks shown on the flood hazard map is not close to the site, you have an option. You can require the applicant to have a surveyor place a temporary benchmark on-site. The building is more likely to be elevated properly if it is easier for the builder to check the elevations during layout and foundation work.

Stake-Out or Footing Inspection. The best time to make sure the building is located where it is supposed to be is during stake-out, but certainly no later than the footing inspection. Be sure to check distances from the watercourse (and setbacks, if required by your ordinance) and document compliance with the grading plan.

In floodways, compliance with the grading plan is just as important as compliance of the building. It is especially important to check that all placement of fill and grading is consistent with the plans. Remember, floodway fill can be allowed ONLY if an engineering analysis shows no increase and if a map change has been approved by FEMA.



The North Carolina Building Code specifies footing and foundation inspections in Chapter 18.

Fill Inspection. When a building is elevated on fill you should inspect the fill during placement to make sure that it is clean material that is placed and compacted properly, including properly sloped to minimize erosion. Some communities require the permittee to have placement of fill certified by a

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qualified professional, a key step if the community is expected to determine that the filled site is “reasonably safe from flooding.”

Most importantly, the elevation of the fill must be checked before building construction starts to make sure the fill is as high as required by the floodplain development permit. That way, the building will be elevated as required.

Foundation Inspection. During the foundation inspection you need to check for flood-related requirements. The single most important part of floodplain construction is making sure that buildings are elevated properly. When the lowest floor elevation is set by the foundation (slab forms are in place, stemwalls are constructed, pilings/columns are installed), and before any further vertical construction takes place, the building inspector has two options to check that everything is correct.

See Section 4 to understand how the cost of flood insurance nearly triples if a builder misses the correct floor elevation by only one or two feet.

The first option is the most effective. Require the builder/owner to have a surveyor or engineer prepare and submit the Elevation Certificate when the floor elevation is set. Not only will the Certificate be needed for your final sign-off, but problems can be identified and resolved with the least cost and the least frustration. Remember, a simple error of a foot or two in elevation may not seem like a lot. But imagine what the owner faces if that error is discovered when the walls are up, the roof is on, and the family is ready to move in.

The less effective option has is to use a simple hand level, shooting off of the on-site temporary benchmark to check the floor elevation. It is important for the builder to understand that the inspector's elevation check is not the final Elevation Certification required by your ordinance. It is the builder/owner's responsibility to submit the final Elevation Certificate before the certificate of occupancy can be issued.

Inspection of Manufactured Homes. The foundation inspection is especially important for manufactured homes because they are so easily damaged by flowing water. Pilings must be permanent and reinforced, not dry-stacked block. Anchoring systems must comply with the manufacturer's instructions and state and local building codes. For more information, consult *Manufactured Home Installation in Flood Hazard Areas* (FEMA 85). Please also refer to the *State of North Carolina Regulations for Manufactured Homes*, 2004

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Technically, a crawl space that is just inches below the adjacent outside grade is a “basement.” It becomes the lowest floor when the insurance policy is rated.

Edition and your local building codes as adopted by the Commissioner of Insurance pursuant to NCGS 143-143.15.

Inspection of Crawl Spaces. Crawl spaces are treated as enclosures below the BFE and must have flood openings. During the foundation inspection, make sure the contractor has not confused flood openings and ventilation requirements. You'll want to make sure the interior grade is at or above the exterior grade to prevent dampness and to avoid the area being called a basement for flood insurance purposes.

Flood Openings/Vents. When solid foundation walls are used, the plans and the floodplain development permit must show the required number of openings specified in the floodplain development permit/plans and their location, size, and height above ground level. Some contractors use standard ventilation units to meet the flood opening requirement – this can lead to problems, because workers may not pay attention to the need for flood openings to be close to the ground. In addition, to meet the requirement for automatic inflow and outflow of floodwaters, standard ventilation units must be disabled in the open position.

Non-Residential Buildings. Generally, most non-residential buildings are elevated and the inspections described above can be followed to check the lowest floor elevation and flood openings.

Floodproofed non-residential buildings are required to be designed and certified by a registered engineer or architect. In addition, when construction is complete, these buildings must be certified as having been built in accordance with the certified plans. But this does not mean the building inspector has less to do during construction – construction has to be monitored throughout.

Final Inspection. The final inspection for floodplain requirements can be done at the same time you do the final inspection to issue the occupancy certificate. A record of this inspection, along with all the others, should be kept in your permanent floodplain development permit file to show compliance and good ordinance administration.

During the final inspection, you need to check the following:

- Verify that the foundation and floor elevations have not been altered since the foundation inspection.

Legal concern:
Communities that fail to verify compliance with floodplain provisions before issuing occupancy certificates may be held liable for future damages.

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- Verify that utilities and other building elements have been properly located above the BFE. Things that are frequently overlooked include electrical outlets, plumbing fixtures, and duct work that most contractors install under the floor (and thus may be non-compliant because they're below the BFE).
- In A Zones, inspect all enclosures below the lowest floor carefully to make sure the flood openings are correct in number and placement. If standard ventilation units are used, the louvers or slide closures must be disabled so that floodwater can automatically enter and exit freely.
- In V Zones, check that utility lines and equipment are not mounted on or passed through breakaway walls.
- For enclosed areas below BFE, check that the approved use (parking, limited storage, building access, crawl space) appears to be consistent with what has been built.
- Check that fill has been placed according to the plans and sloped to minimize erosion during flood conditions.
- Check for any floodway encroachments.
- Check the anchoring system used in manufactured homes.
- For solid foundation walls, make sure the exterior grade is at or below the interior slab or earthen crawl space.
- Verify that flood-resistant materials are used below the BFE, and that the walls and floors of approved enclosures are not finished.
- Collect the as-built Elevation Certificate from the builder/owner (see below). You may wish to obtain photographs, documented with date and circumstances under which the photographs were taken, during the final inspection to document compliance in the floodplain permit file. If the owner makes alterations to the building without the proper permits, these photographs will be useful.
- Document compliance in the final inspection report.

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10.3 Collect the Final Elevation Certificate

For all buildings constructed in the Special Flood Hazard Area, you must require submission of an Elevation Certificate. This is the only way to document that the building was constructed in compliance with the elevation requirements specified in the floodplain development permit. This manual recommends that you require submission of an Elevation Certificate when the foundation is constructed and the lowest floor elevation is set (and prior to further vertical construction). You also must require submission of the “as-built” Elevation Certificate when construction is completed and prior to issuance of the certificate of occupancy.

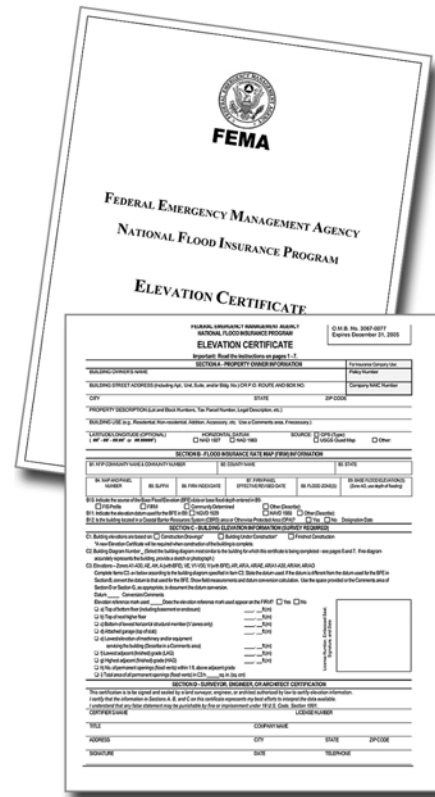
See Section 10.6 for more detail about who must do what – responsibilities associated with completing, reviewing and filing the Elevation Certificate.

Advise owners to keep the Elevation Certificate with their property deeds because the “as-built” Elevation Certificate is required for an insurance agent to prepare the most accurate insurance policy.

10.4 Future Inspections

Although the floodplain development permit process ends when you issue the occupancy certificate, your community’s responsibility to the NFIP continues. You should occasionally drive through Special Flood Hazard Areas to look for unpermitted activity. Many property owners do not know they’re supposed to get floodplain development permits for additions and substantial improvements.

If you find unpermitted activity, you must inspect it, and, if required by ordinance, the owner must be required to obtain a floodplain development permit. If a floodplain development permit cannot be issued for the work that has already been performed, the owner must remove or correct unpermitted,

The image shows a FEMA Elevation Certificate form, which is a standardized document used for floodplain management. It includes sections for property information, elevation data, and certification. The form is titled "FEDERAL EMERGENCY MANAGEMENT AGENCY NATIONAL FLOOD INSURANCE PROGRAM ELEVATION CERTIFICATE". It contains various checkboxes and fields for recording elevation data and property details. The form is shown in a slightly angled, overlapping manner, suggesting it is a physical document.

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non-compliant work. If enclosures below BFE were converted to living space, they must be returned to compliant condition.

“In some states, communities do not have the statutory authority to go onto private property to look for violations. This can make it difficult if not impossible to verify whether an enclosed area has been modified. If this is true in your community, your ordinance should prohibit enclosures or limit their allowable size to less than 300 square feet. Allow larger enclosures only if they have wood lattice or screening so you can tell from the street if changes have been made.”

10.5 Post-Damage Inspections

After a flood, whether big or small, you need to inspect the flooded area to check for damage. You might want to hand out flyers explaining floodplain development permit requirements and how flood damage can be reduced in the future. Most homeowners do not know that they may need floodplain development permits to repair and restore damage. Pay close attention to damage that may meet the “substantial damage” definition. As a rule-of-thumb, any building with more than 2-feet of water above the lowest floor should be carefully checked. Refer back to Chapter 9 for details.

After a building in the floodplain sustains damage by any cause, whether fire, tornado, earthquake, or even a truck running into it, the NFIP requirements should prompt you to check for damage that may trigger the substantial improvement/substantial damage requirement.

You need to act quickly when you discover substantial damage because most owners want to fix things up right away and get back to “normal.” Remember, if they’ve been damaged by flood, then “normal” means they’ll get damaged again by the next flood. After major floods, you should be prepared to hand out information about getting floodplain development permits and the benefits of Increased Cost of Compliance for buildings insured by the NFIP (see Chapter 9). When many buildings have been damaged you might want to set up a special service desk where people can get help. Contact the State NFIP Coordinator about post-disaster help when you have many buildings to inspect and many floodplain development permits to issue.

10.6 Completing, Reviewing, and Filing the Elevation Certificate

You are required to maintain an official record of the as-built elevations of buildings that are permitted in your flood hazard areas. FEMA does not

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mandate use of its Elevation Certificate, but it is the most widely used form of documentation. FEMA's Elevation Certificate may be ordered from FEMA (800/638-6620) or downloaded from the library section of FEMA's website. FEMA has developed a software version which can be ordered by calling the Community Rating System at 317/848-2898. If you use the software version or keep an electronic database, your permanent records must still contain the original signed "hard copy" of the surveyor's certification.

The form has several pages of instructions and illustrations, so the details are not included here. Call the NFIP State Coordinator's office if you or someone else has questions about Elevation Certificates.

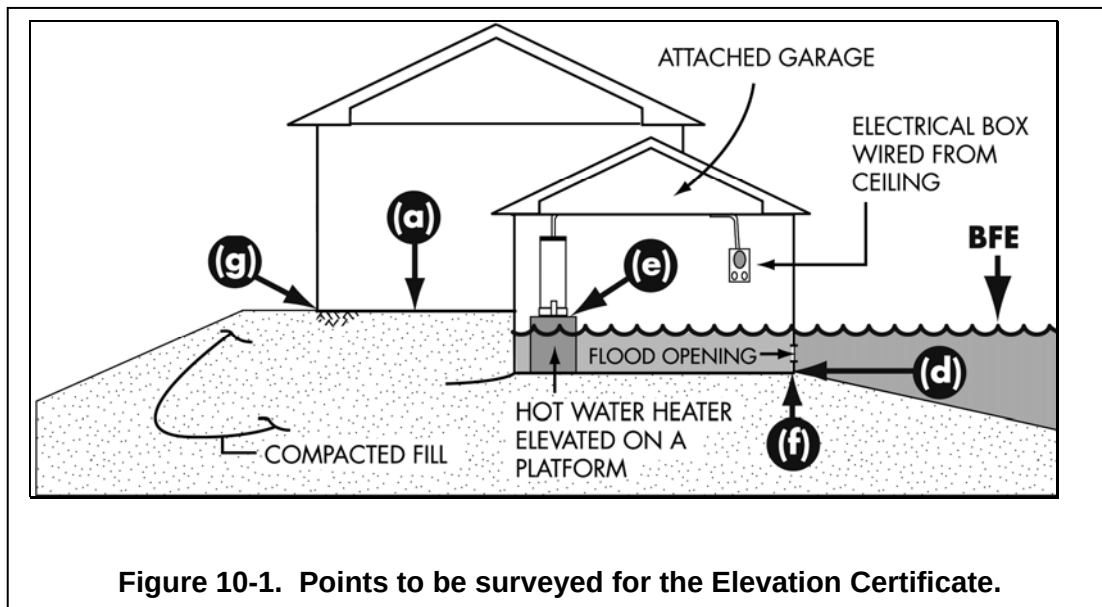
In A Zones and V Zones with BFEs, a surveyor or engineer who is licensed to provide elevations must complete the Elevation Certificate. Local Floodplain Administrators may complete certificates in AO, AH, and unnumbered A Zones unless supporting a request for a LOMA or LOMR-F.

Surveyor/Engineer. A surveyor or engineer is required to provide certain map information and to determine the various elevations. The surveyor does not determine whether the building is compliant – that is the community's responsibility. The building permit shows the BFE, but the surveyor should double-check the BFE on the FIRM before sealing the certificate.

The datum used by the surveyor must be consistent with the datum on the FIRM. If a different datum is used, the surveyor must note it in the comments section, and include the conversion factor.

The surveyor selects the reference level diagram that most closely represents the actual building. Most important is selecting the appropriate points to survey (Figure 10-1). Except for buildings on fill, this is not always as straightforward as it seems. If the diagrams do not exactly cover the configuration of a building, the surveyor may need to fill in the comment section to clarify the diagram selection.

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The lowest adjacent grade elevation is important for insurance rating purposes and must be filled in. The lowest adjacent grade is determined by finding the place right next to the building where the ground surface is lower than all the other ground. In very flat areas, there is no real difference in the ground elevation around a building. But along waterways in areas with more slope to the land, sometimes building lots slope enough so that there is a difference.

The Elevation Certificate is also used to record information about flood openings where there are enclosures below elevated buildings. The number of openings that are within 12 inches of grade, the area of the enclosure, and the total net square inches of open area are to be noted. Openings that are higher than 12 inches above grade are not “flood openings” and should not be counted. If engineered openings are used a notation should be made on the Elevation Certificate and a copy of the certification should be attached (see Chapter 4).

The Elevation Certificate must be dated to document when the lowest floor elevation was surveyed, because future construction could alter the information shown.

The surveyor or engineer must provide his or her registration number, and sign and seal the Elevation Certificate.

Permit Official. Your job is to make sure all required information is filled in on the Elevation Certificate. You also need to check for obvious errors. If you find a mistake, be sure to have it corrected before you accept the Elevation

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Certificate. Make sure a copy is put into the permanent floodplain development permit file. If you keep a separate log with information on floodplain development permits, make sure you note that the Elevation Certificate was completed. The State and FEMA will be checking files during Community Assistance Visits. You will be required to obtain missing Elevation Certificates, so careful record keeping now will help avoid future problems and expense.

Building Owners. You should recommend that owners of floodplain buildings keep copies of their Elevation Certificates. It is important to document that the building was built properly, and it is used to make sure the correct insurance rate is assigned by an insurance agent. Future sales may go more smoothly because new owners will not have to obtain another survey in order to purchase flood insurance.



10.7 Enforcement and Violations

Your community may be held liable if you issue a floodplain development permit that is not in conformance with your ordinance or if you do not follow standard inspection and enforcement procedures set forth in the ordinance or elsewhere in your community's administrative procedures. If you fail to inspect and enforce, then your community is failing to satisfy the NFIP requirements and FEMA may impose sanctions (see Chapter 2). Sanctions may also be imposed if you allow unpermitted activities in flood hazard areas.

Failure to enforce NFIP requirements could mean that all of your citizens lose the opportunity to buy flood insurance, not just the person who causes the violation.

You need to act on floodplain violations just as you act on violations of other community requirements. Generally, this will include consultation with the contractor, permittee or property owner, and issuance of notices, citations, injunctions, stop-work orders, and fines. Violations should be resolved as quickly as possible. What may seem to be a small problem could end up being expensive if it is not fixed right away. Your community's standing in the NFIP depends on making a good faith effort to enforce the ordinance. By allowing any violation to go unresolved, your community may set a precedent that could make it more difficult to deal with future enforcement actions.

Contact the State NFIP Coordinator for help and be sure to document all of your enforcement actions. From the North Carolina Model Flood Damage

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Prevention Ordinance for Non-Coastal Regular Phase the typical enforcement procedure includes these steps:

- (1) Violations to be Corrected:** When the Floodplain Administrator finds violations of applicable State and local laws, it shall be his or her duty to notify the owner or occupant of the building of the violation. The owner or occupant shall immediately remedy each of the violations of law cited in such notification.
- (2) Actions in Event of Failure to Take Corrective Action:** If the owner of a building or property shall fail to take prompt corrective action, the Floodplain Administrator shall give the owner written notice, by certified or registered mail to the owner's last known address or by personal service, stating:
 - (a) that the building or property is in violation of the floodplain management regulations;
 - (b) that a hearing will be held before the Floodplain Administrator at a designated place and time, not later than ten (10) days after the date of the notice, at which time the owner shall be entitled to be heard in person or by counsel and to present arguments and evidence pertaining to the matter; and
 - (c) that following the hearing, the Floodplain Administrator may issue an order to alter, vacate, or demolish the building; or to remove fill as applicable.
- (3) Order to Take Corrective Action:** If, upon a hearing held pursuant to the notice prescribed above, the Floodplain Administrator shall find that the building or development is in violation of the Flood Damage Prevention Ordinance, he or she shall issue an order in writing to the owner, requiring the owner to remedy the violation within a specified time period, not less than sixty (60) calendar days, nor more than (____) calendar days. (*One-hundred-eighty (180) calendar days or less is recommended*) Where the Floodplain Administrator finds that there is imminent danger to life or other property, he or she may order that corrective action be taken in such lesser period as may be feasible.
- (4) Appeal:** Any owner who has received an order to take corrective action may appeal the order to the local elected governing body by giving notice of appeal in writing to the Floodplain Administrator and the clerk within ten (10) days following issuance of the final order. In the absence of an appeal, the order of the Floodplain Administrator shall be final. The local governing body shall hear an appeal within a reasonable time and may affirm, modify and affirm, or revoke the order.
- (5) Failure to Comply with Order:** If the owner of a building or property fails to comply with an order to take corrective action for which no appeal has been made or fails to comply with an order of the governing body following an

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appeal, the owner shall be guilty of a misdemeanor and shall be punished at the discretion of the court.

- Litigation is a last resort. See Chapter 12 to learn about one way to deal with recalcitrant owners through an insurance sanction.

10.8 Handling Violations

The course of action that the North Carolina Floodplain Mapping Program (NCFMP) follows to review potential violation issues is based upon guidance from FEMA Region IV and FEMA HQ Compliance staff. Resolution of any potential compliance issues occurs through the NCFMP's Community Assistance Program – State Support Services Element (CAP-SSSE). NCFMP manages Letter of Map Revision (LOMR) and non-LOMR issues in the same manner, namely: they always resolve issues at the local level if possible; if the community cannot resolve the issue at the local level then they elevate the issue to the State level and notify FEMA Region IV and FEMA HQ Compliance staff. It is also necessary for the NCFMP to record potential violation via FEMA's Community Information System (CIS) database in the Technical Assistance record.

After-the-fact variances must be considered very carefully. Remember, the cost to correct a violation is not a justifiable hardship.

Some Examples

Fill in the Floodway Without a Floodplain Development Permit. Two options are available: remove the fill or allow it to remain if a floodway analysis is approved by FEMA. If you and the property owner decide to pursue getting a floodplain development permit, then you should set a firm timetable for getting the application and engineering analysis into your office. Remember, the analysis has to be approved by FEMA, and in the meantime, flood hazards may be increased by leaving the fill in place. FEMA's approval process can take several months.

Fill in the Flood Fringe Without a Floodplain Development Permit. The same two options are available: remove the fill or get a floodplain development permit (although FEMA's approval of an analysis is not required). However, the floodplain development permit application materials must show how local drainage will be handled so as not to impact adjacent property owners. Remember, if the fill is intended to elevate a building, it has to meet additional criteria in the ordinance (and basements are not allowed).

Building Not Elevated in Accordance with the Floodplain Development Permit. Three options are available. The most extreme is to demolish the

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building and start over. Less extreme, but still difficult depending on the type of construction, is to require the building to be removed from the foundation and then extend the foundation to the correct elevation. Obviously, this is hard if it is slab-on-grade. Even more difficult is if a basement has been sunk, because below-grade spaces have to be filled in before further vertical construction takes place. This is why it is very important that you require the Elevation Certificate when the floor elevation is set by the foundation.

The last option is the least acceptable to the NFIP, and that is to allow the building to remain. You may be tempted to issue a variance. This is acceptable only if you can do it in accordance with your ordinance and the guidance in this manual and FEMA's guidance. Be extremely careful and remember that an improperly issued variance could threaten the availability of flood insurance for everyone in your community. If the owner refuses to resolve the violation and bring the construction into compliance, then the preferred approach is to request that FEMA deny insurance to the current owner, and to all future owners. This sanction, called Section 1316, is described more fully in Chapter 12. Sometimes you get more cooperation when an owner understands that his failure to comply could make it nearly impossible to sell in the future.

Call the State NFIP Coordinator if you consider citing Section 1316 in a violation notice, just to make sure you have all the requirements in order.

10.9 Section 1316 – Denial of Flood Insurance

In some violation cases, exercising action under Section 1316 of the National Flood Insurance Act may be appropriate. With proper documentation that you have exhausted the means available to you to bring a property into compliance, Section 1316 allows FEMA to deny flood insurance coverage to all buildings on a parcel that remains in violation. The threat of flood insurance denial – which is likely to affect future sales – may actually prompt the owner to work with you to achieve compliance.

For a request for Section 1316 denial of federal flood insurance to be validated by FEMA, you must declare the following:

- The name(s) of the property owner(s) and address or legal description of the property,
- A clear and unequivocal declaration that the property is in violation of a cited local ordinance,
- A clear statement that the community has the authority to enforce the cited local ordinance,

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- Evidence that the property owner has been provided notice of the violation and the prospective denial of flood insurance, and
- A clear statement that the declaration is being submitted pursuant to Section 1316 of the National Flood Insurance Act of 1968, as amended.

Chapter 11 Variances & Appeals

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11.1 Goals – Protect Public Health and Safety and Reduce Damage

The primary goals of your floodplain management ordinance are to reduce damage and to protect public health and safety for the entire community. Very few variances to the ordinance can be justified if proposed activities increase the susceptibility of people and buildings to flood damage.

Ordinances and regulations cannot be written to anticipate every imaginable situation. Therefore, they usually include a procedure for consideration of requests to building “at variance” to the requirements. The NFIP defines a variance as “a grant of relief by a community from the terms of a floodplain management regulation.” A variance is, in effect, official permission to vary from the letter of the regulations because of special circumstances.

Variances are referred to a Board of Adjustment/Variance Board of Adjustment and, after weighing the facts, the Board of Adjustment must either grant or deny a variance request. If denied, then the property owner has the legal right to appeal in accordance with the procedures adopted by the community and, if denied, to seek relief through the court system. Before a case is presented to the court, all administrative and legislative remedies should be exhausted.

“Variance” or “Appeal”?

A **variance** asks that a particular standard of the floodplain management ordinance be waived.

An **appeal** is filed when a citizen disagrees with a decision made by the Floodplain Administrator.

11.2 Appeals

An **appeal** may be filed if the applicant disagrees with the local official's interpretation and application of the ordinance requirements or if the applicant feels the ordinance is ambiguous. Appeals are filed with the Board of Adjustment/Variance Board of Adjustment. If an appeal is denied, the property owner can seek relief through the court system. Before a case is presented to the court, all administrative and legislative remedies should be exhausted.

11.3 The Board of Adjustments/Variance Board of Adjustment

As part of administering the building code your community probably has a body that hears appeals and variances and such a Board of Adjustment is anticipated. If you do not have such a body, you are advised to create one in the event you have to handle a variance request for floodplain development. If not defined in the ordinance, the Board of Adjustment can be made up of several department heads or senior staff from several departments. In some communities the Planning Commission serves as the Variance Board of Adjustment. However your community sets it up, the members should not all be in the office that also issues permits.

11.4 Guidance for the Board of Adjustment

For the purposes of the National Flood Insurance Program, a variance is granted for floodplain management purposes only. Flood insurance will still be rated according to risk and could be very expensive if a building's lowest floor is below the BFE (see below). In North Carolina, a variance to construct a structure below the BFE will result in increased premium rates for flood insurance up to \$25 per \$100 of insurance coverage.

A variance should pertain to the unique characteristics of the land itself. A properly issued variance may be granted for a parcel of property with physical characteristics so unusual that complying with the ordinance would create exceptional hardship for the applicant or surrounding property owners. A variance must not be personal in nature, that is, any circumstances that warrant a variance must survive even if the original requestor is no longer the owner or occupant.

The NFIP regulations specifically address variances in three cases (see additional restrictions in text):

1. Historic structures,
2. Functionally dependent uses, and
3. Structures on 1/2 acre or less, surrounded by structures below BFE.

Granting variances is a local decision that must take into consideration applicable state laws. The NFIP does not set out absolute criteria for granting variances. **The best policy is to not grant variances unless they fit into the categories below, or unless there are compelling reasons that are consistent with the NFIP guidance.**

If your ordinance is more restrictive than the NFIP, you can more easily consider variances down to the NFIP minimums. Be careful about being lenient because it sets a precedent for future requests. And if your community participates in the NFIP's Community Rating System, you run the risk of losing credit points if you too readily grant issue variances to your higher standards.

Variances are addressed in the NFIP regulations at 44 CFR §60.6 (see end of this chapter). The North Carolina specific variance regulations provide for granting variances in the following situations from the North Carolina Flood Damage Prevention Ordinance Non-Coastal Regular Phase under Section E. Variance Procedures:

Buildings in historical districts do not qualify for variances. To qualify, they must be individually listed as historic structures.

- (a) the repair or rehabilitation of historic structures upon the determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and that the variance is the minimum necessary to preserve the historic character and design of the structure;
- (b) functionally dependent facilities if determined to meet the definition as stated in Article 2 of this ordinance, provided provisions of Article 4, Section E(9)(b), (c), and (e) have been satisfied, and such facilities are protected by methods that minimize flood damages during the base flood and create no additional threats to public safety; or
- (c) any other type of development, provided it meets the requirements of this Section.

Criteria for Granting Variances. In granting a variance, the Variance Board must consider the following factors as provided in the North Carolina Flood Damage Prevention Ordinance Non-Coastal Regular Phase under Section E. Variance Procedures:

- (a) the danger that materials may be swept onto other lands to the injury of others;
- (b) the danger to life and property due to flooding or erosion damage;

- (c) the susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
- (d) the importance of the services provided by the proposed facility to the community;
- (e) the necessity to the facility of a waterfront location as defined under Article 2 of this ordinance as a functionally dependent facility, where applicable;
- (f) the availability of alternative locations, not subject to flooding or erosion damage, for the proposed use;
- (g) the compatibility of the proposed use with existing and anticipated development;
- (h) the relationship of the proposed use to the comprehensive plan and floodplain management program for that area;
- (i) the safety of access to the property in times of flood for ordinary and emergency vehicles;
- (j) the expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and
- (k) the costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, and streets and bridges.

Hardship and Variances. The concept of unnecessary hardship is the cornerstone of all variance standards. *The applicant has the burden of proving unnecessary hardship.* Hardship is the variance condition that is the least understood and most difficult to establish. To determine whether an applicant has established an exceptional hardship sufficient to justify a variance, the Variance Board of Adjustment must weigh the purported hardship against the goals of the ordinance. Hardship generally includes:

- Loss of all beneficial or productive use
- Deprivation of reasonable return on property
- Deprivation of all or any reasonable use
- Rendering the property valueless
- Inability to develop in compliance with all regulations

Financial hardship or physical disability, while personally difficult, do not constitute a hardship sufficient to justify the granting of a variance.

Public safety and flood damage reduction are the fundamental reasons for regulating floodplain development. If an applicant requests a waiver or reduction of the elevation requirement, the individual hardship must be weighed against the public merit of protecting citizens against the dangers and damages of flooding. Only a truly exceptional and unique hardship should persuade a Variance Board of Adjustment to set aside those public purposes.

It is hard to imagine any physical characteristic specific to a parcel of land that would give rise to a hardship sufficient to justify a variance to the elevation requirements of the floodplain management ordinance. Examples may include a highly irregularly shaped lot, unstable soils or unusual geologic conditions.

Sometimes personal circumstances may prompt compassion, but the hardship is not sufficient to justify deviation from the requirements. Buildings typically last long after a personal hardship ceases to exist. Building to a lesser standard can create safety and financial problems for future owners.

Occasionally, property owners seek variances to the NFIP elevation requirement in order to simplify handicap access. This hardship is considered personal in nature, and a variance would raise a critical public safety concern. A disabled person may be unable to evacuate during a flood emergency. In some variance cases, applicants may be better advised to seek a variance to other standards that have less impact on public safety, such as lot line setbacks or building height restrictions.

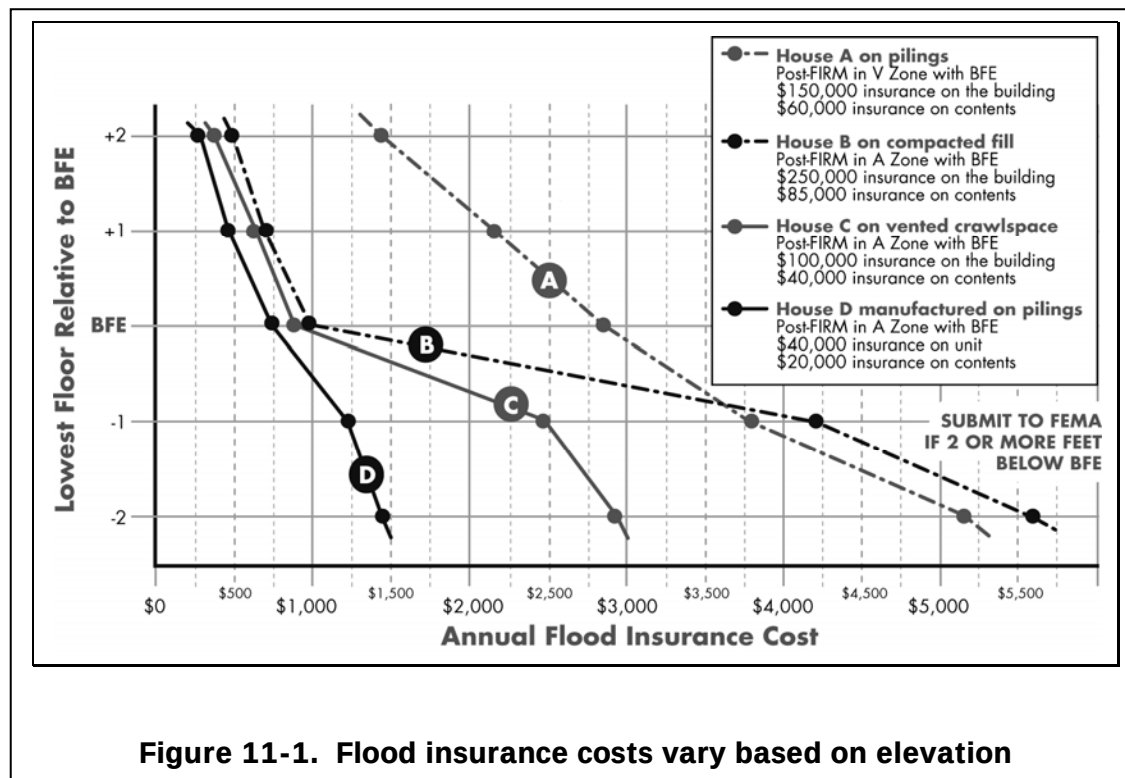
Minimum Necessary. A variance is a request to vary from the rules, not to ignore them. The Variance Board of Adjustment must take care that any variance granted allows only the minimum deviation from the ordinance requirements. For example, even if an applicant can justify not elevating a building as required, the Board of Adjustment should examine whether partial elevation would address the owner's hardship.

Insurance Rates. The effect of a variance on flood insurance premiums should not be downplayed. The Variance Board of Adjustment should request the applicant to obtain an estimate of the cost of a policy if a variance is granted. A structure that is at greater risk to flooding will be rated according to the risk. Premiums may be as high as \$25 for each \$100 of coverage. For different scenarios, Figure

The variance-induced rates may be so high as to make the building essentially uninsurable. In one case, a marine supply store on the Gulf Coast, valued at \$100,000, was built 14 feet below BFE in a V zone. The annual flood insurance premium was \$25,000!

11-1 shows how premiums will vary if the lowest floor is allowed to be one or two feet below the BFE. Figure 11-2 is an example of variations in insurance costs if a damaged building is granted variances or elevated to or above the BFE.

The Variance Board of Adjustment must notify the applicant in writing that the issuance of a variance, especially to allow construction below the BFE, will result in increased premium rates and that there will be increased risks to life and property. A copy of the notification must be maintained with a record of all variance actions. Since flood insurance is required by most mortgage lenders, prohibitively high rates can mean a home that is difficult or impossible to sell.



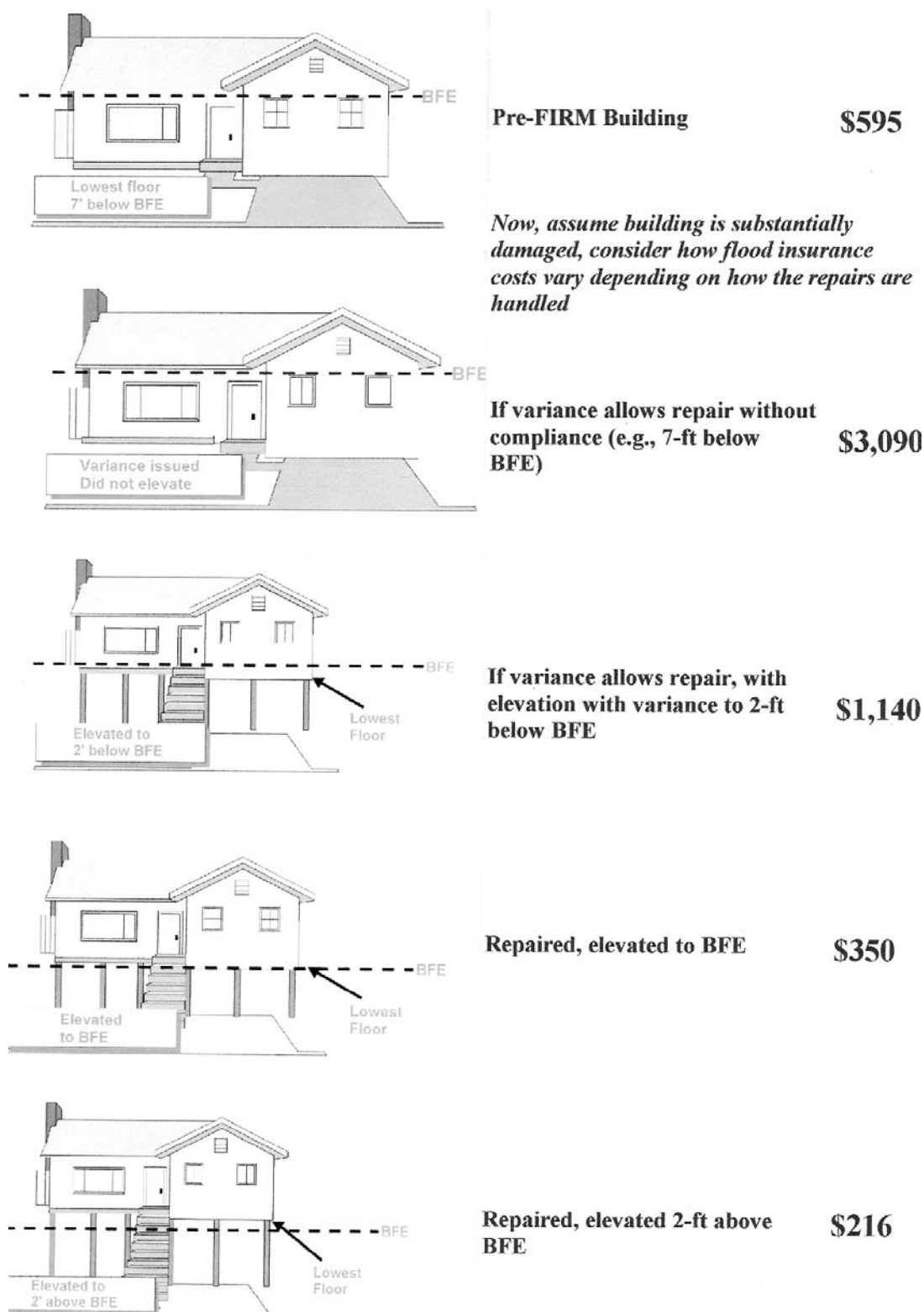


Figure 11-2. Examples of how decisions on repair of a substantially damaged Pre-FIRM home affect the cost of flood insurance

Fraud and Victimization. Properly granted variances must not cause fraud or victimization of the public. Buildings that are built below the base flood elevation will probably remain part of the community for 50 to 100 years. Fraud and victimization may occur if future owners who purchase the buildings are unaware that they are subject to increased risk and can be insured only at very high flood insurance rates.

Accountability to the NFIP. All variance actions will be examined during the Community Assistance Visit. Granting unjustified variances may lead to probation. Establishing a pattern and practices of unjustified variances may result in suspension from the NFIP.

Summary. Local governments have a duty to protect their citizens from flooding. It is a compelling duty. Not only is public safety a fundamental government responsibility, but the implications of future damage and the high cost of flood insurance are serious. Variances from the base flood elevation requirement should not be granted.

A grant of relief from any ordinance requirement that exceeds the NFIP minimum standards may be considered provided all variance conditions are met. In some cases, variances to other zoning or code requirements may satisfy the applicant's need while having less impact on public safety. The Floodplain Administrator and the Variance Board of Adjustment should advise the applicant to first seek relief from those requirements.

11.5 Variances for Historic Buildings

A variance may be issued for the reconstruction, rehabilitation or restoration of historic structures provided the variance is the minimum necessary and the work preserves the historic character and design of the structure. Simply being old is insufficient. "Historic structures" are those listed in the National Register of Historic Places or the State Inventory of Historic Places, or that contribute to a historic district. For North Carolina, refer to the State Historical Preservation Office (SHPO).

The Variance Board of Adjustment can require owners to record variances on property deeds so that title searches will disclose the facts to future buyers.

Changes to a historic structure must not destroy or alter the characteristics that made it eligible for listing. A certified local historic Board or the state historic preservation officer must review and approve remodeling, renovations and additions before granting a variance. If it is determined that the proposed work will result in removal of the structure from the list, then a variance is not appropriate. If the proposed work is acceptable, then

a variance may be issued. However, those mitigation measures that can be taken to reduce future flood damage must be required – such as elevating an air conditioner or using flood-resistant materials.

11.6 Variances for Functionally Dependent Uses

A variance may be issued for new construction, substantial improvements and other development necessary for the construction of a functionally dependant use. A functionally dependent use variance could be issued provided that:

- There is good and sufficient cause for providing relief from the regulations.
- The variance will be the minimum necessary to provide relief.
- The variance does not cause a rise in the 100-year flood level within a regulatory floodway.
- The structure or other development must be protected by methods that minimize flood damage during the base flood and create no additional threats to public safety.

Functionally dependent use means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities.

Minimizing flood damage may be accomplished by requiring use of wet-floodproofing techniques such as flood resistant materials, elevating mechanical equipment, locating offices above the BFE, using ground fault interrupt electrical circuits, or developing an emergency plan to remove contents before a flood.

11.7 Responsibilities of the Floodplain Administrator

The Floodplain Administrator acts in several important roles during the Variance Board of Adjustment's deliberations. You should provide a written recommendation to the Variance Board of Adjustment regarding whether the variance meets the NFIP and local ordinance criteria. The recommendation should be based on several considerations outlined below. Keeping a copy of all records is required by the NFIP. FEMA or the State will review this documentation during Community Assistance Visits.

You should remind the Variance Board of Adjustment of the potential sanctions associated with granting a variance that is inconsistent with FEMA's regulations.

Notify the Applicant. If a variance is approved, the community must send a letter to the applicant. The letter must state that the cost of flood

insurance will be commensurate with the increased risk resulting from the variance action. The notification must also emphasize that the structure may be more susceptible to flooding. Keep a copy of this letter in your permanent records.

11.8 Examples of Variance Requests

Example 1. A small undeveloped lot is surrounded by lots on which buildings have been constructed at grade. The ordinance requires new buildings to be constructed with the lowest floor several feet above grade. If the owner were to build a new house, it would look different, potential buyers might ask questions and find out about the flood problems in the area. If fill is used to meet the elevation requirement the lot might drain onto the neighbors' property.

This situation probably would not warrant a variance because the owner does not face an exceptional hardship. Appearance is not a hardship and no action should be taken to hide the hazard from others. There are ways to elevate a building without creating drainage problems, such as elevating the building on pilings, a crawlspace, or stemwall.

Example 2. A property owner seeks a variance because of the additional expense to elevate a house to comply with the ordinance, including a very expensive ramp or an elevator to provide access for a handicapped member of the family.

While financial considerations are important to property owners and the needs of a handicapped person must be accommodated, these difficulties do not put this situation in the category of "exceptional hardships" because:

- The characteristics that result in the claimed hardship do not pertain to the property but are personal
- A variance is not needed to provide day-to-day access to the building, which can be provided by building a ramp or elevator
- Having a handicapped person occupy a building below the base flood level raises a critical public safety concern

On the one hand, if a variance is granted and the building is constructed at grade, the handicapped or infirm person must leave when floodwaters begin to rise, yet he or she may need help to do so. This poses an unnecessary danger to the handicapped person and places an extra demand on the

community's emergency services personnel, who may be called upon to rescue the resident in the event of a flood. On the other hand, if the building is properly elevated, the handicapped person either can be evacuated or can survive the flood simply by remaining at home safely above the floodwaters. In effect, the variance would not alleviate the property owner's difficulty, but only postpone and perhaps ultimately increase it. It would not help the community, either, as the building will be susceptible to damage long after the current owners are gone.

44 CFR 60.6 Variances and exceptions.

1. Variances shall not be issued by a community within any designated regulatory floodway if any increase in flood levels during the base flood discharge would result;

2. Variances may be issued by a community for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, in conformance with the procedures of paragraphs (a) (3), (4), (5) and (6) of this section;

3. Variances shall only be issued by a community upon

(i) a showing of good and sufficient cause,

(ii) a determination that failure to grant the variance would result in exceptional hardship to the applicant, and

(iii) a determination that the granting of a variance will not result in increased flood height, additional threat to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances;

4. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief;

5. A community shall notify the applicant in writing over the signature of a community official that

(i) the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage and;

(ii) such construction below the base flood level increases risks to life and property. Such notification shall be maintained with a record of all variance actions as required in paragraph (a) (6) of this section.

6. A community shall

(i) maintain a record of all variance actions, including justification for their issuance, and

(ii) report such variances issued in its annual or biennial report submitted to the [Federal Insurance] Administrator.

7. Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that...

(i) the criteria of paragraphs (a) (1) through (a) (4) of this section are met, and

(ii) the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.

Chapter 12 Flood Insurance

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12.1 Introduction

This chapter discusses the relationship between floodplain management and federal flood insurance¹ and offers an overview of factors that influence insurance rates. This relationship is an important one – many decisions directly impact the rates that property owners will pay. The owner of a non-compliant building might have to pay thousands of dollars extra for coverage each year.

Flood insurance rates are based on risk of exposure to flood losses. Local floodplain management measures are designed to acknowledge flood hazards and minimize exposure and future damage. Therefore, *how well local floodplain management regulations are enforced affects the flood insurance rates paid by property owners and others*. Communities that do not adequately administer the minimum provisions contained in their ordinance may be placed on probation, which causes a premium surcharge to be placed on their citizen's flood insurance policies. If the community is suspended from the National Flood Insurance Program, no new policies can be written and existing policies cannot be renewed (see Chapter 2 for more detail on what it means to not participate in the NFIP).

Decisions made by the builder or property owner during design and construction also can have a significant impact on flood insurance premiums and coverage's for the building.

This chapter is intended only to give you an overview. Although a lot of information is summarized here, it is intended to help you understand how what you do influences flood insurance. You should not rely on this chapter as a complete explanation of flood .

¹ A growing number of private insurance companies are offering some form of flood insurance. In this manual, the term “flood insurance” whether specifically referred to as “federal flood insurance”, always refers to federal flood insurance available from the NFIP and its Write-Your-Own partners.

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12.2 Flood Insurance Policies

This section overviews what's covered under a flood insurance policy, what's not covered, when a policy must be bought, and other rules. This is important information for the local Floodplain Administrator to know because some construction decisions affect what is eligible for insurance coverage. If you have additional questions, these publications can be found on FEMA's web site:

- *Answers to Questions about the National Flood Insurance Program*
- FEMA's *Flood Insurance Manual* (primarily for insurance agents)

Nearly all of the 20,000 communities in the NFIP are in the Regular Program. Only a few communities with minor flood problems or which have just recently joined the NFIP are still in the Emergency Program. In North Carolina, there are currently no communities listed as in the Emergency Program (as of December 2010). This section only discusses the Regular Program provisions related to insurance; the only major difference is that policies in Emergency Program communities have limited amounts of coverage available.

Who's Involved. Flood insurance policies are obtained through most insurance agents who write property insurance. Properly writing flood insurance policies is widely acknowledged to be complicated. The agents may sell a policy from one of the Write-Your-Own insurance companies or a "direct" policy through FEMA. Both approaches will result in the issuance of a "Standard Flood Insurance Policy" that meets all the requirements, and as rates are set by the FEMA, there should be no difference in cost between the two. A Write-Your-Own company operates under an agreement with FEMA which allows the company to sell and service flood insurance policies while the NFIP retains the responsibility for underwriting losses and financial risk.

If an insured property is flooded, the property owner contacts his or her insurance agent. The agent arranges for an adjuster to review the damage and work with the insured to settle a claim. Property owners always work through their insurance agents – they do not need to deal directly with FEMA.

Coverage. Flood insurance coverage is available for insurable buildings and contents in NFIP communities. While that may seem simple enough, a glance at the *Flood Insurance Manual* is all it takes to realize that there are many factors to be considered. One important distinction is the difference between a

“building” and a “structure.” All buildings are structures – but not all structures are buildings.

Building Coverage. Building coverage is written to insure the structure only, including all things that typically stay with the building when it changes ownership, including:

- Utility equipment, such as a furnace or water heater
- Carpet permanently installed over unfinished flooring
- Cabinetry and built-in appliances
- Wallpaper and paneling

Ten percent of a dwelling’s building coverage may be applied to a detached garage. Residential detached garages used, or held in use, for residential business or farming are not covered under the dwelling policy. Such detached garages and other accessory/appurtenant structures must be insured under separate policies.

“Building” Defined. For NFIP insurance purposes, a “building” is defined as a walled and roofed structure, including a manufactured home (or recreational vehicle, as defined below), that is principally above ground and affixed to a permanent site or foundation. This definition is similar to, but not quite the same as, the definition for “building” or “structure” used for floodplain management and defined in Chapter 4. The insurance side of the NFIP focuses the definition through three important qualifiers:

- “Walled and roofed” means it has two or more exterior rigid walls and a fully-secured roof so that the building will resist flotation, collapse and lateral movement.
- “Manufactured (mobile) home” is a building transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities; it is an insurable building only if it is attached to a permanent foundation. A recreational vehicle (travel trailer), without wheels, built on a chassis, when affixed to a permanent foundation is also an insurable building.
- “Principally above ground” means a building that has at least 51 percent of its actual cash value, including machinery and equipment (but not land value), above ground.

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Buildings in the course of construction that have yet to be walled and roofed are eligible for coverage except when construction has been halted for more than 90 days and/or if the lowest floor used for rating purposes is below the BFE. Materials or supplies intended for use in such construction, alteration, or repair are not insurable unless they are contained within the enclosed building on the premises or adjacent to the premises.

Examples of structures that are not considered insurable buildings under the NFIP include:

- Gas or liquid storage tanks
- Bridges, culverts, retaining walls
- Radio/cell towers, oil rigs, other permanently installed equipment
- A structure with 50 percent or more of its value underground, such as an underground pumping station, well or septic tank
- Tents
- Tennis and swimming pool bubbles, even if permanent
- Swimming pools
- Fences, docks, driveways
- Open pavilions for picnic tables and bleachers
- Detached carports with open sides
- Recreational vehicles and campers/travel trailers (unless without wheels and attached to a permanent foundation)
- Sheds on skids that are moved to different construction sites
- Licensed vehicles (cars and trucks)
- Certain buildings are not insurable – even though they otherwise meet the definition of a building; these situations are discussed later in this chapter
- A building declared in violation of a state or local law (more information is available in later in this Chapter)
- Buildings over water or seaward of mean high tide which were built after October 1, 1982
- Buildings built or substantially improved in areas designated by Congress as undeveloped units of the Coastal Barrier Resource System (more information is available later in this Chapter)

Contents Coverage. The NFIP offers contents coverage for the removable items inside an insurable building. A renter can get a policy with contents coverage, even if landlord has not obtained a policy on the building. Certain contents are not insurable:

- Animals and livestock
- Licensed vehicles
- Jewelry, artwork, furs and similar items valued at more than \$2,500
- Money or valuable papers
- Personal property that is not secured to prevent flotation located in a building that is not fully enclosed (such as an open carport)

Basements. The NFIP defines a basement as any area of the building, including any sunken room or sunken portion of a room, having its floor below ground level (subgrade) on all sides. There is limited coverage for basements:

- Building Property and Personal Property coverage is not extended to wallpaper, carpeting and similar finish materials.
- The only Personal Property contents kept in a basement that are covered are air conditioning units (portable or window type), clothes washers and dryers, food freezers and food (other than walk-in units).
- Building Property coverage does include central air conditioners, furnaces, heat pumps, hot water heaters and sump pumps.

Despite these limitations on coverage for the contents of basements, it is advisable for owners of Pre-FIRM buildings with basements to obtain flood insurance even if the next higher floor level is not predicted to be affected by floodwaters that rise to or above the BFE. Hydrostatic pressure from floodwaters can cause structural damage to the walls and floor of a basement – this type of damage is costly to repair. In some cases structural damage can occur to the elevated portion of the building as a result of the failure of basement walls or floors even though floodwaters never reach the first floor of the building.

Enclosures Below Elevated Buildings. The NFIP regulations and local ordinances have criteria for enclosures below the lowest floor of an elevated post-FIRM building (including a manufactured home). Because flood insurance

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coverage is limited in those enclosures, the local Floodplain Administrator should inform permit applicants of those limitations – which may discourage enclosures altogether or discourage owners from illegally modifying enclosures to uses that are not allowed. In enclosures:

- Contents coverage is not available for enclosures (which are limited to use for building access, parking, limited storage, and crawlspaces)
- The only structural coverage available is for the required utility connections and the foundation and anchoring system required to support the building.

Amount of Coverage. Insurance rates for all buildings are based on a two-tiered system: a first or basic layer of coverage, and a second or additional layer. The amounts available vary depending on whether the community is in the Regular Program or the Emergency Program.

The maximum amounts available under each layer are shown in Figure 12-1. The first layer of coverage under the Regular Program for pre-FIRM structures is the lesser of either a subsidized rate or the actuarial rate when data is provided to show actual risk. The rate is actuarial for Post-FIRM new construction and substantial improvements (i.e., those started after the effective date of the FIRM). In the Regular Program, a second layer of coverage is available at actuarial rates, up to a total of \$250,000 for a single family structure and \$500,000 for commercial structures. Contents coverage limits are \$100,000 for a residence and \$500,000 for non-residential buildings.

	EMERGENCY PROGRAM	REGULAR PROGRAM		
		Basic Insurance Limits	Additional Insurance Limits	Total Insurance Limits
BUILDING COVERAGE				
Single Family Dwelling	\$ 35,000 *	\$ 50,000	\$200,000	\$250,000
2-4 Family Dwelling	\$ 35,000 *	\$ 50,000	\$200,000	\$250,000
Other Residential	\$100,000**	\$150,000	\$100,000	\$250,000
Non-Residential	\$100,000**	\$150,000	\$350,000	\$500,000
CONTENTS COVERAGE				
Residential	\$ 10,000	\$ 20,000	\$ 80,000	\$100,000
Non-Residential	\$100,000	\$130,000	\$370,000	\$500,000

* In Alaska, Guam, Hawaii, and U.S. Virgin Islands, the amount available is \$50,000.

** In Alaska, Guam, Hawaii, and U.S. Virgin Islands, the amount available is \$150,000.

Figure 12-1. Amount of Insurance Available

Notes on How the NFIP Operates and the Subsidy. The NFIP does not have the authority to operate fully as an insurance company in that it is not allowed to charge for or accumulate sufficient reserves in order to be able to fully pay all claims due to catastrophic floods. Congress explicitly recognized this and provided the NFIP the statutory authority to borrow from the U.S. Treasury when major floods outstrip its normal reserves. This borrowing authority is what helps the NFIP to even out good years and bad. Funds borrowed from the U.S. Treasury are paid back with interest.

The rates used for Pre-FIRM buildings, often called “subsidized” rates, are set for the class of all such buildings and are based largely on historical claims against the NFIP. A common misunderstanding about the NFIP is that this “subsidy” is subsidized by the Federal government (i.e., the taxpayer). Federal tax revenues do *not* pay as subsidy, and in fact the NFIP was self-supporting between 1986 and 2004. Fees assessed on every policy also pay the cost of administration, including salaries, expenses, mapping, and other programmatic functions. The 2005 hurricane season and massive losses throughout the Gulf Coast will require significant borrowing from the U.S. Treasury. Legislation was enacted to increase FEMA’s borrowing authority from \$1.5 billion to \$3.5 billion through fiscal year 2008.

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The “subsidy” that is referred to for Pre-FIRM buildings is really premium income that is foregone by the NFIP because full, actuarial rates are not charged. During years with low claims, surpluses from collected premiums from all policy holders are, in effect, borrowed to help pay claims from their Pre-FIRM counterparts, which helps keep the rates low. A portion of the subsidy is a “cross-subsidy” between all Pre-FIRM policyholders. For example, a pre-FIRM building that is only 6 inches below the BFE pays the same rate as a pre-FIRM building that is 6 feet below the BFE. The rate structure is determined by many factors – one factor is so that premiums collected from all pre-FIRM structures are sufficient to cover claims from pre-FIRM structures that can be expected in the average loss year.

Both the subsidy provided to Pre-FIRM buildings and the ability to borrow from the Treasury rather than accumulate large cash reserves are intended to keep the cost of flood insurance affordable and to encourage communities to participate in order to reduce future flood damage. The success of this scheme is summarized by FEMA, which states that approximately \$1 billion in flood damage is avoided each year because of state and local regulation of mapped flood hazard areas.

Notes on Pre- and Post-FIRM Rates. The NFIP *Flood Insurance Manual* contains a series of rate tables for Pre- and Post-FIRM buildings. Subsidized rates are provided to pre-FIRM structures in recognition of the fact that they were constructed prior to publishing the first FIRM for the area. In many communities, the FIRM was the first formal recognition of the flood threat. Since the majority of flood claims come from pre-FIRM structures, pre-FIRM rates have increased steadily in order to cover the outlays.

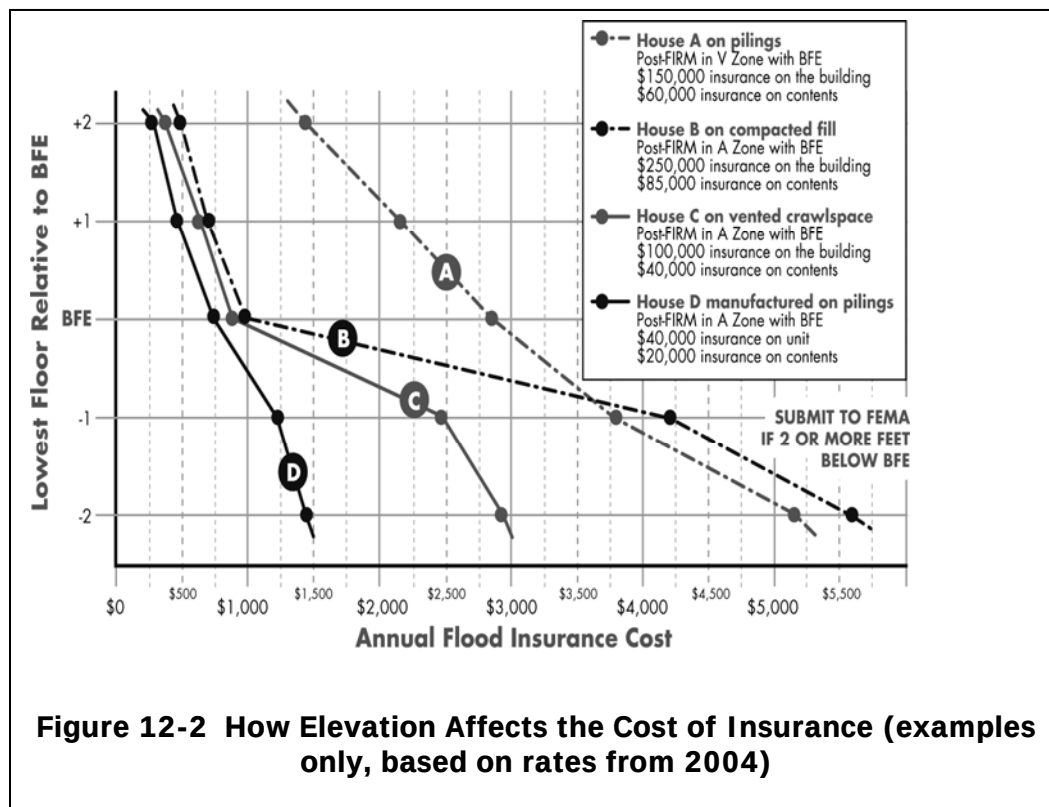
The premium rates are actuarial for post-FIRM buildings (and substantial improvements of pre-FIRM buildings). Actuarial means the rates are based on the risk as determined by the elevation of the lowest floor (including the basement) in relation to the base flood elevation.

Pre-FIRM structures that are substantially improved are rated the same as new construction and are charged the full actuarial or risk rate except in the following cases:

- Replacement manufactured homes in pre-FIRM manufactured home parks

- Historic buildings which are renovated in such a manner as to retain historic integrity, as approved by the State Historic Preservation Officer (SHPO) or Certified Local Historic Preservation Board
- Lateral “additions” onto pre-FIRM buildings in A Zones which are elevated to BFE, but that do not trigger re-rating of the entire structure, so long as only minimal improvements are made to the original building
- Improvement to correct existing, identified cited violations of state or local health, sanitary, or safety code specifications which are the minimum necessary to assure safe living conditions

Building higher than the minimum BFE has considerable benefit. Reflecting the lower risk, the rates are lower for post-FIRM buildings that are one or more feet above the BFE (see Figure 12-2). In many cases, the annual savings can easily offset the additional costs of construction – consider the additional cost for another row or two of concrete block or pilings just two or three feet longer. Post-FIRM buildings with their lowest floors below the BFE are charged significantly higher flood insurance rates – reflecting the higher risk of damage.



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Determining the rates for post-FIRM buildings in V Zones is further complicated by whether there are obstructions (such as enclosures) below the elevated floor. V Zone rates are higher than rates in AE Zones because of the greater damages that can be caused by wave impacts. Enclosures that are less than 300 square feet in area are considered and rated as obstructions (and many communities adopt ordinances that limit enclosures to 299 square feet in order to benefit from this rating factor). Buildings with enclosures 300 square feet or greater have an even higher risk and must be individually rated by the insurance company or FEMA.

Waiting Period. In general, a 30-day waiting period follows the purchase of a flood insurance policy before it goes into effect (there are some exceptions). The objective of this waiting period is to encourage people to keep a policy at all times. There are many locations where flooding can be predicted with several days lead time. In order to be fair, it is not appropriate for people to buy coverage only when officials predict a hurricane or river flooding and then drop policies after the threat has passed. Also, to be on a sound financial basis, the NFIP needs everyone at risk to pay their share of the premiums.

Many people have found out about the waiting period the hard way. Your community would be wise to publicize the availability of flood insurance well in advance of the next flood season so residents can be protected financially when a flood comes.

12.3 The Mandatory Purchase Requirement

The Flood Disaster Protection Act of 1973 added a key requirement to the NFIP: if a community participates in the program, flood insurance is a prerequisite for property owners to receive grants or loans (mortgages) for the acquisition or construction of buildings in a designated floodplain from a federal agency or through a federally-related loan program.

Where it Applies. The mandatory purchase requirement applies to all forms of federal or federally-related financial assistance for buildings located in mapped Special Flood Hazard Areas (SFHAs). This requirement affects loans and grants for the purchase, construction, repair, or improvement of any publicly-owned or privately-owned building in the SFHA, including machinery, equipment, fixtures, and furnishings contained in such buildings.

Financial assistance programs affected include loans and grants from agencies such as the Department of Veterans Affairs, USDA Rural and Housing Services, Federal Housing Administration, Small Business Administration, and Federal Emergency Management Agency.

The requirement applies to secured mortgage loans from financial institutions, such as commercial lenders, savings and loan associations, savings banks, and credit unions that are regulated, supervised or insured by Federal agencies such as the Federal Deposit Insurance Corporation and the Office of Thrift Supervision.

The requirement also comes into play if a loan is made, increased, renewed or extended – at any of those steps, the lender must check to see if the building is in an SFHA at that time. For example, a building in an X Zone when the original mortgage was taken out would be affected if the area is remapped in the SFHA and the loan is later refinanced. The requirement also applies to all mortgage loans purchased by Fannie Mae or Freddie Mac in the secondary mortgage market.

How it Works. Before a person can receive a loan or other financial assistance from one of the affected agencies or lenders, there must be a check to see if the building is in an SFHA shown on the Flood Insurance Rate Map (FIRM). It is the agency's or the lender's responsibility to check the FIRM to determine if the building is in an SFHA, although many communities provide assistance.

Mandatory coverage does not apply to contents coverage. Many people who are required to get building coverage do not realize that their contents are not covered unless they voluntarily purchase contents coverage.

Most lenders have contracts with third party flood hazard determination companies that provide a guarantee for the determination. The lender must document the determination and whether flood insurance is required on a Standard Flood Hazard Determination Form (FEMA Form 81-93). The lender will notify the borrower if flood insurance is required.

If the building is in an SFHA, the agency or lender is required by law to require the recipient to purchase a flood insurance policy on the building. The requirement is for building coverage equal to the lesser of the value of building (not the land), the amount of the loan (or other financial assistance), or the maximum amount of flood insurance available.

The mandatory purchase requirement does not apply if the building footprint is not wholly in a mapped flood hazard area – that is, if only a portion of the lot is

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shown as subject to flooding. However, a lender may exercise discretion and require a flood insurance policy as a condition of a loan. The mandatory purchase requirement also does not affect loans or financial assistance for items that are not covered by a flood insurance policy, such as vehicles, business expenses, landscaping, and vacant lots.

Flood Insurance for Your Community

As a recipient of federal financial assistance, your community may have been required to purchase flood insurance under the mandatory purchase requirement. You should determine if there are any insurable, publicly-owned buildings in your floodplain. If so, see if they received federal aid in the past. Likely prospects include:

- ◆ A wastewater treatment plant (which are always located near a body of water), which received a grant from the Environmental Protection Agency.
- ◆ Public housing or neighborhood center funded with help from the Department of Housing and Urban Development or the Community Development Block Grant.
- ◆ Any facility that received disaster assistance after a flood or other disaster declaration.

Whether a requirement to buy flood insurance was an explicit requirement of the funding, you should advise your community's risk manager about buildings exposed to flooding. Many agencies find out too late that their "all risk" insurance policies do not cover flooding.

Over the last few years, Congress has taken steps to encourage public agencies and private property owners to purchase flood insurance instead of relying on disaster assistance for help after a flood. Disaster assistance for a public building will be reduced by the amount of insurance coverage a community should carry on the building (regardless of whether the community is carrying a policy).

In effect, disaster assistance for public agencies now has a very large deductible equal to the insurance policy it should carry (up to \$500,000 for the structure and \$500,000 for contents). Don't wait for the disaster to be caught short.

Submit-for-Rate. Because of peculiarities of exposure, certain buildings do not lend themselves to use of pre-programmed rates. The insurance premium rate tables used for the NFIP do not cover cases where the building is two or more feet below the Base

Flood Elevation (BFE). The insurance agent must send the application for flood insurance to the company headquarters for a special, individualized rating. This procedure is known as submit-for-rate.

Examples of submit-for-rate buildings include buildings with their lowest floors two feet or more below BFE, buildings with below-grade crawlspaces, certain buildings with enclosures 2-feet or more below BFE, some buildings in unnumbered A zones, and similar risks. Submit to rate premiums on policies that are significantly below the BFE can be as high as \$25,000.

A submit-for-rate policy on a post-FIRM building may be an indicator of the property owner's non-compliance with a community's regulations, the community's failure to enforce its regulations, or the result of a variance action. Therefore, submit-for-rate cases are forwarded to the appropriate FEMA Regional Office for investigation.

Elevation and Floodproofing Certificates. Elevation Certificates and Floodproofing Certificates are tools used by insurance agents, in addition to serving as documentation used by communities to verify floodplain regulations compliance. The required data on the forms includes zone designation, map panel number, BFE, lowest adjacent grade, number/size of flood openings, and most importantly, the certified as-built elevation of the referenced floor level (or elevation to which the structure is dry floodproofed, in the case of non-residential structures protected in that manner). The data assist the agent and the insurance underwriters for the Write-Your-Own companies or NFIP in determining the correct flood insurance rate.

Elevation Certificates are required to rate most Post-FIRM Buildings. The Elevation Certificate is discussed in more detail in Chapter 4.

Floodproofing Certificates are required to rate Post-FIRM non-residential buildings that have been dry floodproofed. A floodproofed non-residential building is rated based on the elevation of its lowest floor, unless it is floodproofed to at least one foot above the BFE. The rating procedure requires that one foot be subtracted from the flood protection level (level to which it is floodproofed). Thus, a building must be floodproofed to at least one foot above the BFE in order to get the same rates as a building elevated to the BFE. The Floodproofing Certificate is discussed in more detail in Chapter 9.

In unnumbered A Zones, a policy can be written for a new structure or a substantially improved structure without an Elevation Certificate or Floodproofing Certificate, but the quoted rate may be high, due to that

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building's risk to flooding is unknown. This serves as an incentive for the owner to submit the completed forms.

NFIP communities are required to obtain and maintain a record of as-built elevation information. Although it is not required that the FEMA Elevation Certificate and Floodproofing Certificate be used for record keeping (other forms are acceptable), many communities suggest or even require the use of the FEMA forms. This dual use of the FEMA form (for both insurance and local permit purposes) can reduce the cost to the property owner and promote consistency.

It is a good idea to encourage builders to provide the as-built Elevation Certificate to the buyer, and encourage homeowners to keep a copy of the Elevation Certificate with their important papers. It will come in handy when they decide to sell the home.

Rating Unnumbered A Zones. Unnumbered A Zones (also called Approximate A Zones) are floodplains that are mapped on the FIRM using approximate methodologies that do not have BFEs. A Post-FIRM building in an unnumbered A Zone cannot be rated using tables that depend on BFEs. A fixed rate is applied, often resulting in total premiums that are higher than those in zones with BFEs. This can be a real disincentive for property owners in these zones to buy flood insurance.

There are two ways to obtain lower rates in unnumbered A Zones if an Elevation Certificate is provided:

- If the community provides a locally developed BFE and the building is elevated to or above that BFE, the rates are comparable to those for buildings in AE Zones.
- If there is no BFE from any source, rates can be set based on the height of the building above the highest adjacent grade. Rates are reduced for buildings 1-foot, 2-feet and 5- or more feet above grade (the higher the building, the lower the rate). For buildings built at or below grade, the submit-for-rate approach is used.

Calculating Total Cost of a Policy. For the typical policy, the total annual premium payment is calculated by:

- Multiplying the amount of building coverage desired times the rate (done once for the basic coverage and again for the additional limits)
- Multiplying the amount of contents coverage times the rate desired (done once for the basic coverage and again for the additional limits)
- Applying the deductible factor
- Adding the premium for Increased Cost of Construction coverage (which varies from \$4 to \$75, depending on the type of building and FIRM zone; see Chapter 9 on ICC coverage)
- Applying the CRS discount (if the community participates in the NFIP Community Rating System, see Chapter 14)
- Adding the Federal policy fee (currently \$30 to help pay for administrative costs, such as floodplain mapping)
- Adding the \$50 surcharge (only if the community is on probation)

12.4 How Variances Affect Insurance Rates

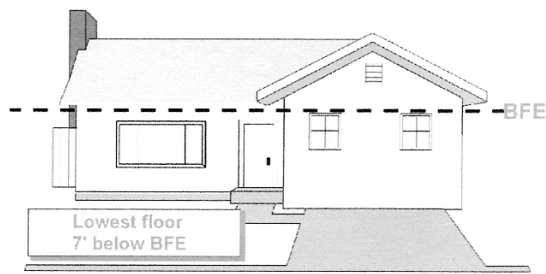
After due consideration a community may grant a variance to permit a new structure or a substantially improved structure to be built at less than full compliance (e.g., with the lowest floor below the BFE). However, the NFIP does not alter or vary the insurance rating mechanism even if a variance is properly granted. All new construction and substantial improvements are rated on an actuarial basis. Because building at variance to the minimum requirements increases the risk, that increased risk is reflected in higher insurance premiums. Figure 12-2 (on page 9) shows examples of how the cost will vary if the lowest floor is 1-foot or 2- feet below the BFE (more than 2-feet below must be submit-for-rate).

Some permit applicants may not be concerned with the potentially high cost of NFIP insurance, for example if the owner does not expect to have a federally regulated mortgage that requires flood coverage. However, very high premiums may adversely affect future owners and make the building unmarketable. Regardless of the intent of the applicant/owner with regard to flood insurance, the community must process variance requests according to the specifics outlined in the local ordinance – which does not identify as a factor the owner's willingness to forego federal assistance, whether flood insurance or disaster assistance.

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Figure 12-3 is another illustration about how choices affect the cost of insurance. The annual premiums noted are for purposes of this example only. (Actual insurance rates vary based on location, date of construction, and lowest floor elevation and must be figured on a case-by-case basis.) Assume the Pre-FIRM building at the top of the next page has a replacement cost of \$100,000 and is covered by a building policy for \$80,000. Now assume that building is substantially damaged, the drawings below show how decisions will affect the cost of insurance (A substantial damage/improvement will cause the structure to lose its Pre-FIRM rating):

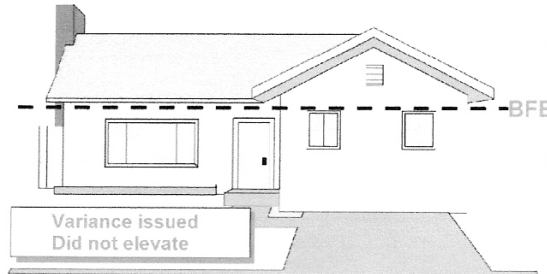
- If a variance is issued to allow repairs without compliance, the building will be re-rated using actuarial rates for a building with its lowest floor 7-feet below the BFE and the annual premium will be \$3,090.
- If a variance is issued allowing repairs with partial elevation such that the lowest floor is 2-feet below the BFE, the annual premium will be \$1,140.
- If the building is repaired and brought into compliance such that the lowest floor is at the BFE, the annual premium will be \$350.
- If the building is elevated 2-feet above the BFE, the annual premium will be \$216.



Pre-FIRM Building

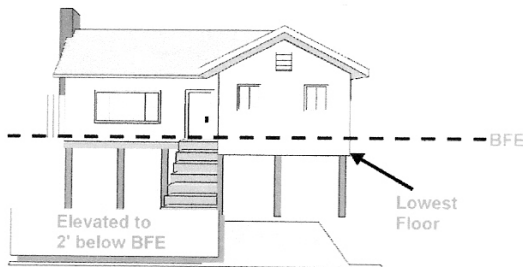
\$595

Now, assume building is substantially damaged, consider how flood insurance costs vary depending on how the repairs are handled



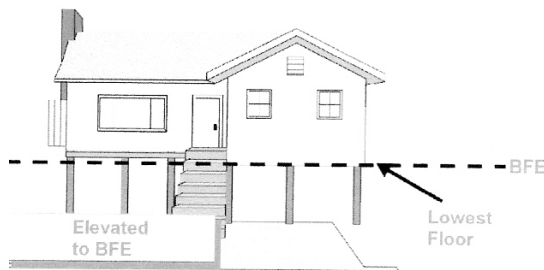
If variance allows repair without compliance (e.g., 7-ft below BFE)

\$3,090



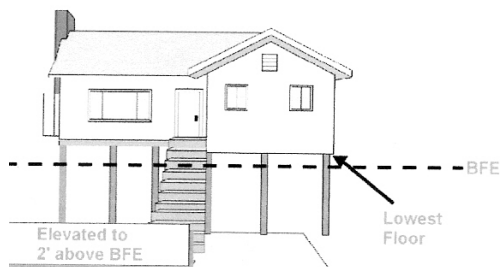
If variance allows repair, with elevation with variance to 2-ft below BFE

\$1,140



Repaired, elevated to BFE

\$350



Repaired, elevated 2-ft above BFE

\$216

Figure 12-3 Flood Insurance Cost Varies by Repair Choices

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12.5 Denial of Flood Insurance

Unresolved Violations (Section 1316). A mechanism whereby flood insurance supports and reinforces the importance of floodplain management is authorized by Section 1316 of the National Flood Insurance Act of 1968, which states,

“No new flood insurance coverage shall be provided under this title for any property which the Administrator finds has been declared by a duly constituted body, to be in violation of state or local laws, regulations, or ordinances which are intended to discourage or otherwise restrict land development or occupancy in floodprone areas.”

Communities can use the Section 1316 process as part of enforcement and handling violations. Explaining that failure to resolve cited violations may lead to the inability to obtain flood insurance coverage may induce the property owner to resolve the violation for several reasons, including the fact that future owners will not be able to obtain an NFIP policy – which could limit financing options for the prospective future owners.

In order to initiate the Section 1316 limitation on insurance, the community must exhaust all of its administrative means to encourage or induce the property owner to bring the property into compliance. It is extremely important that thorough documentation be available – you are encouraged to contact the North Carolina Division of Emergency Management as soon as possible if you determine that a violation situation may be difficult to resolve.

Importantly, the NFIP has interpreted the Section 1316 statutory limitation to apply to any insurable structure on the property – thus an unresolved violation of the ordinance provisions related to floodway fill on the property, though not a violation by the insured structure, could result in the suspension of flood insurance on an otherwise compliant building. In summary, the consequences of unresolved violations that are processed under Section 1316 include:

- Non-availability of flood insurance may make the property difficult or impossible to sell.



Contact the North Carolina Division of Emergency Management as soon as possible if you determine that a violation situation may be difficult to resolve.

- Denial of flood insurance coverage for all insurable buildings on the property may reduce the market value of the property.
- The potential cost for flood damage without the benefit of insurance coverage may be too great a risk for the property owner or prospective owners.
- Lending institutions holding the property mortgage may threaten to foreclose without the necessary insurance coverage.
- Federal disaster assistance is not available for permanent reconstruction.

The Coastal Barriers Resources System. NFIP flood insurance is denied for certain buildings located in certain units of the Coastal Barrier Resources System (CBRS). The Coastal Barriers Resources Act of 1982 (and later amendments) removed the Federal government from financial involvement associated with building and development areas identified as undeveloped portions of coastal barriers (barrier islands, spits, and similar land forms). In 1990, additional units known as Otherwise Protected Areas (OPAs) were added to the CBRS. OPAs are portions of coastal barriers that are owned by Federal, State or local governments or by certain non-profit organizations and that are used primarily for natural resources protection. CBRS units can be found on the Atlantic and Gulf Coasts and on the Great Lakes. Sometimes CBRS and OPA units are called “CBRA zones.”

Any Federal program which may have the effect of encouraging development on coastal barrier islands is restricted by CBRA. These programs include those that offer “any form of loan, grant, guarantee, insurance, payment, rebate, subsidy or any other form of direct or indirect Federal assistance” with specific and limited exceptions. For example, Federal disaster assistance is limited to emergency relief because of the prohibition on loans or grants to repair or rebuild buildings.

The Act also bans the sale of NFIP flood insurance for structures built or substantially improved on or after a specified date. For the initial CBRS designations, the date is October 1, 1983. For all subsequent designations, the date is the date the CBRS or OPA was identified. CBRS and OPA areas and their identification dates are shown on Flood Insurance Rate Maps. In OPAs, flood insurance can be written on some new buildings that support conservation uses.

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If an owner of a building in a CBRS or OPA area that pre-dates the designation wants to buy flood insurance, two pieces of documentation are required: (1) a copy of the building permit showing that the building was built before the designation date, and (2) a signed statement from the local Floodplain Administrator that the building had not been substantially damaged or improved since that date. Insurance agents can provide more information on the format for this documentation.

The boundaries of a CBRS or OPA area cannot be revised through FEMA's Letter of Map Amendment or Revision (LOMA/LOMR) process. Revisions may only be made by:

- Congressional action,
- Interpretation of boundaries by the U.S. Department of the Interior, Fish and Wildlife Service, or
- Cartographic modifications by FEMA to correct errors in transferring the Department of the Interior maps onto FIRMs.

If FEMA determines that an NFIP policy is inadvertently issued on a building in a CBRS or OPA area, the policy will be cancelled and the premium refunded. Claims cannot be paid, even if the mistake is not found until after a damaging event when a claim is made. If a grandfathered building that is insured is substantially improved or substantially damaged, the policy will be cancelled.

Banks can make conventional loans in the CBRS, but many are hesitant to do so because of the uninsured risk and because conventional loans are often sold to the secondary loan market, and that transfer will require flood insurance. Although some private flood insurance is available, it is substantially more expensive than NFIP coverage. While lenders cannot require NFIP flood insurance on newer buildings in CBRS or OPA areas since none is available, they are required to notify borrowers of the flood hazard and the lack of disaster assistance.

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Chapter 13 Community Rating System

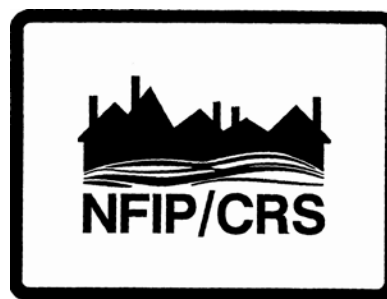
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13.1 Introduction

Since the NFIP was authorized in 1968, participating communities have required that flood hazards be recognized in new construction and development decisions. In many communities, this means that development is guided to areas of lower risk, and new buildings are out of harm's way. Prior to 1990, the program had few incentives for communities to do more than enforce the minimum NFIP regulatory standards, and flood insurance rates were the same everywhere, even though some communities elected to exceed those minimum NFIP regulatory standards.

The NFIP Community Rating System (CRS) was established to encourage community and State activities that go beyond those required by the NFIP. The incentive is reduction in flood risk resulting in lower insurance premiums so citizens save money.

Participation in the CRS is voluntary. Any community in the Regular Phase NFIP for at least one year and in full compliance with the rules and regulations of the NFIP, also called "in good standing," may apply for a CRS classification. The amount of flood insurance premium reduction is based on a community's CRS classification and that classification is based on the number of credit points calculated for specific activities



The goals of the CRS are to:

- Reduce flood damage to insurable property;
- Strengthen and support the insurance aspects of the NFIP; and
- Encourage a comprehensive approach to floodplain management.

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undertaken to meet the goals of the CRS as well as the classification under the Building Code Effectiveness Grading Schedule (BCEGS) and community growth adjustment.

Eighteen creditable activities are organized under four categories (see Section 13.4). The NFIP has conducted extensive evaluation of all the activities and has developed a system of credit points based on how well an activity helps achieve the three goals of the CRS. Communities are welcome to propose alternative approaches in their applications for possible accreditation.

The reduction in flood insurance premiums is only one of the rewards that a community gets by undertaking activities credited by the CRS. Other good reasons include increased public safety, increased public awareness, reduction of damages to property and public infrastructure, avoidance of economic disruption and losses, reduction of human suffering, and protection of the environment.

Class 9 is achieved by accruing a minimum of 500 points. Each additional 500 points will gain another class level. The ISO/CRS Specialist(s) for your state can help you decide whether to apply and can help you put the application together. See Appendix A for more information on contact information. Other requirements include successfully completing a Community Assistance Visit (CAV) within the previous 12 months. The completed application is sent to the Federal Emergency Management Agency's Region IV office in Atlanta, GA.

13.2 CRS Classifications

The CRS is modeled after the Insurance Services Office (ISO) fire insurance classification system. CRS has ten classifications from Class 10 to Class 1:

Class 1 requires the most credit points and gives the greatest premium reduction (45% in SFHAs and 10% in non-SFHAs), while Class 10 does not result in any premium reductions.

Policies in Class 9 communities receive a 5% reduction on all policies – SFHA and non-SFHAs. Reductions are different for policies that fall in the mapped Special Flood Hazard Area and those on buildings outside the SFHA.

Initially, a community is automatically assigned to Class 10. After that, a community's CRS classification is determined by the number of credit points that are accrued for approved activities.



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To move from a Class 10 to a Class 9, a community must initiate activities to accrue a minimum of 500 points and have successfully completed a Community Assistance Visit (CAV) within one year of application. An additional 500 points is required to move to a different class.

In North Carolina, 21 counties and 63 municipalities participate in the CRS (as of May 2010). Of particular note, six communities representing about 9% of all federal flood insurance policies in North Carolina have achieved significant CRS classes:

- Four communities are Class 6 (20% premium reduction for properties in the SFHA): Town of Kitty Hawk, City of Nags Head, Town of Pineville, Town of Southern Shores, Town of Topsail Beach and Mecklenburg County. Only 113 communities in the U.S. are Class 6.
- Three communities are Class 5 (25% premium reduction for properties in the SFHA): Town of Grifton, City of Kinston and City of Charlotte. Only 54 communities in the U.S. are Class 5.

13.3 CRS Application Process

To receive the CRS flood insurance premium reductions, a community can submit its application to the FEMA Regional Office or the Insurance Services Office, Inc. (ISO). ISO manages the program for FEMA. Preparing the application involves completion of worksheets and submission of appropriate documentation to demonstrate that the community has undertaken activities that go beyond NFIP minimum requirements. The ISO/CRS Specialist(s) for your state can assist you in preparing the application. Please refer to Appendix A for the North Carolina's ISO/CRS Specialists' contact information.

ISO offers free technical assistance to help communities design and implement some activities.

For detailed information on the CRS application process, including manuals and application forms, contact the Insurance Services Office (ISO) field representative. This information is also available on-line through the CRS Resource Center: <http://training.fema.gov/EMIWeb/CRS/>. A course on the Community Rating System (E278) is provided several times a year for community officials at the Emergency Management Institute (EMI) in Emmitsburg, MD.

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Classifications become effective on either May 1st or October 1st depending on which is the closest date after classification application is verified. CRS communities may improve their classification by adding new creditable activities. While there is no fee to apply to the CRS program, the community may incur some costs due to the time and staff effort required to complete the application and supporting documentation as well as with the annual recertification and cycle reviews.

The ISO/CRS Specialist reviews the application and supporting documentation on behalf of FEMA to determine the community's classification and flood insurance discounts. The ISO/CRS Specialist will visit the community and verify that the activities are being implemented as described in the application. If a Community Assistance Visit (CAV) has not been undertaken within a year, the State or FEMA Regional Office will schedule a visit.

Communities choose the CRS activities that are applicable to their specific circumstances, objectives, and program capabilities. After the initial review and acceptance, FEMA will periodically review each CRS community performance. If the credited activities are not being properly or fully implemented, credit points and the CRS classification may be adjusted accordingly. A community may add or drop creditable activities at any time and if any classification changes occur, they will become effective the following May 1st or October 1st when the next Flood Insurance Manual is published. The CRS has only two requirements that must be addressed, as applicable:

- Every community must apply for Activity 310—Elevation Certificate. All CRS communities must maintain FEMA elevation certificates (FEMA Form 81-31) for all new and substantially improved construction in the floodplain after the date of application for CRS classification. Every repetitive loss community must apply for Activity 510—Repetitive Loss Projects, and many must also prepare a floodplain management plan compliant with minimum CRS criteria (see Chapter 15 to see how this plan may also satisfy other programmatic requirements).

13.4 CRS Activities

The *CRS Coordinator's Manual* describes the 18 activities credited by the Community Rating System (CRS) and the documentation required to receive credit for each activity, along with the formulae used to calculate credits. The *CRS Application* provides a simpler summary of the activities and the initial

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steps needed to apply for credit. The activities are divided into four series or categories and are summarized below.

Credit points can be increased if activities are part of a comprehensive floodplain management plan under Activity 510 (Floodplain Management Planning). Special credits are provided for activities that affect special hazards that are not reflected in the NFIP mapping or regulatory standards, such as coastal erosion and alluvial fan flooding.

The activities do not all have to be implemented at local expense. Many communities can qualify for “uniform minimum credit” whereby a state or regional agency can apply for a CRS activity that it is implementing on behalf of its communities. The key here is that activities get done to protect your community and citizenry regardless of who implements or pays for such activities.

Communities can receive credit for retrofitting projects funded by the owners, regulatory programs administered by the state or a regional district, or similar projects or programs implemented by another agency or organization. What counts to the CRS is what happens – not who does it.

Public Information Activities. This series credits activities that advise people about flood hazards, flood insurance, and ways to reduce flood damage. These activities also provide data needed by insurance agents for accurate flood insurance rating:

- 310 (Elevation Certificates) Maintain FEMA elevation certificates for new construction in the floodplain. Keeping certificates after the date of CRS application is required of all CRS communities. Maintaining elevation data is a minimum NFIP requirement, but the use of the FEMA Elevation Certificate (FEMA Form 81-31) is mandatory for CRS participation.
- 320 (Map Information Service) Respond to inquiries about what flood zone a property is in and publicize this service. Additional flood map data provides more credit points.
- 330 (Outreach Projects) Send information about the flood hazard, flood insurance, and flood protection measures to residents.
- 340 (Hazard Disclosure) Advise potential purchasers of flood-prone property about the flood hazard or require a notice of the flood hazard.

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- 350 (Flood Protection Information) The community places publications and references on flood insurance and flood protection in the public libraries.
- 360 (Flood Protection Assistance) Give inquiring property owners technical advice on how to protect their buildings or other developments from flooding and publicize this service.

Mapping and Regulation Activities. This series credits activities that provide increased protection to new development (in growing communities, credit points are increased by a growth factor):

- 410 (Additional Flood Data) Develop new flood elevations, floodway delineations, wave heights or other regulatory flood hazard data for an area that was not mapped using detailed methods in the existing Flood Insurance Study or associated flood maps, or for flooding sources not previously mapped. Credits are awarded for Flood Insurance Studies based on a higher state or local standards. Note that all North Carolina communities receive automatic credit for the Cooperating Technical State (CTS) agreement signed with FEMA (see Table 13-1 below). In addition, as new digital FIRMs were published across the state, additional credits were available to all communities that utilize this digital map service locally.
- 420 (Open Space Preservation) Guarantee that currently vacant floodplain lands will be kept free from development; additional credit is given for areas still in, or restored to, their natural state.
- 430 (Higher Regulatory Standards) Require freeboard; require engineered foundations; require compensatory storage; zone the floodplain for minimum lot sizes of one acre or larger; adopt regulations to protect critical facilities, or establish other standards for new construction that exceed the minimum NFIP requirements.
- 440 (Flood Data Maintenance) Keep flood and property data on computer records; use better base maps; or maintain or report damaged or missing elevation reference marks or bench marks.
- 450 (Stormwater Management) Regulate new development throughout the watershed to ensure that post-development runoff is no worse than pre-development runoff and/or protects or improves water quality.

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Credit Points	Class	Premium Reduction SFHA *	Premium Reduction Non-SFHA *
4,500+	1	45%	10%
4,000 – 4,499	2	40%	10%
3,500 – 3,999	3	35%	10%
3,000 – 3,499	4	30%	10%
2,500 – 2,999	5	25%	10%
2,000 – 2,499	6	20%	10%
1,500 – 1,999	7	15%	5%
1,000 – 1,499	8	10%	5%
500 - 999	9	5%	5%
0 - 499	10	0	0

Table 13-1. CRS Credit Points

Flood Damage Reduction Activities. This series credits programs for areas in which existing development is at risk. There is no CRS credit for new structural flood control works because the reduction in risk can be reflected on FIRMs if protection to the 1%-annual chance flood is provided. Creditable flood damage reduction activities include:

- 510 (Floodplain Management Planning) Prepare, adopt, and implement a comprehensive Floodplain Management Plan (FMP) that addresses the community's flood problem, and evaluate and revise the plan annually.
- 520 (Acquisition and Relocation) Acquire and/or relocate flood-prone buildings so that they are out of the Special Flood Hazard Area.
- 530 (Flood Protection) Protect flood-prone buildings through elevation, on-site barriers, or floodproofing.
- 540 (Drainage System Maintenance) Conduct periodic inspections of all channels and retention basins, and remove debris as needed.

Flood Preparedness Activities. This series is oriented toward preparing for and responding to a flood due to natural causes and flooding due to failures of

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levees, floodwalls, and dams. Your county emergency manager may also be involved in these activities:

- 610 (Flood Warning Program) Provide early flood warnings to the public and have a detailed flood response plan keyed to flood crest predictions.
- 620 (Levee Safety) Maintain levees that are not reflected on the FIRM as providing base flood protection. The NFIP has criteria under 44 CFR 65.10 addressing whether a levee provides protections from the base flood.
- 630 (Dam Safety) All communities in the State of North Carolina will receive automatic credit for NC's approved dam safety program. The North Carolina State Dam Safety Program (SDS) credit rating is 52 points. The new 2012 CRS Coordinator's Manual will limit SDS credit to communities downstream of a dam that could be flooded if the dam failed.

Credit Points Awarded for CRS Activities. Please refer to the *CRS Coordinator's Manual* page 120-2 for Table 120-1 and Table 13-1 above for more information on maximum possible points per activity, points earned, and percentage of communities credited.

The CRS Coordinator's Manual, Application package, and other materials are available at no cost.

13.5 Publications

Even if your community is not in the CRS at this time, its free publication series can be helpful. Hardcopies of the publications listed in Table 13-2 may be ordered from FEMA's warehouse, downloaded from the web site for the CRS Resource Center at <http://training.fema.gov/EMIWeb/CRS/>, or see Appendix A for North Carolina's ISO/CRS Specialists contact information.

Table 13-2. CRS Publications
General and Application
CRS Coordinator's Manual CRS Activity Worksheets CRS Application The National Flood Insurance Program's Community Rating System (color brochures) – Joining the Community Rating System CRS Record Keeping Guidance
Specific Activities
CRS Credit for Drainage System Maintenance CRS Credit for Dam Safety CRS Credit for Floodplain Mapping CRS Credit for Flood Warning Programs

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CRS Credit for Outreach Projects CRS Credit for Higher Regulatory Standards CRS Credit for Stormwater Management CTP Credit Elevation Certificate Reference Guide Example Plans
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Special Hazards

CRS Credit for Management of Coastal Erosion Hazards CRS Credit for Management of Tsunami Hazards Special Hazards Supplement to the CRS Coordinator's Manual
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14.1 Disaster Operations

After a disaster, the local Floodplain Administrator expects that everyone will want quick and efficient responses and assistance, without regard to other priorities. Emergency post-disaster responsibilities must be done, often at the expense of normal duties.

There may be pressure from the public and elected officials to waive established procedures and regulations in order to help people return to normal as fast as possible. This is sometimes done in spite of the fact that “back to normal” could mean that people and buildings would be exposed to the high risk of flooding that was possibly the cause of the disaster in the first place.

In short, your residents and businesses are primarily concerned with recovery. Your stress level will be high, pressure will be high, patience can be low, the environment is unfamiliar and often unsafe, and there is never enough time or money.

To help you prepare, it is strongly recommended that your flood permitting office prepare procedures that will ensure full and fair enforcement of your floodplain regulations during this time of stress, confusion and controversy. It is important to have a meeting with all the players and go through the procedures and think about who will do what, what resources are needed, where to find outside assistance if needed and how you can best coordinate everyone’s efforts. You may wish to outreach or remind all the players of these procedures, commonly referred to as a Post-Disaster Standard Operating Procedures (Post-Disaster SOP), when an event is approaching.

Emergency Operations. The county emergency manager is responsible for disaster and emergency response activities, such as evacuation, rescue, sandbagging and coordination with all municipalities as well as the county, state and federal emergency management agencies. Once the disaster proves

to be big enough, the county's emergency manager will open up the Emergency Operations Center (EOC).

You may have a role during the emergency. While you work through this chapter, you should meet with the county emergency manager in your county to review what your office will be expected to do or how to coordinate with the county emergency manager before, during and after the disaster. This may include outreach guidance in advance of the disaster if predictable and then follow-up with recovery issues such as inspections, clean-up and rebuilding after the disaster.

This chapter is focused primarily on the recovery phase; when this phase starts depends on many factors and often isn't clearly identified. In general, you are in recovery when people begin to think about how to rebuild and when questions about permits and regulations are being asked. During past flooding events in NC, this has been about a week or so after the event. You should review with the county emergency manager what your office will be charged with right after an event and at what point you and your staff are able to pursue the recovery activities covered in this chapter.

Windshield Survey. A windshield survey is conducted to help the permit office manage time and resources most efficiently. Right after an event you may be called on to estimate which buildings have been destroyed or have sustained major or minor damage. The results are part of the initial damage assessment usually coordinated with the county emergency manager and used to support requests for disaster declarations and different forms of disaster assistance. When large numbers of buildings have been affected, this survey will help focus further inspections. If the area affected is relatively small, the survey may be skipped and the inspectors can immediately begin inspecting damaged buildings. The initial damage assessment survey, referred to as a "windshield survey" determines:

- If any building is so dangerous that it should not be reentered without a careful inspection,
- Which buildings will need a building or other permit before they can be repaired or reoccupied, and
- Which buildings need further inspection and supporting information so that a determination of whether or not the damage is substantial.

High Water Marks. High water marks are very valuable records. They will help residents relate the flood to the base flood elevations used for regulatory purposes. For example, if the flood level in a particular area was found to have

been two feet below the base flood, people can be told that if they were substantially damaged, they will have to elevate their homes at least two feet above the high water marks. If high water marks are to be used for regulatory purposes, they must be surveyed and recorded to ensure accuracy and consistency in enforcement, especially if mitigation or other grants will be depending on these records for rebuilding efforts.

High water marks are also important for recording the extent of the flood and adding to the hydrologic record. Someone, usually in the public works or engineering office, should be responsible for obtaining readings from stream gauges and other high water marks as they are reported. Using these high water marks, maps of the affected areas can be prepared and the flood recurrence interval can be estimated. Technical assistance may be available from the North Carolina Natural Resources Conservation Service. Other resources for post-disaster technical services may include engineering and surveying associations and services paid through mitigation grants.

Work Maps. You should keep a set of FIRMs or other NFIP flood maps as work maps to keep notes of areas flooded and where damaged buildings are located. Some communities make photocopies of the maps at a size that can be used during field surveys.

Before the survey, you should review the work maps for the affected area(s) and, using the high water mark data, determine which areas are worst hit. This can be done by plotting known flood boundaries or matching high water marks to elevation contour lines. Any area where the flood crest was two feet or more above a building's adjacent grade should be outlined on the map and designated as the first priority for the windshield survey.

Conduct Survey. The survey is conducted from outside all buildings, usually from a vehicle promoting the term, windshield survey. Depending on the severity and duration of flooding, the survey may be conducted concurrently with the county emergency manager's initial damage assessment. On your work maps, code each building with an "A," "B" or "C" for the three categories of building condition:

- *A – Apparently safe:* No exterior signs of structural damage. People can be allowed back in, but they will need building and/or other permits for repairs.
- *B – Building obviously substantially damaged:* The flood swept the building away, it has collapsed or it is missing one or more walls. The building cannot be reoccupied without major structural work.

- *C – Could be substantially damaged:* The building may be substantially damaged, but such damage is not always obvious. Buildings with more than two feet of water over first floors (and manufactured homes with more than six-inches of water or inundation of flooring system) fall in this category.

Notice to Owners. Upon completing the initial windshield survey, you should hand-deliver a letter to each property surveyed, including those assessed as apparently safe. Each letter should include the building's address and, where known, the owner's name. A sample letter is in Figure 14-1. Keep copies in the permit office and start a file on each property designated as "B – Building obviously substantially damaged" or "C – Could be substantially damaged."

With the letter, include a copy of the FEMA/Red Cross book, *Repairing Your Flooded Home* as well as any other pertinent information your department wishes to provide. You can get supplies of the FEMA/Red Cross book from FEMA or the Red Cross. If too few copies are available, you may reproduce your own and even include your community's name on the cover. FEMA and the Red Cross encourage this, as it will make the book more pertinent to local readers.

Dear (Name)

The permit office conducted a windshield survey of flooded buildings in your neighborhood. A review of your building from the outside indicates that the structure was affected by the recent flood. Here are some things you should know:

1. You should start filing for flood insurance claims and check into filing a claim through the Increased Cost of Compliance (ICC). The Increased Cost of Compliance (ICC) is an endorsement of the flood insurance policy that provides a claim payment directly to a property owner for the cost to comply with State or community floodplain management laws or ordinances after a direct physical loss caused by a flood. The ICC claim payment must be used toward the costs of undertaking a mitigation measure that will substantially reduce or eliminate the flood risk to flood-damaged buildings insured under the NFIP.
2. Repairs to your building require a permit from the City's permit office. Before you remove, alter, or replace any of the following items, you **MUST** obtain a building permit; the roof, walls, siding, wallboard, plaster, insulation, paneling, cabinets, flooring, electrical system, plumbing, heating, or air conditioning. Flood permits will be required for demolition as well.
3. Before demolition of damages to your building, get a substantial damage assessment through your local Floodplain Administrator for items built into the structure such as cabinetry, built-in appliances, etc.
4. The permit office will conduct a complimentary inspection of the damage to your building. This inspection will help you identify what needs to be repaired. It will also identify if a permit is needed and if your building could be substantially damaged. There is no cost for this inspection but it must be taken before you begin repairs or reconstruction. We will contact you when we plan to do the inspection. If you have a preferred time, please call us to arrange an appointment.
5. You may proceed with clean-up activities and temporary emergency repairs without a permit. These include:
 - a. Removing and disposing of damaged contents, carpeting, wallboard, insulation, etc.
 - b. Hosing, scrubbing or cleaning floors, wall, ductwork, etc.
 - c. Covering holes in roofs or walls and covering windows to prevent the weather from inflicting further damage.
 - d. Removing sagging ceilings, shoring up broken foundations, and other actions to make the building safer to enter.
6. Some day in the future, your area will flood again. There are things you can do during repair and reconstruction to reduce damage from the next flood. Many of these are discussed in the attached book, *Repairing Your Flooded Home*. We will be glad to talk to you about protecting your property from future flooding. If we receive a disaster declaration, there may be some financial assistance to help pay for making your

property safer than it was before. In the mean time, read Step 8 in *Repairing Your Flooded Home* for some ideas.

7. In order to screen out possible opportunists from taking advantage of the current situation, any contracted work must be done by a firm licensed to work in the City. Furthermore, residents are cautioned and warned *not* to sign blank contracts, agree to have work performed without first seeing the contractor's registration card, or allow work or alterations not authorized by the City permit office.

For further information, please contact the permit office at _____.

Sincerely,

Name, Director

Permit Office

Attachment: Repairing Your Flooded Home

Figure 14-1: Sample letter to flood damaged property owner.

14.2 Post-Flood Permit Requirements

As soon as possible after the flood, you should contact the North Carolina NFIP State Coordinator with the Division of Emergency Management to review regulatory requirements that apply to reconstruction and repairs, and to see if there are any new guidance documents or means of assistance to your recovery efforts.

Permits Required. Permits will need to be issued for each building or other development that will be repaired and the work must comply with all applicable codes including the NC building code and the community's floodplain management ordinance. The requirement for a **floodplain development permit cannot be waived**, although your governing board may opt to waive permit fees. The board may not weaken, waive, or ignore the substantial damage requirement without jeopardizing participation in the NFIP.

Clean Up and Emergency Repairs. You may allow cleanup and temporary emergency repairs to proceed without a permit, including work required to:

- Hose, scrub or clean floors, walls, ductwork, etc.
- Cover holes in roofs or walls and cover windows to prevent weather from inflicting further damage.
- Make the building safe to enter by removing sagging ceilings, shoring up broken foundations, and other actions.

The windshield survey should have identified which buildings may need emergency work to stabilize them for safety reasons.

Owners of buildings that may have been substantially damaged buildings should be advised against making major repairs if the building presents a safety hazard until after the community has considered mitigation options, including whether to seek mitigation funding for floodplain buyouts, elevation projects, or other mitigation measures.

14.3 Enforcement After Floods

Delivering notices to property owners to convey the results of the initial windshield survey is a good first step in enforcing the permit requirements for repairs and rebuilding.

Initial Inspection. As soon as possible after the notice is delivered, your office should inspect each flooded property to review needed repairs, make a preliminary estimate of substantial damage, and determine if a permit is needed. Use a checklist to make the inspection quick and consistent. Learn more by using FEMA's *Residential Substantial Damage Estimator* (FEMA 311CD) and its checklist provided in Figure 14-2a below. See Chapter 9 for more information on RSDE, substantial damage and substantial improvement determinations. Another sample substantial damage field checklist is shown in Figure 14-2b. Provide a copy of your findings to the property owner, along with safety, health and repair information.

BUILDING DEPARTMENT			
SAFE			
For Occupancy			
Address or Lot No. _____		Code Official _____	
Date _____	Inspector _____	(signature) _____	

Post Damaged Buildings. Upon completion of the inspection, you should post the appropriate sign on the front of the building so it is clearly visible from the street. Appropriate colored signs can be purchased in volume from the International Code Council (www.iccsafe.org). If the building needs repairs that do not require a permit, it should be posted with the “Safe for Occupancy” and “Approved to Connect” (utilities) signs. Determination still needs to be made as to whether a flood permit is required.

BUILDING DEPARTMENT			
KEEP OUT			
Uninhabitable			
CONTACT BUILDING DEPARTMENT BEFORE ENTERING			
Address or Lot No. _____		Code Official _____	
Date _____	Inspector _____	(signature) _____	

If a permit to make repairs is needed, post the “Habitable—Repairs Necessary” sign. If it is not safe to clean up or work on the building without major structural repairs, post a “Keep Out – Uninhabitable” sign.

RSDE DAMAGE INSPECTION WORKSHEET
Single/Multi-Family Site Built Residences

1. Subdivision: _____ Parcel # _____ Lot # _____
2. Elevation of lowest floor: _____ Datum: _____
3. NFIP Community Name: _____
4. Latitude: _____ Longitude: _____
5. Owner's First Name: _____ Last Name: _____
6. Building Address: _____ City: _____
 State: _____ Zip: _____ Phone #: _____
7. County: _____
8. Mailing Address: _____ City: _____
 State: _____ Zip: _____ Phone #: _____
9. Date of Construction: _____ Date Damage Occurred: _____
10. Cause of Damage: (A) Fire (B) Flood (C) Fire & Wind (D) Seismic (E) Wind
11. Duration of Flooding: (A) _____ hours or (B) _____ days
12. Description of Residential Site-Built Modular Structure:
 - (A) Quality of Construction:
 - (1) Low ____ (2) Fair ____ (3) Average ____ (4) Good ____ (5) Very Good ____ (6) Excellent ____
 - (B) 1-story ____ 1 ½-story ____ 2-story ____ More than 2 stories ____ 2-Story Bi-level ____ Split-level ____
 - (C) Foundation (check one):
 - Slab-on-grade ____ Basement ____ Crawl space ____ Piers ____ Footings ____
 - (D) Overall Dimensions of building footprint: Size (L) _____ ft X (W) _____ ft
 - (E) Walls (check one)
 - (1) Wood Frame ____ (2) Masonry ____ (3) Concrete Walls ____
 - (4) Exterior Finish (Type) _____
 - (5) Interior Finish (Type) _____

CARRYING OUT FLOODPLAIN MANAGEMENT IN YOUR LOCALITY

(F) Roof:

(1) Metal/Corrugated or ribbed: _____ (2) Composition Shingles: _____ (3) Other: _____

(G) Heating/Cooling:

(1) Forced Air _____ (2) Warm and Cooled _____ (3) Wall Furnace _____ (4) Heat Pump _____

(H) Flooring

Floor Covering (Type) _____

(I) Appliances (built-in only). List: _____

(J) Fireplace: Yes _____ No _____ Quantity _____

(K) Porch/Breezeways: Yes _____ No _____

(L) Garage: Attached _____ Detached _____ No. of cars: _____

Carport: Attached _____ Detached _____ No. of cars: _____

(M) Basement (*check one*): Finished _____ Unfinished _____

(N) Deck: Yes _____ No _____

13. Name of Inspector: _____

14. Date of Inspection: _____ Time of Inspection: _____

15. Phone Number of Inspector (*including area code*) _____

16. Description of Special Flood Hazard Area (SFHA):

NFIP Community I.D.# _____ FIRM Panel #: _____

FIRM Suffix: _____ Date of FIRM Panel: _____ FIRM Zone: _____

BFE (NGVD): _____

Regulatory Floodway: Yes _____ No _____ Potential _____

17. Flood Depth Above Lowest Floor

(A) Exterior Walls _____ ft (B) Interior Walls _____ ft

18. PERCENT OF DAMAGE FIELD ESTIMATE *(for single/multi-family site built homes)*

_____ % Foundations

_____ % Superstructure (Framing/Masonry)

_____ % Roofing

_____ % Insulation and Weather-stripping

_____ % Exterior Finish

_____ % Interior Finish (Plaster/Drywall)

_____ % Doors, Windows, Shutters

_____ % Lumber Finished

_____ % Hardware

_____ % Cabinets/Countertops

_____ % Floor Covering

_____ % Plumbing

_____ % Electrical

_____ % Built-in Appliances

_____ % Heating/Cooling (HVAC)

_____ % Painting

19. CONDITION OF STRUCTURE: *(Check one)*

(A) Inundation damage only (B) Minor structural damage (C) Major structural damage

(D) Partially Collapsed (E) Structure Moved Off Foundation (F) Totally Destroyed/Collapsed

20. DESCRIPTION OF DAMAGE: *(Answer yes or no)*

(A) Plumbing: (1) Exposed _____ (2) In need of repair _____

(B) HVAC/Electrical: (1) Submerged _____ (2) Damaged _____ (3) Repair _____ (4) Replace _____

Use numbers from the right to describe the condition of items C through F:

(C) Foundation _____	1. No visible damage	5. Dislodged/Destroyed
(D) Exterior walls _____	2. Settlement/cracked	6. Submerged
(E) Interior walls _____	3. Partially missing	7. Include all of the above
(F) Roof _____	4. Sagging	8. Other (explain) _____

3

Figure 14-2a Blank RSDE Damage Inspection Worksheet

Property address: _____			Date: _____
Owner: _____			Phone: _____
Check the appropriate column. Column 1 items note that the damage is minor, column 2 items can be expensive to repair, and column 3 items are indicators of substantial damage. Do not count clean up costs or damage to contents (including plug-in appliances) and other items not part of the building's structure (detached structures, fences, sidewalks, swimming pools, etc.).			
1	2	3	General condition
___			Building appears sound and safe to enter, needs minor work to make habitable
	___		Apparently safe to enter, needs extensive cleaning/repairs
		___	Foundation, floor, wall or ceiling damage such that building not safe to enter
			Depth of water
___			In crawlspace, <2" in unfinished basement, not in building
___			In unfinished basement, only affected contents and utilities
	___		< 3' in finished basement or over first floor
		___	≥ 3' over first floor or in finished basement
			Foundation
			Type of foundation: ___ Slab ___ Basement/split level ___ Crawlspace
___			No signs of cracks or settling.
	___		Cracks in basement or crawlspace walls
		___	Buckling of slab or basement floor, broken crawlspace or basement wall
			Exterior
			Type of exterior walls: ___ Masonry ___ Wood/aluminum/vinyl siding
___			No signs of cracks or swelling, doors/windows stick but work
	___		Some swelling or warping of walls, doors/windows may need to be replaced
		___	Deck, porch, balcony damaged
		___	Shifting of wall on foundation, wall broken
			Floors
___			Concrete/tile/bare wooden floors: no signs of damage
___			Tile/vinyl/linoleum coming loose, can be cleaned and reglued
	___		Carpeting/vinyl/linoleum soaked, needs to be replaced
		___	Wooden floor or subfloor warped, broken, or needs replacement
			Interior
___			Water did not reach any wallboard, paneling or insulation, doors stick but work
	___		First four feet of wallboard, paneling or insulation must be replaced
		___	All wallboard, paneling or insulation in the lowest floor must be replaced
		___	Doors/molding/built-in bookcases swollen, warped, need to be replaced
		___	Studs/walls broken, shifted
		___	Ceiling sagging/collapsing

1	2	3	
			Heating & central air conditioning
			Type of system: ☐ Forced air ☐ Electric baseboard ☐ Other: _____
☐			Water did not reach any electrical parts, gas jets, or ductwork
☐			Ductwork needs to be disassembled and cleaned or replaced
☐			Gas jets and/or electrical parts need to be cleaned or replaced
☐			Propane/fuel tank needs to be reconnected and/or anchored
			Electrical
☐			Water did not reach any outlets, switches, meters, or fuse or breaker boxes
☐			Outlets, switches, breakers, lights or other fixtures need to be replaced
☐			Meter or service box need to be repaired or replaced by a professional
			Plumbing
☐			Drains and sewers need to be cleared
☐			Sump pump needs to be repaired or replaced
☐			Water heater needs to be replaced [need a permit or licensed plumber?]
☐			Water softener needs to be replaced [need a permit or licensed plumber?]
			Kitchen and bath
☐			Kitchen and bath(s) only need to be cleaned up
☐			Built-in appliances, ovens, etc. need cleaning by a professional
☐			Built-in appliances, ovens, etc. need to be replaced
☐			Cabinets/counters warped or otherwise need to be replaced
☐			Plumbing fixtures cracked, broken or need to be replaced
☐	☐	☐	Number of checks in each column
			Completed by: _____
If all checks are in column 1, no building permit is needed. If there are any checks in columns 2 or 3, a building permit must be applied for and a repair/reconstruction estimate (prepared and signed by a licensed contractor) must be submitted. Except where professional cleaning is needed, any items checked in columns 1 or 2 can be performed by the owner. A licensed contractor may charge for the repair/reconstruction estimate, especially if the owner intends to do the work. Any item checked in column 3 and any alteration to the electrical or plumbing systems must be performed by a licensed contractor. The owner should read <i>Repairing Your Flooded Home</i>, page 15-29 for clean up and repair guidance and pages 39-41 for mitigation suggestions to incorporate into the repairs. For further information, please contact the Permit Office at _____.			

Figure 14-2b. Sample checklist for initial inspection of a flooded building

Follow Up. Here are some things to consider that may help your office handle post-flood enforcement:

- Check with utility companies and utility providers to advise them of your enforcement procedures. Establish a policy that utilities may not turn service back on unless there is an "Approved to Connect" sign posted on

the building. Not only is it safer for owners, but it will discourage owners from undertaking work that requires permits.

- Instruct police and other departments about the permit requirements and ask them to report to you any construction projects underway in buildings that do not have posted permit signs.
- Meet with elected officials and the planning commission to brief them on your plans so that they will understand the complexities and size of the job you may be faced with after large floods.
- If you have areas that flood frequently, consider hosting workshops for contractors and/or citizens. The state and FEMA can provide instructors.

Flooded Buildings. Flooded buildings can be more difficult to inspect than those damaged by other means because considerable damage may be hidden behind walls or under floors. Owner may not recognize the long term effects of water, moisture and mold.

You should require that the wallboard/plaster and insulation be removed from a flooded building. Once the owner says the framing members are dry, conduct an inspection. Check the cleanliness and moisture content before allowing the walls to be replaced. The best way to measure the level of moisture in wood is with a moisture meter. If the wood's moisture content exceeds normal levels for your area of the country (usually 10% - 15%), it is too wet. Reinspect after the building is allowed to dry some more. If owners are anxious to rebuild, make sure they have the FEMA/Red Cross publication, *Repairing Your Flooded Home*, which reviews how to speed up the drying process.

Contractor Quality Control. After a disaster, not-so-honest or unqualified contractors sometimes come into the area to help disaster victims, sometimes offering cut rates or special deals. Your community may want to control this by requiring that certain construction and reconstruction work be done by qualified and licensed people. If your community issues licenses to contractors, advise property owners of this requirement through the news media. You can also provide handouts on dealing with contractors and what to do in case of a dispute (for some good language, see *Repairing Your Flooded Home*).

If you receive a number of complaints against a contractor, you should take steps to suspend the contractor's license. You also can report unscrupulous contractors to state licensing agencies and/or the consumer protection division of the state attorney general's office.

Informed contractors can be allies. You may want to have a workshop for contractors to be sure they know about the requirements of your flood ordinance and design and construction measures that can further reduce future flood damages.

14.4 Post-Flood Administration

Permit Forms. If a permit is required, the property owner should be given the forms needed and told what repairs, if any, can proceed before the permit is issued. Keep these forms in the property's flood file:

- Notice to the owner (Figure 14-1)
- Initial inspection checklist (Figure 14-2)
- Permit application
- Repair/reconstruction estimate
- Substantial damage worksheets and determination notice or letter
- Inspection records
- Certified Elevation or Floodproofing data, if the building is required to be elevated or floodproofed
- Certificate of occupancy

Public Information. Your community has a role in informing residents about the regulatory flood requirements and the need to carefully clean and rebuild. You can issue news releases and/or distribute materials to advise property owners about:

- Activities that need a permit both building permit and floodplain development permit.
- Activities that do not need a permit (language in Figure 14-1 can form the basis for a news release).
- The NFIP substantial damage rule.
- The benefits of Increased Cost of Compliance flood insurance coverage (see Chapter 9).
- The need for licensed contractors, if required in your community.
- The information provided in steps 2, 3 and 4 in *Repairing Your Flooded Home*, such as taking pictures for insurance and disaster assistance claims before throwing things away, how to drain a basement without breaking the walls, and health and safety precautions.

- The need to include property protection measures as part of repairing homes or businesses. People need to recognize that “returning to normal” means returning to a building that is subject to another flood.

Staff Assistance. If the disaster affected many properties, you likely will need more people to perform survey and inspection work. Staff assistance can come from:

- A mutual aid agreement with neighboring communities. There may already be some agreements with neighboring communities on sharing staff from other offices. If you don't have any, work with your county emergency manager on procedures and agreement language or to submit a request to the state for such assistance.
- Other communities willing to offer help; check with your state NFIP coordinator.
- The building officials association, which may know of members available to help but again, it is best if the county emergency manager makes this request on your behalf.

If there was a disaster declaration, check with your county emergency manager. You may be able to get temporary hires, with part of the cost reimbursed through disaster assistance.

Disaster assistance may also reimburse your community for inspectors to conduct habitability inspections and to determine if buildings are substantially damaged.

Another source of post-disaster assistance can be through volunteer labor and materials assistance from non-profit agencies, churches and other volunteer groups; however, consideration must be taken to determine if permits are needed for their work.

Technical Assistance. Many technical issues can arise during post-disaster permit operations, but you have a number of sources of assistance:

Two organizations certify repair contractors:

International Institute for Cleaning and Restoration Certification (IICRC)
2715 E. Mill Plain Blvd.
Vancouver, WA 98661
Phone: 360/693-5675

Association of Specialists in Cleaning and Restoration (ASCR)
10830 Annapolis Junction Road
Suite 312
Annapolis Junction, MD 20701
Phone: 301/604-4411

- Call the NFIP State Coordinator first. You may request technical assistance staff or workshops. The NFIP State Coordinator may also be able to coordinate additional volunteer assistance for conducting substantial damage field surveys required for use of FEMA's RSDE software.
- Check with county emergency manager if outside assistance is requested so they can submit a resource request into the state on your behalf. Samples are when building, electrical, plumbing or other specific licensed inspectors are needed temporarily due to disaster recovery efforts OR if you need assistance in conducting the field survey information for running the RSDE software to make your substantial damage determinations.
- Check with the NC Building Code Council for publications and example forms for post-disaster operations.

Most states' Cooperative Extension Services have post-disaster materials and can provide advice on technical matters. They are usually located with your land grant university's agriculture school. Refer to the North Carolina State University Cooperative Extension for more information.

Some communities require that a contractor certify that a building has been properly cleaned. This should be allowed only if the contractor is qualified to do so.

Chapter 15 Hazard Mitigation

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15.1 Introduction

“Mitigation” is considered any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery activities. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage. Hazard mitigation efforts reduce loss of life and property by lessening the impact of disasters.

FEMA's Federal Insurance and Mitigation Administration (FIMA) manages the National Flood Insurance Program (NFIP) and implements a variety of programs authorized by Congress to reduce losses that may result from natural disasters. Effective Mitigation planning and projects can break the cycle of disaster damage, reconstruction, and repeated damage.

15.2 Mitigation Planning

Benefits of Planning. Floodplain residents and property owners are not always aware of what is being done to reduce their exposure to flooding, nor are they aware of things they can do to protect themselves or how they can contribute to community efforts. Developing a flood hazard mitigation plan is one of the best ways to correct these shortcomings.

The objective of planning is to produce a program of activities that will best tackle the community's flood problem and meet other community needs. A well-prepared plan will:

- Educate residents about the flood hazard, flood loss reduction measures, and the natural and beneficial functions of floodplains.
- Ensure that all possible activities are reviewed so that appropriate and efficient solutions are used to address the local flood problem.
- Link floodplain management policies to specific activities.
- Ensure that activities are coordinated with each other and with other community goals, objectives and activities, preventing conflicts and reducing the costs of implementing individual activities.
- Build public and political support for projects that prevent new flood problems, reduce flood losses and protect the natural and beneficial functions of floodplains.
- Fulfill planning requirements for state or federal assistance programs.
- Facilitate implementation of floodplain management activities through an action plan that has specific tasks, staff assignments and deadlines.

The Planning Process. The planning process includes getting input from everyone who has relevant information, everyone who is affected by flooding and everyone who will participate in implementing the plan. The process works for all types of plans, such as those for land use, capital improvement, neighborhood redevelopment and hazard mitigation.

The document that results from the planning process can take many forms, using a variety of formats and organizational styles. The format and organization of a plan is not what is important.

Dwight D. Eisenhower said, "Plans are worthless. Planning is essential." This simple phrase says it all: The paper document is not as important as the *process* of planning. Because each community is different, each Hazard

Mitigation Plan will be different. However, the process followed should be similar.

FEMA recommends a 10-step planning process, summarized in Table 15-1. This process provides a framework with which local officials, residents, engineers, technical experts and others can work out the details and reach agreement on what should be done to mitigate the flood hazard.

Table 15-1. The 10-step mitigation planning process

1. Organize to prepare the plan.
2. Involve the public.
3. Coordinate with other agencies.
4. Assess the hazard.
5. Assess the problem.
6. Set goals.
7. Review possible activities.
8. Draft an action plan.
9. Adopt the plan.
10. Implement, evaluate and revise.



Activity 510 Floodplain Management Planning, in the *CRS Coordinator's Manual* and the *CRS Application* provides credit for the 10-step planning process. It is explained in more detail in *Example Plans*. Floodplain Management Plans are a very important part of each community's All Hazard Mitigation Plan which is a mandatory prerequisite for mitigation grant funding under other FEMA programs (see below).

15.3 Disaster Mitigation Act of 2000 Planning Requirements

The Disaster Mitigation Act of 2000 modified the Robert T. Stafford Disaster Relief and Emergency Management Act to establish new community mitigation planning requirements. The Act also applies the requirement for a State Hazard Mitigation Plan as a condition of disaster assistance, and provides for States to receive increased Hazard Mitigation Program Grant (HMGP) funding if they have in effect a FEMA-approved

Enhanced State Mitigation Plan. More importantly for communities, the Act establishes new local mitigation planning requirements. Since November 1, 2004 communities now must have a FEMA-approved multi-hazard mitigation plan in place in order to receive HMGP funding or funding for projects under the new Pre-Disaster Mitigation Program. Contact NC Division of Emergency Management's Hazard Mitigation Section for more information or check the FEMA website at <http://www.fema.gov/plan/mitplanning/>.

15.4 Multi-Objective Management & Mitigation

Because property lines or jurisdictional limits have no influence over where floodwaters may rise, solutions to your community's flood problem will involve not just the people who suffered damage most recently, but also neighborhoods, your community and even the rest of the watershed.

A single-minded approach will not lead to a solution to a flood problem. Other interests are out there, and if everyone focuses only on his or her own concerns, everyone will compete—and no one wins. On the other hand, there is a proven approach to reduce flood losses and simultaneously address other community concerns. Called multi-objective management (M-O-M), it succeeds because it builds alliances among interest groups.

M-O-M uses existing financial and other resources to look at the whole watershed affecting the flooding problem. Properly applied, your community will have coordinated flood loss reduction while reaching some of its other goals and needs. By using M-O-M, solutions to flooding will be more effective, more sensitive to the environment, have broader support, be part of a more comprehensive program and accomplish more than one objective.

M-O-M Guidelines. There is nothing magical about multi-objective management. The idea is to bring together everyone with a concern or problem that has the potential to affect or be affected by the flood problem. It requires communication among groups, and it capitalizes on the help government agencies and private organizations offer. Multi-objective management has six guidelines:

1. Keep the effort locally based. Solutions must be acceptable to residents, their neighbors and others in the area. Solutions must fit with other local concerns and goals.

2. Understand the flood problem and its relation to the watershed.

The problem is not isolated; neither is it limited to one stream or one neighborhood. If people think in terms of the whole watershed, they will come

up with more solutions – solutions that will not cause problems for someone else.

3. Think broadly about possible solutions to reduce the flood problem. There are more ways to do things than conventional wisdom may suggest. Don't get locked into wanting a floodwall or other single-purpose project without first checking out alternatives.

4. Identify the other community concerns and goals that could have a bearing on the flood problem. People who are interested in those other concerns should meet and brainstorm possible solutions that can reach more than one of their objectives.

5. Obtain expert advice and assistance from government agencies and private organizations. Planners should find out what financial assistance and advice are available. They should not put all their eggs in one basket and wait for that big “cure-all” project that may never be funded – many other programs may support solutions.

6. Build a partnership among the private and public groups and individuals that can be enlisted to work on the objectives. More minds and hands mean that better ideas will result, people will be more likely to follow through, and more people will be available to do the work.

Using the systematic 10-step process will help greatly in developing a mitigation plan that coordinates and includes the other community objectives and interests. Preparing a written plan helps keep people get organized, clarifies solutions and formalizes everyone's participation.

M-O-M Benefits. If you have a flood problem, you may ask, “Why bother with this M-O-M stuff? Why not just stop the flooding?” This is not as easy as it sounds, especially if you are on a large river or in an area subject to coastal flooding.

Structures to “stop” or control floods can be expensive to build and maintain; they take a long time to plan, fund, and build; and they can cost more than the value of the property they would protect. Flood control structures may adversely affect other properties, the environment and other people's plans for the area. As shown by the Great Flood of 1993 along the Mississippi and in New Orleans after Hurricanes Katrina and Rita, they don't always work, especially if a flood is larger than anticipated or if the levees fail for other reasons.

If you have only one objective – “stop the flooding” – you may spend a lot of time and money on one problem, in the process you may create problems for other people. You may be competing with other communities that want funds for expensive structural projects. You may also be competing with others in your community who may have different goals in mind.

With M-O-M, you join forces with other people who are just as devoted to their goals – be they parks and recreation, economic development, tourism or environmental education. You all may be able to reach your objectives in a cheaper, faster and less disruptive manner by using M-O-M, and get more permanent, less expensive flood loss reduction than by trying to control the natural forces that cause floods.

One reason M-O-M gets such good results is that you treat the river's floodplain and its watershed as a resource. The floodplain need not be just an area with a flood hazard; it is also an area that has other values. The M-O-M process makes sure that flood projects don't undermine other community objectives and the need to protect the natural environment. For more information on M-O-M, see *Using Multi-Objective Management to Reduce Flood Losses in Your Watershed*.

The M-O-M. Resource Directory prepared jointly by FEMA and the National Park Service is an excellent source of information. A computer program that lists more than 300 government and private programs, the Windows-based software is easy to install and use.

Order the free *M-O-M. Resource Directory* from:
Rivers, Trails and Conservation Assistance
National Park Service
PO Box 25287 IMFA-RM-S
Denver, CO 80225-0287
Phone: (303) 969-2781
Fax: (303) 987-6676

AN EXAMPLE OF M-O-M AT WORK IN KAMPSVILLE, ILLINOIS

Kampsville, Illinois, is a town of 400 residents on the Illinois River. Its residents could have continued to endure flooding, wait for a flood control project that would not be built, or look for alternative ways to reduce flood losses. They chose the third option, and it paid off during the 1993 flood.

After Kampsville was flooded in 1979 and again in 1982, residents and local officials decided to do something. They knew they would not stop the Illinois River from flooding, and that to build a large enough levee would require removing many of the buildings they wanted to protect. So they began a systematic planning process to review alternative ways to reduce flood losses.

One of the first things they did was ask for help. The Illinois Department of Natural Resources provided staff support, and during a series of planning meetings, other agencies were invited to explain their ideas and tell how they could help.

It became apparent that the best solution was to purchase and relocate the worst-hit buildings. Because this would leave the town with a large open area, folks started talking about what they would do with it.

They also were concerned that they would lose some businesses when the flood-prone properties were bought out. During this process, they realized that they had to think about more than just flooding; they had to consider the future of their town and its economic base. They expanded their planning process to encompass other goals, including redeveloping the acquired area, designing a park and building a base for tourism.

Taking the plan to various funding sources, Kampsville eventually received more than \$1 million to buy 50 properties and convert flooded and dilapidated buildings to open space. The money was used also to elevate some buildings that historically were not flooded very deeply, to floodproof the water treatment plant and to relocate the fire station. A new ferry landing and all-weather access into town were also built.

Pursuing its other objectives, the village started sponsoring recreation activities, including an annual celebration that brings in hundreds of people. They now view the riverfront as a resource, not a problem area.

In all, financial assistance was provided by three state agencies, two federal agencies and the town's largest employer. Although it took almost 10 years to plan, fund and complete, Kampsville's approach paid off during the 1993 Midwest flood. The town suffered some minor damage because the '93 floodwaters exceeded the base flood elevation, but Kampsville's damage was relatively minor compared to that of its neighbors.

15.5 Hazard Mitigation Assistance (HMA) Program Overview

Many communities are interested in reducing their existing exposure to natural hazards. The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to natural hazards. Together, these programs provide significant opportunities to reduce or eliminate potential losses to State, Tribal, and local assets through hazard mitigation planning and project grant funding.

This chapter takes a quick look at these unified hazard mitigation assistance programs that support flood mitigation efforts. Always contact the North Carolina Division of Emergency Management's Hazard Mitigation Unit (NCDDEM-HM) as early as possible if you want to consider seeking a mitigation grant.

Below are brief descriptions of the five HMA grant programs.

- [Hazard Mitigation Grant Program \(HMGP\)](#) HMGP assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal, and local priorities.
- [Pre-Disaster Mitigation \(PDM\)](#) PDM provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The goal of the PDM program is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from actual disaster declarations.
- [Flood Mitigation Assistance \(FMA\)](#) FMA provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program (NFIP).
- [Repetitive Flood Claims \(RFC\)](#) RFC provides funds on an annual basis to reduce the risk of flood damage to individual properties insured under the NFIP that have had one or more claim payments for flood damages. RFC provides up to 100% federal funding for projects in communities that meet the reduced capacity requirements.
- [Severe Repetitive Loss \(SRL\)](#) SRL provides funds on an annual basis to reduce the risk of flood damage to residential structures insured under the NFIP that are qualified as severe repetitive loss structures. SRL provides up to 90% federal funding for eligible projects.

Eligible Activities

Eligible Activities	HMGP	PDM	FMA	RFC	SRL
1. Mitigation Projects	✓	✓	✓	✓	✓
Property Acquisition and Structure Demolition or Relocation	✓	✓	✓	✓	✓
Structure Elevation	✓	✓	✓	✓	✓
Mitigation Reconstruction					✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓	✓	✓
Dry Floodproofing of Non-residential Structures	✓	✓	✓	✓	
Minor Localized Flood Reduction Projects	✓	✓	✓	✓	✓
Structural Retrofitting of Existing Buildings	✓	✓			
Non-structural Retrofitting of Existing Buildings and Facilities	✓	✓			
Safe Room Construction	✓	✓			
Infrastructure Retrofit	✓	✓			
Soil Stabilization	✓	✓			
Wildfire Mitigation	✓	✓			
Post-disaster Code Enforcement	✓				
5% Initiative Projects	✓				
2. Hazard Mitigation Planning	✓	✓	✓		
3. Management Costs	✓	✓	✓	✓	✓

✓ Mitigation activity is eligible for program funding

Source: FEMA Hazard Mitigation Assistance (HMA) Grant Program Fact Sheet

Ineligible Activities: The following (non-inclusive) list provides examples of activities that are not eligible for HMA funding:

- Projects that do not reduce the risk to people, structures, or infrastructure;
- Projects that are dependent on another phase of a project(s) in order to be effective and/or feasible (i.e., not a stand-alone mitigation project that solves a problem independently or constitutes a functional portion of a solution);
- Projects for which actual physical work such as groundbreaking, demolition, or construction of a raised foundation has occurred prior to award or final approval. Projects for which demolition and debris removal related to structures proposed for acquisition or mitigation reconstruction has already occurred may be eligible when such activities were initiated or completed under the FEMA Public

Assistance program to alleviate a health or safety hazard as a result of a disaster;

- Projects for preparedness activities or temporary measures (e.g., sandbags, bladders, geotubes, or portable generators);
- Projects constructing new buildings or facilities, with the exception of safe room construction and mitigation reconstruction;
- Activities required as a result of negligence or intentional actions, or those intended to remedy a code violation, or the reimbursement of legal obligations such as those imposed by a legal settlement, court order, or State law;
- All projects located in a CBRS Unit or in OPAs, other than property acquisition and structure demolition or relocation projects for open space under PDM, FMA, RFC, and SRL. For details on property acquisition and structure demolition or relocation projects for open space within a CBRS Unit or OPAs see Part IX A.2;
- Major flood control projects related to the construction, demolition, or repair of dams, dikes, levees, floodwalls, seawalls, groins, jetties, breakwaters, and erosion projects related to beach nourishment or re-nourishment;
- Projects that address, without an increase in the level of protection, operation, deferred or future maintenance, repairs, or replacement of existing structures, facilities, or infrastructure (e.g., dredging, debris removal, replacement of obsolete utility systems, bridges, and facility repair/rehabilitation);

HMA Minimum Project Eligibility. Minimum eligibility standards are set forth in federal regulations and the State's mitigation plan. As a rule, acquisition, elevation, and relocation of flood-prone homes, and drainage projects, are eligible provided they meet all of the following criteria:

- Conform to the State's plan;
- Supported by a local mitigation plan;
- Provide a beneficial impact on the disaster area (for HMGP). Especially in areas of high risk or repetitive flooding, acquisition and elevation may meet this criterion through reduction in safety risks and property damage;
- Conform with environmental regulations. Acquisition and elevation projects typically are categorically excluded from an extensive environmental review, although certain information is required so that the

HMA unified program guidance is released by FEMA on a yearly basis. For more information visit <http://www.fema.gov/government/grant/hma/index.shtm>

State and FEMA can make informed decisions. Drainage projects typically require more extensive documentation;

- Solve a problem either independently or as a functional part of a solution. Acquisition and elevation projects readily satisfy this criterion, in that a successful project may address only one or many homes. The acquired land can be part of a solution, for example if it will be used for stormwater management;
- Impact a local government that participates in the NFIP. To receive mitigation grant funding, communities that have mapped special flood hazard areas must participate in the NFIP; see the National Flood Insurance Program Eligibility Requirements section below for more information.
- Meet all applicable State and local codes and standards and does not contribute to or encourage development in coastal high hazard areas or other vulnerable areas. In communities that have adopted a building code, certain requirements may be triggered by elevation projects. Project applications must provide evidence that codes and standards are addressed and that permits have been or will be issued, as applicable;
- Demonstrate cost-effectiveness. There is a distinct priority placed on acquisition and elevation projects, especially those that address repetitive loss properties; and
- Consider a range of alternatives. Communities are required to determine that a proposed project is the most practical, effective and environmentally sound alternative after considering a range of options.

Benefit:cost analysis is a quantitative procedure to assess the desirability of a hazard mitigation measure by taking a long-term view of avoided future damages compared to the investment (cost) in a project. The outcome of the analysis is a benefit:cost ratio, which demonstrates whether the net present value of benefits exceeds the net present value of costs.

Increased Cost of Compliance as Non-Federal Cost Share. The NFIP ICC claim payment from a flood event may be used to contribute to the non-Federal cost share requirements, so long as the claim is made within the timeframes allowed by the NFIP. ICC payments can only be used for costs that are eligible for ICC benefits; for example, ICC cannot pay for property acquisition, but can pay for structure demolition or relocation. In addition, Federal funds cannot be provided where ICC funds are available; if the ICC payment exceeds the required non-Federal share, the Federal funding award will be reduced to the difference between the cost of the activity and the ICC payment.

If an ICC payment is being used as a subapplicant's non-Federal cost share, the NFIP policyholder must assign the claim to the subapplicant. However, only

that part of the ICC benefit that pertains to the project can be assigned to the subapplicant. The NFIP policyholder can only assign the ICC benefit to the subapplicant; in no case can the policyholder assign the ICC benefit to another individual. Steps for the assignment of ICC coverage are available at <http://www.fema.gov/business/nfip/iccdmw.shtm>.

The State's Role in Mitigation. FEMA's mitigation funds are administered by the NCDEM-HM, which is called the "grantee." This means NCDEM-HM is responsible to FEMA for proper administration of the grant funds. Eligible sub-applicants apply for HMA funding through the State HM unit. These sub-applicants, also called the "sub-grantee" include state agencies, tribal governments and local governments for all five HMA programs. Certain private non-profits (PNPs) may also apply for the HMGP. Individuals and businesses are not eligible to apply for HMA funds, however an eligible sub-applicant may apply for funding.

Although there are some variations depending on the grant program, described below, NCDEM-HM is expected to:

- Prepare and maintain a State Hazard Mitigation Plan that establishes State priorities and is the basis for identifying eligible projects and prioritizing the award of funding;
- Maintain the State Administrative Plan for Hazard Mitigation, which describes procedures for administration of mitigation grant funds;
- Foster hazard mitigation planning by local jurisdictions;
- Conduct post-flood field inspections to help determine the cause of damage and to identify potential mitigation projects;
- Provide technical assistance to communities conducting benefit-cost analysis and preparing grant applications; and
- Review grants applications for completeness and consistency.

After award of a grant, NCDEM-HM continues to:

- Work with applicants to turn anticipated project schedules prepared for the application into implementation schedules;
- Coordinate obtaining Duplication of Benefits data;
- Monitor and evaluate progress;
- Monitor the financial status of the project, including review of reimbursement requests and determination of eligibility of submitted costs;

- Conduct on-site inspections of selected projects or properties. Although you have to certify satisfactory completion, NCDEM-HM visits to check on progress; and
- Conduct audits of project files and/or financial records.

Application Process. Applicants applying for funding under PDM, FMA, RFC, or SRL MUST use FEMA's web-based [Mitigation Electronic Grants Management System \(MT eGrants\)](#) to submit their HMA applications. Deadlines and yearly guidance are established annually by FEMA. Eligible sub-grantees must apply through NCDEM-HM to access the eGrants portal. HMGP applications are submitted by the Applicant to FEMA via NEMIS. Only State mitigation project managers are granted access to input HMGP applications into NEMIS.

Technical Assistance. Help with mitigation planning may be available from a local, regional or state planning agency or a private organization. For example, the National Park Service's Rivers, Trails and Conservation Assistance Program provides staff support for local planning under certain conditions. If they can't help with the whole plan, they may be able to help with some parts, like providing a facilitator for an all-day community input workshop.

Another source of assistance is a private consultant. Planning and engineering firms usually have personnel skilled in the various flood loss reduction measures and the planning process.

The following agencies and organizations may help in providing technical assistance or in implementing mitigation activities that benefit your community:

- NC Division of Community Assistance
- NC Council of Government (COGs)
- North Carolina Natural Resources Conservation Service
- Agencies of the U.S. Department of Agriculture that work with watershed property owners, such as the Natural Resources Conservation and Cooperative Extension services.
- Watershed, stormwater management or flood control districts.
- Regional or metropolitan water, sewer or sanitary districts.
- The state or county emergency management or civil defense agency.
- The state natural resources or water resources agency.
- Local watershed councils or associations.
- The district office of the U.S. Army Corps of Engineers.



National Flood Insurance Program Eligibility

Requirements. HMA eligibility is related to the NFIP as follows:

Sub-applicant eligibility: All sub-applicants for FMA, RFC, or SRL must currently be participating in the NFIP, and not withdrawn or suspended, to be eligible to apply for grant funds. Certain non-participating political subdivisions (i.e., regional flood control districts or county governments) may apply and act as sub-grantees on behalf of the NFIP-participating community in areas where the political subdivision provides zoning and building code enforcement or planning and community development professional services for that community;

Project eligibility: HMGP and PDM mitigation project sub-applications for projects sited within an SFHA are eligible only if the jurisdiction in which the project is located is participating in the NFIP. There is no NFIP participation requirement for HMGP and PDM project sub-applications for projects located outside of the SFHA;

Hazard Mitigation Planning eligibility: There are no NFIP participation requirements for HMGP and PDM hazard mitigation planning sub-applications; and

Property eligibility: Properties included in a project sub-application for FMA, RFC, or SRL funding must be NFIP-insured at the time of the application submittal. Flood insurance must be maintained at least through completion of the mitigation activity.



Some interesting numbers from the NFIP:

- Over 136,345 buildings in North Carolina have NFIP flood insurance coverage as of December 2010.
- About 17,967 properties in North Carolina are on FEMA's "repetitive loss" list as of December 2010, which is defined by the structure receiving 2 or more flood claims of at least \$1,000 each in any 10 year period.

Special Flood Hazard Area Requirements

For structures that remain in the SFHA after the implementation of the mitigation project, flood insurance must be maintained for the life of the structure to an amount at least equal to the project cost or to the maximum limit of coverage made available with respect to the particular property, whichever is less. Insurance coverage on the property must be maintained during the life of the property regardless of transfer of ownership of such property.

The sub-grantee (or property owner) must legally record, with the county or appropriate jurisdiction's land records, a notice that includes the name of the current property owner (including book/page reference to record of current title, if readily available), a legal description of the property, and the following notice of flood insurance requirements:

This property has received Federal hazard mitigation assistance. Federal law requires that flood insurance coverage on this property must be maintained during the life of the property regardless of transfer of ownership of such

property. Pursuant to 42 U.S.C. 5154a, failure to maintain flood insurance on this property may prohibit the owner from receiving Federal disaster assistance with respect to this property in the event of a flood disaster. The Property Owner is also required to maintain this property in accordance with the floodplain management criteria of 44 CFR Part 60.3 and City/County Ordinance.

Applicants/sub-applicants receiving assistance for projects sited in an SFHA must ensure that these requirements are met by requesting the participating property owner(s) to sign an Acknowledgement of Conditions for Mitigation of Property in an SFHA with FEMA Grant Funds form and providing the form to FEMA prior to award or final approval.

15.6 Hazard Mitigation Grant Program

Program Overview. In light of the rising costs of natural disasters, in 1988 FEMA's Hazard Mitigation Grant Program (HMGP) was authorized by Congress to fulfill four objectives:

- To prevent future loss of life and damage to property due to disasters;
- To implement State or local mitigation plans;
- To enable mitigation measures to be implemented during immediate recovery from a disaster; and
- To provide funding for previously identified mitigation measures that benefit the disaster area.

HMGP Funding. HMGP funds become available only as a result of a Presidential disaster declaration. The amount of funding is computed as a percentage of certain other federal disaster assistance (emergency support, assistance to repair public infrastructure, and assistance provided to individuals and families). It is set aside for the purpose of supporting State and local mitigation projects. After every disaster declaration that includes HMGP, NCDEM-HM will contact affected communities and then provide the opportunity to participate statewide if funds are not used in the declared counties first.

The HMGP provides up to 75 percent of eligible costs of projects that meet all the eligibility criteria. The non-federal share can be made up of several funding sources, including Community Development Block Grants (CDBG) funds, local funds, private non-profit funds, and contributions by the owner (including proceeds from the NFIP's Increased Cost of Compliance insurance coverage). A portion may be covered by certain in-kind or donated services and property

owners typically provide the non-federal share for elevation projects. The State of North Carolina has historically funded the non-federal HMGP match in most presidentially declared disasters.

HMGP can fund projects to protect public or private property as long as the projects are in compliance with the program's guidelines and policies. Since the floods of 1993 along the Mississippi River and Hurricanes Fran (1996) and Floyd (1999) in North Carolina, a great deal of attention has focused on projects to acquire homes, and there is growing interest in home elevation projects since Katrina in (2005). Some flood problems can most effectively be addressed by improving drainage, although careful engineering evaluation of the impacts on downstream flood flows must be undertaken. Many communities consider projects to protect public infrastructure in order to better serve all of their residents. HMGP funds may not be used as a match, substitute or replacement to fund projects that may be eligible under other federal programs.

15.7 Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation (PDM) Program was authorized by Section 203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act. PDM is a nationwide, competitive program. Beginning in FY2003, Congress appropriated funds for mitigation plans and projects by States and communities and the amount of funds varies from year to year. States and communities must have adopted and approved mitigation plans in order to apply for a PDM grant. Although funding is available to develop mitigation plans and to support projects that address all hazards, it is expected that a significant portion of the funding will be for projects that reduce flood damages. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. The cost-share requirement for this award is 75 percent Federal and 25 percent non-federal. Contact NCDEM-HM for assistance. FEMA's information on how to apply for these funds and on the criteria that will be used to rank projects can be found on FEMA's website at <http://www.fema.gov/government/grant/pdm/index.shtm>.

15.8 Flood Mitigation Assistance Program

The National Flood Insurance Reform Act of 1994 authorized FEMA to provide grants to states and communities for planning assistance and for mitigation projects that reduce the risk of flood damage to structures covered by flood insurance. The overall goal of the Flood Mitigation Assistance (FMA) program is to protect the National Flood Insurance Fund by supporting cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other insurable structures – thus reducing claims against the Fund.

The 1994 Act was prompted by evidence that a small number of insured buildings account for a large percentage of the dollars paid out by the NFIP. In the long run, if mitigation measures are focused on that subset of buildings, then claim payments will be reduced and the pressure to raise the rates may be relieved, which will benefit all current and future NFIP flood insurance policyholders.

FEMA provides FMA funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program. The funds for FMA are paid out of the policy service fee charged to every NFIP flood insurance policy. Originally authorized with a ceiling of \$20 million per year, the Flood Insurance Reform Act of 2004 increased the amount to \$40 million per year.

FMA grants cover 75 percent of the eligible costs for mitigation planning and for mitigation projects that are eligible and cost-effective.¹ Each state receives annual funding for planning and project grants.

FMA Planning Grants. The purpose of a planning grant is to develop or update a Flood Mitigation Plan. To be eligible for an FMA project grant, an eligible applicant must develop, and have approved by the FEMA regional director, a Flood Mitigation Plan. The statute notes that a plan “will articulate a comprehensive strategy for implementing technically feasible flood mitigation activities for the area affected by the plan.”

The regulations note that “existing plans, such as those credited through the Community Rating System ... may meet the requirements of FMA with few or no modifications.”

¹ The 2004 Act offers an opportunity for applicants to qualify for 90-10 cost share.

At a minimum, plans must include these elements, all of which are part of the 10-step hazard mitigation planning process:

- A description of the planning process and public involvement, which may include workshops, public meetings or public hearings.
- A description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties and the extent of flood depth and damage potential.
- The applicant's flood management goals for the area covered by the plan.
- The community's goals for the area covered by the plan.
- Identification and evaluation of cost-effective and technically feasible mitigation actions that were considered.
- Presentation of the strategy for reducing flood risks and continued compliance with the NFIP, and procedures for ensuring implementation, reviewing progress and recommending revisions to the plan.
- Documentation of formal plan adoption by the legal entity submitting the plan.

FMA Project Grants – Eligible Applicants. Most applicants for FMA funds are communities, although other authorities that are specifically and formally designated by communities to develop and administer mitigation plans and projects may apply, such as planning districts or water management districts. Communities must:

- Participate in the NFIP (communities on probation or suspended from the NFIP are not eligible);
- Have an approved Flood (or Hazard) Mitigation Plan; and
- Have the ability to provide the non-federal cost share.

15.9 Repetitive Flood Claims Program

The RFC program is authorized by Section 1323 of the National Flood Insurance Act, as amended, 42 U.S.C. 4030, with the goal of reducing or eliminating the long-term risk of flood damage to individual properties for which one or more claim payments for losses have been made under flood insurance coverage and that will result in the greatest savings to the National Flood Insurance Fund (NFIF) in the shortest period of time.

Residential or non-residential (commercial) properties that have received one or more NFIP insurance payments are eligible for RFC funds. Properties included in a sub-application must be NFIP-insured at the time of the application submittal. Flood insurance must be maintained at least through completion of the mitigation activity.

RFC funds may only mitigate structures that are located within a State or community that cannot meet the requirements of the FMA program for either cost share or capacity to manage the activities. FEMA may contribute up to 100 percent of the total amount approved under the RFC grant award to implement approved activities, if the Applicant has demonstrated that the proposed activities cannot be funded under the Flood Mitigation Assistance (FMA) program due to lack of State or local capacity, which includes either inability to manage the sub-grant or lack of 25 percent match.

FEMA will rank all eligible mitigation project sub-applications on the basis of the greatest savings to the NFIF as demonstrated by the verified project aggregate BCR. All projects will be ranked from highest verified BCR to lowest verified BCR. FEMA will consider the national ranking and program priorities in determining which projects are identified for further review up to the amount of funds available for the RFC program.

15.10 Disaster Assistance

If your community is hit by a disaster and the area subsequently receives a presidential disaster declaration, a variety of programs can provide mitigation assistance. Most of them are authorized by the Robert T. Stafford Disaster Relief and Emergency Act.

First, a disaster field office will be established under the guidance of a state coordinating officer and a federal coordinating officer. They will be supported by mitigation staff that is directed by a deputy federal coordinating officer for mitigation and the State Hazard Mitigation Officer.

Two types of help will be provided: technical assistance and financial assistance. The federal-state team will distribute up-to-date materials about these programs. This section provides a brief overview for background purposes only. There may be some differences when actually implemented.

Technical Assistance. The disaster assistance staff should be able to spend time with your community's mitigation planners. They can review mitigation measures, techniques and funding sources. One of their prime concerns will be proper permitting of reconstruction activities.



Some interesting numbers from FEMA:

From NFIP inception until 2010, there have been 38 Federal disaster declarations within North Carolina, most of which were due to flooding and winter storms.

Over 34 Million dollars in post-disaster mitigation funds have been allocated to North Carolina since 2002.

The disaster team may also provide technical assistance to property owners. Information on repairing and retrofitting is given through public meetings, handouts and news releases. Sometimes mitigation tables are set up in disaster service centers, or separate Reconstruction Information Centers are opened so that experienced architects, engineers and other specialists can work closely with owners to help identify appropriate flood protection measures.

In North Carolina, NFIP staff is available at each Disaster Field Office (DFO) to answer regulatory questions as well as discuss flood insurance coverage issues.

Financial Assistance. FEMA will widely publicize the assistance programs that are made available after a disaster declaration. Three main types of assistance are available from FEMA (and one from SBA), each of which can fund mitigation measures:

Public Assistance, formerly known as the Public Assistance Program, it can provide 75 percent of the cost of repairing or restoring facilities owned by public agencies and certain private nonprofit organizations. If an applicant prefers to relocate a facility out of the floodplain rather than replace it, FEMA will still provide funds, but at a reduced share.

FEMA takes the first step in obtaining Public/Infrastructure Assistance funding by completing a Damage Survey Report (DSR) for each facility. The community should have a representative on each DSR team to provide local input into the repair or replacement design for damaged facilities.

The local DSR representative should be aware that this program provides an opportunity to incorporate hazard mitigation features while replacing some damaged property. This Public Assistance program is called 406 Mitigation and it presents an opportunity for applicants to fortify their infrastructure against future catastrophic events. FEMA can provide funding above and beyond the cost of repairing or replacing a public facility, if it can be demonstrated that the proposed mitigation measure is technically feasible, cost-effective and required by a state or local regulation.

406 Mitigation Example #1. A flood washes out a culvert that used to back up every time there was a 2-inch rain. FEMA and the state will estimate the cost to repair or replace it as it was. If someone points out that (1) a larger culvert can save more money than it costs by reducing flood damage to other properties and (2) floodplain regulations prohibit obstructions in the floodway, then FEMA may share the expense of replacing the lost culvert with a larger one.

Similarly, funds from this program can be used to protect or relocate damaged water and sewer lines, floodproof pumping stations or replace bridges with clear spans.

Insurance Note. Public/Infrastructure Assistance grants for public buildings are subject to a “deductible.” Under the Stafford Act, Federal disaster assistance for a flooded public building will be reduced by the amount of flood insurance coverage the community should have on that building.

It does not matter whether the building is insured; FEMA will still only provide assistance for damage that exceeded the level of available insurance.

406 Mitigation Example #2. The maximum amount of flood insurance available for a non-residential building is \$500,000. Floodville's \$2 million city hall is flooded and receives \$600,000 in damage. If the city hall is in an SFHA, the disaster assistance program will assume it's insured for \$500,000. Federal aid to repair or rebuild the city hall will be 75% of \$100,000 (\$600,000 - \$500,000).

Floodville will receive \$75,000 in disaster assistance for a building that suffered \$600,000 in damage. If the city hall was not insured, Floodville's taxpayers are going to have to come up with the balance. If it was insured, the city will have \$575,000 (\$500,000 in insurance claim and \$75,000 from disaster assistance) toward repairs and reconstruction.

Flood insurance is also a good idea because not every flood warrants a Federal disaster declaration. A good rule of thumb is to make sure that all publicly owned buildings subject to flooding have flood insurance.

2. Human services programs provide resources to assist residents and business owners, such as temporary housing, unemployment aid, food stamps, grants and loans. Many of these were formerly called the Individual Assistance Program.

Temporary housing can be particularly helpful in providing homes for people waiting to find out if their homes can be reoccupied or if they will be acquired and cleared.

The Individual and Family Grants (IFG) program is designed to help disaster victims pay for “unmet needs,” such as those that are not funded by other programs. It is a grant to individuals, usually people who cannot qualify for a loan or cannot get a loan to cover all of their expenses.

Sometimes IFG can be used to fund minor property protection projects, such as elevating a furnace, water heater, washer or electrical service box above the flood level. These grants can be especially useful in areas with lower income or fixed income families that are subject to shallow or basement flooding.

3. Hazard Mitigation Grant Program (HMGP) provides financial resources to help reduce susceptibility to damage from a future disaster. Section 404 of the Stafford Act makes money available to assist eligible applicants after a Presidential disaster declaration. Section 404's Hazard Mitigation Grant Program will pay up to 75 percent of the cost of such mitigation projects. See section 15.6 in this chapter for more information.

4. Small Business Administration Disaster Loan Program provides loans to disaster victims that meet the ability to repay, income qualifications. In addition to borrowing enough funds to repair damages, the SBA Disaster Loan Program will provide additional loan amounts in order for the repairs to comply with local codes. Also, SBA will allow an additional 15 percent for incorporating mitigation measures during the repair process.

15.11 Severe Repetitive Loss Program

The Severe Repetitive Loss (SRL) program began in NC as a pilot program in 2006. It is now a regular HMA program authorized by Section 1361A of the NFIA, as amended, 42 U.S.C. 4102a, with the goal of reducing flood damages to residential properties that have experienced severe repetitive losses under flood insurance coverage and that will result in the greatest savings to the NFIF in the shortest period of time. SRL grants cover 90 percent of the total approved mitigation project cost.

The SRL program differs from other FEMA mitigation grant programs in that those property owners who decline offers of mitigation assistance will be subject to increases to their insurance premium rates. Furthermore, prior to submitting a grant application to FEMA, applicants and sub-applicants must consult, to the extent practicable, with the property owner to select the most appropriate project type for that property to meet all programmatic, State, and local requirements. Any mitigation offer made under the SRL program remains open and available to the property owner as long as the SRL program exists, subject to the availability of funds. In the event that the property owner does not accept a mitigation offer, the property owner may appeal the insurance premium rate increase under certain conditions. The sections below provide more detail on the SRL program.

Properties eligible for inclusion in a sub-application for SRL must be identified on the FEMA-validated severe repetitive loss property list. A severe repetitive loss property is a residential property that is covered under an NFIP flood insurance policy and either:

- a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000;

or

- b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any 10-year period, and must be greater than 10 days apart. To maintain eligibility for SRL funds, NFIP insurance coverage on structures to be mitigated must be maintained throughout implementation of the mitigation activity.

The National Flood Insurance Fund (NFIF) provides the funding for FMA, RFC, and SRL programs. The PDM, FMA, RFC, and SRL non-disaster programs are subject to the availability of appropriation funding, as well as any program-specific directive or restriction made with respect to such funds.