
Managing Floodplain Development: Procedures, Standards, and Requirements

If men were angels, we wouldn't need government.

James Madison, 1789

Overview

This unit discusses a number of topics pertaining to floodplain management at the local level. They involve the procedures, standards, and requirements for adoption of local floodplain management measures, principally carried out through a local ordinance. It presents an overview of the local floodplain management ordinance, National Flood Insurance Program floodplain management standards and requirements, and state requirements.

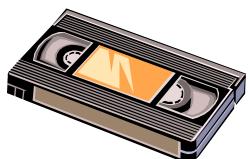
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Videos: *Federal and State Floodplain Management Requirements, Best Build I, Best Build II*

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A. Introduction

Before carrying out responsibilities for administration of the local floodplain management ordinance, the local official tasked with this responsibility, and others involved in the administrative process, should have a clear understanding of its provisions and why they exist.

The ordinance can incorporate one or more of the following provisions, depending on the wishes of the community:

- Measures which the community believes are important to protect the future health, safety, and welfare of its citizens
- Measures which the state requires that communities include in any adopted floodplain management ordinance
- Measures which the community must include if it wishes to participate in the National Flood Insurance Program

This unit discusses each of the above provisions.

Understanding these provisions and their purpose can greatly aid those who will be administering the ordinance in a number of important ways. They will be better able to explain the need for certain provisions to citizens and to other officials. This can greatly assist in gaining public and political support for compliance and enforcement. They will better visualize the required processes for administering various provisions. Finally, their overall understanding of the ordinance language should aid local officials to more effectively carry out their administrative responsibilities.

The next section discusses the first element of managing floodplain development, the local ordinance.

B. Floodplain Management Ordinance

To provide a legal basis for control of future development in flood hazard areas, it is necessary that the community adopt certain standards in the form of an ordinance. Often this ordinance will implement a community comprehensive plan or special floodplain management plan. In general, an ordinance is a local law or statute that includes:

- Rationale and objectives for its creation
- Administrative and enforcement procedures for its implementation
- Specific requirements, regulations and/or standards to bring about its desired purpose

A community can incorporate floodplain management provisions into an existing ordinance or adopt a separate floodplain management ordinance that specifies:

- Land subject to regulation (identified Special Flood Hazard Areas, floodways, and other locally identified floodprone areas)
- Uses permitted within these areas upon issuance of a Floodplain Development Permit
- Uses allowed under certain conditions (conditional uses)
- Uses that are prohibited
- Construction and development standards to minimize future flood damages

The ordinance should address changes to present uses as well as how to guide future development.

The objectives that the ordinance sets out to achieve are, typically,

- 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

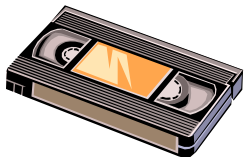
- To help maintain a stable tax base by providing for sound use and development of flood hazard areas in such a manner as to minimize flood blight areas
- To prevent victimization by ensuring that potential land, home, and business buyers are notified that property is located in an identified flood hazard area
- To prevent increased flood levels caused by unwise floodplain development



The North Carolina Division of Emergency Management has prepared models of a local flood damage prevention ordinance to assist localities in understanding the required components of such an ordinance and to aid in its adoption. Appendix D of this text contains non-coastal and coastal model ordinances prepared by the DEM. See Figure 6-1 for a reproduction of the title page of the non-coastal ordinance. These ordinances are available in digital format from the Department of Emergency Management.

C. NFIP Floodplain Management Standards and Requirements

For a community to participate in the National Flood Insurance Program, it must adopt and enforce floodplain management regulations that meet or exceed the minimum NFIP standards and requirements. In some instances, more restrictive state standards may exist, and they must also be met. A discussion of these standards and requirements is the subject of this part of the unit.



Before proceeding, this is a good time to view the fourth video segment *Federal and State Floodplain Management Requirements*. It is about 18:30 minutes in length. It is part of a series produced by the Commonwealth of Pennsylvania. It summarizes much of the material contained in this section. After viewing the segment, return to the text. You may rewind the tape.

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Figure 6-1

What is the Purpose of the NFIP's Management Standards?

The NFIP's floodplain management standards are intended to prevent loss of life and property, as well as economic and social hardships, resulting from flooding. There is clear evidence that these goals have been achieved in areas where buildings and other developments are in compliance with the community's floodplain management ordinance. Nationally, over \$700 million in structural damages are saved each year due to NFIP-based floodplain management regulations.

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, 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 residential and non-residential structures. However, critical facilities such as schools, hospitals, police, 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 and the 500-year floodplain whenever possible.

Before proceeding to the discussion on standards and requirements, it is important to restate the relationship of the floodplain maps provided in Flood Insurance Studies to the NFIP standards and requirements.

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.

The maps are the direct bridge linking floodplain management regulations with the issuance of flood insurance. Section 60.2 of Part 44 of the Code of Federal Regulations (CFR) states that “*the community shall adopt and enforce floodplain management regulations based on the data provided by the [Federal Insurance] Administrator.*”

There are a variety of reasons for this requirement including:

WHY THE LINK?
<ul style="list-style-type: none"> • Flood data used to ensure consistency relative to insurance and regulation. • Map designations and zones are keyed to NFIP requirements. • Map serves as official map by specific reference in local ordinance.

- 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, and property owners. The consistency of data is important in the administration of all facets of the NFIP.
- 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 floodprone 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 floodprone, even if not shown within the boundaries of the SFHA shown on the FIRM. For regulatory purposes, flood elevations are the ruling guideline.

However, this does not mean that a community is prohibited from using other technical data to identify and regulate floodprone areas not identified by FEMA. For example, many cities and urban counties map and regulate areas on small tributary streams that are not included in NFIP mapping criteria.

Key Definitions of Floodplain Management

The importance of having clear, concise definitions to aid in the interpretation and understanding of local floodplain management regulations cannot be overemphasized. The following are some of the important 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 currently required 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.

Basement

Any area of the building having its floor subgrade (below ground level) on all sides. Note that “daylight basements” 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.

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
- Is designed to give a municipality maximum opportunity to review for flood impacts
- Includes outside storage of materials

Elevated Building

An elevated building is a structure without a basement which meets the following standards: the building is elevated above the ground by means of fill, stem walls, crawl spaces, 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, it must be constructed of flood-resistant materials and provided with hydrostatic openings. 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 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 is at or above BFE*. Only non-supporting breakaway wall panels, lattice, or screening may be used to enclose the 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 Zones
- Bottom of lowest horizontal structural member at BFE in V Zones
- Only pilings or columns for foundation in V Zones

Lowest Floor

The “lowest floor” means 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. However, in V Zones, breakaway walls or obstruction-free areas must be used. To summarize, the definition of lowest floor means:

- The basement, if one exists
- Top of lowest floor in A Zones
- Bottom of lowest structural member in V 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.

New Construction

New construction refers to structures for which the “start of construction” commenced on or after the effective date of a floodplain management regulation (i.e., post-FIRM) adopted by a community and *any subsequent improvements to such structures*. For flood insurance rating purposes, the applicable date is December 31, 1974, or the effective date of the first FIRM, 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 definition also includes:

- Substantial improvements to structures built before ordinance adoption.
- All additions onto post-FIRM structures
- New construction, for insurance purposes, is given post-FIRM rates rather than pre-FIRM non-actuarial rates.

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 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 building 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 “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
- Excludes corrective actions for code violations and historic structures



Take a few minutes to enjoy completing the following Learning Check crossword puzzle, which provides a review of some important NFIP definitions.



Learning Check # 1

Purpose: To review some important NFIP definitions.

Directions: Use the clues on the following page to complete the crossword puzzle.

The crossword puzzle grid is set against a gray background. The grid consists of white squares for letters and gray squares for empty space. The clues are as follows:

- 1**: 7-letter horizontal word starting at row 2, column 4.
- 2**: 12-letter horizontal word starting at row 4, column 2.
- 3**: 10-letter vertical word starting at row 4, column 1.
- 4**: 8-letter horizontal word starting at row 6, column 4.
- 5**: 10-letter horizontal word starting at row 8, column 4.
- 3**: 3-letter vertical word starting at row 6, column 8.

CLUES

ACROSS:

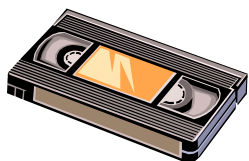
1. Includes manufactured homes and gas or liquid fuel tanks.
2. A structure having the top of the floor at or above the BFE.
3. Structures built after ordinance adoption.
4. Is below grade on all sides.
5. Elevated placement is critical to ordinance compliance and insurance rating.

DOWN:

1. Improvements equal to or exceeding 50 percent of the market value.
2. Definition applies to the entire floodplain, not just the floodway.
3. Is referred to as a 100-year flood.

NFIP Requirements

This part of Unit 6 focuses on the specific requirements for local floodplain management, as spelled out in the NFIP regulations.



Video Segment: Best Build II on Riverine Construction

Before continuing, please view the 23:00 minute video segment on construction techniques along rivers and streams. It is on the second videotape included in the course materials. Do not rewind the tape.

Tables 6-1 to 6-4 on the following pages describe specific floodplain management criteria as they appear in the Code of Federal Regulations (CFR) under 44 CFR, Chapter 1 (FEMA), Section 60.3, Parts (a), (b), (c), (d) and (e).

Note that the requirements are cumulative, which means that a community that is required, for example, to meet 44 CFR §60.3(d) must also meet the applicable requirements of §60.3(a), §60.3(b), and §60.3(c).

The Chief Executive Officer of your community has been notified (or is notified upon enrollment, or when additional information is provided) through a letter from the FEMA regional office of the requirements that apply to your community.

Section 60.3(a) of 44 CFR—Floodprone Areas Not Identified

Section 60.3(a) of the floodplain management criteria for floodprone areas applies to communities in which Special Flood Hazard Areas (SFHA) have not yet been defined by FEMA. Often the community is aware of certain floodprone areas and thus desires that flood insurance be available. In these situations, the community may apply to participate in the NFIP if it agrees to the following six requirements, as listed in Table 6-1.

Table 6-1. Section 60.3(a) of 44 CFR—Requirements When SFHA Not Identified

<p>1) <i>Require Permits</i> Require permits for all proposed construction or development in the community. In evaluating the permit site, the community will determine if flood risk exists at the proposed location.</p>
<p>2) <i>Ensure all Required Permits are Obtained</i> Review proposed development to ensure other required federal and state permits have been obtained.</p>
<p>3) <i>Review Permit Applications</i> Review permit applications to determine whether proposed building sites will be reasonably safe from flooding. If floodprone,</p> <ul style="list-style-type: none"> • Anchor buildings to prevent flotation, collapse, and lateral movement during a flood. • Use materials and apply construction methods and practices that minimize flood damage, including site design. This means use of flood-resistant materials and finishes for that portion of a building subject to flooding. • Design and/or locate electrical and mechanical equipment so as to prevent the entry or accumulation of floodwater, i.e., elevated to above BFE or floodproofed.
<p>4) <i>Review Subdivision Proposals</i> Review subdivision proposals and other proposed new development to determine if such proposals will be reasonably safe from flooding. If floodprone,</p> <ul style="list-style-type: none"> • The proposal should minimize flood damage (e.g., through locating structures on highest ground, setbacks from streams, etc.). • Locate and construct public utilities and facilities to minimize flood damage. • Provide adequate drainage for each building site.
<p>5) <i>Minimize Water System Infiltration</i> Require new and replacement water supply systems located within floodprone areas to be designed to minimize or eliminate infiltration of floodwater into the systems.</p>
<p>6) <i>Prevent Sewage System Contamination or Impairment</i> Require new and replacement sanitary sewage systems and on-site waste disposal systems be protected or sited to prevent contamination or impairment from floodwater.</p>

Require Permits



Permits are an important element under the 44 CFR §60.3(a) requirements. In North Carolina, all communities already require building permits for construction projects and manufactured homes by means of the state building code and manufactured home code. Many communities also have zoning regulations for all new development. The floodplain review can be incorporated into both of these existing processes. If the community does not have zoning, a floodplain permit process will have to be initiated for “development” that is not building construction or manufactured home installation.

Review Permits

When reviewing the permits, the community will want to ensure that the following actions have been taken:

- The property owner (applicant) has obtained all necessary permits
- Buildings are designed to minimize flood damage
- Proposed development is safe from flooding

There are many ways that flood damage can be minimized. Two important methods are *anchoring* and use of *flood-resistant construction materials*.

New Terms

Anchoring
Flood-resistant material

Anchoring is a technique that can be used to stabilize a structure against flood forces. For example, concrete foundation walls, piers, or posts can be anchored to footings with hooked 1/2” rods extending from the footing to the cap. Anchor bolts may be used to attach sills or plates to the foundation walls. Manufactured homes must also be adequately anchored to a permanent foundation. See the North Carolina Manufactured Home Code and 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.

It would be wise to consult with a local structural or construction engineer for details on the stability of the proposed anchoring for any new construction or developments.

Flood-resistant material is defined as any building material capable of withstanding direct and prolonged contact with floodwater without sustaining *significant damage*. 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 2-93, *Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*.

Ensure All Other Necessary Permits

Other local permits are usually required, such as for building, access, and septic systems. State permits include those required by the Coastal Area Management Act (CAMA) for construction in the twenty coastal counties, including Areas of Environmental Concern (AEC). Federal permits include Section 404 wetlands filling from the U.S. Army Corps of Engineers and Conditional Letter of Map Revision (CLOMR) from FEMA for highway projects that create a floodway encroachment. Since the floodplain permit process is only one component of a wide spectrum of local, state, and federal land-use regulation, the local administrator should be familiar with the other permits needed and advise the applicant of these requirements. It is not always necessary to wait on the floodplain permit until all others are obtained.



Review Subdivision and Other Developments

The site plans of new development and proposed plats for subdivisions can usually be designed to minimize the potential for flood damage while still achieving the economic goals of the project. For example, lot size could be reduced and the lots clustered on high ground, with homesites having views down into the floodplain. Each building site must have adequate drainage, and public utilities and facilities must be flood resistant. It is very important to realize this review applies to apartments, individual parks, shopping centers, schools, etc., not just to subdivisions.

Water and Sewer Systems

New and replacement water supply and sanitary systems are to be designed to minimize or eliminate the infiltration of floodwater into the systems. In most instances, this is accomplished by requirements for system design. Manholes should be raised above the 100-year flood level or equipped with seals to prevent leakage. Pump stations should have electrical panels elevated above BFE.

On-site waste disposal systems should be located to avoid impairment to them, or contamination from them, during a flood. The first objective should be to locate the system outside the flood hazard area, if that is feasible. At a minimum, an automatic backflow valve should be installed to prevent the backup of sewage into the building during flooding. Septic systems are usually prohibited below the 10-year flood elevation.

Section 60.3(b) of 44 CFR—A Zones Identified without Base Flood Elevations

Section 60.3(b) applies to communities for which FEMA has provided a Flood Hazard Boundary Map (FHBM) or Flood Insurance Rate Map (FIRM) that identifies Special Flood Hazard Areas (A Zones), but has not identified BFEs, a floodway, or coastal high hazard area.

Communities that fall into this category must meet the standards listed in Table 6-2. *Remember that all requirements in §60.3(a) apply in addition to those described in §60.3(b).* The following is a summary of some key concepts contained in 44 CFR §60.3(b).

Flood Data for Large-Scale Developments

Any subdivision proposal or other large-scale proposed development (including schools, shopping centers, and apartments) must be evaluated to determine if any part of the proposal is located within identified Special Flood Hazard Areas (A Zones). If any portion of a development with more than 50 lots or 5 acres is located in an SFHA, then the developer must provide BFE data. Such data must be either obtained using other sources (described below) or developed using detailed methodologies comparable to those contained in a Flood Insurance Study. This is usually a cost borne by the developer. The BFE for each building site is then shown on the proposed site plan or preliminary plat.

Table 6-2. Section 60.3(b) of 44 CFR—Requirements for Identified A-Zones	
1. <i>Permits Required</i>	Require permits for all development in flood hazard areas on the FHBM or FIRM.
2. <i>Apply §60.3(a) Requirements</i>	Require development in flood hazard areas to meet standards of §60.3(a)(2)–(6).
3. <i>Flood Data for Subdivision Proposals and Other Large-Scale Development</i>	Require floodplain elevation data for subdivisions and other proposed developments (including manufactured home parks and subdivisions) over fifty lots or five acres. Such data must be developed using standard hydrologic and hydraulic engineering studies.
4. <i>Use of Available Flood Data</i>	Obtain, review, and reasonably utilize any base flood elevation data available from a federal, state, or other source to require development to meet the elevation or floodproofing requirements. (Often the U.S. Army Corps of Engineers has or can develop an estimated BFE.)
5. <i>Elevation or Floodproofing</i>	When BFE data are utilized, document elevation or floodproofing of structures in the flood hazard area.
6. <i>Watercourse Alterations</i>	Notify, in riverine situations, adjacent communities and the state NFIP coordinating agency of any proposed watercourse alteration. Provide the FEMA regional office with documentation of this notification.
7. <i>Maintain Carrying Capacity</i>	Assure that the flood-carrying capacity of any altered watercourse is maintained.
8. <i>Anchoring and Placement of Manufactured Homes</i>	Require manufactured homes placed in flood hazard areas to be installed using methods and practices that minimize flood damage.

Use of Available Flood Data

In designated A Zones where BFEs have not been provided by FEMA, the community must try to obtain and utilize any BFE data available from other federal agencies, and state and local agencies. This is called “best available data.” A list of some of these sources is contained in Unit 12. All available data, including that for large-scale developments described above, is to be used for requiring that new construction, substantial improvements, or other development in Zone A of the FHBM or FIRM meet applicable requirements in the NFIP regulations contained in 44 CFR §60.3(c). This includes the requirement that structures have their lowest

floor elevated to or above the BFE, or floodproofed to or above the BFE for non-residential structures. Sometimes the only data consists of historical flood records. In such cases, it is recommended that the lowest floor of any structures be elevated at least two feet above that historical flood level. Any such data should be used as long as it reasonably reflects flooding conditions expected during the base (100-year) flood, is not known to be scientifically or technically incorrect, and represents the best data available.

Once developed, it is recommended that communities formally adopt the best available data by reference as part of their floodplain management regulations. If no flood data is available and the development is not large enough to require the procurement of elevation data, the lowest floor should be elevated above the highest adjacent grade to afford a level of protection. It is recommended that two to five feet of elevation be required in order to provide a better margin of safety and to thereby obtain reasonable flood insurance rates.



Communities in North Carolina are encouraged to adopt a setback area to function the same way as a floodway in a detailed study area. This setback is often five times the width of the stream or twenty feet from the top of the bank. In some areas in the twenty coastal counties, a setback may be required under CAMA regulations.

Elevation or Floodproofing

Where BFE data are utilized, the community is to obtain and maintain a record of the elevation (in relation to mean sea level, NGVD) of the lowest floor of buildings that are constructed within Zone A on the community's FHBM or FIRM. Residential structures must be elevated so that the lowest floor is at or above the BFE, while non-residential structures have the option of floodproofing the building to the BFE instead of elevating.

Watercourse Alterations



The community must notify adjacent communities and the North Carolina Division of Emergency Management prior to the alteration or relocation of any river or stream within its jurisdiction. Copies of such notifications must be submitted to the FEMA regional office. Federal and state permits may be required for any alteration or relocation activity. It is

recommended that the community require the submittal and approval of a CLOMR from FEMA for large-scale proposals.

Maintain Carrying Capacity

Any alteration or relocation of a watercourse should not increase the community’s flood risks or those of any adjacent community. This could happen if the watercourse’s flood-flow carrying capacity is reduced because of a smaller or less-efficient channel or by modifications to the floodway as a result of the project. For any significant alteration or relocation, the community should consider requiring that the applicant secure the services of a registered professional engineer to ensure that the flood-flow carrying capacity is maintained and to certify as to that analysis. This is also evaluated in a CLOMR review.

Anchoring and Placement of Manufactured Homes



Site-specific flood information is critical when considering a siting strategy for a manufactured home or manufactured home community. At a minimum, manufactured homes must be elevated at or above the base flood level and must be securely anchored to a permanent foundation. For engineering and technical details, refer to the FEMA publication, *Manufactured Home Installation in Flood Hazard Areas* (FEMA 85) and the North Carolina Manufactured Home Code.

Section 60.3(c) of 44 CFR—Base Flood Elevations Defined

Section 60.3(c) applies to communities where FEMA has provided BFEs for one or more Special Flood Hazard Areas (SFHA) of the community's FIRM, but has not identified a regulatory floodway or coastal high hazard area. Often such communities also have unnumbered A Zone areas.

Communities that fit this description must fulfill the specific requirements listed in Table 6-3, as well as those of §60.3(a) and (b).

Table 6-3. Section 60.3(c) of 44 CFR—Requirements (Base Flood Elevations Defined)
1. <i>Apply 44 CFR §60.3(a) and (b) Requirements</i>

Table 6-3. Section 60.3(c) of 44 CFR—Requirements (Base Flood Elevations Defined)	
2.	<i>Elevation of Residential Structures</i> Require elevation of the lowest floor (including basement) of new or substantially improved residential structures to or above the BFE.
3.	<i>Elevation or Floodproofing of Non-residential Structures</i> Require elevation or floodproofing of non-residential structures to or above the BFE.
4.	<i>Professional Certification of Floodproofing</i> Require certification by a registered professional engineer or architect that the design and construction methods proposed for a dry floodproofed structure are in accordance with accepted standards to satisfy the requirements.
5.	<i>Enclosures below Lowest Floor</i> Ensure that fully enclosed areas below elevated lowest floors are designed to automatically equalize hydrostatic pressures on the structure through the use of openings or self-activating vents. These areas must be used solely for parking, access, or storage and must be constructed of flood-resistant materials.
6.	<i>Elevation and Anchoring of Manufactured Homes</i> Require that newly placed or substantially improved manufactured homes in Zone A1-30 or AE or AH have the lowest floor elevated to or above the BFE on an adequately anchored foundation system (see # 12 below)
7.	<i>Residential Structures in AO Zones</i> Require elevation of residential structures in AO Zones to or above the depth number on the FIRM (at least two feet if no depth number is specified).
8.	<i>Non-Residential Structures in AO Zones</i> Require elevation or floodproofing of non-residential structures in AO Zones to or above the depth number on the FIRM (at least two feet if no depth number is specified).
9.	<i>Development Protected by Flood Control Projects</i> Require within A99 Zones on the FIRM the standards of §60.3(a)(1)– (4)(i), and §60.3(b)(5)–(b)(9).
10.	<i>Regulating Encroachments Where Floodways Are Not Identified</i> Require that, until a regulatory floodway is designated, no development is permitted within Zones A1-30 or AE unless it is demonstrated that the cumulative effect of the proposed development, and existing or anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point in the community.
11.	<i>Drainage around Structures</i> Require adequate drainage around structures on slopes in AH or AO Zones. Remember §60.3(a)(4) requires adequate drainage for all building sites.
12.	<i>Manufactured Homes in Existing Parks</i> Require manufactured homes, to be placed or substantially improved, on sites within an existing manufactured home park or subdivision within Zone A1-30, AH, or AE, on the FIRM, be elevated such that their lowest floor is at or above the BFE or the chassis is 36

Table 6-3. Section 60.3(c) of 44 CFR—Requirements (Base Flood Elevations Defined)	
	inches above grade and is anchored to an adequately anchored foundation system. In a park in which a manufactured home has incurred substantial damage as the result of a flood, any home to be placed on that lot must be elevated with the lowest floor at or above BFE and be adequately anchored. This requirement of elevation for substantially damaged manufactured homes is on a lot-by-lot basis.
13.	<i>Increases Beyond One Foot</i> Under certain conditions, a community may approve development in Zones A1-30, AE, or AH that would increase the water surface elevation more than one foot (the conditions are established in 44 CFR §65.12).
14.	<i>Recreational Vehicles</i> Require that recreational vehicles placed on sites within Zones A1-30, AE, or AH, either <ul style="list-style-type: none"> • Be on site fewer than 180 consecutive days, • Be fully licensed and road ready, <i>or</i> • Meet the requirements of §60.3(b)(1) and §60.3(c)(6), like a manufactured home.

Elevation of Residential Structures

In Zones A1-A30, AE, and AH, all new construction and substantial improvements of residential structures must be elevated so that the lowest floor (including the basement) is elevated to or above the BFE on fill, posts, piers, columns, extended walls, or crawlspace foundations.

The NFIP standard allows fill to be used, but its use is restricted in floodways to prevent loss of floodplain storage and possible obstruction of flood flows. Many communities also limit the use of fill in the flood fringe to protect flood storage capacity. The flood fringe is that portion of the 100-year floodplain outside of the floodway.

New Term
Retrofitting

Existing structures can often be raised in place to or above expected flood levels. This is only *required* in cases of substantial improvement or damage, but often owners become tired of being flooded and want to elevate their building. The structure is jacked up and set on cribbing while a new or extended foundation is constructed underneath the structure, as illustrated in Figure 6-2. Protecting an existing building from flooding is called **retrofitting**.

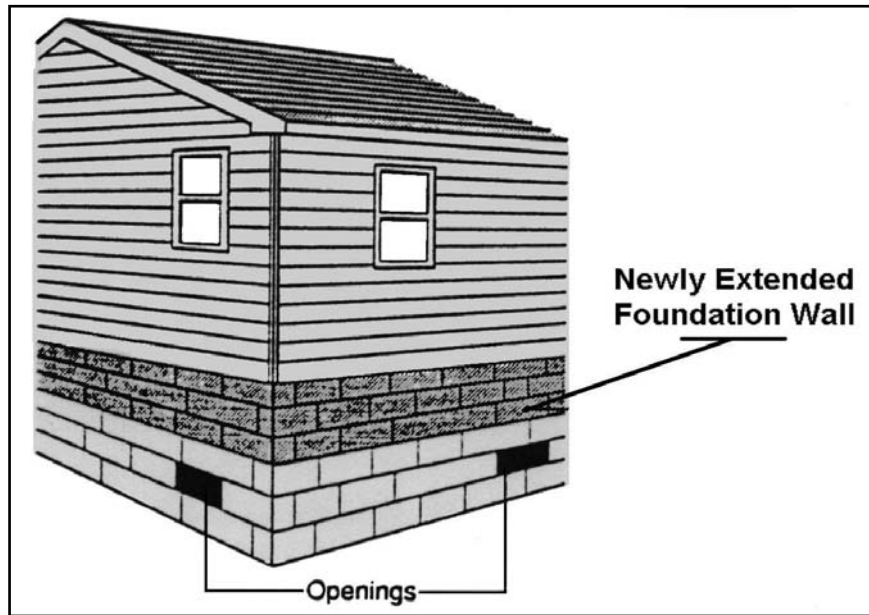


Figure 6-2. Elevated Building

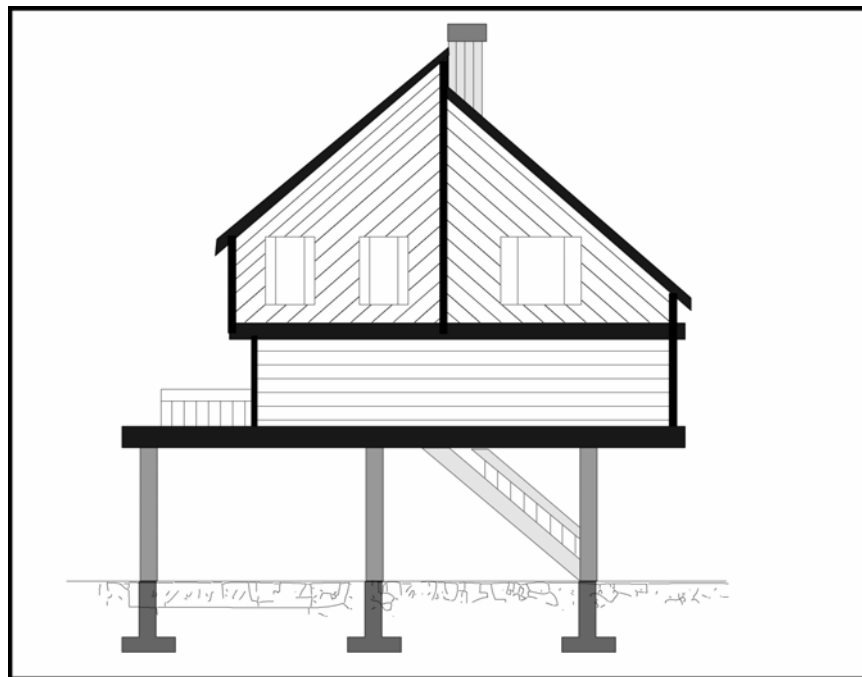


Figure 6-3. Elevation on Piles or Columns

In areas where flooding is likely to have strong currents or waves, elevation on piles or columns with no lower area enclosure is the only recommended elevation technique, as illustrated in Figure 6-3.

Pile and column foundation systems are an excellent elevation technique for new construction because they allow for the unrestricted flow of floodwater under buildings and cause little blockage or encroachment. Damage to the building is minimized.

Stem wall construction is another elevation technique. This normally creates a crawl space. The crawl space must have adequate openings to ensure that a potentially habitable space is not created. For further information, please see *Elevated Residential Structures*, FEMA-54 (1984) and *Openings in Foundation Walls*, FIA-TB-1 (FEMA 1993).

The allowance of certain uses below the BFE, such as parking of vehicles, is permitted because the amount of damage caused by flooding to these areas can easily be kept to a minimum by following design and construction requirements such as adequate anchoring and flood resistant materials.

Another method is to physically move the building to another location where floodwater cannot reach it. This method is referred to as “relocation.” Relocation is an appropriate measure in high hazard areas, such as floodways, where continued occupancy may be unsafe.

Accessory Structures

Detached vehicle parking garages and boathouses are not required to be elevated to BFE provided that they are wet floodproofed and outfitted with required hydrostatic openings. Wet floodproofing involves elevating electrical and mechanical equipment above the BFE in addition to using flood resistant materials during construction (refer to *Wet Floodproofing Requirements*, FIA-TB-7, FEMA 1994). This exemption for accessory structures also extends to small low-value storage sheds and open buildings such as gazebos, picnic pavilions and pole sheds. A variance must be issued to allow such activity.

Elevation and Floodproofing of Non-Residential Structures

Elevation of a non-residential structure to or above the BFE is a protective measure that is often feasible for new construction and selected existing structures. Structures may be elevated on concrete columns, compacted fill, or a variety of other foundation types, or they can be relocated out of the floodplain. This requirement applies to confined-animal feeding

houses, milking parlors, farm-products storage buildings, and machine shops, and many other non-residential buildings.

Foundations and other lower portions of elevated structures must be capable of resisting the loads caused by flooding. Substantial modifications to standard walkways, steps, ramps and utility systems may also be required. Elevation of the structure must be designed so that it doesn't interfere with access to the structure. This is often accomplished by using elevators, which can be designed and installed to minimize flood damage (see *Elevator Installation for Buildings Located in Special Flood Hazard Areas*, FIA-TB-4, FEMA 1993).

While “floodproofing” in common usage applies to any means of protecting a structure from flooding, the NFIP standard for non-residential structures is more specific. In dry floodproofing, combinations of structural and non-structural features are incorporated into the design, construction, or alteration of a structure to make it watertight below the base flood level. The walls are made substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. In wet floodproofing, water is allowed to enter the structure to equalize hydrostatic pressures.

Figure 6-4 shows a variety of techniques that are often necessary 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 should be consulted when considering dry floodproofing.*

Professional Certification of Non-Residential Floodproofing

A Floodproofing Certificate is required for all non-residential buildings that are to be dry floodproofed and is to be completed by the design professional. A sample Floodproofing Certificate is shown in Figure 6-5.

Section I of the certificate documents the BFE at the building site as determined from the FIRM. Section II requests information regarding the floodproofing design. First, the engineer/architect indicates the elevation to which the building is floodproofed, which must be equal to or greater than the BFE. *It is important to note that for insurance rating purposes, the floodproofing design must provide protection to at least*

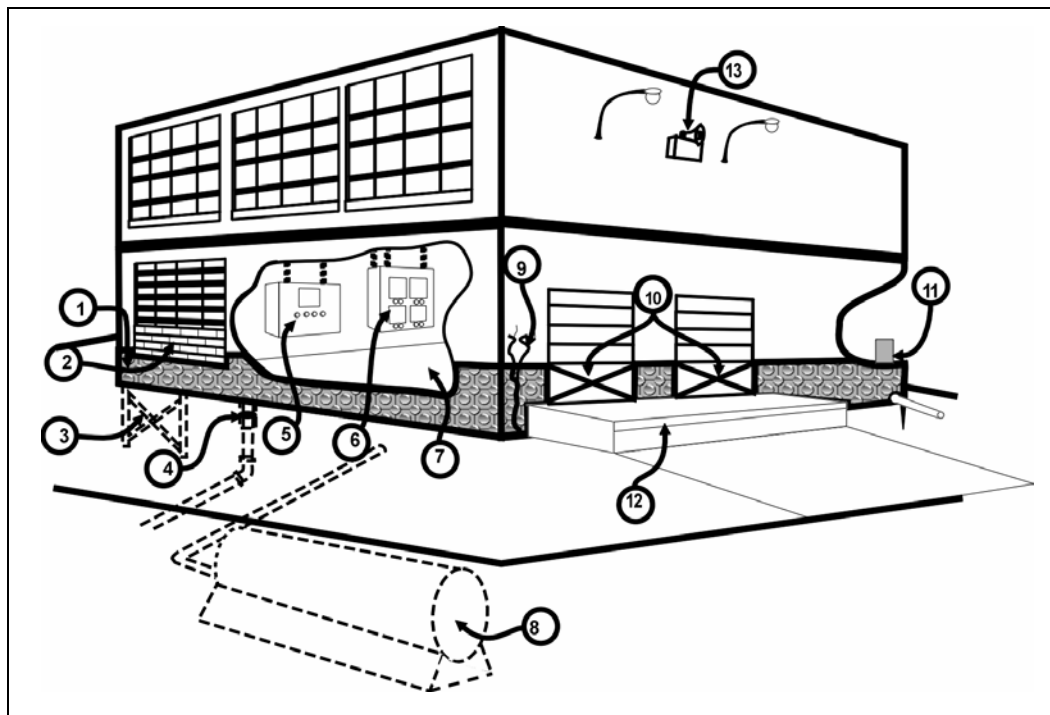


Figure 6-4. A Combination of Floodproofing Techniques

Key to Figure 6-4

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Waterproof coating to reduce seepage 2. Permanent closure of opening with masonry 3. Underpinning of structure to resist hydrostatic pressure 4. Valve on sewer line to prevent backflow 5. Instrument panel raised above expected flood level 6. Major equipment installed with quick-disconnects and elevated above flood level with overhead hoist | <ul style="list-style-type: none"> 7. Floor has been reinforced to withstand uplift pressure 8. Underground storage tank properly anchored 9. Cracks sealed with hydraulic element 10. Steel bulkheads for doorways 11. Sump pump and drain to eject seepage 12. Rescheduling has emptied the loading dock 13. Audible alarm installed as part of area-wide flood warning system (optional) |
|---|--|

one foot above the BFE to receive rating credit. If it does not meet this level of protection, it is rated for insurance purposes at one foot below the BFE, and therefore subject to substantially higher long-term rates (see Unit 11 for more information on this subject.)

The height of the floodproofing above the lowest adjacent grade is recorded for use by community building officials, FEMA, and NFIP insurance underwriters to analyze the level of safety that the floodproofing design will provide.

FLOODPROOFING CERTIFICATE

FOR NON-RESIDENTIAL STRUCTURES

The floodproofing of non-residential buildings may be permitted as an alternative to elevating to or above the Base Flood Elevation; whenever, a flood design certification is required. This form is to be used for that certification. Floodproofing of a residential building does not alter a community's floodplain management elevation requirements or effect the insurance rating unless the community has been issued an exception by FEMA to allow floodproofed residential basements. The permitting of a floodproofed residential basement requires a separate certification specifying that the design complies with the local floodplain management ordinance.

BUILDING OWNER'S NAME	FOR INSURANCE COMPANY USE POLICY NUMBER
STREET ADDRESS (Including Apt., Unit, Suite and/or Bldg. Number) OR P.O. ROUTE AND BOX NUMBER	COMPANY NAIC NUMBER
OTHER DESCRIPTION (Lot and Block Numbers, etc.)	
CITY	STATE ZIP CODE

SECTION I FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Provide the following from the proper FIRM:

COMMUNITY NUMBER	PANEL NUMBER	SUFFIX	DATE OF FIRM INDEX	FIRM ZONE	BASE FLOOD ELEVATION (in AO Zones, use depths)
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SECTION II FLOODPROOFING INFORMATION (By a Registered Professional Engineer or Architect)

Floodproofing Design Elevation Information:

Building is floodproofed to a elevation of feet NGVD. (Elevation datum used must be the same as that on the FIRM.)

Height of floodproofing on the building above the lowest adjacent grade is feet.

(NOTE: for insurance rating purposes, the building's floodproofed design elevation must be at least one foot above the Base Flood Elevation to receive rating credit. If the building is floodproofed only to the Base Flood Elevation, then the building's insurance rating will result in a higher premium.)

SECTION III CERTIFICATION (By a Registered Professional Engineer or Architect)

Non-Residential Floodproofed Construction Certifications:

I certify that based upon development and/or review of structural design, specifications, and plans for construction that the design and methods of construction are in accordance with accepted standards of practice for meeting the following provisions:

The structure, together with attendant utilities and sanitary facilities, is watertight to the floodproofed design elevation indicated above, with walls that are substantially impermeable to the passage of water.

All structural components are capable of resisting hydrostatic and hydrodynamic flood forces, including the effects of buoyancy, and anticipated debris impact forces.

I certify that the information on this certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by the fine or imprisonment under 18 U.S. Code, Section 1001.

CERTIFIERS'S NAME	LICENSE NUMBER (or Affix Seal)
TITLE	COMPANY NAME
ADDRESS	CITY STATE ZIP CODE
SIGNATURE	DATE PHONE

Copies should be made of this Certificate for: 1) community official, 2) insurance agent/company, and 3) building owner.

Section III is the actual certification of the floodproofing design that is required and which must be completed by a registered professional engineer or architect.

It is strongly recommended that a second floodproofing certificate be required upon completion of the project to certify that the floodproofing was properly installed in accordance with the certified design.

For further details, refer to *Floodproofing Non-Residential Structures*, FEMA-102 (1986) and *Non-Residential Floodproofing—Requirements and Certification*, FIA-TB-3 (FEMA 1993).

Enclosures below Lowest Floor

New construction or substantial improvements to existing structures that include fully enclosed areas formed by foundation or other exterior walls below the BFE shall be designed to allow for the entry and exit of floodwater to automatically equalize hydrostatic flood forces on exterior walls.

Designs for complying with this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:

- Provide a minimum of two openings having a net area of not less than one square inch for every square foot of enclosed area subject to flooding. It is suggested that the openings be installed on at least two walls of the enclosure.
- The bottom of all openings shall be no higher than one foot above grade.
- Openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic flow of floodwater in both directions or double the amount of openings for a dual set which flow only inward or outward. Garage doors cannot be used to satisfy this requirement because they do not permit the automatic flow of floodwater. Crawl space doors on universal hinges that swing both ways are acceptable as long as the latch will not prevent the door from opening.
- Openings are not required for crawl-space stem wall foundations that have been backfilled for pouring of a concrete floor slab.

The North Carolina state building code requires vents for ventilation purposes. The vents to comply with the NFIP requirements are in addition to the state code requirements. The same vents can be used as long as the type and location meet NFIP regulations.

Access to the enclosed area shall be the minimum necessary to allow for the parking of vehicles (garage door), or limited storage of maintenance equipment used in connection with the premises (standard exterior door), or entry to living area (stairway). The interior portion of such enclosed area shall not be partitioned or finished into separate rooms, except to enclose storage areas. Refer to *Openings in Foundation Walls*, FIA-TB-1 (FEMA 1993) for further guidance.

Elevation and Anchoring of Manufactured Homes

New or substantially improved manufactured homes located within Zones AI-30, AH, and AE on the community's FIRM shall be:

- Elevated on a permanent foundation such that the lowest floor is at or above the BFE
- Securely anchored to an adequate anchored foundation system to resist flotation, collapse, or lateral movement

Note that most manufactured home ductwork is flexible and “disposable,” so it can be cheaply and easily replaced after damage by flooding. Therefore, unless the ductwork is boxed and permanently installed, the manufactured home does not have to be elevated any extra height due to duct work below the floor.



Article 5, Section B (3) *Manufactured Homes* of the North Carolina Flood Damage Prevention Ordinance, found in Appendix D of this document, elaborates on these and other NFIP requirements and state recommendations for manufactured homes in A Zones. See also the *North Carolina Manufactured/Mobile Home Regulations* and *Manufactured Home Installation in Flood Hazard Areas*, FEMA-85 (1985).

Section 60.3(c)(12) of the NFIP criteria allows for a limited exemption to elevating to the BFE in pre-FIRM mobile home parks. However, the North Carolina Division of Emergency Management has taken the position that, in many cases, this is not wise public policy—it creates a false sense of security and exposes both rental and owner-occupied mobile

homes to flood damage. Thus, the exemption is not in the North Carolina model ordinances.

Structures in AO (Shallow Flooding) Zones

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
- At least two feet if no depth number is specified.

All new construction or substantial improvements of non-residential structures shall meet the above requirements, or, together with attendant utility and sanitary facilities be floodproofed to meet the above elevation requirements, along with those specified earlier in this section for floodproofing of non-residential structures.

Development Protected by Flood Control Projects (Zone A99)

General requirements are listed in Table 6-3. These types of development are special situations and the student should contact the state NFIP coordinating agency or FEMA regional office for any further guidance should this situation exist or be encountered in the community.

Regulating Encroachments—No Floodways Identified

In Zones A1-30 and AE, for which no regulatory floodway is designated, encroachments (including fill, new construction, substantial improvement, and other development) shall not be permitted unless a technical evaluation certified by a registered professional engineer is provided to 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
- Is consistent with the technical criteria contained in Chapter 5 entitled "Hydraulic Analyses," in *Flood Insurance Study: Guidelines and Specifications for Study Contractors*, FEMA-37, 1995

This standard must be required for all development—bridges, road embankments, large buildings or building complexes, and large fills. However, it may be prohibitively expensive for single-family homes, accessory structures, and other small buildings to meet this requirement.

Increases beyond One Foot

When the community proposes to permit encroachments in the floodplain that will cause increases in the BFE in excess of one foot at any point in the community, the community must apply to the FEMA regional office for *conditional* approval of such action prior to permitting the encroachments to occur. One example is construction of a reservoir. The community is required to submit the following as part of its application for conditional approval:

- A complete application and letter of request for conditional approval of a change in the FIRM (Conditional Letter of Map Revision—CLOMR), along with the appropriate initial fee for the change (contact the regional office for the fee amount)
- An evaluation of alternatives which, if carried out, would not result in an increase in the BFE of more than one foot at any point in the community, along with documentation of why these alternatives are not feasible
- Documentation of individual legal notice to all impacted property owners, i.e., those affected by the increased flood elevations, within and outside of the community, explaining the impact of the proposed action on their property
- Concurrence, in writing, of the Chief Executive Officer of any other communities impacted by the proposed actions
- Certification that no structures are located in areas which would be impacted by the increased BFE (unless they have been purchased and moved or demolished)
- A request for revision of BFE determinations in accordance with the provisions of 44 CFR §65.6 of the FEMA regulations

Upon receipt of the FEMA national office's conditional approval of the map change and prior to approving the proposed encroachments, the community is to provide evidence to FEMA of the adoption or revision of

a floodplain management ordinance incorporating the increased BFEs that reflect the post-project condition.

Upon completion of the proposed encroachments, the community must provide as-built certifications to the FEMA regional office within six months, as required by 44 CFR §65.3. FEMA will initiate a final map revision upon receipt of such certifications.

Drainage around Structures

Within Zones AH and AO, adequate drainage paths are required around structures on slopes to guide floodwater around and away from proposed structures. This actually is a good idea and is required throughout the community by §60.3(a)(4)—*provide adequate drainage for each building site...in all new development.*

Recreational Vehicles

A recreational vehicle is one that is ready for highway use. This means it is on its wheels or jacking system, is attached to the site only by quick-disconnect type utilities and security devices, and has *no permanently attached additions.*

Communities are to require that recreational vehicles placed on sites with Zones A1-30, AH, and AE on the FIRM either:

- be on the site for fewer than 180 consecutive days, and
- be fully licensed and ready for highway use, or
- meet the elevation and anchoring requirements for manufactured homes as outlined earlier in this section.

Section 60.3(d) of 44 CFR—BFE and Floodway Defined

Section 60.3(d) of 44 CFR applies to communities where the FIA has (1) provided final BFEs within Zones A1-30 and/or AE on the FIRM, (2) has provided information to designate a regulatory floodway, but (3) has not identified a coastal high hazard area. The community must fulfill the specific requirements, as listed in Table 6-4.

Table 6-4 Section 60.3(d) of 44 CFR—Requirements for Zones A1–A30 and/or AE	
1. <i>Apply 44 CFR §60.3(a)(b)(c) Requirements</i>	
2. <i>Adopt Floodway</i>	Select and adopt a regulatory floodway that will carry the base flood with no more than a one foot increase in the water surface elevation.
3. <i>No Impact Requirement</i>	Prohibit encroachments within the adopted regulatory floodway unless it is demonstrated through hydrologic and hydraulic analyses by a professional engineer that the proposed encroachment would not result in any increase in flood levels within the community during a base flood discharge. A no-impact certificate must accompany the permit application.
4. <i>Encroachments in the Regulatory Floodway</i>	Permit an encroachment that would increase BFEs if the provisions of 44 CFR §65.12 are satisfied and the community first applies for a Conditional LOMR.

Adopt Floodway

The floodway is that portion of the base floodplain which serves as a flood “channel” to pass the deeper, faster moving water. Buildings, structures, and other development activities, such as fill, placed within the floodway can obstruct flood flows causing the water to slow down and back up, resulting in higher flood elevations. Therefore, the floodway should be reserved or excluded from further development plans. Selecting a regulatory floodway for inclusion on the FEMA Flood Boundary Floodway Maps (FBFM) or on the newer Flood Insurance Rate Maps (FIRM) is greatly aided by computer modeling. After base flood levels have been calculated for a particular stream, a computer model is used to determine the floodplain area that needs to be reserved so that the elevation of the base flood is not increased more than one foot at any point along the stream. (Refer to the discussion on “Floodway Analysis” in Unit 4.)

Normally, FEMA provides the floodway delineations and specifications that the community is required to “select and adopt.” If new floodway data is prepared for a community, it is to be submitted to FEMA within six months, usually by means of the LOMR or CLOMR process.

No Impact Requirements

Development in the floodway is strongly discouraged because of the hazardous nature of floodwater during a severe flood and potential adverse impacts to flood elevations. However, bridges and highways often must cross floodways. Prior to issuing any building, grading, or development

permits involving activities in a regulatory floodway, the community must obtain a certification and supporting technical data stating the proposed development will not impact the pre-project BFEs, floodway elevations, or floodway widths, i.e., the increase in flood levels must be 0.00 feet. The certification should be obtained from the permittee and be signed and sealed by a registered professional engineer (see form provided in Appendix I).

The engineering or “no-impact” certification must be supported by technical data. The supporting technical data should be based upon the standard step-backwater computer model used to develop the floodway shown on the community’s effective Flood Insurance Rate Map (FIRM) or Flood Boundary and Floodway Map (FBFM). The results are tabulated in the community’s Flood Insurance Study (FIS). This data is obtained for a fee from the Engineering Study Data Processing (ESDP) library through a request in writing to the FEMA regional office. Please see Appendix G for current policy guidance on the no-impact analysis.

Although communities are required to review and approve the “no-impact” submittal, they may request technical assistance and review from the FEMA regional office. If this alternative is chosen, the community must review the technical submittal package and verify that all supporting data are included in the package before forwarding to FEMA. The no-impact analysis must use the same engineering methodology that was used to develop the FIS.

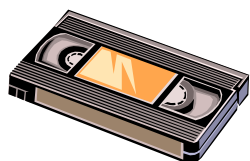
Encroachments in the Regulatory Floodway

When the community proposes to permit development within the floodway that will cause a further increase in the BFE, then it follows the procedures outlined in 44 CFR §60.3(c) requirements for *increases beyond one foot*. In addition, the community submits, as part of its application, a request for a revision of the floodway in accordance with the provisions of 44 CFR §65.7 of the FEMA regulations. Upon receipt of FEMA’s conditional approval of the FIRM change and prior to approving the proposed development, the community must provide evidence to FEMA of the adoption or revision of a floodplain management ordinance incorporating the increased BFEs and/or revised floodway reflecting the post-project conditions.

For a more detailed discussion regarding floodways and floodway development, see Appendix E.

Section 60.3(e) of 44 CFR—Coastal High Hazard Areas

Section 60.3(e) of 44 CFR applies to communities for which FIA has provided final BFEs within Zone A1-30 and/or AE; has identified Zones AH, AO, and A99, if appropriate; and has identified coastal high hazard areas by designating Zones V1-30, VE, and/or V.



Video Segment: Best Build I on Coastal Construction

Before continuing, view the 19:20 minute segment on construction techniques in coastal areas.

The video segment is found on the second videotape included in the course materials.

The community must meet the following requirements, as listed in Table 6-5. Keep in mind that all of the previously referenced requirements also apply for V Zones.

Zones V1-30, VE, and/or V identified on Flood Insurance Rate Maps are associated with coastal high hazard areas located along coastlines which are subject to high water levels, wave action, and erosion from strong storms and hurricanes. The wind and resultant waves and tidal surges associated with these storms cause water of high velocity to sweep over nearby land. Generally, the V Zone indicates the inland extent of a three-foot breaking wave atop a storm surge.

Table 6-5. Section 60.3(e) of 44 CFR—Requirements for Coastal High Hazard Areas

1. <i>Apply 60.3(a) (b) (c) and (d) Requirements.</i>
2. <i>Maintain Elevation of Lowest Member</i> Within Zones V1-30, VE, and V, obtain and maintain the elevation of the bottom of the lowest structural member of the lowest floor of new and substantially improved structures.
3. <i>Locate Structures Landward of Mean High Tide</i> Require that new construction or substantially improved in Zones V1-30, VE, or V be located landward of mean high tide. No new construction is allowed over water.
4. <i>Elevation on Piles or Columns</i> Require new construction and substantial improvements in Zones V1-30, VE, or V to be elevated such that the bottom of the lowest horizontal structural member of the lowest floor is at or above the BFE, on a pile or column foundation. Assure that the foundation

Table 6-5. Section 60.3(e) of 44 CFR—Requirements for Coastal High Hazard Areas	
	and the structure attached thereto is anchored to resist wind and water loads acting simultaneously on the building components. This requires an engineering certification that design and construction methods will resist the water loads from the base flood and wind loads according to state or local code.
5. Free of Obstruction or Breakaway Walls	Require the space below the lowest elevated floor be free of obstruction, meaning left open, or enclosed with non-supporting breakaway walls, open lattice-work, or insect screening designed to collapse under wind and water loads without causing damage to structural supports or the elevated structure.
6. No Fill	Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, or V.
7. No Alteration of Sand Dunes and Mangrove Stands	Prohibit manmade alteration of sand dunes and mangrove stands within Zones V1-30, VE, or V that would increase potential flood damage.
8. Manufactured Homes	Require newly placed or substantially improved manufactured homes in Zones V1-30, VE, or V to meet the requirements of 44 CFR §60.3(e)(2)–(e)(7). Manufactured homes in existing manufactured home parks or subdivisions that have not previously incurred substantial damage due to flooding may meet the requirements of §60.3(c)(12) instead.
9. Recreational Vehicles	Require recreational vehicles placed on sites in Zones V1-30, VE, or V: <ul style="list-style-type: none"> • Be on site less than 180 consecutive days, and • Be fully licensed and ready for highway use, or • Meet the requirements in §60.3(b)(1) and (e)(2)–(e)(7).

These areas are extremely hazardous to life and property. Because of such hazardous conditions, FEMA standards require that buildings in V Zones be constructed to a stricter standard.

Maintain Elevation of Lowest Horizontal Member

The community is to obtain and maintain a record of elevation data (in relation to NGVD) of new and substantially improved structures within V Zones on the community's FIRM. Within these zones, the controlling elevation is the *bottom* of the lowest horizontal structural member of the lowest floor. (In comparison, within A Zones, the controlling elevation is the *top* of the lowest floor.) This is to keep the entire building above the anticipated breaking wave height of a base flood storm surge.

Locate Structures Landward of Mean High Tide

Simply put, communities are not to permit new or substantially improved development in or over water in V Zones.

Elevation on Piles or Columns

All new construction and substantial improvements in V Zones shown on the FIRM are to be elevated on pilings or columns so that:

- The bottom of the lowest horizontal structural member of the lowest floor is elevated to or above the base flood level.
- The pile or column 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. Water loading values used are to be those associated with the base flood. Wind loading values used are to be those required by applicable state or local building codes.
- Only piling or column foundations may be used, with the exception of certain accommodations for mid- and high-rise buildings.

A registered professional engineer or architect is to develop or review the structural design, specifications, and plans for the construction, and is to certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the above provisions.

The North Carolina Division of Emergency Management has prepared a V-Zone Certification form (Figure 6-6) to ensure that these requirements are met. The community must maintain a copy of the completed form in the permit file for all structures built or substantially improved in the V Zone.



Refer to the *Coastal Construction Manual*, FEMA-55 (1986) and *Building Performance Assessment: Hurricane Fran in North Carolina, Observations, Recommendations and Technical Guidance*, FEMA-290 (1997).

Free of Obstruction or Breakaway Walls

The space below the lowest floor of all new structures or substantial improvements to existing structures in V Zones must either be free of obstruction or constructed with non-supporting breakaway materials. Preferred construction materials are open wood latticework or insect screening. However, solid breakaway wall panels are allowed. Garage doors must meet the same breakaway requirements.

Any construction below the lowest floor should collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or the supporting foundation system. If non-supporting breakaway walls are used, they are to have a design safe-loading resistance of not less than ten nor more than twenty pounds per square foot. If breakaway walls exceed the twenty-pound criteria, they must be designed or certified by a registered professional engineer or architect, using the V-Zone Certification form.

Any enclosed space is to be used solely for parking of vehicles, building access, or storage, and must be constructed of flood-resistant material. The area enclosed by solid breakaway walls should be limited to 299 sq. ft. for two reasons:

- Flood insurance rates increase dramatically for enclosures beyond the threshold of 299 sq. ft.
- Larger areas encourage conversion to habitable living areas, which are difficult to detect and enforce as violations.

National Flood Insurance Program V-Zone Certification				
Property Information			For Insurance Company Use	
Name of Structure Owner			Policy Number	
Structure 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>				
1. Community Number	2. Panel Number	3. Suffix	4. Date of FIRM Index	5. 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: _____	<input type="checkbox"/> NGVD '29 <input type="checkbox"/> NAVD '88 <input type="checkbox"/> Other	

SECTION III: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: This section must be certified by a registered professional engineer or architect

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

Note: This section must be certified by a registered professional engineer or architect

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:

- a) Breakaway collapse shall result from water load less than that which would occur during the base flood; and,
- b) 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
 (Check: Section III _____ and/or Section IV _____)

Name of Certifier	Title
Firm Name	License Number
Street Address	Phone Number ()
City	State Zip Code
Signature	Date

For further information see *Coastal Construction Manual*, FEMA-55 (1986), and *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*, FIA-TB-5 (FEMA 1993).

No Fill

Use of fill for structural support for buildings within V Zones on the community's FIRM is prohibited because of the severe erosion potential of V-zone locations. Limited fill is allowed for landscaping and to smooth out a site for a concrete pad. See *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*, FIA-TB-5 (FEMA 1993) for more details.

No Alteration of Sand Dunes and Mangrove Stands

Human alteration of sand dunes and mangrove stands within V Zones is also prohibited unless it can be demonstrated that such alterations will not increase potential flood damage. Both of these natural features are important first lines of defense against coastal storms and can do much to reduce losses to inland coastal development. It is for these reasons that they are protected against alteration.

Manufactured Homes



Manufactured homes located in V Zones must meet all of the above requirements of this section of the FEMA regulations, just like other structures, as well as any state requirements [for North Carolina, see Appendix D, Flood Damage Prevention Ordinance, Article 5, Section B(3)]. There is a limited exemption allowed for manufactured home parks in 44 CFR §60.3(c)(12), but this is not recommended by the North Carolina DEM and is not found in most community's ordinances.

Recreational Vehicles

Communities are to require that recreational vehicles placed on sites with V Zones on the FIRM meet the following criteria:

- Be on the site for fewer than 180 consecutive days, and
- Be fully licensed and ready for highway use, *or*

- Be permitted only upon issuance of a permit by the community and meeting all above applicable requirements.



Please complete Learning Check # 2.

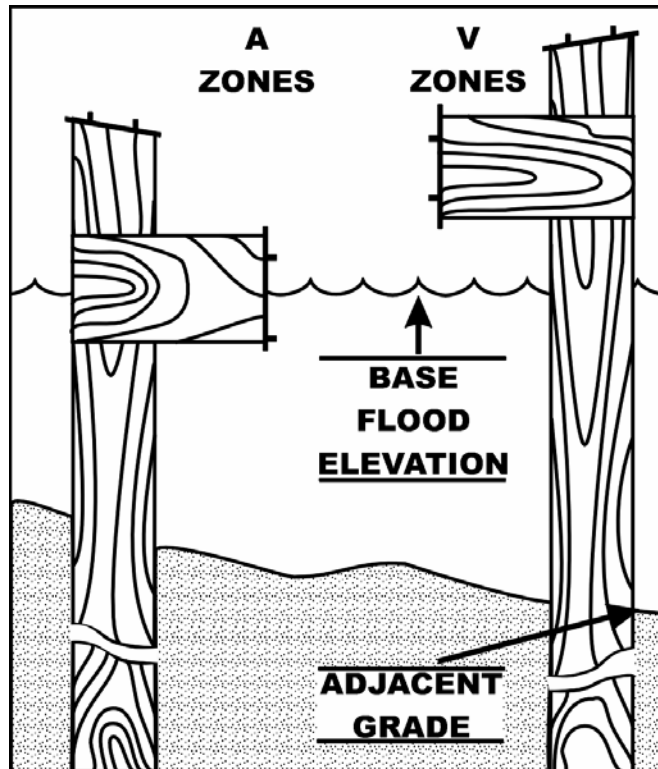


Learning Check #2

Purpose: To gain experience in interpreting NFIP requirements contained in 44 CFR §60.3(a)–(e).

Directions: Use the NFIP regulations to analyze requirements presented in hypothetical floodplain scenarios.

1. Using the following diagram, determine the difference between the elevation requirements for the A Zones and V Zones.



2(a). A property owner wishes to construct a conventional residential structure in an approximate floodplain area (Zone A). What construction standards apply when flood data is available from a federal, state, or other source?

2(b). A property owner wishes to construct a conventional residential structure in an approximate floodplain area (Zone A). What construction standards apply when no flood data exist?

3. A property owner wishes to place a manufactured home in a Zone AO. What elevation standard applies?

4. What regulations apply to recreational vehicles located in V Zones? Why?

5. When is a professional certification of floodproofing required?

6. Prior to constructing a residence, a property owner wishes to construct a three-foot-high retaining wall around the perimeter of the property and to fill the interior up to the height

of the wall including the area which will be underneath the house. The property is located in a Zone VE. Do the NFIP regulations allow for this? Explain.

7. A property owner wishes to construct a vacation home on a beachfront lot located in a Zone VE. List the applicable regulations. Why do you think these are reasonable requirements?

8. A property owner wishes to locate a manufactured home within Zone AE. The site is in the floodway. What regulations apply? Why or why not is it a good idea to site a residential structure in a floodway?

9. A property owner wishes to have a commercial building designed to receive a floodproofing rating. To receive insurance rating credit, the floodproofing design must provide protection to what level?

D. North Carolina Floodplain Management Standards and Requirements



In addition to meeting minimum NFIP floodplain management standards and requirements, communities must also comply with applicable state standards and requirements involving development in identified flood hazard areas. These standards are not tied to community participation in the NFIP, but exist as a separate set of requirements. The following descriptions of these standards and requirements have been provided by the respective state regulatory agencies for inclusion in this course. They are listed by agency in alphabetical order.

Department of Agriculture and Consumer Services, Standards Division

Anchoring Propane Tanks

National Fire Protection Association Pamphlet No. 58 (NFPA 58), Section 3-2.2.7(h), states, “Where necessary to prevent flotation due to possible high flood waters around above ground or mounded containers, or high water table for those underground and partially underground, containers shall be securely anchored.” This requirement is necessarily vague to keep from imposing an overly conservative national requirement on localities.

Since North Carolina topography varies greatly across the state, the characteristics of floodprone areas also vary. Included in the considerations are flood level, wave action, speed of the current, and soil type. In reality, no anchoring system can keep a tank in place for extreme storms or floods, especially if several feet of soil are washed away.

A number of methods of meeting the NFPA 58 requirement are possible. Most solutions involve using a mobile-home type of auger anchor to keep a propane tank from floating away from its intended location. For tanks beside buildings, attaching the tank to the building is permitted. However, to reduce the chance for propane leaks, the method of securing the tank to the building or anchors is important so the tank is prevented from rotating around vertical and horizontal axes and, thus, breaking piping or tubing. The North Carolina Department of Agriculture and Consumer Services (NCDA&CS), Standards Division, under NCAC, Title 2, Chapter 38, Section .0700, is responsible for enforcing provisions of NFPA 58,

including the anchoring of propane tanks in floodprone areas. NCD&CS does not specify exactly how to implement anchoring of these tanks. In interpreting NFPA 58, some guidelines have been developed. These guidelines are:

1. The method of securing the tank must consider the flotation force of an empty tank, which will vary according to the volume (capacity) of the tank. The anchors used must be able to resist that flotation force. The strength of the anchors and their resistance to pullout for the type of soil present at the location must be considered. The number and size of anchors required will be based on these considerations. The strength of the attaching cables, straps, chains, etc., must also be considered.
2. The tank must be secured to the anchors to prevent the tank from rolling along a horizontal axis (turning upside down or to its side) or from rotating around the vertical axis. This is to prevent breaking piping or tubing carrying gas from the tank to the structure and to keep the pressure relief valve in communication with the vapor space in the tank. This can be accomplished by securing opposite legs to anchors near those legs, by using several anchors to hold the tank firmly to the ground, by running a cable or strap through a foot ring or legs, or by providing a firm attachment to a structure. Other methods are possible and will be considered when suggested or found in use.
3. Corrosion due to galvanic action between dissimilar metals must be considered. To prevent galvanic action, electrical insulation must be provided between cables, straps, or chains and the tank. The paint on the tank is not sufficient for this. Insulation will usually be provided by a layer of plastic between a strap and the tank, by putting cables or chains in a plastic tube, or by using plastic-coated cables.
4. Several companies make and/or supply mobile-home-type anchors. Often they will provide engineering data to help determine the force an anchor will resist for different types of soils. If this type of information is not available for a particular anchor, that anchor is not acceptable unless reference can be made to engineering data for an identical anchor from another manufacturer.
5. The supplying gas company is responsible for providing appropriate anchoring systems for tanks they own. If the customer owns the tank, the customer is responsible for providing the anchoring system or for making appropriate arrangements for installing the system. A

tank in a floodprone area must not be filled until it meets the anchoring requirements.

A local ordinance may be enacted to further specify how to secure LP-gas tanks in floodprone areas. This ordinance must not be less restrictive than the guidelines specified above.

Enforcement of the anchoring requirements is performed by NCDA&CS LP-Gas Inspectors. When a tank not meeting the requirements is found, the servicing gas company is issued an inspection report identifying the non compliant tank and stating the required corrective action and the date that action must be completed. If the date is not met, civil and/or criminal penalties may be initiated. If the locality has enacted a local ordinance, the tanks may be inspected by a local official with penalties in accordance with the ordinance.

Contact: Standards Division, Post Office Box 27647, Raleigh, NC 27611. Telephone: (919) 733-3313. Fax: (919) 715-0524.

Department of Cultural Resources, Division of Archives and History

Preservation of Historic Resources

Pursuant to Section 106 of the National Historic Preservation Act and North Carolina General Statute 121-12(a), the State Historic Preservation Office (SHPO) within the division reviews all federal and state assisted, licensed, approved, permitted, or funded undertakings that may affect historic properties. Historic properties are buildings, districts, sites, or objects that are listed in or eligible for listing in the National Register of Historic Places. Properties must be at least fifty years old and have archaeological, architectural, or historical significance to be eligible for the National Register. Private undertakings with federal or state involvement may require review by the SHPO.

Minimal information needed for SHPO review is a good map which clearly shows the location of the undertaking in relationship to major, named landmarks such as rivers, creeks, state roads or highways, plus a description of the type and size of the proposed work.

Contact: Environmental Review Coordinator, SHPO, 109 East Jones Street, Raleigh, NC 27601-2807. Telephone: (919) 733-4763.

Fax: (919) 733-8653. E-mail: hpo@ncsl.dcr.state.nc.us.

Some counties and municipalities have designated local properties and districts as “historic” under local ordinance. Any change to these properties requires a Certificate of Appropriateness from the local preservation commission prior to issuance of a building permit. Information on local commissions may be obtained from the local governmental unit’s planning department.

Department of Environment and Natural Resources (DENR), Division of Coastal Management

CAMA Development Permits

The North Carolina Coastal Area Management Act (CAMA) of 1974 and the North Carolina Dredge and Fill Act of 1969 require permits for development undertaken in Areas of Environmental Concern (AEC) in the 20 coastal counties (see Figure 6-7). Areas of Environmental Concern encompass four broad areas: the ocean hazard area (ocean & inlet shorelines); the estuarine system (including estuarine waters, coastal wetlands, public trust areas, and estuarine shorelines); public water supply areas (including small surface water supply watersheds and public water supply well fields); and designated natural and cultural resource areas (including unique coastal geologic formations, such as Jockey’s Ridge).

“Development” includes activities such as dredging or filling coastal wetlands or waters, and construction of marinas, piers, bulkheads, oceanfront structures, and roads. Development activities are subject to standards by type of development and by Area of Environmental Concern (see 15 NCAC 7H). All development must be consistent with the rules in 15 NCAC 7H and with CAMA land use plans prepared by local governments.

Local permit officers frequently may issue permits for single family homes. Other permits, especially those for large projects, may require review by the Division of Coastal Management. State review of permits for major developments is coordinated by the division.

Contact: Division of Coastal Management, P.O. Box 27687, Raleigh, NC 27611-7687. Telephone: (919) 733-2293.

See Appendix C for telephone numbers and addresses of the division's regional offices.

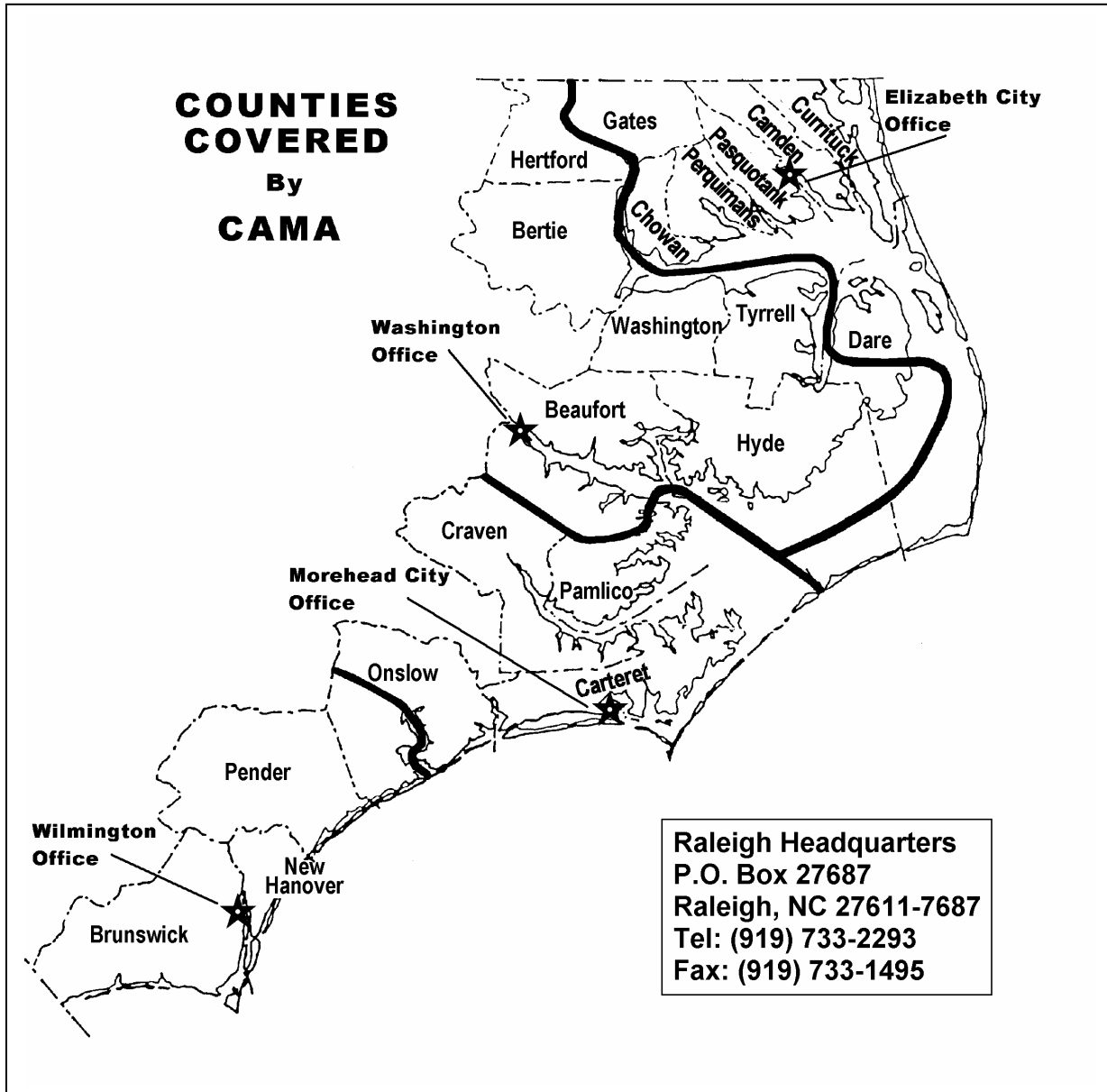


Figure 6-7. Counties Covered by CAMA

DENR Division of Environmental Health

On-Site Wastewater Systems

Within North Carolina, all on-site wastewater treatment and disposal systems that discharge to the subsurface are regulated by local health departments, who issue permits for such systems. No person shall commence or assist in the construction, location, or relocation of a residence, place of business, or place of public assembly in an area not served by an approved wastewater system unless an improvement permit and an authorization for wastewater system construction are obtained from the local health department.

15 NCAC 18A.1950 (I) provides that septic tank systems, their components, or controls shall not be located in areas subject to frequent flooding (areas inundated at a 10-year flood or less frequency) unless they are designed and installed to be watertight and remain operable during such flooding. Mechanical and electrical components of treatment systems shall be located above the 100-year flood or otherwise be protected against that inundation.

When a facility is damaged or the on-site system has fallen into disrepair or has malfunctioned, the facility may not be reoccupied or the wastewater system reused until a construction authorization is issued by the local health department for repairs to the system and these repairs are approved by the issuance of a new operation permit.

In situations where a site is evacuated due to flooding, it is recommended that water level indicators be located in the existing sewage effluent disposal trenches and the evacuated facility not be reoccupied until the water level in the disposal system has dropped at least to the bottom of the trenches.

General Statute 130A-338 provides that no permit required for electrical, plumbing, heating, air conditioning, or other construction, location, or relocation activity shall be issued until an authorization for wastewater system construction has been issued.

Contact: Onsite Waste Water Section, P.O. Box 29594, Raleigh, NC 27626-0594. Telephone: (919) 715-2895. Fax: (919) 715-3227.

DENR Division of Land Resources

Mining, Sediment Control, and Dam Safety

As provided in 15A NCAC 5B .0001 - .0012, a **mining** permit is required from the Division of Land Resources for any land disturbing activity that affects one or more acres of land and is conducted to accomplish one or more of the following:

- Breaking surface soil to extract or remove minerals, ores, or other solid matter
- Any activity or process to remove or extract minerals, ores, soils, and other solid matter from its original location
- The preparation, washing, cleaning, or other treatment of such materials so as to make them suitable for commercial, industrial, or construction use

As provided in 15A NCAC 4B .001 - .0027, an approved **erosion and sedimentation control** plan is required for any land disturbing activity that uncovers one or more acres on a tract of land. The plan must be submitted to the field office Land Quality Regional Supervisor or local government with an approved program at least 30 days prior to project initiation. The plan must be approved prior to the commencement of the land disturbance activity.

Land disturbing activity means any use of the land by any person in residential, industrial, educational, institutional, or commercial development; highway and road construction; and maintenance that results in a change in the natural cover or topography and that may cause or contribute to sedimentation. Agricultural and silvicultural activities subject to the conditions of North Carolina General Statute 113A-52(6)(a) and (b) and those activities regulated under the Mining Act of 1971 are exempted.

Control measures must be planned, designed, and constructed to provide protection from the calculated peak rate of runoff from a 10-year frequency storm, except that measures for land disturbance activities with High Quality Water Zones shall be designed for the peak rate of runoff from a 25-year frequency storm.

As provided in 15A NCAC 2K .0100–.0504, any person proposing to construct, repair, modify, or remove a **dam** must file a statement with the Division of Land Resources concerning the proposed activity. A permit

will be required prior to the initiation of such activity if the dam is high hazard (determined by the division that the failure of the dam could cause loss of life or severe property damage), or if the dam is 15 feet or greater in height (from top of dam to lowest point at downstream toe) and the impoundment capacity is 10 acre-feet or greater at the top of the dam.

The complete application must be filed at least 60 days prior to the proposed construction date. A North Carolina registered professional engineer must prepare the plans, inspect the construction and certify that the dam was constructed according to approved plan before “Permission to Impound” may be granted.

Contact: Division of Land Resources, Land Quality Section, Post Office Box 27687, Raleigh, NC 27611. Telephone: (919) 733-4574. Fax: (919) 733-2876.

DENR Division of Water Quality

Underground Storage Tanks, Water Supply Wells, and Waste Disposal

The division’s Groundwater Section is responsible for three program areas that may involve activities in or near a floodplain area. They are underground storage tank sites, water supply wells, and sites permitted for the land application of waste material.

No state restrictions are imposed on the location of **underground storage tanks** containing liquid petroleum products in identified flood hazard areas. However, if a tank is properly registered with the state and it has a spill due to some flood-related problems, the state has a fund that will help with the associated cleanup cost after the tank’s owner has met their deductible.

The section is responsible for the oversight of the **well** construction standards that are included in 15A NCAC 2C .0010. Section .0107(a)(1) states, “The well shall not be located in an area generally subject to flooding. Areas which have a propensity for flooding include those with concave slope, alluvial or colluvial soils, gullies, depressions, and drainage ways.” If the wells are properly located, they should not be impacted by flooding.

Sites that are permitted by the division for land application of **waste** are required to be located outside the 100-year floodplain. Therefore, if properly located, these sites should have minimal impact from flooding.

On the following page is a map (Figure 6-8) showing the regional offices of the Division of Water Quality where more specific information can be obtained.

Wetland Regulation

Authority for wetland regulation is contained in NC Administrative Codes that identify the wetland standards (15A NCAC 2B .0231) and the 401 Water Quality Certification Process (15A NCAC 2H .0500). Wetlands and streams are regulated by the U.S. Army Corps of Engineers (USACE) and the North Carolina Division of Water Quality (DEQ). The U.S. Environmental Protection Agency (USEPA) also has an oversight role.

The USACE requires permits for many activities in wetlands or waters under the authority of Section 404 of the Clean Water Act. Section 401 of the Clean Water Act gives the state the authority to review these “404” permits and issue a 401 Water Quality Certification (WQC) on all activities that require a federal permit. The conditions of the 401 WQC then become conditions of the 404 permit.

In October 1996, the state adopted specific standards for wetlands and rules governing the review and issuance of 401 certifications. These standards and rules, along with the revised General Water Quality Certifications issued in conjunction with the reissuance of the Nationwide Permits by the USACE in February 1997, provide the basis for most of the state’s regulatory authority with regard to wetlands, streams, and other waters of the state. Water quality chemistry standards are also enforced by DWQ.

Generally, any activity which impacts over 1/3 acre of wetlands, 150 linear feet of a stream, or any area of a lake, pond, or other water body will typically require authorization from the USACE and the DWQ. The type of authorization and degree of review needed depends on the type of impacts and the size of those impacts.

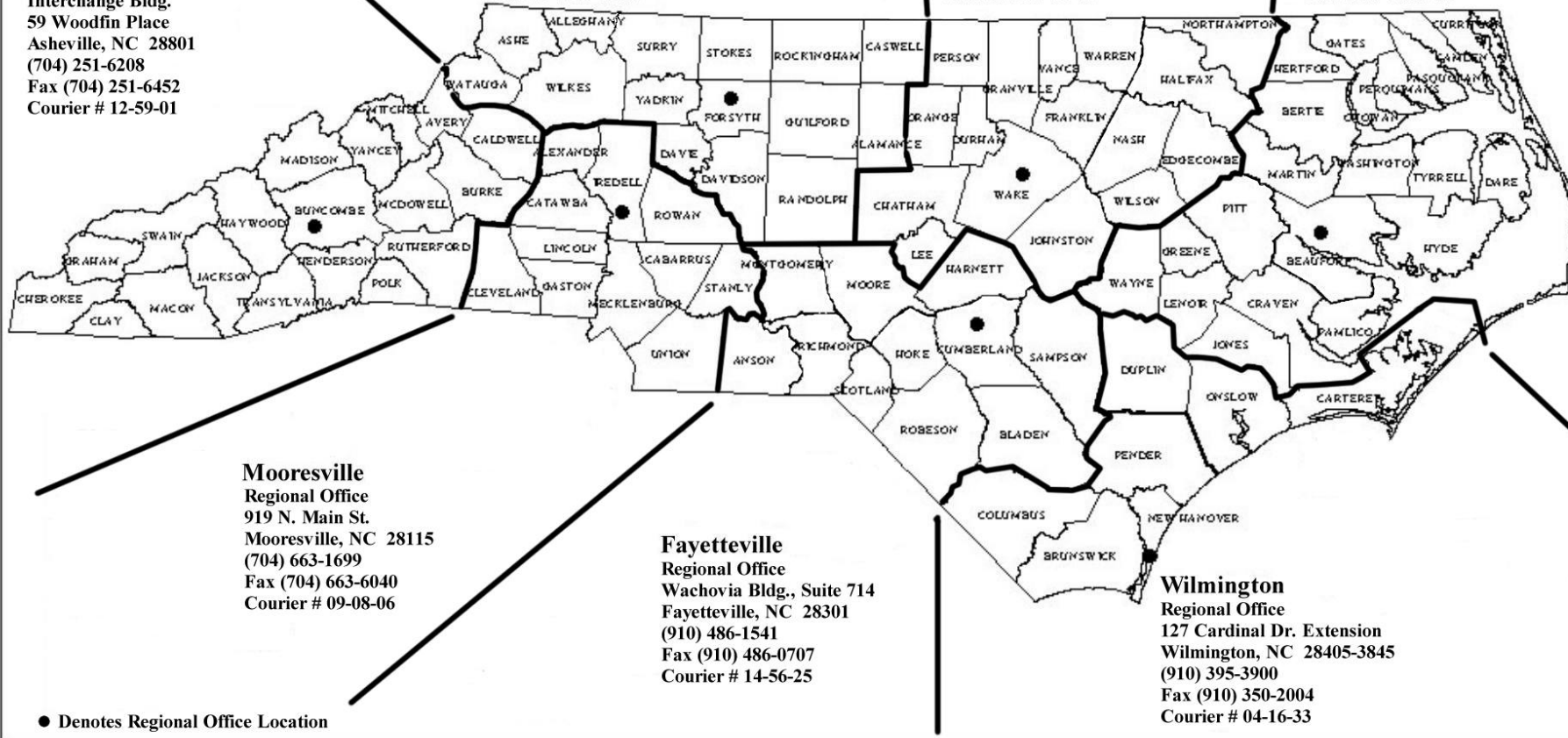
**North Carolina
Department of Environment and Natural Resources
Division of Water Quality**

Asheville
Regional Office
Interchange Bldg.
59 Woodfin Place
Asheville, NC 28801
(704) 251-6208
Fax (704) 251-6452
Courier # 12-59-01

Winston-Salem
Regional Office
585 Waughtown St.
Winston-Salem, NC 27107
(910) 771-4600
Fax (910) 771-4632
Courier # 13-15-01

Raleigh
Regional Office
3800 Barrett Dr., Suite 101
Raleigh, NC 27609
(919) 571-4700
Fax (919) 571-4718
Courier # 52-01-00

Washington
Regional Office
943 Washington Square Mall
Washington, NC 27889
(919) 946-6481
Fax (919) 975-3716
Courier # 16-04-01



Mooreville
Regional Office
919 N. Main St.
Mooreville, NC 28115
(704) 663-1699
Fax (704) 663-6040
Courier # 09-08-06

Fayetteville
Regional Office
Wachovia Bldg., Suite 714
Fayetteville, NC 28301
(910) 486-1541
Fax (910) 486-0707
Courier # 14-56-25

Wilmington
Regional Office
127 Cardinal Dr. Extension
Wilmington, NC 28405-3845
(910) 395-3900
Fax (910) 350-2004
Courier # 04-16-33

Figure 6-8. Location of Division of Water Quality Regional Offices

The types of impacts that typically require permit review include:

- Filling wetlands or waters
- Excavation of wetlands and waters
- Stream channelization or relocation
- Draining or flooding wetlands
- Clearing and grubbing wetlands

Certain activities such as silviculture, ongoing farming, and the routine maintenance of existing structures may be exempt from the permitting process.

Wetland impacts exceeding one acre in size or impacts to permanent streams exceeding 150 feet in length now require compensatory mitigation to replace the functional losses from those impacts. The mitigation measure may be carried out by the applicant at an approved site or the applicant may pay into the State Wetland Restoration Program (WRP). The WRP will plan and carry out larger wetland restoration efforts within the appropriate river basin.

The DWQ regional offices (Figure 6-8) should be the first point of contact for questions concerning activities in wetlands, waters, or streams.

Neuse River Basin—Maintaining and Protecting Existing Riparian Areas

The Division of Water Quality administers a temporary rule in the Neuse River basin that protects natural areas beside streams. Effective since July 22, 1997, this rule requires that existing riparian (streamside) areas in the Neuse River basin be protected and maintained on both sides of intermittent and perennial surface waters. It does not establish new buffers. A total of 50 feet of riparian area is required on each side of certain water bodies in the basin. This 50-foot riparian area must consist of 30 feet of virtually undisturbed forest vegetation and 20 feet of grassed/vegetated area or trees that could be harvested. Certain activities are exempt from the riparian area requirement, including:

- Ditches and manmade conveyances other than modified natural streams.

- Areas mapped as water bodies on the most recent versions of United States Geological Survey 1:24,000 scale (7.5 minute quadrangle) topographic maps where no perennial or intermittent water body actually exists on the ground.
- Ponds and lakes created for animal watering, irrigation, or other agricultural uses that are not part of a natural drainage way.
- Where application of this Rule would prevent all prospective uses of a lot platted and recorded prior to the effective date of this Rule, a variance may be granted by the Environmental Management Commission.
- Water dependent structures (those structures for which the use requires access or proximity to or siting within surface waters to fulfill its basic purpose) such as boat ramps, boathouses, docks and bulkheads.
- Roads, bridges, stormwater management facilities, ponds, and utilities may be allowed where no practical alternative exists.
- Stream restoration projects, scientific studies, stream gauging, water wells, passive recreation facilities such as boardwalks, trails, pathways, historic preservation and archaeological activities are allowed.
- Stream crossings associated with timber harvesting are allowed if performed in accordance with the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J .0201-.0209).

Questions about the riparian area requirement in the Neuse River basin can be directed to: Nonpoint Source Planning Group, DENR, Division of Water Quality, P.O. Box 29535, Raleigh, NC 27626-0535
Telephone: (919) 733-5083. Fax: (919) 715-5637

Stormwater Management

The Division of Water Quality (DWQ) administers a number of water quality programs that include stormwater management as part of their provisions. All of the stormwater programs stress stormwater control through the implementation of source reduction alternatives where practical. These types of alternatives focus on removing or reducing the amount of pollutants available to be picked up and transported by stormwater flows as opposed to trying to remove these pollutants afterward. Source reduction alternatives include: planning considerations, low density development, pollution prevention measures,

good housekeeping methods, etc. Two specific program areas are covered by existing state requirements.

State Stormwater Programs. These stormwater requirements have been developed on the state level to address specific priority areas for protection of sensitive waters. These areas include coastal waters; waters classified as High Quality Waters (HQW), Outstanding Resource Waters (ORW), Water Supply (WS) Watersheds, or Nutrient Sensitive Waters (NSW). While the specific requirements (i.e., allowable built-upon percentage, etc.) may vary within the different state stormwater programs, they are all based on similar principles and strategies for stormwater control for new development activities. These strategies promote stormwater control through low-density development and buffer areas around streams. Higher density development is allowed with the use of structural best management practices to control runoff. More specific details on the requirements can be found in the following rules: Water Supply Watersheds—15A NCAC 2B.0100 and .0200; all others—15A NCAC 2H .1000.

Federal NPDES Stormwater Permitting Programs. DWQ administers this federal program requiring NPDES (National Pollutant Discharge Elimination System) permits for point source discharges of stormwater from certain industrial activities and large municipalities. The industrial activities are generally related to manufacturing, processing, or material storage areas at an industrial facility, but also include other areas such as construction sites with land disturbing activities of five (5) acres or more. Municipal coverage applies to municipalities with populations of 100,000 or more and covers discharge from their municipal storm sewer systems.

The NPDES stormwater permits require the development of comprehensive site-specific stormwater management programs for industries and municipalities. These programs are designed to reduce the pollutants discharged in stormwater runoff through educational efforts, source reduction, pollution prevention, good house keeping, planning measures, monitoring, and structural controls where needed. Pending federal regulations will expand the NPDES stormwater programs to other industries and municipalities.

DWQ has a number of guidance manuals and fact sheets available on stormwater management. *For more information contact:* Division of Water Quality, Water Quality Section, Stormwater and General Permits Unit, Post Office Box 29535, Raleigh, NC 27626-0535. Telephone: (919) 733-5083.

Department of Insurance

State Building Code

The Department of Insurance’s Safety Services Group houses the Engineering Division, which is responsible for administering the state building code and providing staff to the N.C. Building Code Council and the N.C. Code Officials Qualifications Board. Building codes are critical in ensuring structures are constructed to a standard that promotes the life, health, and welfare of the public in the built environment. This protection is provided in North Carolina through the adoption and enforcement, by state and local governments, of the performance-based provisions found in the North Carolina State Building Code.

The N.C. State Building Code contains coastal and floodplain construction standards. Chapter 37 in “Volume I-General Construction” and Chapter 41 in “Volume VII-Residential Construction” address floodplain development. Both volumes require the lowest floor of a structure in the regulatory floodplain to be elevated above the base flood elevation. *The standards in the state code apply to all jurisdictions, not just those that participate in the National Flood Insurance Program.*

Regulations for Manufactured/Mobile Homes

The Manufactured Building Division, also under the Safety Services Group, works to ensure that construction standards for manufactured homes are maintained and those warranty obligations under state law are met. Currently there are no state code requirements for setup standards when a manufactured home is placed in the regulatory floodplain. Appendix C of the “Regulations for Manufactured/Mobile Homes” contains a guide for elevated manufactured homes. This standard, although not required by the code, is an option available for setup contractors. Communities that participate in the NFIP have adopted regulations that address setup requirements in the regulatory floodplain. *Contacts: NC Building Code Council.* Elaine R. Brown, PE, Secretary to Council, Building Code Council, NC Department of Insurance, 410 N. Boylan Avenue (27603), P. O. Box 26387, Raleigh, NC 27611. Telephone: (919) 733-3901. Fax: (919) 733-9171. Email: ebrown@mail.DOI.state.nc.us.

NC Building Code, General Construction. Barry N. Gupton, PE, Chief Code Consultant, Engineering Division, NC Department of Insurance, 410 N. Boylan Avenue (27603), P. O. Box 26387, Raleigh, NC 27611.
Telephone: (919) 733-3901. Fax: (919) 733-9171.
Email: bgupton@mail.DOI.state.nc.us.

NC Manufactured Housing Code. Pat Walker, Deputy Commissioner, Manufactured Building Division, NC Department of Insurance, 410 N. Boylan Avenue (27603), P. O. Box 26387, Raleigh, NC 27611.
Telephone: (919) 733-3901. Fax: (919) 715-9693.
Email: pwalker@mail.DOI.state.nc.us.



Please complete Learning Check # 3.



Learning Check #3

Purpose: To check understanding of floodplain management standards and criteria found in various State of North Carolina administrative codes.

Directions: Please answer the following questions.

1. Most solutions involving the anchoring of propane tanks in floodprone areas use a _____ type of auger anchor.
2. The method of securing a propane tank to the building or anchors is important so the tank is prevented from rotating around vertical and horizontal axes, thus breaking _____ or _____.
3. Changes to historical properties designated in the National Register of Historic Places or by local ordinance may require review by _____ and approval by _____.
4. In Areas of Environmental Concern in the 20 coastal counties, local permit officers frequently may issue permits for _____. Other permits, especially those for large projects, may require review by the State Division of _____.
5. All on-site wastewater treatment and disposal systems that discharge to the subsurface are regulated by _____, who issue permits for such systems.
6. State regulations provide that septic tank systems, their components, or controls shall not be located in areas inundated at a _____-year flood or less frequency unless they are designed and installed to be watertight and remain operable during such flooding.
7. With the exception of agricultural and silvicultural activities subject to conditions of state statutes, and regulated mining activities, an approved _____ plan is required for any land disturbing activity that uncovers one or more acres on a tract of land.
8. A state permit is required to construct, repair, modify, or remove a dam if the dam is classified as _____ hazard, or is _____ feet or greater in height and the impoundment capacity is _____ acre-feet or greater.

9. Sites permitted by the state for land application of waste material are required to be located outside the _____ floodplain.

10. Generally, any activity which impacts over _____ acre of wetlands, _____ linear feet of a stream, or any area of a _____, _____, or other water body will typically require authorization from the Corps of Engineers and the State Division of Water Quality.

11. List three types of impacts in the above areas that typically require permit review.

12. The State Division of Water Quality administers a temporary rule in the _____ River basin that protects natural areas beside streams.

13. State stormwater programs stress stormwater control through the implementation of source reduction measures where practical. List two strategies that may be employed.

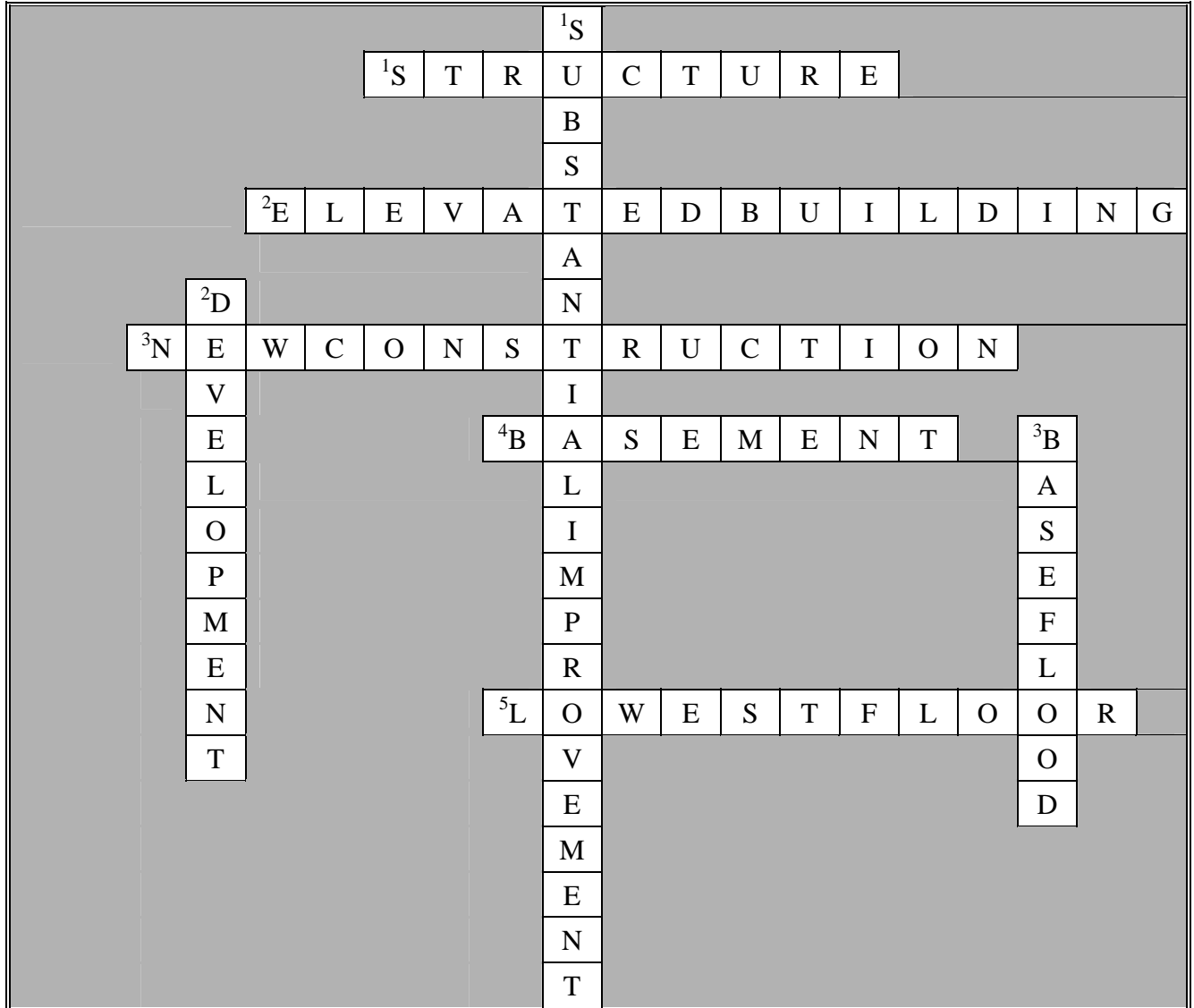
14. The State Building Code requires the lowest floor of a structure in the regulatory floodplain to be _____. The standards in the Code apply to (all jurisdictions) (just those jurisdictions that participate in the National Flood Insurance Program).

15. Which one of the following is accurate:
 - a. Communities that participate in the NFIP have adopted regulations that address setup requirements when a manufactured home is placed in the regulatory floodplain.
 - b. When a manufactured home is placed in the regulatory floodplain, more restrictive state code requirements for setup standards have to be met.

Answers are found at the end of the unit.

Answers to Learning Checks

Answers to Learning Check # 1



Answers to Learning Check #2

- Using the following diagram, determine the difference between the elevation requirements for the A Zones and V Zones.

For the A Zones, buildings must be elevated so that the lowest floor (including basement) is elevated to or above the BFE. For the V Zones, the building must be elevated so that the bottoms of the structural members supporting the lowest floor are elevated to or above the BFE.

- 2(a). A property owner wishes to construct a conventional residential structure in an approximate floodplain area (Zone A). What construction standards apply when flood data is available from a federal, state or other source?

If elevation data exist, according to 44 CFR §60.3(b)(4) the lowest floor (including basement) must be elevated to or above the BFE.

- 2(b). A property owner wishes to construct a conventional residential structure in an approximate floodplain area (Zone A). What construction standards apply when no flood data exist?

The applicable requirements of 44 CFR §60.3(a). The structure is NOT required to be elevated since no flood data exists, but it is recommended to provide some protection.

3. A property owner wishes to place a manufactured home in a Zone AO. What elevation standard applies?

The elevation requirement of 44 CFR §60.3(c)(7) applies. The structure must be elevated to the depth number specified on the map or, if no number is shown, elevation to two feet. It also must be anchored to an adequate foundation system as required by Section 60.3(c)(6).

4. What regulations apply to recreational vehicles located in V Zones?

Require recreational vehicles placed on sites in Zones VI-30, VE, or V:

- ***Be on site less than 180 consecutive days, and***
- ***Be fully licensed and ready for highway use, or***
- ***Meet the requirements in §60.3(b)(1) and (e)(2)–(e)(7).***

Why? To avoid becoming permanent structures on the site

5. When is a professional certification of floodproofing required?

A professional certification of floodproofing is required for all non-residential buildings that are to be floodproofed.

6. Prior to constructing a residence, a property owner wishes to construct a three-foot high retaining wall around the perimeter of the property and to fill the interior up to the height of the wall including the area which will be underneath the house. The property is located in a Zone VE. Do the NFIP regulations allow for this?

No—according to 44 CFR §60.3(e)(5&6), which requires the space below the lowest elevated floor to be free of obstruction. Fill is also prohibited because of erosion potential.

7. A property owner wishes to construct a vacation home on a beachfront lot located in a Zone VE. List the applicable regulations.

Development must meet the requirements of 44 CFR §60.3(e):

- ***Locate landward of the reach of the mean tide***
- ***Elevate on posts or columns such that the lowest structural member is at or above the BFE***
- ***Superstructure anchored to foundation***
- ***Space below free of obstruction or use of breakaway walls.***

Why do you think these are reasonable requirements?

These areas are subject to high water levels, wave action, and erosion from coastal storms. They are extremely hazardous to life and property. Development must therefore be constructed to a stricter standard.

8. A property owner wishes to locate a manufactured home within Zone AE. The site is in the floodway. What regulations apply?

Elevation and anchoring [44 CFR §60.3(c)(6)] and the no-impact requirement [44 CFR §60.3(d)(3)].

Why or why not is it a good idea to site a residential structure in a floodway?

Development in the floodway is strongly discouraged because of the hazardous nature of floodwater (flowing rapidly and deep) during a severe flood, along with potential adverse impacts of such development on nearby properties by increasing flood elevations.

9. A property owner wishes to have a commercial building designed to receive a floodproofing rating. To receive insurance rating credit, the floodproofing design must provide protection to what level?

To at least one foot above the base flood elevation

Answers to Learning Check #3

1. Most solutions involving the anchoring of propane tanks in floodprone areas use a **mobile-home** type of auger anchor.
2. The method of securing a propane tank to the building or anchors is important so the tank is prevented from rotating around vertical and horizontal axes, thus breaking **pipng** or **tubing**.
3. Changes to historical properties designated in the National Register of Historic Places or by local ordinance may require review by **the State Historic Preservation Office, Department of Cultural Resources** and approval by **the local preservation commission**.
4. In Areas of Environmental Concern in the 20 coastal counties, local permit officers frequently may issue permits for **single family homes**. Other permits, especially those for large projects, may require review by the State Division of **Coastal Management**.
5. All on-site wastewater treatment and disposal systems that discharge to the subsurface are regulated by **local health departments** who issue permits for such systems.
6. State regulations provide that septic tank systems, their components, or controls shall not be located in areas inundated at a **10-year** flood or less frequency unless they are designed and installed to be watertight and remain operable during such flooding.
7. With the exception of agricultural and silvicultural activities subject to conditions of state statutes, and regulated mining activities, an approved **erosion and sediment control** plan is required for any land disturbing activity that uncovers one or more acres on a tract of land.
8. A state permit is required to construct, repair, modify, or remove a dam if the dam is classified as **high** hazard, or is **15** feet or greater in height and the impoundment capacity is **10** acre-feet or greater.
9. Sites permitted by the state for land application of waste material are required to be located outside the **100-year** floodplain.
10. Generally, any activity which impacts over **1/3** acre of wetlands, **150** linear feet of a stream, or any area of a **lake, pond**, or other water body will typically require authorization from the Corps of Engineers and the State Division of Water Quality.
11. List three types of impacts in the above areas that typically require permit review. **Filling wetlands and waters. Excavation of wetlands and waters. Stream channelization or relocation. Draining or flooding wetlands. Clearing and grubbing wetlands.**
12. The State Division of Water Quality administers a temporary rule in the **Neuse** River basin that protects natural areas beside streams.

13. State stormwater programs stress stormwater control through the implementation of source reduction measures where practical. List two strategies that may be employed. ***Planning considerations. Low-density development. Pollution prevention measures. Good housekeeping methods. Buffer areas around streams. Structural best management practices for higher density development to control runoff.***
14. The State Building Code requires the lowest floor of a structure in the regulatory floodplain to be ***elevated above the base flood elevation.*** The standards in the Code apply to (***all jurisdictions***) (just those jurisdictions that participate in the National Flood Insurance Program).
15. Which one of the following is accurate:
 - a. ***Communities that participate in the NFIP have adopted regulations that address setup requirements when a manufactured home is placed in the regulatory floodplain.***
 - b. When a manufactured home is placed in the regulatory floodplain, more restrictive state code requirements for setup standards have to be met.
There are currently no state code requirements.