Floodplain Management Desk Reference

IOWA DEPARTMENT OF NATURAL RESOURCES

LEADING IOWANS IN CARING FOR OUR NATURAL RESOURCES

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1. Flooding and Floodplain Dynamics

1.1. The Hydrologic Cycle

Floods are part of the Earth's natural hydrologic cycle. The cycle circulates water throughout the environment (see Figure 1-1) to maintain an overall balance between water in the air, on the surface, and in the ground.

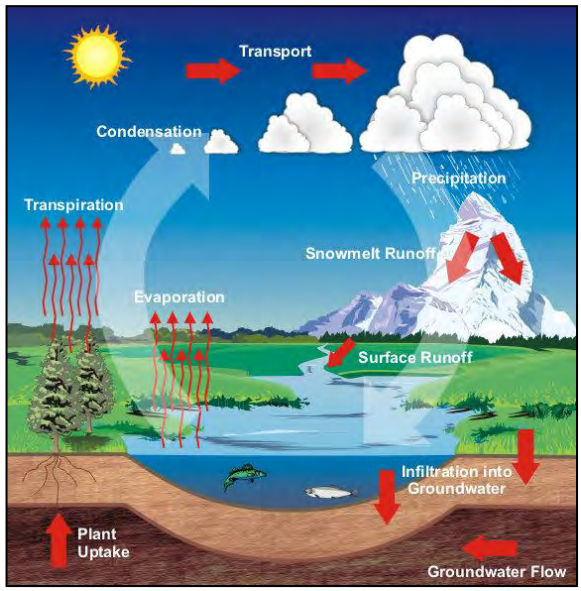


Figure 1-1. The hydrologic cycle

Since this process is a cycle, there is no specific start or end point. Water in the air, or atmospheric water, is in the form of vapor, small droplets, and ice crystals. Under the right conditions, these droplets become heavy enough to fall as precipitation in the form of rain, snow, hail, or sleet.

Precipitation lands on multiple surfaces, including natural ground, vegetation, manmade structures, streets, and existing bodies of water. Some water evaporates directly from these surfaces or wets the surface it lands on. On soils or other permeable surfaces, some of the water soaks in, or infiltrates.

The water that infiltrates the ground during rainstorms and during spring thaws is still part of the hydrologic cycle. Infiltration rates are dependent on factors such as surface type (permeability), moisture content of soils, and slope. The initial infiltration rate for dry soil is high, but as the soil becomes saturated, the infiltration rate is lower, causing water to accumulate and run off. If the infiltration continues long enough, the water in the soil moves down to strata—layers of soil and rock in the ground—which are saturated. When this layer, called the water table, is reached, the infiltrated water raises the water table. Water in the water table moves through the saturated ground much like water on the surface. If the water table is higher in one spot than another, the groundwater flows toward the lower spot.

Whenever the rate of precipitation is greater than the combination of evaporation and infiltration, water accumulates on the surface as runoff. Surface runoff will naturally seek lower elevations of terrain to continue to flow, or in some cases, pond. Water initially accumulates in surface depressions on the ground. These depressions may be natural, resulting from frost heaving of the soil, collapsed rodent tunnels, and many other causes, or they may be tire tracks, footprints, farm furrows, or other man-caused reasons.

After a precipitation event ends, some of the water migrates back to the surface and evaporates. Also, the roots of plants take in water that is transpired through the plants' leaves. When the soil is dry and there is a brief shower, all the precipitation may either evaporate or be transpired by plants. The evaporation of the excess precipitation into the atmosphere begins the hydrologic cycle over again.

1.2. Watersheds and Floodplains

A watershed is a land area that channels rainfall and snowmelt to creeks, streams, rivers, and eventually outflow points such as reservoirs, bays, and the ocean. Other names for it are drainage basin or catchment area. Watersheds vary in size and can be a single small creek or as large as a watershed of a big river, including many streams and tributaries. These larger watersheds can be further divided into sub-watersheds.

Figure 1-2 shows an example of a riverine watershed. The boundary between two watersheds can be a ridge or other area of higher elevation and is called the watershed divide. Water from rain and snowmelt naturally accumulates at the lowest points within the watershed, which coincides with streams, rivers, and lakes.

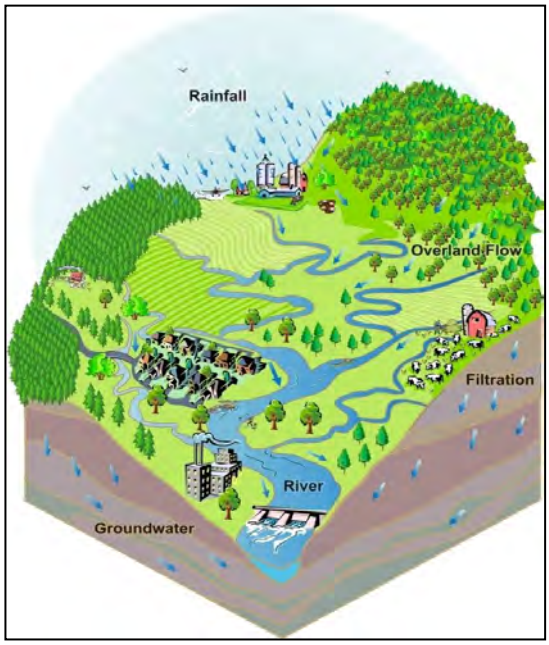


Figure 1-2. Riverine watershed

Rivers and streams that are continuously flowing all the time are supplied by groundwater. When there is excessive precipitation or snowmelt, surface water increases in streams and rivers. If there is too much water, the excess water flows over the channel banks and into the adjacent floodplain, causing flooding.

A floodplain is any land area susceptible to being inundated by floodwaters from any source. If the floodplain is undeveloped, it has two major effects on a flood: it stores more water temporarily while the channel is overflowing, and it allows additional infiltration of water during flood events. Both effects reduce the amount of water moving downstream, reducing peak flows and the maximum flood depths. Infiltration also temporarily raises the water table, allowing the water to reenter the stream sometime after the flood has passed.

What happens in a watershed will affect events and conditions downstream. Terrain characteristics help determine the dynamics of riverine flooding. In relatively flat areas, shallow, slow-moving floodwater may cover large areas of land for days or even weeks. In hilly areas and along bluffs, a flood may come and go in minutes after a heavy rain (flash flood).

1.3. Types of Flooding

There are three main types of flooding that may impact a community. These are riverine (fluvial), rainfall (pluvial) and coastal. As Iowa does not have any coastal areas, we will focus on the riverine and rainfall flood sources.

1.3.1. Riverine (Fluvial) Flooding

The most common type of flooding in Iowa is called **riverine (or fluvial) flooding**. Riverine flooding occurs when the water level in a river, lake, or stream rises and overflows onto the surrounding banks, shores, and neighboring land. This can be due to excessive rain or snowmelt that overloads the capacity of the receiving water body. Riverine flooding can also be in the form of overland flooding or flash flooding.

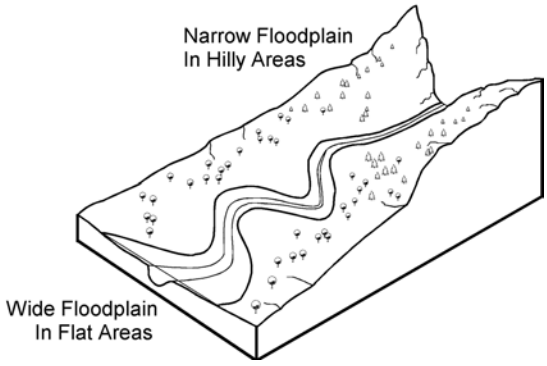


Figure 1-3. Riverine floodplain

Riverine flooding varies with the watershed's size and terrain. One measurement of a flood's severity is the speed of its moving water, which is called **velocity**. Flow velocity is normally measured in feet per second and can cause destruction to structures and manmade features.

Due to the steepness of the terrain, hilly areas have faster moving water, so velocity can pose a serious hazard. In flat areas, the flood may move slowly, making its velocity less of a hazard.

Terrain can affect how much advanced warning people may have that a flood is imminent. Populations along a river that drains a large watershed may have hours or even days of advance notice. On the other hand, smaller streams in hilly areas may give residents little or no warning that a flood is about to occur.

Flood depths vary, as do flood durations. Generally, the larger the river, the deeper the flood and the longer it will last. Along some rivers with large drainage areas, a flood can inundate vast areas of normally dry land for days or even weeks. In hilly or mountainous areas with narrow valleys, flooding usually occurs quickly with a shorter duration, although flooding can still be very deep even in small watersheds.

1.3.2. Flash Flooding

Flash flooding can occur in either riverine or urban environments and does not need to be centralized on a river or stream. Flash flooding occurs when too much rain falls too fast and too long for the ground to absorb. All flash floods strike quickly and end swiftly.

Figure 1-4. Flash flood

Areas with steep slopes and narrow stream valleys are particularly vulnerable to flash flooding, as are the overbank areas of small tributary streams. In hilly areas, the high velocity flows and short warning time make flash floods extremely dangerous and very destructive.

In urban areas, flash flooding can occur where impervious surfaces, gutters, and storm sewers intensify runoff. Flash floods can also be caused by dam failure, the sudden release of ice jams, the collapse of debris dams, or the failure of a levee.

1.3.3. Riverine Erosion

River channels change as water moves downstream, acting on the channel banks and on the channel bottom (the **thalweg**). This force is made more potent during a flood when the river's depth and velocity increase.

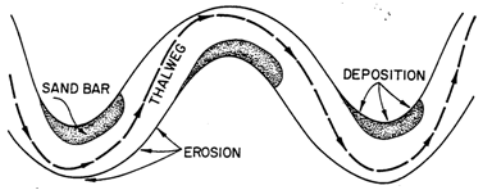


Figure 1-5. Erosion changes the shape of channels

Several features along a river are affected by this flow of water in different ways. A meander is a curve in a channel. On the outside of a meander, the banks are subject to erosion as velocities are higher and the water scours against them (see Figure 1-5 1-5). Properties on the outside of the meander face the double threat of inundation and undercutting from **riverine erosion** during floods (see Figure 1-6). On the other hand, areas on the inside of meanders receive deposits of sand and sediment transferred from the eroded sites. Meanders do not stay in the same place—they migrate slowly downstream and across the floodplain, reworking the shape and location of the channel within the floodplain. The natural migration of river channels is an important consideration when proposing any type of development within the floodplain.

Figure 1-6. Riverine erosion can undercut structures

1.3.4. Rainfall (Pluvial) Flooding

Rainfall (or pluvial) flooding is caused by persistent, heavy rainfall and is independent of an overflowing water body. It occurs when the ground cannot absorb rainwater effectively or when drainage systems are overwhelmed by the excess water. These events are sometimes categorized as urban flooding or flash flooding.

An urban drainage system is composed of natural channels and manmade ditches, storm sewers, retention ponds, and other facilities constructed to store runoff or carry it to a receiving stream or lake. Other features in such a system include yards and swales that collect runoff and direct it to the streams, sewers, and ditches.

When most of the manmade systems were built, they were typically designed to handle the amount of water expected during a 10-year or smaller storm. Larger storms overload them, and the resulting backed-up sewers and overloaded ditches produce flooding.

A 10-year storm refers to rainfall totals that have a 10 percent chance of happening in any given year. In comparison, a 25-year storm has a 4 percent chance of happening in any given year, and a 50-year storm has a 2 percent chance of happening in any given year.

1.4. Other Types of Flood Hazards

1.4.1. Sheet Flow

Where there are inadequate or undefined channels, floodwater spreads out over a large area at a somewhat uniform depth in what is called **sheet flow.**

Sheet flows occur after an intense or prolonged rainfall during which the rain cannot soak into the ground. During sheet flow, the floodwater moves downhill and covers a wide area.

1.4.2. Ponding

In some flat areas, runoff collects in depressions and cannot drain out, creating a ponding effect. Ponding floodwaters do not move or flow away. Floodwater will remain in the temporary ponds and depressional storage areas until it infiltrates into the soil, evaporates, or is pumped out. Ponding can be attributed to rainfall or pluvial flooding, but not in all cases.

Ponding is common in areas where manmade features, such as roads and railroad embankments, have blocked outlets. An example is the areas along the landward side of levees. Being in floodplains, these areas are flat and do not drain naturally, especially when a levee blocks the flow to the river.

In the example of ponding behind a levee, to drain these areas, channels are often built, and pumps are installed to mechanically move the water past the levee. Often, these manmade systems do not have the capacity to handle heavy rains associated with intense storms.

1.4.3. Levee and Dam Failures

Levees and dams are intended to hold back or impound large amounts of water. Due to the potential large amounts of water behind a dam or levee, there is a risk of developing or residing below or behind one of these structures. If they fail or are overtopped, they can produce a dangerous flood situation because of the high velocities and large volumes of water released. Flooding behind levees is caused by overtopping, failure/breach, or seepage through or under the structure. It typically occurs during a flood on the river, so people are usually alerted to a potential problem and given time to evacuate.

Figure 1-7. Levee

It is important to remember that the river is connected to the water table, so as flood stages on the riverward side of the levee increase over time, the water table on the landward side of the levee rises. Even though the levee keeps surface water out of an area, it may not prevent rising groundwater from damaging basements, septic tanks, and underground storage tanks on the landward side of the levee when there are prolonged high flows in the river.

A dam failure, on the other hand, can occur with little or no warning on clear days when people are not expecting rain, much less a flood. Breaching often occurs within hours after the first visible signs of dam failure, leaving little or no time for evacuation.

Dam breaks occur for one of three reasons:

- The foundation fails due to seepage, settling, or earthquake
- The design, construction, materials, or operation were deficient
- Flood discharges from the dam exceed the capacity of its spillway

Proper design and construction can help prevent dam failure. However, while state and federal dam safety programs help ensure that new dams are properly designed, there are still many private or locally built dams that are poorly designed and maintained.

1.4.4. Ice Jams

An ice jam is defined as an accumulation of ice in a river, stream, or other flooding source that reduces the cross sectional area available to carry the flow and increases the water surface elevation. Ice usually accumulates at a natural or manmade obstruction or a relatively sudden change in slope, alignment, or cross section shape or depth. They can cause considerable increases in upstream water surface elevations, and the flooding caused often occurs quite rapidly after the jam forms.

Ice jams present three hazards:

- Sudden flooding of areas upstream from the jam, often on clear days with little or no warning.
- Movement of ice chunks (floes) that can push over trees and crush buildings.
- Sudden flooding of areas downstream when an ice jam breaks. The impact is similar to a dam break, damaging or destroying buildings and structures.

High risk areas for ice jams include, but are not limited to, the following:

- Areas where the river slope naturally decreases
- Culverts that can freeze solid
- The headwaters of a reservoir
- Areas of channel constriction, such as bridges
- Bends in the channel
- Shallow areas where channels can freeze solid

Learn more about ice jams through the U.S. Army Corps of Engineers' Ice Jam Database.

Additional information on ice jams can be found in the Federal Emergency Management Agency (FEMA) Guidance Document, *Ice Jam Analysis and Mapping*, found on the FEMA Mapping Service Center website.

1.4.5. Debris Dams

Debris, such as logs, can collect at shallow parts of a stream, sharp bends, bridges, and other "choke points" similar to the places that form ice jams. If the channel is not kept clear, the debris will build up and form a dam. If the debris dam breaks during high flows (or anytime), the result can be a flood.

Usually, debris dam floods are not as severe as floods from manmade dams because they do not hold as much water. However, they, too, can occur on sunny days and be completely unexpected.

1.4.6. Closed Basin Lakes

A closed basin lake is a natural lake from which water leaves primarily through evaporation and whose surface area normally exceeds one square mile. There are two types of closed basin lakes:

- Lakes with no outlet
- Lakes with inadequate, regulated, or elevated outlets

Seasonal increases in rainfall can cause a closed basin lake's level to rise faster than it can drain. As a result, they are subject to large fluctuations in water surface elevation. Floodwaters trapped in a closed basin lake can result in increased lake elevations for weeks, months, or even years.

The potential for long durations of high water makes closed basin lake flooding particularly problematic. Properties may not be heavily damaged, but they could be unusable for long periods of time due to being surrounded by (or under) water. In some areas, the formation of ice can substantially damage or destroy building foundations.

1.5. Natural and Beneficial Floodplain Functions

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

These benefits include providing aesthetic pleasure, reducing the number and severity of floods, helping handle stormwater runoff, providing a diverse ecosystem essential for many rare and endangered species, and minimizing non-point water pollution.

Figure 1-8. Wetlands store and filter floodwater and help recharge aquifers

For example, natural channels generally have lower velocities than manmade channelization, reducing erosion and allowing sediments to settle out, thus maintaining water quality. The natural vegetation filters out impurities and uses excess nutrients. Such natural processes often cost far less money than it would take to build facilities to correct flood, stormwater, water quality, and other problems.

Natural resources of floodplains fall into three categories: water resources, biological resources, and societal resources. The following sections describe each category's natural and beneficial functions.

1.5.1. Water Resources – Natural Flood and Erosion Control

Over time, floodplains develop their ways to handle flooding and erosion with natural features that provide floodwater storage and conveyance, reduce flood velocities and flood peaks, and curb sedimentation.

Natural controls on flooding and erosion help to maintain water quality by filtering nutrients and impurities from runoff, processing organic wastes, and moderating temperature fluctuations.

These natural controls also contribute to recharging groundwater by promoting infiltration and refreshing aquifers, and by reducing the frequency and duration of low surface flows.

Figure 1-9. Community park that incorporates natural floodplains

1.5.2. Biological Resources and Functions

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

1.5.3. Societal Resources and Functions

People benefit from floodplains through the food they provide, the recreational opportunities they afford, and the scientific knowledge gained in studying them.

Wild and cultivated products are harvested in floodplains, where the agricultural land has been made rich by sediment deposits. They provide open space, which may be used to restore and enhance forest lands, for recreational opportunities, or for simple enjoyment of their aesthetic beauty.

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

Floodplains can increase a community's overall quality of life, a role that often has been undervalued. Parks, bike paths, open spaces, wildlife conservation areas, and aesthetic features are important to citizens. Assets like these make the community more appealing to potential employers, investors, residents, property owners, and tourists. By transforming floodplains from problem areas into value-added assets, the community improves its quality of life.

1.6. Impact of Development

Because rivers and other waterways have attracted people and industry, a substantial portion of this country's development is now subject to flooding. Floodplains account for only 7 percent of the nation's total land area. However, they contain a tremendous amount of property value. It is estimated that there are roughly 13 million housing units in our nation's floodplains. (Source: Congressional Budget Office [CBO] study that evaluated communities at risk of flooding).

Figure 1-10. Flooding and development

Two problems result from floodplain development:

- Development alters the floodplain and the dynamics of flooding
- Buildings and infrastructure are damaged by periodic flooding

Human development (increase of impervious surfaces, buildings, structures, and more) can have an adverse impact on flooding. Problems arise in two areas: the watershed (where the water comes from) and the floodplain (where it goes).

1.6.1. Watersheds

Development in riverine watersheds affects the runoff of stormwater and snowmelt. Farming, buildings, and parking lots replace the natural vegetation, which more effectively absorbs water. When rain falls in a natural setting, as much as 90 percent of it will infiltrate into the ground, evaporate, or be transpired by plants. In an urbanized area, as much as 90 percent of it will run off (see Figure 1-11).

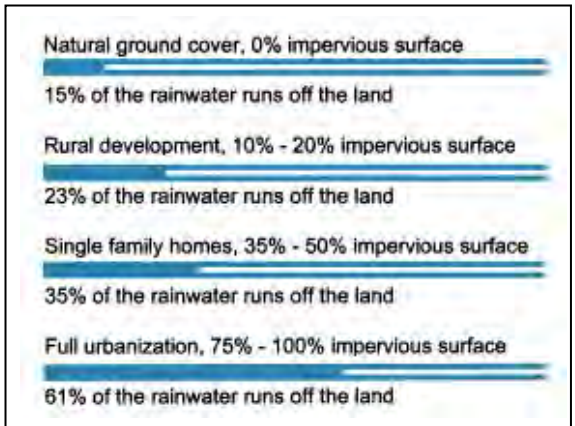


Figure 1-11. Effects of development on stormwater runoff in typical midwestern terrain

Urban features alter flood dynamics as well. Storm sewers and more efficient ditches that come with urban drainage systems speed flood flows. The result of urbanization is that there is more runoff in the watershed, and it moves faster, increasing flooding downstream. Thus, a 10-year storm on an urbanized

watershed may produce the runoff equivalent of a 25-year storm, thereby overloading the drainage system.

Urbanization also changes the timing of flows along the tributaries. If one sub-watershed develops faster than another, the flood will leave sooner than it used to, possibly arriving at the main channel at the same time as the peak arrives from another tributary, causing increased flooding downstream.

1.6.2. Floodplains

Some of the most obvious impacts of development on riverine flooding come from moving or altering channels, or constructing bridges and culverts with insufficient openings. Construction and regrading of the floodplain can obstruct or divert water to other areas. Levees and dikes are the best-known examples of this, but even small construction projects have an impact.

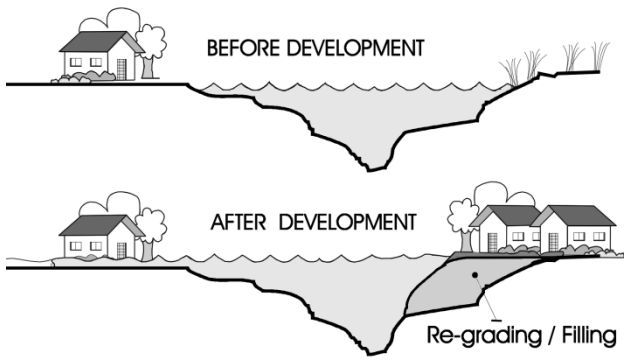


Figure 1-12. Floodplain development can increase flood problems

Placement of fill material in the floodplain obstructs flood flows, diverting floodwaters onto upstream and adjacent properties (see Figure 1-12). It reduces the floodplain's ability to store excess water, sending more water downstream and causing floods to rise to higher levels and flow at higher velocities. Filling also reduces the area available for infiltration and recharging of groundwater levels.

1.7. Property Damage

This section discusses the five ways that floods damage property.

1.7.1. Hydrodynamic Forces

Moving water creates a hydrodynamic force that can damage a building's walls in three ways (see Figure 1-13):

- Frontal impact, as water strikes the structure.
- Drag effect, as water runs along the sides of a structure.
- Eddies or negative pressures, created as water passes the downstream side.

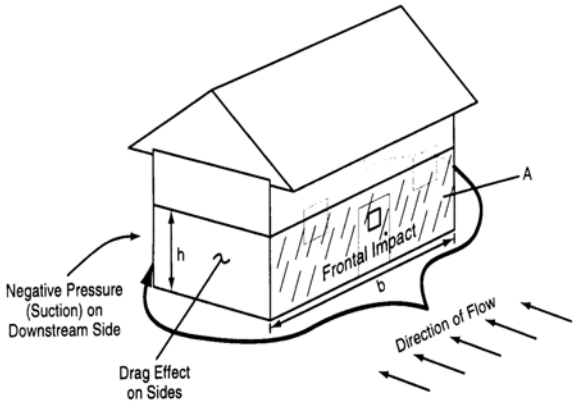


Figure 1-13. Hydrodynamic forces on a building

The speed of moving water is called **velocity**, a movement that is usually measured in feet

per second. The faster water moves, the more pressure it puts on a structure, and the more it will erode stream banks and scour the earth around a building's foundation.

Traditionally, floodwaters moving faster than 5 feet per second comprise a high velocity flood, requiring special design considerations for buildings, roads, bridges, and other manmade structures in its path. While velocity is one factor in determining the potential harm of a flood, the total impact of moving water is related to the depth of the flooding. Studies have shown that deep water and low velocities can cause as much damage as shallow water and high velocities.

1.7.2. Debris Impact

Debris also increases the hazard posed by moving water. Floodwater can and will pick up anything that will float—logs, lumber, ice, even propane and farm chemical tanks and vehicles. Moving water will also drag or roll objects that do not float. All this debris acts as battering rams that can knock holes in walls and demolish foundations.

1.7.3. Hydrostatic Forces

Hydrostatic forces are one of the main causes of flood damage. Standing water or slowly moving water can induce horizontal hydrostatic forces against a structure, especially when floodwater levels on different sides of a wall are not equal. The weight of standing water puts hydrostatic pressure on a structure. The deeper the water, the more it weighs and the greater the hydrostatic pressure.

Figure 1-14. Hydrostatic pressure increases with deeper water

Because water is fluid, it exerts the same amount of pressure sideways (lateral pressure) as it does downward. As water gets deeper, it exerts more lateral pressure than shallow water.

Most walls are not built to withstand lateral pressure. Studies and tests have shown that the lateral force presented by three feet of standing water can be enough to collapse the walls of a typical frame house.

Most foundations and below grade concrete floors (basements) are particularly susceptible to damage by hydrostatic pressure. Not only is the water deeper, but a basement is also subjected to the combined weight of water and saturated earth. Water in the ground underneath a flooded building will seek its own level, resulting in uplift forces that can collapse a foundation and break a concrete floor (see Figure 1-14).

1.7.4. Soaking

When soaked, many materials change their composition or shape. Wet wood will swell, and if it is dried too fast, it will crack, split, or warp. Plywood can come apart, and gypsum wallboard will fall apart if it is bumped before it dries out.

The longer these materials are wet, the more moisture they will absorb. Walls present a special problem: a “wicking” effect pulls water up through wood and wallboard, soaking materials as much as several feet above the actual high water line.

Soaking can cause extensive damage to household goods. Wooden furniture and cabinets may get so badly warped that they cannot be used. Other furnishings, such as upholstery, carpeting, mattresses, and books, usually are not worth drying out and restoring. Electrical appliances and gasoline engines will not work safely until they are professionally dried and cleaned.

1.7.5. Sediment and Contaminants

Floods leave a mess made of natural and manmade debris, and few floods have contaminant-free floodwaters. Stormwater, snowmelt, and river water pick up whatever was on the ground, such as soil, road oil, and farm and lawn chemicals. If a wastewater treatment plant or livestock feedlot were inundated, the floodwaters would likely include untreated sewage.

Many materials, including wood and fiberglass or cellulose insulation, absorb floodwater and its sediment. Even if allowed to dry out, the materials will still hold the sediment and contaminants brought in by the flood. Also, mold, mildew, and bacteria can grow in damp building materials and ventilation ductwork (see Figure 1-15).

Figure 1-15. Mold and mildew can grow quickly after a flood

Simply letting a flooded house dry out will not render it clean—and it certainly will not be as healthy a place as it was before the flood. The American Red Cross website Disaster Cleanup & Repair For Your Home devotes many pages to proper and healthy clean-up procedures. In addition, FEMA and the American Red Cross have a publication titled *Repairing Your Flooded Home* which discusses the steps taken after a flood.

Learn more about clean-up following a flood event from the Iowa State University Extension and Outreach program. A variety of pre- and post-flooding resources are available on their website at Flooding | Iowa State University Extension and Outreach Disaster & Crisis Recovery (iastate.edu).

2. The National Flood Insurance Program

2.1. History

2.1.1. Insurance

Historically, people at risk from flooding could only hope for help from their neighbors and charitable organizations in the event of a flood. Government assistance varied from community to community, and flood insurance was scarce. During the 1920s, the insurance industry concluded that flood insurance could not be a profitable venture because the only people who would want flood coverage would be those who lived in floodplains, those who were most at risk. Since they were sure to be flooded, the rates would be too high to attract customers.

2.1.2. Flood Control

It wasn't until the great Mississippi River flood of 1927 that the Federal Government became a major player in flooding. As defined by the Flood Control Acts of 1928 and 1936, the role of government agencies was to build massive flood control structures to control the great rivers, protect coastal areas, and prevent flash flooding. The 1936 Act authorized the construction of some 250 projects for both flood control and relief work.

Until the 1960s, such structural flood control projects were seen as the primary way to reduce flood losses. Public policy emphasized that flood losses could be curbed by controlling floodwater with structures, such as dams, levees, and floodwalls.

During the 1960s, the effectiveness of this single solution was questioned. Studies concluded that flood losses were increasing despite the number of flood control structures that had been built. Disaster relief expenses were increasing, making all taxpayers pay more to provide relief to those with property in flood risk areas. The realization that the tremendous expenditures on physical structures did not eliminate the flood risk spurred discussions and ultimately legislation to mandate alternative approaches for protecting development in the floodplain.

2.1.3. Floodplain Management

One of the main reasons structural flood control projects failed to reduce flood losses was that development in floodplains continued and even increased due to the perceived protection provided by a flood control project. In response, federal, state, and local agencies began to develop policies and programs with a "non-structural" emphasis, ones that did not prescribe projects to control or redirect the path of floods. Since the 1960s, flood protection programs evolved from heavy reliance on flood control, or structural measures, to one using a combination of many tools. As a result of this evolution, U.S. floodplain policies are now multi-purpose and result in a mix of solutions to suit many situations.

Instead of "flood control", we now speak of "floodplain management". Floodplain management is officially defined by the Federal Government's *Unified National Program for Floodplain Management* as "a decision-making process that aims to achieve the wise use of the nation's floodplains" by both reducing flood losses and protecting the natural resources and functions of floodplains.

Where floodplain development is allowed, floodplain management results in development and construction measures that minimize loss of life and property and reduce the impact of human development on the natural functions of the floodplain.

2.1.4. Creation of the National Flood Insurance Program (NFIP)

By the late 1960s, Congress had become concerned with problems related to the traditional methods of dealing with floods and flood damage—construction of structural projects and federal disaster assistance. Both were proving to be quite expensive, with no end in sight.

Congress concluded that:

- Although federal flood programs were funded by all taxpayers, they primarily helped only residents of floodplains.
- Flood protection structures were expensive and could not protect everyone.
- People continued to build and live in floodplains, thus still risking disaster.
- Disaster relief was both inadequate and expensive.
- The private insurance industry could not sell affordable flood insurance because only those at high risk would buy it.

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

- Transfer the costs of private property flood losses from the taxpayers to floodplain property owners through flood insurance premiums.
- Provide floodplain residents and property owners with financial aid after floods, especially smaller floods that do not warrant federal disaster aid.
- Guide development away from flood hazard areas.
- Require that new, substantially improved, and substantially damaged buildings be constructed in ways that would minimize or prevent damage in a flood.

Congress charged the Federal Insurance Administration (FIA), which at that time was in the Department of Housing and Urban Development, with responsibility for the program.

2.1.5. Evolution of the NFIP

Participation in the NFIP grew slowly. In 1972, Hurricane Agnes devastated a wide area of the eastern United States, and disaster assistance costs were the highest ever, leading Congress to examine why the NFIP was so little used. Investigators found that few communities had joined the NFIP, and there were fewer than 100,000 flood insurance policies in force nationwide.

To remedy this, the Flood Disaster Protection Act was passed in 1973, requiring that buildings located in identified flood hazard areas have flood insurance coverage as a condition of federal aid or loans from federally insured lending institutions, and as a condition for receiving federal disaster assistance. These "sanctions" for non-participation (see Section 2.6.4) make it hard for any community not participating in the NFIP to obtain any federal assistance for properties located in an identified flood hazard area. The 1973 Act dramatically spurred participation in the NFIP. By the end of the decade, more than 15,000 communities had signed on, and nearly two million flood insurance policies were in effect.

National Flood Insurance Program Legislation

- *National Flood Insurance Act of 1968*
- *Flood Disaster Protection Act of 1973*
- *National Flood Insurance Reform Act of 1994*
- *Flood Insurance Reform Act of 2004*
- *Biggert-Waters Flood Insurance Reform Act of 2012*
- *Homeowners Flood Insurance Affordability Act of 2014*

In 1979, the FIA and the NFIP were transferred to the newly created FEMA. During the early 1980s, FIA worked to reduce the program's dependence on its authority to borrow from the Federal Treasury. As a result of a series of rate increases and other program adjustments, beginning in 1986, the NFIP was self-supporting for a number of years (prior to the widespread Midwest flooding of 1993).

Since 1973, the program has been amended several times. The Reform Act of 1994 strengthened the provisions that mandate the purchase of flood insurance and fine tuned various aspects of the program, such as authorizing the Community Rating System (CRS), increasing the maximum amount of flood insurance coverage, and establishing a grant program for mitigation planning and projects. The improved enforcement and the initiation of a flood insurance advertising campaign known as "Cover America" boosted sales of flood insurance policies again. By 2002, there were over 4.4 million NFIP flood insurance policies in force.

In 2002, the FIA was incorporated into FEMA's new Federal Insurance and Mitigation Administration (FIMA), which combined the insurance, floodplain management, and flood hazard mitigation aspects of the NFIP into one office. In 2003, FEMA and FIMA became part of the newly created U.S. Department of Homeland Security and the Emergency Preparedness and Response Directorate.

In June of 2004, the Flood Insurance Reform Act of 2004 was signed into law. The goals of the Act are to help property owners who have experienced serious and repetitive flood damage to mitigate their risk with financial assistance from the NFIP, communities, and states; to end the abuses by those who misuse the program; and to improve consumer understanding and rights of NFIP policyholders.

Due to tremendous insurance losses as a result of several devastating flood events that occurred early in the 21st century, the NFIP was required to borrow more than $20 billion from the U.S. Treasury. In an effort to make the NFIP more financially sound, Congress passed the Flood Insurance Reform Act of 2012, also known as Biggert-Waters 2012 or simply as BW-12.

The centerpiece of BW-12 is the phasing out of many of the premium discounts for structures built before the publication of a community's first Flood Insurance Rate Map (FIRM), known as pre-FIRM structures. By eliminating the discounts for pre-FIRM structures, the insurance rates will move toward full-risk rates, either immediately or incrementally.

In March 2014, the Homeowner Flood Insurance Affordability Act of 2014 was signed into law. This law repeals and modifies certain provisions of BW-12, which were enacted in 2012, and makes additional program changes to other aspects of the program not covered by that Act. The new law lowers the recent rate increases on some policies, prevents some future rate increases, and implements a surcharge on all policyholders. The Act also repeals certain rate increases that have already gone into effect and provides for refunds to those policyholders.

In 2013, the number of communities participating in the NFIP exceeded 22,000 out of more than 24,000 with identified flood hazard areas. In Iowa, there are currently 639 participating communities out of 751 that have identified flood hazard areas. As of December 2013, there are more than 5.5 million flood insurance policies in force across the nation, with more than 16,000 of these in Iowa.

NFIP Profile as of December 2013

>22,686 communities participate nationwide
739 Iowa communities participate
>3.6 million flood insurance policies are in effect nationwide
>9,549 flood insurance policies are in effect in Iowa

2.1.6. FEMA Mapping Programs

One of the requirements of the Reform Act of 1994 is that FEMA review and assess the need to update and revise flood hazard maps every five years. Due in large part to funding constraints, FEMA was not able to meet this goal. So, in 2003, Congress authorized funding under the Flood Map Modernization Program for the update and improvement of the Nation's flood hazard maps. The Flood Map Modernization Program initiative resulted in the production of digital flood maps for much of the nation. Updates are currently continuing under the Risk Mapping, Assessment, and Planning (Risk MAP) program (see Appendix 1 for more information on FEMA's Risk MAP program), with the majority of Iowa receiving new model backed flood hazard identification. Regular budget allocations from Congress continue to provide funding for the development of new flood hazard identification and flood risk data.

2.1.7. Disaster Programs

Concurrently with the evolution of the NFIP, federal disaster programs were evolving. Over the years, the federal cost share has been reduced in order to get states and communities to shoulder more of the burden.

With the passage of the Robert T. Stafford Disaster Relief and Emergency Act (known as the Stafford Act) in 1988, disaster assistance programs included funding for mitigation projects to reduce future flood damage. Like the NFIP statutes, the Stafford Act was amended after the 1993 floods, and mitigation funding levels were increased. These programs are discussed in Section 22.4.

In the 1990s, FEMA also began funding mitigation projects through the Hazard Mitigation Assistance (HMA) Program. Through FEMA's HMA Program, state, tribal, and local governments can receive funds following a Presidential major disaster declaration for projects that reduce the risk to life and property from disasters. These programs are discussed further in Section 22.

The Disaster Recovery Reform Act of 2018 amended Sectio 203 of the Stafford Act. Amendments included discontinuing the Pre-Disaster Hazard Mitigation program and establishing the Building Resilient Infrastructure and Communities (BRIC) grant program. BRIC was designed to provide funding to support states, local governments, tribes, and territories in their efforts to implement mitigation strategies, actions, and projects, as well as technical assistance as they pursue these projects.

2.2. How the NFIP Works

The NFIP is based on a mutual agreement between the Federal Government and the community. Federally guaranteed flood insurance is made available in those communities that agree to regulate development in their mapped floodplains. If the communities do their part in making sure future floodplain development meets certain criteria, FEMA makes flood insurance available for properties in the community.

There are four basic parts to the NFIP—mapping, insurance, mitigation, and regulations. These four parts are interconnected and mutually supportive.

2.2.1. Mapping

FEMA has prepared a floodplain map and developed flood hazard data for most of the flood-prone communities in the country. The maps and data are used for several purposes:

- Communities, states, and federal agencies use them as the basis for regulating new construction and substantial improvements (see Section 12.2) in a flood hazard area.
- Insurance agents use them when rating flood insurance policies.
- Lenders and federal agencies use them to determine when flood insurance must be purchased as a condition of a loan or financial assistance.

FEMA has issued two kinds of maps:

- The first map received by most communities was called a Flood Hazard Boundary Map (FHBM), which shows the boundaries of the floodplain using approximate methods (see Section 4.1.2).
- The second map is a FIRM, which shows flood elevations and other flood hazard information that is used to better protect new construction and substantial improvements from flood damage and to determine flood insurance requirements and rates (see Section 4.3). All communities in Iowa with flood hazards have received a FIRM.

The NFIP's maps and flood studies are covered in depth in Sections 3 through 6.

2.2.2. Insurance

NFIP flood insurance can be purchased to cover any building located in a community participating in the NFIP—even buildings not located in a mapped floodplain. Insurance coverage is limited to losses incurred due to a "flood". A flood is defined by the NFIP as a general and temporary condition of partial or complete inundation of normally dry land areas from:

- "The overflow of inland or tidal waters".
- "The unusual and rapid accumulation or runoff of surface waters from any source".

Under the new pricing methodology, often referred to as Risk Rating 2.0 (RR 2.0), flood insurance premiums for buildings are based on the flood risk, the amount and type of coverage (contents and structure), location, deductible amount, the design and age of the structure and the location of building contents. Therefore, it is very important for communities to ensure that new buildings constructed in the mapped flood hazard area are in compliance with all local, state, and federal floodplain regulations. In general, the lower the risk of flooding, the lower the flood insurance premiums will be.

Flood insurance coverage is important for any building with a risk of flooding since flood damages are not covered by most other insurance policies. Since its creation in 1968, the NFIP has paid out billions of dollars in flood insurance claim payments nationally for large and small flood events. Maintaining a flood insurance policy provides relief for flood damage, including damage from events that are not severe enough to warrant a federal disaster declaration.

Flood insurance and more details regarding its relation to construction regulations are discussed in Section 19. More information can also be found on the *FloodSmart.gov* website or from an insurance agent familiar with the NFIP.

2.2.3. Mitigation

Mitigation refers to the action of reducing the severity, seriousness, or painfulness of something, in our case, those associated with flooding. It involves implementing measures to lessen the impact of adverse events or conditions. Mitigation strategies might include building flood defenses, enforcing strict building codes, or creating early warning systems to minimize damage and enhance safety.

Flood mitigation strategies can be broadly categorized into structural and non-structural measures. Structural measures include constructing barriers like levees, floodwalls, and dams to control water flow and protect areas from flooding. Nonstructural measures focus on reducing risk by implementing measures such as zoning laws, creating floodplain management plans, and promoting the use of green infrastructure such as rain gardens and permeable pavements to enhance water absorption and reduce runoff.

Under the NFIP, communities are encouraged to identify mitigation opportunities within their community that will help to reduce the impacts of flooding. This comes in the form of planning assistance and grant programs.

More information on mitigation is discussed in Chapter 22.

2.2.4. Regulations

The NFIP underwrites flood insurance coverage only in those communities that adopt and enforce floodplain regulations that meet or exceed the NFIP minimum requirements. Buildings built-in accordance with NFIP regulations have a lower risk of flooding and can be insured at lower rates.

The community's floodplain regulations are designed to ensure that new buildings will be reasonably protected from damage by flooding and that development within the flood hazard area will not increase the flood hazard. In theory, a community's vulnerability to damage by floods will decrease over time as older buildings with higher flood risk are replaced with newer ones built-in compliance with the community's floodplain regulations.

The NFIP regulations focus on protecting insurable buildings, but they also provide a degree of protection for other types of development. These criteria are detailed in Sections 9 through 12.

It should be noted that the NFIP's regulations are **minimum standards**. States and communities are encouraged to adopt and enforce additional or more restrictive rules that will better protect property from local flooding conditions. Suggested higher standards are discussed in Section 13.

Floodplain regulations are often controversial and difficult to enforce. Many people want the freedom to build what they want without government controls. In some areas, they may not be aware they need a local permit to build.

As a result of public opposition, a community may be inclined to provide variances and not fully enforce all the provisions of its ordinance, which puts its participation in the NFIP at risk. If the community does not fulfill its NFIP obligations to the Federal Government and allows construction in violation of its regulations, three things can happen:

- New buildings will be subject to damage by the 1% annual chance flood (also known as the 100-year or base flood).
- Insurance on an improperly constructed building may be very expensive.
- FEMA can impose sanctions on the community to encourage it to correct its floodplain management program, including suspending the community from the NFIP. The sanctions are discussed in Section 2.6.4.

2.3. NFIP Roles and Responsibilities

The NFIP is founded on a mutual agreement between the Federal Government and each participating community. Local, state, and federal governments, and private insurance companies must share roles and responsibilities to meet the goals and objectives of the NFIP.

The community's role is of paramount importance. Residents and property owners can get NFIP flood insurance only if the community carries out its responsibility to enforce its adopted floodplain regulations.

2.3.1. The Community Role

A **community** is a governmental body with the statutory authority to enact and enforce development regulations. In Iowa, the NFIP definition of "community" includes only tribal nations, cities, and counties. Counties have jurisdiction only over the unincorporated areas.

The community enacts and implements the floodplain regulations required for participation in the NFIP. The community's measures must meet regulations set by the Iowa Department of Natural Resources (DNR) (http://www.iowadnr.gov/InsideDNR/RegulatoryLand/FloodPlainManagement), as well as NFIP criteria. Details of these requirements are covered in Sections 7 through 12.

2.3.2. The State Role

Each governor has selected a state coordinating Division for the NFIP. In Iowa, it is the Department of Natural Resources (DNR). The office is responsible for:

- Ensuring that communities have the legal authority necessary to adopt and enforce floodplain management regulations.
- Establishing minimum state regulatory requirements consistent with the NFIP.
- Providing technical and specialized assistance to local governments.
- Coordinating the activities of various state agencies that affect the NFIP.

Other agencies are also active. For example, the State Emergency Management Division coordinates flood warning and response activities and several flood hazard mitigation programs.

2.3.3. The Federal Role

FEMA administers the NFIP through its Regional Offices and the FIMA in Washington, DC.

There are 10 FEMA Regional Offices, each with an Insurance and Mitigation Division that coordinates the NFIP with states and communities. Region VII covers the States of Iowa, Missouri, Kansas, and Nebraska.

The Regional Office is responsible for:

- Assisting the state NFIP coordinating agencies.
- Assessing community compliance with the minimum NFIP criteria.
- Advising local officials responsible for administering the ordinance.
- Answering questions from design professionals and the public.
- Helping review and adopt new maps and data.
- Review and approval of local floodplain management ordinances.
- Administering the Hazard Mitigation Grant and HMA Programs.
- Providing information and training on the flood insurance purchase requirements.

FIMA in Washington, DC, administers the flood hazard mapping program, sets national policy for floodplain regulations, researches floodplain construction practices, and manages the NFIP. FIMA also administers the insurance portion of the program. It sets flood insurance rates, establishes coverage, monitors applications and claims, and markets flood insurance.

Current information on State and FEMA offices can be found in Section 28 of this guide.

Most flood insurance applications and claims are processed by private insurance companies through an arrangement with FIMA called the Write Your Own Program. FIMA also contracts for agent training and other assistance through regional insurance offices (see Section 28 for contact information).

2.4. Joining the NFIP

Community participation in the NFIP is voluntary. No federal or state law requires a community to join. However, as discussed later in Section 2.6.4, communities mapped as flood-prone that do not participate face sanctions, such as loss of federal aid for insurable buildings in the floodplain. These sanctions make participation a very important decision for many communities.

To join, a community submits an application form, a resolution of participation, and its floodplain management ordinance. More details on the procedures for joining the NFIP can be found on the FEMA website titled Flood Insurance.

The DNR has model resolutions and ordinances. The resolution states the community's intent to participate and cooperate with FEMA. The community agrees to "maintain in force … adequate land use and control measures consistent with the [NFIP] criteria" and to:

1. Assist the Administrator (FEMA) in the delineation of the floodplain.

2. Provide information concerning present use and occupancy of the floodplain.

3. Maintain for public inspection and furnish upon request, for the determination of applicable flood insurance risk premium rates within all areas having special flood hazards, elevation, and floodproofing records on new construction.

4. Cooperate with agencies and firms that undertake to study, survey, map, and identify floodplain areas, and cooperate with neighboring communities with respect to the management of adjoining floodplain areas in order to prevent aggravation of existing hazards.

5. Notify the Administrator (FEMA) whenever the boundaries of the community have been modified by annexation, or the community has otherwise assumed or no longer has authority to adopt and enforce floodplain management regulations for a particular area.

The community must also adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP and State criteria. These criteria are explained in Sections 7 through 12.

Most communities joined the NFIP in the 1970s. At that time, they were provided with an FHBM that showed only the approximate boundaries of the floodplain. Generally, they entered the "**Emergency Phase"**, whereby their regulatory responsibilities were limited because of the limited flood hazard data provided on the map.

Communities participating in the "**Regular Phase**" of the NFIP receive a FIRM, and some also receive a Flood Insurance Study (FIS) report with more detailed flood hazard data. The FIRM and flood data are discussed in Sections 3 through 5.

A community is given a period of time during which it can review and appeal the results of a proposed FIRM before it is finalized. Following that review and appeal period, the community is given six months in which to adopt the FIRM as part of its floodplain management ordinance.

Whether the community receives a FIRM and FIS report or has had its FHBM specially converted to a FIRM, it is converted to the "Regular Phase" on the effective date of the FIRM. Buildings that were constructed prior to the effective FIRM date are referred to as "**pre-FIRM**" buildings, and those constructed after that date are referred to as "**post-FIRM**" buildings.

If a participating community does not adopt or update its ordinance in the time provided, it is suspended from the NFIP. The FIRM still goes into effect on the same date. However, federally backed flood insurance will no longer be available for the purchase of any new policies or policy renewals until the community is reinstated in the NFIP.

Buildings that pre-date the first NFIP FIRM for the community are called "pre-FIRM" buildings, while buildings constructed after the effective FIRM date are called "post-FIRM" buildings.

Non-participating, newly mapped, or remapped communities are similarly notified and given a one-year (mapped for the first time) or six-month (remapped) period in which to enact a floodplain management ordinance and join/rejoin the NFIP. Until such ordinances are adopted, the community remains **sanctioned,** and federally backed flood insurance is unavailable in the community.

2.5. The NFIP's Regulations

For a community to participate in the NFIP, it must adopt and enforce floodplain management regulations that meet or exceed the minimum NFIP standards and requirements. These standards are intended to prevent loss of life and property, as well as economic and social hardships, which result from flooding.

The NFIP standards work—as witnessed during floods in areas where buildings and other developments have been built-in compliance with them.

It is important to note that the NFIP criteria are minimum. There are some more restrictive state standards that must be met by Iowa communities in the NFIP. Communities are also encouraged to enact their own higher regulatory standards, as discussed in Section 13.

2.5.1. 44 CFR

The NFIP requirements can be found in *Chapter 44 of the Code of Federal Regulations (44 CFR).* Revisions to these requirements are first published in the *Federal Register*, a publication the Federal Government uses to disseminate rules, regulations, and announcements.

Most of the requirements relative to a community's ordinance are in Parts 59 and 60.

Figure 1 and 2-2 show how the regulations are organized. The sections are referred to in an abbreviated format, such as 44 CFR 60.1—Chapter 44, *Code of Federal Regulations*, Part 60, Section 1.

44 CFR 59.2(b) To qualify for the sale of federally-subsidized flood insurance a community must adopt and submit to the Administrator as part of its application, flood plain management regulations, satisfying at a minimum the criteria set forth at Part 60 of this subchapter, designed to reduce or avoid future flood, mudslide (i.e., mudflow) or flood-related erosion damages. These regulations must include effective enforcement provisions.

As noted in Section 2.3.1, when a community joined the NFIP, it agreed to abide by these regulations. When the community's FIRM is published, it must submit its ordinance to FEMA to ensure that it meets these requirements.

Note: The NFIP regulations are periodically revised to incorporate new requirements or clarify old ones. These changes are published in the *Federal Register* (a government publication where proposed and final regulatory notices are published). Some revisions require local ordinance amendments. A community may or may not have made the amendments needed to stay updated. Local staff should periodically check with the DNR or the FEMA Regional Office to verify that their ordinance is currently in full compliance with the latest NFIP and State requirements.

Part 59—General Provisions

Subpart A—General

59.1 Definitions
59.2 Description of program
59.3 Emergency program
59.4 References

Subpart B—Eligibility Requirements

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

Figure 2-1. 44 CFR Part 59

Part 60—Criteria for Land Management and Use

Subpart A—Requirements for Floodplain Management Regulations

60.1 Purpose of subpart
60.2 Minimum compliance with floodplain management criteria
60.3 Floodplain management criteria for flood-prone areas
- (a) When there is no floodplain map
- (b) When there is a map, but no flood elevations
- (c) When there are flood elevations but no mapped floodways
- (d) When there is a floodway mapped
- (e) When there is a map with coastal high hazard areas

60.4 Floodplain management criteria for mudslide (i.e., mudflow)-prone areas
60.5 Floodplain management criteria for erosion-prone areas
60.6 Variances and exceptions
60.7 Revisions of criteria for floodplain management regulations
60.8 Definitions

Subpart B—Requirements for State Floodplain Management Regulations

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

Figure 2-2. 44 CFR Part 60

2.5.2. Community Types

NFIP regulations identify minimum requirements that communities must fulfill to join and stay in the program. The requirements that apply to a particular community depend on its flood hazard and the level of detail of the data FEMA provides to the community. The specific requirements are in Section 60.3 and apply to communities as follows:

- **60.3 (a)** FEMA has not provided any maps or data
- **60.3 (b)** FEMA has provided a map with approximate A Zones
- **60.3 (c)** FEMA has provided a FIRM with Base Flood Elevations (BFEs)
- **60.3 (d)** FEMA has provided a FIRM with BFEs and designation of a regulatory floodway
- **60.3 (e)** FEMA has provided a FIRM that shows coastal high hazard areas (V Zones, which are not relevant in Iowa)

The DNR also categorizes communities based on the size of their watersheds and whether they have detailed flood data. The categories determine which types of permit applications must be reviewed by the DNR. This is discussed more in Section 9.4.

Two important notes:

The NFIP requirements are the minimum. As noted in 44 CFR 60.1(d), "Any floodplain management regulations adopted by a state or a community which are more restrictive than the criteria set forth in this part are encouraged and shall take precedence".

Communities are encouraged to enact regulatory standards that exceed the NFIP's minimum standards and that are more appropriate for local conditions. The **Community Rating System** (CRS) is a part of the NFIP that rewards communities that implement programs that exceed the NFIP minimum standards. It is explained in more detail in Section 20.

***These requirements are cumulative*.** A 60.3 (c) community must comply with all appropriate requirements of sections 60.3 (a) and (b). For example, 60.3 (a) includes basic requirements for subdivisions and utilities that are not repeated in the later sections. All communities in the NFIP must comply with these subdivision and utility requirements. For example, a 60.3 (c) community must use the BFEs provided on the FIRM. If that community has an approximate A Zone without a BFE, it must comply with the requirements of 60.3 (b) for that area. See Sections 3.2 and 4.3 for more information about BFEs.

Base Flood Elevation— *The predicted elevation to which floodwater is anticipated to rise during the 1% annual chance flood. The BFE is also referred to as the 100-year flood elevation.*

The details of the requirements of 44 CFR 60.3 are explained in Sections 7 through 12. These sections are organized by subject matter, so they do not directly correspond with the sections in 44 CFR. Where appropriate, the specific section numbers are referenced.

2.6. Compliance

A community's floodplain management program and permit records are reviewed periodically by the FEMA Regional Office. FEMA staff may inspect records as part of a Community Assistance Visit (CAV) or Community Assistance Contact (CAC), collectively what they are now calling NFIP Compliance Audits.

If a community doesn't uphold its part of the agreement and fails to adequately enforce its floodplain management regulations, FEMA has recourse through three approaches:

- Reclassification under the CRS
- Probation
- Suspension from the program

2.6.1. CRS Reclassification

The CRS provides a discount for the flood insurance premiums of properties in communities that participate in the CRS. The CRS is explained in Section 20. CRS communities that are deemed to no longer be in full compliance with the NFIP requirements can be reclassified to Class 10. Should that happen, residents will lose their CRS flood insurance premium discounts.

2.6.2. Probation

Probation represents formal notification to the community that FEMA regards the community's floodplain management program as non-compliant with the NFIP criteria.

Prior to imposing probation, FEMA provides a 90-day written notice to the community and lists specific deficiencies and violations. It also notifies all policyholders of the impending probation, telling them that an additional $50 premium will be charged on policies sold or renewed during the probation period. The objective of this surcharge is to bring the policyholders' attention to the fact that their community is not compliant, and failure to correct the problems may lead to suspension.

The community has 90 days to avoid this sanction by correcting deficiencies and remedying identified violations. Probation may be continued for up to one year after the community corrects all program deficiencies. This ensures that the community has truly changed its ways and become compliant, and that all policyholders are advised of the situation when their policies are renewed.

2.6.3. Suspension

If, after a period of probation, a community fails to remedy its program deficiencies, it will be suspended from the NFIP. Suspension means the community is no longer in the NFIP. It is subject to the sanctions for non-participation that are explained in Section 2.6.4.

FEMA grants a community 30 days to show why it should not be suspended and then gives it a 30-day suspension letter. FEMA may also conduct a written or oral hearing before suspension takes effect.

A community can automatically be suspended if, following due notice, it failed to adopt revisions to its floodplain ordinance in response to flood map revisions or amended minimum NFIP criteria. It can also be suspended within 30 days for knowingly making its ordinance non-compliant.

A community suspended from the NFIP may apply to the FEMA Regional Office for reinstatement by submitting the following:

- A local legislative or executive measure reaffirming the community's intent to comply with the NFIP criteria.
- Evidence that all program deficiencies have been corrected.
- Evidence that any violations have been remedied to the maximum extent possible.

FEMA may reinstate the community to full program status, bring it to a probationary status, or withhold reinstatement for up to one year after a satisfactory submission from the community.

2.6.4. Sanctions for Non-participation

A community that a) does not join the NFIP, b) has withdrawn from the program, or c) is suspended from it faces the following sanctions:

- Flood insurance will not be available. No residents will be able to purchase an NFIP flood insurance policy.
- If the community withdraws or is suspended, existing flood insurance policies will not be renewed.
- No direct federal grants or loans for development may be made in identified flood hazard areas under programs administered by federal agencies such as the Department of Housing and Urban Development, the Environmental Protection Agency, and the Small Business Administration. State agencies may also deny financial assistance for floodplain properties.
- Federal disaster assistance will not be provided to repair insurable buildings located in identified flood hazard areas for damage caused by a flood.
- No federal mortgage insurance or loan guarantees may be provided in identified flood hazard areas. This includes policies written by the Federal Housing Administration, the U.S. Department of Veterans Affairs, and others.
- Federally insured or regulated lending institutions, such as banks and credit unions, must notify applicants seeking loans for insurable buildings in flood hazard areas that:

- There is a flood hazard
- The property is not eligible for federal disaster relief

These sanctions can be severe on any community with a substantial number of buildings in the floodplain. Most communities with a flood risk have joined the NFIP and are in full compliance with their regulatory obligations.

3. How Flood Maps are Prepared

3.1. The Floodplain Mapping Effort

3.1.1. Map Accuracy

All communities lie within an area of flood risk, it is just a question of the level of flood risk. This can be described as high risk, medium-risk, or low-risk floodplains. To determine the level of flood risk that exists within a community, flood maps have been developed for all Iowa communities to show a community's risk of flooding, in particular the flood zone, floodplain boundaries, and base flood elevation (if determined). The accuracy of the flooding sources depicted on a floodplain map depends on the purpose for which it is prepared and the resources put into it. Some flooding sources are modeled and mapped to show approximate areas subject to flooding. Other flooding sources may need more detailed analysis and modeling with greater accuracy due to highly urbanized areas or to show the effects of a flood control project, which requires greater detail and, therefore, is more expensive to produce.

NFIP maps are prepared for communities, property owners, insurance agents, and lenders to determine flood insurance requirements, building code requirements, and floodplain management requirements. The NFIP insurance pricing approach is determined separately from the floodplain maps but still relies on the maps for the determination of mandatory purchase. The NFIP is implemented by the FEMA, which is funded to produce and update the nation's floodplain mapping. However, this funding is not endless, so NFIP maps do not always show flood hazards for every flooding source. In areas studied by approximate methods, the floodplain map does not provide published base flood elevations. It is possible for a community or a developer to conduct a study that might be more accurate or have more detailed information. Therefore, it is important to know how maps are prepared and the process for updating and revising them. How maps are prepared is the subject matter of this section. Updating and revising FEMA's maps to account for new information is covered in Section 6.

3.1.2. FEMA's Mapping Program

The National Flood Insurance Act of 1968 directed the FIA to:

- Identify all flood-prone areas within the United States
- Establish flood risk zones within flood-prone areas

The NFIP is managed by FEMA through its subcomponent, the FIMA. Federally backed flood insurance is made available to those communities that agree to regulate development in their mapped floodplains. In order to achieve this goal, FEMA funds flood studies and floodplain mapping to identify these floodplains. The flood studies analyze the terrain and the factors that affect flooding. This information is used to create maps that delineate the boundaries of the floodplain.

The initial flood study and mapping efforts of the NFIP were focused on identifying all flood risk areas within the United States. Using flood data and floodplain information from many sources—such as soils mapping, actual high water profiles, aerial photographs of previous

floods, topographic maps—the approximate outline of the 1% annual chance (100-year) floodplain for specific stream reaches was overlaid on available community maps, usually United States Geological Survey topographic quadrangle maps.

These first flood maps are known as FHBMs and most of them were based on approximate studies and had no BFEs established. The majority of communities used a FHBM when they first joined the NFIP.

Most communities have had their FHBM replaced by a FIRM. A FIRM is usually based on a FIS and includes flood elevations and other hazard information needed to better inform communities of flood risk. (See Sections 4 and 5 for more details on map products and their use.) These studies provide communities with the data needed to adopt and implement a comprehensive floodplain management program and to enter the **Regular Phase** of the NFIP.

Most communities in the NFIP have a FIRM, which may have areas mapped in detail, mapping based on an approximate study, or a combination of floodplains mapped using each approach. The areas mapped with an approximate study are typically those where there is little or no development and/or little expectation of new development when the mapping was completed.

Originally, FHBM and FIRMs were paper based maps developed on a community basis and did not include any information or coordination with areas outside of the community's jurisdiction. Starting in 2003, FEMA began an aggressive multi-year initiative to upgrade the country's flood maps. This included the goal of modernizing and digitizing the nation's flood maps on a county wide basis instead of by community. Future FEMA programs, such as Risk MAP, have built upon and enhanced the digital data created under Map Modernization. Today, all Iowa counties have digital countywide FIRMs that are readily available.

Additional studies likely have been conducted by other agencies, but FEMA's studies and maps are what a community must use as the minimum criteria for managing floodplain development. When a more accurate or detailed flood study is available, the community may wish to submit it to FEMA with a request for a Letter of Map Change (see Section 6 for more information).

3.2. Flood Study Terminology

Before describing how flood studies are developed, we first need to introduce some of the common terms used in floodplain analysis and by the NFIP. The following terms are integral for understanding the basis for flood studies and flood maps:

- The 1% annual chance flood (also known as the 100-year or base flood)

What is the Special Flood Hazard Area?

The SFHA is the land area covered by the floodwaters from the base flood (i.e., the flood having a 1% chance of occurring in any given year, also known as the "100-year flood"). It is the area where the mandatory purchase of flood insurance applies. The SFHA is shown the FIRMs.

- BFE
- The 0.2% annual chance flood (sometimes referred to as the 500-year flood)
- Special Flood Hazard Area (SFHA)
- FIRM
- FIRM Database
- FIS
- State review

3.2.1. The Base Flood

Floods come in many sizes—with varying degrees of magnitude and frequency.

Rivers and lakes are expected to flood, as all bodies of water have floodplains. But each river, each tributary of a river, and each lake is different, and each has its own probability of flooding. For each body of water, engineers assign a statistical probability of recurrence to different size flood events. A flood that is more likely to occur in any given year is assigned a higher probability. Larger events occur less frequently than smaller ones. See Figure 3-1 for more information.

In order to have common standards, the NFIP and the State of Iowa adopted the same baseline flooding probability, the 1% annual chance flood, for the purpose of regulating new development. The NFIP refers to this as the **base flood** since it represents the baseline flood used to map the SFHA boundaries. The predicted elevation representing the base flood event is called the BFE.

What Are the Odds of a "100-Year" Flood?

The term "*100-year flood,"* which is sometimes used to refer to the "*1% annual chance flood,"* has caused much confusion for people not familiar with statistics. It is the flood that statistically has a **1% chance of occurring or being exceeded in any year**. Another way of looking at it is to think of the odds that a base flood (1% chance) will happen sometime during the life of a 30-year mortgage (26% chance).

Chance of flooding over a period of time					
	Flood size				
Time period	10-year	25-year	50-year	100-year	500-year
1 year	10%	4%	2%	1%	0.2%
10 years	65%	34%	18%	10%	2%
20 years	88%	56%	33%	18%	4%
30 years	96%	71%	45%	26%	6%
50 years	99%	87%	64%	39%	10%

Even these numbers do not convey the true flood risk because they focus on the larger, less frequent floods. If a house is low enough, it may be subject to the 10- or 25-year flood. During the life of a 30-year mortgage, it has a 26% chance of experiencing a "100-year" flood, but the odds are 96% (nearly guaranteed) that it will experience a 10-year flood. Compare those odds to the 5% chance that a house will catch fire during the same 30-year mortgage.

Figure 3-1. Probability of flooding

The 1% annual chance flood was chosen as a compromise between a more frequent flood such as a 10% annual chance flood (10-year), which would permit excessive exposure to flood risk and a more infrequent flood such as a 0.1 % annual chance flood (1,000-year) flood, which would be considered excessive and unreasonable for the intended purposes of regulating new development and requiring the purchase of flood insurance.

To restate, the base flood refers to a flood that has a one percent chance of occurring or being exceeded in any given year. The terms **base flood** and **1% annual chance flood** are used interchangeably as they relate to NFIP requirements. Higher floodplain management standards are encouraged and are discussed in more detail in Section 13.

Technical Terms

Base flood = 100-year flood = 1% annual chance flood

Base Flood Elevation = 100-year flood level = 1% annual chance flood elevation

Base floodplain = 100-year floodplain = 1% annual chance floodplain = SFHA

While the odds of it occurring are more remote than for the 1% annual chance flood, the 0.2% annual chance flood (500-year flood) is the standard used for protecting critical facilities such as hospitals and power plants. However, several Iowa communities have adopted more stringent floodplain regulations that require new and substantially improved structures to be protected to one foot above the 0.2% flood elevation.

3.2.2. Special Flood Hazard Area

On FIRMs, the area that would be inundated by the base flood is called the SFHA. The SFHA is the area where the NFIP's floodplain management regulations must be enforced by the community and the area where the mandatory flood insurance purchase requirement applies. These correspond to high risk areas shown on the flood map beginning with the letters A or V.

Non-SFHAs are moderate to low-risk areas shown on a flood map that are shown as Zone X (shaded or unshaded). This risk of flooding is lower, but the risk still exists. Flood insurance is available but not mandatory in these areas. Some flood maps may also include areas where there are possible, but undetermined, flood hazards or unstudied areas. These are shown on flood maps as Zone D and are also considered non-SFHAs.

3.2.3. Flood Insurance Rate Map

The **FIRM** is the official map of a community on which FEMA has delineated the SFHAs, the BFEs, and the risk premium zones applicable to a community. This can include delineation of the 1% and sometimes the 0.2% annual chance floodplains and establishes BFEs for portions of the 1% annual chance floodplain that have been studied by detailed methods. It might also include the delineation of a regulatory "floodway" (explained in Section 3.3.6) for some detailed study stream reaches. The FIRM serves as the basis for rating flood insurance and for regulating floodplain development and carrying out other floodplain management measures.

3.2.4. Flood Insurance Rate Map Database

The FIRM database is used to store the digital Geographic Information Systems (GIS) data used in the FEMA map production process, as well as the tabular data information inside the FIS. The information within the FIRM database should be consistent with information presented on both the FIRM and the FIS. This database is the basis for the information displayed on the National Flood Hazard Layer.

3.2.5. Flood Insurance Study

The FIS report is the companion to the FIRM and FIRM database in the depiction and communication of regulatory flood hazard information. When a flood study is completed for the NFIP, the information and maps are assembled into a FIS report. A FIS is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community, which typically consists of an FIS report and FIRM.

Several variations of the FIS reports may be available to communities, depending on the effective date of their floodplain studies. Some older FIS (produced prior to 1985) include a separate Flood Boundary and Floodway Map that depicts (among other things) the regulatory floodway. Since 1985, the floodway and other flood study data have been included on the FIRM. These FIS reports were mainly community-based reports. Beginning with the FEMA Map Modernization program in 2003, the FIS reports were published on a countywide level and included unincorporated and incorporated areas in one report. In 2011, the FIS report format was updated to include a more tabular format to capture the flood study data and to align with information presented in the FIRM database. This format is still used today.

Regardless of the vintage of the FIS report, the overall contents of the report have not changed. The **FIS report** includes supplemental information about the technical analysis used to perform the flood study and a summary of the community's flooding history and flood hazard areas. Specific components of the FIS report include the following.

- The purpose of the flood study
- Floodplain management and insurance applications
- Area studied
- The engineering methods employed
- The mapping methods employed
- Contracted studies and community coordination
- Tables summarizing the data used to produce the FIRM and other relevant information
- Computed flood profiles for each detailed studied stream or tributary usually showing the recurrence probabilities for the 10%, 4%, 2%, 1%, 1%+ (if calculated) and 0.2% annual chance floods

Learn more about Flood Risk Products developed under FEMA's Risk MAP program through the following FEMA resource:

- *Flood Risk Products fact sheet*

As part of FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program, additional **flood risk tools** are being developed as part of many new flood studies, in addition to the standard FIRMs and FIS reports produced to support the regulatory requirements of the NFIP. These flood risk products and associated tools, which are not regulatory but intended to help communities better understand and plan for flood risk, consist of **flood risk datasets** and **flood risk products.** See Appendix 1 for more information about Risk MAP and flood risk products.

3.2.6. State Review

In Iowa, all new flood studies and revisions to studies, including those that will be used for regulatory purposes, are reviewed and approved by the DNR Land Quality Bureau. The purpose of this requirement is to ensure that:

- An adequate study was performed
- The DNR's study standards are followed
- Different studies on the same stream are consistent
- All map revisions to reflect stream modifications and flood control structures are based on projects that have been approved by the DNR

3.2.7. City of Independence/Buchanan County

Included in Section 26 is the FIS report for Buchanan County, Iowa, and Incorporated Areas. This countywide FIS includes one set of FIRMs for both the unincorporated areas of the county and all the incorporated areas, including the City of Independence. Section 26 also has excerpts from the FIRM and a street map for the City of Independence. Independence was chosen as a case study because it provides succinct examples of the features in a detailed FEMA FIRM and FIS report.

Note that the FIRMs typically do not show or name streets away from the floodplain because such details are not needed for floodplain management. FEMA maps also may not show streets in new subdivisions that were platted after the FIRM was published.

3.3. Riverine Flood Studies

Detailed flood studies are conducted differently for different types of flooding, such as:

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

As noted in Section 1, there are other types of flooding, such as ice jams, levee failures, and dam failures. This section does not cover how these areas are studied because each situation is unique.

Riverine flooding is the most prevalent flood hazard that is depicted in the FEMA flood studies within Iowa and occurs in rivers, streams, ditches, or other waterways that are subject to overbank flooding, flash floods, and urban drainage system flooding. Riverine studies involve the collection and analysis of information about the river's watershed, the topography of the land along the river, precipitation, and the characteristics of the river itself.

For purposes of riverine flood studies, the study of the watershed's behavior is called **hydrology,** and the study of the river or stream's behavior is called **hydraulics**. The results of a riverine study are flood depths and/or flood profiles, which are used to define the SFHA.

3.3.1. Hydrology

Hydrology is the science dealing with the distribution and circulation of water in the atmosphere, on land surfaces, and underground, and is used to determine flood flow frequencies. The study of a watershed's behavior during and after a rainstorm is, therefore, hydrology. A hydrologic analysis determines the amount of rainfall that will stay within a watershed—absorbed by the soil, trapped in puddles, etc.—and the rate at which the remaining amount of rainfall will reach the stream.

The rainfall that reaches the stream is called **runoff**. The rate at which the runoff reaches the stream and flows downstream is known as the **flood discharge**. Discharges are measured in cubic feet per second or "**cfs**". For perspective, a cubic foot of water is about 7.5 gallons, and one cubic foot per second is about 450 gallons per minute.

Hydrologic conditions for a studied water course should be evaluated on a watershed basis and not be limited by manmade or political boundaries. Several hydrologic methodologies are available to determine the flood discharge for a water course. The three types that are traditionally used in the development of flood studies for the FIS reports are rainfall-runoff analysis, stream gage analysis, and regression analysis.

Runoff-runoff models convert a spatial and temporal description of a given frequency storm event over a watershed into a flood flow hydrograph at a specific concentration point, normally an outlet. The discharge rates vary depending on soil type, ground slope, land use, and the presence of storm sewers or drainage tiles. In general, more runoff occurs on unforested land, on paved and built on urban land, and on steeper slopes. Computer models, such as HEC-1 or HEC-HMS from the U.S. Army Corps of Engineers' (USACE) Hydrologic Engineering Center, allow engineers to incorporate rainfall and snowmelt data, along with numerous watershed characteristics, into the hydrologic analyses used to determine the 1% annual chance flood discharge. Numerous other hydrologic models can be used to analyze these situations but only models accepted by FEMA can be used for the development of hydrology in support of floodplain studies. These accepted models are shown on the link Numerical Models Meeting the Minimum Requirements of the National Flood Insurance Program | FEMA.gov.

For larger watersheds, stream gage analysis utilizing river gages with many years of historical flood records are generally the best source of data to use for estimating infrequent floods like the 1% annual chance flood event. River gage records are used where they are available. In order to use them, the hydrologist must make sure that conditions upstream of the gage have not changed significantly during the length of the gage records. Changes such as the construction of upstream dams, levees, and even new development may cause the gage record to be unusable.

Where river gage records are not available or are unusable, and where use of the previously described rainfall-runoff methods is impractical because of the size of the watershed or scope of the flood study, other hydrologic methods must be used to determine the 1% annual chance flood discharge. These include regional regression equations provided by the U.S. Geological

Service (USGS). For Iowa, the latest documentation on current regression equations as well as an application to determine flows based on regression equations can be found at the USGS website (Iowa StreamStats | U.S. Geological Survey (usgs.gov)).

Upon completion of the hydrologic analysis, engineers have flood discharges for various frequency events that are measured at different points along a stream, such as at the confluence with another stream and at the mouth of a tributary stream.

3.3.2. Terrain Data

All flood studies examine the areas through which floodwater will flow. This requires a determination of ground elevations and obstructions (such as buildings, bridges, and other development) for these areas. Accurate data on the shape of the stream and changes in the floodplain are obtained from field surveys, aerial photo maps, topographic maps, or Light Detection and Ranging (Lidar) data. Sometimes the elevation values are shown as a Digital Elevation Model (DEM), which is a representation of continuous elevation values at regularly spaced or gridded intervals. The DEMs are created as a product of the lidar collection and are useful in both 1D and 2D analyses.

> ***Lidar System—****A laser system that acquires x, y, and z coordinates of terrain and terrain features that are either human-made or naturally occurring. Lidar systems consist of Global Positioning System (GPS) with attendant GPS base station(s), an Inertial Measuring Unit, and a light-emitting scanning laser.*

To locate the true elevations at a site, surveyors have established elevation reference marks or benchmarks that are referenced to a common vertical elevation reference called a **datum**. Using a datum ensures a uniform standard and helps avoid the confusion of using different vertical reference points in adjacent areas.

While there are some benchmarks set by federal agencies, most of them are established by private surveyors and local agencies. Local reference marks usually relate to a national datum (see “About Datums and Elevations” on the following page), but some may not. It is important to double check that the datum used in your community for elevation reference marks is the same datum used for the flood elevations in the FIS.

There are two datum used for almost all FEMA flood studies: the National Geodetic Vertical Datum of 1929 (NGVD 29) or the North American Vertical Datum of 1988 (NAVD 88). NAVD 88 is used for all new flood studies produced by FEMA. If elevations are not in the same vertical datum, they must be converted before making any comparison between the field surveyed elevations and the elevations shown in the FIS. Datum conversion between NGVD 29 and NAVD 88 can easily be performed using the National Oceanic and Atmospheric Administration’s (NOAA’s) NGS Coordinate Conversion and Transformation Tool (NCAT) conversion tool.

About Datums and Elevations

During the 1920s, the U.S. government created a network of 21 tidal gauges in the U.S. and 5 in Canada to provide a fixed continental datum that would bring a consistent relationship to all vertical determinations in the U.S. This new datum was known as the National Geodetic Vertical Datum of 1929 (NGVD 29) and is the base elevation to which all relief features and elevation data were referenced in the contiguous United States. NGVD 29 is also the datum of reference for older FEMA flood studies.

To eliminate inconsistencies caused by assuming that 0 feet NGVD 29 was the same as mean sea level at all 26 tidal stations (which it is not), a new and more accurate datum was developed known as the North American Vertical Datum of 1988 (NAVD 88). Elevations for newer flood studies are now based on NAVD 88.

Most permanent elevation reference marks (or bench marks) are referenced to either NGVD 29 or NAVD 88. Bench marks can be brass caps, chiseled squares, permanent nails, or other designated markers left by surveyors. The city or county surveyor or engineer's office usually has a list of bench marks in a local community. The National Geodetic Survey also maintains a listing of many bench marks that can be accessed at http://www.ngs.noaa.gov.

Established reference marks and bench marks with a recorded elevation allow surveyors to describe the changes in the ground levels or stream characteristics as elevations. They are also used by surveyors to determine the elevations of buildings that are at risk of flooding.

A **cross section** is a graphical depiction of the stream channel and the floodplain at a particular point along the stream. It is taken at right angles to the direction of flow of the stream. At each cross section, the engineer has accurate information on the size of the channel, the shape of the floodplain, and the changes in the elevation of the ground. A typical surveyed cross section is shown in Figure 3-2.

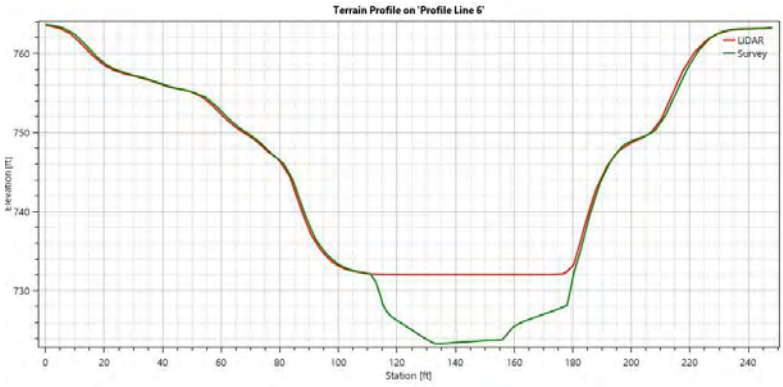


Figure 3-2. Surveyed cross section

Cross sections are taken of the floodplain at locations along the stream that are representative of local conditions. They are taken at each bridge or other major obstruction and at other locations, depending on how much the stream or adjacent floodplain conditions change. Traditionally, several cross sections are taken for structures, such as bridges, to represent the upstream and downstream conditions to better represent these structures in the modeling.

Cross sections are shown on FIRMs (see Figure 3-3) with a line and a letter in a hexagon at each end. Generally, the more changes there are in topography (e.g., steep riverbanks changing to large flat overbank areas or meandering streams), the more cross sections are needed to define the floodplain accurately. For example, in the City of Independence, the

mapping partner developed a cross section at the 2nd Street bridge (Wapsipinicon River, cross section J) to be sure that the bridge is reflected in the flood study.

Cross sections are also shown on the stream profile within the FIS and are consistent with the location on the FIRM. Cross sections enable a profile user to quickly associate stations on the profile with locations on the FIRM and data in the Floodway Data Table (FDT) in the FIS.

The surveyors and engineers also estimate the roughness factor along the floodplain to determine how fast floodwater will flow through the area. Roughness factors, normally referred to as Mannings "n" values, are related to ground surface conditions, and they reflect changes in floodwater velocity due to ground friction. For example, water will flow faster over mowed grass and pavement than it will over an area covered in bushes and trees or planted in tall crops.

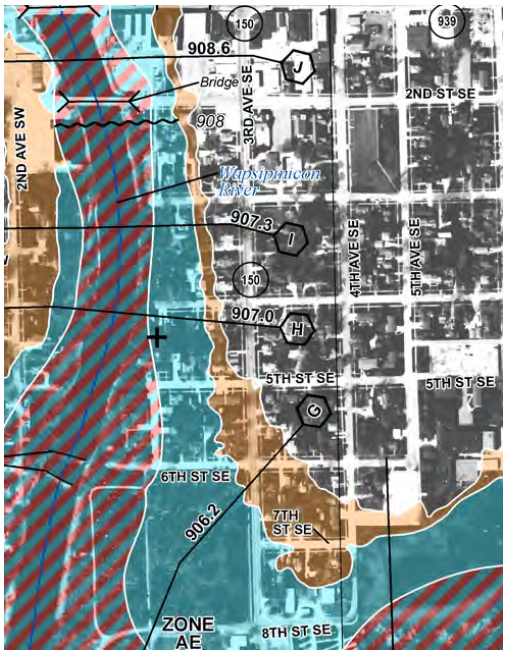


Figure 3-3. Cross sections on a FIRM

A portion of the collected survey information is used in the hydrologic analysis, but the surveyed cross sections and other survey information are the building blocks of the hydraulic analysis and mapping effort.

3.3.3. Hydraulics

For purposes of floodplain analysis, hydraulics is the study of floodwater moving through the stream and the floodplain. Hydraulic analysis combines:

- Flood hydrology (i.e., the discharges).
- The cross section data to define how much area there is to carry the flood for 1-dimensional (1D) hydraulic analysis.
- The DEM, which defines the gridded cells for analyzing how much volume is available at a particular location for conveyance of the base flood event in a 2-dimensional (2D) hydraulic analysis.
- Stream and floodplain characteristics— "roughness" or Mannings "n" values, slope, location, and size of structures. Water will flow faster where the slope is steeper and the floodplain is "smooth" (e.g., where there are no trees, buildings, or other obstructions to cause turbulence). Development can change these characteristics, which can change both the hydrology and the hydraulics of a flood.

The data are usually processed using a computer model, most commonly HEC-RAS, which was developed by the USACE Hydrologic Engineering Center. Other models may be utilized but for recognition by FEMA floodplain analysis and mapping, the models need to be approved by FEMA. A list of hydraulic models approved by FEMA can be found here.

The 1D hydraulic study produces **water surface elevations**, velocities, and floodplain widths at each cross section for a range of flood flow frequencies (see Figure 3-4). These elevations are the primary source of data used by engineers to map the floodplain. For more information on the methods used to map the floodplain, see Table 12 of the Buchanan County, Iowa, and Incorporated Areas FIS in Section 26.

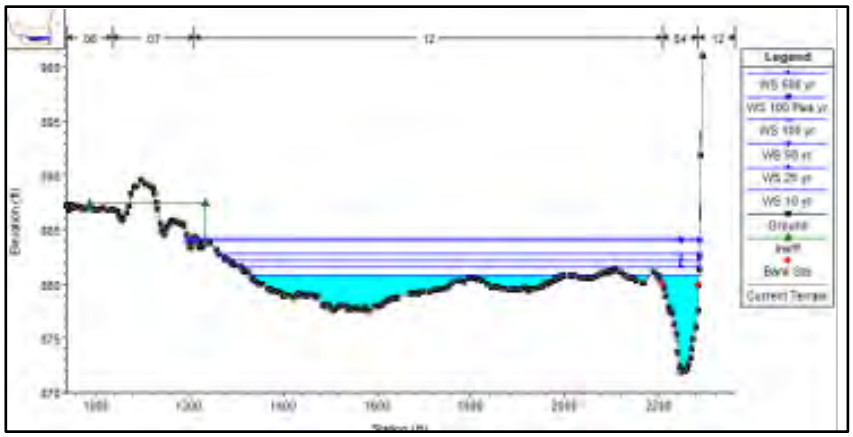


Figure 3-4. Cross section with flood elevations

An FIS usually produces water surface elevations for the 10%, 4%, 2%, 1%, 1%+ (when calculated), and 0.2% annual chance floods, although some studies may just show the 1% annual chance flood. Elevations for the other frequency floods are typically used for varying floodplain management purposes. For example, the 2% annual chance flood data may be used for designing bridge and culvert openings, and the 0.2% annual chance flood for siting critical facilities.

3.3.4. Flood Profile

The hydraulic analysis will produce a flood elevation at each cross section, but flood elevations at locations between the cross sections need to be determined as well. This is done by producing a graph of the flood elevations along the centerline of a stream called a **flood profile**.

Located in Section 26 is the FIS for Buchanan County, Iowa, and Incorporated Areas, which includes the City of Independence. The flood profiles are found in the back of the FIS report. There are two waterways studied in detail but there are five profile sheets since the profile for Malone Creek extends onto two pages (01P and 02P), while the profile for Wapsipinicon River extends onto three pages (03P, 04P, and 05P).

The bottom of the flood profile (the horizontal axis or x-axis) shows the distance along the stream, which is commonly called **stationing**. When profiles are plotted, the slope of the stream profiles will rise as the graph is read from left to right (i.e., downstream-to-upstream).

River distances are measured in either feet or miles and are measured from the centerline of the stream or profile baseline. The profile baseline shows the path of flood flows on the FIRM and is an accurate representation of the distance between cross sections, structures, or nodes

in the hydraulic model. For most profiles, the distance is measured above the mouth of the stream or above its confluence (where it meets with another stream). However, there are other starting points that can be referenced, such as a road crossing, a dam, or some other easily identified point of reference. Note that a profile distance should not be measured from a political jurisdiction boundary, as these may change, but some instances may still exist within the FIS of some counties.

One example of a stream measured from a political jurisdiction is shown in Buchanan County, included in Section 26. The downstream limit of the detailed study for the Wapsipinicon River is approximately 138 feet upstream of the City of Independence community boundary. Therefore, the profile's stationing starts at the downstream end of the study, which is 138 feet upstream of the City of Independence community boundary.

The left and right sides of the graph (the vertical axis or y-axis) show the elevation in feet NAVD datum (or NGVD for older studies). The legend at the bottom right corner shows the symbol for each flood profile plotted (see Figure 3-6). Bridges are indicated with an "I" shape symbol, which represents the distance from the bridge's low chord (lowest beam) to the top of the roadway (see Figure 3-5).

Additional information is provided on the profiles, including corporate limits, the locations of culverts, and confluences with smaller streams. Profiles also provide a picture of stream characteristics, such as steep sections of the stream bed and where restrictive bridge openings cause floodwaters to back up.

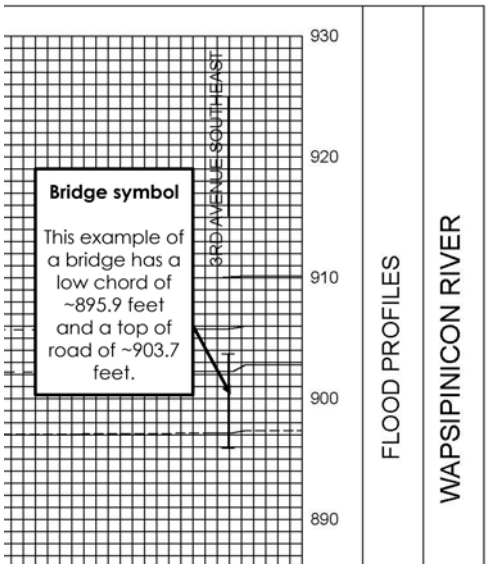


Figure 3-5. Profile showing bridge symbol

Figure 3-5 and Figure 3-6 show profile page 03P for Wapsipinicon River. Note the "I" for the 3rd Avenue Southeast bridge and how flood heights back up upstream (to the right) of the bridge. You can see how the bridge affects, to some degree, all flood profiles behind the bridge. This is because the bridge opening does not have sufficient area to convey the flood events without some floodwater backing up behind the bridge.

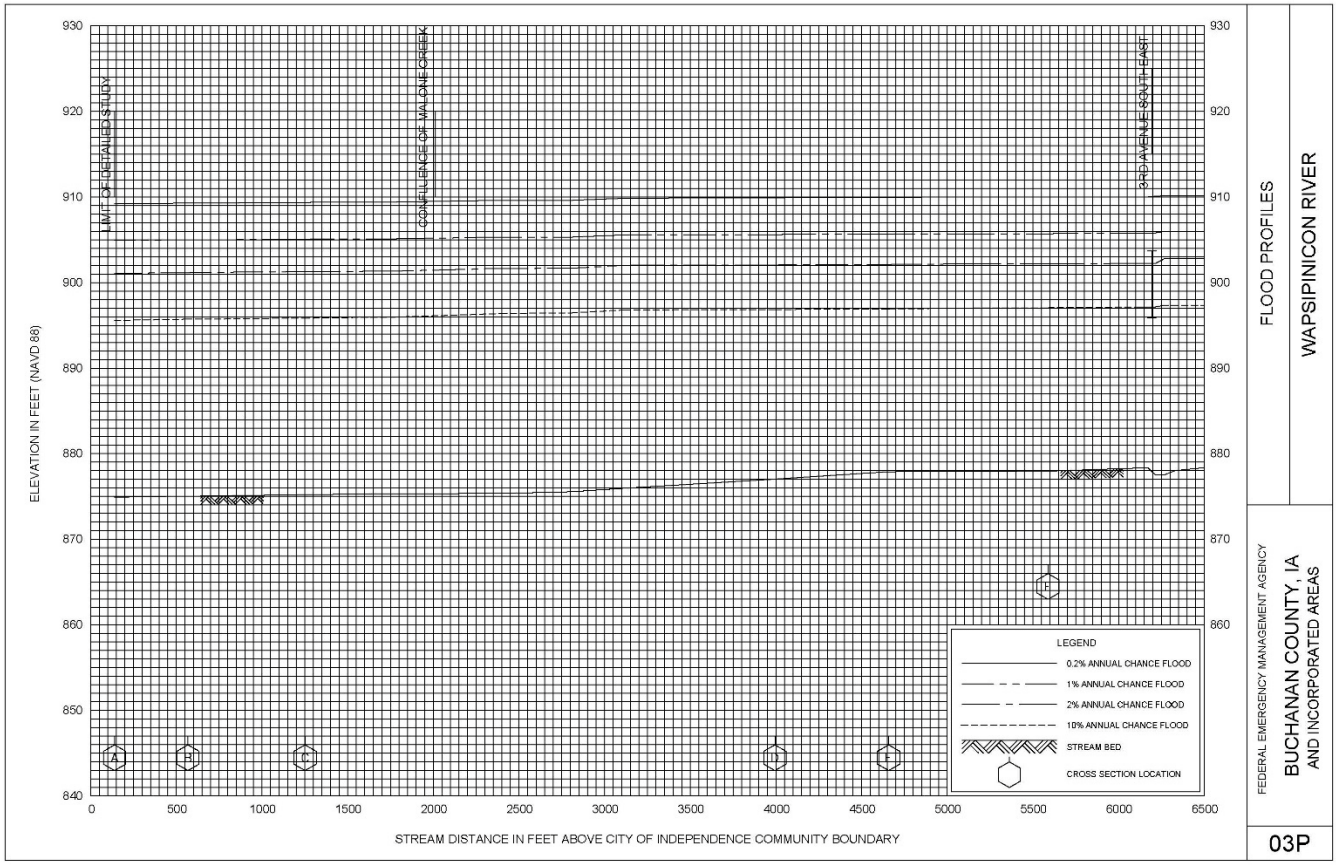


Figure 3-6. Flood profile for Wapsipinicon River

By reading a profile, the flood elevation at any point along the stream can be determined. This information should be consistent with flood elevations and delineation on the FIRM. Reading profiles is covered in Section 5.

3.3.5. Floodplain Mapping

The next step in developing the flood study is to map the flood profiles generated by the hydraulic modeling program using the best available topographic data. The more detailed the topographic data is used the more accurate the mapped floodplain boundaries will be. Some communities have collected their own topographic data and provided it to FEMA for use in the floodplain mapping process. Between 2019 and 2021, the State of Iowa collected high-quality topographic data for the entire state using lidar technology.

3.3.6. Floodway Analysis

The final step in preparing most riverine flood studies is to produce the floodway analysis and map the regulatory floodway, which identifies where encroachment by development can and cannot be allowed.

The **floodway** is defined as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (normally one foot

unless the community regulates to a higher standard). Floodwaters generally are the deepest and swiftest in the floodway, and anything in this area is at the greatest risk during a flood.

The remainder of the floodplain is called the **floodway fringe** (see Figure 3-77) where water may be shallower and slower. NFIP minimum standards provide that areas outside the boundaries of the floodway can be developed. Consequently, most communities permit development in the floodway fringe if the development is elevated or otherwise protected to the 1% chance flood level (or any higher State or local standards).

A floodway analysis establishes the boundaries of the floodway or "encroachment limits" using these floodplain management concepts:

- Properties on both sides of a river or stream should be treated equitably. The degree of obstruction permitted now for one side of the river should be permitted in the future on the other side.
- An increase in the 1% annual chance flood elevation will not exceed one foot as a result of encroachment along the floodway.
- To the extent feasible, the floodway encroachment limits will be located to limit impacts to existing structures. However, continued development in the floodplain will likely further obstruct flood flows which will back water up or divert it other properties.

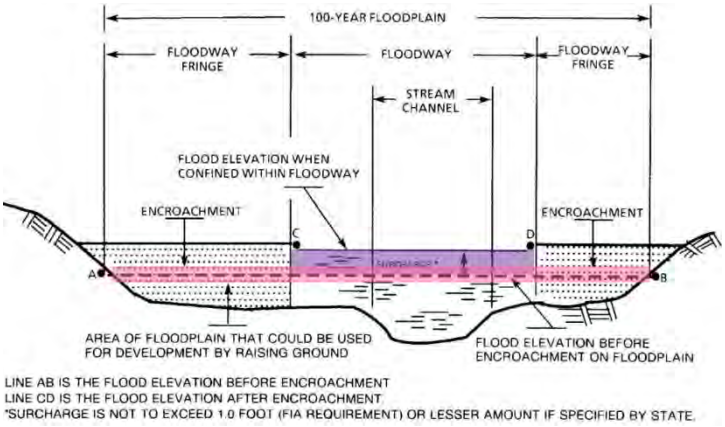


Figure 3-7. Floodplain cross section and floodway map

A floodway analysis is performed using a hydraulic modeling program, such as the USACE's HEC-RAS program, which can make the necessary calculations of the effects of further development. Beginning at both edges of the floodplain, the computer model starts "filling" the floodplain. This proportionally "squeezes" the floodwater toward the channel and causes the flood level to rise. At the point where this process reaches a 1-foot rise, the floodway boundaries are drawn (see Figure 3-8).

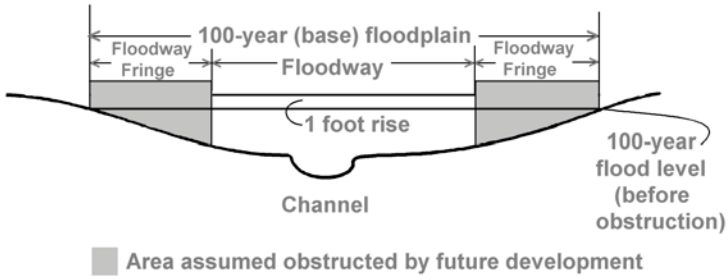


Figure 3-8. Computer floodway analysis

Not every cross section will show exactly a 1-foot rise. Topographic conditions and the need to "smooth out" the floodway line will result in some cross sections having surcharges of less than one foot.

Allowing flood heights to rise to one foot is a compromise standard. Prohibiting any rise in flood heights would prohibit most types of development in the floodplain area. On the other hand, allowing development to cause greater increases in flood heights will increase flood risk for others.

A floodway analysis should be prepared with close coordination between the modeling engineer and those who are responsible for community planning and floodplain management.

The number of possible floodway configurations can seem limitless. Therefore, in choosing a regulatory configuration, the interests of individual property owners and the community as a whole should be considered.

3.3.7. State Review

When a flood study is completed, it is sent to the DNR's Land Quality Bureau for the State review. The DNR reviews the discharges, 1% annual chance flood elevations, and floodways for regulatory use.

3.4. Other Flood Studies

3.4.1. Lacustrine Flooding of Lakes and Ponds

Lakes, ponds, and other large depressions can be modeled and shown in several ways. Traditionally, a hydrologic study is conducted (such as a rainfall-runoff modeling or gage analysis) for the determination of the inflow and static water surface elevations. For small lakes and ponds, they may be included directly into the hydraulic routing model, such as HEC-RAS, especially if the lakes and ponds have limited or no flood storage capabilities.

For larger lakes and ponds, they may be entirely modeled by hydrologic methods to determine the runoff contributing and to determine the flood storage characteristics to determine a static BFE. These studies may be used in conjunction with other hydraulic models if the flood waters are to be routed downstream.

Most lakes that are analyzed for NFIP purposes will be mapped on the FIRM with a static BFE, shown in parentheses below the flood zone. These BFEs can be a whole foot or shown to the tenth of a foot. Where studies have been carried out for lakes and ponds, information on the BFE is contained in the FIS under Table 10: Summary of Non-Coastal Stillwater Elevation Table and is shown to the nearest tenth of a foot.

3.4.2. Shallow Flooding Studies

For the NFIP, **shallow flooding** is defined as flooding with an average depth of one to three feet in areas where a clearly defined channel does not exist. Shallow flooding can exist in any of the following situations:

- **Ponding:** In flat areas, where water collects or ponds in depressions.
- **Sheet flow:** In steeper areas where there are no defined channels or on flat plains where water will spread out over the land surface.

- **Urban drainage:** Local drainage problems can be caused where runoff collects in yards or swales, or when storm sewers back up.

For the purposes of the NFIP, shallow flooding is distinguishable from riverine flooding because it occurs in areas where there is no channel or identifiable flow path.

In older flood studies, shallow flooding may have been mapped based on historic flood experiences and a study of the topography. Currently, all floodplains shown on the FIRM should have an analysis as the basis of the floodplain delineation and elevations or depths. For shallow flooding, the same techniques used for riverine studies are used. The result will either be a 1% annual chance flood elevation (i.e., in NAVD or NGVD) or a 1% annual chance flood depth (i.e., in feet above the ground). A shallow flooding study usually delineates the inundation area for the 1% annual chance flood elevation, but not for other flood frequencies.

These areas are usually designated on the FIRM as an “AH” Zone (elevation referenced to NAVD or NGVD) (see Figure) or an “AO” Zone (flood depth shown above existing ground). Note that if the average depth of the shallow flooding area is less than one foot, FEMA will not map this as an SFHA and may show this as a moderate flood risk or a Zone X shaded area. Therefore, a FIRM probably does not show all areas prone to shallow flooding in a community.

Figure 3-9. AH Zones on a FIRM

3.4.3. Approximate Studies

Detailed flood studies are expensive to produce, so it is not cost effective to perform a detailed study in watersheds where there is little or no development or where none is anticipated, such as in many rural areas.

Many NFIP maps show floodplains that were mapped using approximate study methods. These approximate flood hazard areas are designated as Zone A on the FIRM. While approximate flood zones are part of the SFHA, BFEs are not established for those areas. In the past, approximate flood zones were determined using a variety of data sources, including soils maps, actual high water profiles, aerial photographs of previous floods, and topographic maps. Currently, all approximate studies must be produced using hydrologic and hydraulic methods. Approximate flood zones have frequently been delineated using hydrologic and hydraulic modeling methods similar to those used for detailed studies, but do not involve the level of accuracy needed to satisfy the NFIP’s standards for an FIS.

3.4.4. Two-Dimensional Studies

Due to advances in technology and computing, the use of two-dimensional (2D) models has become more prevalent in addressing floodplain issues and has been incorporated into FEMA

floodplain studies. These 2D models can range from approximate studies to detailed studies, but the methodology is traditionally the same.

For 2D models, the flood is typically routed through a mesh or grid that calculates flow in multiple directions. Each mesh is comprised of elements such as a 10-foot by 10-foot square representing a typical elevation. These types of analyses and models are often capable of providing much more detailed output than a 1D analysis. Profiles can also be generated or extracted along the stream centerline for these 2D studies, but the water surface elevations along the profile may vary significantly from nearby mesh elements. Figure 3-10 shows an example of a 2D model floodplain that illustrates where approximating the BFE along the profile baseline would produce an inaccurate estimate at locations farther away from the profile baseline.

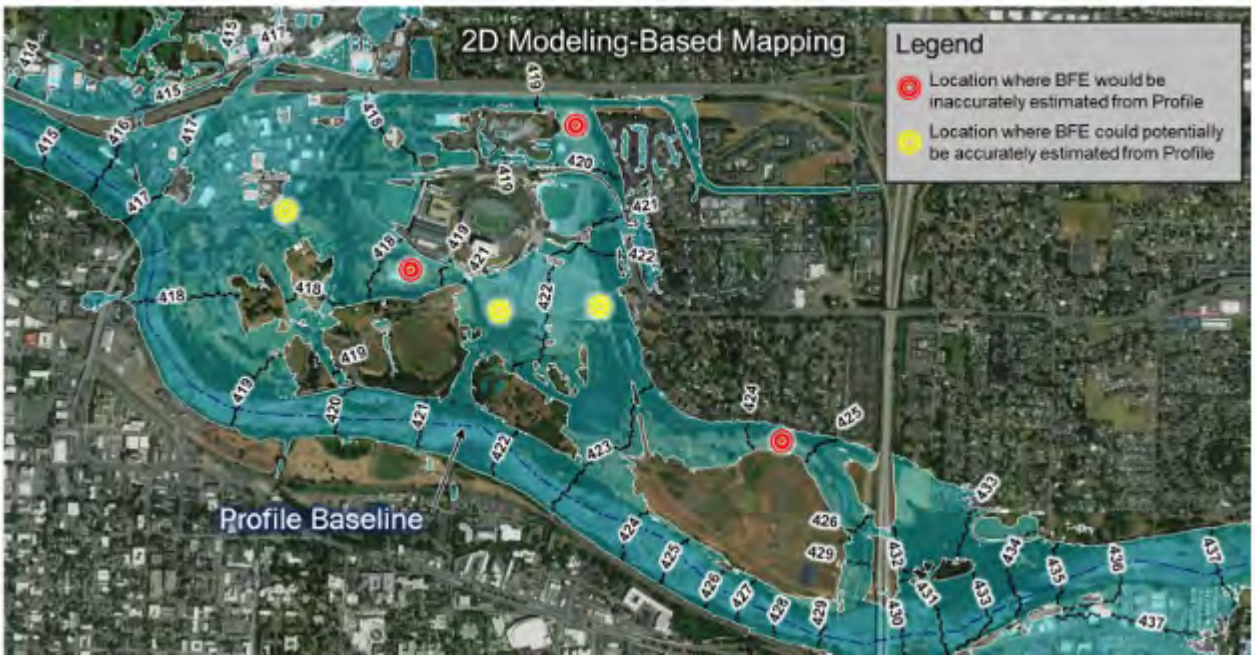


Figure 3-10. 2D Analysis Floodplain Mapping

To combat this, the use of BFEs is extremely important for determining the elevation at a site located within the overbanks and away from the profile baseline. In most 2D flood studies, the profile is not published, and the user may need to rely on an annotated grid published in the FIS or solely on the BFE placement on a FIRM for determining the regulatory elevations for a site.

3.4.5. Floodway Analysis

FEMA guidelines and standards are currently being updated in the context of 2D analyses, and users should check the FEMA website for the latest direction on these analyses. For additional information on floodways and 2D floodways in Iowa, please refer to Section 10 of this document.

4. NFIP Maps

4.1. Types of Maps

4.1.1. Introduction

As the NFIP has evolved, so have the flood map products used for it. The first flood maps published in the early days for the NFIP were intended to provide only a rough approximation of the flood risk areas within individual communities. Over the years, the quality and complexity of flood map products increased, with the latest generation of FEMA flood map products being produced under the Risk Mapping, Assessment, and Planning (Risk MAP) program, providing seamless digital flood hazard information for an entire watershed. While the uses for earlier map products were primarily land use regulation and insurance, the new products include a number of non-regulatory flood risk tools that can assist communities with flood risk assessment and mitigation planning efforts.

While all Iowa communities have access to the latest FEMA digital flood map products, the historic FHBMs and FIRMs are available on the FEMA Map Service Center (MSC) and may be helpful in leveraging to trace the history of a floodplain determination or a study. For this reason, this section explains each of the various flood map products that have been historically produced and those that still may be used by Iowa communities.

4.1.2. Flood Hazard Boundary Map

FHBMs were initially prepared to provide an identification of flood risk for many communities in a short period of time. They were published in the 1970s and early 1980s without benefit of detailed studies or hydraulic analyses for more than 21,000 flood-prone communities in the nation. In most cases, they were intended for interim use until more detailed studies could be performed for communities.

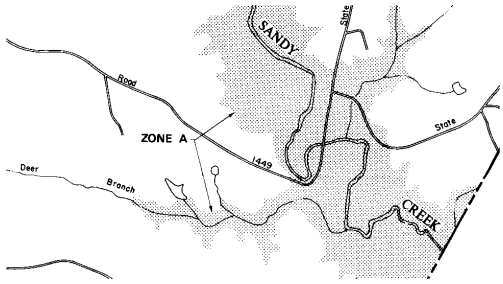
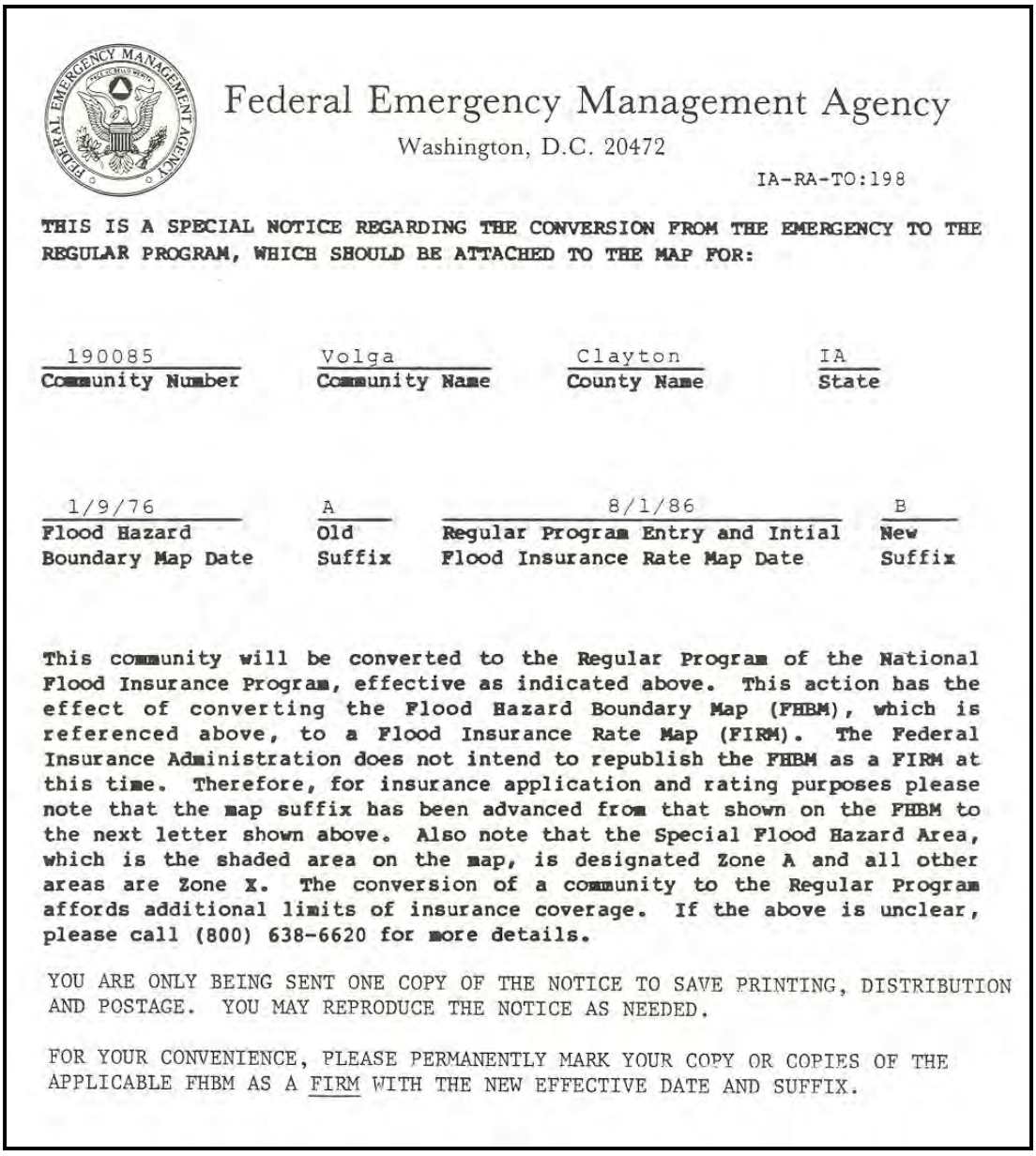


Figure 4-1. Flood Hazard Boundary Map

On the FHBM, the SFHA is designated as a shaded area labeled “Zone A”, and no BFEs are provided (see Figure 4-1).

In some cases, FEMA simply converted the FHBM to a FIRM by issuing a letter to the community stating that the FHBM shall be considered a FIRM without printing a new map. This process is called a “special conversion”—converting the community from the Emergency Phase to the Regular Phase of the NFIP. (These phases of the NFIP are discussed in Section 2.4).

Figure 4-2 is a sample of a special conversion letter for the City of Volga. The letter tells the community that FEMA is not reprinting its map but asks the Administrator to permanently mark the “FHBM as a FIRM with the new effective date and suffix”. In these situations, Zone A is treated the same as an approximate A Zone on the FIRM.



Federal Emergency Management Agency

Washington, D.C. 20472

IA-RA-TO:198

THIS IS A SPECIAL NOTICE REGARDING THE CONVERSION FROM THE EMERGENCY TO THE REGULAR PROGRAM, WHICH SHOULD BE ATTACHED TO THE MAP FOR:

190085	Volga	Clayton	IA
Community Number	Community Name	County Name	State

1/9/76	A	8/1/86	B
Flood Hazard Boundary Map Date	Old Suffix	Regular Program Entry and Intial Flood Insurance Rate Map Date	New Suffix

This community will be converted to the Regular Program of the National Flood Insurance Program, effective as indicated above. This action has the effect of converting the Flood Hazard Boundary Map (FHBM), which is referenced above, to a Flood Insurance Rate Map (FIRM). The Federal Insurance Administration does not intend to republish the FHBM as a FIRM at this time. Therefore, for insurance application and rating purposes please note that the map suffix has been advanced from that shown on the FHBM to the next letter shown above. Also note that the Special Flood Hazard Area, which is the shaded area on the map, is designated Zone A and all other areas are Zone X. The conversion of a community to the Regular Program affords additional limits of insurance coverage. If the above is unclear, please call (800) 638-6620 for more details.

YOU ARE ONLY BEING SENT ONE COPY OF THE NOTICE TO SAVE PRINTING, DISTRIBUTION AND POSTAGE. YOU MAY REPRODUCE THE NOTICE AS NEEDED.

FOR YOUR CONVENIENCE, PLEASE PERMANENTLY MARK YOUR COPY OR COPIES OF THE APPLICABLE FHBM AS A FIRM WITH THE NEW EFFECTIVE DATE AND SUFFIX.

Figure 4-2. Special conversion letter

Note that the majority of Iowa (including the City of Volga) has updated FIRMs and is not covered by special conversion. The example is for historical context.

4.1.3. FIRMs and FBFMs

As discussed in Section 3, FISs that were published prior to 1985 included, in addition to the FIRM, a separate map panel called the **Flood Boundary and Floodway Map** (FBFM), which showed, among other things, the regulatory floodway. The reason for this is that, prior to 1985, the FIRMs were designed for use by insurance agents and lending institutions, while the FBFMs were intended for floodplain regulation purposes. For FIRMs produced after 1985, all floodplain boundary information, including the floodway, is presented on the FIRM.

Starting in 2003, FEMA began an aggressive multi-year initiative to upgrade the country's flood maps. This included the goal of modernizing and digitizing the nation's flood maps on a county wide basis instead of by community. This also updated the format of the FIRM maps to add color and consistency to the mapping applications. The FIRM format was updated again in 2011 during the FEMA Risk MAP initiative to be more user-friendly and align more with the digital vision.

As all Iowa communities have FIRMs, this section will focus on the information relevant to the FIRM format, though a lot of the items discussed also pertain to FHBMs.

4.2. General Map Features

Flood maps are prepared with an Index Map, which shows the panel layout and panel numbers for the entire county. The index will also include all incorporated areas as well as watershed divides, streams, and major roads. Each map panel also contains similar general features or elements that include:

- The community name and NFIP number
- A title block
- An effective date or revision date information
- Map panel information
- A map scale to relate horizontal distance on the ground to distance on the map
- An arrow pointing north on the map
- Bench marks
- Notes to Users containing basic information on the use of the map and how it was developed (see Section 4.2.7)
- A legend (or key) to identify the features shown on the map, including FIRM zones

Note that for FIRM panels funded in 2011 or later, the notes to users, map legend, and FIRM index are located in the FIS report, in addition to on the FIRM panel itself.

In this section, we will discuss the map index, map scale, direction, bench marks, and other map features.

4.2.1. Map Index

Prior to the mid-1990s, FEMA typically produced flood map products for each individual community. Many communities were small enough geographically that their flood hazard areas fit on one map panel. An example is the original FIRM for City of Independence, effective date October 18, 1988 (see Figure 4-4). In these situations, no map index was printed, and the title box of the FIRM included the words "Only Panel Printed".

But, many communities, especially counties, are geographically too large to fit on one map panel at a usable scale. Beginning in the late 1990s and early 2000s, FEMA started replacing some of the earlier maps with countywide mapping products that include all the communities within the county boundaries. Starting in 2003, FEMA began a national effort to upgrade the country's flood maps, which included incorporating the community-based maps into a countywide format. One of those communities is the City of Independence, which is now included in the countywide FIRM for Buchanan County.

The map index is included in the FIS report for current FIRM formats but can also be found on the FEMA MSC. In addition, as all FIRM information is also digitally captured in the FIRM database and National Flood Hazard Layer (NFHL), a map index may not be needed as the panels and floodplain information for a community, or an address, can be found digitally. Additional information on how to locate a site using these tools is discussed in Section 5.2.1 of this reference.

The map index shows the community's boundaries, highlighting prominent features such as major highways, railroads, and streams. For updated studies funded in 2011 or later, the FIRM index will also show watershed boundaries. The map index shows how the community is displayed on various panels. Panels that are not printed (often due to being all one flood zone or having no flood hazards identified) are identified with an asterisk ("*") following the panel number. The specific reason the panel is not printed (such as No SFHAs Identified) will be identified on the index, usually at the bottom left or right. For FIRMs funded before 2011, the index for a countywide map product also includes a "Listing of Communities" and the "Map Repository" locations for each community. For FIRMs funded in 2011 or later, the Listings of Communities and Map Repository locations are shown in the FIS report as Tables 1 and 30, respectively. An example is shown in Figures 4-6 and 4-7, and other information is shown by the example in Figure 4-5. For very large counties, there may be more than one index panel in order to show the entire county at a usable scale.

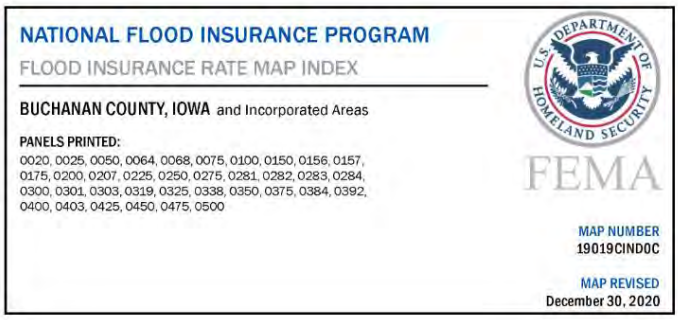


Figure 4-3. Map index for Buchanan County, Iowa, and Incorporated Areas

Figure 4-5 is from the map index for the Buchanan County FIRM. As previously mentioned, in the initial community-based FIRM and FIS, the City of Independence was included on one map panel. Because of the panel scheme and map scale for the most recent Buchanan County FIRM, the corporate boundaries and SFHA for the City of Independence now extend onto seven separate FIRM panels (see Figure 4-5).

The map panel numbers for each panel printed appear in the title block of the index (see Figure 4-3 - "PANELS PRINTED: 0020, 0025, 0050, 0064, 0068, 0075, 0100, etc".). For a countywide map product, the "Listing of Communities" table (see Figure 4-6) included in the FIS can be used to find the map panels that apply to an individual community. For example, for December 30, 2020, the FIRM for Buchanan County, the City of Independence, is shown on FIRM panels 0281, 0282, 0283, 0284, 0300, 0301, and 0303.

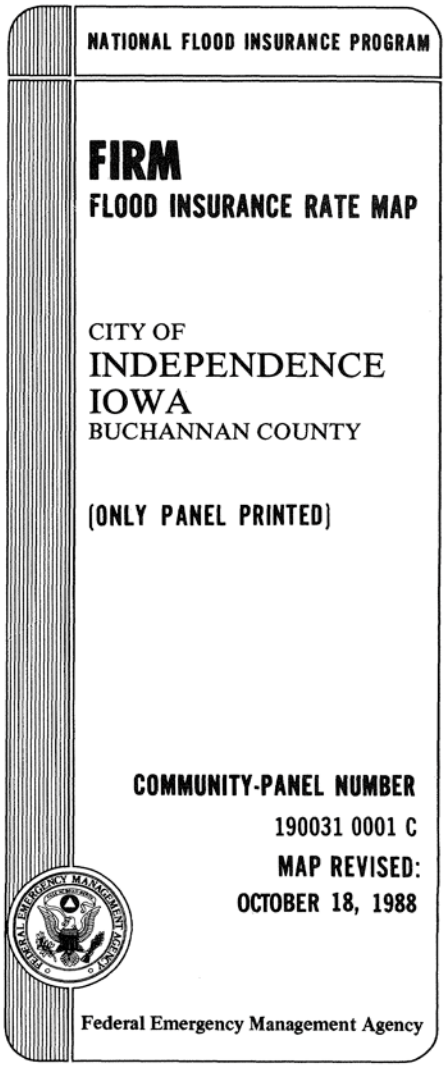


Figure 4-4. Historic FIRM – City of Independence, Iowa

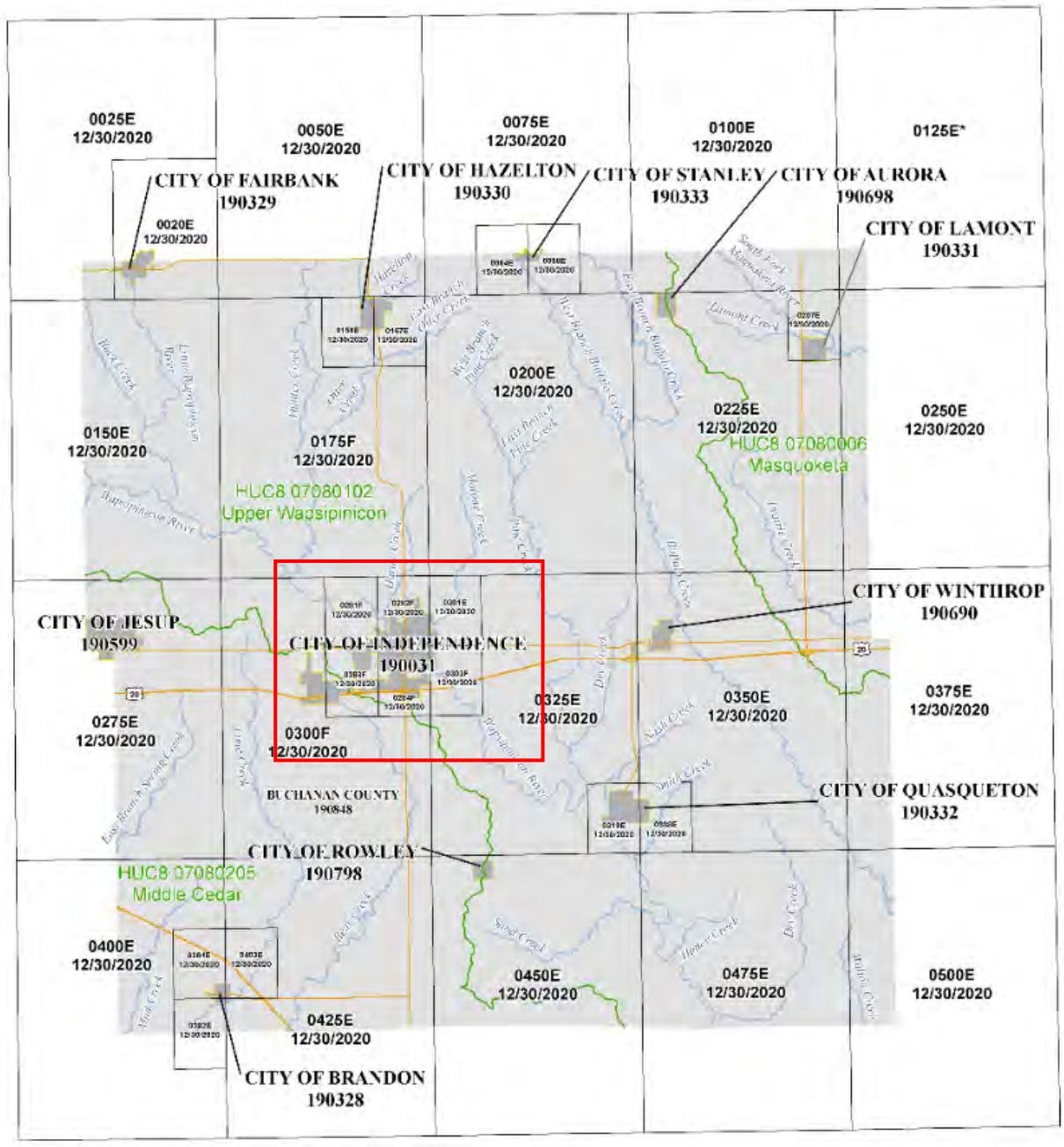


Figure 4-5. Index for Buchanan County, Iowa and Incorporated Areas showing City of Independence

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Independence, City of	190031	07080102 07080205	19019C0281F 19019C0282F 19019C0283F 19019C0284F 19019C0300F 19019C0301E 19019C0303F	
Jesup, City of	190599	07080205	19019C0275E	
Lamont, City of	190331	07060006	19019C0207E 19019C0225E	
Quasqueton, City of	190332	07080102	19019C0319E 19019C0338E	
Rowley, City of[1]	190798	07080102 07080205	19019C0450E	
Stanley, City of	190333	07080102	19019C0064E 19019C0068E	
Winthrop, City of	190690	07080102	19019C0325E 19019C0350E	

[1] No Special Flood Hazard Areas Identified
[2] Panel Not Printed

Figure 4-6. Listing of communities table from FIS Report for Buchanan County, Iowa

Community	Address	City	State	Zip Code
Aurora, City of	City Office 313 Main Street	Aurora	IA	50607
Brandon, City of	City Hall 400 North Street	Brandon	IA	52210
Buchanan County, Unincorporated Areas	Buchanan County Courthouse Zoning Office 210 5th Avenue Northeast, Suite I	Independence	IA	50644
Fairbank, City of	City Hall 116 East Main Street	Fairbank	IA	50629
Hazleton, City of	City Hall 111 3rd Street North	Hazleton	IA	50641
Independence, City of	City Hall 331 1st Street East	Independence	IA	50644
Jesup, City of	City Hall 791 6th Street	Jesup	IA	50648
Lamont, City of	City Hall 644 Bush Street	Lamont	IA	50650
Quasqueton, City of	City Hall 113 Water Street North	Quasqueton	IA	52326
Rowley, City of[1]	City Clerk's Office 109 Oak St	Rowley	IA	52329
Stanley, City of	Mayor's Office 128 East Main Street	Stanley	IA	50671

Figure 4-7. Map repository table from FIS Report for Buchanan County, Iowa

4.2.2. Community Name and NFIP Number

FEMA has assigned every community a unique six-digit number known as a Community Identification Number (CID). This number is shown on the index and on each FIRM panel to identify each community that is included on it. In Iowa, the CID for each community starts with "19" because Iowa is the 19th state alphabetically. For example, the City of Independence, Iowa has a CID of 190031.

In addition to each community receiving a CID, Countywide flood maps will have a five-digit identification number followed by the letter "C". This is called a countywide number (CWID) and is helpful when searching for specific countywide products. For example, Buchanan County and Incorporated Areas have a CWID of 19019C.

4.2.3. Title Block

The title block is located in the lower right portion of each unopened index and FIRM panel (see Figure 4-8). Included in the title block are:

- The community name, in this case, the county, since this is a countywide study
- The map panel number
- The names of the individual communities shown on this panel
- The six-digit CID numbers for the communities shown on the panel (i.e., 190050 and 190058), followed by the panel number 0281
- Map panel suffix – a letter, e.g., A, B, C, etc.
- Version number
- Map number – For a countywide FIRM, the sixth digit is always a "C" and
- Map effective or map revision date – December 30, 2020, for Buchanan County, Iowa, and Incorporated Areas

Figure 4-8. FIRM Title Block

4.2.4. Map Revision Date

The effective date in the title block indicates the map's most recent revision. If changes occur within a community that require a physical map change, FEMA republishes only the map index and map panels affected by the change. The revised panels are given a new map effective date and a new suffix letter. Countywide FIRMs that have been partially revised more than once may have map panels with several different effective dates and suffix letters.

The map index shows the current effective map date for all the FIRM panels or that of the most recently revised panel. Buchanan County, Iowa, and Incorporated Areas was first published as a countywide study on July 16, 2008. Numerous map revisions occurred following the 2008 countywide study that altered the suffixes for select panels inside of Buchanan County. The latest countywide study has an effective date of December 30, 2020. Though all panels have the same effective date, some panels have different suffixes due to past revisions.

You can use the FEMA MSC website (http://msc.fema.gov) to ensure that you are using the community's latest effective FIRM. The MSC website contains the effective flood map products for all communities that have their SFHA mapped by FEMA, as well as historic maps and, in the case of communities where a mapping project is in progress, it may also contain copies of future FIRMs. Section 5 provides additional information on the MSC and other ways to view and access FIRM data online.

4.2.5. Map Scale and North Arrow

The map scale used on a FIRM depends on the size of the mapped area for a community, whether or not a detailed flood study is shown on the panel, and on the base map that is used. Be aware that different map scales may be used for a single community with more than one map panel. For instance, some map panels in Buchanan County are at 1" = 500' while other panels for the county have a scale of 1" = 2000'. Obviously, using the correct scale is critical when accurately locating a property on the FIRM panel.

An arrow pointing north is shown on all maps, including the map index. For countywide FIRM panels, the maps show north at the top of the map. However, for historic FIRMs the north direction on the map is sometimes "turned" to maximize the mapped area that can be shown on a panel and to minimize the number of panels. *Be sure to check the north arrow on any map you use*.

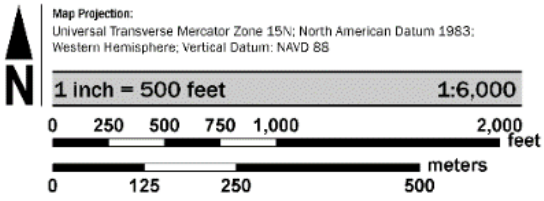


Figure 4-9. Map scale and north arrow

4.2.6. Bench Marks or Elevation Reference Marks

For the current FIRMs funded in 2011 or later, bench marks or elevation reference marks are no longer being shown on the FIRM and FBFM panels. Text has been added to Section 6.1 (Vertical and Horizontal Control) in the FIS report to note these are no longer shown on the FIRM but may be obtained in the archived project documentation. In addition, information on local

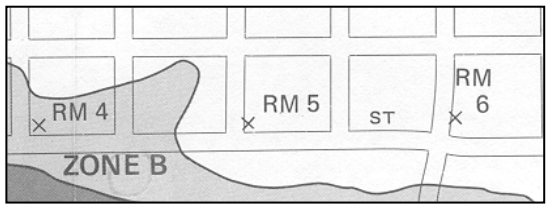


Figure 4-10. RMs – pre 2003 FIRM

benchmarks may be obtained by visiting the National Geodetic Survey (NGS) website at www.ngs.noaa.gov.

If referencing paper based FIRM panels developed prior to 2003, reference mark locations are identified with an "x" and the designation "ERM" or "RM" followed by a number. Descriptions of the reference marks, including their elevations, appear on the map panel, on the map index, or in the FIS report.

For FIRM panels funded and produced between 2003–2011 bench marks are shown on the FIRM with an "x" but the identifying number used (MG0379) is a NGS bench mark number. The current elevation, description, and/or location information for bench marks shown on the FIRM can be found by visiting the NGS website.

Bench marks or elevation reference marks contain important information for local surveyors since they provide a known starting point for any elevation survey.

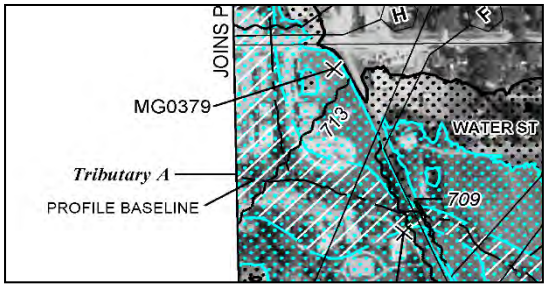


Figure 4-11. Bench mark - 2003–2011 FIRM

4.2.7. Notes to Users

Starting in 2003, all FIRMs, known as digital FIRMs, contain additional information under the "Notes to Users" on the left-hand border of each FIRM panel. For FIRMs funded in 2011 or later, this information was moved to Figure 2 of the FIS report, with only minor notes remaining on the FIRM itself. The "Notes to Users" contains information on using the FIRM and some basic information regarding data used to produce it. The "Notes to Users" example shown below is from the Buchanan County FIS Report:

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Flood Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 27 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and FDTs may reflect stream channel distances that differ from what is shown on the map.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Non-Coastal Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 15N. The horizontal datum was the North American Datum of 1983 NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov.

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 30 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was derived from digital orthophotography collected by the Iowa Geological and Water Survey, Department of Natural Resources. This imagery was flown in 2010. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Figure 4-12. Notes to users from Buchanan County, Iowa FIS Report

4.2.8. FIRM Zones

The floodplain areas shown on FIRMs can consist of several different zone designations. Though these different zone designations are primarily used for insurance rating purposes, they could also be used for other floodplain management purposes. The more common zones are listed in Figure 4-13.

Zone A	Designation of the area inundated by the 1% annual chance flood (also known as the 100-year or base flood), which is also called the base floodplain. No coastal flood hazard dynamics or coastal flood hazard areas were determined. There are seven types of A Zones: **A** The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFE) or depths are shown within this zone. **AE** The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from hydraulic analyses are shown within this zone. **AO** The flood insurance rate zone that corresponds to the 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where the average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone. **AH** The flood insurance rate zone that corresponds to the 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown in selected intervals in this zone. **AR** The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood. **A99** **The flood insurance rate zone corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system, where construction has reached a specific statutory milestone. No base flood elevations or flood depths are shown within this zone.**
Zone V	**V** The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone. **VE** The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown in this zone as static whole-foot elevations that apply throughout the zone.
Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 1%- and 0.2%- annual chance floods. It can also be an area of the 1% annual chance flood (1) with average depths of less than one foot, (2) with a drainage area less than one square mile, or (3) areas of reduced flood risk due to levees.
Zone X (unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 0.2% annual chance flood level.
Zone D	Area of undetermined but possible flood hazard.

Figure 4-13. FIRM zones

Note that the SFHA includes only A and V zones, with V zones not present in Iowa.

4.3. Map Formats

The FEMA flood map formats have been revised several times since the original inception, and these formats have already been discussed in several other sections of this reference. Regardless of format, the flood map was used to determine whether a property was located in the SFHA, the flood zone that applied to the property and the BFE (when provided) for the site. The main formats can be summarized as five distinct updates over the years and are shown as follows:

- 1970's to early 1980's - FHBM
    - These maps were an early form of flood hazard identification and based on approximate data. All flood areas were Zone A.
- Early 1980's - FIRMs and FBFM
    - As noted in Section 4.1, FISs that were published prior to 1985 included, in addition to the FIRM, a separate map panel called the **FBFM**, which showed, among other things, the regulatory floodway. The reason for this is that, prior to 1985, the FIRMs were designed for use by insurance agents and lending institutions, while the FBFMs were intended for floodplain regulation purposes.
- 1985–2003 format FIRMs
    - Mainly paper based FIRMs developed on a community basis, but include approximate and detailed floodplain mapping (including floodway). This format incorporated floodways and other floodplain management information, such as cross sections, which were previously provided on separate FBFMs. It also simplified the flood insurance zone designations, such as replacing the previous Zones A1-A30 with a designation of AE, and Zone B and C were replaced by Zone X.
- 2003–2011 format FIRMs
    - Starting in 2003, FEMA began an aggressive multi-year initiative to upgrade the country's maps called Map Modernization. This included modernizing and digitizing the flood maps on a countywide basis. The FIRMs now included some color (blue for floodplains) and were accompanied by a FIRM database, which provided options for accessing the data digitally.
- 2011–Present FIRMs
    - The current format was applied to studies funded in 2011 and later. FIRMs were further updated to closer align with the digital vision, including transferring the notes to users, index, and a portion of the FIRM legend to the FIS report. This version also introduced more color and hatching to differentiate between the different flood zones.

Regardless of format, the same general information is shown on the body of the FIRMs starting in 1985. This information is as follows:

- **1% annual chance (aka 100-year) floodplain or SFHA** designated by blue hatching and labeled Zone A, AE, AH, or AO.
- **0.2% annual chance (aka 500-year) floodplain** designated by black hatching on 2003 format FIRMs and orange hatching on 2011 format version.
- **Floodway** designated with white hatching within Zone AE areas on the 2003 format and red hatching on the 2011 format.
- **BFE** indicating the water surface of the 1% annual chance flood at specific points along a stream or water body. Prior to 2011, these were shown as whole foot numbers as wavy lines running across the floodplain**.**
- **Cross section line** representing the location of the surveyed cross sections used in the computer model that calculates the BFEs. The cross section locations and information align with similar data in the FIS (profile and FDT) and **FIRM database.** In 2011 FIRM formats, the cross sections include the BFE value shown to the nearest tenth of a foot.
- **Profile Baseline** indicating the path of the riverine flood flows and is an accurate representation of the distance between the cross sections and structures within the hydraulic model. The profile baseline also aligns with the distances shown on the flood profile in the FIS report.
- **Jurisdictions** are the defined political boundaries and are usually incorporated locations recognized by the U.S. Census Bureau. Each jurisdiction on the FIRM (including unincorporated areas) is noted with a CID.

Currently, all 99 counties are using FIRMs developed in 2003 or later. Though other formats are available through the FEMA MSC for historical context, the rest of this section will focus of the FIRM format developed in 2003 or later.

4.3.1. 2003–2011 FIRMs

Though some countywide FIRM formats may have existed prior, FEMA made a concentrated effort to update the nation's flood maps starting in 2003 and produce them on a countywide basis. FEMA Countywide FIRMs show flood hazard information for all geographic areas of a county, including incorporated cities and villages. Buchanan County has a countywide FIRM that includes the City of Independence, the case study community used in this document.

Previously, maps were prepared for each jurisdiction. County FIRMs, for example, only showed the flood hazards identified in the unincorporated areas of the county and did not show any flood information inside the corporate limits of a given municipality. Now, all the identified flood hazard areas within the boundaries of the county are shown on one set of countywide maps.

In addition to the 2003 FIRM format being produced digitally, it also included the introduction of color (mainly blue for SFHA) to the FIRMs and the use of orthophotography for the base map. FIRMs produced prior to this time were vector maps utilizing a monochromatic color scheme.

The countywide FIRM format has a number of advantages; one in particular is that FIRMs do not need to be updated when municipal boundaries change. An example of a countywide FIRM showing the SFHAs across community boundaries is shown in Figure 4-14.

Note: Each countywide FIRM panel has a number with five digits and the letter "C", which stands for "countywide". Do not confuse the five-digit map panel number with the six-digit NFIP CID (see Figure 4-14).

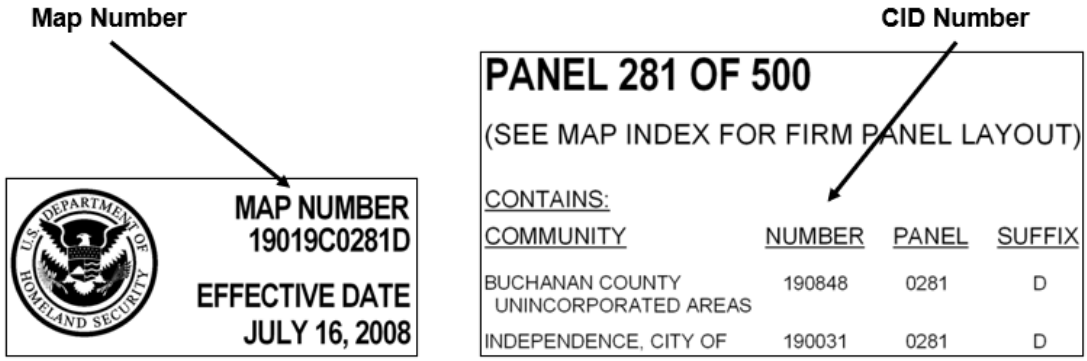


Figure 4-14. Buchanan County and Incorporated Areas – countywide map panel number (left) and Community Identification Number (right)

The initial FIRM date for each community is shown on the FIRM index. These are the "post-FIRM" dates used for insurance rating. Do not confuse them with the effective date of the latest FIRM panel, which is shown in the title box. Figure 4-15 shows the "Listing of Communities" for the Buchanan County FIRM. This table lists the communities located within the county, the panels on which they can be found, and their respective identification and post-FIRM dates.

LISTING OF COMMUNITIES

COMMUNITY NAME	COMMUNITY NUMBER	LOCATED ON PANELS	INITIAL NFIP MAP DATE	INITIAL FIRM DATE	MOST RECENT FIRM PANEL DATES
AURORA, CITY OF	190698	0225	July 16, 2008	July 16, 2008	July 16, 2008
BRANDON, CITY OF	190328	0384, 0392, 0403, 0425	October 29, 1976	July 16, 2008	July 16, 2008
BUCHANAN COUNTY UNINCOPRORATED AREAS	190848	0020, 0025, 0050, 0064, 0068, 0075, 0100, [1]0125, 0150, 0156, 0157, 0175, 0200, 0207, 0225, 0250, 0275, 0281, 0282, 0283, 0284, 0300, 0301, 0303, 0319, 0325, 0338, 0350, 0375, 0384, 0392, 0400, 0403, 0425, 0450, 0475, 0500	June 7, 1977	September 1, 1991	July 16, 2008
FAIRBANK, CITY OF	190329	0020	July 25, 1975	August 19, 1986	July 16, 2008
HAZLETON, CITY OF	190330	0156, 0157	May 28, 1976	July 16, 2008	July 16, 2008
INDEPENDENCE, CITY OF	190031	0281, 0282, 0283, 0284, 0300, 0301, 0303	May 3, 1974	May 16, 1977	July 16, 2008
JESUP, CITY OF	190599	0275	July 16, 2008	July 16, 2008	July 16, 2008
LAMONT, CITY OF	190331	0207, 0225	September 12, 1975	July 16, 2008	July 16, 2008
QAUSQUETON, CITY OF	190332	0319, 0338	November 5, 1976	July 2, 1987	July 16, 2008
*ROWLEY, CITY OF	190798	0450	N/A	N/A	N/A
STANLEY, CITY OF	190333	0064, 0068	July 16, 2008	July 16, 2008	July 16, 2008
WINTHROP, CITY OF	190690	0350	July 16, 2008	July 16, 2008	July 16, 2008

*NON-FLOODPRONE
[1]PANEL NOT PRINTED

Figure 4-15. Listing of communities table from Buchanan County, Iowa Countywide index

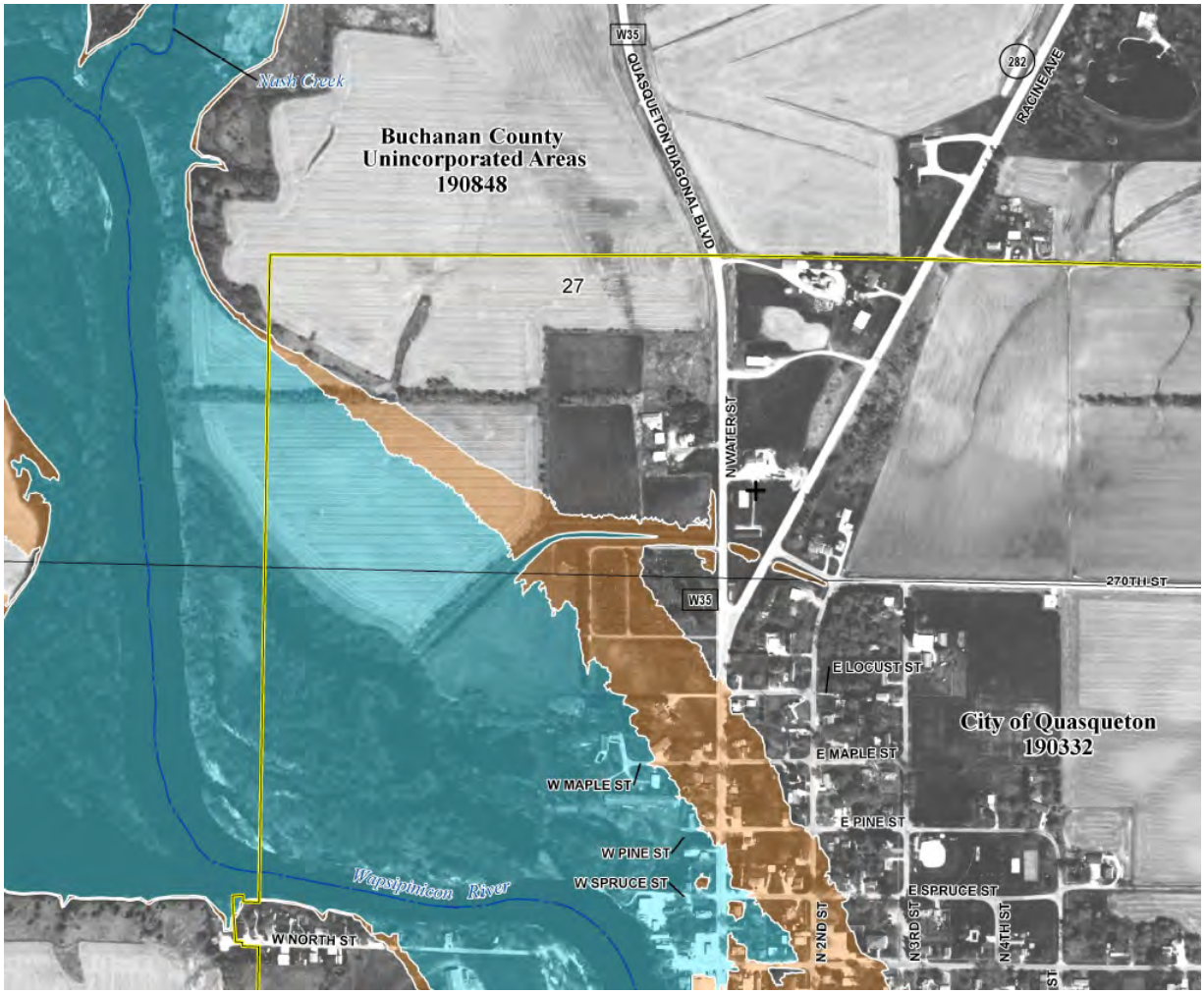


Figure 4-16. Countywide FIRM Showing SFHAs in Multiple Communities

4.3.2. 2011–Present FIRMs

The current FIRMs format is built on the countywide format but simplifies the 2003 format for more ease of use. This included moving the FIRM index, listing of communities, and map repository tables into the FIS. In addition, the majority of the notes to users, as well as the FIRM legend, were moved to the FIS report.

Graphically, additional colors and hatching were introduced to further differentiate the various flood zones. For example, shaded Zone X has several definitions that were all represented by a single graphical element in previous versions. These are now shown with unique shading and hatching. Figure 4-17 shows the current FIRM legend and how the various flood zones are shown on the FIRM.

Figure 4-17. Current FIRM Legend

With the introduction of labeling the BFEs at all cross sections in this format, the use of BFE wavy lines was reduced. BFE wavy lines were still used in areas that were not well represented by cross sections, but could be shown to the nearest half foot or tenth of a foot instead of whole feet. The use and precision of the BFE wavy lines depended on the application. The cross section labeled with BFEs and the lack of wavy BFE lines are shown in Figure 4-18.

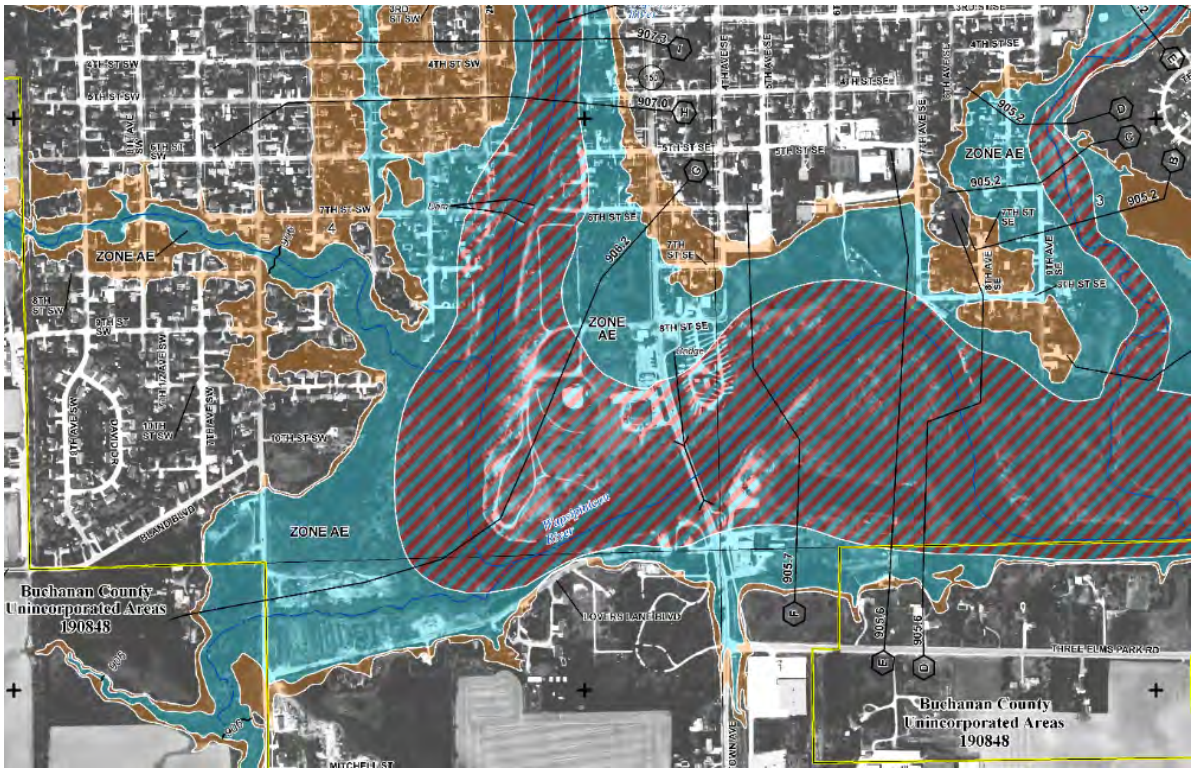


Figure 4-18. Current FIRM Layout

For any floodplain mapping projects funded in fiscal year 2020 or later, the FIRM panels must be developed using FEMA's Automated Map Production (AMP) tool. AMP will read the data in a submitted FIRM database and use a series of cartographic algorithms to autogenerate FIRM panels and indexes that comply with FEMA requirements. The format of these panels is consistent with the current format discussed in this section, but the goal is to eliminate the need for manual edits or adjustments to labels on the FIRM. This change puts more emphasis on the linkage between the FIRM database and the FIRM panels, and requires accurate digital data.

4.4. Special FIRM Features

4.4.1. Lakes

Most lakes have a single static (i.e., **stillwater**) BFE shown in parentheses below the flood zone in situations where a 1% annual chance flood elevation has been established (Figure 4-19). However, some long lakes, especially reservoirs, have a higher BFE at the upstream end than at the outlet. These types of lakes and reservoirs have the 1% annual chance flood elevation shown on the FIRM with wavy lines in the same manner as riverine BFEs. Lakes such as these will also be included in the stream profiles section in the FIS report.

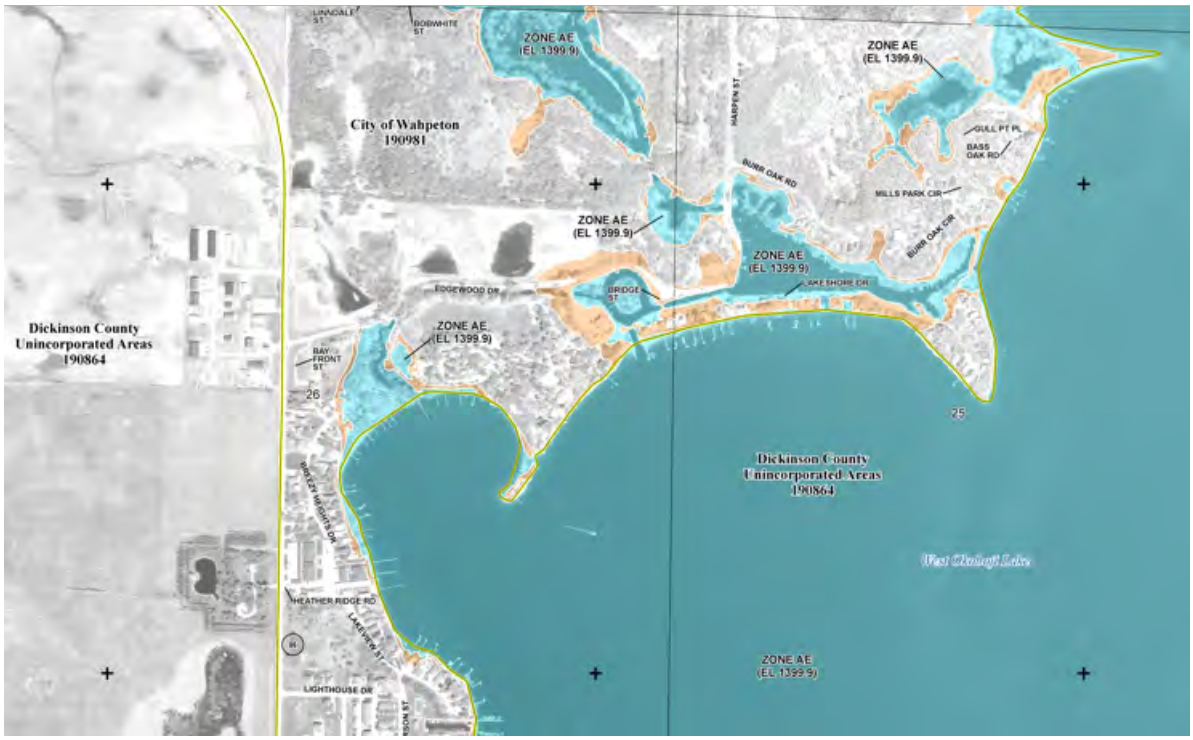


Figure 4-19. FIRM with Lake Floodplain

Where studies have been carried out for lakes and reservoirs, information on the associated stillwater elevations is contained in Section 5 of the FIS report within Table 10 *Summary of Non-Coastal Stillwater Elevations* (Figure 4-20). Note that BFEs are rounded to one-tenth of a foot in the table but are shown in parentheses in whole-foot numbers on the FIRM. For the most accurate flood elevation, use the more detailed elevation as provided in the FIS report.

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
West Okoboji Lake Area	Arnolds Park, City of; Dickinson County Unincorporated Areas; Okoboji, City of; Wahpeton, City of	*	*	*	1,399.9	*

Figure 4-20. Summary of Stillwater Elevations for West Okoboji Lake

4.4.2. Shallow Flooding on FIRMs

Under the NFIP, ponding or sheet flow constitutes shallow flooding if the average depths are between 1 and 3 feet.

Two methods can be used to display shallow flooding. An AH Zone may be used for areas of ponding, whereas an AO Zone may be designated if there is flow with no defined channel, such as sheet flow or overland flow. Unlike most other SFHAs, Zone AOs are not referenced to

a vertical datum. Instead, the depth of flooding for these areas is provided in feet of depth above ground. This is normally labeled as Zone AO (2 Feet). This would designate that the 1% annual chance flood is 2 feet deep.

Figure 4-21 provides an example of the Zone AH typically used for ponding areas. This figure highlights both the river (Zone AE) and the interior ponding areas behind the levee (Zone AH).

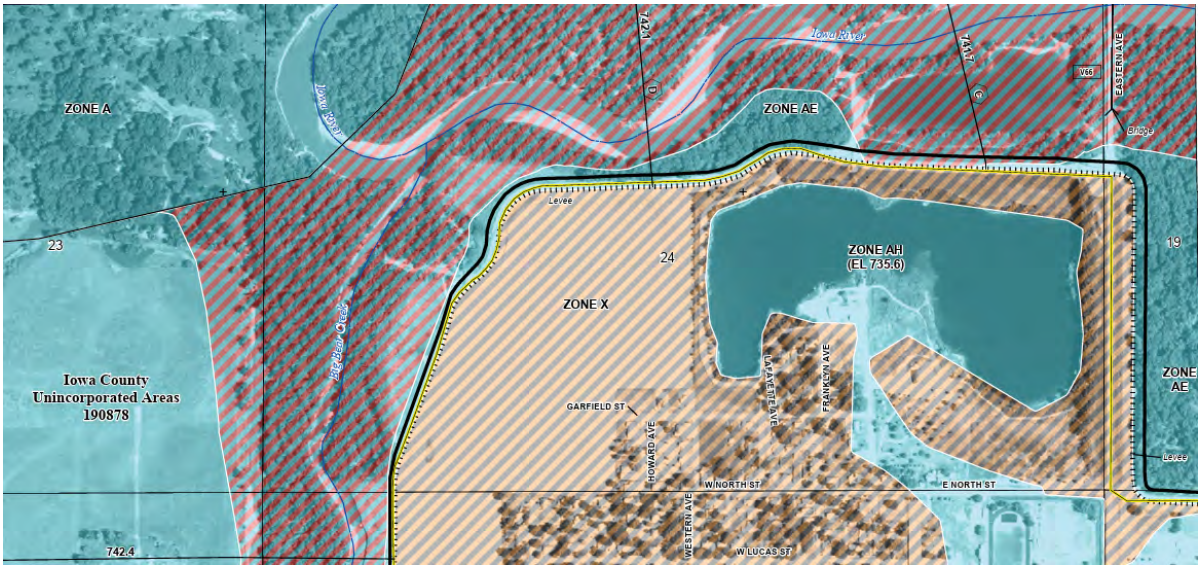


Figure 4-21. Shallow flooding areas shown as AH Zones behind an accredited levee

Note how the BFE on the river is approximately 742 feet while in the Zone AH ponding area, the BFE is 735.6 feet. While there are still SFHAs landward of the levee, the flood levels are much lower because it was determined that the levee provides a reduction in risk from the 1% annual chance flood from the river.

4.5. Digital FIRMs

Starting in the late 1990s and early 2000s, FEMA began starting to produce FIRMs digitally. In 2003, FEMA initiated a nationwide initiative to digitally produced FIRMs that have many benefits. For example, they can be more easily updated by FEMA and its mapping partners. Additionally, the flood hazard data shown on the FIRMs can be incorporated in a community's GIS and used with other data layers, such as zoning and parcel information and detailed street networks, for planning purposes, mitigation activities, or additional analysis.

Users should keep in mind that the simple conversion of FIRMs to a digital format does not inherently improve the engineering quality of the product. Many of the same difficulties with interpretation of flood risk data and the need for users to apply sound judgment in decision-making based on the maps remain unchanged.

While all FIRM panels and FIS reports for communities participating in the NFIP (including older maps and reports that were not developed digitally) can be accessed and downloaded through the FEMA

MSC, digital FIRMs have a number of additional products associated with them, which are discussed in the sections below.

4.5.1. The National Flood Hazard Layer and FIRM Databases

The **NFHL is a geospatial database that** includes the current effective flood hazard data from all digital FIRMs and Letters of Map Revision (LOMRs) produced across the nation. The NFHL includes coverage for all 99 counties in Iowa. The NFHL data can be accessed in several different ways:

- Through FEMA's NFHL Viewer, FEMA's National Flood Hazard Layer (NFHL) Viewer (arcgis.com))
- In database format (by county or State) through the FEMA Map Service Center

In addition, preliminary floodplain data and draft floodplain data (workmaps) are also available digitally and can be viewed online. Please note that the data in either viewer represents data that is not regulatory and should only be used for informational purposes.

- FEMA Flood Changes Viewer (preliminary data) Flood Map Changes Viewer (arcgis.com)
- FEMA Draft National Flood Hazard Viewer (draft data) Draft National Flood Hazard Viewer (arcgis.com)

The **FIRM database** is a regulatory product that is developed for a FEMA flood study, which stores all the flood hazard data on an updated FIRM for a particular county in a GIS-compatible format and is integrated into the NFHL dataset. The FIRM database is consistent with the data shown in the FIS and on the FIRM.

Note that the aerial, orthorectified photography used to create the base maps often shown on actual FIRM panels is not part of a FIRM database or the NFHL dataset. However, this imagery is viewable on the NFHL Viewer.

The use of the NFHL and the FIRM database within a GIS environment allows communities and others to overlay the flood mapping and engineering data with other local data sets, allowing these products to support a wide variety of existing and future engineering, mapping, and planning efforts.

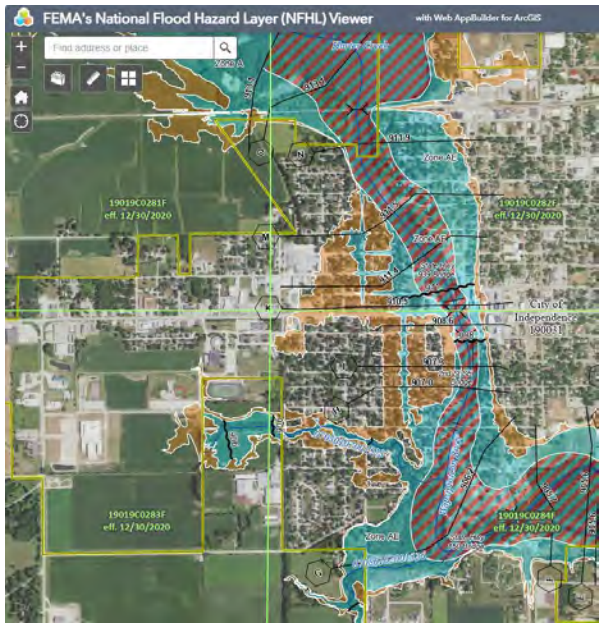


Figure 4-22. The NFHL Viewer

For more information on the NFHL, see the following resources:

- National Flood Hazard Layer | FEMA.gov
- NFHL GIS Services page (https://hazards.fema.gov/femaportal/wps/portal/NFHLWMS)

4.6. Flood Risk Products

4.6.1. What is Risk MAP?

FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program goes beyond the creation of FIRMs and FIS reports for communities. It is a comprehensive program that involves close collaboration with State, Tribal, and local partners across the nation to identify flood risk and help reduce that risk. Through Risk MAP, FEMA is delivering both traditional (FIRMs and FIS reports) as well as flood risk tools and products to help communities and their citizens better determine the risk of flooding in their communities and prioritize actions to mitigate their flood risk.

4.6.2. Flood Risk Products

In addition to the standard regulatory FIRM, FIS report, and FIRM database, there are a number of additional flood risk products available through the FEMA Risk MAP program that can be developed to aid community officials in emergency planning, flood response operations, flood recovery tasks, and prioritizing mitigation actions. Decisions regarding what products are produced are made in collaboration with local stakeholders and may include visualization tools, maps, and reports. Risk MAP and its products are covered in detail in Appendix 1.

5. Using Maps and Data

5.1. Using Flood Insurance Study Reports

As described in Chapter 3, the FIS report is the companion to the FIRM and the FIRM database in the depiction and communication of regulatory flood hazard information. All current format FIS reports use the same general outline and numbering system. In this section, we will highlight the report's contents; explore the report's data, tables, and profiles; and describe how they are related to the FIRM.

Can't find your community's FIS report? Call the Federal Emergency Management Agency (FEMA) Map Service Center (MSC) at 1-877-336-2627 or get it online through https://msc.fema.gov.

The FIS report and FIRM (and at times, the FIRM database) should be used in conjunction to determine whether or not a site is located in a SFHA and/or a regulatory floodway and to accurately determine the BFE for a specific site. Each product will contain necessary information to help the user make this determination as well as other information for floodplain management purposes.

Important: Because the elevation determinations for riverine floodplains are typically used to establish BFEs for development in the SFHA and for floodplain management practices, accuracy is critical. You should always double check your BFE determinations before using them in the permit application process.

5.1.1. FIS Report Contents

Two different formats of the FIS report are currently being used nationally and within the State of Iowa. Beginning in 1985, FEMA produced FIS reports (cover shown in Figure 5-1) that used a narrative format to describe the data and analyses used in flood studies. Starting in 2014, FEMA updated the FIS report format (cover shown in Figure 5-2) to utilize more tabular information that aligns with the FIRM database for consistency and easy integration. In addition, aspects of the FIRM panel including the index, notes to users, and map legend are included. Though the information in both formats is consistent, the layout and presentation of this information differs. For discussion of the FIS report contents in this section, we will focus on the current FIS report format that was introduced in 2014.

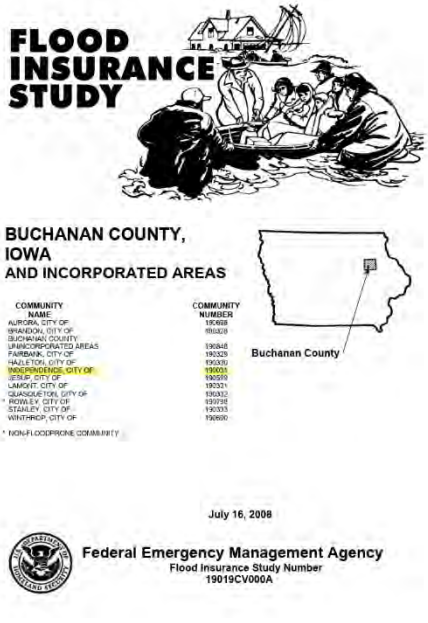
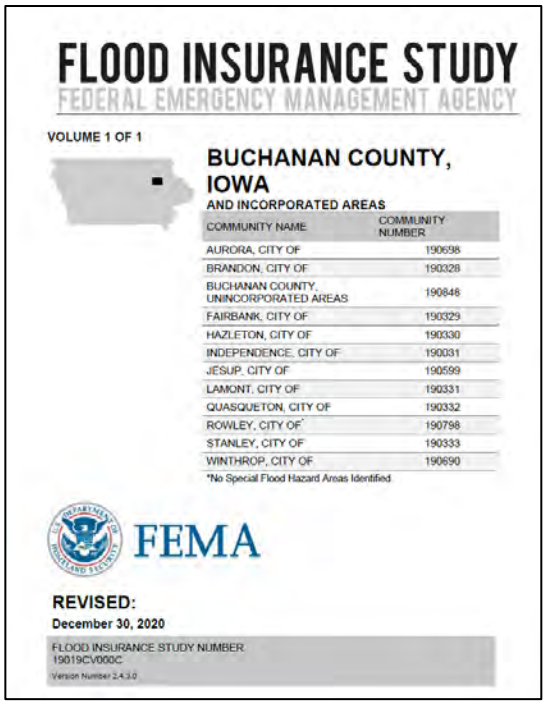


Figure 5-1. Cover of historic Buchanan County, Iowa and Incorporated Areas Flood Insurance Study

Regardless of the format, the cover of a county's FIS report has an outline map of Iowa with the representative county pinpointed. The effective date of the FIS report, a list of the communities in the county, and their Community Identification Numbers (CIDs) are also indicated on the cover. A copy of any FIS can be obtained by using the Search all Products link on FEMA's Map Service Center website (https://msc.fema.gov).


FLOOD INSURANCE STUDY
FEDERAL EMERGENCY MANAGEMENT AGENCY
VOLUME 1 OF 1
BUCHANAN COUNTY, IOWA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
AURORA, CITY OF	190698
BRANDON, CITY OF	190328
BUCHANAN COUNTY, UNINCORPORATED AREAS	190846
FAIRBANK, CITY OF	190329
HAZLETON, CITY OF	190330
INDEPENDENCE, CITY OF	190331
JESUP, CITY OF	190599
LAMONT, CITY OF	190331
QUASQUETON, CITY OF	190332
ROWLEY, CITY OF	190798
STANLEY, CITY OF	190333
WINTHROP, CITY OF	190690

*No Special Flood Hazard Areas Identified

FEMA

REVISED:
December 30, 2020

FLOOD INSURANCE STUDY NUMBER
19019CV000C

Figure 5-2. Cover of current format Buchanan County Iowa and Incorporated Areas Flood Insurance Study

One change that occurred with the 2014 FIS format is that each FIS report, regardless of location and scope of study, will have a consistent table of contents, sections, figures, and tables. An example of this is that FIS reports in Iowa will include section headers for coastal flood hazard areas, even though coastal areas do not exist within the state. While the text and information will not be provided, the section and table headers will still be included in the FIS report. A summary of the sections included in the current FIS report is as follows:

Section 1.0 of all FIS reports provides an introduction to the report and states the purpose of the FIS, jurisdictions included, and considerations for using the FIS report. This section also includes the FIRM Index figure, the FIRM notes to users, and the map legend for the FIRM panels.

Section 2.0 provides background information on the floodplain management applications of the flood study. This includes information on floodplain boundaries, floodways, BFEs, non-encroachment zones (where applicable), and coastal flood hazard areas (where applicable).

Section 3.0 discusses the insurance applications of the flood study. This includes information on the National Flood Insurance Program Insurance Zones and impacts to each community.

Section 4.0 provides information regarding the area studied including basin descriptions, principal flood problems, any dams, or other flood hazard reduction measures within the county, and information on any levee systems.

Section 5.0 describes the engineering methods used. Section 5.1 covers the hydrologic analysis—how much water will flow through the floodplain during floods of varying recurrence intervals. This section will also include a summary of the discharge table. Section 5.2 describes the hydraulic analysis—how high the water will get. (Basic information on hydrology and hydraulics is described in Section 3 of this reference.) Section 5.3 discusses coastal analyses (if applicable), and Section 5.4 discusses alluvial fan analyses (if applicable).

Section 6.0 provides information on mapping methods for the flood study. Section 6.1 includes vertical and horizontal control including the vertical datum used for the FIS and conversion from NGVD 29, if applicable. Section 6.2 contains information on the base map data, while Section 6.3 includes information regarding the floodplain and floodway delineation (including

information on LiDAR and other topographic elevation sources). This section will also contain the FDT. Section 6.4 will discuss coastal flood hazard mapping (if applicable), and Section 6.5 will provide information on FIRM revisions, including Letters of Map Change (LOMC), which will be discussed in more detail in Section 6 of this reference.

Section 7.0 of the FIS report discusses information pertaining to the contracted studies within the report and the community meetings.

Section 8.0 contains any additional information pertinent to the development of the FIS that was not covered in other sections. This can include the location of the map repository for each community and additional Federal and state contact information.

Section 9.0 provides information regarding the bibliography and references used within the FIS report.

Most information previously presented as narrative text in FIS reports prior to 2014 is now located within tables in the current version. The numbering and location of the tables are consistent for all FIS reports, even in the information is not applicable for the referenced counties and incorporated areas. The tables included in all FIS reports are shown below:

- Table 1: Listing of NFIP Jurisdictions
- Table 2: Flooding Sources Included in this FIS Report
- Table 3: Flood Zone Designations by Community
- Table 4: Basin Characteristics
- Table 5: Principal Flood Problems
- Table 6: Historic Flooding Elevations
- Table 7: Dams and Other Flood Hazard Reduction Measures
- Table 8: Levee Systems
- Table 9: Summary of Discharges
- Table 10: Summary of Non-Coastal Stillwater Elevations
- Table 11: Stream Gage Information used to Determine Discharges
- Table 12: Summary of Hydrologic and Hydraulic Analyses
- Table 13: Roughness Coefficients
- Table 14: Summary of Coastal Analyses
- Table 15: Tide Gage Analysis Specifics
- Table 16: Coastal Transect Parameters
- Table 17: Summary of Alluvial Fan Analyses
- Table 18: Results of Alluvial Fan Analyses
- Table 19: Countywide Vertical Datum Conversion
- Table 20: Stream-by-Stream Vertical Datum Conversion
- Table 21: Base Map Sources
- Table 22: Summary of Topographic Elevation Data used in Mapping
- Table 23: Floodway Data
- Table 24: Flood Hazard and Non-Encroachment Data for Selected Streams
- Table 25: Summary of Coastal Transect Mapping Considerations
- Table 26: Incorporated Letters of Map Change
- Table 27: Community Map History

- Table 28: Summary of Contracted Studies Included in this FIS Report
- Table 29: Community Meetings
- Table 30: Map Repositories
- Table 31: Additional Information
- Table 32: Bibliography and References

If the FIS report contains streams or rivers studied by detailed methods, then the associated flood profiles will be included as an exhibit at the end of the document (or, for large FIS reports, in a separate FIS report volume).

Additional information regarding the details and information included in the FIS report sections, figures, tables, and profiles can be found in the FEMA FIS Report Guidance Document 37 and the FEMA FIS Report Technical Reference Document. These and other related guidance documents can be found on the FEMA Guidelines and Standards website.

5.1.2. Flood Discharges

Table 9, *Summary of Discharges*, from page 23 of the Buchanan County, Iowa and Incorporated Areas FIS report is shown below (Figure 5-3).

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Malone Creek	At the Wapsipinicon River confluence	10.2	2,300	*	3,930	4,770	7,200
Wapsipinicon River	At the downstream City of Independence boundary	1,070.5	17,500	24,100	29,300	34,900	48,900
Wapsipinicon River	At USGS Gage # 05421000	1,051.5	17,400	23,900	29,100	34,600	48,500
Wapsipinicon River	Approximately 0.17 miles upstream of the Harter Creek confluence	1,042.6	17,300	23,800	29,000	34,500	48,400

*Not calculated for this Flood Risk Project

Figure 5-3. FIS Report Table 9-Summary of Discharges

Table 9 summarizes the peak flood discharge determined for various flood frequencies at locations within the study area. (The hydrologic study procedures for arriving at these amounts were discussed in Section 3.3 of this reference.) The size of the drainage area, or watershed, contributing to the water runoff producing the floods is also shown in the table.

The 1% annual chance peak discharge for Malone Creek at the Wapsipinicon River confluence is 4,770 cubic feet per second (cfs). This means that during the peak of the 1% annual chance flood (also known as the 100-year or base flood) event, 4,770 cubic feet of water will pass this point each second.

Manning's "n" Values

Roughness coefficients that describe the type/density of vegetation in channel and overbank areas.

Table 13, *Roughness Coefficients,* located on page 27 of the Buchanan County, Iowa, and Incorporated Areas FIS report is shown in Figure 5-4. The Manning's "n" values,

or roughness coefficients, are used in hydraulic modeling to describe the roughness of the channel and overbank areas. They are dependent on the type of land cover, including the type and density of vegetation, and can greatly affect the flood elevation calculated by the hydraulic model.

Table 13: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Malone Creek	0.045-0.050	0.055-0.080
Wapsipinicon River	0.040	0.040-0.150

Figure 5-4. FIS Report Table 13-Roughness Coefficients

5.1.3. Floodway Data Table (FDT)

The FDT is a table listing specific data for each flooding source having a regulatory floodway. The FDT is Table 23 in the current FIS report format. Information shown in each column of the FDT is as follows.

- **Cross Section** – The letter for each cross section. This corresponds to the label on the FIRM at each cross section.
- **Distance** – The horizontal distance from a known starting point that is usually measured along the stream centerline or profile baseline of the flooding source.
- **Width** – The width of the floodway at each cross section (measured in feet).
- **Section Area** – The area of each cross section underwater for the width of the floodway (measured in square feet).
- **Mean Velocity** – The mean velocity of the floodway (measured in feet per second).
- **Regulatory** – The BFE used for floodplain management purposes (measured in feet and referenced either to NGVD or NAVD datum). This elevation corresponds to what is shown on the FIRM and the flood profiles.
- **Without Floodway** – Usually the same elevation as the Regulatory except in backwater situations or when the area is controlled by another flooding source.
- **With Floodway** – The 1% annual chance flood elevation that would result if the entire floodway fringe is developed and all flow is restricted to the area of the floodway. This elevation is not required to be used for floodplain management purposes unless a community has required it to be used by adopting this as a higher standard and modifying its floodplain ordinance.
- **Increase** – The amount the BFE (regulatory) increases due to the floodway encroachment. This is the resultant increase if the entire floodway fringe is developed,

constricting all flow to the area of the floodway. For Iowa, this increase cannot exceed 1.0 feet.

The FDT in Section 6.3 of the Buchanan County, Iowa, and Incorporated Areas FIS report presents data from the hydraulic analysis (Table 23, pages 31-32 in this case study FIS report for Buchanan County found in Section 26). The FDT for Malone Creek is shown below in Figure 5-5.

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,080	345	1,366	3.5	905.2	894.7[2]	895.7	1.0
B	2,330	164	863	5.5	905.2	899.5[2]	900.3	0.8
C	2,720	269	1,885	2.5	905.2	900.7[2]	901.7	1.0
D	3,010	121	811	5.9	905.2	901.1[2]	901.9	0.8
E	3,885	130	615	7.8	905.2	903.9[2]	904.7	0.8
F	4,510	197	1,254	3.8	906.5	906.5	907.5	1.0
G	5,020	120	828	5.8	907.5	907.5	908.4	0.9
H	5,970	74	751	6.3	911.2	911.2	911.3	0.1
I	7,245	160	1,008	4.7	913.7	913.7	914.4	0.7
J	8,875	250	873	5.5	916.2	916.2	917.2	1.0
K	10,180	200	622	7.7	925.0	925.0	925.0	0.0

[1]Stream distance in feet above mouth at Wapsipinicon River
[2]Elevation computed without consideration of backwater effects from Wapsipinicon River

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUCHANAN COUNTY, IOWA

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: MALONE CREEK

Figure 5-5. FIS Report Table 23-Floodway Data

To interpret the FDT, follow these steps:

All values in the table are calculated for each lettered floodplain cross section that is shown on the FIRM. The flooding source is identified in the bottom right corner of the FDT. The first of the two columns grouped under “Location” – *Cross Section* – identifies the letter labels for the mapped cross sections used in the FIS. The second column – *Distance* – gives the calculated distance for each cross section upstream from a reference point where the stationing starts. This is usually the mouth of a river or the confluence with another stream and is identified with a footnote at the bottom of the FDT.

In the case of Malone Creek, the starting point is the confluence with Wapsipinicon River, located 1,080 feet downstream from cross section A. Locations of the cross sections are shown on the FIRM (see Figure 26-5). Cross section B of Malone Creek is 2,330 feet above (or upstream from) the confluence with Wapsipinicon River, or 1,250 feet upstream from cross section A. It is the line with the “B” in the hexagon that crosses Malone Creek north of 8th Street.

Cross section C is 2,720 feet above the reference point. It is 390 feet upstream of cross section B.

The next three columns under “Floodway”—*Width, Section Area, and Mean Velocity*—provide data at each cross section. A floodway’s width is usually not symmetrical; it varies with the topography at each cross section. At cross section B on Malone Creek, the floodway width is 164 feet. That means the distance from the floodway boundary on one side of the stream along cross section B to the floodway boundary on the other side of the stream is 164 feet. This information is useful for double-checking the width of the floodway portrayed on the FIRM.

Figure 5-6 is a representation of the description of cross section B given in the FDT. The area of the floodway here is 863 square feet. This is the cross sectional area of the floodway that is needed to convey the 1% annual chance flood at this location. The average or mean velocity of the 1% annual chance flood in the floodway at cross section B is 5.5 feet per second.

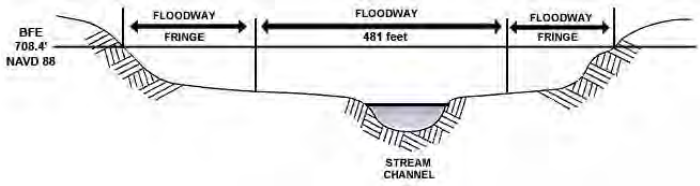


Figure 5-6. Representation of Cross Section B

Similar data is provided at each of the other cross sections. Looking at the values in the mean velocity column, you can see that velocity is highest at cross sections E and K and lowest at cross section C. Cross sections E and K have the smallest section area values. In addition, the profile for Malone Creek shows a steeper slope at these sections. Conversely, cross section C has the largest section area, and the slope of the streambed is less steep at this location, where the velocity is lowest.

Of the last four columns under “1% Annual Chance Flood Water Surface Elevation”, the most important one regarding floodplain management is the first one titled, *Regulatory*, which in most situations has the same elevation values as the one titled *Without Floodway*. The regulatory BFE will correspond to the floodplain mapping and BFEs shown on the FIRM maps. The regulatory and without floodway elevations may differ if the cross section is impacted by

backwater or flooding effects from another water body. The regulatory BFE is calculated assuming no obstructions have been placed within the floodway fringe. The other columns explain what happens to the water surface elevation when the floodway analysis is run through the computer model. Notice that at no cross section is the increase more than 1.0 foot (e.g., if the fringe was completely filled in), which is the maximum increase allowed based on Federal minimum standards. Communities may elect to enforce higher standards than the Federal minimum, which can be documented in their floodplain ordinance. Please see Section 13, Additional Standards, for more information on this topic.

5.1.4. Relating Report Data to Maps and Profiles

The data contained in the FIS report are consistent with those found in the hydrologic and hydraulic analyses and on the accompanying profiles, FIRM; and for digitally produced FIRMs, the NFHL dataset/FIRM database. For example, the BFE at each identified cross section can be found in the FDT, read from the flood profiles, labeled on the FIRM, and included as an attribute value in the FIRM database. Within the limits of map accuracy, you should obtain the same answer regardless of which source you use. Just keep in mind that the BFEs shown on FIRMs prior to 2014 are rounded to the whole foot. BFEs shown on FIRMs funded after 2014 can be shown to the nearest half foot or tenth of a foot, but may still be shown to the whole foot, depending on space for labeling. So, the FDT, flood profile, and the NFHL/FIRM database will provide a more accurate value. Please note that for some applications including Zone AO/AH and for mapping of some 2D analyses, the FIRM may represent the only location for BFE values outside of the analyses.

For communities with Geographic Information System (GIS) capabilities, the NFHL dataset can be used to view all of the flood hazard data from digitally produced effective FIRMs. More information about the NFHL is available in Section 4.5.1.

The output of the hydraulic analyses is the basis of the flood profiles within in the FIS report and are used with ground elevation data to delineate the extents of the various zones shown on the FIRM. Again, BFEs can be determined at any location along the studied stream using the flood profiles and the FIRM. If mistakes are found, please advise the FEMA Region 7 Office and the Iowa DNR.

Note: Floodplain mapping is only as accurate as the topographic data used for the base map. Older FIRMs may be based on coarser topographic data than today's standard, and the floodplain boundaries shown may have been interpolated between contour lines. When compared to actual field surveyed ground elevations, discrepancies might be found. The SFHAs on the maps are simply the best graphical representation of the 1% annual chance flood elevation at the point in time the map was produced. Updating the floodplain maps and addressing any discrepancies are further discussed in Section 6, Revising Maps.

Here is the order of precedence for identifying the BFE at a particular location (also see Section 5.3.2):

- The most accurate BFEs are found in the FDT (for a riverine floodplain) and the Summary of Stillwater Elevations table (for a lake). These BFEs are listed to an accuracy of 0.1 feet. However, the BFE information from the FDT is only applicable for sites located on or immediately adjacent to a mapped cross section.

- For sites not located on or next to a mapped cross section, the most accurate source of elevation data is the flood profile. The flood profile is a graph of the flood elevations along the centerline of a stream that normally corresponds to the output of the hydraulic model. Since most flood profiles are drawn with a vertical scale of either 1" – 5 feet or 1" = 10 feet, even at the cross sections, the profile line may not be as accurate as the values found in the FDT.

- For regulatory purposes, the least accurate source of elevation data for a riverine floodplain is the BFEs shown on the FIRM. For FIRMs prior to 2014, BFE values are rounded to the nearest whole foot and, depending on the stream slope and map scale, may not be shown on the map for every 1 foot of change. Current FIRMs may include BFEs rounded to the nearest half or tenth of a foot, but may still be shown to the nearest foot. For this reason, the previous two sources should be used when determining the BFE at a specific location. However, the FIRM is the only source of BFEs or depths for most AH Zones and AO Zones as well as most detailed flooding sources studied by 2D analyses.

As the floodplain maps are just the graphical representation of the hydrologic and hydraulic analyses, BFEs take precedence if there is a dispute between the BFE and the location of the SFHA boundaries shown on the maps. As a local permit administrator, you should make your decisions based on the most accurate source of data.

It should be noted that only FEMA can amend or correct the maps. Discrepancies should be brought to FEMA's attention through a request for a map change, such as a LOMC (see Section 6).

Note: Lending institutions (and others who must read the FIRM to determine if flood insurance is required) must use the effective FIRM. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a request for a LOMC so the map can be officially changed to reflect more accurate data (see Section 6).

Reading and using flood profiles, the last set of data contained in an FIS report, is covered later in this section.

5.2. Using FIRMs

5.2.1. Locating a Site

On older, paper based FIRMs, how easily you can locate a site on an NFIP map depends on your familiarity with streets and properties in your community and on the level of detail shown on the flood maps. However, with the advances of technology and the availability of digital flood data, sites can be easily located using online tools and GIS data. This can be used to view the flood hazard data online or to direct you to the correct FIRM panel for the site in question.

The FEMA MSC website provides several tools to view the effective floodplain data and help narrow your search for a specific property, view the flood hazard data online and locate the correct FIRM panel. The online search tool on the home page of the MSC (https://msc.fema.gov) allows you to search for a FIRM using one of the following methods:

- A street address, place of interest, or longitude/latitude coordinates to locate the specific FIRM.

- The Search All Products link to search by state, county, and community for a list of FIRMs, including the map index. This link will also include the effective FIS, FIRM database, and any LOMCs that impact that area of interest. In addition, this search will include Preliminary, Pending, or Historical products. As noted earlier, only the effective FIRMs for a community may be used for regulatory purposes, but awareness of upcoming updates or historical FIRMs may be beneficial.

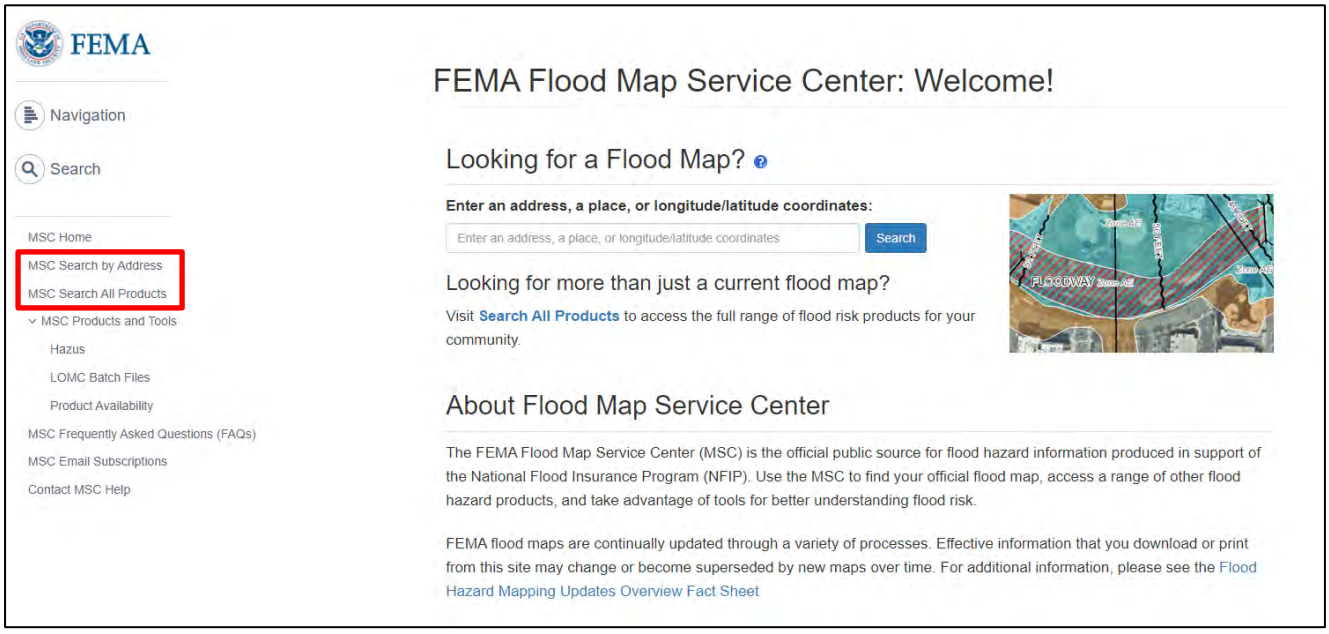


Figure 5-7. Map Service Center

When using the MSC Search by Address function, a link to the NFHL is made available to help the user identify the correct FIRM panels, but also to convey the digital data available in the area. The search results using this function will also note which FIRM panel the requested site falls on and provide options for downloading a portion or all of the FIRM panel. See Figure 5-8.

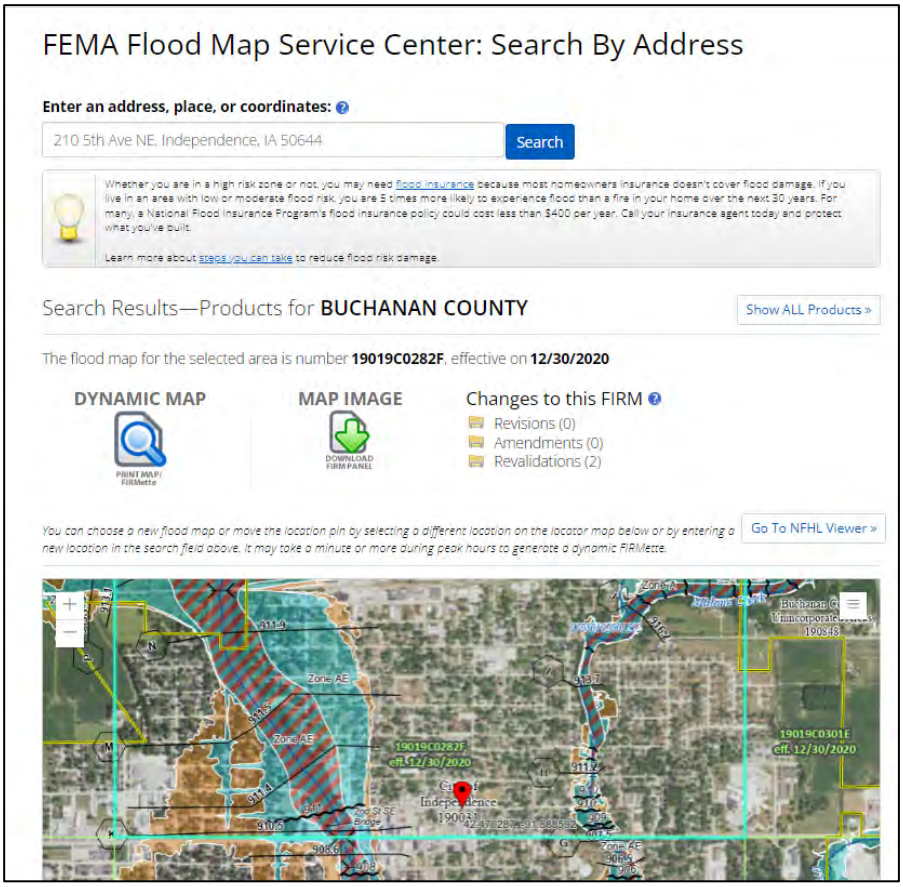


Figure 5-8. Map Service Center – Search by address

The Search All Products link on the FEMA MSC is a great resource for community officials looking to access historic FIRMs and other mapping products in one location. This link will also provide the current FIS report, any active LOMCs, and the FIRM database (NFHL) that are available for download. Available data is shown in
Figure 5-9.

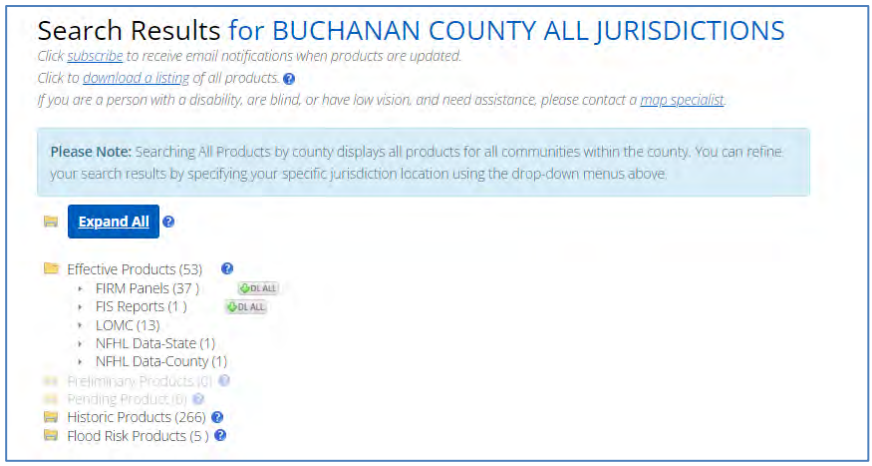


Figure 5-9. Map Service Center – Search All Products

Once the FIRM panel is located containing the site in question, using the Search by Address feature on the MSC or using the FIRM Index, the FIRM panel can be viewed or downloaded from the MSC. When using the Search All Products feature on the MSC, a list of effective FIRM panels and LOMCs is available under “Effective Products”. When viewing or downloading the effective FIRM, please be aware of any LOMCs that may be associated with the FIRM panel that may revise this information. This will be shown with a LOMC symbol. See Figure 5-10.

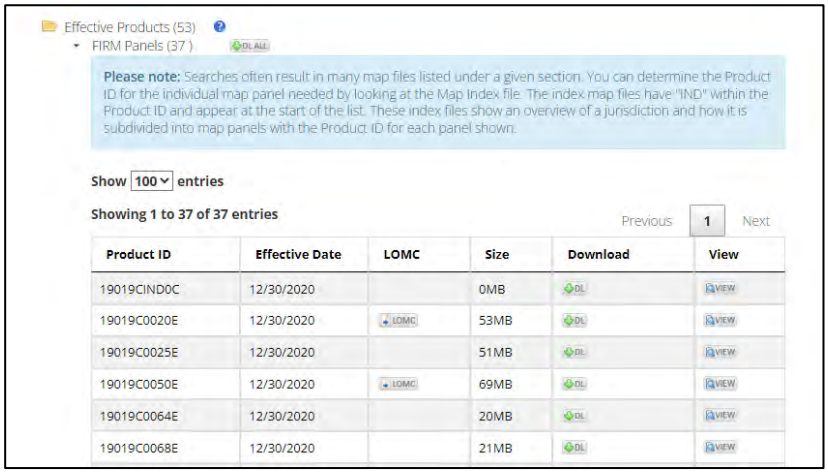


Figure 5-10. List of Effective FIRMs for Buchanan County and Incorporated Areas via MSC

In addition to the FEMA MSC, flood hazard information regarding a site location may be found using the NFHL. The NFHL is a geospatial database that contains current effective flood hazard data. The NFHL consists of the digital data developed for effective flood maps and LOMC delivered to communities. Currently, the NFHL digital data covers 100% of the state of Iowa and is updated continuously as new information is made available. This digital data is also available to the public via the NFHL Viewer.

With the advances in technology and the linking of the FIS, FIRM, and FIRM database, these tools are fairly accurate in locating structures, related FIRM panels and floodplains, and establishing whether a particular site is within the SFHA or Floodway. However, it is always

good practice to double check the location. Also, structures may be impacted by floodplains that originate from neighboring map panels, as the countywide FIRMs may include numerous map panels that cover the entire county.

Note: You may be called on by a bank or lender to determine if a property is in or out of the SFHA. Communities should be aware that lenders are legally responsible for determining if a flood insurance policy is required for a loan.

Under the National Flood Insurance Reform Act, if someone other than a lender provides map information to decide if a flood insurance policy is required as a condition for a loan, the information must be guaranteed. This information is usually provided on FEMA's *Standard Flood Hazard Determination Form*. Note that if you are asked to sign such a form, you are guaranteeing the accuracy of the determination, so you may assume some liability for your action.

5.2.2. Determining Mileage (Stationing)

To identify the BFE at a development site, the stream mileage—or stationing—for the site must usually be determined (unless a property is exactly at a labeled cross section). The stationing of a site will allow us to obtain a BFE from the flood profiles.

1. Locate your site on the FIRM or NFHL Viewer. Identify which labeled cross sections are nearest to your site, both upstream and downstream. If using a paper map, the upstream or downstream cross section may be located on an adjacent FIRM panel.

   Site A is on the east side of 9th Avenue NE, 85 feet south of 4th Street NE. Using the FIRM (Figure 5-11), the site is between cross sections H and I.

Figure 5-11. Sites A, B & C on FIRM 19019C0282F (not to scale)

2. If using paper maps, check the map scale used for the panel. The scale is in the map legend or key.

   For the Buchanan County FIRM Panel 282, the map scale is 1 inch = 500 feet.

3. If using the NFHL Viewer, a measurement tool can be found in the upper left corner of the application. Use this tool to measure the distance from the site in question to the nearest cross section along the stream centerline or profile baseline. If using a paper FIRM, use an engineer's scale to measure this distance. It would be worthwhile to measure the distances to both cross sections to check accuracy. If the stream curves, follow all bends and curves.

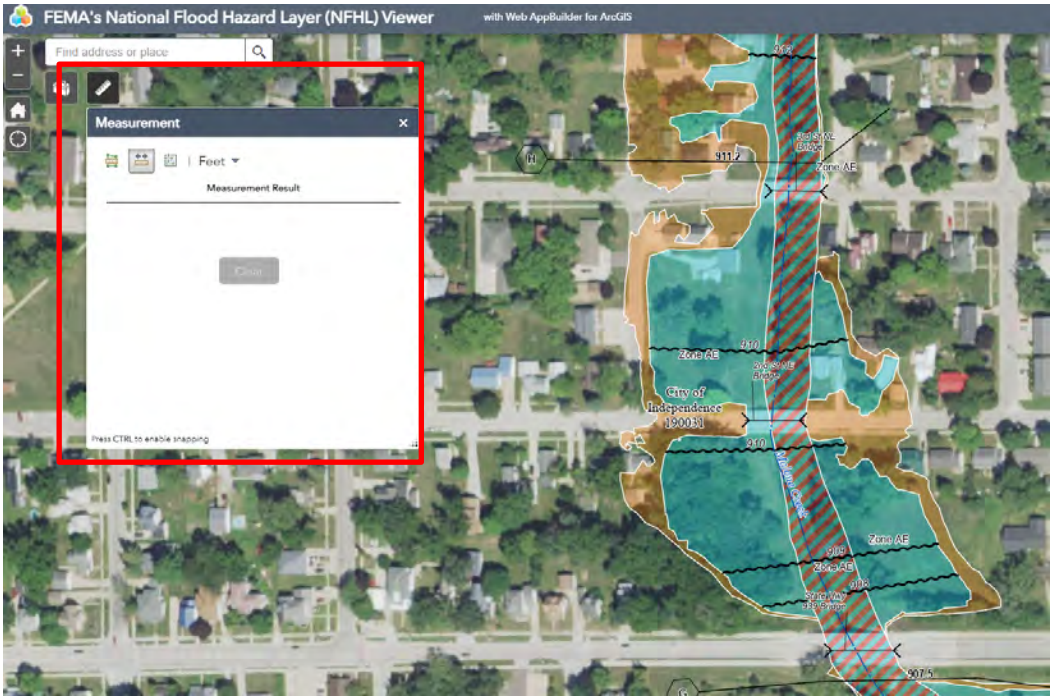


Figure 5-12. NFHL Viewer Measurement Tool

   Cross section (X/S) I is located 825 feet upstream (north) of 4th St NE. Site A is 85 feet south of 4th St NE. Using the "50" scale, Site A is 910 feet downstream (or south) of cross section I. This site is also 265 feet upstream from X/S H.

4. If the X-axis on your flood profile is in feet, you can simply measure 265 feet from X/S H (or 825 feet from X/S I) on the profile to find the location of Site A and the BFE can be read using the vertical axis. Which X/S letter is chosen may depend on profile panel breaks. Section 5.3 has more information on using the profile.

   This approach will also work by measuring from another reference point that is shown on both the flood profile and the FIRM, such as a bridge or confluence of another stream.

5.2.3. BFEs on FIRMs

BFEs can be shown on the FIRMs as whole numbers for older FIRMs but recent FIRMs may show BFEs to the nearest half foot or tenth of a foot, as well as the actual BFE value labeled on mapped cross sections. For lake SFHAs with static elevations (AE Zones), check the Summary of Stillwater table in the FIS for an elevation. If there is no elevation in a Summary of Stillwater table for the flooding source, then use the BFE printed in parentheses below the flood zone designation.

Zone AE	Zone AH
(EL 701')	(EL 701')

No further interpolation is necessary. The same holds true for AH Zones with whole number BFEs.

For other Zone AE areas, read the BFE from the nearest wavy BFE line shown on the map. Refer to the map legend if you are unsure of the line markings.

Site A is located midway between the 912 and 913 wavy lines for an estimated BFE of 912.5 feet NAVD 88. Site B is located between 910 and 912 for an estimated whole foot BFE of 911 feet NAVD 88. Site C is located between two 910 BFEs, resulting in a whole-foot BFE of 910 feet NAVD 88.

AO Zones are mapped as base flood depths and do not have a BFE referenced to a national datum (such as NAVD 88). Instead, the equivalent flood protection level is the number of feet shown in parentheses after the “Zone AO”. This is not an elevation above sea level (or other reference point); it is the depth of flooding measured above the existing ground level. For example, for a “Zone AO (2 feet)”, the flood depth is 2 feet above ground level.

5.2.4. Locating the Floodway Boundary

The floodway boundary is easily identifiable on the FIRMs and within the accompanying digital data. If the site is located at a mapped cross section, floodway width data from the FDT and the mapped floodway width on the FIRM should match within mapping tolerance (normally 25 feet). Remember that the width listed in the FDT is the total floodway width and does not include the floodplain fringe in this value.

If the floodway width measured on the map at a site is at a cross section and does not agree with the width in the FDT, the map should be used because it is the floodway depiction officially adopted by the community. If the difference between the map width at the site and the cross section width in the FDT is greater than map tolerance (25 feet or 5% of map scale, whichever is greater), contact the Iowa DNR and/or the FEMA Region 7 Office for a resolution.

Most sites will not fall conveniently on a cross section, so the digital tools and viewers described in earlier sections should be used. The width of the floodway at any location can be easily measured using the NFHL Viewer or digital data available through the FEMA MSC.

Keep in mind: if any portion of a development site is determined to be within the floodway, then the floodway provisions of your ordinance apply.

5.3. Using Flood Profiles

As discussed in Section 3.3.4, a flood profile is a graph of computed flood elevations at the modeled cross sections. It can be used to determine the elevations of floods of various frequencies at any location along the studied stream.

5.3.1. Flood Profile Features

Up to six flood profiles are shown on the flood profile fold-out sheets at the back of the FIS report: the 10%, 4%, 2%, 1% (base), 0.2%, and 1%-plus floods. Some profiles show all recurrence intervals, while some may show only the 1% annual chance flood profile. The 1%-plus event represents the elevations corresponding to the upper confidence limits of the 1% annual chance flood event and may not be shown on older profiles. While required to be shown on the profile, mapping is optional.

Only the 1% annual chance or base flood is used for compliance with NFIP standards, though the 0.2% annual chance flood (500-year) is often used as the protection level for critical facilities. The other flood frequencies are useful for other floodplain management applications, such as bridge and culvert design, and urban stormwater management.

In addition to the flood elevation profiles, the FIS report flood profile sheets contain:

- A plot of the stream bed.
- The locations of the cross sections used in the FIS and shown on the FIRM (a letter within a hexagon).
- The location of dams and other hydraulic structures.
- The location of bridges, roads, and other stream crossings (usually depicted as a large “I” with the bottom of the “I” representing the elevation of the bottom or “low beam” of the crossing and the top of the “I” representing the Top of the Road). These structures are typically shown only if they are included in the hydraulic model.
- Stream connections and other flooding influences including backwater or conjoined floodplains.

The data are plotted on a grid to facilitate their interpretation. The profile grid contains major gridlines and minor gridlines. Major gridlines should be at 1-inch intervals, while minor gridlines are typically 1/10th of an inch. This greatly aids in making measurements.

Refer to the flood profile for Malone Creek, “01P”, at the back of the Buchanan County and Incorporated Areas FIS report in Section 26. The bottom or X-axis shows the distance along the creek. To be consistent with other data in the FIS report, such as the FDT, distance is usually measured in feet upstream of the mouth of the river, its confluence with another river, or some other easily identifiable known point.

In this case, the starting point of the flood profile for Malone Creek is at the mouth of the Wapsipinicon River. For this profile, each large square (1 inch) along the X-axis (along the stream) represents 500 feet, and each smaller square (1/10 inch) is 50 feet. On some flood profiles, the distances are measured in miles and tenths of a mile, or other units.

The left side or Y-axis shows the elevation in feet NAVD 88. In this example, each large square (1 inch) represents five feet, and each small square (1/10 inch) is one-half foot. Again, flood profiles in other FISs may have different scales. Use of the correct scale is critical in properly locating a site on the flood profile and obtaining the correct BFE.

5.3.2. Determining BFEs

There are four ways to find a BFE. As described below, the FDT and the FIRM database/NFHL dataset are the most accurate, and the FIRM is the least accurate.

FDT

If a site is at or very close to a cross section, you can use the information in the FDT to obtain an accurate BFE. The FDT is discussed in Section 5.1.3.

> *Site B is on the northeast corner of 3rd St NE and 9th Ave NE. It is located at cross section H on the FIRM.*
>
> *The FDT for Malone Creek is shown in the FIS report as "Table 23", and is located after page 30 in the Buchanan County, Iowa and Incorporated Areas FIS report shown in Section 26. It shows that the regulatory BFE for cross section H is 911.2 feet NAVD 88.*

Using the FIRM Database/NFHL Dataset

For communities with digital map products, the "S_XS" cross section data layer is the part of the NFHL or FIRM database that includes the BFE value at each lettered cross section (to the tenth of a foot) and can be used in place of the FDT to obtain the most accurate BFE at cross section locations. This data can also be viewed on the NFHL Viewer.

Flood Profiles

Here are the steps to determine the BFE for a site using the flood profiles found in the FIS report:

1. Using the FIRM or NFHL Viewer, locate features near the site that appear on the flood profile, such as a bridge or cross section.

   Site C is on the north side of 2nd St NE, in between 9th Ave NE and 11 Ave NE.

2. Follow the stationing procedures described in the previous section to determine the site's distance (in feet) along the stream centerline or profile baseline from a cross section or other feature that appears on the flood profile.

Site D is approximately 110 feet north (upstream) of the 2nd St NE bridge crossing and approximately 300 feet south (downstream) of the 3rd St NE bridge crossing.

3. Find the feature(s) on the flood profile for that stream.

   The profile for this portion of Malone Creek is on page 02P located in Section 26 near the end of the Buchanan County, Iowa, and Incorporated Areas FIS report. "3RD STREET NORTHEAST" appears near the left side of the flood profile just downstream of X/S H. The location of the 3rd St NE bridge is represented by the capital letter "I". The 2nd St NE bridge crossing is located on page 01P, so 3rd St NE will be used.

4. Check the scale used for the flood profile and using an engineer's scale or PDF software tools, measure the distance from the feature(s) to the site.

   Site C is 300 feet south of 3rd St NE, or approximately 345 feet downstream of X/S H. On profile 02P, each square is 50 feet horizontal, so the site is 6 squares downstream from the bridge ("I") labeled 3rd Street Northeast. See Figure 5-13.

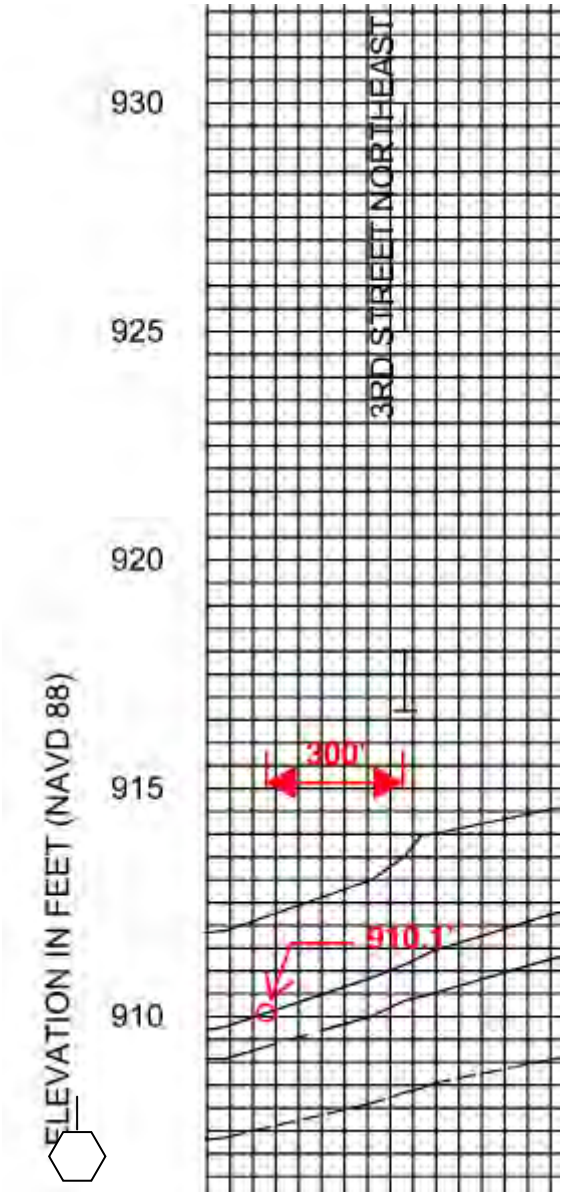


Figure 5-13. Use of the profile to obtain a BFE for Site C – 300' downstream of 3rd St NE

5. Find the site's location on the appropriate flood profile line and read the elevation on the Y-axis. You can draw a straight line to the left or right edge of the graph, count squares, or use an engineer's scale. Remember to use a different scale if the scale on your Y-axis is different than the scale for the X-axis.

   On profile 02P, go downstream (to the left) six squares from the bridge ("I,") at 3rd Street Northeast. From this point, move down the profile until you intersect the 1% annual chance flood line. The 1% annual chance line is denoted by the long dash, two short dashes, and a long dash. This point (the intersect) is noted by a circle in 5-13*.*

   From the intersect with the 1% annual chance flood line, move horizontally to the left or right until you reach the vertical axis. The BFE is read from that vertical axis. Each square on the vertical axis represents a half-foot.

In this example, you intersect the vertical ("Y") axis approximately 1/5 of a square up from 910 feet. Since each vertical square is ½ foot, the BFE at your site is 910.1 feet NAVD.

6. A surveyor can establish the BFE at the site so the owner or builder will know how high the BFE is predicted to be.

   A surveyor can either shoot 910.1 feet at the site or shoot any elevation and tell the owner how high the BFE is in relation to the mark.

Use of the FIRM

The fourth way to determine the BFE is directly from the FIRM. The wavy lines (BFE lines) represent whole-foot BFEs. In more recent FIRMs, the BFE lines may be represented to half a foot or a tenth of a foot as well as whole foot. Using the FIRM should only be done to verify that you did not make a one foot or ten-foot error when you read the profile or in rare instances when a 1% flood elevation is not available in the FIS report.

Site D is located north of 2nd St NE, between two 910 BFE lines. This tells you that Site D could have a BFE of between 909.5 and 910.4 feet, but without using the flood profile or FDT you don't know what the specific BFE is. However, by using the flood profile we can confirm the BFE is in fact 910.1 feet NAVD 88.

Other Types of Floodplains

For determining the BFE at bodies of water with static elevations, the Summary of Non-Coastal Stillwater Elevations table (Table 10 in the FIS report) should be referenced. For some lakes or ponding areas (Zone AE and Zone AH) the FIS report will contain a Summary of Non-Coastal Stillwater Elevations table listing specific BFEs (to the tenth of a foot) for flooding sources with a static flood elevation. These areas are shown on the map as Zone AH or Zone AE with the BFE in parenthesis such as:

Zone AE	Zone AH
(EL 701')	(EL 701')

When determining a BFE in those zones, it is important to check the FIS report for a Summary of Non-Coastal Stillwater Elevations table to ensure you are using the most accurate BFE for the area. If there is no table, or if your flooding source is not listed in the table, then you should use the whole foot BFE listed on the FIRM. Note that in FIS reports funded before 2014, this table may be referenced as Summary of Stillwater Elevations.

5.3.3. Relating BFEs to the Ground

If a site is clearly outside the boundary of the 1% annual chance floodplain (SFHA), no floodplain regulations apply.

If it cannot be determined whether the site is in or out of the SFHA, then additional information and/or investigation will be needed. In this instance, ground elevation and the lowest floor

elevations of any structures will be needed for the site. The applicant will have to hire a surveyor if he or she wants to prove that the property is outside the mapped SFHA.

If the survey finds that the site is on ground higher than the BFE, the owner should be advised to apply for a Letter of Map Amendment (LOMA) or Letter of Map Revision based on fill (LOMR-F) to officially show the property is out of the SFHA (see Section 6.2). Until the FIRM is changed, the local administrator is bound to enforce the regulations based on the current effective FIRM.

Banks (and others who must read the FIRM to determine if flood insurance is required) must go by the effective FIRM. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a request for a LOMC so the map can be officially changed to reflect the more accurate data (see Section 6.2).

5.3.4. Relating Profiles to Maps

Elevation data shown on the flood profiles and FDT are directly related to the BFEs shown on the FIRM and within the FIRM database. Within the limits of map accuracy, you should obtain the same BFE whether you use the map or the profile.

However, when available, the flood profiles and FDT should always be used to determine BFEs along rivers and streams.

If you find obvious mistakes or discrepancies between the tables, flood profiles, and FIRM, contact the Iowa DNR or the FEMA Region 7 Office.

5.4. Using Risk MAP Products and Datasets

As a part of FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program, new processes and products have been introduced to assist with identifying local flood risk and taking appropriate mitigation actions to reduce flood risk and minimize future losses. See Appendix 1 for information about Risk MAP and using Risk MAP products and datasets.

6. Maintaining and Revising NFIP Maps

6.1. Revising National Flood Insurance Program Maps and FIS

NFIP maps and related flood studies—referred to as FIRMs and FIS—are vital to effective enforcement of a community's floodplain management responsibilities. They are also key to fair determinations of the flood insurance purchase requirement.

No map is perfect, and no flood situation is static. From time to time, the FEMA, communities, or individuals may find it necessary for a FIRM to be updated, amended, or changed. Common reasons why a map may need to be changed are discussed in the following sections and include:

- Correcting errors in non-flood-related features
- Including better ground elevation data
- Reflecting changes in ground elevation in the floodplain
- Reflecting new flood data
- Incorporating manmade alterations to the floodplain

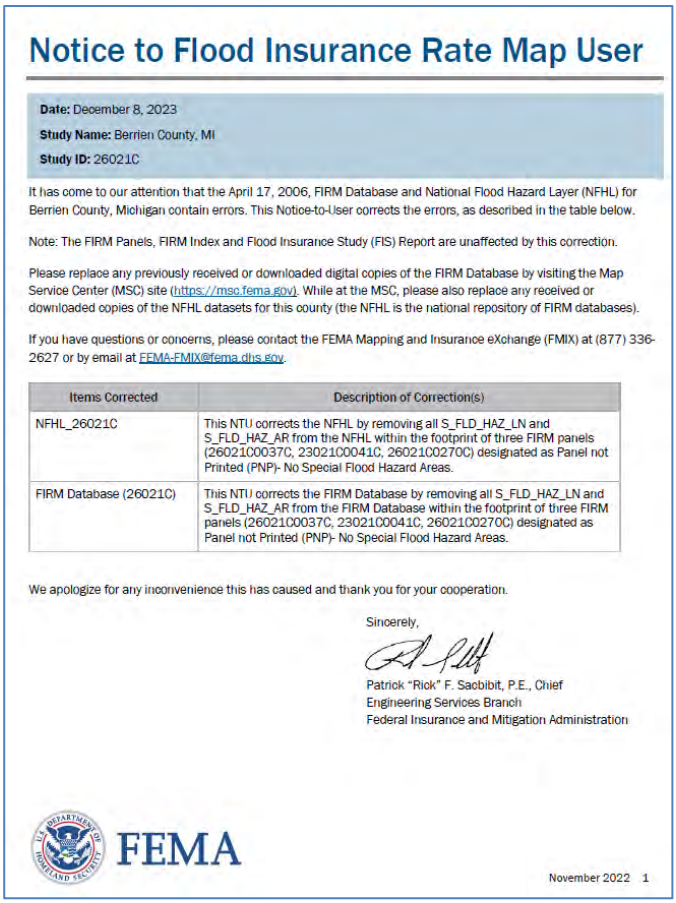
Important Information

A community participating in the NFIP is obligated by its agreement with FEMA to submit new or revised map information when it becomes available. *44 CFR 65.3 of the NFIP regulations states:*

> *A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify [FEMA] of the changes by submitting technical or scientific data…*

6.1.1. Correcting Errors in Non-Flood-Related Features

FIRMs and FIS may contain minor errors, such as street labels, text updates, and minor errors in the FIRM database. As these changes would not change regulatory information, formal map changes may not be initiated. However, these changes may be addressed by FEMA using a Notice To User (NTU) correction. A NTU will involve a correction notice provided to the impacted community with the updated sections of the FIRM, FIRM database, or FIS (Figure 6-1), but does not require a regulatory or due process change. These changes will also be reflected in the digital products located on the FEMA MSC. A NTU cannot be used for any changes that are subject to an administrative appeal period or would change the status of a levee. A NTU would not change the effective date of a FIRM or FIS but would correct the products online and provide an update to the community. For these instances, the local government should send the correct information to the FEMA Region 7 Office in Kansas City (see Section 28 for the address). If the change does not warrant a NTU, these minor changes will likely be held until the map is updated in the next cycle.



Notice to Flood Insurance Rate Map User

Date: December 8, 2023
Study Name: Berrien County, MI
Study ID: 26021C

It has come to our attention that the April 17, 2006, FIRM Database and National Flood Hazard Layer (NFHL) for Berrien County, Michigan contain errors. This Notice-to-User corrects the errors, as described in the table below.

Note: The FIRM Panels, FIRM Index and Flood Insurance Study (FIS) Report are unaffected by this correction.

Please replace any previously received or downloaded digital copies of the FIRM Database by visiting the Map Service Center (MSC) site (https://msc.fema.gov). While at the MSC, please also replace any received or downloaded copies of the NFHL datasets for this county (the NFHL is the national repository of FIRM databases).

If you have questions or concerns, please contact the FEMA Mapping and Insurance eXchange (FMIX) at (877) 336-2627 or by email at FEMA-FMIX@fema.dhs.gov.

Items Corrected	Description of Correction(s)
NFHL_26021C	This NTU corrects the NFHL by removing all S_FLD_HAZ_LN and S_FLD_HAZ_AR from the NFHL within the footprint of three FIRM panels (26021C0037C, 23021C0041C, 26021C0270C) designated as Panel not Printed (PNP)- No Special Flood Hazard Areas.
FIRM Database (26021C)	This NTU corrects the FIRM Database by removing all S_FLD_HAZ_LN and S_FLD_HAZ_AR from the FIRM Database within the footprint of three FIRM panels (26021C0037C, 23021C0041C, 26021C0270C) designated as Panel not Printed (PNP)- No Special Flood Hazard Areas.

We apologize for any inconvenience this has caused and thank you for your cooperation.

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

FEMA

November 2022 1

Figure 6-1. Notice to User Correction

FEMA currently does not have a map change vehicle for areas that have changed due to revisions to corporate limits or annexations. For annexed areas, the community does not need a new map to regulate floodplain development in those areas. Instead, it can adopt the FIRM panels from the neighboring community where the annexation has occurred as part of its floodplain ordinance. This is especially easy where the community is included in a countywide FIRM. Doing so will clarify the regulatory flood data used for the newly annexed properties. Note that FEMA will not provide a map update for annexed areas or changes to corporate boundaries until the next funded restudy of the area.

6.1.2. Including Better Ground Elevation Data

Maps do not always represent site-specific ground elevations. If detailed topographic information shows discrepancies in the floodplain boundaries, the more detailed information may be submitted to FEMA. All topographic information submitted for consideration must be certified by a registered professional engineer or licensed land surveyor. If the topographic data submitted is for a single structure or property, this may be addressed via a LOMA. Topographic data that would change the mapping of the SFHA may require a LOMR. LOMAs and LOMRs are explained more in Section 6.2.

6.1.3. Reflecting New Flood Data

A request may be made to revise the effective FIRM and FIS based on the results of updated ground elevations or from a new flood study.

If there has been a substantial change in ground elevation—for example, fill is placed in the floodplain to raise building sites above the BFE—the applicant may request a map change to reflect the new ground elevation information. Revising to reflect new fill requires documentation that the fill was placed according to NFIP criteria. This may require a Letter of Map Revision based on Fill (LOMR-F). More information on this requirement is shown in Section 6.2.3.

Iowa DNR Approval

In Iowa, proposed changes to an existing flood study must first be approved by the Department of Natural Resources for urban areas that drain two square miles or more and rural areas that drain 10 square miles or more. Revisions to existing studies must be performed using DNR guidelines.

A revision can also be requested based on the results from a new flood study. The new study can reflect updated hydrology such as stream flows or reservoir operations, and hydraulic updates such as topographic data and cross section information. Note that with an updated flood study, the applicant must demonstrate that the original study was in error or that the new study is based on more accurate or better technical data. Any updated data based on physical updates such as new or revised bridges, culverts, levees, dams, etc., should follow Section 6.1.5.

When a flood study is prepared for development in a high risk flood zone (Zone A or AE area), the data should be submitted to FEMA for consideration for incorporation into the FIS and FIRM. Such flood studies must be performed using Iowa DNR guidelines and receive DNR approval before submitted to FEMA for incorporation into the FIRM and FIS. If FEMA does not have an active mapping project in the project area, the flood study can be submitted as a LOMR for incorporation.

6.1.4. Incorporating Manmade Alterations to the Floodplain

If the project involves proposed or actual manmade alterations to the floodplain, such as modifications of the channel, construction or modification of a bridge, culvert, levee, reservoir, or similar measure that affects the flow of the 1% annual chance flood (also known as the 100-year or base flood), the community must request that the map be revised to reflect the new conditions and BFE. Any changes (increase or decrease) that are equal to or greater than 0.1 feet would necessitate a map revision. In addition, per 44 CFR 65.3, a community would need to submit updated data to FEMA and Iowa DNR within six months of completing a project that affects the BFE, but may not always require map revision. 44 CFR 65.3 notes the following:

- *A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practical, but not later than six months after the date such information becomes available, a community shall notify the administrator of the changes by submitting technical or scientific data in accordance with this part. Such a submission is necessary so that upon confirmation of those physical changes affecting the flooding conditions, risk premium rates and floodplain management requirements will be based upon current data.*

The map cannot be changed until the project is constructed and/or operating. For these projects, a DNR permit is required before construction of the floodplain alteration can begin. During the permit process, proposed changes to flow rates, BFEs, and the corresponding SFHA boundaries will be reviewed by DNR.

It is important to note that many small projects, such as channel clearing, low-level dams, land treatment, or retention basins in new subdivisions, do not have a measurable effect on the base flood and do not warrant a map change. If this work is within a floodway illustrated on the FIRMs, a permit and no-rise analysis may be needed. If the applicant cannot demonstrate that the work within the floodway will not cause any increase to the flood stage, meaning nothing greater than 0.00 feet, then a Conditional Letter of Map Revision (CLOMR) would be required. The request for any change needs to be carefully prepared by an engineer who knows DNR and FEMA flood study guidelines.

6.2. Types of Map Changes

FEMA uses two methods to make flood map changes. The first method is to update the map and publish a new FIRM panel and FIS. This approach is called a Physical Map Revision (PMR) and would be scoped and funded by FEMA and adhere to the due process schedule consistent with a full flood study and map revision. This method is more time intensive and is performed only if the change is significant and affects a large area or numerous FIRM panels.

The more common method is to issue a document that describes the map change. These are called LOMCs. There are six types of LOMCs, each of which is described below.

LOMCs include the following:

- LOMA and electronic LOMA (eLOMA) – Section 6.2.1
- Conditional Letter of Map Amendment (CLOMA) – Section 6.2.2
- LOMR Based on LOMR-F – Section 6.2.3
- CLOMR Based on Fill (CLOMR-F) – Section 6.2.4
- LOMR – Section 6.2.5
- CLOMR – Section 6.2.6

6.2.1. Letter of Map Amendment

Occasionally, one or more structures or parcels of land may be inadvertently included in the SFHA. In other cases, it may be difficult to determine whether a structure or parcel of land is in the SFHA. A LOMA can be requested if it can be shown that a structure or property (or portion of a property) is on natural high ground that is at or above the BFE.

Lowest Adjacent Grade—*the lowest point where the ground touches the outside of a building's foundation. This includes bottom of exterior stairwells, patios, attached decks or porches, supporting posts, and piers. The LAG is usually not the same as the top of the foundation, lowest opening, building pad elevation, or lowest floor.*

- For buildings built ***before*** the site was designated as an SFHA (i.e., before the initial identification date when the first FEMA flood map was published), it must be shown that:
  - The building was built, and any fill material was placed before the initial identification date (shown below the legend on older format FIRMs or FHBMs); and
  - The lowest adjacent grade (LAG) is at or above the BFE.
- For buildings built ***after*** the site was designated as a SFHA, it must be shown that:
  - The lowest floor (including basement) is above the BFE; and
  - The LAG is above the BFE.
- For vacant lots, it must be shown that the *lowest elevation* within the boundaries of the property (or a legally described portion of the property) is at or above the BFE.

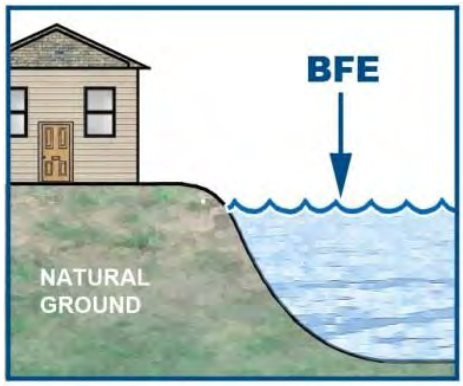


Figure 6-2. LOMAs are issued for structures or property on natural high ground above the BFE

To determine the initial identification date for your community, this information is shown in Table 27 of the current version of the FIS report.

An Elevation Certificate is needed to formally document the elevation of the building or property for floodplain managers enforcing local building ordinances. Sometimes the local community may have the required elevation information on a copy of an Elevation Certificate or other elevation data. Often times, however, the applicant will need to hire a licensed land surveyor or professional engineer to perform a field survey and provide the required elevation(s). There will be a cost associated with this survey; however, there is no LOMA processing fee charged by FEMA.

Once submitted to FEMA and it has received a determination, a "Letter of Map Amendment Determination Document" is sent to the applicant and to the local floodplain administrator—this is the official determination from FEMA outlining the action taken. Please note that these are not only used to state that a structure or property has been removed; they are also used to

indicate when FEMA has NOT approved the removal request. It is important to review the "Outcome" section to determine what decision was reached.

To help simplify the LOMA process, FEMA has designed a web-based tool through the Mapping Information Platform (MIP) for licensed surveyors and engineers and other FEMA approved certified professionals to submit select LOMA requests known as an electronic LOMA (eLOMA). An eLOMA determination document serves the same function as a standard LOMA. Please note that the eLOMA process cannot be used for areas modified by fill to raise the elevation of a structure, currently being processed by another LOMA application, or requests regarding CLOMA, CLOMR-F, LOMR, or LOMR-F. To submit an eLOMA, an account should be created through the MIP.

An example of a LOMA is in Figure 6-3.

Page 1 of 2		Date: February 08, 2023	Case No.: 23-07-0090A	LOMA

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP AMENDMENT
DETERMINATION DOCUMENT (REMOVAL)

COMMUNITY AND MAP PANEL INFORMATION		LEGAL PROPERTY DESCRIPTION
COMMUNITY	CITY OF INDEPENDENCE, BUCHANAN COUNTY, IOWA	Lot 4, Block 7, Stoughton and McClure's Addition, as described in the Quit Claim Deed recorded as Document No. 2006R04647, in the Office of the Recorder, Buchanan County, Iowa
	COMMUNITY NO.: 190031	
AFFECTED MAP PANEL	NUMBER: 19019C0284F	
	DATE: 12/30/2020	
FLOODING SOURCE: WAPSIPINICON RIVER		APPROXIMATE LATITUDE & LONGITUDE OF PROPERTY: 42.466870, -91.892672 SOURCE OF LAT & LONG: LOMA LOGIC DATUM: NAD 83

DETERMINATION

LOT	BLOCK/ SECTION	SUBDIVISION	STREET	OUTCOME WHAT IS REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)
4	7	Stoughton and McClure's Addition	208 3rd Street SE	Structure (Residence)	X (shaded)	--	908.5 feet	--

Special Flood Hazard Area (SFHA) - The SFHA is an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood).

ADDITIONAL CONSIDERATIONS (Please refer to the appropriate section on Attachment 1 for the additional considerations listed below.)

PORTIONS REMAIN IN THE SFHA
STATE LOCAL CONSIDERATIONS

This document provides the Federal Emergency Management Agency's determination regarding a request for a Letter of Map Amendment for the property described above. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we have determined that the structure(s) on the property(ies) is/are not located in the SFHA, an area inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood). This document amends the effective NFIP map to remove the subject property from the SFHA located on the effective NFIP map; therefore, the Federal mandatory flood insurance requirement does not apply. However, the lender has the option to continue the flood insurance requirement to protect its financial risk on the loan.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Figure 6-3. First page of a LOMA

Page 2 of 2		Date: February 08, 2023	Case No.: 23-07-0090A	LOMA

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP AMENDMENT
DETERMINATION DOCUMENT (REMOVAL)
ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

PORTIONS OF THE PROPERTY REMAIN IN THE SFHA (This Additional Consideration applies to the preceding 1 Property.)
Portions of this property, but not the subject of the Determination/Comment document, may remain in the Special Flood Hazard Area. Therefore, any future construction or substantial improvement on the property remains subject to Federal, State/Commonwealth, and local regulations for floodplain management.

STATE AND LOCAL CONSIDERATIONS (This Additional Consideration applies to all properties in the LOMA DETERMINATION DOCUMENT (REMOVAL))
Please note that this document does not override or supersede any State or local procedural or substantive provisions which may apply to floodplain management requirements associated with amendments to State or local floodplain zoning ordinances, maps, or State or local procedures adopted under the National Flood Insurance Program.

This attachment provides additional information regarding this request. If you have any questions about this attachment, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Figure 6-4. Second page of a LOMA

6.2.2. Conditional Letter of Map Amendment

Property owners and developers who intend to place structures in the SFHA may need to demonstrate to the lending institutions and local officials before construction that proposed structures will be above the BFE. If the project involves only the elevation of structures on natural high ground (i.e., not elevated by fill), they can request a CLOMA from FEMA. A CLOMA is a document from FEMA that states whether a proposed structure, which will be constructed on natural grade, would or would not be removed from the SFHA if built as proposed. There is a fee associated with this type of LOMC. For fee information please see the Flood Map-Related Fees page on FEMA's website.

6.2.3. Letter of Map Revision Based on Fill

A LOMR-F makes a determination on whether a structure or property can be removed from the SFHA based on the placement and proper compaction of fill outside of the regulatory floodway. Fill is considered to be that material placed to raise the ground elevation above the BFE. Fill that was placed before the date of the first NFIP map showing the area in the SFHA is considered natural grade for this application.

For properties without structures, a LOMR-F can be used to determine if the lowest filled elevation is at or above the BFE. For existing structures placed on fill, the LAG and lowest floor (including basement) is compared to the BFE. In order for a property or structure to be removed from the SFHA, it must be demonstrated that the appropriate feature(s) are at or above the BFE.

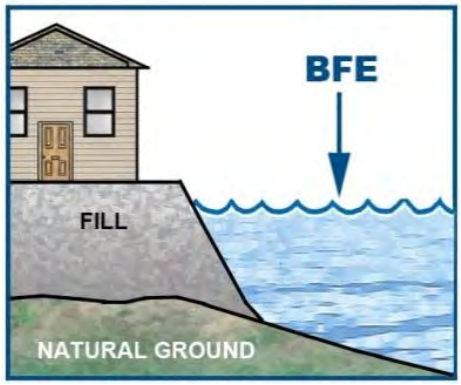


Figure 6-5. LOMR-Fs are issued for structures or property raised on fill above the BFE

Additionally, as the local floodplain administrator, you will be asked to complete the community acknowledgement form. The community acknowledgement form is the community's acknowledgement that they are aware of the proposed revisions and have determined that any existing or proposed structures on the property will be reasonably safe from flooding. Note that you are not required to complete this information if you do not agree that this will be the case.

One reason people apply for a LOMR-F for a vacant lot is to build a building with a basement. Once the land is removed from the SFHA by the LOMR-F, they believe the building will be safe from flooding; however, this is not always true. A building site may still be subject to flood problems, especially from saturated soil and hydrostatic pressure due to subsurface flows.

Because of the potential flood risk and associated structural damage, FEMA has published Technical Bulletin 10 titled *Reasonably Safe from Flooding Requirements for Building on Filled Land*. Here are some quotes from that bulletin:

> *"Local officials who have the authority to make determinations as to whether filled sites are reasonably safe from flooding should require permit applicants to submit appropriate information such as that described in this Technical Bulletin to review and to make the*

determination. A common practice is to require a signed statement or certificate by a qualified design professional to indicate that all land and existing or proposed structures to be removed from the SFHA, are or will be reasonably safe from flooding, according to the criteria described in this Technical Bulletin".

"Certifications may be provided by professional engineers, professional geologists, professional soil scientists, or other design professionals qualified to make such evaluations. Local officials should have the certification and its supporting documentation submitted with permit applications to be able to make reasonably safe from flooding determinations before issuing building or floodplain development permits".

Technical Bulletin 10 as well as other resources are available on FEMA's website.

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

Property owners and developers who intend to place structures in the SFHA may need to demonstrate to the lending institutions and local officials before construction that proposed structures will be above the BFE. If the project involves the elevation of structures on earthen fill, they can request a CLOMR-F from FEMA. A CLOMR-F is a document from FEMA with its comment on whether a parcel of land or proposed structure would be inundated by the base flood if fill is placed on the parcel and/or the structure is built as proposed. Also note that applicants must provide documentation which demonstrates that Endangered Species Act (ESA) compliance has been achieved prior to the review of any CLOMR-F request. A fee is charged for review of a CLOMR-F. For fee structure information please see the Flood Map-Related Fees page on FEMA's website.

6.2.5. Letter of Map Revision

A LOMR is a letter from FEMA officially revising a portion of the effective FIRM and any associated FIS sections to show changes to floodplains, regulatory floodway, and/or flood elevations. Through the LOMR process, changes to SFHA boundaries, BFEs, and the regulatory floodway may be made to an existing FIRM, although a revised FIRM or FIS will not be published. A LOMR is normally based on revised hydraulic modeling and usually will not involve specific lots, properties, or structures. The LOMR must be obtained before a building permit can be issued for any proposed development based on the revised area of the FIRM. LOMRs require a processing fee unless the submittal is based entirely on more detailed data and there are no physical changes to the floodplain.

Any interested party can request a LOMR. However, because a LOMR approved by FEMA will revise official regulatory data for that area, the request for a LOMR must be reviewed and approved by the affected communities.

A LOMR response from FEMA includes a determination document describing the changes to the FIS report and FIRM, as well as an annotated map attachment showing the revised portions of the affected FIRM panels. The annotated FIRM shows changes to the BFEs, SFHAs, and if applicable the delineation of the regulatory floodway. The revised area of the map panel supersedes the effective FIRM panel for that revised area. Note that for LOMRs covering large areas impacting numerous FIRM panels, FEMA may decide to fund a PMR to

update the FIRMs. In these instances, the submitted modeling will be reviewed with the LOMR, but the FIRM panels will not be updated until the PMR is funded and completed.

For more information on LOMRs see the Process to Revise a Flood Map page on FEMA's website as well as FEMA Guidance Document, *Guidance for Flood Risk Analysis and Mapping: MT-2 Requests* found on the FEMA Guidance and Standards webpage.

6.2.6. Conditional Letter of Map Revision

The CLOMR allows FEMA to review and comment on anticipated map revisions based on proposed modifications or conditions that are expected to exist in the future. Under this process, engineering data may be submitted for a proposed project or future condition with a request that FEMA review the data and issue a CLOMR describing the revisions that may be made upon completion of the proposed work.

A CLOMR can be submitted for any project, but FEMA only **requires** a CLOMR submittal for proposed revisions involving the regulatory floodway or when a project will result in an increase of greater than 1.00 foot for streams with BFEs specified but no regulatory floodway. This process normally involves revised modeling and requires submittal of certified plans showing initial filling, grading, etc. A follow up LOMR is required once the project is complete and requires submittal of as-built plans and elevations that match the proposed information used for the CLOMR. Note that similar to CLOMR-F, applicants must provide documentation which demonstrates that ESA compliance has been achieved prior to the review of any CLOMR request. There is normally a processing fee for a CLOMR.

CLOMR Special Considerations

- A CLOMR is required for proposed projects located:
  - (a) within the floodway that cause ANY BFE increases or
  - (b) in a Zone AE area without a floodway determined that cumulatively increases the BFE by 1.00 foot or more at any point.
- Impacted property owners must be individually notified of the proposed change.
- An evaluation of project alternatives and a certified statement that no insurable structures will be impacted by the proposed project must also be submitted.
- Must provide documentation demonstrating ESA compliance has been achieved.

6.2.7. Areas with a Reduced Flood Risk Due to a Flood Control Project

FEMA can issue a LOMR to communities that have a flood control project under construction (new construction or restoration). During construction, the SFHA may be designated as a Zone A99 or a Zone AR where FEMA has determined that a community has made adequate progress on its construction, reconstruction, or restoration of a project designed for flood risk reduction. At the completion of the project, this designation will be changed to Zone X. The flood insurance purchase requirement remains in effect in an A99 or AR zone floodplain, but the floodplain management requirements are generally less than those required in other SFHAs (Zone AE, Zone AO, and Zone AH).

To qualify for an A99 Zone, the flood control project must have reached specified statutory progress toward completion. No BFEs or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply. FEMA's specific requirements are outlined in 44 CFR Subpart 60.3(c)(9) and 44 CFR 61.12.

To qualify for an AR Zone, the flood control project must have been previously shown as providing a flood hazard reduction on the effective FIRM, no longer meets NFIP accreditation requirements of 44 CFR 65.10, provide some risk reduction to residents in the levee impacted area, and be the subject of a restoration project to restore the flood hazard reduction system to provide risk reduction to the 1% annual chance flood. An AR Zone may be beneficial in situations where the project has not progressed to the point of being eligible for a Zone A99 determination. FEMA requirements for Zone AR determinations are outlined in 44 CFR 65.14.

In addition, please see FEMA's Guidance Document: *Guidance for Flood Risk Analysis and Mapping: Zone AR and A99 Determinations.*

6.2.8. Fees

A processing fee is charged for LOMRs, LOMR-Fs, CLOMRs, CLOMAs, and CLOMR-Fs. There is no fee for FEMA's review of LOMA. The current fee schedule can be found at the Flood Map-Related Fees page on FEMA's website.

6.3. Requesting Map Changes

FEMA's maps are based on the best available information at the time the study was completed. As better information becomes available or as changes are proposed in the floodplain, the floodplain maps should be updated. Each of the methods described below requires an applicant to submit data for FEMA to review and validate.

The applicant is often the party that would benefit the most from a new map. Usually, this is a property owner or developer who wants to eliminate the flood insurance purchase requirement or the extra floodplain building regulations. In some cases, the community submits a map revision. If the request is for a map revision (i.e., a change in the regulatory data), the request must have the community's concurrence before FEMA will approve it.

The applications and a list of the necessary supporting information can be downloaded on the Paper Application Forms for Letter of Map Changes.

The following sections outline the steps to follow when requesting map changes:

- Step 1: Obtain FEMA forms (Section 6.3.1)
- Step 2: Prepare needed information (Section 6.3.2)
- Step 3: (Specific to LOMR or CLOMR) Submit the request to DNR (Section 6.3.3)
- Step 4: Submit FEMA forms and necessary attachments by mail or online (Section 6.3.4)

- Step 5: FEMA forwards the request (Section 6.3.5)

6.3.1. Step 1: Obtain FEMA Forms

To request a LOMC, the appropriate FEMA forms should be used and submitted. The forms begin with a "MT" prefix followed by a form identifier depending on the request. The LOMC request should use one of the following FEMA forms, which can be downloaded from FEMA's website:

Figure 6-6. FEMA's MT-1, MT-2, and MT-EZ forms

MT-1:

- LOMA
- CLOMA
- LOMR-F
- CLOMR-F

MT-2:

- LOMR
- CLOMR

MT-EZ: The MT-EZ is the shortest and simplest of the three forms.

- LOMA for a single residential lot or structure

See Section 27 for the links to these forms.

6.3.2. Step 2: Prepare Needed Information

With the exception of applicable certified elevation information or completion of the community acknowledgement form, requests for LOMAs, CLOMAs, LOMR-Fs, and CLOMR-Fs can be completed by a property owner or other applicant. Due to the technical nature of the data needed for most LOMRs and CLOMRs, these applications should be completed by a qualified engineer. It is crucial that the applicant review and understand the required forms. The most common reason that FEMA does not take action on a LOMC request is because the applicant did not complete all necessary forms or did not submit adequate technical data to validate the change.

Find LOMA fact sheets, tutorials, forms, and the online application on FEMA.gov.

The LOMC forms can either be mailed to the LOMC Clearinghouse or utilize the Online Letter of Map Change website for submittal. This web page includes an online submittal process for all six types of LOMC but will require the user to register for a Login.gov account to access. In addition, the review process is currently the same as LOMC applications submitted by regular mail.

For LOMA submittals, FEMA has designed an interactive online determination tool for MT-1 requests called electronic Letter of Map Amendment (eLOMA). The eLOMA is a web-based application within FEMA's MIP that provides licensed land surveyors, professional engineers, and other authorized users with a system to submit basic LOMA requests to FEMA. The eLOMA process can be much quicker than the standard LOMA (i.e., 5 days vs. 30-60 days). However, it can only be used for a single lot/structure locate in a Zone AE or Zone AH. Note, the eLOMA process should not be confused with the Online LOMC process discussed previously.

Information Needed to Request a CLOMA, LOMA, CLOMR-F, or LOMR-F

Most often, requests for LOMAs or LOMR-Fs are made to remove the mandatory purchase requirement for properties where better ground elevation data or fill material placed in accordance with all Federal, State, and local regulatory requirements demonstrates the property or structure is above the BFE. Anyone (local governments or individuals) can request a LOMC of this type.

The request should generally include the following information:

- A completed application with the appropriate forms for the required LOMC:
    - MT-1 Forms
    - MT-EZ Forms
- Recorded legal document that includes a description of the property. Can be a copy of the recorded deed or plat, indicating the legal description of the property and the official recording information (deed or plat book volume and page number) and bearing the seal of the Recorder of Deeds.
- A map that shows the location of the property, either:
    - A subdivision plat
    - An official county, city, and/or subdivision map indicating the lot location
    - A subdivision map indicating the lot location sealed by a surveyor or engineer
- Subject(s) of the determination (structure, lot, or portion of property), i.e., a map that shows the location of the property, either:
    - Provided on the Property Information Form
    - Entered into the Online LOMC or eLOMA portals
- A photocopy of the effective FIRM panel (including title block), annotated to show the location of the property requested.
- Certified elevation information:
    - Elevation Form on MT-1 Application
    - MT-EZ Application Form (Section B)
        - Only used for existing single residential lot or structure

  - Elevation Certificate
    - Only used for single structure, existing, or proposed
  - Certified Topographic Survey Map
    - May be required if elevation data on forms does not provide enough detail to review
  - Certified Grading Plan
    - Normally required when fill is being placed on a property in the vicinity of a floodway

- If the request involves a structure:

  - A plat of survey that shows the location of the structure on the lot
  - The elevation of both the lowest floor (including basement) and the LAG to the structure
  - The type of structure (slab, crawlspace, or full basement)
  - The date construction was completed

  Note: If the request involves a structure, a topographic map that shows adjacent ground elevations may be required. The elevations must be certified by a licensed professional engineer or professional land surveyor and be written as follows:

  Lowest floor elevation (including basement) is _____

  Lowest adjacent grade elevation is _____

  Type of construction is _____

  Date construction completed is _____

- If the request is for a legally recorded parcel of land, a certified lowest property elevation for the parcel must be submitted. For a portion of a legally described parcel of land (described by a metes and bound), a certified lowest property elevation for the *portion of the described property*, a certified metes and bounds map, and a certified metes and bounds description must all be submitted.

- A completed Community Acknowledgement form (MT-1 form 3) for all LOMR-F, CLOMR-F, or LOMA requests in which the property/structure is believed to be inadvertently included in the regulatory floodway. For LOMA requests in which the property has been inadvertently included in the regulatory floodway, only the applicable section of the form (Section B) needs to be completed for this type of request.

- If the request is for a CLOMR-F, documented ESA compliance must be submitted. Appropriate documentation includes a copy of the Incidental Take Permit, an Incidental Take Statement, a “not likely to adversely affect” determination from the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS) or an official letter from NMFS or USFWS concurring the project has “No Effect” on proposed or listed species or designated critical habitat.

- A completed payment information form and applicable payment, if any.

Information Needed to Request a CLOMR or LOMR

A CLOMR or LOMR submittal must be supported by scientific and technical data and must be accompanied by the completed MT-2 forms. No matter who initiates the request for a LOMR, if it is for a change in the regulatory data (such as the BFE or floodplain boundaries), the request must have the community's agreement before FEMA will approve it. Approval by DNR should be obtained before submittal to FEMA.

Changes to an existing flood study must use hydrologic and hydraulic analyses consistent with the effective FIS and are generally required to be performed for the same recurrence interval floods as those performed for the FIS. For submittals proposing hydrologic and hydraulic analyses not consistent with the effective FIS (for example, 2D analyses for areas previously studied by 1D methods), documentation must be provided noting why the effective hydrologic and hydraulic analysis method is no longer valid. The proposed hydrologic and hydraulic analyses must use FEMA acceptable models in the analysis. In addition, new flooding information cannot be added to a FIRM in such a way as to create mismatches with the effective flooding information shown for unrevised areas (i.e., located upstream and downstream). Therefore, in performing new analyses and developing revised flooding information, applicants must tie the new BFEs, base flood depths, SFHA boundaries, SFHA zone designations, and/or regulatory floodway boundaries to those shown on the effective FEMA maps for areas not affected by the revision. Regarding floodplain profiles and BFEs, the new data must tie into the effective data within a half-foot or less on the upstream and downstream extents of the revision.

The vertical datum used in any data submitted must match the datum used in the FIS report and FIRM. Further, SFHA boundaries are to be shown on a topographic map (preferably in digital form) whose scale and contour interval are sufficient to provide reasonable accuracy.

Similar to CLOMR-F, CLOMR applicants are responsible for providing FEMA with documentation that the project has met ESA compliance. This must occur before FEMA or Iowa DNR reviews the CLOMR application.

All analyses and data submitted by applicants must be certified by a registered professional engineer or licensed land surveyor, as appropriate.

For additional information on CLOMR and LOMR submittals, please see FEMA Guidance Document 106: MT-2 Requests found on the FEMA Guidance and Standards website.

6.3.3. Step 3: For a LOMR or CLOMR, Submit the Request to DNR

For LOMRs or CLOMRs involving better flood data, physical changes (e.g., a new bridge), or a new flood control project, additional information may be required by the DNR. Requests for LOMRs and CLOMRs should also be approved by the DNR before being submitted to FEMA.

6.3.4. Step 4: Submit FEMA Forms and Necessary Attachments by Mail or Online

Applicants are encouraged to submit via the Online LOMC tool (hazards.fema.gov/femaportal/onlinelomc/signin) but can also submit hard copy (paper) submittals to the LOMC Clearinghouse. See FEMA's website for the latest application forms

and submittal instructions, including the latest mailing address. Information on LOMC submittal is also in Section 27.

6.3.5. Step 5: FEMA Forwards the Request

LOMC requests will be forwarded to FEMA's contractor for processing. The contractor will send an acknowledgement of receipt and will also coordinate with the applicant regarding any additional information that may be required. Upon receipt of all required information, the FEMA contractor will complete the processing of the draft LOMC. Upon concurrence by FEMA, the final LOMC is distributed to the applicant and the local community official responsible for floodplain management. The LOMC should be filed by the community with your copy of the FIS report and FIRMs since it represents the latest available data for the area addressed by the LOMC.

It is important to note that though a LOMC may remove the Federal mandatory flood insurance purchase requirement, a bank or other lending institutions may still require the purchase of a flood insurance policy on structures that has been removed from the SFHA by a LOMC.

Additional information on how to change the flood zone designation can be found on FEMA's website.

6.4. Maintaining Maps

6.4.1. Keeping FIRMs Updated

As the primary repository for NFIP maps and studies, it is important that your community maintains adequate copies, keeps them updated, and makes them available for public review. You should have at least one master copy that includes all the changes, annexations, map revisions, and other pertinent information.

It is also important to keep copies of old, superseded maps and studies. They provide a historical record of what was known and the basis of what was required in the past. For example, a property may not have been shown in the SFHA on an old FIRM, so there were no floodplain requirements at the time the building was constructed. If that property is later flooded, the community would need to show the old map as the basis for the community's action. Superseded versions of previous FIRM panels as well as historic LOMCs are also kept online at the FEMA Map Service Center under "Search All Products" for a specific community. Please note that not all historic FIRMs and LOMCs may be available digitally on the FEMA MSC.

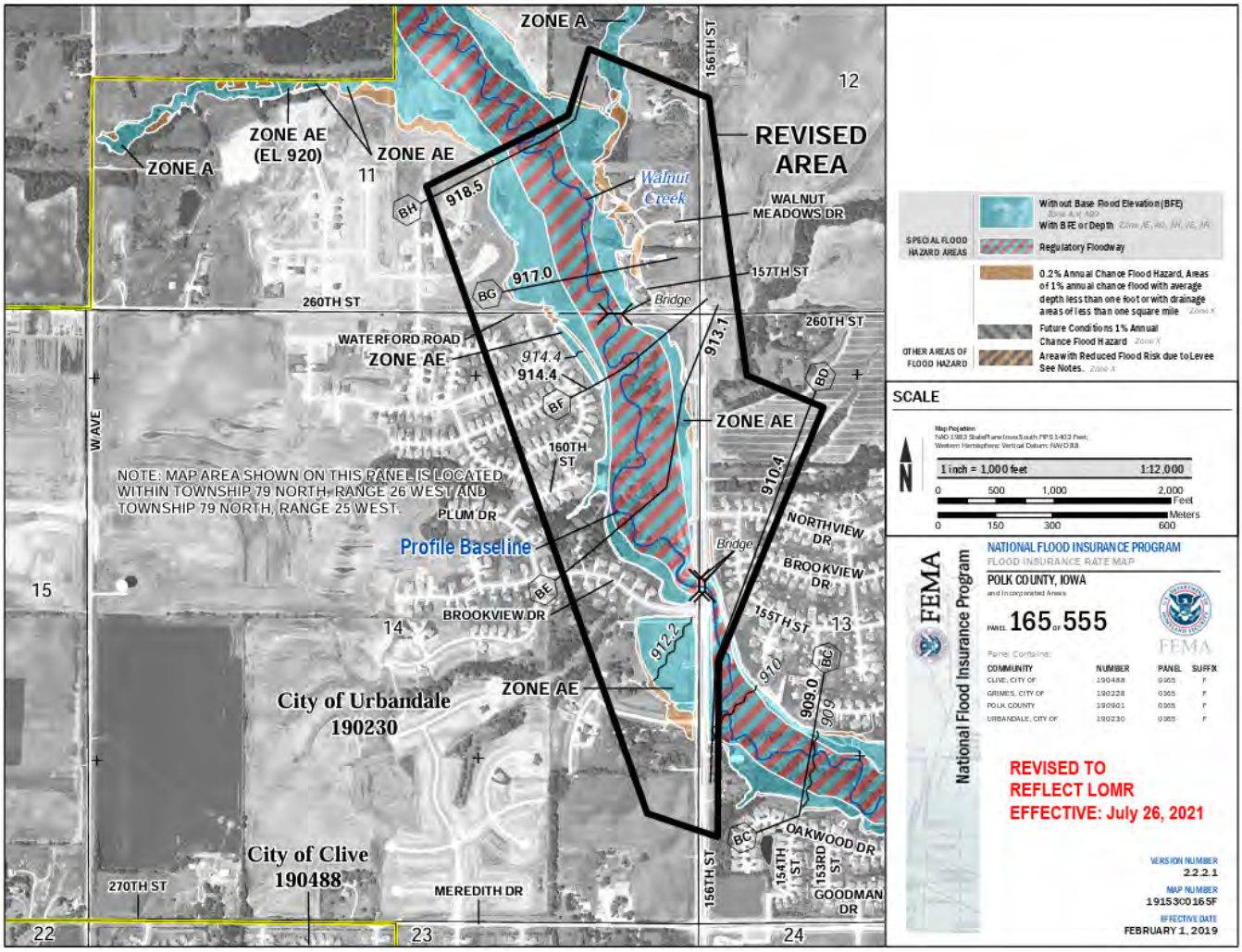


Figure 6-7. Example of a LOMR annotated panel

Communities should always direct users to and work with the most current FIRM including all the latest revisions and amendments. The map user needs to be sure that the data reflects the latest flood hazard information for their area.

6.4.2. Tracking Changes

LOMCs can be found online tied to the FIRM panel they impact on FEMA's Map Service Center website.

Because LOMAs amend and LOMRs revise the effective NFIP map, they are public records that the community must maintain. LOMAs and LOMRs should be noted on the community's copy of the FIS report and/or FIRMs and filed by panel number in an accessible location. When an FIS is revised, it will have a section that explains what changes were made to the previously adopted data. Generally, the revision will incorporate all past LOMRs, but not past LOMAs/LOMR-Fs, since they are too small to be reflected on the map.

When FEMA publishes a new FIRM, it provides the community with a Summary of Map Actions (SOMA). The SOMA details the status of all map changes after the new FIRM

becomes effective. The SOMA categorizes LOMAs by those that were incorporated into the new FIRM, those that could not be incorporated due to map scale limitations but will be revalidated, and those that will be superseded by updated flood hazard information. Rarely do LOMAs get incorporated into the new FIRM, but it is still an option on the SOMA. The revalidation letters (for LOMCs that are still valid and not incorporated) are also sent to your community and are also available on the MSC website (http://msc.fema.gov) under "Search All Products".

6.4.3. Obtaining and Ordering Maps

Copies of a community's FIS report or FIRM can be found on the MSC website under Product Catalog. The available FIRMs include effective, pending effective, preliminary, and historic FIRMs, as applicable. More information on use of the MSC website, available map products, or other mapping questions is available by calling 1-877-336-2627.

FEMA's National Flood Hazard Layer provides access to seamless digital FIRM data including recent LOMCs.

In communities where digital map products have been produced, FEMA makes the FIRM database available. The FIRM database product contains digital data of the information contained within the FIRM and FIS reports and is used with GIS software and provides the user with the ability to determine the flood zone, BFE, and the floodway status for a particular location. In addition, the NFHL Viewer will show the case number and limits of a revision area for a LOMR.

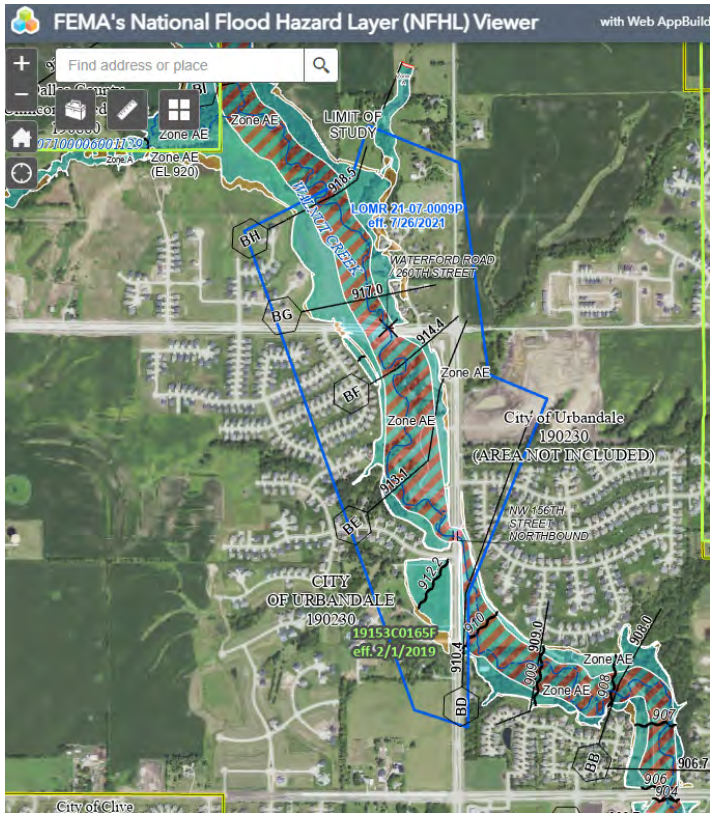


Figure 6-8. LOMR Depiction in NFHL Viewer

The digital flood data are also available online through the NFHL Viewer. The NFHL dataset represents the current effective flood data for the country using a compilation of effective FIRM databases and LOMRs and is updated as studies and LOMRs go effective. The FIRM database is available on the FEMA MSC, and the NFHL can be viewed online on the NFHL Viewer.

7. Regulatory Framework

7.1. The Legal Basis

Designing and administering a floodplain management program is essentially a job of writing and enforcing your local laws, rules and regulations. In some communities, legal challenges have prevented the implementation of well-planned programs. Therefore, we must know some basics about the law of regulating what people can do on their property.

7.1.1. Statutory Authority

"Statutory authority" means the powers given to a community by state law. In Iowa, city and county home rule amendments to the constitution were passed by voters in 1968 and 1978, respectively. These amendments give cities and counties the authority to govern local affairs to the extent that they are not in conflict or inconsistent with state statute. An ordinance can exceed minimums set forth in state statutes but cannot prohibit an act specifically permitted by state statute or permit an act specifically prohibited by the state.

To show that a regulation has a sound legal basis, it is a good idea to include the statutory authority for the regulations at the beginning of the ordinance. Communities with zoning should include their zoning authority: Chapter 414 for cities and Chapter 335 for counties (formerly Chapter 358A). Home rule communities can add their home rule authority as granted by the Iowa Constitution and described under Chapter 364 for cities and Chapter 331 for counties.

7.1.2. Limitations on Local Authority

Cities, villages, and counties are created by the State. They have only those powers granted to them by state law or assumed under home rule powers. The Legislature did not grant cities and counties the authority to regulate state construction (e.g., Iowa Department of Transportation, Board of Regents). Similarly, Federal government development is exempt from local regulation.

Other Local Governments

Local governments such as school districts, sanitary districts, park districts, cities, and counties were created by the Legislature to perform specific duties. A city or county does not have the authority to regulate where the regulation would conflict with or "frustrate" the functions of a public division specifically granted by law.

If a local government or other organization undertakes a development project that would violate the flood protection standards of your ordinance, it should be required to show how its statutory authority exempts the project. Each situation will be different, but let the developer have the burden of proof that your ordinance "frustrates" its statutory responsibilities or privileges. You may also want to write a letter for the record to the agency, advising them that their project may be exposed to flooding or cause increased flooding elsewhere. Local governments, however, are not exempt from Iowa DNR permit requirements.

Agricultural Activities

The authority for counties to zone (Chapter 335) exempts certain agricultural activities. However, that exemption specifically excludes floodplain development.

> ***335.2 Farms exempt.*** *Except to the extent required to implement Section 335.27, no ordinance adopted under this chapter applies to land, farmhouses, farm barns, farm outbuildings, or other buildings or structures which are primarily adapted, by reason of nature and area, for use for agricultural purposes, while so used. However, the ordinances may apply to any structure, building, dam, obstruction, deposit, or excavation in or on the flood plains of any river or stream.*

While farming may be exempt from some county regulations, counties and cities have all the authority needed to enforce state and FEMA requirements, ensuring all development in the floodplain is properly managed. In some instances, to clearly delineate between the floodplain regulations and local zoning ordinances, some counties in Iowa have established a "stand-alone" floodplain management ordinance as allowed by the *Code of Iowa.*

Guidance on requirements for agricultural structures has been developed by FEMA and will be discussed in detail in Chapter 11 – Regulatory Requirements: New Buildings.

Extraterritorial Jurisdiction

Cities have certain authorities over the lands just outside their corporate limits. They may have zoning authority over areas up to two miles out provided:

- The county has not enacted a zoning ordinance.
- The city's zoning ordinance and zoning map specifically include the unincorporated areas of the county.

A majority of Iowa's counties have zoning ordinances. A city that is exercising extraterritorial zoning would lose its authority if the county adopted a zoning ordinance.

Cities with populations over 25,000 and/or cities that have adopted subdivision ordinances that grant them extraterritorial authority within two miles of their corporate boundaries may review plans for subdivisions located within two miles of the city limits.

Taking

Why not simply tell people that they cannot build in the floodplain? If we did, we would not have to worry about new buildings getting flooded, and the regulations would be simple to administer: Just say "No".

While this regulatory standard appears desirable, it has one fatal legal problem: It could be a "taking".

The Fifth Amendment to the U.S. Constitution states, "Nor shall property be taken for public use without just compensation". The Constitution contains this provision because in England,

the king could take property and use it for his own purpose, such as quartering troops or hunting, without compensation.

The term “taking” has come to mean any action by a government division that relieves a person of his or her property without payment.

Government agencies possess the authority to condemn and acquire privately owned land. Under the power of eminent domain, they can acquire land without the owner’s agreement provided the acquisition clearly is for a demonstrably public purpose, official condemnation proceedings are followed, and the owner is paid for the value of the land. Some common examples of eminent domain actions are:

- Purchase of land for roads and public works projects
- The development of public park land
- Utility acquisition of rights of way for transmission lines

Courts have ruled that a taking may occur when the government enacts a law, standards, or regulation that limits the use of the land to the extent that the owner has been deprived of all economic interest in using the property. Thus, the government has “taken” the property under a legal provision known as inverse condemnation. In cases where a court has found a taking, the governmental body has been required to pay the property owner for the value of the loss. Often, though, the regulations are retracted as applied to that property.

Usually, courts undertake a complicated balancing of public and private interests in deciding to take issue. The courts will consider such factors as:

- Regulatory objectives
- The harm posed by uncontrollable development
- Reasonableness of the regulations
- Severity of the economic impact upon the private property owner

Very restrictive floodplain regulations, as well as state and NFIP regulatory standards, have been challenged as a taking in a number of cases. Figure 7-1 summarizes important cases challenging the legality or constitutionality of NFIP regulations.

Most NFIP criteria are performance standards that do not prohibit development of a floodplain site provided the performance standards are met. For example, development in the floodway is prohibited only if it increases flood heights.

These performance-oriented standards of the NFIP have never been ruled as a taking. This is highly significant, given that more than 21,000 communities nationally administer floodplain management ordinances.

One reason for this success rate is that property owners must prove that they have lost all economic return on their parcels. It is hard to prove that nothing can be done on a piece of land, especially since the NFIP and State rules allow many types of activities.

Case	Issue	Decision/Impact
Village of Euclid v. Ambler Realty Company (1926)	The use of police power to regulate land use.	The court upheld the basic concept of zoning.
Turnpike Realty Co. v. Town of Dedham (1972)	Challenge to the constitutionality of the NFIP.	The court upheld the floodplain management regulations.
Just v. Marienette (1972)	A wetland regulatory case.	The court decided that a landowner does not have the unlimited right to use the land for a purpose that is unsuited to its natural state or that will injure the rights of others.
Texas Landowners Association v. Harris (1978)	Challenge to the validity of the NFIP and its mitigation requirements.	The courts held that the NFIP was reasonable. A community could not claim a taking if insurance or disaster relief was denied for failure to comply with NFIP standards, because they are benefits, not rights.
First Evangelical Lutheran Church of Glendale v. Los Angeles County, LA (1987)	Whether a temporary building moratorium that was deemed a taking would require compensation.	The U.S. Supreme Court held that temporary regulatory takings could require compensation. This case was sent back to the state to decide if a taking had occurred. The state endorsed the floodplain regulations and held that the regulations were not a taking.
Adolph v. FEMA (1988)	Whether the parish floodplain management regulations adopted constituted a taking.	The Court upheld that the NFIP as a whole is not a taking, nor are the parish regulations.
April v. City of Broken Arrow (1989)	Whether two Oklahoma floodplain ordinances constituted a taking (requirement for elevation of new homes to 1 foot above the 100-year flood elevation).	The courts accepted the general proposition that local public officials must be afforded reasonable elasticity in planning and implementing legitimate state interests and held that regulations were valid.

Case	Issue	Decision/Impact
Lucas v. South Carolina Coastal Council (1992)	South Carolina Supreme Court—whether the South Carolina Beachfront Management Act constituted a taking. U.S. Supreme Court—whether the property owner was entitled to compensation for his alleged "total loss of value" attributed to the Beachfront Management Act.	The South Carolina Supreme Court ruled that the Act did not constitute a taking and reversed the trial court's award of $1.2 million to Lucas. The U.S. Supreme Court ruled that where the value of a property is essentially "destroyed" by regulation, compensation should be paid.
Dolan v. Tigard (1994)	The imposition of a floodplain bike path as a condition of a permit to expand commercial structures.	The U.S. Supreme Court found that the business owners should not be required to construct a bike path to obtain the permit.
Palazzolo v. Rhode Island (2001)	Discusses the violation of the Takings Clause of the Fifth Amendment related to a coastal wetlands property in Westerly, Rhode Island.	The U.S. Supreme Court agreed with the Rhode Island Supreme Court decision that the property owner did not have a claim since he obtained the property after the enactment of the regulations that he was challenging. The U.S. Supreme Court ruling did not address whether it was a total taking since some of the parcel was still economically usable, as discussed by the Rhode Island Supreme Court.
Tahoe-Sierra Preservation Council, Inc. v. Tahoe Regional Planning Agency (2002)	The question presented was whether a moratorium on development imposed during the process of devising a comprehensive land use plan constitutes a *per se* taking of property requiring compensation under the Takings Clause of the United States Constitution.	The U.S. Supreme Court concluded that the temporary moratorium at issue here was not a taking because it was not a 'taking of' the parcel as a whole.
Lingle v. Chevron (2005)	Discusses the Hawaii statute that limits the rent that oil companies may charge to dealers who lease service stations owned by the companies.	The U.S. Supreme Court stated that the "substantial advances" formula used in Agins v. City of Tiburon (1980) is not a valid takings test. However, the Court did not grant Chevron relief due to only discussing the "substantially advances" theory, which had been previously struck down.

Case	Issue	Decision/Impact
Kelo v. New London (2005)	Whether the public use clauses of the Federal and state constitutions authorize the exercise of the eminent domain power in furtherance of a significant economic development plan that is projected to create in excess of 1,000 jobs, to increase tax and other revenues, and to revitalize an economically distressed city, including its downtown and waterfront areas.	The U.S. Supreme Court offered support to the concepts and principles of the NFIP and No Adverse Impact floodplain/stormwater management and determined that economic development in the community can be considered a "public use" under the Takings Clause.
San Remo Hotel v. City and County of San Francisco (2005)	This case presents the question of whether Federal courts may craft an exception to the full faith and credit statute for claims under the Takings Clause of the Fifth Amendment.	The U.S. Supreme Court stated that there was no basis for Federal courts to re-litigate based on the Full Faith and Credit Statue after a state court previously denied the Fifth Amendment Takings Clause.

Note: These are brief summaries of the court cases. They should not be quoted without reading the full text of the ruling.

Figure 7-1. Selected cases of challenges to land use regulations

It may be more costly to build according to the floodplain management standards, and, in some instances, it may not be economical to develop a property. However, the NFIP performance standard is a valid exercise of the police power because it is based on a legitimate public purpose—preventing flood damage. Floodway requirements are defensible because they prevent the actions of one property owner from increasing flood damage to his or her neighbors.

The NFIP regulatory criteria have not lost a taking case because they allow most flood-prone sites to be built on as long as development standards are followed to reduce the risk of flooding for new structures and neighboring properties. The owners are not denied all economic uses of their properties as long as their construction accounts for the level of hazard.

Courts have supported regulatory standards that are more restrictive than NFIP regulations, such as complete prohibitions of new buildings or new residences in the floodway. These cases tied the prohibition to the hazard and the need to protect the public from hazards created by the development.

Things need to be reasonable. For example, a complete prohibition of development in a shallow flooding area where there is no velocity may not be considered "reasonable" by a court.

The rationale does not always have to be tied to property damage. For example, in Illinois, upholding the state's prohibition of new buildings in the northeastern Illinois floodways, the Illinois Supreme Court noted that while buildings could be protected, the residents would be surrounded by moving water during floods, preventing access by emergency vehicles.

The prohibition takes into consideration not only the concern about preventing further flooding, but also the concern about the need to provide disaster relief services and the need for the expenditure of State funds on shelters and rescue services for victims of flooding.
(Beverly Bank v. Illinois Department of Transportation, September 19, 1991)

The lesson is that before your community enacts a regulatory provision that severely restricts the use of property, your community's attorney should review the provision to be sure it will not be overturned as a taking. Regulatory standards that are reasonable, tied to the hazard, and support public objectives should be upheld.

7.1.3. Liability

Ordinance administrators naturally fear they could be sued if a person gets flooded or a building is damaged by a flood. Debated nationally for some time, this issue has been studied extensively by Dr. Jon Kusler, a nationally known attorney in floodplain management law.

Dr. Kusler summarized his most recent findings in *Floodplain Management in the United States: An Assessment Report*, Volume 2, prepared for the Federal Interagency Floodplain Management Task Force, 1992.

Excerpts from that report are quoted here. However, your community's legal department should provide more specific guidance.

- Government agencies are generally not liable for flood damage unless the flood was caused by a government action.

  Except in a few instances, governments are not liable for naturally occurring flood damages. Government has, in general, no duty to construct dams, adopt regulations, or carry out other hazard reduction activities unless required to do so by a statute. It is only where a government unit causes flood damages or increases natural flood damages that liability may arise.
  (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1012)

- Liability is based on negligence; a community is well defended by a properly administered program.

  In general, government units are not 'strictly or absolutely' responsible for increased flood damages. Liability usually results only where there is a lack of reasonable care. [...] Where the standard of reasonable care is judicially applied to an activity, the seriousness of foreseeable threat to life or economic damage is an important factor in determining reasonableness of conduct. In general, the more serious the anticipated threat, the greater the care the government entity must exercise.
  (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1013)

- Policy or discretionary actions are more defensible than nondiscretionary, ministerial actions. It is better to have clear standards spelled out in the ordinance adopted by your

governing board than to leave a lot of interpretation up to the administrator.

As a general rule, courts do not hold legislative bodies or administrative agencies liable for policy decisions or errors in judgment where the Legislature or [agency] exercises policymaking or discretionary powers. But they often hold agencies responsible for failure to carry out nondiscretionary duties or for negligence in carrying out ministerial actions.
(*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1013)

- *[F]rom a legal perspective it may be desirable to submit proposed standards [...] to a community's legislative body (e.g., community council) for debate and approval. Due to the special way legislative decisions are treated by the courts, legislative judgments, particularly those of a discretionary nature, are less likely to result in a successful liability suit than are division decisions. Courts generally defer to legislative judgment.*
(*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1017)

- Government employees are usually protected from liability suits.

  Although governments may be liable for increased flood or drainage losses in a broad range of contexts, government employees are usually not personally liable for planning, permit issuance, operation of dams and adoption of regulations or other activities. [...] No personal liability results where a government employee acts in good faith, within the scope of his or her job, and without malice. Successful lawsuits for hazard-related damages against government employees under common law theories or pursuant to Section 1983 of the Civil Rights Act are apparently nonexistent.
  (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Pages 1013-1014)

Based on these findings, you may be able to protect your jurisdiction from lawsuits by:

- Adopting sound and appropriate flood protection standards. Remember, NFIP standards are minimums. Buildings should not be allowed in a mountainous floodplain with no warning time and very high velocities, even though the NFIP minimums would allow it. If you know flooding could be or has been higher or more expansive than the SFHA shown on the FIRM, you are not doing your residents any favors by allowing them to build buildings exposed to a known hazard.

- Becoming technically competent in the field. You will not be sued if you have ensured that the project was properly constructed. There are no grounds for a suit if no one is damaged by flooding:

  [L]iability can be avoided if flood damages are avoided'. From a legal perspective, this is a sound philosophy.
  (*Floodplain Management in the United States: An Assessment Report*, Volume 2, Page 1017).

- Insuring the community. Your community may want to purchase liability insurance or establish a self-insurance pool or plan to protect itself.

- Encouraging property owners to buy flood insurance coverage. If people are compensated for any flood losses, they are less likely to file a lawsuit.

- Adopting an ordinance provision that exempts the community from liability. The DNR's model ordinances have a section entitled "Warning and Disclaimer of Liability" that may well already be in your ordinance. It reads as follows:

  > The standards required by this Ordinance are considered reasonable for regulatory purposes. This Ordinance does not imply that areas outside the designated SFHAs will be free from flooding or flood damages. This Ordinance shall not create liability on the part of the [city or county name] or any officer or employee thereof for any flood damages that result from reliance on this Ordinance, or any administrative decision lawfully made thereunder.

7.2. The Ordinance

This manual assumes that your community has a floodplain management or development ordinance in effect and that it is based on one of the DNR models. (If you have not adopted an ordinance, please refer to the contacts in Section 28.) If you want to change your floodplain management ordinance, contact the DNR for guidance before doing so. Keep in mind your legally enforceable ordinance *must* be approved by FEMA in order for your community to remain in the NFIP.

7.2.1. State Approval

Certain communities are considered "delegated" communities by the DNR. They have authority to issue permits for certain project types without waiting for a DNR floodplain permit. Any change to a delegated community's ordinance must have DNR approval.

Non-delegated communities are not required to get DNR approval of ordinance changes, but it is advisable. The DNR can double check that your proposed provisions will still comply with state and NFIP requirements (see Section 28 for contact information).

If a community wants or has DNR delegation, a draft of the ordinance or amendment should be submitted before it is adopted. The approval will be subject to the following conditions:

1. Approval from the DNR shall be obtained prior to undertaking any amendment to the approved ordinance and prior to granting variances from the approved ordinance.

2. The issuance of the approval shall not subject the State of Iowa or the DNR to any legal or financial responsibility arising from the enforcement of the approved ordinance.

3. Approval from the DNR must still be obtained prior to any floodplain construction (e.g., channel alterations, flood control levees, bridges) not specifically addressed in the approved ordinance.

7.2.2. Types of Ordinances

Floodplain management regulations may be defined and implemented through one of four types of regulations, including: “stand-alone”, zoning ordinances, building codes, and subdivision regulations ordinances. The first two are most common in Iowa, but each is explained below.

“Stand-Alone” Ordinance

The DNR has created model “stand-alone” ordinances that include all the NFIP and state regulatory requirements. The advantage of adopting a stand-alone ordinance is that one ordinance contains all floodplain development standards. Developers can easily see what is required of them, and FEMA and the state can easily see if your community has adopted the latest requirements.

The disadvantage to a separate ordinance is that it may not be coordinated with other building, zoning, or subdivision regulations. Some communities have found that by adopting a stand-alone model, they adopt standards that are inconsistent or even contrary to the standards in the other regulations. For example, your building code may require crawlspace vents to be high, near the floor joists, while the floodplain ordinance requires them to be no more than one foot above grade.

If you have a stand-alone ordinance, you should review its provisions with all other offices and ordinances that regulate land development and building construction. Make sure that others know the floodplain regulations and that there are no internal inconsistencies. For example, a floodplain ordinance administered by the city engineer may not be coordinated with the permit process conducted by the building department.

Zoning Ordinance

A zoning ordinance regulates development by dividing the community into zones or districts and setting development criteria for each district. Two approaches address development in flood-prone areas: separate districts and overlay zoning.

In a separate district, the floodplain can be designated as one or more separate zoning districts that only allow development that is not susceptible to damage by flooding. Appropriate districts include public use; conservation; agriculture; conservation subdivision; and cluster or planned unit developments that keep buildings out of the floodplain, wetlands, and other areas that are not appropriate for intensive development.

Overlay zoning adds special requirements in areas subject to flooding. The areas can be developed in accordance with the underlying zone provided the flood protection requirements are met. As illustrated in Figure 7-2, there may also be setbacks, buffers, or other performance standards to protect stream banks and shorelines or to preserve the natural functions of the channels and adjacent areas.

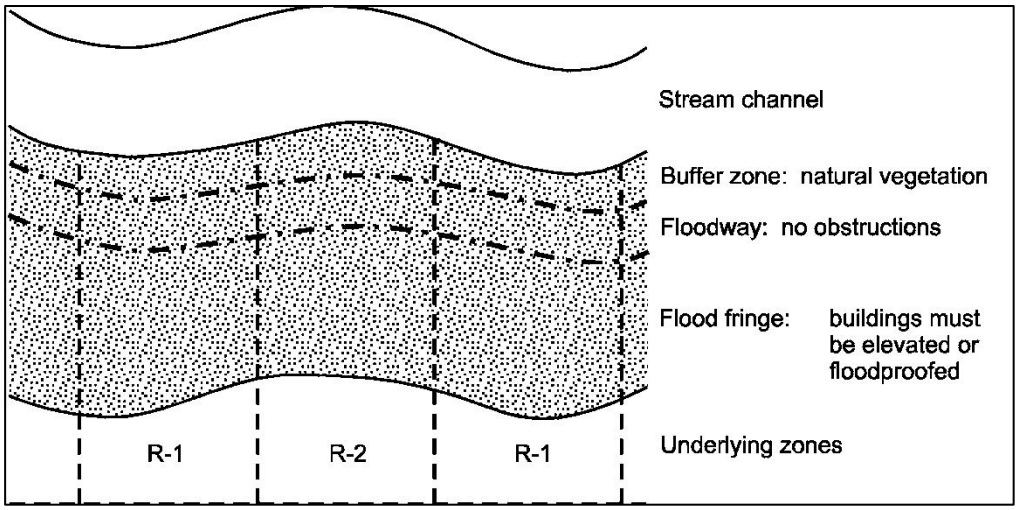


Figure 7-2. Example of overlay zoning

Building Codes

A building code establishes construction standards for new buildings. The code may or may not set site or location requirements as a zoning ordinance does.

The International Code series (I-Codes) includes provisions that address all NFIP minimum floodplain management requirements. Those NFIP requirements related to the actual construction of buildings are contained in the bodies of the International Building Code and International Residential Code. Requirements related to building utilities are contained in the International Plumbing Code, International Mechanical Code, International Fuel Gas Code, and International Private Sewage Disposal Code.

The other NFIP requirements, such as administrative provisions and requirements that apply to floodways, subdivisions, and manufactured homes, are contained in Appendix G of the International Building Code. Communities that adopt the I-Codes have the option of either adopting Appendix G or addressing these other requirements through other ordinances and regulations. However, some amendments to Appendix G may be required to meet the minimum floodplain requirements in Iowa.

In the past, the model national building codes included, to a variable extent, provisions related to natural hazards such as seismic, high winds, severe winter storms, and flooding. I-Codes address all these hazards on a consistent, rational basis that allows mitigation of those natural hazards found within each jurisdiction's boundaries.

You should not assume that since your community uses one of these codes all your regulatory requirements are covered. However, because of the advantages of incorporating the I-Codes into community floodplain management programs and addressing other hazards, the CRS provides credit for adoption of the series. See Section 20 for more information on the CRS.

More information on I-Codes and the NFIP can be found on the FEMA website at https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes/flood-resistant-provisions-2018-international-codes-2018.

Subdivision Regulations

Subdivision regulations govern how land is divided. They define improvement and location standards for the infrastructure the developer will provide, including roads, sidewalks, utility lines, storm sewers, drainage ways, and more.

As noted in Section 13, subdivision regulations offer an opportunity to keep buildings out of the floodplain entirely with cluster developments, conservation subdivision design, low impact developments, and other types of site plan design tools.

Figure 7-3. Example of well-designed subdivision plan building site out of SFHA

Subdivision regulations can also require that every lots have a buildable area above the regulated flood elevation, include dry land access, and meet other performance standards that provide more flood protection than a building code can.

Subdivision regulations can specify what appears on the recorded plat of the subdivision, something that is checked whenever a property is purchased. This offers the community a chance to clearly designate the hazard.

7.2.3. Contents of the Floodplain Management Ordinance

Whether your floodplain regulations are in one ordinance or several, they should have these provisions:

- **Purpose:** Why was the ordinance adopted? What are its objectives? This provision helps set the tone for regulatory standards. For example, if the only purpose of the ordinance is to meet the NFIP minimum building requirements, a court may rule that it should not have higher regulatory standards that protect life safety.

- **Definitions:** What technical terms are needed? Most ordinances have to define terms like “development”, “building”, “1% annual chance flood elevation”, and “lowest floor” in order for the regulations to be clearly understood.

- **Adoption of flood data:** Your community needs to adopt the effective FEMA FIRM and any other regulatory flood data like a FIS. This provision may need to be amended when new studies and maps are published, or new areas are annexed.

- **Requirement for a development permit:** Your ordinance must have a development permit process. Relying on your community’s building code or zoning ordinance permit process may not be sufficient because those programs may not require permits for all development, including fill, mining, septic system installation, culvert construction, and other types of improvements.

- **Construction standards:** This is the meat of the ordinance. It should cover all of the minimum NFIP and State standards and additional regulatory standards that the community deems appropriate. The standards should include provisions for:

- Building protection standards (elevation, floodproofing, anchoring)
- Standards for manufactured homes and mobile home parks
- Construction standards peculiar to the flood zones in your community, such as AO and AH
- Construction in the floodway and standards for encroachments where floodways are not mapped
- Standards for subdivisions
- Standards for water and sewer service
- Rules on water course alterations
- Bridges and culverts
- Substantial damage and improvements

- **Designation of administrator:** The community must officially designate one person responsible for administering the ordinance. This provision may list that person's duties as detailed in Section 7.3.1. Where possible, this should be an identified position within the community, not a specific person and not an elected official.

- **Variances and appeals process:** The regulations need to provide a way for people to appeal or request a variance when they feel that the construction standards cannot be successfully applied to the property as defined in the ordinance. This process should be handled by a separate body, such as a board of appeals or planning commission; it should not be left up to the decision of a single person, such as the administrator. (See also the discussion on variances in Section 16.)

- **Enforcement:** The ordinance must have enforcement procedures clarifying penalties for violations. These are usually fines and orders to correct the violation.

- **Abrogation and greater restriction:** This is a legal provision that specifies that the ordinance takes precedence over less restrictive requirements.

- **Severability:** This is a statement that the individual provisions are separable and if any one is ruled invalid, it does not affect the rest of the ordinance.

7.2.4. CRS Credit

If your community chooses to exceed the minimum requirements of the NFIP, you may wish to join the CRS program. This program encourages communities to enact regulatory standards that exceed the minimums that are more appropriate for local conditions. Participating communities are rated and insurance policies in their community are discounted based on the quality of the community's floodplain management programs and ordinance restrictions.

CRS is explained in more detail in Section 20. Where provisions that can receive CRS credit are mentioned in this reference, they are highlighted with the CRS logo.

7.3. The Administrator

The state grants communities the police powers to adopt, administer, and enforce local codes and regulations, including floodplain regulations. Generally, elected officials delegate authority for ordinance administration and enforcement to a subordinate officer.

A local floodplain administrator might be an existing local staff person, such as the building inspector, community zoning official, sanitarian, city clerk, engineer, or planner. The community also might contract to have the job done by the county, regional planning division, another jurisdiction or authority, or a private firm.

Throughout this reference, the person designated as responsible for administering the floodplain management ordinance is called “the administrator”. This reference also assumes that you are the administrator, so the terms “you” and “the administrator” are used interchangeably.

7.3.1. Duties

In general, the administrator is responsible for ensuring that development activities comply with the floodplain management regulations and other applicable codes and ordinances.

Duties of the administrator vary depending on the kind, size, and characteristics of the community. However, certain responsibilities are common to all ordinance administrators.

Understand the regulations: This is the most important of all of your duties and is the main subject of this reference. A sound working knowledge of the general and technical provisions of various Federal, state, and local regulations is essential. You must be able to explain them to others, to review permit applications for compliance, and to provide adequate interpretations.

Ensure that permit application processes are followed: Often people do not realize that they need to apply for a permit for a project in the floodplain. You need to ensure that the public is informed as to when permits are needed and how they are obtained. Anyone engaged in a development project without a permit must be told to stop and apply for one.

Correct violations: You must evaluate complaints, conduct investigations, and use legal recourse when necessary to correct violations.

Process permit applications: Your primary role is to review permit applications for compliance with applicable local regulations. This involves:

- Collecting permit fees, where applicable
- Assessing the accuracy and completeness of the application
- Evaluating site plans, topographic data, building design plans, and other technical data
- Identifying deficiencies and devising ways to correct them

- Issuing or denying the permit
- Helping applicants pursue appeals or requests for variances

Coordinate with other programs: Responsibility for permit review may reside in or be shared with other offices, such as public works, planning and zoning, code enforcement, or housing departments. Depending on your duties, you may be involved in coordinating permit reviews.

You must advise the applicant of any need for additional local, state, or Federal permits for the proposed development, including DNR permits (see Section 9). Your office could have copies of the permit application forms or advise applicants whom to contact.

One of your NFIP responsibilities is to notify adjacent communities and the DNR prior to any alteration or relocation of a watercourse. You must submit evidence of such notification to the FEMA Regional Office.

You should also notify adjacent communities of plans for a substantial commercial development or large subdivision that could change the amount of pervious surfaces and storage areas within the watershed and affect their flood hazard areas.

Ensure projects are built according to approved permits: You or your staff must perform periodic and timely on-site inspections to confirm visually that development is following the approved plans. The best way to do this is with a series of inspections at appropriate stages in the construction process, as discussed in Section 15. A certificate of use or occupancy is a final permit that allows the owner to use the building. It should not be given until a final inspection confirms that everything was done according to the approved plans.

Take enforcement actions: When non-compliant activities are uncovered, you must act to resolve the situation. This may involve issuing stop work orders or other violation notices, coordinating enforcement procedures with the community's attorney, or appearing in court.

Keep records: You should have on hand a sufficient supply of current permit applications, variance requests, and other administrative forms. A project file should be kept for each development permit application. Records are covered in more depth in Section18.

Maintain and update flood data and maps: As noted in Section 6.4, your community should ensure that the maps showing the regulatory floodplain for your community are available for public use. This includes keeping a detailed record of all LOMCs, LOMRs and LOMAs issued in your community and as appropriate, tying those changes to the affected map panel.

You should also cooperate with Federal, state, and local agencies, and private firms undertaking flood studies. You must submit any new floodplain data to the DNR within six months of their development. Community staff should review revisions to maps, including CLOMRs and LOMRs, to ensure they meet regulations.

The NFIP regulations are included Chapter 44 of the ***Code of Federal Regulations (CFR)*** (see Section 2.5.1 for more information). These regulations set forth several requirements for maintaining and updating flood data and maps. Each of these requirements is detailed below.

- You must notify the FEMA Regional Office and the DNR within one year of an annexation or when your community has assumed or relinquished authority to adopt or enforce floodplain management regulations for a particular area.

44 CFR 59.22(a)(9)(v) Upon occurrence, [the community must] notify the Administrator in writing whenever the boundaries of the community have been modified by annexation or the community has otherwise assumed or no longer has authority to adopt and enforce flood plain management regulations for a particular area. In order that all FHBMs and FIRMs accurately represent the community's boundaries, include within such notification a copy of a map of the community suitable for reproduction, clearly delineating the new corporate limits or new area for which the community has assumed or relinquished floodplain management regulatory authority.

- You must notify the FEMA Regional Office and the state within six months of physical changes that can affect flooding conditions, such as channel modifications or upstream detention.

44 CFR 65.3. A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of the changes by submitting technical or scientific data in accordance with this part. Such a submission is necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and flood plain management requirements will be based upon current data.

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

44 CFR 60.7. From time to time Part 60 may be revised as experience is acquired under the Program and new information becomes available. Communities will be given six months from the effective date of any new regulation to revise their flood plain management regulations to comply with any such changes.

- Similarly, if you are given new flood data by FEMA, you have six months to update your ordinance to adopt the data and the regulatory requirements appropriate for that level of data (see Section 8).

44 CFR 60.2(a) A flood-prone community … will be given a period of six months from the date the Administrator provides the data set forth in § 60.3(b), (c), (d), (e) or (f), in which to meet the requirements of the applicable paragraph.

A certified copy of any ordinance revision should be submitted to the FEMA Regional Office and to the DNR promptly after adoption.

7.3.2. Dealing With the Public

As you administer your ordinance, you will be interacting with the residents, engineers, surveyors, builders, developers, and public officials. It is important that you convey the need to abide by the floodplain regulations for their safety and others in the community. This will encourage voluntary compliance and reduce the number of problems you may face.

You are, in effect, the public relations manager for floodplain management in your community. If you explain the rules showing the positive side (flood damage prevented, lives saved), you will be more successful than if people think you are grudgingly enforcing some unwelcome Federal mandate.

You can use your website, brochures, newsletters, and newspaper articles to help educate the general public and permit applicants. You can also order a number of pamphlets from FEMA that explain the threat of flooding or the reasons to buy flood insurance. As shown in Figure 7-4, some communities develop their own pamphlets or mailings to explain the reasons for their floodplain ordinances and the importance of the protecting the floodplain and the drainage system from improper development.

Some examples include the Cities of Clive and Cedar Falls

Cedar Falls Flood Brochure

Clive Flood Information Website

Figure 7-4. Examples of a local public information website

You may also want to consider educating your city council, county board, or other public officials. It is important that citizens and community officials understand and support your regulatory program. They are the ones that decide whether variances will be issued or whether

the ordinance will be amended. One place to start is to get them a copy of or share the web link of *Understanding and Managing Flood Risk: A Guide for Elected Officials* from the Association of State Floodplain Managers (ASFPM). Another option is to have them view the web-based video series created by Iowa State University Extension and Outreach. This video series is designed to educate local officials and the general public about floodplains, flood risks, and basic floodplain management principles. The videos are divided into five categories: Introduction to the NFIP, Understanding Flooding, Floodplain Mapping, Floodplain Regulation, and Flood Insurance. Access the videos at http://www.extension.iastate.edu/floodinginiowa.

7.3.3. Qualifications

Iowa does not set minimum requirements for the person who administers the floodplain management ordinance. This does not mean just anyone can do any part of the job. One of your responsibilities is to make sure that the person with the right qualifications helps you. Some tasks should be conducted by a licensed professional engineer (P.E.) experienced in hydrologic and hydraulic studies, such as reviewing a developer's flood study before you accept new flood elevations. Some model ordinances call for an engineer to review certain permits. Check your ordinance for this.

- Once a building has been constructed in the floodplain, you will need an elevation certificate which must be completed by a professional land surveyor or P.E.
- You should always consult your community's attorney before you initiate an enforcement action.
- A few states are encouraging or requiring that the ordinance be administered by a "Certified Floodplain Manager" (CFM ™). The ASFPM offers a program to certify you as floodplain manager.

7.3.4. Training

In many cases, only you will have the expertise needed to administer your ordinance. As the administrator, you will probably be your community's primary source of information on:

- The basic NFIP requirements
- DNR requirements
- Additional requirements of your ordinance
- How to use the NFIP maps and regulatory flood data
- How maps are reviewed and revised
- When permits are needed
- Whether a proposed project meets the ordinance's standards
- Whether a completed project complies with the approved plans

- What records are needed
- How to deal with citizens and builders
- How to deal with violations
- How floodplain development regulations and flood insurance rating are related
- Where citizens and builders can get more information or help

These topics are not taught at any high school or college. To learn these things, you will need additional training. Here are some ways to get it:

- Spend time with the floodplain administrator in a neighboring community
- Check with the FEMA Regional Office and/or the DNR before you issue your first few permits or certificates of occupancy
- Request a CAV whereby a FEMA or state person will visit you and review your procedures
- Attend a workshop put on by the DNR, FEMA, or Iowa Floodplain and Stormwater Management Association (IFSMA)
- If available before you take a certification test, attend a recommended training or refresher course
- Attend the Emergency Management Institute (EMI) (see below)
- Visit FEMA's website periodically
- Order and review the publications listed in Section 25
- ASFPM Resources

7.3.5. The Emergency Management Institute

The EMI in Emmitsburg, Maryland, provides several courses related to the administrator's job, both as resident courses and home study.

The introductory course is "Managing Floodplain Development through the National Flood Insurance Program". However, it covers the same information as this reference book (without the additional information on State of Iowa requirements and programs). Therefore, if you feel comfortable with the subject matter after reading this reference (and especially if you become a CFM), you should not need to attend "Managing Floodplain Development".

EMI offers other courses that would be helpful:

- NFIP/CRS

- Substantial Damage Determinations
- Digital Hazard Data (how to use DFIRMs and other data)
- Retrofitting Flood-Prone Residential Buildings
- Advanced Floodplain Management
- HAZUS (a computer model for estimating potential hazard losses)

These courses are designed to give you step-by-step practical knowledge and experience. In addition, by attending an EMI course, you meet other local administrators from around the country, from whom you can also learn the ins and outs of floodplain management administration.

EMI courses run Monday through Friday, one to four times a year. They are free for state and local officials. Generally, FEMA will pay for transportation to Emmitsburg and will house you in dormitories on campus.

For more information, upcoming course dates, etc., visit the EMI website (https://training.fema.gov/emicourses).

To register for a resident course, all applications must be submitted through the Emergency Management Division's Training Office and the FEMA Regional Office (see Section 28).

There are also home study courses called Independent Study. They can be accessed through the EMI website.

7.3.6. Certified Floodplain Manager

People interested in the ASFPM certification program for floodplain managers should submit an application form, which includes a signed code of professional conduct. Once approved, the applicant is eligible to take the exam. Examinations are proctored by a vendor for ASFPM, Meazure Learning.

The CFM designation is valid indefinitely, provided that the applicant complies with the biennial (every two years) renewal requirements: payment of a renewal fee and submittal of proof of continuing education credits. The continuing education requirement can be met through attendance at floodplain management conferences or workshops, formal courses, home study courses, and other approved technical meetings.

For more information on the CFM program, visit the ASFPM CFM certification website here: ASFPM Getting Certified or IFSMA (http://www.iowafloods.org).

8. Regulatory Requirements: Maps and Data

8.1. NFIP Maps and Data

Flood maps and flood data were discussed in Sections 3 and 4. This section builds on that information, covering the NFIP requirements as to when and how a community must use those maps and data.

8.1.1. Basic Rule #1

Basic rule #1: You must use the effective maps and flood data published by the FEMA.

A community must adopt and enforce floodplain management regulations based on data provided by FEMA (44 CFR 60.2(h)). This includes the floodplain boundaries, 1% annual chance flood elevations (also known as the BFE), FIRM zones and floodway boundaries shown on your effective FIRM, and/or FIS.

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

This requirement does not prevent a community from adopting and enforcing regulations based on more restrictive data than that provided by FEMA. For example, a community may want to regulate draft data or a historical flood that was higher than the BFEs shown on the FIRM. However, such data must be approved by the FEMA Regional Office before it is used, normally during the community ordinance update process.

This requirement also does not prevent a community from using other technical data to identify and regulate flood-prone areas not shown on FEMA maps. For example, many cities and urban counties map and regulate areas on streams that are not shown on the FIRM. In addition, FEMA has made available a suite of Flood Risk products developed during their Risk MAP projects that are not regulatory but meant to assist communities. Additional information on these products is found in Appendix 1.

The community always has an opportunity to provide input and comment on maps and data produced. FEMA offers several outreach opportunities during the FIRM and FIS update process to encourage community input and comments. Before kicking off an update for a community or watershed, FEMA may hold a Discovery meeting with the intent of gathering input from the community on best available data, areas of concern, and potential scope of a future project. During a FEMA Risk MAP project, at the completion of the modeling and work map stage, FEMA may hold a Flood Risk Review meeting with impacted stakeholders to gather input on the draft modeling and mapping. After the FEMA FIRMs and FIS has been issued preliminary maps, FEMA will hold a meeting with community officials and potentially a public open house to present the updated flood maps with the community. Shortly after the release of the preliminary maps, FEMA will also offer a comment and appeal period to all impacted communities. Communities will have time to review them and submit comments and

appeals to FEMA before they are published. Appeals are further discussed in Section 16. If you disagree with the effective FEMA data, then you should submit a request for a map revision as noted in Section 6, Maintaining and Revising NFIP Maps.

8.2. Exceptions

Basic rule #1 does not cover every situation. Three situations where a community may vary from the regulatory data provided by FEMA are:

1. When the FEMA data disagrees with ground elevations
2. When FEMA has provided draft revised data
3. When FEMA provides “advisory” flood hazard data

However, there are specific situations where these exceptions can be applied and are covered in more detail in the following sections.

Note: These situations only apply to the use of flood data for floodplain management purposes. Insurance agents and lenders must use the effective FIRM when determining whether flood insurance is required. If a person wants to vary from the effective FIRM to obtain a different flood zone or to not have to purchase a flood insurance policy, the FIRM must be officially revised or amended. Refer back to Section 6 for more details on map revisions.

8.2.1. When FIRM and Ground Data Disagree

The BFEs published in the FIS set the level for flood protection purposes. The maps are a graphic portrayal of that information.

If a flood study contractor does not have detailed topographic mapping and survey data to use in preparing the flood maps, the flood boundaries are interpolated. This can result in inaccuracies in drawing the boundaries on the map.

The BFE in relation to the actual ground elevation sets the floodplain limits for regulatory purposes.

Ground Higher than the BFE

If a site is located in a SFHA and field surveys show the **natural ground elevation at** a development site **is above the BFE, the site is still subject to the regulations in the floodplain ordinance, until the site is removed from the SFHA by a LOMA. Note that a LOMA will not physically update the flood map for floodplain boundaries but will provide a determination if a site is removed from the SFHA. If a site is removed from the SFHA by a LOMA, a floodplain development permit is no longer required.** If the developer or property owner chooses to not obtain a LOMA, the lowest floor must still be elevated as required by your floodplain ordinance (see Section 11 for more information). This requirement is especially important to consider when the proposed structure has a basement or below grade crawlspace. If a LOMA was obtained by the property owner, it is recommended that it be attached to the deed for the property.

If fill was placed in the floodplain to elevate the site above the BFE, a Letter of Map Revision based on fill (LOMR-F) would be required if the developer or property owner wants the site removed from the SFHA. It is up to the developer or property owner to apply for a map change, not community officials. The LOMA and LOMR-F process is discussed in Section 6.

Ground Lower than the BFE

Conversely, if site surveys show that areas considered outside the SFHA on published maps are in fact below the BFE, you should advise the applicant of the hazard and encourage protection of new buildings to the BFE.

Iowa DNR Requirements

Sites outside the mapped SFHA but known to be below the BFE require a permit if the development site falls within the DNR's jurisdiction.

The NFIP regulations do not require you to apply the floodplain management regulations on a property clearly outside the SFHA on a published map. However, even though a site may be technically outside the mapped SFHA, you should strongly encourage development practices that protect future occupants from known flood hazards in those areas. Additionally, if the area is known to be below the BFE, it is considered a floodplain and a DNR permit will be needed for new development if it falls within the DNR's jurisdiction.

8.2.2. Draft Revised NFIP Data

The second situation where a community may vary from the official FEMA data is when FEMA has sent preliminary data to the community for review. FEMA encourages communities to "reasonably utilize" the data from a draft or preliminary FIRM or FIS.

Three scenarios are possible:

1. Where the original FIRM shows an SFHA with *no* BFEs and the draft FIRM has flood elevations, use the draft information. In the absence of other elevation or floodway data, the draft information is presumed to be the best available.

2. Where the original FIRM shows an AE or AH Zone *with* an elevation (or an AO Zone with a flood depth) or floodway and the revision *increases* the BFE or *widens* the floodway, the community should consider using the draft revised data. However, if the community disagrees with the data and intends to appeal, the current effective data can be presumed to be valid and may still be used until the appeal is resolved.

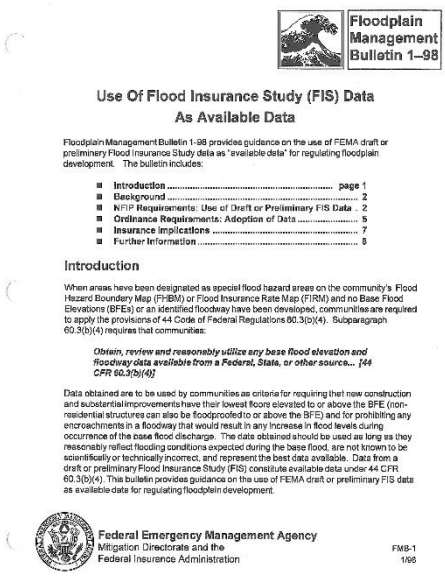
3. Where the original FIRM shows a B, C, or X Zone and the draft FIRM shows an SFHA, NFIP regulations do not require that the draft revised data be used. However, you are encouraged to use the draft data to regulate development, since these areas are subject to a flood hazard and new development may need a DNR permit.

Note: Where the original FIRM shows an AE or AH Zone *with* an elevation (or an AO Zone with a flood depth) or floodway and the revision *decreases* the BFE or *shrinks* the floodway, the Effective data should be used. Appeals may change the draft data and the final BFE may be higher than the draft. If you were to allow new construction at the lower level as shown in the draft, the owners will have to pay higher flood insurance premiums.

If the community intends to appeal preliminary data provided by FEMA, it must be done during the official appeal period. Otherwise, you will have to wait for the new map to become effective and submit a request for a map amendment or revision. These processes are described in Section 6.

For more information on this issue, see *Use Of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98.

For more information on the right to appeal proposed revisions to the FIRM issued by FEMA, see FEMA Guidance Document 26, *Appeal and Comment Processing*.



Floodplain Management Bulletin 1–98

Use Of Flood Insurance Study (FIS) Data As Available Data

Floodplain Management Bulletin 1-98 provides guidance on the use of FEMA draft or preliminary Flood Insurance Study data as "available data" for regulating floodplain development. The bulletin includes:

Introduction

When areas have been designated as special flood hazard areas on the community's Flood Hazard Boundary Map (FHBM) or Flood Insurance Rate Map (FIRM) and no Base Flood Elevations (BFEs) or an identified floodway have been developed, communities are required to apply the provisions of 44 Code of Federal Regulations 60.3(b)(4). Subparagraph 60.3(b)(4) requires that communities:

Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source... [44 CFR 60.3(b)(4)]

Data obtained are to be used by communities as criteria for requiring that new construction and substantial improvements have their lowest floors elevated to or above the BFE (non-residential structures can also be floodproofed to or above the BFE) and for prohibiting any encroachments in a floodway that would result in any increase in flood levels during occurrence of the base flood discharge. The data obtained should be used as long as they reasonably reflect flooding conditions expected during the base flood, are not known to be scientifically or technically incorrect, and represent the best data available. Data from a draft or preliminary Flood Insurance Study (FIS) constitute available data under 44 CFR 60.3(b)(4). This bulletin provides guidance on the use of FEMA draft or preliminary FIS data as available data for regulating floodplain development.

Federal Emergency Management Agency
Mitigation Directorate and the
Federal Insurance Administration

FMB-1
1/98

Figure 8-1. Use of FIS Data as Available Data, FEMA Floodplain Management Bulletin 1-98

The above three scenarios are also relevant for projects affected by a CLOMR. Refer back to Section 6 for information on CLOMRs.

8.2.3. Advisory Flood Hazard Data

Sometimes FEMA issues advisory data after a major flood where it was found that the FIRM and/or FIS underestimated the hazard. This information is provided so communities can ensure that reconstructed buildings are protected from the true hazard, not the effective data shown on the FIRM.

When you receive such advisory information, you should "reasonably utilize" it. If your community agrees with the information, the ordinance should be revised to adopt it. If your community disagrees with the data, you should be ready to explain why it is not requiring construction and reconstruction to be protected. You and your community are not protecting residents if you allow them to rebuild without recognizing a known hazard.

For more information on this issue, see *Use Of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98a, *Guidance on the Use of Available Flood Hazard Information*, FEMA Policy Memo #104-008-2, and FEMA Guidance Document 97, *Post Flood Hazard Verification / Recovery Tools*.

8.3. Approximate A Zones

An additional situation where communities may vary from the data provided by FEMA is in approximate A Zones. Approximate A Zones are those areas not studied by detailed hydrologic and hydraulic methods.

The FIS will not contain specific flood elevations for approximate study areas, nor will there be a floodway/fringe designation on the FIRM. Regulating development in approximate or unnumbered A Zones is one of the tougher jobs floodplain administrators will face, especially in counties that have large areas of such zones. The FEMA criteria for regulating floodplains in approximate A Zones is located in 44 CFR 60.3(b) but Iowa DNR has jurisdiction and requirements on a subset of the approximate A Zones shown.

8.3.1. DNR Jurisdiction

The rules in approximate A Zones depend on whether the DNR has regulatory jurisdiction. The DNR has jurisdiction over streams in:

- Incorporated (urban) areas where the drainage area is 2 square miles or greater.
- Unincorporated (rural) areas where the drainage area is 10 square miles or greater.

The permit applicant is required to provide the necessary data for DNR staff to calculate the BFE in an approximate A Zone. This can be a very lengthy process. An applicant can submit an engineering study for DNR review and approval to accelerate the permit process.

The DNR can delegate a portion of this authority to communities with floodplain ordinances that meet the minimum standards and where most of the floodplain areas are covered by a detailed study. In the remaining approximate flood zones (where delegated), the DNR will provide the BFE to the community for administration of the ordinance. The applicant is still required to submit the necessary data through the community to the DNR for the BFE determination.

8.3.2. Outside DNR Jurisdiction

Approximate A Zones that are outside the DNR’s jurisdiction include:

- Incorporated (urban) areas where the drainage area is less than 2 square miles
- Unincorporated (rural) areas where the drainage area is less than 10 square miles

In these areas, communities do not get the benefit of the DNR’s permit authority and determination of flood data and are held to the FEMA regulatory requirements found under 44 CFR 60.3(b). However, the DNR will still provide technical assistance and advice, and can conduct a courtesy review of a floodplain permit application.

NFIP Requirement

44 CFR Section 60.3(b)(4) requires that you make every effort to use any flood data available in order to achieve a reasonable measure of flood protection.

> 44 CFR 60.3(b) When the Federal Insurance Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:
>
> (4) Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards in paragraphs (c)(2), (c)(3), (c)(5), (c)(6), (c)(12), (c)(14), (d)(2) and (d)(3) of this section;

Existing Data

Where do you get the flood data you need when FEMA does not publish BFEs on the FIRM for A Zones? Though these floodplains may not have published elevations, they may be based on a hydraulic model that is available and can be leveraged. Starting in 2013, FEMA required that any new or updated flood hazard data used for regulatory products to be supported by modeling. If the county is utilizing the current FIS report format, information is provided on the date of the analysis and modeling used for most streams. This information can be found and downloaded on the FEMA Map Service Center. If models are available, they may be obtained from the FEMA Engineering Library by using the Search Engineering Data function within the FEMA Mapping Information Platform. As the Iowa Department of Natural Resources is a Cooperative Technical Partner with FEMA, some of this information may also be available through the DNR.

If the Zone A floodplains were developed prior to 2013, it was best practice, but not required to develop these areas with models. If the information is not available through FEMA, the best place to start is to find out whether data has already been prepared by a State or Federal agency or from another project. Possible sources of existing floodplain data include:

- Iowa DNR
- Iowa Department of Transportation – bridge design
- County engineer
- U.S. Army Corps of Engineers studies or projects
- Natural Resource Conservation Service
- U.S. Geological Survey

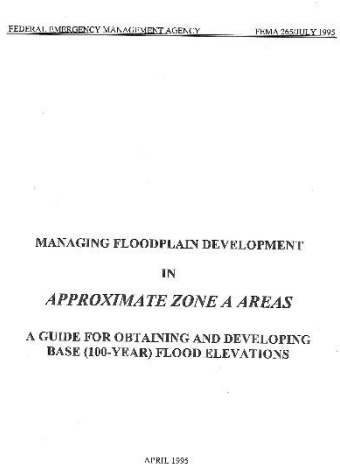
Data obtained from one of the above sources should be used, provided the project site is in an area outside of the DNR's permit jurisdiction and the data:

- Reasonably reflect flooding conditions expected during the 1% annual chance flood (also known as the 100-year or base flood)
- Are known to be technically correct
- Represent the best data available

New Flood Studies

If there are no data available and the requested site does not meet the criteria for a DNR permit, then a new study must be conducted. Usually, the developer provides the funding necessary to perform a study since he or she is the one wanting to build in the floodplain.

Some good guidance is found in the FEMA publication *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations*. This provides information on numerous methodologies for developing BFEs in approximate A Zones. These methodologies range from detailed methods that produce BFEs and floodway analyses (similar to those developed for an FIS), to simplified methods that can be used in isolated areas where more costly studies cannot be justified.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MANAGING FLOODPLAIN DEVELOPMENT
IN
APPROXIMATE ZONE A AREAS
A GUIDE FOR OBTAINING AND DEVELOPING
BASE (100-YEAR) FLOOD ELEVATIONS

APRIL 1995

Figure 8-2. FEMA Publication Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations

Your community should obtain and review this document if it has approximate A Zones that are likely to be developed. In some cases, the developer will not need to finance a detailed study. These cases are discussed in the next two sections on large and small developments. Whatever method is used, be sure to record on the permit records how the flood elevation was determined. This will help provide consistency with future development in the same area.

Large Developments

44 CFR 60.3(b)(3): [Communities must] Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals BFE data.

If a subdivision in the SFHA meets the above threshold and BFEs are required, the developer must conduct the needed study (the community or the DNR may provide assistance). The study must provide BFEs and a floodway delineation. Please note that the requirement is not stating that all 50 lots or 5 acres be within the floodplain, but instead if any of the proposed large development is located in the floodplain that meets this threshold. This is illustrated in Figures 8-3 and 8-4.

Figure 8-3 shows a 76-lot subdivision with several lots clearly affected by an approximate A Zone boundary. The subdivision depicted in Figure 8-4 is only 12 lots, but BFEs are required because the subdivision covers more than 5 acres. It also clearly shows buildable sites affected by an approximate A Zone boundary. A detailed flood study is required in both situations before development occurs.

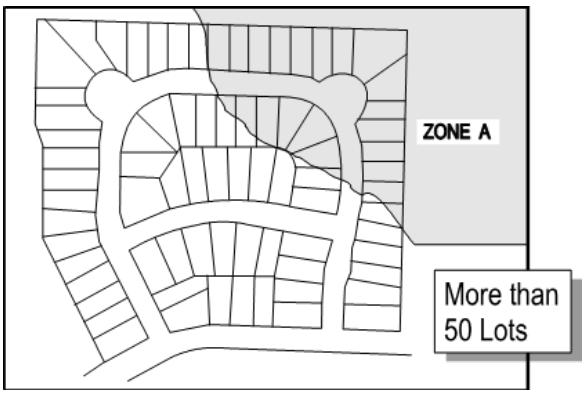


Figure 8-3. Proposed 76-lot subdivision

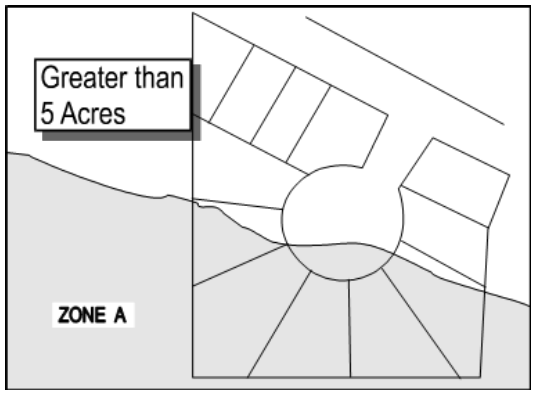


Figure 8-4. Proposed 6.7-acre subdivision

In Figure 8-5, the entire approximate Zone A area is to be left as open space. If the planned subdivision shows the floodplain is contained entirely within an open space lot, it may not be necessary to conduct a detailed engineering analysis to develop BFE data.

You are encouraged to discuss any flood hazards as early as possible with those wishing to subdivide and/or develop large areas. If a subdivision or planned unit development will be partially in the floodplain, there may be ways to avoid building in the flood hazard area. This can be made desirable by saving the developer the cost of a flood study.

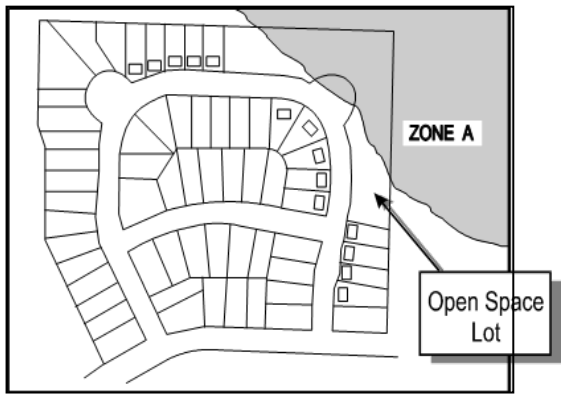


Figure 8-5. Proposed 76-lot subdivision

Small Developments

If the project is an isolated building (e.g., a cabin) outside the area of DNR permit jurisdiction, it may not make economic sense to conduct a detailed hydrologic and hydraulic study to determine the BFE. In these cases, you can use one of the alternatives below (listed in priority order):

- Check with other agencies for an available study.
- Use historical records or the flood of record (the highest known flood level for the area) prepared by a government division. It may be that a recent flood was close to the 1% annual chance flood. If records of the recent flood can be used, base your regulatory

flood elevations on them (or add a foot or two to the historical flood levels to provide a margin of error).

Before using any of these or other methods, contact the DNR floodplain staff for their advice.

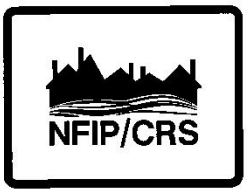
8.4. Submittal to FEMA

When a detailed flood study provides new data in an approximate A Zone, it must be submitted to FEMA within six months based on the requirements under 44 CFR 65.3. The community can pass that cost on to the developer by requiring that he or she submit a LOMR as a condition of approving the development. LOMRs are discussed in Section 6.

44 CFR 65.3 Requirements

As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator [FEMA] of [map] changes by submitting technical or scientific data in accordance with this part.

8.5. Community Rating System Credit



CRS credit is provided if BFEs, floodways, and related regulatory data are provided in areas not mapped by the NFIP. It does not matter who prepared the study. It can be the developer, the community, or a State or Federal division (other than FEMA). The size of the watershed and FIRM zone designation are relevant when determining credit.

This credit can be found in Activity 410, Section 411, of the *CRS Coordinator's Manual* or the *CRS Application*. Most communities that adopted one of the DNR model ordinances qualify for this credit due to the State's procedures being above and beyond the minimum requirements of the NFIP. For more on the CRS, see Section 20.

Note: The CRS credit is available in all areas, both inside and outside of the DNR's jurisdiction.

9. Regulatory Requirements: What Requires a Permit

9.1. Development Permit

9.1.1. Basic Rule #2

Basic rule #2: A permit is required for all development in the SFHA shown on your FIRM.

Communities participating in the NFIP have adopted regulations that require floodplain development permits for any development occurring in the identified SFHA.

9.1.2. Development

The NFIP requirements are keyed to development in the SFHA. "Development" means "any manmade change to improved or unimproved real estate" as defined in Chapter 44 of the *Code of Federal Regulations* (44 CFR), Part 59.

Definitions: "Development" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

Key Floodplain Development Permit Review Questions

The permit reviewer must check many things. The key questions are:

- Is the site near a watercourse?
- Is the site in the mapped FEMA SFHA?
- Is the site in the mapped floodway?
- Have other Federal permits been obtained?
- Is the site reasonably safe from flooding?
- Does the site plan show the flood zone, BFE, and building location?
- Is an improvement or addition to an older building proposed?
- Will new buildings and utilities be elevated properly?
- Do the plans show an appropriate and safe foundation?

Figure 9-1. Floodplain development review considerations

- Will the owner/builder have to submit an as-built Elevation Certificate?

9.1.3. Where Required

Floodplain development permits are required for all development projects in the SFHA shown on the FIRM. Communities are encouraged to require development permits outside the SFHA where there is a known flood hazard or where the ground elevation is lower than the 1% annual chance flood elevation, otherwise known as the BFE.

You must review each project's location to determine if it has a flood risk. If it does, the best way to protect a new building/structure from flood damage is to obtain a BFE for the site and require that the building or structure be elevated and/or protected to or above that BFE.

9.1.4. Building Permits

While many communities have a system for issuing building permits, few have a permit system for "development". Regulating all development in the SFHA is essential because fill or other materials can obstruct flood flows just as structures can.

Because a "building permit" often covers only construction or modifications of buildings, this reference uses the term "development permit". You should check your permit system to ensure that in the SFHA, permits are being required for all projects that meet the definition of development, not just "building" projects. Make sure you regulate the following in addition to the traditional building projects:

- Filling and grading
- Excavation, mining, and drilling
- Storage of materials (both temporary and permanent)
- Erection of fences, walls, and signage
- Repairs to a damaged building (even those that do not affect structural members)
- Utilities including septic systems and wells
- Temporary stream crossings
- Activities by other government agencies, such as roads, bridges, and school buildings

Figure 9-2. Example of a grading project

If your building permit system does not require permits for these activities, you'll need to revise your system and enact a new type of "development permit", or otherwise ensure that people apply for a permit for these non-building projects.

9.1.5. Public Projects

It is important to note that your community is responsible for enforcing the floodplain management regulations on all development within its jurisdiction. This includes projects implemented by other public offices, even though they may not be in the habit of applying for permits from you.

Section 7 discusses the limitations of your statutory authority to regulate other local units of government. However, you have no such limitations on other offices in your unit of government. While the street or sewer departments do not have to apply for a permit from the building department, your community needs some system to ensure that their activities meet your ordinance's regulatory standards. One way to do this is to follow the regular permit process. This will provide the documentation that is needed to show that the community is meeting all of its obligations to the NFIP.

9.1.6. Highways

Highways often must cross rivers and floodplains. They are one kind of development that cannot be avoided. Complications arise when a State agency has to develop in a community's floodplain.

In 1994, the Iowa Department of Transportation (IDOT) and the Iowa DNR entered into a Memorandum of Agreement (MOA) establishing procedures for coordinating floodplain encroachments with NFIP communities. The MOA applies to floodplain encroachment in:

- Rural areas with a river or stream draining less than 100 square miles
- Urban areas with a river or stream draining less than 2 square miles

Projects with drainage areas greater than those above must be permitted through the DNR.

In short, IDOT will do its share to help communities meet their NFIP obligations when it comes to constructing highways through floodplains. Here's what the MOA says:

Location Hydraulic Studies

The IDOT shall prepare a location hydraulic study in association with projects that encroach on a base flood plain. The NFIP maps shall be used to determine whether a highway location alternative will include an encroachment on the base flood plain. Where NFIP maps do not provide detailed hydraulic information (i.e., 100 yr. flood elevation, floodway delineation), information developed by the IDOT will be used. Location studies shall include evaluation and discussion of the practicability of alternatives to any longitudinal and latitudinal encroachments. Studies shall also include discussion of the following items for all alternatives containing encroachments:

1. Hydraulic Structures

2. Anticipated effects on upstream uses; and

3. Alternative to minimize flood plain impacts associated with the action.

Coordination with Local Communities

It is intended that there shall be IDOT coordination with local communities in situations where a project encroaches into the identified base flood plain. The local community shall be consulted to determine if the proposed highway action is consistent with existing flood plain management regulations. The IDOT will provide the community with the location hydraulic study for any project that encroaches on the identified base flood plain.

There will be situations where it is not cost effective nor in the best overall public interest to design a highway project that avoids encroachment on an established floodway. The IDOT recognizes that the responsibility for demonstrating that an alternative floodway configuration meets NFIP requirements ultimately rests with the local community. The IDOT will consult with the local community in developing an alternative floodway configuration and, if the community concurs with the proposed change, assist it with providing the detailed information required by FEMA for map revision (44 CFR, Ch 1, Part 65) and if applicable the fees associated with an application for the FEMA map revision. In such situations, the IDOT's requirements for coordination and obligation to ensure that a project is consistent with the basic intent and purpose of the NFIP are met upon the approval of the Letter of Map Revision (LOMR).

9.1.7. Small Projects

You have some discretion to exempt insignificant activities from the permit requirement, such as planting a garden, farming, putting up a mailbox, or erecting a flagpole.

The key is whether the project will present a new obstruction to flood flows, alter drainage, or have the potential to be a substantial improvement. The permit official can only make these determinations, not the builder, so make sure your exemptions are clear.

There should be no possibility of a misunderstanding resulting in the construction of a flood flow obstruction or a substantial improvement without a permit. For example, such exemptions should not be allowed in drainage easements or floodways.

Some communities specifically exempt small projects in their ordinances. This is the recommended approach, as it avoids challenges that the permit official arbitrarily decides what projects need permits. If you have adopted the DNR's model, your ordinance already includes the following exemptions:

> *"Development" does not include "minor projects" or "routine maintenance of existing buildings and facilities" as defined in this section. It also does not include gardening, plowing, and similar practices that do not involve filling or grading.*

9.2. Non-Building Requirements

The primary thrust of the NFIP regulations is to protect insurable buildings and reduce future exposure to flood hazards. Sections 11 and 12 are devoted to the rules for ensuring that new and existing buildings comply with the NFIP and DNR requirements.

There are some additional requirements that help ensure that the buildings stay habitable and additional flood problems are not created. This section reviews the requirements for these "non-building" development projects.

9.2.1. Subdivisions

As noted in Section 8, larger subdivisions must provide BFEs and floodway delineations if they are not already provided with the FIRM and Flood Insurance Study. With this data, new buildings must be properly elevated or floodproofed.

Subdivisions must also be reviewed to ensure their infrastructure is reasonably safe from flood damage.

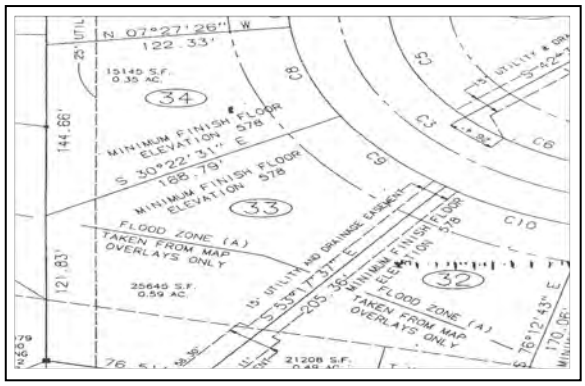


Figure 9-3. Subdivision plat showing flood hazard data

44 CFR 60.3(a)(4) [The community must] Review subdivision proposals and other proposed new development including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such proposals shall be reviewed to assure that (i) all such proposals are consistent with the need to minimize flood damage within the flood-prone area, (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and (iii) adequate drainage is provided to reduce exposure to flood hazards;

This review applies to subdivisions and other large developments, such as apartments, parks, shopping centers, schools, factory-built home parks, and planned unit developments. If one is flood-prone, the builder should:

- Minimize flood damage by locating structures on the highest ground
- Have public utilities and facilities located and constructed so as to minimize flood damage
- Provide adequate drainage for each building site

The site plans for new developments 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.

Developers should be encouraged to view the floodplain as an amenity to be kept open to provide habitat, recreation, and aesthetic benefits for future occupants. For example, lot size could be reduced, and the lots clustered on high ground, with home sites having views of the floodplain (see also the discussion in Section 13 and Figure 13-1).

Many communities require developers to choose to subdivide to show the flood hazard on their final plats. These are the documents that are filed with the official property records. When title searches or other property reviews are conducted, the hazard is disclosed. This is especially helpful for potential buyers. In the example in Figure 9-3, the community requires both the floodplain boundary and the minimum floor elevation to be posted on new subdivision plats.

Note: It is a good idea to reference the source of the flood hazard data on the plat so the designations can be superseded by later map revisions and amendments.

9.2.2. Water and Sewer Systems

44 CFR 60.3(a)(5) [The community must] Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and

44 CFR 60.3(a)(6) [The community must] Require within flood-prone areas (i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and (ii) on-site waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.

The objective of these requirements is to ensure that a building that is protected from flood damage can still be used after the flood recedes.

In most instances, these criteria can be met through careful system design. Manholes should be raised above the BFE or equipped with seals to prevent leakage. Pumping stations should have electrical panels elevated above the BFE.

Septic tanks and on-site waste disposal systems should be located to ensure they are accessible during a flood, and that they will not release contamination in a flood. The first objective should be to locate the system outside the SFHA, if that is feasible. At a minimum, an automatic backflow valve should be installed to prevent sewage from backing up into the building during flooding.

Check with your municipal or county health or sanitation department—it may already prohibit septic systems in the floodplain or have special design requirements that account for the wet conditions.

9.2.3. Hazardous Materials

If you have adopted a DNR model ordinance, you have a section that reads:

> *Storage of materials and equipment that are flammable, explosive, or injurious to human, animal or plant life is prohibited unless elevated a minimum of one foot above the BFE. Other material and equipment must either be similarly elevated or (i) not be subject to major flood damage and be anchored to prevent movement due to flood waters or (ii) be readily removable from the area within the time available after flood warning.*

This provision is neither a State nor Federal mandate. However, it is good practice and if it is in your ordinance, it needs to be enforced. If similar language is missing, it would be wise to have these specific standards in your ordinance.

The next three lists were taken from the *U.S. Army Corps of Engineers' (COE) Flood Proofing Reference*. The following items are extremely hazardous or vulnerable to flood conditions and, therefore, should be prohibited from the SFHA or even the 500-year floodplain:

Acetone	Prussic acid
Ammonia	Magnesium
Benzene	Nitric acid
Calcium carbide	Oxides of nitrogen
Carbon disulfide	Phosphorus
Celluloid	Potassium
Chlorine	Sodium
Hydrochloric acid	Sulfur

The following items are sufficiently hazardous that larger quantities should be prohibited in any space below the BFE:

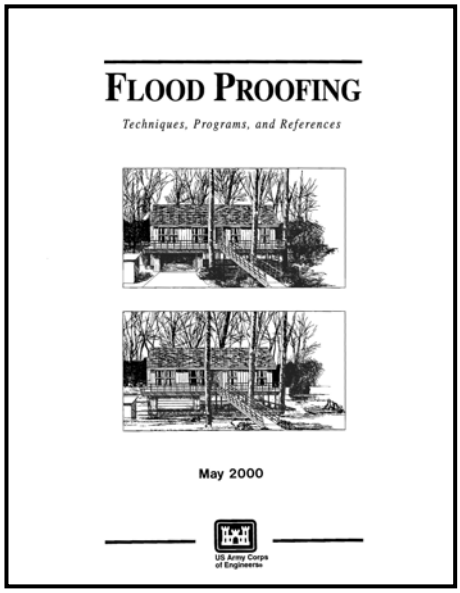


Figure 9-4. U.S. Army Corps of Engineers Flood Proofing Techniques, Programs, and References

Acetylene gas containers	Gasoline
Storage tanks	Charcoal/coal dust
Lumber /buoyant items	Petroleum products

Larger quantities of the following items should be prohibited in any space below the BFE:

Drugs	Food products
Tires	Matches/sulfur products
Soaps/detergents	

9.3. Permits from Other Agencies

44 CFR 60.3(a)(2) requires all NFIP communities to ensure that other Federal and State permits have been obtained. You should not issue your local permit until you are certain that the other agencies' requirements are met.

Some communities allow their permit officials to issue the local permit on the condition that other required permits are obtained. However, this is not advised and not as effective as holding the local permit until the applicant can show that the other agencies have issued or will issue their permits. Otherwise, the project may get underway before you are sure that it meets all legal requirements.

To implement this requirement, you are encouraged to develop a list of what permits are required in your jurisdiction. The DNR can help (see Section 28 for contact information).

> 44 CFR 60.3(a)(2) Review proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334.

9.3.1. Local Agencies

First, check with other local offices. Here's whom you should coordinate across your community government. Each office may have some permit review authority or interest, so you need to decide which projects, if any, should be run by them before you issue a floodplain development permit.

- Building department
- Planning department
- Zoning department
- Sanitation department
- Fire Marshal

- Engineer
- Public works, streets, or highways

Then check with other local governments. The local authorities that may have jurisdiction over some aspects of floodplain development are:

- County and adjacent municipalities (pursuant to intergovernmental agreements)
- Drainage districts
- Levee district
- Sanitary district
- River conservancy district
- Park district
- County health or sanitation department

9.3.2. Soil and Water Conservation Districts

Generally, each county in Iowa has its own soil and water conservation district. Many communities have entered into intergovernmental agreements with their local district to review the impact of development on natural resources. The district's staff can provide an expert technical review of how the project will affect other concerns, as well as flooding. The districts are separate from county government and are co-located with the local office of the U.S. Department of Agriculture's Natural Resources Conservation Service.

9.4. Iowa Department of Natural Resources

The DNR administers permit programs for any construction, excavation, or filling in a stream, lake, river, wetland, or floodplain. The DNR permit programs are described below. While these may look overwhelming, a single joint permit process, discussed at the end of this section, is used for many of the programs.

9.4.1. Floodplain Construction Permits

A floodplain development permit is required from the State for all activities that meet the thresholds defined in Chapter 71 of the Iowa Code. These are summarized in the matrix in Table 9-1. For details on the following activities, refer to Chapter 71 of the DNR regulations:

Table 9-1. DNR Floodplain Permit and Flood Data Approval Requirements

Flood Data and Delegation Status	Incorporated Areas		Unincorporated Areas	
	Drainage area ≥ 2 sq. miles	Drainage area < 2 sq. miles	Drainage area ≥ 10 sq. miles	Drainage area < 10 sq. miles
No Detailed Study (AO and approximate A Zones)				
No delegation of DNR floodplain authority	Permit application and flood data needed	No DNR floodplain permit required	Permit application and flood data needed	No DNR floodplain permit required
DNR floodplain authority delegated to community	DNR approves flood data	No DNR floodplain permit required	DNR approves flood data	No DNR floodplain permit required
Detailed Data Available (AE, AO, and AH Zones)				
No delegation of DNR floodplain authority	Permit application needed	No DNR floodplain permit required	Permit application needed	No DNR floodplain permit required
DNR floodplain authority delegated to community	Permit needed only for bridges and flood protection systems	No DNR floodplain permit required	Permit needed only for bridges and flood protection systems	No DNR floodplain permit required

Note: While there may be no requirement for a DNR *floodplain* permit, other DNR, State, and Federal permits may be required.

9.4.2. Water Quality Certification

The DNR provides water quality certification pursuant to Section 401 of the Clean Water Act. This certification is mandatory for all projects requiring a COE Section 404 permit (see Section 9.5.2). This certification is the Department's concurrence that the State's water standards have been met.

Additional permits may be required for activities such as construction of sanitary sewers, construction and operation of wastewater and water treatment plants, landfill and mining activities, special waste hauling, solid waste disposal, water withdrawal and water storage permits, disposal of dredged material, and other miscellaneous activities.

9.4.3. Dam Safety

Construction of a dam may require a DNR permit. "Dams" are defined as "a barrier which impounds or stores water". A permit is required for the construction, operation, or maintenance of a dam that meets certain conditions. Because the conditions can be complicated, it is advised that the community and the applicant contact the DNR Dam Safety Office to determine if a

Figure 9-5. Example of a dam

proposed dam also needs a dam safety permit (see Section 28 Contacts).

The DNR operates a dam safety inspection program defined in Chapter 73 of the DNR regulations. The Department will conduct periodic inspections of all major structures. The owners of these structures are responsible for annual inspections and submittal of written reports to the department. The DNR also manages a program for the inspection of all preexisting dams. More information can be found on the dam safety program and permit application process at http://www.iowadnr.gov/InsideDNR/RegulatoryLand/DamSafety.aspx.

9.4.4. Other DNR Programs

The DNR is responsible for implementing statutes that conserve and preserve the State's natural resources. Under the provisions of the Fish and Wildlife Coordination Act (16 USC 661-664), the Department is given permit review responsibilities relative to COE permit applications.

The Department also administers a wetland permitting program under Chapter 456 in conjunction with the COE permit process. See Section 9.6 for more information.

9.5. Federal Agencies

9.5.1. FEMA

FEMA does not directly permit development projects. The agency's role is to set minimum standards for local regulations and to provide assistance to local officials.

FEMA is involved in map revisions, and often requests for map changes go hand in hand with development proposals, especially larger ones. Map revision procedures are explained in Section 6.

9.5.2. U.S. Army Corps of Engineers

The primary federal agency with permit authority over floodplain activities is the COE. The COE has two major programs:

- Regulation of the discharge of dredged or fill materials into rivers, lakes, streams, and adjacent wetlands (Section 404 of the Clean Water Act, 33 USC 1334)

- Regulation of all construction activities on navigable waterways (Section 10 of the River and Harbor Act of 1899, 33 USC 403)

The COE is responsible for determining the jurisdictional limits of wetlands and other "waters of the United States". The "waters of the United States" regulated by the COE under Section 404 of the Clean Water Act include most wetland areas. See Section 28 for the address and phone number of the COE office with regulatory authority over your area.

How Did the Army Get into Floodplain Management?

During the 19th century, the COE was the nation's main public works agency. It had primary responsibility for facilitating water transportation. The Section 10 authority was given to the COE in 1899 when Congress passed the Rivers and Harbors Act. Until 1968, the Rivers and Harbors Act were administered to protect only navigation and the navigable capacity of the nation's waters.

In 1968, in response to a growing national concern for environmental values, the policy for review of Section 10 permit applications was revised to include additional factors besides navigation: fish and wildlife, conservation, pollution, aesthetics, ecology, and general welfare. This new type of review was identified as a "public interest review".

The COE's regulatory function was expanded again when Congress passed the Federal Water Pollution Control Act Amendments of 1972 and then the Clean Water Act Amendments in 1977. The purpose of the Clean Water Act was to restore and maintain the chemical, physical, and biological integrity of this nation's waters.

9.6. Federal and State Permit Applications

There are two main agencies with floodplain-related permit programs: the DNR and the COE. While both have their own statutory authority and concerns, their interests overlap. To facilitate their permit review process, the Iowa DNR and the Army Corps of Engineers have each created their own separate online permit application systems.

The Iowa DNR's is the Flood Plain & Sovereign Lands Permit Application. Applications with the Iowa DNR can be submitted online at Permit and Environment Review Management Tool (PERMT): https://programs.iowadnr.gov/permt/. Applicants will first be required to create an account with the website before an application or request for technical assistance can be submitted.

The US Army Corps of Engineers (USACE) has created the Regulatory Review System (RRS): https://rrs.usace.army.mil/rrs. This online portal system will allow users to submit permit requests, determine if a permit is needed, request a pre-application meeting, and report potential non-compliant activity.

Anyone proposing the following activities will need to submit separate applications to each the Iowa DNR and USACE:

- Cutting a bank of a river or stream
- Any excavation or dredging in a stream or river channel
- Channel changes or relocations (including stream straightening)
- Construction of any dock, pier, wharf, seawall, boat ramp, beach, intake, or outfall structure on a stream, river, or lake
- Placement of any fill, riprap, or similar material in a stream, river channel, lake, or wetland

- Construction of a dam across a waterway
- Placement of fill, construction of levees, roadways and bridges, and similar activities on a floodplain
- Construction of buildings on a floodplain

Approvals may be required by both agencies. Applicants are encouraged to file their applications with each agency simultaneously. If a permit is not required by one of the agencies, they will inform the applicant and the other agency. Coordination with each agency is recommended as early as possible during the project planning stage. This allows revisions or other measures necessary to meet each agency's requirements to be made before project plans are finalized.

10. Regulatory Requirements: Floodways

10.1. The Floodway Concept

Preserving the capacity of floodplains to convey floodwaters through the designation and preservation of a floodway has been an important concept in floodplain management from the very beginning. Preserving the floodway limits the impact of development in the floodplain on flood heights and velocities and resulting damage to upstream and downstream properties.

Prior to floodplain management, railroads and other development blocked drainage ways and floodplains. Subsequent flooding and resulting damage led to legal battles between developers and impacted property owners. Since the regulation of floodways began in the 1970s, courts have upheld the concept of the floodway in nearly all cases.

10.1.1. Basic Rule #3

Basic rule #3: Development must not increase the flood hazard on other properties.

10.1.2. Floodplain Map

Trying to determine a proposed project's effect on flood heights can be difficult and expensive, particularly when future development is considered. To reduce this regulatory burden on communities and property owners, detailed FISs have been completed for many communities in Iowa. The FIS defines the floodway and the floodway fringe, which is then included on the community's FIRM. An example of a FIRM showing the floodway, cross section locations and BFEs is shown in Figure 10-3.

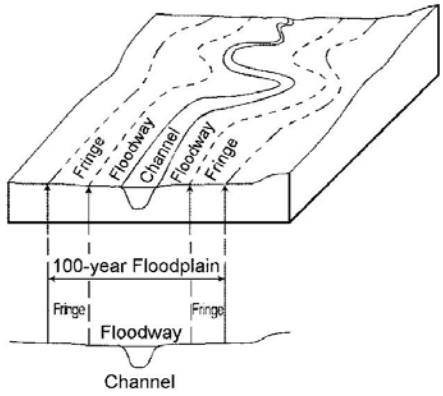


Figure 10-1. Floodplain cross-section and map

10.1.3. Understanding the Floodway

The floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved to pass the 1% annual chance flood discharge (also known as the 100-year or base flood) without increasing the base water surface elevation more than one foot. Computer models of the floodplains are used to simulate "encroachment" or development in the flood fringe in order to predict where, and how much, flood heights would increase if the floodplain were allowed to be developed.

44 CFR [Chapter 44 of the *Code of Federal Regulations*] 59.1 Definitions: "Regulatory floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

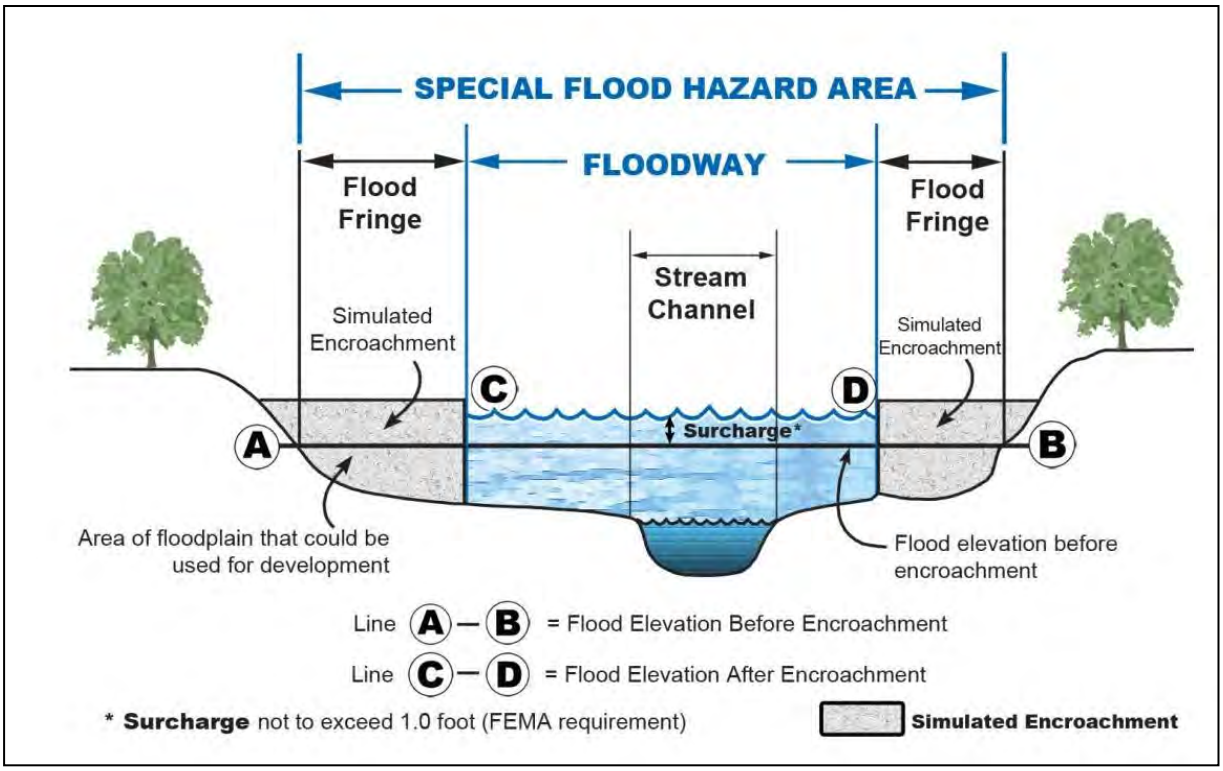


Figure 10-2. Floodway breakdown

As explained in Section 3.3.6, the floodway is the central portion of a riverine floodplain that tends to include the most hazardous areas of the floodplain with the greatest depths and velocities of floodwaters and amount of debris. Buildings, structures, and other development activities, such as fill, placed within the floodway are more likely to obstruct flood flows, causing higher flood elevations upstream of the obstruction and increased velocities of floodwater adjacent to and downstream of the obstruction.

The designation of a regulatory floodway and the resulting map are based on the following legal concepts:

- Property owners should be allowed to develop their land provided they do not obstruct flood flows and cause damage to others. For development outside of the floodway, the water surface elevation of the base flood may be allowed to increase, but not if significant damage would result.

- Properties on both sides of a stream must be treated equitably. The degree of obstruction permitted for one must also be permitted for the other.

Floodway maps are adopted to designate those areas where flood flows are most sensitive to changes caused by development. Communities must regulate development in a floodway to ensure that there are no increases in upstream flood elevations.

For streams and other watercourses where the FEMA has provided BFEs, but no floodway has been designated, construction projects and developments must be reviewed on a case-by-case basis to ensure that these increases do not occur. The Iowa DNR must be contacted to

provide a floodway delineation, based on sufficient technical information provided by the applicant.

10.1.4. Developing the Floodway

The hydraulic model used to develop the floodway may be 1D, 2D or hybrid 1D, 2D. Regardless, the floodway shall be determined using a procedure based on equitable consideration of encroachment of both overbanks. The procedure itself may vary based on the model type – see FEMA's Guidance Document No. 79 for examples. The purpose is to ensure that like-situated properties are treated equally, but this does not mean that the floodway or floodway fringe will be an equal width on both sides of the stream.

For a 1D floodway analysis, the encroachment boundaries are identified on each cross section within the model where a floodway is defined. Engineering judgment is then used to interpolate the floodway boundary between the cross sections.

For a 2D, or hybrid 1D, 2D floodway analysis, the encroachment boundaries are identified as continuous polygons on either side of the model domain, removing the need for interpolation. See FEMA's Guidance Document No. 79 for additional information and guidance on the setup and evaluation of a 2D floodway analysis.

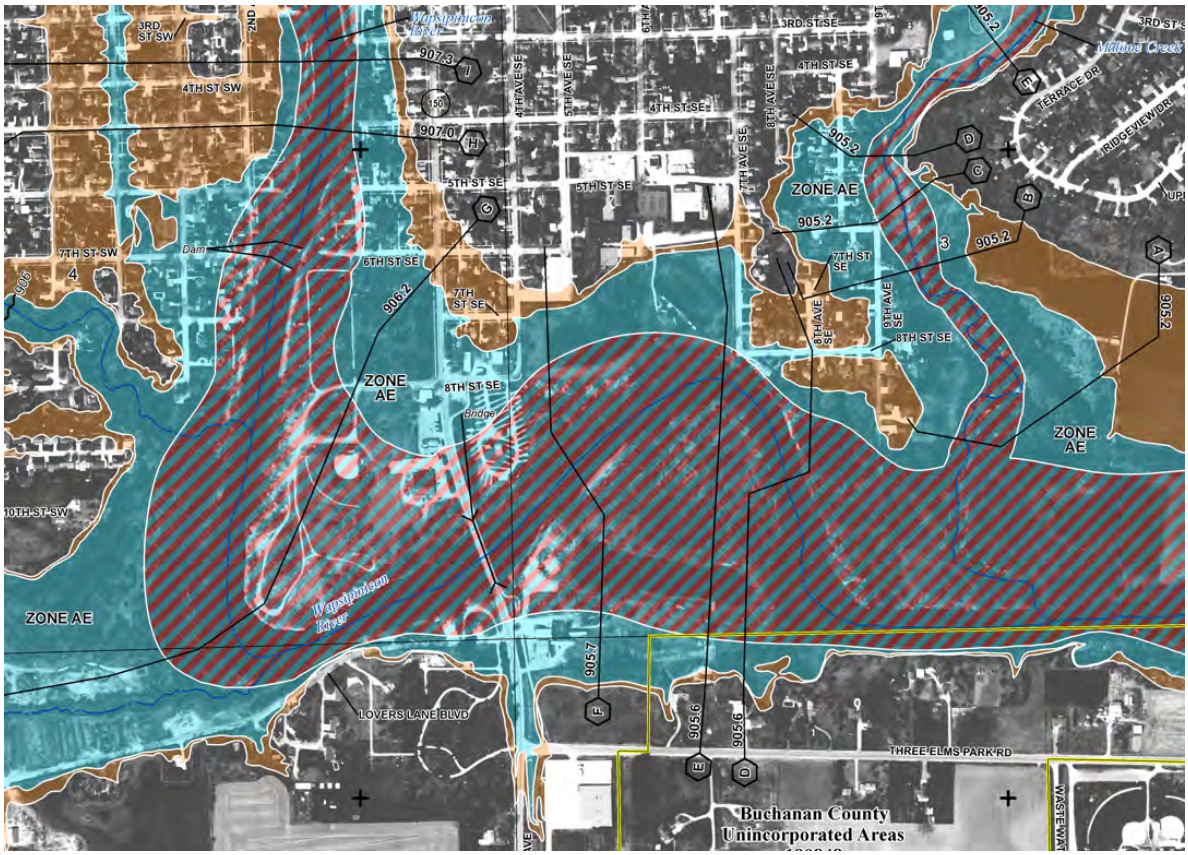


Figure 10-3. Example floodway on a countywide FIRM

In addition to the floodway on the FIRM, there is data provided in the FDT in the FIS report. See **Error! Not a valid bookmark self-reference.** for an example of a one-dimensional

floodway analysis FDT. When a 2D or hybrid 1D, 2D model is used, evaluation lines are created to report the appropriate FDT parameters. Use the appropriate template from the FIS Report Technical Reference to ensure users are aware that the values reported are based on a 2D or 1D, 2D model. Refer to Section 5.1.3 for an explanation of the FDT and how to interpret it.

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	140	1,284	22,312	1.6	904.9	904.9	905.7	0.8
B	568	1,188	21,998	1.6	905.0	905.0	905.7	0.7
C	1,252	993	16,585	2.1	905.1	905.1	905.8	0.7
D	3,994	1,371	26,388	1.3	905.6	905.6	906.4	0.8
E	4,658	1,486	25,779	1.4	905.6	905.6	906.4	0.8
F	5,588	1,340	23,441	1.5	905.7	905.7	906.5	0.8
G	7,710	1,706	20,304	1.7	906.2	906.2	907.2	1.0
H	10,308	299	5,729	6.0	907.0	907.0	908.0	1.0
I	10,656	287	5,671	6.1	907.3	907.3	908.2	0.9
J	11,356	318	5,636	6.1	908.6	908.6	909.5	0.9
K	11,697	473	7,811	4.4	910.5	910.5	911.3	0.8
L	12,679	776	11,764	2.9	911.4	911.4	912.3	0.9
M	13,538	880	10,232	3.4	911.5	911.5	912.4	0.9
N	14,815	715	12,553	2.8	911.9	911.9	912.9	1.0
O	16,094	2,093	34,608	1.0	913.1	913.1	914.0	0.9
P	17,246	2,493	42,583	0.8	913.1	913.1	914.0	0.9

[1]Stream distance in feet above City of Independence community boundary

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUCHANAN COUNTY, IOWA

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: WAPSIPINICON RIVER

Figure 10-4. Example FDT

10.1.5. Changing the Floodway

Communities that have an FIS adopt the "regulatory floodway" into their local floodplain ordinance. However, when a project will change the flood level, the floodway maps must be updated to reflect the new hazard. FIRMs can also be revised to reflect changed conditions and/or better topographic information. The process for doing this is explained under map revisions in Section 6.2.5.

Floodway & Floodplain Development Exceptions

In limited situations, it may be in the public interest to allow an increase in flood heights greater than allowed under the DNR or NFIP regulations. For example, constructing or increasing the height of a flood control reservoir would affect flood heights. However, the DNR must be contacted for all such permitting.

10.2. Floodway Rules

10.2.1. Section 60.3(b) and 60.3(c) Communities

In some areas, floodways have not been designated because of high costs and historically low development pressure. For communities without Zone AE floodplain studies, the DNR must be contacted to establish floodplain and floodway limits and, in most cases, to issue a permit. As a local floodplain ordinance administrator, you will also be responsible for reviewing the project with respect to your ordinance and issuing a local floodplain development permit.

If your community has a FIRM with BFEs but no mapped floodway, you are subject to the requirements of 44 CFR Section 60.3(c). DNR permits are still required, and the following applies to you:

44 CFR 60.3(c)(10): [Communities must] Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

10.2.2. Section 60.3(d) Communities

Once a floodway is established, your job as a local administrator is greatly simplified. When a permit application is submitted, you should check the site location in relation to the floodway boundaries.

> 44 CFR 60.3(d)(3): [In the regulatory floodway, communities must] Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.

If the site is in an identified fringe (in other words, outside of the floodway), you know the development or construction project will not cause an increase in flood heights above that already accounted for by the delineation of the floodway. (**Note:** This does not mean that the development will not create a localized drainage problem or an increase in potential flood damage.)

10.3.DNR Jurisdiction

In accordance with Title V, Flood Plain Development, 567 IAC Section 70.1, the DNR regulates certain floodplains and floodways in the State. The DNR's jurisdiction is covered in more detail in Section 9.4.1. See the chart in that section to determine where this jurisdiction is in your area.

Local permits are still required in mapped SFHAs outside the DNR's jurisdiction, e.g., within a mapped floodway for a drainage area less than 2 square miles.

10.3.1. Delegated Communities

Communities that have received DNR delegation and have Zone AE studied streams are responsible for permitting development in the mapped floodways. Communities that have received DNR delegation that have Zone A floodplain maps must contact the DNR at the time of a permit application to assist in delineating the floodway and establishing a BFE. Once a floodway is identified, the community is responsible for issuing the floodplain development permit.

10.3.2. Non-Delegated Communities

If the DNR has not delegated permit authority to your community, all construction and development projects must be submitted to the DNR for review. If you have a mapped floodway, you must meet the NFIP requirements of section 60.3(d). Again, do this by making sure that all projects are sent to the DNR.

DNR permit applications can be submitted online through the PERMT which is discussed in Section 9.6.

Note: Just because a project receives a DNR permit, it does not mean that all the requirements of your ordinance have been met.

10.3.3. Exemptions

Some projects are too small to warrant an engineering study and the need to apply for a DNR permit. For example, a signpost should not appreciably block flood flows. A driveway, road, or parking lot at grade (without any filling) should not cause a problem either.

As such, specific construction activities have been exempted from DNR review. Exempted activities include:

- Construction, operation, and maintenance of buried pipeline crossings if the natural contours of the channel and floodplain are maintained. (**Note:** Approval of stream bank protection measures may need approval).

- Recreational non floating type boat docks located on the Mississippi and Missouri Rivers, and the conservation pools of the Coralville, Rathbun, Red Rock, and Saylorville Reservoirs. However, a permit is still needed from the Parks, Recreation, and Preserves Division of the DNR and the DNR Sovereign Lands Division.

10.4. Additional Responsibilities for Delegated Communities

In some cases, it is a delegated community's responsibility to ensure that the NFIP floodway rules are met.

10.4.1. No-Rise Certification

All projects in the floodway must undergo an encroachment review to determine their effect on flood flows and ensure that they do not cause problems. Development projects in the flood fringe by definition do not increase flood heights above the allowable level, so encroachment reviews are not needed.

Your floodplain ordinance has language similar to the following: "No development shall be permitted in the floodway that would result in any increase in the base flood level. Consideration of the effects of any development on flood levels shall be based upon the assumption that an equal degree of development would be allowed for similarly situated lands".

The objective of this requirement and the floodplain management ordinance is to ensure that the floodway is reserved to do its natural job—carrying floodwater. The preferred approach is to avoid all development there.

The regulations call for preventing any increase in flood heights. This does not mean you can allow a tenth of a foot or even a 0.01-foot increase —**it means zero increase (0.00 feet)**. Projects, such as filling, grading, or construction of a new building, must be reviewed to determine whether they will obstruct flood flows and cause an increase in flood heights on similarly situated land upstream or adjacent to the project site. The review must also consider what would happen if other properties in the same situation were to be allowed to do the same type of project.

Projects such as grading, large excavations, channel improvements, and bridge and culvert replacements should also be reviewed to determine whether they will remove an existing obstruction that may result in increased flood flows downstream.

Your community may conduct the encroachment review, or you may require the owner to conduct it. Most local permit officials are not qualified to make an encroachment review, so most require that this be done by an engineer at the owner's expense.

To ensure that the encroachment review is done correctly, you may want to require the developer to provide an encroachment certification. This is often called a **"no-rise" certification** because it certifies that the construction or development project will not affect flood heights. An example is included as Figure 10-5. The certification must be supported by technical data, which should be based on the same computer model (the effective model) used to develop the floodway shown on the community's FIRM. FEMA's Guidance Document 79, Floodway Analysis and Mapping, provides information on obtaining this model and how to develop the "no-rise" certification.

Although your community is required to review and approve the encroachment review, you may request technical assistance and review from the FEMA Regional Office or the DNR. If this alternative is chosen, you should review the technical submittal package and verify that all supporting data are included in the package before sending it to FEMA.

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of _____.

It is further to certify that the attached technical data supports the fact that proposed _____ (Name of Development) will not impact the 100-year flood elevations, floodway elevations, or floodway widths on similarly situated land along _____ (Name of Stream) at published sections in the Flood Insurance Study for _____ (Name of Community) dated _____ (Study Date) and will not impact the 100-year flood elevations, floodway elevations, or floodway widths on similarly situated land at unpublished cross sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

_____

_____

Date: _____

Signature: _____

Title: _____ License number: _____

Figure 10-5. Example no-rise certification

10.4.2. Permitted Uses

The DNR has established model ordinance language for communities with Zone AE studies that defines limited permitted and conditional uses of the floodway. Permitted uses do **not** include:

- Placement of structures
- Placement of manufactured homes
- Fill, levees, or other obstructions
- Storage of materials or equipment
- Excavation or alteration of a watercourse

The list of permitted uses below is probably in your ordinance. **Remember: These uses are only allowed if they do not involve filling, grading, or altering the surface of the ground so as to affect flood flows.**

- Agricultural uses such as general farming, pasture, grazing, outdoor plant nurseries, horticulture, viticulture, truck farming, forestry, sod farming, and wild crop harvesting
- Industrial-commercial uses such as loading areas, parking areas, and airport landing strips
- Private and public recreational uses such as golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, boat launching ramps, etc.
- Residential uses such as lawns, gardens, parking areas, and play areas
- Such other open space uses similar in nature to the above

10.4.3. Conditional Uses

Unlike the permitted uses above, the following uses may involve structures (temporary or permanent), fill, storage of materials or equipment, excavation, or alteration of a watercourse upon issuance of a conditional use permit by the applicable board or public agency. The uses must also meet the performance standards required by your ordinance (e.g., they do not involve filling, grading, or altering the surface of the ground so as to affect flood flows or increase the BFE).

- Uses or structures accessory to open space uses
- Circuses, carnivals, and similar transient amusement enterprises
- Drive-in theaters, new and used car lots, roadside stands, signs, and billboards
- Extraction of sands, gravel, and other materials

- Marinas, boat rentals, docks, piers, and wharves
- Utility transmission lines and underground pipelines
- Other uses similar to those described above and those listed as permitted uses, which meet the performance standards for floodway construction specified in your ordinance

10.4.4. Watercourse Alterations

44 CFR 60.3(b)(6) [The community must] Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the [FEMA] Administrator.

A community must notify adjacent communities and the DNR prior to altering or relocating any river or stream within its jurisdiction. Copies of such notifications must be submitted to the FEMA Regional Office. A DNR permit is required for most channel changes.

44 CFR 60.3(b)(7) [The community must] Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.

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 capacity to carry flood flow is reduced because a smaller or less-efficient channel is created, or by modifications to the floodway as a result of the project.

After altering a watercourse, the owner has created an artificial situation and must assume responsibility for maintaining the capacity of the modified channel. Otherwise, flooding is likely to increase as the channel silts in or becomes choked with vegetation. In addition, altered or relocated streams often meander and try to return to their original location.

Figure 10-6. Channel alterations have special permit requirements

For any significant alteration or relocation, you should consider requiring the applicant to have an engineer certify that the flood flow carrying capacity is maintained and that there will be no increase in flood flows or elevations downstream.

It is recommended that you require the submittal and approval of a CLOMR from FEMA for large-scale proposals (see CLOMR procedures discussion in Section 6.2.6).

10.4.5. Conveyance Shadow

Building additions, swimming pools, garages, accessory buildings, and similar small projects can be located in a “conveyance shadow”. This is the area upstream and downstream of an existing building or other obstruction to flood flows. Flood water is already flowing around the larger obstruction, so the addition of a new structure will not change the existing flood flow.

Determining the limits of the conveyance shadow is illustrated in Figure 10-7. Small structures located completely within the shadow may be permitted without an extensive hydraulic analysis. This method may not be sufficient if the building is located in an area with complex 2D flow characteristics.

Note: Although a small structure can be located in the conveyance shadow, it is still preferable to keep all development out of the floodway. Don’t forget: all buildings must be elevated or otherwise protected from the base flood and any other requirements that apply.

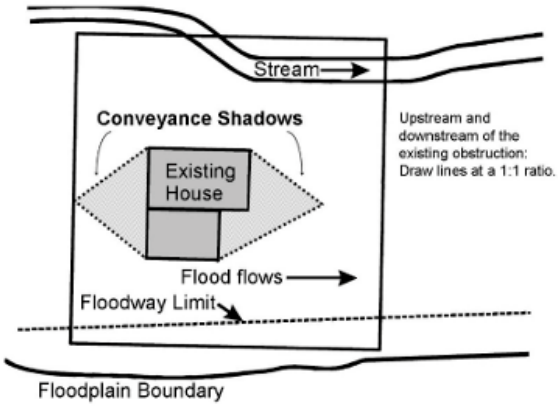


Figure 10-7. Determining the conveyance shadow

11. Regulatory Requirements: New Buildings

11.1. Terminology

11.1.1. Basic Rule #4

Basic rule #4: New buildings must be protected from damage caused by the base flood event.

11.1.2. Building

One objective of your floodplain ordinance is to protect new buildings and structures. In this reference, the term “building” is the same as the term “structure” in the NFIP regulations. Your local ordinance should refer to structures.

44 CFR 59.1 Definitions: “Structure” means, for flood plain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured [factory-built] home.

The term “building” or “structure” does not include open pavilions, bleachers, carports, and similar structures that do not have at least **two rigid walls and a roof**.

How to determine if a building is substantially improved or substantially damaged is discussed in Section 12. In this Section, consider the term “building” as an all-encompassing term, which includes substantial improvements and repairs of substantial damage to existing structures located in the SFHA.

Residential and non-residential buildings are treated differently. If building in the floodplain, a residential building must be elevated to the design flood elevation (flood protection elevation for the purposes of this reference manual), which the NFIP minimum is at the 1% annual chance elevation, otherwise known as the BFE. Non-residential buildings, on the other hand, may be elevated or floodproofed.

Exemptions: Small additions and inexpensive buildings may be exempted from the building protection standards. See Section 11.6 on accessory structures.

11.1.3. Freeboard

Freeboard is an additional elevation requirement above the BFE that provides a margin of safety against extraordinary or unknown risks. This reduces the risk of flooding and makes the building eligible for a lower flood insurance rate.

The State of Iowa requires a **minimum freeboard of one (1) foot above the NFIP minimum protection level**. Freeboard is beneficial for the following reasons:

- Accounts for future increases in flood stages if additional development occurs in the floodplain

- Accounts for future flood increases due to upstream watershed development
- Acts as a hedge against backwater conditions caused by ice jams and debris dams
- Reflects uncertainties inherent in flood hazard modeling, topography, mapping limitations, and floodplain encroachments
- Provides an added measure of safety against flooding

When constructing a new elevated building, the added cost of going up an additional foot or two is usually negligible.

The CRS credits freeboard under Activity 430. The flood insurance discounts of 5 percent to 45 percent available for communities participating in CRS are another way your community can help offset flood insurance costs for your constituents. See *CRS Credit for Higher Regulatory Standards* for more information on the higher regulatory standards CRS credits.

11.1.4. Flood Protection Elevation

The flood protection elevation is a term used in this reference for the BFE plus applicable freeboard. It is the minimum protection level your ordinance requires for new buildings in the floodplain. In the State of Iowa, the level must be at least **1 foot** above the BFE.

11.2.Elevation

Elevating a building above the flood protection elevation is the most common and secure way to protect it from flood damage. It is the only way allowed for residential buildings, except for those few communities that have been granted floodproofed basement exceptions by the FEMA.

44 CFR 60.3(c)(2) [Communities must] Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH Zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level.

In Zones A, AE, AO, 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 flood protection elevation. This can be done in one of three ways:

- Elevation on fill (where permissible)
- Elevation on piles, posts, or columns

Substantial Improvement—*Any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure (a) before the improvement is started or (b) if the structure was damaged, and is being restored, before the damage occurred.*

- Elevation on walls or a crawlspace

The Iowa DNR model ordinance requires approval be granted by the Board of Adjustments or Board of Supervisors prior to the use of a method other than fill for elevating a residential building.

Figure 11-1. A new building elevated on fill plus freeboard was not damaged by this flood

11.2.1. Fill

DNR and NFIP regulations allow fill to be used, but restrictions apply in floodways where fill would cause any increase in flood heights.

Many communities also limit the use of fill in the flood fringe to protect flood storage capacity, which is discussed in Section 13.

Where fill is the method of choice, it should be properly designed, installed in layers, and compacted. Simply adding dirt to the building site may result in differential settling over time.

The fill should also be properly sloped and protected from erosion and scour during flooding. To provide a factor of safety for the building and its residents, the DNR model ordinance recommends that the fill extends 18 feet beyond the walls of a structure before it drops below the flood protection elevation. Further, the fill should not adversely affect the flow of drainage from or onto neighboring properties.

FEMA's Technical Bulletin 10-01, *Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding*, has some good guidance on constructing buildings on fill. If the builder intends to build on fill and submit a request for a Letter of Map Revision based on fill (LOMR-F), there are some additional concerns that are discussed in Section 6.2.2 that you need to review.

11.2.2. Piles, Posts, Piers, or Columns

Piles, piers, posts, or columns are appropriate where there is deeper flooding and fill is not feasible. Where flooding is likely to have high velocities or to create waves, elevation with **no enclosure** below the elevated finished floor is preferred. As illustrated in Figure 11-2, this permits unrestricted flow of floodwater under buildings and causes little, if any, impact on flood heights.

Figure 11-2. Structure elevated on piers

11.2.3. Stem Walls and Continuous Foundation Walls

The third elevation technique is to build on solid walls. In shallower flooding areas, this elevation technique creates a crawlspace—a foundation of solid walls that puts the lowest floor above the flood level.

When solid walls are used for a foundation in the SFHA, care must be taken to ensure that hydrostatic or hydrodynamic pressure does not damage the foundation. As discussed in Section 1.6.3, water pressures can collapse a solid wall or lift and break a concrete floor.

Figure 11-3. Building elevated on crawlspace with foundation openings

There are two ways to prevent this:

- Stem walls can be used on two sides parallel to the predominant direction of flow of water. The other two sides are kept open. This minimizes the obstruction to floodwaters and reduces the pressure on the foundation.

- Continuous foundation walls can be used for shallower flooding, but the walls require openings large enough to allow floodwaters to flow in and out, preventing differential pressures on the walls. This is discussed in more detail in the later Section on enclosures.

11.2.4. How High?

NFIP regulations require that the lowest floor of a building must be elevated above the BFE, while in Iowa the lowest floor must be elevated to the flood protection elevation (minimum of 1 foot above the BFE). Note three things about the minimum NFIP requirement:

1. The term “lowest floor” includes basement because all usable portions of a building must be protected from flood damage.

> 44 CFR 59.1. Definitions: “Lowest Floor” means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building’s lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of Section 60.3.

2. The minimum requirement in Iowa is to elevate to the flood protection elevation. Earlier in this Section, freeboard was covered. Freeboard is an extra margin of protection that requires the lowest floor to be at least 1 foot above the BFE (i.e., to the flood protection elevation).

3. In **A Zones**, under the minimum NFIP requirement, the lowest floor is measured from the top of the floor (see Figure 11-4). However, it is recommended that buildings on elevated foundations, such as piles or a crawlspace, have supporting beams or floor joists above the flood protection elevation to protect them from flood damage.

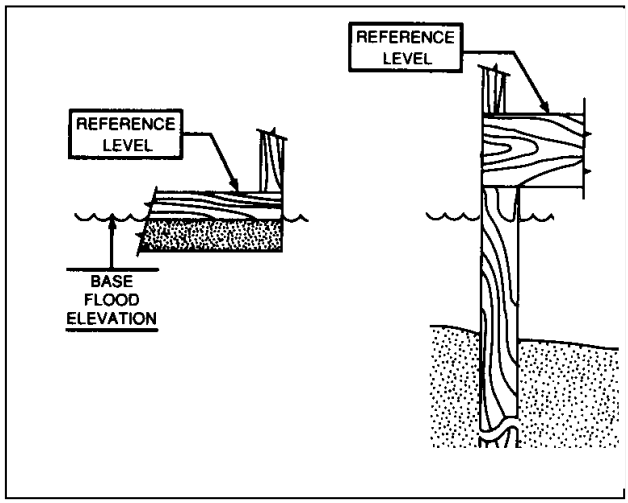


Figure 11-4. In A Zones, the top of the floor is the reference level

11.2.5. Elevation Certificate

Because most new buildings constructed in the floodplain are residences, elevating them is one of the most important requirements of the NFIP. To ensure that a building is elevated above the flood protection elevation, the lowest floor is surveyed, and an Elevation Certificate is completed by a licensed surveyor or engineer. A copy is kept by the local permit office. This is discussed in more detail in Section 18.

> *Completing and maintaining the FEMA Elevation Certificate is an important element of a floodplain management program. A copy of the FEMA Elevation Certificate is included in Section 27.*

11.3.Enclosures

Enclosures, as referenced here, are areas created by continuous foundation walls below the flood protection elevation. They deserve special attention for two reasons:

- The walls of enclosed areas are subject to flood damage from hydrostatic and hydrodynamic forces
- Owners are tempted to convert enclosures into finished space that will sustain significant monetary losses when damaged in a flood

Does an enclosure under an elevated floor just go to waste? It need not; allowable uses are discussed in the sections that follow.

11.3.1. NFIP Requirement

NFIP regulations allow certain uses for enclosures below the flood protection elevation because these uses are subject to minimal flood damage. Note that any level in a building that is below grade on all four sides is considered a basement. Basements are discussed in Section 11.5.2. This Section addresses crawlspaces and other levels that are **not below grade**.

Three uses may be allowed in the area below the floor elevated above the flood protection elevation:

- Building access
- Vehicle parking
- Storage of materials that have low flood damage potential

The floodplain regulation requirements can be easier to accept if owners and builders are encouraged to think about the enclosed lower areas as usable space. If a building has to be elevated, say, five feet above grade, the owner should be encouraged to go up eight feet. This allows the lower area to be used for parking and provides three extra feet of flood protection.

However, if the lower area is enclosed, there is a tendency for the owner to forget about the flood hazard and convert the enclosure to a bedroom or other finished room. This must be prevented.

11.3.2. Materials and Utilities

The lower area below the flood protection elevation of an elevated building must be floodable—it must be built of flood resistant materials (see Section 11.5.4 on what materials are acceptable). Not allowed are finishings such as carpeting, paneling, insulation (both cellulose and fiberglass), and gypsum wallboard (also known as drywall and sheetrock).

Utilities, including ductwork, that serve the upper level also must be protected from flood damage. Consequently, a furnace cannot be put in such an enclosure unless it is above the flood protection elevation. Air conditioning units should be suspended from the first floor's floor joists or on a pedestal, above the flood protection elevation.

It is especially important to make sure that all HVAC equipment, including any ductwork in a crawlspace be elevated to 1 foot above the BFE (see Figure 11-5 and 11-6on the next page). See also the FEMA document *Protecting Building Utility Systems from Flood Damage*.

If the lower area is used for access to the upper level, a stairway can easily be designed that is resistant to flood damage. Installing an elevator is tricky, but there are ways to design and install an elevator that will result in minimal flood damage, as explained in FEMA Technical Bulletin 4, *Elevator Installation for Buildings Located in Special Flood Hazard Areas*.

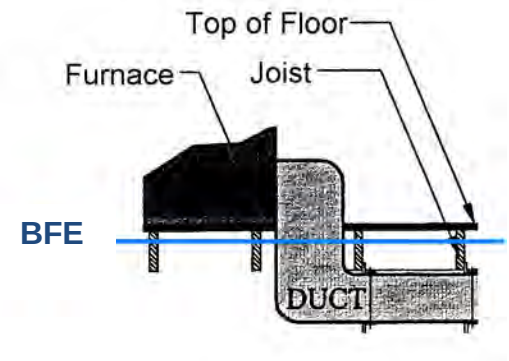


Figure 11-5. Just focusing on getting the lowest floor above the base flood elevation (BFE) means that floor joists and ductwork may still be flooded.

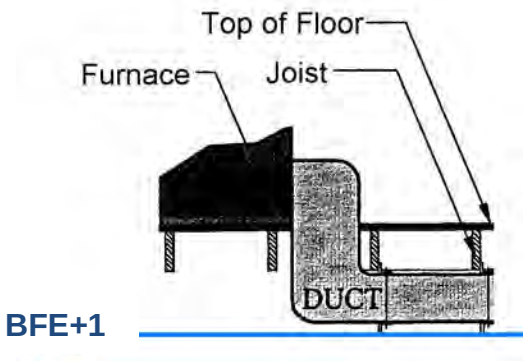


Figure 11-6. A properly elevated building has all damageable items, including floor joists, furnace, and ductwork, 1 foot above the base flood elevation (BFE). The ductwork could also be run overhead, through the attic.

Openings

As noted in Section 1, solid walls can collapse if floodwaters get too deep. To prevent this, the enclosure must have openings to allow floodwaters to automatically enter and exit, thus automatically equalizing hydrostatic flood forces on the walls.

44 CFR 60.3(c)(5) [Communities must] Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. 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 that they permit the automatic entry and exit of floodwaters**.**

You can be sure the openings are adequate by using one of two methods. The first method is to require the builder to have the design certified by a licensed P.E. or architect.

The second method is to have the design meet or exceed the following three criteria:

1. The bottom of the openings must be no higher than 1 foot above grade (see Figure 11-7).

2. The openings should be installed on at least two walls of the enclosure to ensure floodwaters will enter **and exit** the enclosure.

3. Provide a minimum of two openings having a net area of not less than 1 square inch for every square foot of enclosed area that is subject to flooding. If the area of the enclosure is 1,000 square feet, the area of the openings combined must total at least 1,000 square inches.

A standard crawlspace vent for block walls is 8-inch x 16 inches or 128 square inches (see Figure 11-7). To determine how many would be needed, divide the square footage of the floor area by 128.

Example 1:

$$\frac{\text{1,280 square foot house}}{\text{128 square inches/vent}} = 10 \qquad \text{10 vents will be needed}$$

Example 2:

$$\frac{\text{2,000 square foot house}}{\text{128 square inches/vent}} = 15.62 \qquad \text{16 vents will be needed}$$

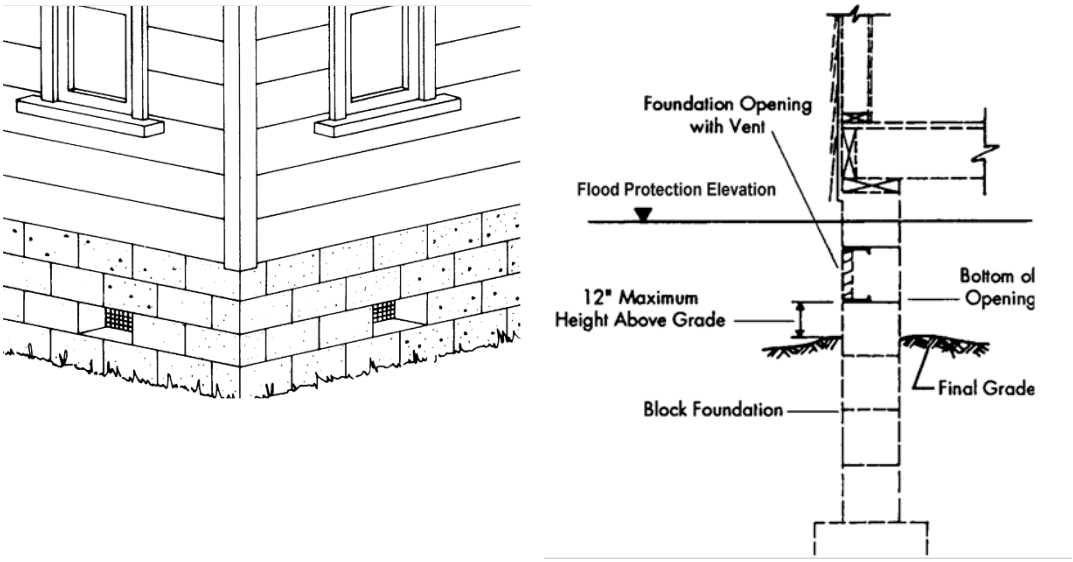


Figure 11-7. Opening location in solid foundation wall

Openings may be equipped with screens, louvers, valves, or other coverings or devices to keep animals out of the enclosure. However, any covering must permit the automatic flow of floodwater in both directions.

The opening sizes in the previous examples and in Figure 11-7 are based on standard crawlspace vents, which most building codes require to be installed in a crawlspace for ventilation purposes. Often these are located close to the floor joists in order to circulate air around the wooden members.

Figure 11-8. The house on the left has compliant crawlspace openings. The openings in the foundation on the right are too high.

Vents for air circulation are well above the ground in an elevated house and would not meet the NFIP requirement that the bottom of the opening be within 1 foot of grade (see the house on the right in Figure 11-8). However, NFIP requirements and building codes can be satisfied by the same vents if they meet the three criteria listed above.

Normal garage doors cannot be used to satisfy this requirement because they do not permit the automatic flow of floodwaters. However, garage doors may have flood vents in them that meet the above criteria.

Openings are not required for stem wall foundations that have been backfilled for pouring of a concrete floor slab. For further guidance, refer to FEMA Technical Bulletin 1, *Openings in Foundation Walls and Walls of Enclosures*.

11.3.3. Use

Enclosed areas must be floodable and used only for parking vehicles, storage of low-damage potential items, or entry to a living area—uses that are subject to little or no flood damage.

Materials to be stored within enclosures shall be of low flood damage potential. The type of storage permitted in an enclosed lower area should be limited to that which is incidental and accessory to the principal use of the structure. For instance, if the structure is a residence, the enclosure should be limited to storage of lawn and garden equipment, snow tires, and other low-damage items that are flood resistant or can be conveniently moved to the elevated part of the building. The interior portion of an enclosed area should not be partitioned or finished into separate rooms, except to enclose storage areas.

The permit official must ensure that furnaces and other items that can be damaged by floodwater are not allowed in a crawlspace or other enclosure below an elevated lowest floor. Mechanical equipment installed below the lowest floor can have an adverse impact on flood insurance premiums under Risk Rating 2.0. It is also a good idea to advise the builder and owner of the limited coverage for items stored in an enclosure below an elevated floor (below the BFE). This limited coverage is explained more in Section 19.

If a building is elevated eight feet or more, regulating the use of the enclosure presents special problems. Over time, the owner may forget about the flood hazard and want to convert the floodable area into a finished room. Such an action would increase the flood damage potential for the building, violate the conditions of the building permit, and violate the NFIP regulations.

However, because the room is hidden behind walls, it can be difficult for the permit office to monitor such a conversion. You should carefully check new building plans for signs, such as roughed-in plumbing and sliding glass doors, which indicate the owner may expect to finish the area in the future.

11.4.Floodproofing

Non-residential buildings must be elevated or floodproofed. If they are elevated, they must meet the same standards as the residential buildings that were just reviewed. Elevation is the preferred method because it is more dependable. Elevated commercial and industrial buildings can often be designed so that they can continue to operate during a flood, reducing or eliminating business disruptions.

11.4.1. NFIP Requirements

44 CFR 59.1. Definitions: "Flood proofing" means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures, and their contents.

44 CFR 60.3(c)(3) [Communities must] Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH Zones on the community's firm (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

44 CFR 60.3(c)(4) [Communities must] Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this Section, and (ii) a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under §59.22(a)(9)(iii);

For the purposes of regulating new construction, floodproofing is defined as measures incorporated in the design of the building so that below the flood protection elevation:

- Walls are watertight (substantially impermeable to the passage of water).
- Structural components can resist hydrostatic and hydrodynamic loads and effects of buoyancy; and
- Utilities are protected from flood damage.

Floodproofing

Floodproofing is a viable solution only where floodwaters are less than three feet deep since walls and floors may collapse under higher water levels.

Most floodproofing is appropriate only where floodwaters are less than three feet deep since walls and floors may collapse under higher water levels.

A licensed P.E. or architect must prepare the building plans and certify the floodproofing measures, preferably using the FEMA Floodproofing Certificate. This is discussed in more detail in Section 18.

11.4.2. Human Intervention

Human intervention means that for a floodproofing measure to work, a person has to take some action before the floodwater arrives, such as turn a valve, close an opening, or switch on a pump.

There are many potential causes of failure for these techniques, including inadequate warning time, no person on duty when the warning is issued, the responsible person can't find the right parts or tools, the person is too excited or too weak to install things correctly, and/or the

electricity fails. Floodproofing techniques that require human intervention, or an outside source of power are allowed by the NFIP but should be discouraged.

Before you approve plans for a building that relies on human intervention to be floodproofed, you should make sure that (1) your ordinance allows it and (2) there are plans and precautions to keep problems from occurring. Techniques that rely on human intervention should only be allowed in areas with adequate warning time and in situations where there will be someone present who is capable of implementing or installing the required measures.

More information on floodproofing can be found in FEMA's Technical Bulletin 3, *Non-Residential Floodproofing - Requirements and Certification for Buildings Located in Special Flood Hazard Areas*.

11.4.3. How High?

The State of Iowa requires floodproofing to provide protection to 1 foot above the BFE. *The way flood insurance rates are calculated for floodproofed structures has changed under Risk Rating 2.0.*

11.5. Other Provisions

11.5.1. AO Zones

AO Zones are shallow flooding areas where FEMA provides a 1% annual chance flood (also known as 100-year or base flood) *depth*. Since there is no 1% annual chance flood *elevation*, the rules read a little differently.

In AO 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 1 foot above the depth number specified in feet on the community's FIRM; or
- At least 2 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 the same elevation.

11.5.2. Basements

The definition of the "lowest floor" includes basements and the definition of "basement" includes any floor level below grade on all sides.

> 44 CFR 59.1 Definitions: "Basement" means any area of the building having its floor sub grade (below ground level) on all sides.

Note that "walkout basements", "daylight basements", or "terrace levels" are usually sub grade on only three sides, with the downhill side at or above grade. Thus, they are not considered

basements for either floodplain management or flood insurance rating purposes (but they are still the lowest floor of a building for floodplain management and insurance rating purposes).

If these areas are used only for parking, access, or storage and they meet other ordinance requirements, they can be regulated as enclosures below an elevated building and not be considered the lowest floor of the building.

On the other hand, cellars, the lower level of a split-level or bi-level house, garden apartments, and other floors below grade (finished or unfinished) are considered basements under NFIP regulations. *This interpretation also applies to crawlspace floors that are below grade on all sides.*

Basements

Basements below the BFE are NOT allowed in new buildings and flood insurance coverage is very limited in existing basements for a very good reason. It only takes an inch of water over the sill and the entire basement fills up! Constructing a basement into fill doesn't make it safe because saturated groundwater can damage the walls.

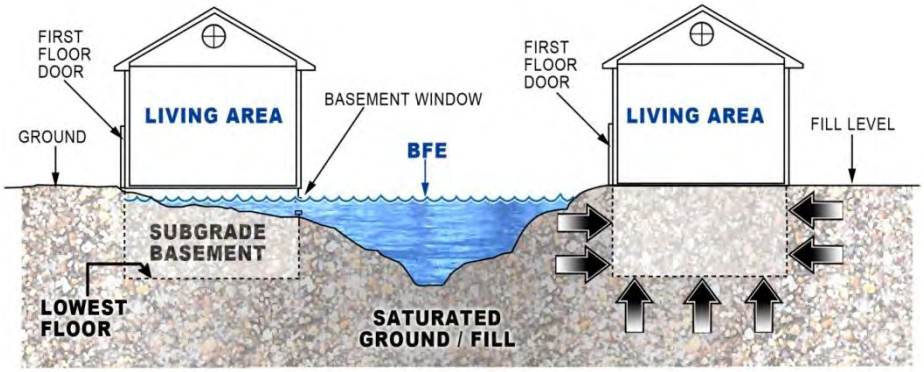


Figure 11-9. Basements in the SFHA are at considerable risk and are not allowed in new buildings

Since the lowest floor of a residential building must be above the flood protection elevation, the only way to build a residential basement in the floodplain is if it is elevated above the flood protection elevation and surrounded by fill. Floodproofed non-residential basements are allowed, though.

Basement floodproofing exception: Two Iowa communities—City of Clive, and La Porte City—have received a residential basement floodproofing rating credit (exception) from FEMA. Residential basements are allowed, provided a FEMA Residential Basement Floodproofing Certificate is completed. The certificate requires that a P.E. or architect certify that the:

- Basement area, together with attendant utilities and sanitary facilities, is watertight to the floodproofing design elevation with walls that are impermeable to the passage of water without human intervention

- Basement walls and floor are capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy resulting from flooding to the floodproofing design elevation,

and have been designed so that minimal damage will occur from floods that exceed the floodproofing design elevation

- Building, including the floodproofing design elevation, complies with all other community requirements

Floodproofing is not as dependable as elevating a structure above the flood protection elevation. Since the floodproofing exception is for a residential building, the basement could place occupants at considerable risk by living and sleeping in an area well below the base flood level.

11.5.3. Anchoring

> 44 CFR 60.3(a)(3) …If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy…

Both elevated and floodproofed buildings must be properly anchored to stabilize them against flood forces. This means anchoring the building to its foundation and ensuring that the foundation won't move. Therefore, you need to make sure there is adequate protection against hydrostatic and hydrodynamic forces and erosion and scour that can undercut the foundation.

In areas of shallow flooding and low flood velocities, normal construction practices suffice. Additional anchoring measures, such as using extra bolts to connect the sill to the foundation or installing rods to connect the cap to the sill, should be required in three situations:

- Where base flood velocities exceed five feet per second
- In areas subject to waves and high winds
- In manufactured homes

In some areas it may be necessary to use foundations such as piles or piers to elevate the building since these provide less obstruction to floodwaters.

If your community has any of these conditions, it is recommended that the builder's architect or engineer sign a statement certifying the design of the building includes "anchoring adequate to prevent flotation, collapse, and lateral movement" during a base flood event.

11.5.4. Flood Resistant Material

Whether a building is elevated or floodproofed, it is important that all building materials exposed to floodwaters be made of flood resistant materials.

> 44 CFR 60.3(a) (3) …If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (ii) be constructed with materials resistant to flood damage…

“Flood resistant materials” include any building product capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. “Prolonged contact” means at least 72 hours, and “significant damage” is any damage requiring more than low-cost cosmetic repair (such as painting). Examples of common flood resistant materials include:

- Concrete, concrete block, or glazed brick
- Clay, concrete, or ceramic tile
- Galvanized or stainless-steel nails, hurricane clips, and connectors for any area below the BFE or throughout a building in areas subject to airborne salts (coastal)
- Indoor-outdoor carpeting with synthetic backing (do not fasten down)
- Vinyl, terrazzo, rubber, or vinyl floor covering with waterproof adhesives
- Metal doors and window frames
- Polyester-epoxy paint (do not use mildew-resistant paint indoors because it contains a toxic ingredient)
- Stone, slate, or cast stone (with waterproof mortar)
- Mastic, silicone, or polyurethane formed-in-place flooring
- Closed cell or plastic foam insulation
- Water resistant glue
- Preservative-treated (.40 CCA minimum) or naturally decay-resistant lumber
- Marine grade plywood

Much more detail on flood resistant material requirements can be found in FEMA Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*.

11.6. Accessory Structures

Certain accessory structures may not qualify as “buildings”. Open structures, such as gazebos and picnic pavilions that do not have at least two rigid walls, are not “buildings” and do not have to be elevated or floodproofed.

In certain cases, agricultural buildings can be granted waivers to the full requirements for flood protection. However, a variance would be required. This is discussed in Section 16, Appeals and Variances. The building should still meet the wet floodproofing requirements spelled out in Section 11.6.2. An alternative to issuing a variance every time (which is **not** a good practice) is to adopt the appropriate specifications in your ordinance. Have the DNR and FEMA review the draft language before the ordinance is amended to ensure it meets their requirements.

11.6.1. Residential Accessory Structures

Accessory structures proposed in the floodway fringe for **residential uses only** may be exempted from the building protection standards. These would normally be limited to detached garages and sheds on a residential lot. Per the State's model ordinances, if exempted they must meet the following criteria:

- The structure shall not be used for human habitation.
- The structure shall be designed to have low flood damage potential. For example, the building materials located below the flood protection shall be water resistant such as metal or treated lumber.
- The structure shall be constructed and placed on the building site so as to offer minimum resistance to the flow of floodwaters. For example, the building could be placed immediately downstream of an existing building to reduce the effects of velocity of the flowing floodwater on the structure.
- The structure shall be firmly anchored to prevent flotation, which may result in damage to other structures.
- The structure's service facilities, such as electrical and heating equipment, shall be elevated or floodproofed to at least 1 foot above the BFE (flood protection elevation).

11.6.2. Wet Floodproofing Specifications for Accessory Structures

Wet floodproofing involves using flood resistant materials below the flood protection elevation and elevating things subject to flood damage above the flood protection elevation. Items that must be installed above the flood protection elevation include electrical boxes, switches, and outlets. Only the minimum amount of electrical equipment required by code may be located below the flood protection elevation, and that equipment must be flood damage resistant.

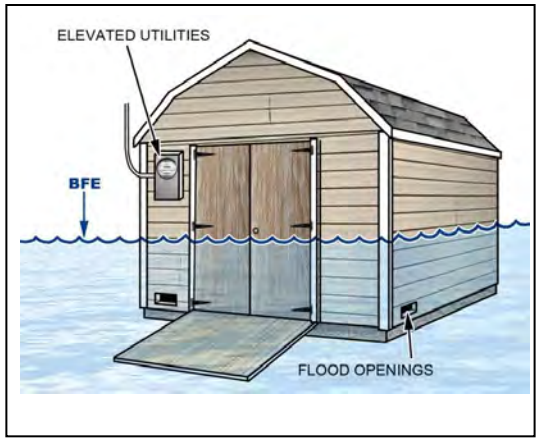


Figure 11-10. Wet floodproofed accessory structure with utilities

The following specifications can be used when approving a wet floodproofed accessory building. They are limited to small, detached garages, sheds, and other accessory buildings. (Note: a community can adopt these specifications in its ordinance. If it does, permit applicants would not have to go through the variance procedure.)

There are two precautions to note:

- The community's action does not affect flood insurance rates. A separate policy on a wet floodproofed building can be very expensive.

- Larger or more expensive buildings, attached garages, room additions, and similar modifications to a larger building must meet the regular flood protection requirements (e.g., additions to a residential building must be elevated above the flood protection elevation plus any required freeboard). Size limitations are defined in FEMA P-2140, Section 2.1.5 and Technical Bulletin 7 Section 5.1.3. Size limitations for Zone A are not larger than a one-story, two-car garage (600 square feet).

Here is FEMA's guidance on allowing wet floodproofed accessory structures:

1. The site must be in the flood fringe. No variances may be issued for accessory structures within any designated floodway if any increase in flood levels would result during the base flood.

2. Use of the structure must be limited to parking or limited storage and not used for human habitation.

3. The accessory structure must be built with flood resistant materials for the exterior and interior building components and elements (e.g., foundation, wall framing, exterior and interior finishes, flooring) below the flood protection elevation (see Section 11.5.4).

4. The accessory structure must be adequately anchored to prevent flotation, collapse, or lateral movement of the structure (see Section 11.5.3). All the building's structural components must be capable of resisting specific flood-related forces, including hydrostatic, buoyancy, hydrodynamic, and debris impact forces.

5. The accessory structure must meet the NFIP openings requirement spelled out in Section 11.3.2.

6. Any mechanical, electrical, or other utility equipment must be located above the flood protection elevation or floodproofed so that they are contained within a watertight, floodproofed enclosure that is capable of resisting damage during flood conditions.

7. Major equipment, machinery, or other contents must be protected. The rate-of-rise of flood waters or the flood warning time available through an existing, reliable (community-based or regionally based) flood warning system must be adequate to provide sufficient lead time to remove and relocate contents to land above the flood protection elevation. A community must make a finding that the rate-of-rise of flood waters and/or flood warning is adequate. Protection techniques must be specified:

    - Protection techniques for contents that cannot be relocated in the event of a flood include constructing protective watertight floodproofed areas within the building, the use of equipment hoists for readily elevating contents, or permanently elevating certain contents on pedestals or shelves above the flood protection elevation.

    - For contents that can be relocated, a determination must be made that property owners can safely remove contents at any time, 365 days a year, without risk to lives and that the contents will be relocated to a site out of the floodplain. The site for storing relocated contents should be specified.

For additional guidance, see FEMA's *Wet Floodproofing Requirements* and *Protecting Building Utilities From Flood Damage*.

11.7. Agricultural Structures

Agricultural structures are considered non-residential structures with regards to NFIP design standard when proposed within an SFHA. An agricultural structure is "walled and roofed" when the structure has at least two outside rigid walls and a fully secured roof. There are some relative purposes and uses that would still not be considered agricultural structures. These include:

- Structures used for human habitation. These can be a permanent residence or a short-term, temporary residence
- Structures used by the public. This means a place of employment or entertainment
- Structures with multiple, or mixed uses. This means structures where one of more of the uses don't meet the requirement of an agricultural structure

44 CFR 59.1 Definitions: "agricultural structure" means a structure that is used exclusively in connection with the production, harvesting, storage, and raising, or drying of agricultural commodities and livestock; an agricultural structure specifically excludes any structure used for human habitation.

As stated in previous sections of this manual, agricultural structures are not provided with exemptions to development and design criteria requirements required by communities that participate in the NFIP. When considering new construction and improvements to any structures, it is important to first reference the guidelines and performance standards that are defined in 44 CFR Section 60.3(c).

The structure should include the following:

- The structure should be constructed with the lowest floor elevated to or above the BFE or, together with attendant utilities and sanitary facilities, be dry floodproofed to or above the BFE
- Enclosed areas used only for building access, parking, or storage should have adequate flood openings that are designed to automatically equalize hydrostatic flood forces
- Have and maintain a record of the certified elevation for all new construction and substantial improvements

Communities may request a community-wide exception from FEMA to allow certain agricultural or accessory structures located in the SFHA to be wet floodproofed in lieu of the elevation or dry floodproofing requirements. The request must be made in writing to FEMA Region 7. Details required in the request can be found in the Agricultural and Accessory Structures policy document. The community will also need to update its floodplain management ordinance to define the requirements for allowing certain agricultural structures to be wet floodproofed.

More information and guidance on protecting agricultural structures from flooding in SFHA's can be found on FEMA's website *Floodplain Management Requirements for Agricultural and Accessory Structures* and the policy document #104-008-03 from February 2020.

Floodplain Management Agricultural Structures Policy

11.8.Factory-Built Homes

A factory-built home includes a building that is transportable, a mobile home, or a "double wide" home **on a permanent chassis** as per the NFIP regulations. The term does not include a "recreational vehicle", which is defined in Section 11.7.4. Under Iowa law, "manufactured home" does not include mobile homes, therefore, this reference and the DNR model ordinances use the term "factory-built home".

44 CFR 59.1 Definitions: "Manufactured [factory-built] home" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured [factory-built] home" does not include a "recreational vehicle".

11.8.1. Elevation

Factory-built homes must meet the same flood protection requirements as "stick-built" or conventional housing, as they are usually residential buildings, and they must be elevated so the lowest floor is at or above the flood protection elevation. Due to the construction materials and methods used for most factory-built homes, it is strongly recommended they be elevated higher than the required flood protection elevation and that they not be allowed in SFHAs with higher flood velocities or higher flood depths.

44 CFR Section 60.3(c)(12) allows for a limited exemption to elevating to the flood protection elevation in pre-FIRM factory-built home parks. However, DNR regulations do not recognize this exemption. While it does not affect your community, because the State rule is a higher standard than the minimum NFIP requirements, the CRS provides credit under Activity 430 (Higher Regulatory Standards).

11.8.2. Anchoring for Factory-Built Homes

44 CFR 60.3(c)(6) …[Manufactured [factory-built] homes must] be elevated on a permanent foundation … and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

A "permanent foundation" means more than a stack of concrete blocks. It should include the following factors:

- A below grade footing capable of resisting overturning
- A footer depth that accounts for frost depth and expected scour

- A footing of appropriate size for the site's soil bearing capacity
- The design needs to account for seismic and other hazards

The following types of permanent foundations for elevation should be used:

- Reinforced piers
- Posts
- Piles
- Poured concrete walls
- Reinforced block walls
- Compacted fill (as appropriate and with a fill permit)

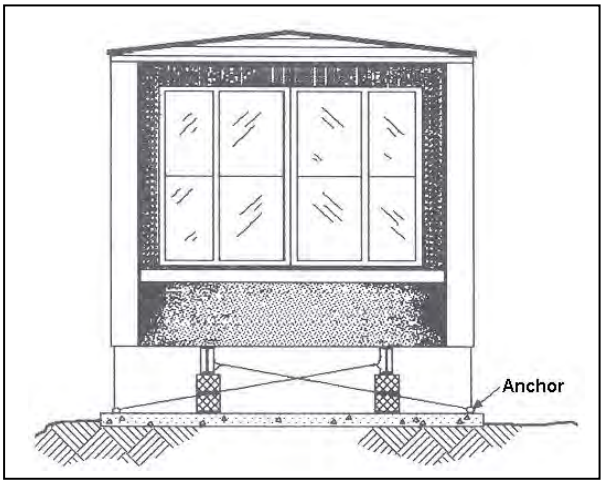


Figure 11-11. Factory-built home tie-downs elevated above the BFE

"Adequately anchored" means a system of ties, anchors, and anchoring equipment that will withstand flood and wind forces. The system must work in saturated soil conditions. Usually this means over-the-top or frame tie-downs in addition to standard connections to the foundation.

More information on protecting factory-built homes from flooding and other hazards can be found in FEMA P-85, *Protecting Manufactured Homes from Floods and Other Hazards*.

11.8.3. Evacuation

In some areas, there is adequate warning time to remove a factory-built home from harm's way. Protecting such property should not be discouraged, so FEMA allows an evacuated factory-built home to be put back on the original site without having to meet the requirements for siting a new building (assuming it was originally on the site legally). A legally placed existing factory-built home can be returned after an evacuation without being elevated provided it is not enlarged or altered.

11.8.4. Recreational Vehicles

44 CFR 59.1 Definitions: “Recreational vehicle” means a vehicle which is:

(a) Built on a single chassis;

(b) 400 square feet or less when measured at the largest horizontal projection;

(c) Designed to be self-propelled or permanently towable by a light duty truck; and

(d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

A recreational vehicle placed on a site in a SFHA must:

- Be on the site for fewer than 180 consecutive days; and
- Be fully licensed and ready for highway use. “Ready for highway use” means that it is on its wheels or jacking system and is attached to the site only by quick disconnect type utilities and has no permanently attached additions.

Otherwise, it must meet the elevation and anchoring requirements for factory-built homes.

The purpose of this requirement is to prevent recreational vehicles from being permanently placed in the floodplain unless they are as well protected from flooding as a factory-built home.

12. Regulatory Requirements: Existing Buildings – Improvements and Repairs

12.1.Basic Rule #5

Section 11 focused on the rules and regulations that prevent or reduce damage from floods to new buildings. But what if a building has been substantially damaged by a fire, flood, or other cause? What happens when the owner wishes to make a substantial improvement, such as an addition, to an existing building?

Basic Rule #5: If the cost of improvements or the cost to repair the damage equals or exceeds 50 percent of the market value of the building, it must be brought up to current floodplain management standards. This requirement also applies when the original floor area of a building is increased by 25 percent.

Under the conditions of Rule #5, an existing building must meet the requirements for new construction if it is substantially damaged or improved.

People who own existing buildings that are being substantially improved will be required to make a major investment to bring the building into compliance with the law. They often are not happy with this requirement and if the building has just been damaged, they may be financially strapped, and your elected officials will want to find ways to make repairing and rebuilding easier.

For these reasons, it is easy to see that this basic rule can be difficult to administer. It is also the one time when your regulatory program can reduce future flood damage to existing buildings.

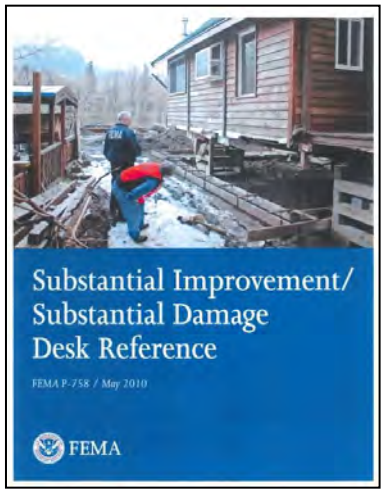


Figure 12-1. FEMA's Substantial Improvement/ Substantial Damage Desk Reference

Note: Rule #5 does not typically apply to a structure which was lawful before the passage of your community's floodplain ordinance unless it was substantially damaged or being substantially improved. The FEMA has developed a number of excellent resources to aid communities in making substantial improvement and substantial damage determinations, including the *Substantial Improvement/Substantial Damage Desk Reference*.

The term "building" is the same as the term "structure" in the NFIP regulations. Your ordinance may use either term. The terms are reviewed in more detail in Section 11.

12.2.Substantial Improvement

44 CFR 59.1. Definitions: "Substantial improvement" means any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement.

Under the Iowa model ordinance, the definition of substantial improvement also includes:

> *"-any addition which increases the original floor area of a building by 25 percent or more. All additions constructed after the Flood Insurance Rate Map (FIRM) date shall be added to any proposed addition in determining whether the total increase in original floor space would exceed 25 percent".*

The CRS credits regulations that set a threshold lower than 50 percent as well as counting improvements cumulatively. These credits are found under Activity 430, in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

12.2.1. Projects Affected

All building improvement projects worthy of a permit must be considered. These include:

- Remodeling projects
- Rehabilitation projects
- Building additions
- Repair and reconstruction projects (these are addressed in more detail in Section 12.4 on substantial damage)

Note that if part of a building is in the Special Flood Hazard Area (SFHA), the entire building is subject to these provisions.

If your community does not require permits for minor maintenance, such as reroofing, or projects under a certain dollar amount, then such projects are not subject to the substantial improvement requirements. However, if you have a larger project that includes reroofing, etc., then you must include the cost of all the improvements in the cost of the project.

12.2.2. Multiple Projects

Due to the financial investment required, one problem you may face is a permit applicant applying for a permit for only part of the job and then later applying for another permit to finish the work.

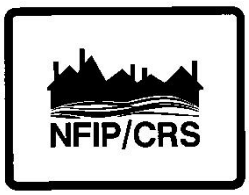
If both applications together equal or exceed 50 percent of the value of the building (and the second permit is applied for less than one year after the first), the combined project should be considered a substantial improvement and subject to the rules. FEMA requires that the entire improvement project be counted as one.

To help you enforce this, you may want to count all applications submitted over, say, one year as one project. Check with your attorney on whether your ordinance clearly gives you the authority to do this, and be sure to spell it out in the permit papers given to the applicant.

Substantial Improvement

Consider the costs of multiple permit applications submitted over the course of a year. If the combined costs equal or exceed 50 percent of the pre-improvement value of the building, the project should be considered a substantial improvement.

Some communities require that improvements be calculated cumulatively over several years. All improvement and repair projects undertaken over a period of five years, 10 years, or the life of the structure are added up. When they total 50 percent, the building must be brought into compliance as if it were new construction.



The CRS credits keeping track of improvements to enforce a cumulative substantial improvement requirement. It also credits using a lower threshold than 50 percent. These credits are found under Activity 430 in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check). See also *CRS Credit for Higher Regulatory Standards* for example, regulatory language.

12.2.3. Post-FIRM Buildings

The rules do not address only pre-FIRM buildings—they cover *all* buildings, post-FIRM ones included.

In most cases, a post-FIRM building will be properly elevated or otherwise compliant with regulations for new construction. However, sometimes a map change results in a higher 1% annual chance flood elevation (otherwise known as the BFE) or change in a FIRM zone. A substantial improvement to a post-FIRM building may require that the building be elevated to protect it from the new, higher regulatory flood protection elevation.

It should be remembered that all additions to a post-FIRM building must be elevated at least as high as the flood protection elevation in effect when the building was built. (You cannot allow a compliant building to become non-compliant by allowing additions at grade.) If a new, higher flood protection elevation has been adopted since the building was built, additions that are substantial improvements must be elevated to the new flood protection elevation.

12.2.4. The Formula

A project is a substantial improvement if:

$$\frac{\text{Cost of improvement project}}{\text{Market value of the building}} \geq 50\%$$

For example, if a proposed improvement project will cost $30,000 and the value of the building is $60,000:

$$\frac{\$80{,}000}{\$160{,}000} = 0.5\ (50\%)$$

The cost of the project equals 50 percent of the building's value, so it is a substantial improvement. The floodplain regulations for new construction apply and the building must meet the post-FIRM construction requirements. If the project is an addition that meets the criteria discussed in Sections 12.3.3 and 12.3.4, only the addition must be elevated.

The formula is based on the cost of the project and the value of the building. These two numbers must be reviewed in detail. Keep good records of the applicant's estimates and your calculations.

12.2.5. Project Cost

The cost of the project means all structural costs, including:

- All materials
- Labor
- Built-in appliances
- Overhead
- Profit
- Repairs made to damaged parts of the building worked on at the same time

A more detailed list is included in Figure 12-2. You must count all work that is done as part of the project, even things that may not normally require a permit, such as the cost of painting.

Labor is the "true" cost of hiring someone to do the job, e.g., the prevailing rates contractors charge. If the owner does it himself or has volunteer help, the "true" cost of that labor must be included.

To determine substantial improvement, you need a detailed cost estimate for the project, prepared by a licensed general contractor, professional construction estimator, or your office.

Your office must review the estimate submitted by the permit applicant. To verify it, you can use your professional judgment and knowledge of local and regional construction costs, or you can use building code valuation tables published by the major building code groups. These tables can be used to determine estimates for particular replacement items if the type of structure in question is listed.

There are two exemptions to calculating the cost of an improvement or repair project: 1) improvements to correct pre-identified code violations and 2) historic buildings. These are explained in more detail in Section 12.6.

12.2.6. Market Value

In common parlance, market value is the price a willing buyer and seller agree upon. The market value of a structure reflects its original quality, subsequent improvements, physical age of building components, and current condition.

However, market value for property can be different than that of the building itself. Market value of developed property varies widely due to the desirability of its location. For example, two houses of similar size, quality, and condition will have far different prices if one is on the coast, or in the best school district, or closer to town than the other—but the value of the building materials and labor that went into both houses will be nearly the same.

For the purposes of determining substantial improvement, market value pertains only to the structure in question. It does not pertain to the land, landscaping, or detached accessory structures on the property. Any value resulting from the location of the property should be attributed to the value of the land, not the building.

Market Value

Market value pertains only to the structure in question. It does not pertain to the land, desirability of the location, landscaping, or detached accessory structures on the property.

Acceptable estimates of market value can be obtained from these sources:

- An independent appraisal by a professional appraiser. The appraisal must exclude the value of the land and not use the “income capitalization approach”, which bases value on the use of the property, not the structure.
- Property appraisals used for tax assessment purposes with an adjustment recommended by the tax appraiser to reflect market conditions (adjusted assessed value).
- Qualified estimates based on sound professional judgment made by the staff of the local building department or tax assessor’s office.

Some market value estimates are often used only as screening tools (i.e., NFIP claims data and property appraisals for tax assessment purposes) to identify those structures where the substantial improvement ratios are obviously less than or greater than 50 percent (i.e., less than 40 percent or greater than 60 percent). For substantial improvement ratios that fall in the 40 percent to 60 percent range, more precise market value estimates are usually necessary.

Items to be included:

- All structural elements, including:
  - Spread or continuous foundation footings and pilings
  - Monolithic or other types of concrete slabs
  - Bearing walls, tie beams, and trusses
  - Floors and ceilings
  - Attached decks and porches
  - Interior partition walls
  - Exterior wall finishes (brick, stucco, siding) including painting and moldings
  - Windows and doors
  - Reshingling or retiling a roof
  - Hardware
- All interior finishing elements, including:
  - Tiling, linoleum, stone, or carpet over subflooring
  - Bathroom tiling and fixtures
  - Wall finishes (drywall, painting, stucco, plaster, paneling, marble, etc.)
  - Kitchen, utility, and bathroom cabinet
  - Built-in bookcases, cabinets, and furniture
  - Hardware
- All utility and service equipment, including:
  - HVAC equipment
  - Plumbing and electrical services
  - Light fixtures and ceiling fans
  - Security systems
  - Built-in kitchen appliances
  - Central vacuum systems
  - Water filtration, conditioning, or recirculation systems
- Cost to demolish storm-damaged building components
- Labor and other costs associated with moving or altering undamaged building components to accommodate improvements or additions
- Overhead and profits

Items to be excluded:

- Plans and specifications
- Carpeting over a finished floor
- Survey costs
- Permit fees
- Post-storm debris removal and clean up
- Outside improvements, including:
  - Landscaping
  - Sidewalks
  - Fences
  - Yard lights
  - Swimming pools

Figure 12-2. Items included in calculating cost of the project

12.3.Substantial Improvement Examples

12.3.1. Example 1: Minor Rehabilitation

A rehabilitation is defined as an improvement made to an existing structure that does not affect the external dimensions of the structure.

If the cost of the rehabilitation is less than 50 percent of the structure's market value, the building does not have to be elevated or otherwise protected. However, it is advisable to incorporate methods to reduce flood damage, such as use of flood resistant materials and installation of electrical, heating, and air conditioning units above the flood protection elevation.

Figure 12-3 shows a building that had a small rehabilitation project. Central air conditioning was installed, and the electrical system was upgraded. The value of the building before the project was $160,000. The value of the project was $32,000:

$$\frac{\$20,000}{\$100,000} = 0.2\ (20\%)$$

The project costs less than 50 percent of the building, so this is not a substantial improvement.

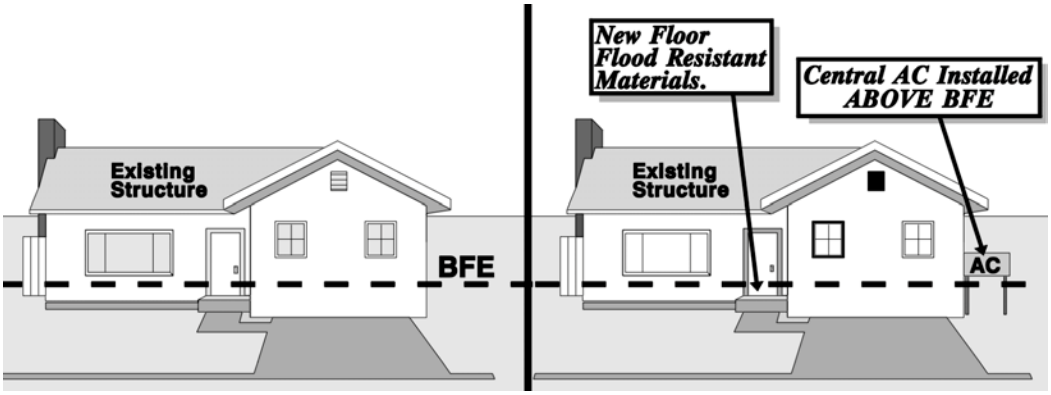


Figure 12-3. Minor rehabilitation using flood resistant methods and materials

Note: Minimum NFIP requirements state that a building must be protected to the level of the BFE. In Iowa, structures are required to be protected to one foot above the BFE.

12.3.2. Example 2: Substantial Rehabilitation

If the rehabilitation equals or exceeds 50 percent of the market value of the building, your floodplain ordinance requires that an existing structure be elevated and/or the basement filled to meet the elevation standard.

Figure 12-4 shows a run-down building. Its market value is $35,000. To rehabilitate it will require gutting the interior and replacing all wallboard, built-in cabinets, bathroom fixtures, and

furnace. The interior doors and flooring will be repaired. The house will get new siding and a new roof. The cost of this rehabilitation will be $25,000:

$$\frac{\$25,000}{\$35,000} = 0.714\ (71.4\%)$$

Because total cost of the project is greater than 50 percent, the rehabilitation is a substantial improvement.

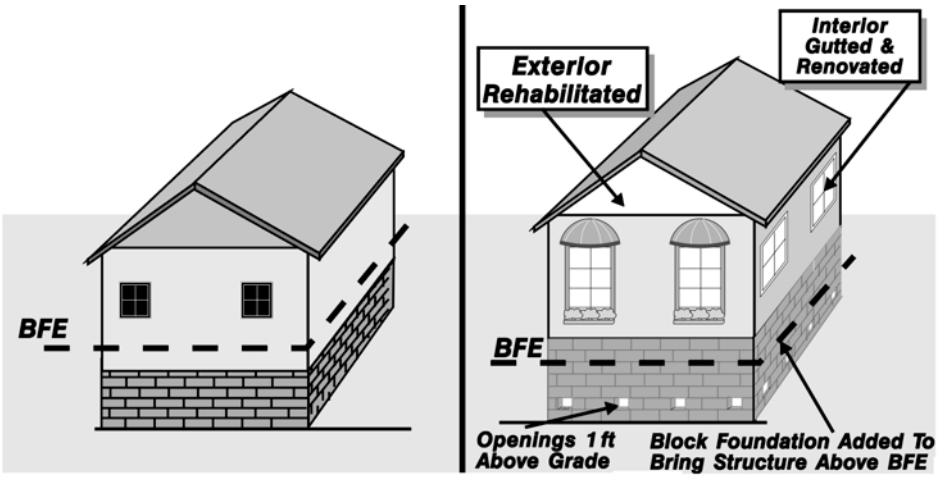


Figure 12-4. Substantially rehabilitated building elevated above the BFE

12.3.3. Example 3: Lateral Addition – Residential

Additions are improvements that increase the square footage of a structure. Commonly, this includes the structural attachment of a bedroom, den, recreational room, garage, or other type of addition to an existing structure.

When a substantial improvement is an addition (i.e., it either equals or exceeds 50 percent of the original building or it increases the original floor area by 25 percent), typically only the addition must be elevated or floodproofed (non-residential only), assuming other improvements to the *existing* structure are minimal. The other determining factor is the treatment of the common wall. If the common wall is demolished as part of the project, the entire structure must be elevated. If only a doorway is knocked through the common wall and only minimal finishing is done, then only the addition must be elevated. Figures 12-5 and 12-6 illustrate lateral additions that are compliant.

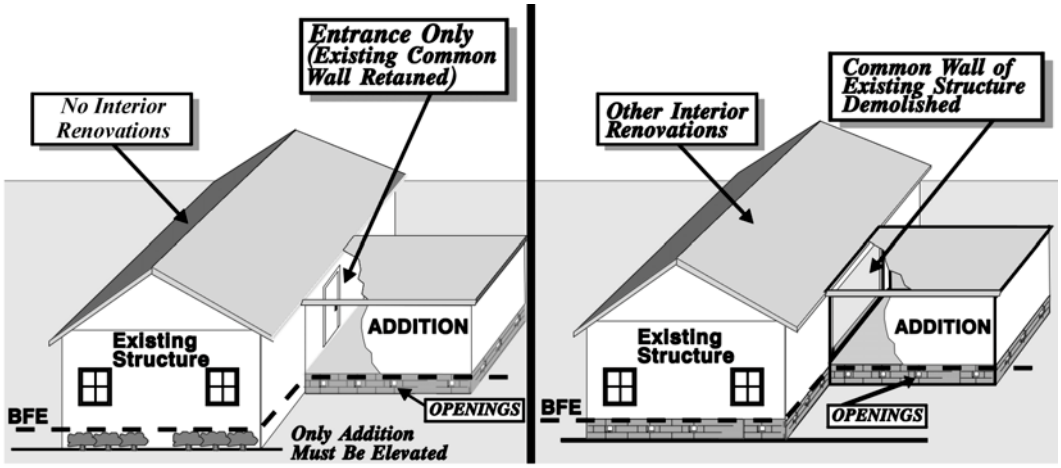


Figure 12-5. Lateral additions to a residential building

If significant improvements are made to the existing structure (such as a kitchen makeover), both it and the addition must be elevated and otherwise brought into compliance. Some communities have higher standards, and their floodplain ordinance requires that both the existing structure and lateral additions be elevated in all cases.

12.3.4. Example 4: Lateral Addition – Non-Residential

A substantial improvement addition to a non-residential building may be either elevated or floodproofed. See Section 11.4 for the requirements for floodproofing. Otherwise, all the criteria for residential buildings reviewed in Example 3 must be met.

Remember, an addition is a substantial improvement if it either equals or exceeds 50 percent of the original building value or it increases the original floor area by 25 percent.

If floodproofing is used, the builder must ensure that the wall between the addition and the original building is floodproofed.

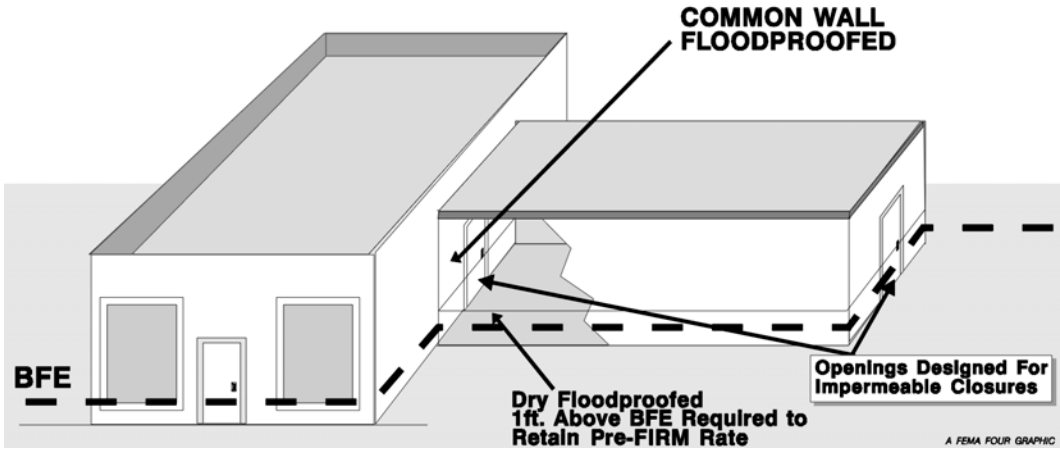


Figure 12-6. Lateral addition to a non-residential building

12.3.5. Example 5: Vertical Addition – Residential

When the proposed substantial improvement is a full or partial second floor, the entire structure must be elevated (Figure 12-7). In this instance, the existing building provides the foundation for the addition. Failure of the existing building would result in failure of the addition.

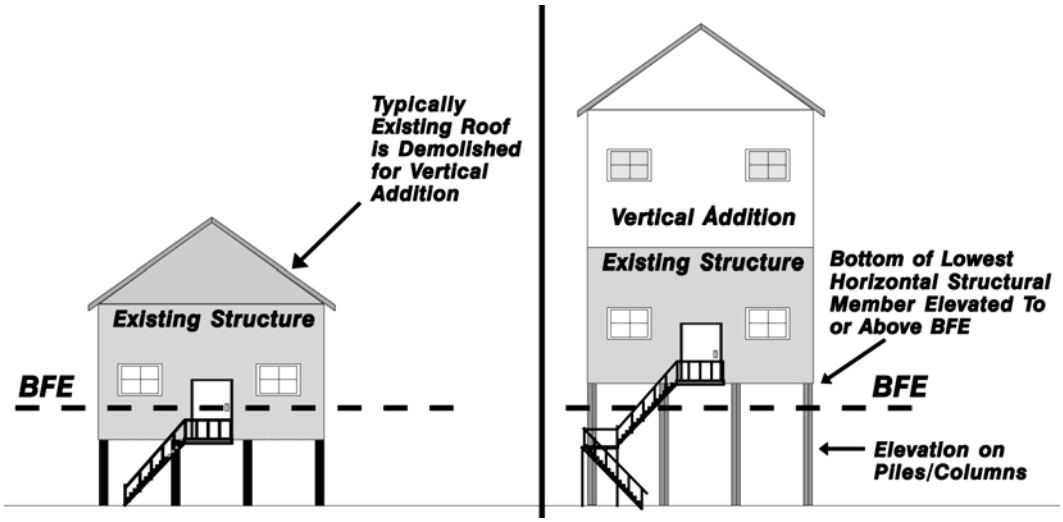


Figure 12-7. Vertical addition to a residential building

12.3.6. Example 6: Vertical Addition – Non-Residential

When the proposed substantial improvement is a full or partial second floor, the entire structure must be elevated or floodproofed (

Figure 12-8).

If a vertical addition constitutes a substantial improvement, the original building must be elevated to or above the BFE or dry floodproofed to the BFE (A zone only). In addition, the foundation must be modified or reconstructed (and below grade areas filled in) to be compliant with applicable NFIP requirements based on the flood zone.

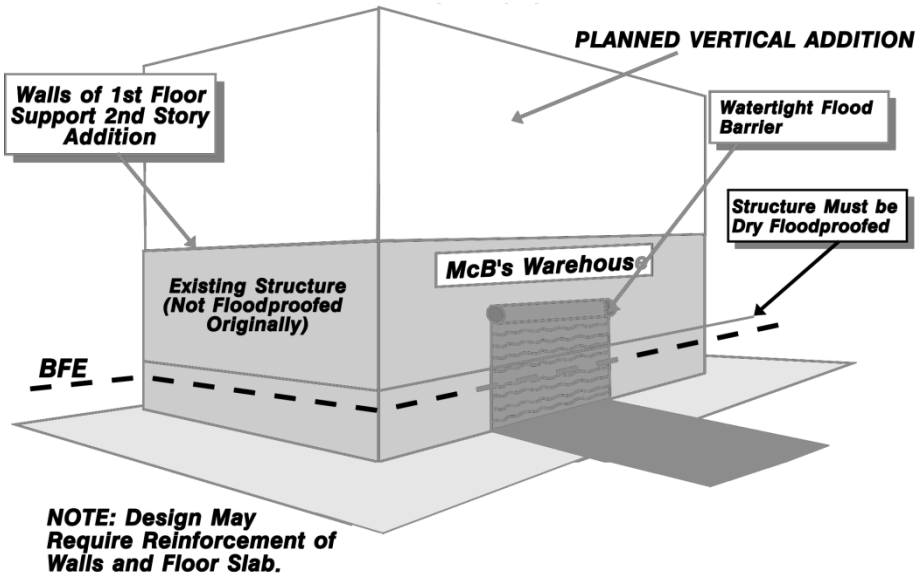


Figure 12-8. Vertical addition to a non-residential building

12.3.7. Example 7: Post-FIRM Building – Minor Addition

All additions to post-FIRM buildings are defined as new construction and must meet the requirements of your floodplain management ordinance regardless of the size or cost of the addition (

Figure 12-9). A small addition to a residential structure must be elevated at least as high as the flood protection elevation in effect when the building was built.

If a map revision has taken place and the BFE has increased, only additions that are substantial improvements must be elevated to the **new** flood protection elevation.

Post-FIRM Buildings

All additions to a post-FIRM building must be elevated at least as high as the flood protection elevation in effect when the building was built. (You cannot allow a compliant building to become non-compliant by allowing additions at grade). If a new, higher flood protection elevation has been adopted since the building was built, additions that are substantial improvements must be elevated to the new flood protection elevation.

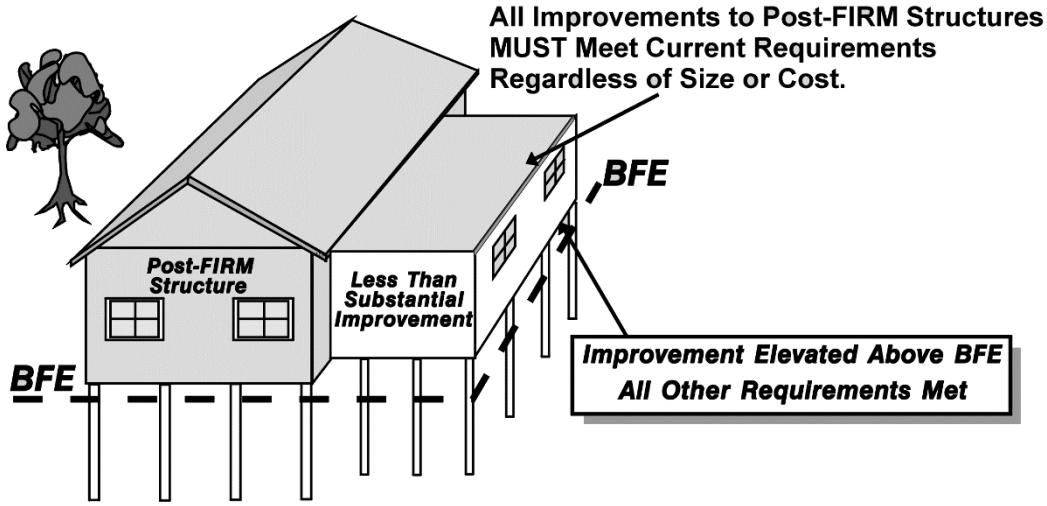


Figure 12-9. Small additions to post-FIRM buildings must be elevated

12.3.8. Example 8: Post-FIRM Building – Substantial Improvement

Substantial improvements made to a post-FIRM structure must meet the requirements of the current ordinance. Figure 12-10 shows a lateral addition made after a map revision took place and the BFE was increased.

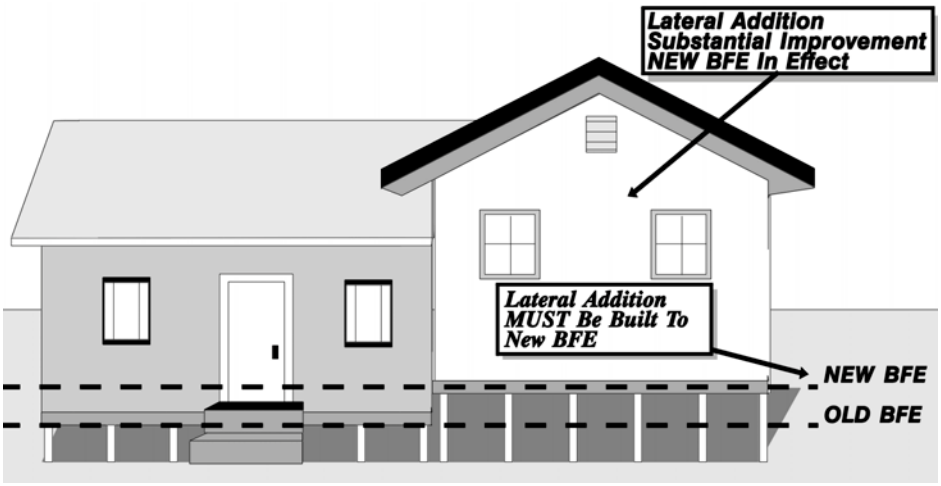


Figure 12-10. Substantial improvements to post-FIRM buildings must be elevated above the new BFE. Non-residential buildings may be dry floodproofed.

12.4.Substantial Damage

44 CFR 59.1. Definitions: “Substantial damage” means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Two key points:

- The damage can be from any cause—flood, fire, earthquake, wind, rain, or other natural, or human-induced hazard.
- The substantial damage rule applies to all buildings in a flood hazard area, regardless of whether the building was covered by flood insurance.

The formula is essentially the same as for substantial improvements:

$$\frac{\text{Cost to repair}}{\text{Pre-damage market value of the building}} > 50\%$$

Market value is calculated in the same way as for substantial improvements. Use the pre-damage market value.

FEMA has developed a number of excellent resources including the *Substantial Improvement/ Substantial Damage Desk Reference*.

12.4.1. Cost to Repair

Notice that the formula uses “cost *to* repair”, not “cost *of* repairs”. The cost to repair the structure must be calculated for full repair to the buildings *before damage* condition, even if the owner elects to do less. It must also include the cost of any improvements that the owner has opted to include during the repair project.

The total cost to repair includes the same items listed in Figure 12-15. As shown in Example 2 in Section 12.5.2, properly repairing a flooded building can be more expensive than people realize. The owner may opt not to pay for all the items needed. Even if the owner does some of the work himself, obtains some of the materials for free, has a volunteer organization do some of the work, or decides not to do some repairs, repair costs must be calculated based on the fair market value of repairing the building to its pre-damaged condition.

Cost to Repair

Substantial damage is determined regardless of the actual cost to the owner. You must figure the true cost of bringing the building back to its pre-damage condition using qualified labor and materials obtained at market prices.

In short, substantial damage is determined regardless of the actual cost to the owner. You must figure the true cost of bringing the building back to its pre-damage condition using qualified labor and materials obtained at market prices.

The permit office and the owner may have disagreements over the total list of needed repairs and their cost, as the owner has a great incentive to show less damage than occurred to avoid the additional cost of bringing the building into compliance with current floodplain ordinances.

Here are four things that can help you:

1. Get the cost to repair from an objective third-party or conclusive source, such as:

   - A licensed general contractor
   - A professional construction estimator
   - Insurance adjustment papers (exclude damage to contents)
   - Damage assessment field surveys conducted by building inspection, emergency management, or tax assessment agencies after a disaster

   Regardless of the source of the cost estimate, it needs to be reviewed. You can use your professional judgment and knowledge of local and regional construction costs, or you can use building code valuation tables published by the major building code groups.

2. Use an objective system that does not rely on varying estimates of market value or different opinions of what needs to be repaired. The Residential Substantial Damage Estimator (SDE) program discussed later in this section will do this.

3. Publicize the need for the regulations and the benefits of protecting buildings from future flooding. A well-educated public will not argue as much as one that sees no need for the requirement.

4. Help the owner find financial assistance to meet the extra cost of complying with the code. If there was a disaster declaration, there may be sources of financial assistance as discussed in Section 22. If the owner had flood insurance and the building was

substantially damaged by a flood, the Increased Cost of Compliance (ICC) coverage will help. (See Section 12.4.3.)

12.4.2. Substantial Damage Estimator Software

FEMA has developed a software program (SDE 3.0) to help local officials make substantial damage estimates. The software is Windows-based and will work on Windows XP, Windows Vista, Windows 7, or Windows 8 and while the estimating software is self-contained, it is used with Adobe Reader Version XI or higher for the generation of reports.

The software is available online and there is an available manual, FEMA P-784, *Substantial Damage Estimator (SDE) User Manual and Workbook*, August 2017. The manual includes detailed instructions on the use of the SDE 3.0 tool and details of the report use and export capability.

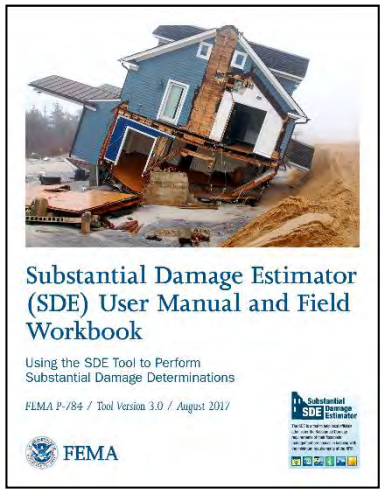


Figure 12-11. FEMA's Substantial Damage Estimator User Manual and Workbook

Contact the FEMA Regional Office for additional assistance in using SDE 3.0. Following a major disaster declaration, special training sessions and technical assistance may be available.

Much more information on substantial improvement and substantial damage is provided in FEMA's *Substantial Improvement/Substantial Damage Desk Reference*.

12.4.3. Increased Cost of Compliance

The NFIP offers additional coverage, known as ICC, to all holders of structural flood insurance policies.

The name refers to cases where the local floodplain management ordinance requires elevation or retrofitting of a substantially damaged building. Under ICC, the flood insurance policy will not only pay for repairs to the flooded building, but it will also pay up to $30,000 to help cover the additional cost of complying with the elevation requirements of the ordinance (including some relocation or demolition costs if the owner does not want to rebuild in the floodplain). This is available for any flood insurance claim and, therefore, is not dependent on the community receiving a disaster declaration.

Figure 12-12. ICC claim use examples

There are some limitations to ICC:

- Payment is dependent on bringing the building into compliance with your community's floodplain ordinance
- It is only available if there is a current NFIP policy on the building before and during the flood
- It covers only damage caused by a flood
- Claims are limited to $30,000 per structure
- Claims must be accompanied by a substantial damage determination completed by the floodplain administrator

In certain cases, an ICC claim can be filed if the building is repetitively flooded. However, to accomplish this the community must have specific language in its floodplain management ordinance. Figure 12-13 has example ordinance language for repetitive loss. This language exceeds the minimum NFIP requirements but would *only* be needed if you want to trigger the ICC provision for repetitively damaged buildings.

A portion of the flood insurance claim payment may be used to meet the cost of bringing the building up to code. For example, if there was foundation damage, the regular claim will pay for the cost of repairing or replacing the foundation. The ICC funds would only be needed for the extra costs of raising the foundation higher than it was before. Your community (usually the permit official) should provide assistance, and the records needed for the owner to receive an ICC payment.

More information on ICC coverage is available through FEMA's ICC web page. FEMA has also developed the brochure *Frequently Asked Questions About Increased Cost of Compliance*, which you may wish to distribute to residents following a flood.

One of the activities eligible for CRS credit is the adoption of higher regulatory standards (Activity 430). Under this activity, a community can receive credit if it adopts and enforces a cumulative substantial damage or cumulative substantial improvement provision **or** a repetitive loss provision. Sample floodplain ordinance language for a repetitive loss provision is shown in Figure 12-13.

Information on higher regulatory standards can be found on the CRS Resources Page: *CRS Series 400 Credits* provides additional information on elements credited for higher standards, including example ordinance language and documentation. Communities are encouraged to obtain and read the document before applying for this activity.

Option 1

Adopt the following definition: "Repetitive loss" means flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

Then modify the "substantial improvement" definition as follows: "Substantial improvement" means any reconstruction, rehabilitation, addition, or other improvement of 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 repetitive loss or substantial damage, regardless of the actual repair work performed.

Option 2

Modify the "substantial damage" definition as follows: "Substantial damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. "Substantial damage" also means flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damaged occurred.

Note: Communities need to make sure that these definitions are tied to the floodplain management requirements for new construction and substantial improvements and to any other requirements of the ordinance, such as the permit requirements, to enforce this provision.

Note: An ICC claim payment is only made for flood-related damage. The "substantial damage" part of the definition must still include "damage of any origin" to be compliant with the minimum NFIP Floodplain Management Regulations.

Figure 12-13. Sample ordinance language for ICC repetitive loss definitions

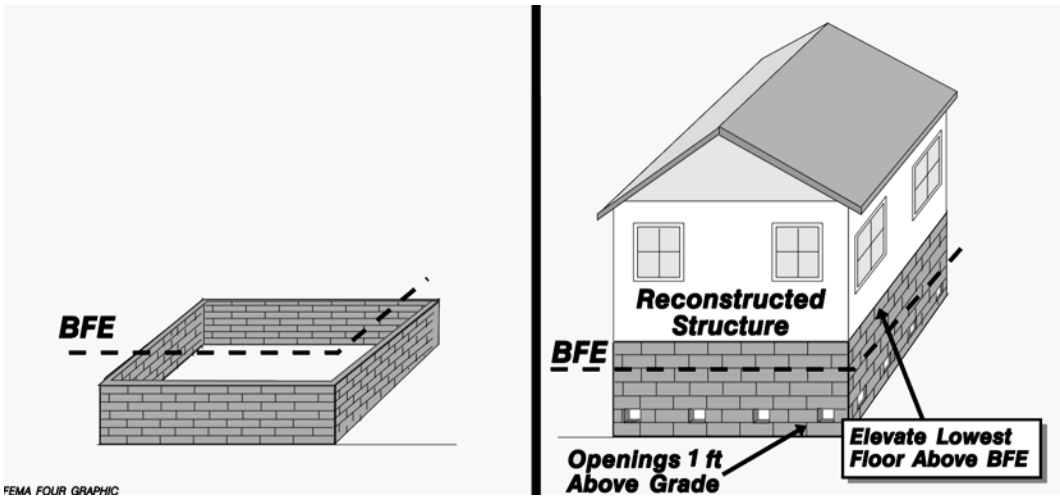
Source: *Increased Cost of Compliance Coverage, Guidance for State and Local Officials*, FEMA 301, 2003. This language is only needed to trigger an ICC payment for a repetitive loss. No ordinance changes are needed for the ICC coverage for substantial damage incurred by a single flood.

12.5.Substantial Damage Examples

12.5.1. Example 1: Reconstruction of a Destroyed Building

Reconstructions are cases where an entire structure is destroyed, damaged, purposefully demolished, or razed, and a new structure is built on the old foundation or slab. The term also applies when an existing structure is moved to a new site.

Reconstructions are, quite simply, “new construction”. They must be treated as new buildings.



Razed or “totaled” building with remaining foundation

Reconstruction on existing foundation

Figure 12-14. A reconstructed house is new construction

The Plainfield Tornado

In 1990, Plainfield, Illinois, was hit by a tornado. Twenty buildings in the village’s floodway were destroyed. The village used the substantial damage requirements and funding assistance from FEMA disaster assistance and state programs to encourage residents to relocate and not rebuild in the floodway. Eventually all 20 properties were acquired, and the floodway development was converted to public open space.

12.5.2. Example 2: Substantially Damaged Structure

To determine if a damaged structure meets the threshold for substantial damage, the cost of repairing the structure to its pre-damaged condition is compared to the market value of the structure prior to the damage. The estimated cost of the repairs must include all costs necessary to fully repair the structure to its pre-damaged condition.

If equal to or greater than 50 percent of that structure’s market value before damage, then the structure must be elevated (or floodproofed if it is non-residential) to or above the level of the

base flood and meet other applicable local ordinance requirements. This is the basic requirement for substantial damage.

Figure 12-15 graphically illustrates the amount of damage that can occur to a building flooded only four feet deep. Even though the structure appears sound and there are no cracks or breaks in the foundation, the total cost of repairs can be significant.

Figure 12-15. Even slow-moving floodwater can cause substantial damage

The cost of repair after a flood that simply soaked the building will typically include the following structural items:

- Remove all wallboard and insulation
- Install new wallboard and insulation
- Tape and paint
- Remove carpeting and vinyl flooring
- Dry floor, and replace warped flooring
- Replace cabinets in the kitchen and bathroom
- Replace built-in appliances
- Replace hollow-core interior doors
- Replace furnace and water heater

- Clean and disinfect duct work
- Repair porch flooring and front steps
- Clean and test plumbing (licensed plumber may be required)
- Replace outlets and switches, clean and test wiring (licensed electrician may be required)

The longer the water is in the building, the more damage it will cause. It can “wick” up the walls and damage a wallboard ceiling that is several feet above the high water line. Standing water (or the moisture it brings) causes warping, mold, and mildew that adds to the cost of repair.

Note: Flood insurance can be excessively high when a substantially damaged building is granted a variance and is not brought up to post-FIRM standards.

12.6.Exceptions

As explained in previous sections, the substantial improvement and substantial damage requirements affect all buildings regardless of the reason for the improvement or the cause of the damage. There are three possible exceptions:

- Exempt expenses
- Historic buildings
- Projects required by code

12.6.1. Exempt Expenses

Certain activities related to making improvements or repairing damaged buildings do not have to be counted toward the cost of the improvement or repair. These include:

- Plans and specifications
- Surveying
- Permit fees
- Demolition or emergency repairs made for health or safety reasons or to prevent further damage to the building
- Improvements or repairs to items outside the building, such as the driveway, fencing, landscaping, and detached structures

12.6.2. Historic Structures

Historic structures are exempt from the substantial improvement requirements subject to the criteria listed below. The exemption can be granted administratively if the current NFIP

definitions of substantial improvement and historic structure are included in your ordinance, or they can be granted through a variance procedure.

In either case, they are usually granted subject to several conditions.

If the improvements to a historic structure meet the following three criteria and are approved by the community, the building will not have to be elevated or floodproofed. It can also retain its pre-FIRM flood insurance rating status.

1. **The building must be a bona-fide "historic structure".** See Figure 12-16 for notes on determining whether a structure is a "historic building". Historic buildings are also discussed in Section 16.2.7 under the review of variances.

   Many older buildings are not considered historic, so the first thing to check is whether the structure proposed for an exemption is historic. Look for it on a list maintained by:

   - The National Register of Historic Places
   - The State Historical Society of Iowa's Historic Site Inventory
   - A federally certified local historic preservation board

   Structures are listed in the National Register or on a federally recognized State or local inventory in one of two ways: as an individual building or asD a primary, secondary, or other contributing building in a designated historic district.

   Structures are either listed or may be eligible to be listed. Only a federally certified State or local historic preservation program can make such determinations. The State historic preservation office in the Iowa Department of Cultural Affairs or a federally certified local historic preservation board should be consulted to determine if a structure proposed for the historic exemption is indeed historic.

Figure 12-16. Definition of "historic building"

2. **The project must maintain the historic status of the structure.** If the proposed improvements to the structure will result in it being removed from or ineligible for the National Register, then the proposal cannot be granted an exemption from the substantial improvement rule.

   The best way to make such determinations is to seek written review and approval of proposed plans by the state's historical society. If the plans are approved, you can grant the exemption. If not, no exemption can be permitted.

3. **Take all possible flood damage reduction measures.** Even though the exemption to the substantial improvement rule means the building does not have to be elevated to or above the flood protection elevation or be renovated with flood resistant materials that are not historically sensitive, some actions can and should be taken to reduce the flood damage potential. Examples include:

- Locating mechanical and electrical equipment above the flood protection elevation or floodproofing it
- Elevating the lowest floor of an addition to or above the flood protection elevation with the change in floor elevation disguised externally
- Building the lowest floor of an addition with flood resistant materials and providing hydrostatic openings

12.6.3. Code Violations

The definition of substantial improvement includes another exemption:

> 44 CFR 59.1 Definitions: "Substantial improvement" means …. The term does not, however, include … Any project for improvement 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.

Note the key words in this exemption: *correct* existing violations, *identified* by the local official, and *minimum* necessary to assure safe conditions. This language was included to avoid penalizing property owners *who had no choice* but to make improvements to their buildings or face condemnation or revocation of a business license.

This exemption was intended for an *involuntary* correction of a violation that existed before the improvement permit was applied for or before the damage occurred—for example, a restaurant owner who must remodel and enlarge the kitchen to meet current local and state health and safety codes.

You can only exempt the items specifically required by code. For example, if a single stair tread was defective and had to be replaced, do not exempt the cost of rebuilding the entire stairway. Similarly, count only replacement in like kind and what is minimally necessary. If the owner chooses to upgrade the quality of a code-required item, the extra cost is not exempt from the formula—it is added to the true cost of the improvement or repairs.

Unfortunately, many property owners and builders pressure local building officials to exclude “code violation corrections” from their voluntary improvement proposals. There are “code violations” in all structures built before the current code was enacted. In many cases, those elements must be brought up to code as part of an improvement project.

Figure 12-17. In-process elevation project to bring a substantially damaged building into compliance

This is very different from a code violation citation that forces a property owner to correct those violations and make improvements that were otherwise not planned. The building official must know about and document the violations before or at the time the permit is issued.

Example: A small business in a 40-year-old building was damaged by a fire. The building’s pre-fire market value was $100,000. The insurance adjuster and the permit office concluded that the total cost to repair would be $45,000.

The business is in an urban renewal area. The City had inspected it and cited the following violations:

- Replace unsafe electrical wiring
- Install missing fire exit signs, smoke detectors, and emergency lighting
- Inadequate bathrooms

The total cost of the improvements to meet the code requirements would be $8,000. If added to the cost of repairs this would result in the building being substantially damaged ($45,000 + $8,000 = $53,000 or 53 percent of the pre-damaged value). However, since the citation was issued **before** the fire occurred, the code requirements would not have to be counted toward the cost to repair. Based on the basic formula:

$$\frac{\$45{,}000}{\$100{,}000} = 0.45\ (45\%)$$

The building is not declared substantially damaged.

In this example, the building can be repaired without elevating or floodproofing. However, the permit office should strongly recommend incorporating flood protection measures and flood resistant materials in the repair project (as in the example in Figure 12-3).

13. Additional Regulatory Standards

13.1.NFIP Planning Consideration

FEMA has established minimum floodplain management requirements for communities participating in the NFIP. In Iowa, communities must also enforce more restrictive requirements due to state laws. Iowa communities should also consider enacting regulations that exceed the minimum state and Federal criteria.

The NFIP requires communities to at least consider additional measures, which are found in 44 CFR 60.22, Planning Considerations for Flood-prone Areas. They are summarized in Figure 13-1.

(a) The floodplain management regulations adopted by a community for flood-prone areas should:
  (1) Permit only that development of flood-prone areas which:
    (i) is appropriate in light of the probability of flood damage
    (ii) is an acceptable social and economic use of the land in relation to the hazards involved
    (iii) does not increase the danger to human life
  (2) Prohibit nonessential or improper installation of public utilities and public facilities.

(b) In formulating community development goals after a flood, each community shall consider:
  (1) Preservation of the flood-prone areas for open space purposes
  (2) Relocation of occupants away from flood-prone areas
  (3) Acquisition of land or land development rights for public purposes
  (4) Acquisition of frequently flood-damaged structures.

(c) In formulating community development goals and in adopting floodplain management regulations, each community shall consider at least the following factors:
  (1) Human safety
  (2) Diversion of development to areas safe from flooding
  (3) Full disclosure to all prospective and interested parties
  (4) Adverse effects of floodplain development on existing development
  (5) Encouragement of floodproofing to reduce flood damage
  (6) Flood warning and emergency preparedness plans
  (7) Provision for alternative vehicular access and escape routes
  (8) Minimum retrofitting requirements for critical facilities
  (9) Improvement of local drainage to control increased runoff
  (10) Coordination of plans with neighboring community's floodplain management programs
  (11) Requirements for new construction in areas subject to subsidence
  (12) Requiring subdividers to furnish delineations for floodways
  (13) Prohibition of any alteration or relocation of a watercourse
  (14) Requirement of setbacks for new construction within V Zones
  (15) Freeboard requirements
  (16) Requirement of consistency between state, regional and local comprehensive plans
  (17) Requirement of pilings or columns rather than fill to maintain storage capacity
  (18) Prohibition of manufacturing plants or facilities with hazardous substances
  (19) Requirements for evacuation plans

Figure 13-1. NFIP planning considerations (44 CFR 60.22)

13.2.Location Restrictions

Figure 13-2. Consider prohibiting new critical facilities in your floodplain

Where the hazard is so severe that certain types of development should be prohibited, a location restriction provision may be appropriate. Some communities prohibit some or all development in all or parts of their floodplains. A common approach is to prohibit particular structures in the floodway or areas exceeding certain flood depths or velocities. Because location restriction is the most restrictive higher regulatory provision, this language must be drafted carefully to avoid a taking challenge. (Refer back to Section 7.1.2 for more information on "takings").

13.2.1. Highly Hazardous Areas

Prohibiting development makes sense in high hazard areas, where people are exposed to a life-threatening situation even though buildings could be protected from flood damage. For example, it would be appropriate to prohibit development in an area prone to ice jam and overbank ice floes or along a narrow floodplain in a stream valley that is susceptible to flash flooding.

13.2.2. Subdivision Design

Undeveloped land, still in large tracts, offers the best opportunity to limit where certain types of development will be located. When a developer wants to subdivide the land, communities have many tools to arrange the development so that buildings are kept out of the floodplain. This has two advantages over simply requiring the buildings to be protected from flooding:

- Buildings are not isolated by floodwaters, putting a strain on local emergency services to guard them or evacuate or rescue their occupants.

- The neighborhood will have waterfront open space and recreation areas—a valuable amenity in most communities. Many communities require a minimum amount of open space for dedication, and this can be combined with setting aside flood hazard areas. Such an arrangement meets several goals: it keeps structures out of flood-prone areas, provides storage space for stormwater management, preserves native habitat, and provides a valuable amenity.

A housing development can be clustered, as shown in Figure 13-3, so the developer can sell the same number of homesites as a conventional subdivision. Check your state laws on whether cluster development can be mandated or just encouraged during the subdivision review process.

As explained in the American Planning Association's *Subdivision Design in Flood Hazard Areas*, the planner's toolbox contains other tools for encouraging developers to avoid floodplains. A density transfer can be used to, say, trade development rights with a flood-free

site. Credits or bonuses can be given to increase the allowable density if the developer puts building sites on high ground or does not disturb a wetland.

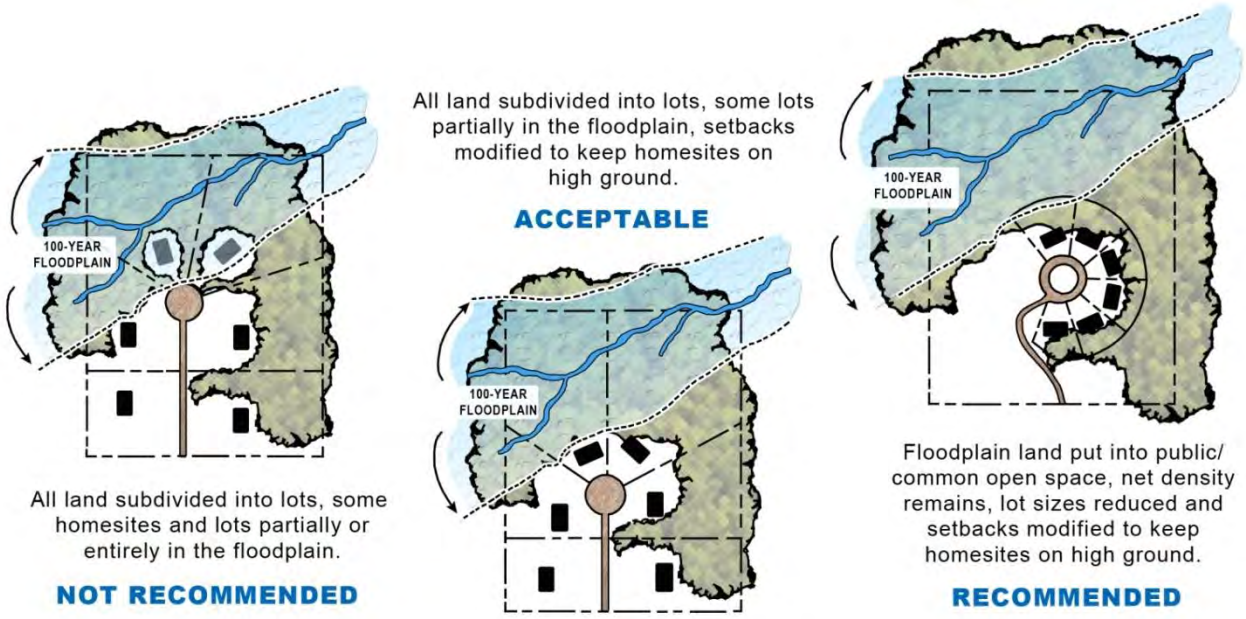


Figure 13-3. Clustering can keep buildings out of smaller floodplains

Source: *Subdivision Design in Flood Hazard Areas*

The **planned unit development (PUD)** approach offers developers flexibility in planning the entire area. For example, a PUD may have a cluster development with houses closer together than allowed under normal zoning lot line setbacks.

Subdivision and planning regulations also can mandate that a certain portion of a development be set aside as open space for recreation or stormwater management purposes. Developers find that it is cheaper to put the open space in the floodplain than to put buildings there that must incorporate the more expensive floodplain construction requirements. Linear parks and greenways that connect the open space areas through a community are becoming increasingly popular and help sell new developments.

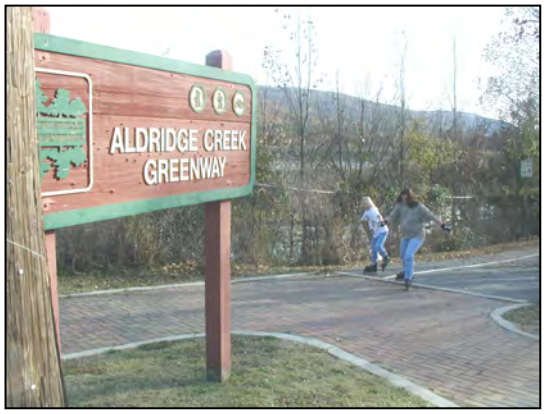


Figure 13-4. Riversides offer excellent opportunities for linear parks and greenways

13.2.3. Setbacks

Setbacks may be used to keep development out of harm's way. Setback standards establish minimum distances that structures must be positioned—set back—from river channels. Setbacks can be defined by vertical heights or horizontal distances.

While floodplain boundaries are defined by vertical measures, horizontal setbacks also provide protection from flood damage, especially along lakes and wide rivers where the effects of

waves decrease further inland. Note the photo in Figure 13-5, setbacks can protect new construction from riverine erosion, too.

Setbacks prevent disruption to the channel banks and protect riparian habitat. Such setbacks are frequently created to serve as isolation distances to protect water quality, and stream and wetland resources.

Setbacks from watercourses have been used to minimize the effect of non-point sources of pollution caused by land development activities, timber harvesting, and agricultural activities. Solid waste landfills and on-site sewage disposal systems often are restricted within certain distances of a body of water.

Figure 13-5. Setbacks can protect areas from riverine erosion

The CRS credits setbacks that prevent disruption to shorelines, stream channels, and their banks under Activity 430, Section 431.g.2 in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check). See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

13.2.4. Manufactured (Factory-Built) Homes

Many communities have adopted provisions prohibiting the placement of factory-built or manufactured homes in the flood hazard area. Manufactured homes on a permanent foundation are treated differently from those that are placed temporarily on a site and are intended for transport. Examine your ordinance language carefully. Manufactured homes on a permanent foundation should be treated no differently than stick-built homes. Both must be built so that the lowest floor is one foot above the BFE and adequately anchored to prevent flotation, collapse, or lateral movement.

13.2.5. Natural Areas

The natural functions and values of floodplains coupled with their hazardous nature have led communities to promote and guide the less intensive use and development of floodplains. More municipalities are requiring that important natural attributes such as wetlands, drainage ways, and floodplain areas be set aside as open space as a condition to approving subdivision proposals.

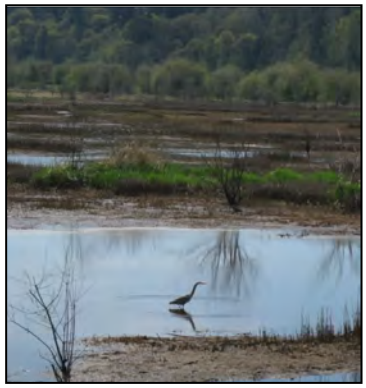


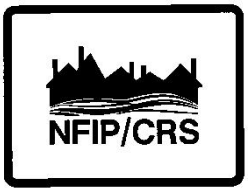
Figure 13-6. Open space preservation has many benefits

The CRS provides substantial credit for preserving floodplain areas as open space. If buildings and filling are prohibited, credit is found under Activity 420 Open Space Preservation, Section 421.a in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).If the area has been kept in or restored to its natural state, more credit is provided under Section 421.c.

13.2.6. Low-Density Zoning

When a community prepares its land use plan and zoning ordinance, it should consider what uses and densities are appropriate for floodplains. If buildings are not prohibited entirely, the community should zone its floodplains for agricultural or other low-density use to reduce the number of new structures.

For example, it is better to have a floodplain zoned for agricultural or conservation use with a minimum lot size of 20 or 40 acres than to allow four single-family homes to every acre. In some areas, "residential estate" zones with minimum lot sizes of two to five acres provide lots large enough that homes can be built out of the floodplain.



The CRS provides substantial credit for zoning floodplains with low-density uses under Activity 430LZ Low-Density Zoning in the CRS Coordinator's Manual and the *CRS Application* (http://crsresources.org/quick-check).

13.3. Building Requirements

Section 13.1 reviewed regulatory approaches to keeping buildings or certain uses out of all or parts of the floodplain. An ordinance can also set higher standards for those structures that are allowed to be built-in the floodplain.

13.3.1. Freeboard

Freeboard is an additional height requirement above the elevation of the 1% annual chance flood, (otherwise known as the BFE) that provides a margin of safety against extraordinary or unknown risks. This reduces the risk of flooding and makes the structure eligible for a lower flood insurance rate.

One foot of freeboard is required by the Iowa DNR and is in the state's model ordinance. This helps account for the one-foot rise built into the concept of designating a regulatory floodway and the encroachment requirements where floodways are not identified.

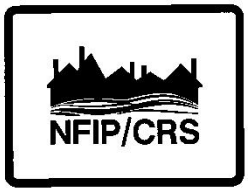
There are reasons for considering a freeboard greater than one foot. Such a freeboard:

- Accounts for future increases in flood stages if additional development occurs in the floodplain
- Accounts for future flood increases due to upstream watershed development
- Acts as a hedge against backwater conditions caused by ice jams and debris dams
- Reflects uncertainties inherent in flood hazard modeling, topography, mapping limitations, and floodplain encroachments
- Provides an added measure of safety against flooding

Freeboard safety factors are common in the design of flood control projects and floodplain development. Many communities have incorporated freeboard requirements into the elevation and floodproofing requirements stipulated by the NFIP. Freeboard requirements adopted by communities range up to four feet above the BFE.

When constructing a new elevated building, the additional cost of going up another foot or two is usually negligible. Elevating buildings above the flood level also reduces flood insurance costs for current and future owners.

Many communities have focused on elevating the top of the lowest floor, but have allowed utilities, especially ductwork, to hang below the floor joists and be subject to flood damage. Flooded ductwork can add thousands of dollars to a flood insurance claim. This is primarily a concern for buildings on crawlspaces. Be sure mechanical and electrical and duct work are addressed in your ordinance language to ensure the freeboard requirement is similarly applied.



The CRS credits freeboard under Activity 430, Section 431.a in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

Keep in mind, For CRS credit, freeboard must be applied not just to the elevation of the lowest floor or floodproofing level, but also to the level of protection provided to **all components of the building**. All building utilities, including ductwork, must be elevated, or protected to the freeboard level and all portions of the building below the freeboard level must be constructed using materials resistant to flood damage. If the garage floor is below the freeboard level, the garage must meet the opening requirements for enclosures.

See Protecting Building Utility Systems from Flood Damage, FEMA-348 for more information on the importance of protecting building utilities. Also see Technical Bulletin 2, Flood Damage Resistant Materials Requirements.

Under Activity 450, Section 451.c, the CRS credits require all buildings to be elevated above the street level to prevent flood problems caused by local drainage. See also *CRS Credit for Higher Regulatory Standards* under Activity 42 in the CRS Coordinators Manual for example regulatory language.

Iowa's model floodplain management ordinances require all electrical and mechanical equipment including ductwork that service a new or substantial improvement building must be elevated or protected to one foot above the BFE at a minimum.

13.3.2. Foundation Standards

Without a safe and sound foundation, an elevated building can suffer damage from a flood due to erosion, scour, or settling. The NFIP regulations provide performance standards for anchoring new buildings and foundations, and fill placement standards for floodproofed buildings.

However, the NFIP performance standards do not specify how a building's foundations are to be constructed. Especially in areas where an engineer's certificate is not required by the NFIP regulations, more specific foundation construction standards would help protect buildings from flood damage. One option is to require that a registered P.E. or architect certify the adequacy of elevated building foundations and the proper placement, compaction, and protection of fill when it is used in building elevation.

The CRS credits foundation protection under Activity 430, Section 431.b in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

13.4. Safety Requirements

13.4.1. Critical Facilities

For some activities and facilities, even a slight chance of flooding poses too great a threat. These should be given special consideration when formulating regulatory alternatives and floodplain management plans.

FEMA defines four kinds of critical facilities:

- Structures or facilities that produce, use or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials.
- Hospitals, nursing homes and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a flood.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during, and after a flood.
- Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood.

A critical facility should not be in a floodplain. Communities often prohibit critical or hazardous facilities or uses from the floodway or the entire floodplain. While a building may be considered protected from the 1% annual chance flood, a higher flood or an error on the builder's or operator's part could result in a greater risk than the community is willing to accept.

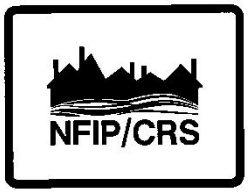
Figure 13-7. Critical facility in a floodplain

If a critical facility must be in a floodplain, then it should be designed to higher protection standards and have flood evacuation plans. The more common standards—

freeboard, elevation above the 0.2% annual chance flood elevation (also known as the 500-year flood), and elevated access ramps—should be required.

The State of Iowa has regulations for Maximum Damage Potential Development located in the SFHA. Maximum Damage Potential Development refers to hospitals and like institutions; buildings containing documents, data, or instruments of great public value; buildings containing materials dangerous to the public or fuel storage facilities; power installations needed in emergencies or buildings similar in nature or use to those listed above. Any proposed buildings that meet this definition are required to have the lowest floor elevated or protected to one foot above the 500-year flood elevation.

According to Executive Order 11988, Federal agencies must meet rigorous alternative site evaluations and design standards before funding, leasing, or building critical facilities in the 0.2% annual chance floodplain. Executive Order 11988 is discussed further in Section 23.



The CRS credits prohibiting critical facilities or requiring them to be protected from damage by the 0.2%-chance flood in Activity 430, Section 431.e in the

CRS Coordinator's Manual and the *CRS Application* (http://crsresources.org/quick-check).

13.4.2. Dry Land Access

Fire prevention, evacuation, and rescue operations are common emergency response activities associated with flooding. The effectiveness and success of these efforts greatly depend on readily available access. However, streets and roads are usually the first things to be inundated in the event of a flood.

To ensure access, some communities have enacted ordinance provisions requiring that all roads and other access facilities be elevated to or above the BFE. Some require elevation to within one foot of the BFE so at least fire and rescue equipment can travel on them during a flood.

While some local officials may feel that this approach is too restrictive, it is important to note that emergency response personnel die every year attempting to rescue flood-stranded citizens. Also, others may die or be seriously injured because they cannot be rescued in time.

Naturally, there are some areas with floodplains so extensive that a developer cannot be expected to connect his development to high ground. As with all regulatory standards, you must carefully weigh the local hazard, the regulation's objectives, and the costs and benefits of meeting the standard before you draft new ordinance language.

Figure 13-8. Critical facility without dry land access

Four people died in this nursing home during a 1978 flood in Rochester, Minnesota. It was isolated by high velocity floodwaters. Because there was no dry land access, firefighters could not rescue the occupants.

NFIP/CRS

The CRS has credited dry land access provisions under Activity 430, Section 431.i in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

13.4.3. Dam Breaks

The DNR and the Corps of Engineers have identified high hazard dams. The designation is based on both the height of the dam and the amount of development at risk downstream.

Should a dam give way, the area covered by the resulting flood downstream is called the dam breach inundation area. Dam breach analyses may have been done for some of the dams upstream of your community, in which case, you can obtain a map of the area subject to inundation. (Check with the DNR's dam safety office to be sure that the map was prepared using an approved method.)

Close to the dam, the dam breach inundation area is likely to be larger than the mapped floodplains. A community may choose to include this larger area as part of its regulatory program. This should also take into account the lack of warning time that a dam breach would pose.

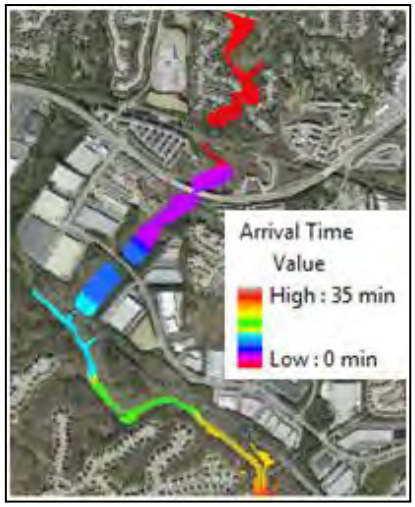


Figure 13-9. Dam inundation map created in Hazus

Typical measures include:

- Prohibiting construction of buildings in the dam breach inundation area
- Prohibiting siting of critical facilities in the dam breach inundation area
- Requiring new buildings to be elevated above the BFE or the dam breach elevation, whichever is higher
- Requiring dam owners to maintain their facilities
- Requiring dam owners to establish warning systems if their dams are in danger of failing

The CRS credits dam failure emergency action plans under Activity 630, Section 631.b in the in the

CRS Coordinator's Manual and the *CRS Application* (http://crsresources.org/quick-check).

13.4.4. Ice Jams

Ice jams form in several ways and at different times in winter and early spring. Damage from ice jam flooding often exceeds that of clear water flooding because of higher surface elevations, rapid increases in flood elevations and physical damage caused by moving ice floes (see Figure 13-11).

Figure 13-10. Ice floes and other large items of debris can crush a house

FEMA and the Corps of Engineers have developed an ice jam flood study methodology which is explained in FEMA's *Ice Jam Guidance November 2023* and *Guidelines and Standards for Flood Analysis and Mapping*. If your community has a study done following this methodology, you should adopt the results as your regulatory flood elevation.

In the absence of such a detailed study, you could use the historic ice jam flood of record plus a foot or two of freeboard as your building protection level. Other standards could include requiring new buildings to be elevated on engineered fill or pilings and prohibiting new buildings (or at least requiring them to be on fill) in the floodway or other defined area subject to ice floes.

For more information, contact the Corps of Engineers, which has ice jam expertise in its district offices and its Cold Regions Research and Engineering Laboratory in Hanover, New Hampshire. See also the *Special Hazards Supplement to the CRS Coordinator's Manual*, which includes a section on ice jams.

13.5.Flood Conveyance and Storage

13.5.1. Encroachment Standards

Some communities are not comfortable with allowing development in the flood fringe to increase flood heights by up to a foot. A one-foot increase in flood heights will increase the potential for flood damage to flood-prone buildings and affect properties that were otherwise not threatened by the 1% annual chance flood. This is especially true in flat areas where a one-foot increase can extend the floodplain boundary by several blocks.

These communities require floodway mapping and encroachment studies to allow a smaller surcharge, usually 0.5 or 0.1 foot. Twelve States require that regulatory maps use a smaller floodway mapping surcharge than the NFIP's one-foot minimum standard. This results in a wider floodway, but less potential for increased flood losses due to future development.

In Minnesota, one watershed district took another regulatory approach, enacting regulations that restricted encroachments in the flood fringe to 20 percent of the total floodplain area. In Washington State, some communities treat higher velocity and deeper flood fringe areas as floodways and make development in those areas comply with the floodway construction standards.

NFIP/CRS

The CRS credits more restrictive floodway mapping standards under Activity 410 Additional Flood Data, Section 411.c in the

CRS Coordinator's Manual and the *CRS Application* (http://crsresources.org/quick-check).

13.5.2. Compensatory Storage

The NFIP floodway standard in 44 CFR 60.3(d) restricts new development from obstructing the flow of water and increasing flood heights. However, this provision does not address the need to maintain flood storage. Especially in flat areas, the floodplain provides a valuable function by storing floodwaters. When fill or buildings are placed in the flood fringe, the flood storage areas are lost, and flood heights will go up because there is less room for the floodwaters. This is particularly important in smaller watersheds, which respond sooner to changes in the topography.

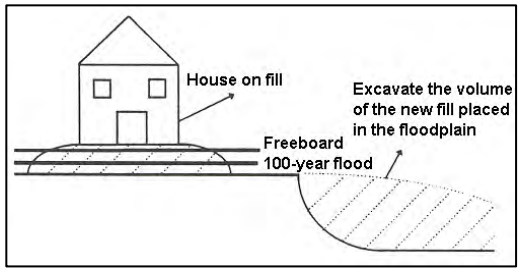


Figure 13-11. Compensatory storage

For this reason, some communities adopt more restrictive standards that regulate the amount of fill or buildings that can displace floodwater in the flood fringe. One simple approach is to prohibit filling and buildings on fill—all new buildings must be elevated on columns or flow through crawlspaces. On the other hand, communities prefer buildings on fill because it provides a safe spot above flood levels outside the building walls.

Another approach is to require compensatory storage to offset any loss of flood storage capacity. The developer is required to offset new fill put in the floodplain by excavating an

additional floodable area to replace the lost flood storage area. This should be done at "hydraulically equivalent" sites—fill put in below the 10% annual chance flood elevation (also known as the "10-year flood") should be compensated by removal of soil below that elevation elsewhere in the floodplain.

The CRS credits prohibition of fill and compensatory storage under Activity 430, Section 431.f in the

CRS Coordinator's Manual and the *CRS Application* (http://crsresources.org/quick-check).

See CRS Series 400 activities in the CRS Resources page for example regulatory language.

CRS Series 400 Activities

13.5.3. Stormwater Management

A floodplain management program in an urbanizing area must confront the increase in flood flows caused by development within the watershed. As forests, fields, and farms are covered by impermeable surfaces like streets, rooftops and parking lots, more rain runs off at a faster rate. In an urbanized area, the rate of runoff can increase fivefold or more.

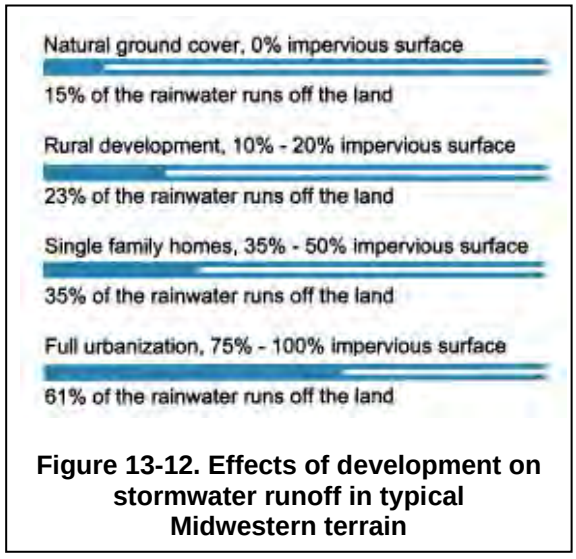


Figure 13-12. Effects of development on stormwater runoff in typical Midwestern terrain

Changes in the surface drainage system compound this problem. Stormwater runoff travels faster on streets and in storm drains than it did under pre-development conditions. As a result, flooding is more frequent and more severe (Figure 13-13). Efforts to reduce the impact of increased runoff that results from new development in a watershed are known as stormwater management.

One way to reduce the impact of stormwater from new development is to require the developer to restrict the rate at which the increased runoff leaves the property. The developer must build a facility to store stormwater runoff on the site. Unfortunately, stormwater detention only manages the rate of release of the water—it does nothing about increased volumes of water due to decreases in permeable surfaces.

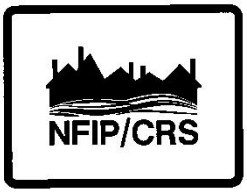
Under stormwater detention, the stored water is held for release at a restricted rate after the storm subsides. Stormwater runoff can also be held for later use in irrigation or groundwater recharge, or for gray-water household applications like watering plants and even for laundering clothes.

As an alternative to using a uniform standard for all areas, many communities regulate development according to a master plan that analyzes the combined effects of existing and expected development on stormwater and flood flows

See the Iowa Construction Site Erosion Control Manual for guidance.

in the watershed. Such watershed-specific regulations may allow different amounts of runoff for different areas in order to control the timing of increased flows into the receiving streams.

Instead of requiring developers to build stormwater facilities on-site, a plan may require them to contribute funds for a regional facility. By planning the runoff from entire watersheds, this approach can be more effective in reducing increases in downstream flooding.



Stormwater management also has water quality aspects and includes efforts to reduce erosion and the entry of sediment and pollutants into receiving streams.

The CRS credits both water quantity and water quality stormwater management regulations and plans under Activity 450 in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

See also *CRS Credit for Stormwater Management* for example regulatory language.

13.6.Environmental Protection Measures

Flooding may not occur often enough in your area to be viewed as a problem in need of a solution, making it difficult to obtain the public and political support needed to carry out local floodplain management measures designed solely to reduce future flood losses.

Support often can be gained by associating flood loss reduction with broader community concerns and goals. A larger constituency for managing the community's floodplains can be built if other interests realize that their needs can be met through their involvement and support in flood protection. This, in turn, brings more resources and expertise into play.

Then, too, designing and packaging funding proposals to meet a number of community goals can boost your chances of obtaining outside resources. One approach is to tie the need to manage the floodplain to protect your community's economic well-being with the need to protect and maintain the natural resources and functions of the floodplain. These resources and functions can be of considerable benefit to the community, a benefit often unrealized or underestimated.

13.6.1. Strategies

Preservation and restoration are the two basic approaches to protecting a floodplain's natural resources. Preservation strategies focus on strict control or prohibition of development in sensitive or highly hazardous areas. Restoration strategies focus on actions to improve the quality or functioning of degraded floodplains. It is not always possible, or necessary, to make a distinction between the two strategies.

This section focuses on the development controls and regulatory standards you can use to protect natural resources or minimize harm to them. These measures, used by all levels of government, are among the most effective means available for protecting natural resources of floodplains and reducing flood damage.

13.6.2. Federal Regulations

Federal regulations and those in many States protect resources by limiting the ways, location, and extent to which these resources may be modified. Two Federal regulations can have far-reaching impact:

NEPA: When a Federal agency proposes to fund a project located in a flood hazard area, the National Environmental Policy Act (NEPA) requires an evaluation of the project's environmental impact as part of the decision-making process. The evaluation should include the impact on flooding as well as water and air quality.

EO 11988: Executive Order 11988 Floodplain Management requires Federal agencies to check NFIP maps to see if a proposed project will be in a floodplain. If one is, the agency must follow an eight-step process to determine whether there is a feasible alternative to location in the floodplain. If not, the project must include flood damage reduction measures.

In short, Federal agencies must meet the same or more restrictive development standards as do private property owners under the community's NFIP regulations. See Section 23 for the full text of the executive order.

EO 13690: Executive Order 13690 establishes a Federal Flood Risk Management Standard (FFRMS) for federally funded development. FFRMS gives flexibility and requires agencies to select one of the three approaches for establishing the **flood elevation** ("how high") and corresponding **flood hazard area** ("how wide") used for project siting, design, and construction:

- Climate Informed Science Approach (CISA)
- Freeboard Value Approach
- 500-year Floodplain

13.6.3. Wetland Protection

Past studies have estimated that 1 acre of wetland can store over 1.5 million gallons of flood water. The bottomland hardwood wetlands along the Mississippi River once stored at least 60 days of floodwater but now only have capacity for 12 days storage because most have been filled or drained.

Figure 13-13 Wetlands are being devoured by new developments

The Federal regulation that local permit officials see most often is the program established by Section 404 of the Clean Water Act. Jointly administered by the Corps of Engineers and the U.S. Environmental Protection Agency, the Section 404 program regulates the discharge of dredged or fill material into U.S. waters, including adjacent wetlands.

The Section 404(b)(1) guidelines provide extensive environmental criteria for judging permit applications while emphasizing the need to prevent avoidable losses of aquatic resources, as well as the need to minimize adverse environmental impacts. The permit is discussed in more detail in Section 9.

The desire to reduce the cumulative impacts of wetland losses has led many jurisdictions to adopt a "no net loss of wetlands" policy. No net loss is addressed either in terms of acreage or the functional value of the wetlands. Despite these programs and other such efforts, the U.S. is continuing to lose wetlands at a significant rate. According to a report released by NOAA and Fish and Wildlife found coastal watersheds (Atlantic, Gulf of Mexico, and Great Lakes specifically) comprise 37.3 percent of the wetlands in the contiguous U.S. The major report finding was that the annual rate of wetland loss in these watersheds was 80,160 acres between 2004 and 2009, a 25 percent increase from the 1998 to 2004 rate. A net loss of 360,720 acres (95,000 acres of saltwater wetlands and 265,720 acres of freshwater wetlands) occurred over this time period (source: *Status and Trends of Wetlands in the Coastal Watersheds of the Conterminous United States 2004 to 2009*, November 2013).

13.6.4. Rare and Endangered Species

Undeveloped floodplains may contain habitat for rare and endangered species of plants and animals. On the Federal level, the Endangered Species Act of 1973 directs Federal agencies not to undertake or assist projects that would adversely affect any endangered species.

The Act also requires an "incidental take permit" when it appears that the habitat of a rare or endangered species will be "taken" or impacted by a non-Federal activity. Communities should coordinate their permit review with this program which is administered by the U.S. Fish and Wildlife Service. Some communities have sensitive areas regulations or a similar approach that protects such habitats.

The CRS credits regulations that protect natural and beneficial floodplain functions for the indirect flood protection benefit they provide. The CRS recognizes three types of regulations related to protecting natural and beneficial functions:

1. Regulations that protect public health or water quality
2. Regulations that protect shorelines, channels, and banks from disruption and erosion
3. Regulations adopted pursuant to a Habitat Conservation Plan

Information on the credit provided can be under Sections 431.g and 511.b in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

13.6.5. On-Site Sewage Disposal

Most municipalities regulate the design, location, and placement of on-site sewage systems. Because the objective of such programs is to prevent surface and subsurface contamination, there are many requirements to selecting a proper site and designing a system that will work in a flood.

Less than desirable locations for on-site systems include areas with high groundwater tables, impervious soils, certain types of porous soils, and the potential for flooding. These characteristics often coincide with floodplains.

Regulations that restrict where septic systems can go often mean that a property owner cannot build in or near the floodplain.

13.6.6. Water Quality Regulations

Since the enactment of the Clean Water Act in 1972 and related state legislation, more care is being given to the regulation of direct discharges of pollutants into waterways. Federal and state point source regulations focus on wastewater treatment plants and industrial sites where polluted water is piped to a stream or lake at a single point.

Non-point sources of pollutants are harder to regulate. If stormwater is not collected and sent to a wastewater treatment plant, it flows directly into a body of water. On its way, stormwater collects sediments from soil erosion as well as road oil, pesticides, lawn treatment chemicals, and other pollutants. There is no treatment facility to clean this runoff water.

Regulatory approaches for non-point sources include buffer zones or stream setbacks where there are on-site disposal systems, timber harvesting, tilling of soil, mining, or development in general. These requirements are often part of, or complement, state, or local stormwater management regulations.

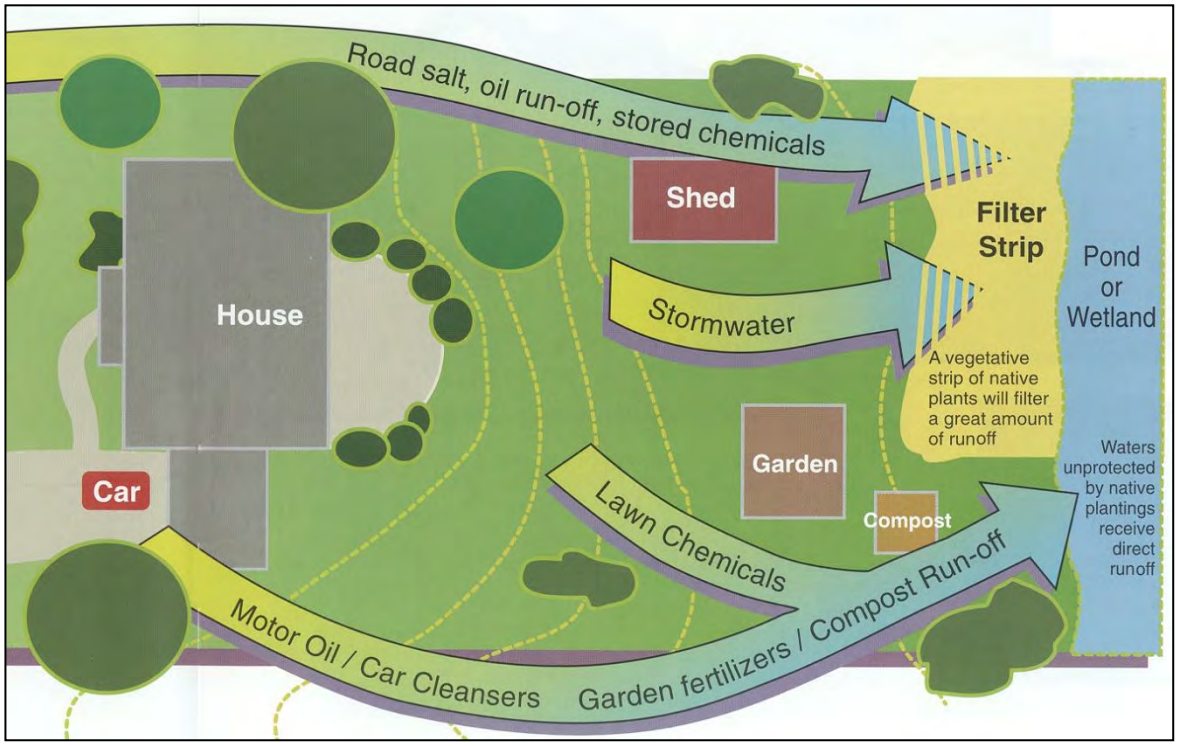


Figure 13-14. Buffer zones improve water quality

Source: *Living With Wetlands, A Handbook for Homeowners in Northeastern Illinois*

13.6.7. Special Designations

Stream corridors often possess special value for an area, region, or state. These corridors are given special designations, such as a wild or scenic river, and are afforded an extra level of recognition and protection.

While such programs are not necessarily regulatory in nature, they do encourage proper planning and land use control, discourage unwanted development, and guide Federal and state actions.

The CRS credits preserving areas for their natural functions under Activity 420 Open Space Preservation, Section 421.c. Credit for prohibiting critical facilities in floodplains and for prohibiting on-site sewage treatment, landfills, and other hazardous use or threats to public health, is provided in Activity 430 Higher Regulatory Standards, Sections 431.e and 431.g, respectively. Water quality regulations are credited in Activity 450 Stormwater management, Sections 451.e and f in the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

14. Permit Review

14.1. Development Permits

Once the ordinance is in force, any development or change in land use requires authorization, generally in the form of a permit from the local administrator or agency. “Development” and what needs a permit is discussed in Section 9.

FEMA Definition/Description for 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 or drilling operations, or storage of equipment or materials. Once a FIRM has been issued for the community, it must require permits within the designated SFHA.

This section reviews a standard process. It is not a mandatory process, but it does ensure that all your State and NFIP requirements will be met. Even if your community has a permit process that has proven successful, you should review this section to see if there are things you would want to add to your process.

14.1.1. When a Permit is Required

A permit is required for almost any development-related change to the floodplain, including but not limited to:

- Construction of new structures
- Modifications or improvements to existing structures
- Reconstruction of damaged structures
- Fencing
- Excavation
- Filling
- Paving
- Drilling
- Driving of piles
- Mining
- Dredging
- Land clearing

Figure 14-1. Even land clearing in the SFHA requires a permit

- Grading
- Permanent storage of materials and/or equipment
- Issuance of other permits, such as building, mechanical, plumbing, and demolition, if your jurisdiction issues these types of permits, unless they are specifically excluded by your ordinance as minor improvements

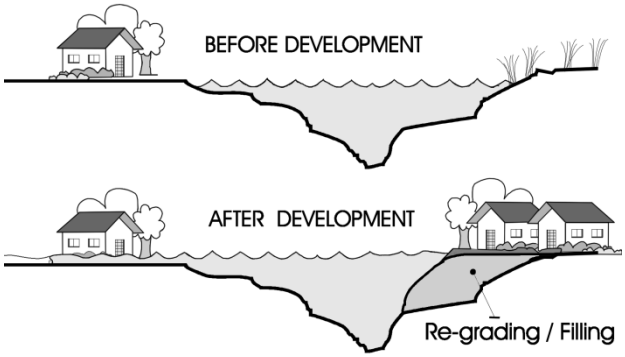


Figure 14-2. Floodplain fill can make flooding worse

While many communities have issued building permits for some time, most usually don't have a permit system for such a wide range of activities as "development". Regulation of all development in floodplains is essential because fill or other material can obstruct flood flows just as structures can. This is discussed more in Section 9 and illustrated in Figure 14-2.

Figure 14-3 shows the permit process that forms the organization for this section. To facilitate your work, you may want to develop your own checklist.

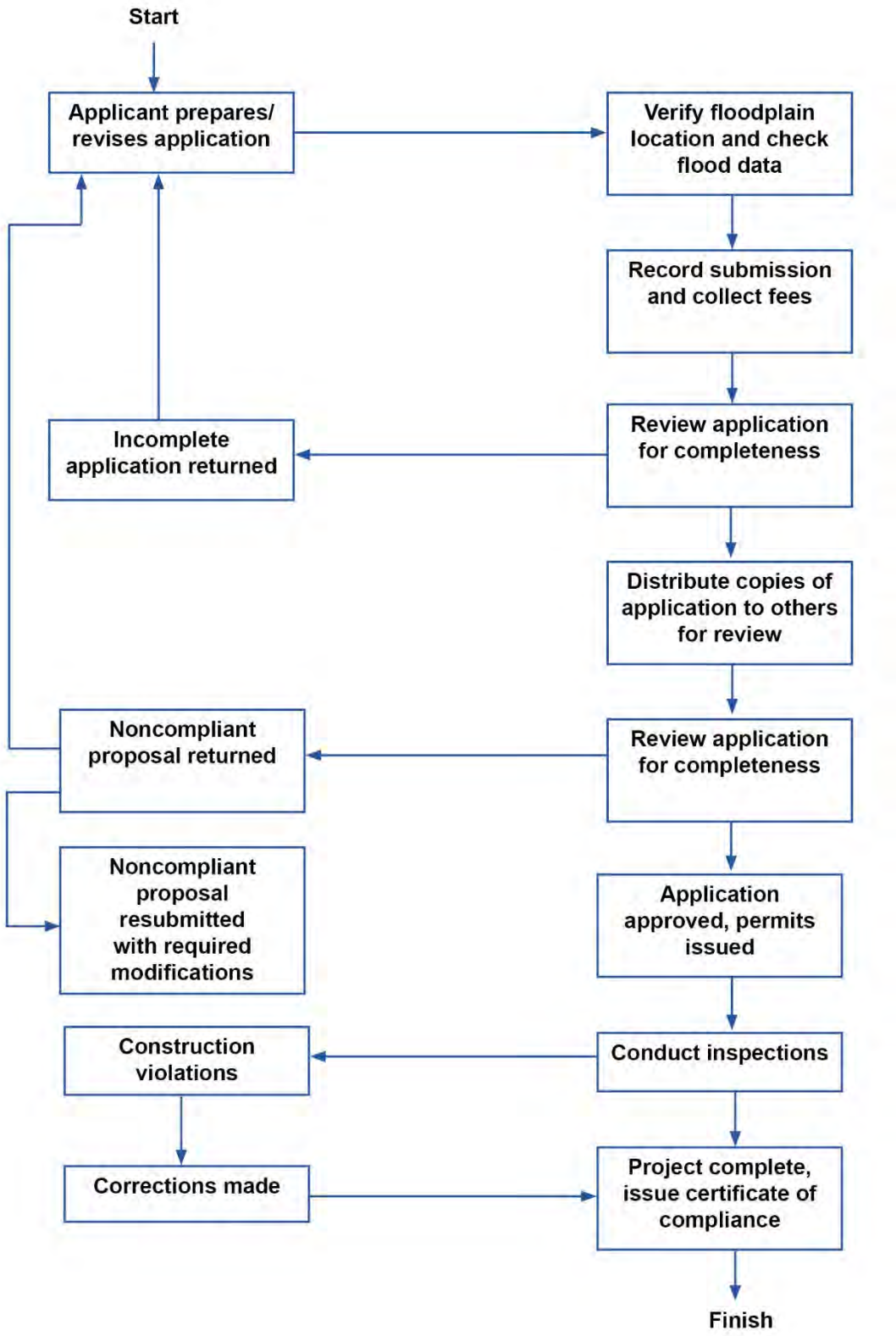


Figure 14-3. Permit review flow chart

14.1.2. Where a Permit is Required

Section 9 reviews the minimum NFIP requirements, and Section 7.1.1 reviews your statutory limitations to regulate some development.

> 44 CFR 60.1(b) These regulations must be legally enforceable, applied uniformly throughout the community to all privately and publicly owned land within flood-prone … areas, and the community must provide that the regulations take precedence over any less restrictive conflicting local laws, ordinances or codes.

You cannot exempt activities by your own community government. Just because the public works department does not get a permit from the building department does not mean that it does not have to follow the NFIP rules that govern all development within your statutory authority. Your ordinance and your agreement with the NFIP states that your community will ensure that all development within its jurisdiction will be regulated.

You do have some discretion to exempt obviously insignificant activities from the permit requirement—such as planting a garden, putting up a mailbox, or erecting a flagpole. Similarly, other projects, such as reroofing and replacing siding, will not affect flood flows or be labeled substantial improvements (see the discussion in Section 9.1.7).

14.1.3. Permit Application Form

Forms are a valuable and necessary tool in reviewing development proposals for regulatory compliance. When designed properly, they can be the most efficient way to get information that is essential to conducting an effective and thorough review.

A good administrative form can serve as a checklist for identifying the kinds of information that should accompany a permit application. The forms should be revised periodically to remain current with changes in the floodplain management ordinance and to include pertinent information.

Your community should have its own permit application form. Check it to be sure it includes all State and NFIP requirements. The Iowa DNR has model permit application forms available upon request. Examples of these forms are shown as Exhibit 14-4 and 14-5. A unique number should be assigned to each floodplain development permit application.

Make sure that the person who signs the form is either the property owner or someone who can speak for the owner. If in doubt, talk to the owner or get it in writing that the person signing the application is authorized to commit the owner to meeting the requirements.

Where a particular activity that is required by the NFIP regulations is mentioned in this reference, the reference to 44 CFR Part 60 is included in brackets (e.g., [44 CFR 60.3(c)(5)]). These activities must be included in the permit process for the community to remain in full compliance with the NFIP.

FLOOD PLAIN DEVELOPMENT APPLICATION/PERMIT

Application # _____ Date _____

TO THE ADMINISTRATOR: The undersigned hereby makes application for a Permit to develop in a flood plain. The work to be performed, including flood protection works, is as described below and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirements of the (____city/county____) Flood Plain Management Ordinance and with all other applicable county/city ordinances and the laws and regulations of the State of Iowa.

_____ _____ _____ _____
(Owner or Agent) (Date) (Builder) (Date)

_____ _____
(Address) (Address)

Telephone # _____ Telephone # _____

1. Location: _____¼ _____¼ , Section _____ , Township _____ , Range _____
   Street Address: _____
2. Type of Development
   Filling _____ Grading _____ Excavation _____ Routine Maintenance _____
   Minor Improvement _____ Substantial Improvement _____ New Construction _____
3. Description of Development: _____
   _____
4. Premises: Size of site: ____ft. x ____ft. Area of Site: _____ sq. ft. Estimated cost: $_____
   Principal Use: _____
   Accessory Uses (Storage, parking, etc.) _____
5. Addition or modification to non-conforming use? Yes ___ No ___ Assessed value of structure $ _____
6. Elevation of the 100 year (Base) flood (identify source) : _____
   _____
7. Elevation of the proposed development site (natural ground): _____ MSL/NGVD
8. Required elevation/floodproofing elevation for lowest floor: _____ MSL/NGVD
9. Proposed elevation/flood proofing level for lowest floor (including basement): _____ MSL/NGVD
10. Other flood plain information (identify and describe source) _____
    _____

THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE LOWEST FLOOR (INCLUDING BASEMENT) OF ANY NEW OR SUBSTANTIALLY IMPROVED RESIDENTIAL BUILDING WILL BE ELEVATED AT LEAST 1.0 FOOT. ABOVE THE 100 YR. (BASE) FLOOD ELEVATION. IF THE PROPOSED DEVELOPMENT IS A NON-RESIDENTIAL BUILDING, THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE LOWEST FLOOR (INCLUDING BASEMENT) OF A NEW OR SUBSTANTIALLY IMPROVED NON-RESIDENTIAL BUILDING WILL BE ELEVATED OR FLOOD PROOFED TO AT LEAST 1.0 FOOT ABOVE THE 100 YR. (BASE) FLOOD ELEVATION.

Figure 14-4. Page 1 of the DNR model permit application form for 60.3(b) and 60.3(c) communities, i.e., those without mapped floodways.

THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE LOWEST FLOOR (INCLUDING BASEMENT) OF ANY NEW OR SUBSTANTIALLY IMPROVED RESIDENTIAL BUILDING WILL BE ELEVATED AT LEAST 1.0 FOOT. ABOVE THE 100 YR. (BASE) FLOOD ELEVATION. IF THE PROPOSED DEVELOPMENT IS A NON-RESIDENTIAL BUILDING, THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE LOWEST FLOOR (INCLUDING BASEMENT) OF A NEW OR SUBSTANTIALLY IMPROVED NON-RESIDENTIAL BUILDING WILL BE ELEVATED OR FLOOD PROOFED TO AT LEAST 1.0 FOOT ABOVE THE 100 YR. (BASE) FLOOD ELEVATION.

8. Other permits required?

Iowa Department of Natural Resources: Yes___ No___ If yes, permit # _____

Date Received: _____

Corps of Engineers: Yes___ No___ If yes, permit # _____

Date Received: _____

Other: _____

All provisions of the City/County of _____, Flood Plain Management Ordinance (Ordinance Number _____) shall be complied with.

THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE DEVELOPER/OWNER WILL PROVIDE CERTIFICATION BY A REGISTERED ENGINEER, ARCHITECT, OR LAND SURVEYOR OF THE "AS-BUILT" LOWEST FLOOR (INCLUDING BASEMENT) ELEVATION OF ANY NEW OR SUBSTANTIALLY IMPROVED BUILDING COVERED BY THIS PERMIT.

Plans and Specifications Approved this _____ Day of _____, 19_____.

_____ _____

(Signature of Developer/Owner) **(Authorizing Official)**

cc: Water Resources Section
Iowa Department of Natural Resources
Wallace State Office Building
East 9th and Grand
Des Moines, IA 50319

App_d.doc 8/28/96

Figure 14-4. Page 2 of the DNR model permit application form for 60.3(b) and 60.3(c) communities, i.e., those without mapped floodways.

FLOOD PLAIN DEVELOPMENT APPLICATION/PERMIT

Application # _____ Date _____

TO THE ADMINISTRATOR: The undersigned hereby makes application for a Permit to develop in a flood plain. The work to be performed, including flood protection works, is as described below and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirements of the (city/county) Flood Plain Management Ordinance and with all other applicable county/city ordinances and the laws and regulations of the State of Iowa.

_____ _____ _____ _____
(Owner or Agent) (Date) (Builder) (Date)

_____ _____
(Address) (Address)

Telephone # _____ Telephone # _____

1. Location: _____ ¼ _____ ¼ , Section _____ , Township _____ , Range _____

   Street Address: _____

2. Type of Development

   Filling _____ Grading _____ Excavation _____ Routine Maintenance _____
   Minor Improvement _____ Substantial Improvement _____ New Construction _____

3. Description of Development: _____

   _____

4. Premises: Size of site: ____ft. x ____ft. Area of Site: _____ sq. ft. Estimated cost: $_____

   Principal Use: _____

   Accessory Uses (Storage, parking, etc.) _____

5. Addition or modification to non-conforming use? Yes ___ No ___ Assessed value of structure $ _____

6. Is property located in a designated Floodway (FW District)? Yes ___ No ___

   IF ANSWERED YES, CERTIFICATION MUST BE PROVIDED PRIOR TO THE ISSUANCE OF A PERMIT TO DEVELOP, THAT THE PROPOSED DEVELOPMENT WILL RESULT IN NO INCREASE IN THE 100 YEAR (BASE) FLOOD ELEVATION.

7. Property located in a designated Floodway Fringe (FF), General Flood Plain (FP), or Shallow Flooding (SF) District? Yes ___ No ___ If so, indicate which one: _____

   a. Elevation of the 100 year (Base) flood (identify source if other than FIRM) : _____

      _____

   b. Elevation of the proposed development site (natural ground): _____ MSL/NGVD

   c.. Required elevation/floodproofing level for lowest floor: _____ MSL/NGVD

   d. Proposed elevation/floodproofing level for lowest floor (including basement): _____ MSL/NGVD

   e. Other flood plain information (identify and describe source) _____

      _____

Figure 14-5. Page 1 of the DNR model permit application form for 60.3(d) communities, i.e., those with mapped floodways.

THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE LOWEST FLOOR (INCLUDING BASEMENT) OF ANY NEW OR SUBSTANTIALLY IMPROVED RESIDENTIAL BUILDING WILL BE ELEVATED AT LEAST 1.0 FOOT. ABOVE THE 100 YR. (BASE) FLOOD ELEVATION. IF THE PROPOSED DEVELOPMENT IS A NON-RESIDENTIAL BUILDING, THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE LOWEST FLOOR (INCLUDING BASEMENT) OF A NEW OR SUBSTANTIALLY IMPROVED NON-RESIDENTIAL BUILDING WILL BE ELEVATED OR FLOOD PROOFED TO AT LEAST 1.0 FOOT ABOVE THE 100 YR. (BASE) FLOOD ELEVATION.

8. Other permits required?

Iowa Department of Natural Resources: Yes___ No___ If yes, permit # _____

Date Received: _____

Corps of Engineers: Yes___ No___ If yes, permit # _____

Date Received: _____

Other: _____

All provisions of the City/County of _____, Flood Plain Management Ordinance (Ordinance Number _____) shall be complied with.

THIS PERMIT IS ISSUED WITH THE CONDITION THAT THE DEVELOPER/OWNER WILL PROVIDE CERTIFICATION BY A REGISTERED ENGINEER, ARCHITECT, OR LAND SURVEYOR OF THE "AS-BUILT" LOWEST FLOOR (INCLUDING BASEMENT) ELEVATION OF ANY NEW OR SUBSTANTIALLY IMPROVED BUILDING COVERED BY THIS PERMIT.

Plans and Specifications Approved this _____ Day of _____, 19____.

_____ _____

(Signature of Developer/Owner) **(Authorizing Official)**

cc: Water Resources Section
Iowa Department of Natural Resources
Wallace State Office Building
East 9th and Grand
Des Moines, IA 50319

App_d.doc 8/28/96

Figure 14-5. Page 2 of the DNR model permit application form for 60.3(d) communities, i.e., those *with* mapped floodways.

14.2.Review for Completeness

Submission of a development permit application starts the permit process. Before submitting an application, the prospective applicant often will contact you to obtain a copy of the regulations, locate the proposed site in relation to the NFIP maps, determine flood elevations, or gather procedural and technical information needed to complete the application.

This informal part of the permit process can be important in guiding the applicant to locate and design the development in compliance with your regulations. It also can help the applicant to prepare a complete application, avoiding unnecessary delays at the outset.

Some communities ensure that the permit process will go smoothly by having a formal pre-application meeting with a developer to review a preliminary plan.

The application package should contain all the administrative forms, plans, blueprints, and technical documentation required for you to review the proposed project for regulatory compliance. If the application package is incomplete, the review should stop. The applicant should be advised (in writing) of missing documents and told (in writing) that the review will not start until the missing documents are submitted.

Some communities require that a permit be issued within so many days of receipt of the application. You should not officially "receive" the application or log it in until it has been reviewed and determined to be complete.

Figure 14-6. Face to face site plan review with an applicant

14.2.1. Check all Forms

Make sure all administrative forms are completed satisfactorily and properly signed. Scan the administrative forms to ensure that all questions have been answered. If important items are left blank or not addressed completely, bring them to the attention of the applicant for completion.

Inaccurate information also should be brought to the attention of the applicant. Your review should be halted until deficiencies are corrected.

14.2.2. Check Site Plan for Completeness

Depending on the specificity or detail of the administrative forms, the various plans that accompany the application will provide the technical data needed for a thorough review. At a minimum, there needs to be a site plan, drawn to scale. Such a plan should show:

- Location of property lines
- Required set back lines and easements
- Topographic information, such as contour lines or spot elevations

- Streets
- Watercourses
- Location of existing and proposed structures
- All clearing, filling, and other proposed changes to the ground
- Floodway and floodplain boundaries
- 1% annual chance flood elevations (also known as BFEs)

When a plan is prepared by a licensed professional architect, engineer, or land surveyor, it should be stamped with the license seal to certify technical accuracy.

14.2.3. Check Building Plan for Completeness

If a building site is in the SFHA shown on the FIRM, each building must be protected to the minimum flood protection elevation. The application package must include building design plans that show:

- The kind and potential use of the structure
- Proposed lowest floor elevations of all new construction and the existing lowest floor for substantially improved or substantially damaged buildings
- Proposed elevations of adjacent grades
- The type of foundation system
- The existence of any enclosure below the lowest floor, along with electrical and plumbing plans for the area, location and dimensions of openings, and materials proposed for use in an enclosure below the BFE
- The height to which a non-residential structure is to be floodproofed and the complete list of floodproofing techniques to be used, with detailed drawings

In this reference, the term “building” is the same as the term “structure” in the NFIP regulations. Your ordinance may use either term. The terms are reviewed in more detail in Section 11.1.1.

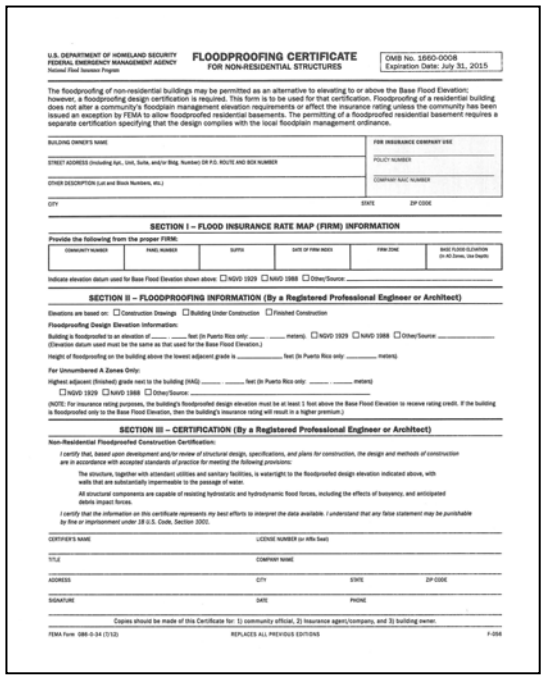
14.2.4. Check Certifications

Ensure that all necessary certifications are included and properly signed. The applicant must provide all completed certifications needed for the permit review.

Based on the minimum NFIP requirements, two situations would require the filing of certified documents with the permit application:

- Floodproofed building: In the event a non-residential structure is to be floodproofed, the applicant must submit a statement from a licensed P.E. or architect certifying that the design and methods of construction meet these standards [44 CFR 60.3(c)(4)]. A second, as-built, certificate is also required to be submitted later. FEMA's Floodproofing Certificate (form 086-0-34) should be used and is required for a community in the CRS.

- Enclosures below the lowest floor: Section 11 covers the requirements for openings in enclosures. If an applicant designs an enclosure below the lowest floor using an alternative to the NFIP standard, a licensed professional architect or engineer must certify the design [44 CFR 60.3(c)(5)]. FEMA's Elevation Certificate (form FF-206-FY-22-152) should be used and is required for a community in CRS.



U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
National Flood Insurance Program

FLOODPROOFING CERTIFICATE
FOR NON-RESIDENTIAL STRUCTURES

OMB No. 1660-0008
Expiration Date: July 31, 2015

The floodproofing of non-residential buildings may be permitted as an alternative to elevating to or above the Base Flood Elevation; however, a floodproofing 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 affect 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

STREET ADDRESS (Including Apt., Unit, Suite, and/or Bldg. Number) OR P.O. ROUTE AND BOX NUMBER

POLICY NUMBER

OTHER DESCRIPTION (Lot and Block Numbers, etc.)

COMPANY NAIC NUMBER

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 Depth)

Indicate elevation datum used for Base Flood Elevation shown above: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

SECTION II – FLOODPROOFING INFORMATION (By a Registered Professional Engineer or Architect)

Elevations are based on: ☐ Construction Drawings ☐ Building Under Construction ☐ Finished Construction

Floodproofing Design Elevation Information:

Building is floodproofed to an elevation of _____ . _____ feet (In Puerto Rico only: _____ . _____ meters). ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____
(Elevation datum used must be the same as that used for the Base Flood Elevation.)

Height of floodproofing on the building above the lowest adjacent grade is _____ feet (In Puerto Rico only: _____ meters).

For Unnumbered A Zones Only:

Highest adjacent (finished) grade next to the building (HAG) _____ . _____ feet (In Puerto Rico only: _____ . _____ meters)
☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

(NOTE: For insurance rating purposes, the building's floodproofed design elevation must be at least 1 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 Certification:

I certify that, based upon development and/or review of structural design, specifications, and plans for construction, 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 fine or imprisonment under 18 U.S. Code, Section 1001.

CERTIFIER'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.

FEMA Form 086-0-34 (7/12) REPLACES ALL PREVIOUS EDITIONS F-056

Figure 14-7. FEMA form 086-0-34, Flood Insurance Floodproofing Certificate

14.2.5. Check for Federal and State Permits

Ensure that all necessary Federal and State permits are being obtained. You must review the application package to determine whether Federal and State permits are necessary [44 CFR 60.3(a)(2)]. To help you and the applicant, you might include the agency or program names as a checklist on your permit application form. See Section 7 for a list of other agencies that are likely to need to review the project.

When obtaining Federal and State approval takes a long time, you may condition the issuance of your permit on the applicant's obtaining such permits later. The applicant should provide documentation to the administrator stating that the required Federal and State permits have been applied for and that the portion of the project affected by needed permits will not proceed until the permits are issued.

For example, getting a Section 404 wetlands permit from the U.S. Army Corps of Engineers may take several months. Under such circumstances, you may issue a local permit with the stipulation that the applicant must have submitted all required permits before beginning construction. You can verify this at your first inspection.

Note: This approach may be asking for problems if the developer misinterprets conditional approval for complete permission. The safest approach is to wait for all required permits, but

you have some flexibility if this puts a hardship on the builder who can proceed without affecting the area subject to the other regulations.

14.2.6. Circulate for Others to Review

You may need to submit copies of appropriate parts of the application package to other departments for review. Depending on the type and size of the proposed development and on the regulatory responsibilities of other departments or offices in your community, the applicant should submit a sufficient number of copies to allow for other's review.

Here are some departments and agencies that might need to review a portion of the application:

Figure 14-8. Coordination between departments may be necessary to ensure adequate review of certain projects

- Building department
- Zoning department
- Planning department
- Engineer's office
- Sanitation department (septic system approval)
- DNR (State permit requirements)
- U.S. Army Corps of Engineers (Sections 404 or 10 permit)
- Soil and water conservation district (impact of subdivisions and other large development on the natural resources of the area)
- Adjacent communities (alteration or relocation of a watercourse)

If your office has not done this already, you should contact these agencies to determine what, if anything, they need to review and prepare a checklist for the permit applicant that advises them of the other approvals that will be needed.

14.3.Review for Compliance

Now that you have a complete application package, follow these recommended procedures to verify that the project will meet all your ordinance requirements.

14.3.1. Examine Site Information

Check the site plan to ensure that the plotted floodplain and floodway boundaries appear accurately plotted. Look for possible obstructions in the floodway and other potential violations.

Inspect the plan carefully and compare it with the FIRM, floodway map, and profile. Some project sites may be located close to the boundaries of the SFHA. Because the map scale is

small, or it is difficult to pinpoint the project site, you may have trouble determining whether the project will be in or out of the SFHA. See Section 5 on reading maps and making floodplain and floodway boundary determinations.

Remember, a floodplain development permit is required only if the planned development (building, fill, grading, excavating…) is located within the SFHA. For example, while the applicant's property may be located partially in the SFHA, the proposed structure could be built on land outside the SFHA. In this case, floodplain regulations would not apply, and no special floodplain development permit is needed (unless regrading makes the structure susceptible to flooding). However, if clearing, grading, filling, road, or bridge construction is associated with erecting the structure within the SFHA, a permit is necessary.

Note that while you can use better ground elevation data to determine that a building location is above the BFE (and, therefore, outside the SFHA), the property will remain in the SFHA on the FIRM. That means that it is still subject to the flood insurance purchase requirement. It is the owner's responsibility to submit a request for a LOMA in order to have the FIRM reflect the better data (see Section 6 for more information on LOMAs).

14.3.2. Review Building Plans

Any conflict or inconsistency with applicable regulations will require adjustments to the building plans. Check the proposed elevations against your flood protection elevation. Be sure to look at what is planned to be installed below the lowest floor, such as in a crawlspace. Items such as ductwork must be elevated above the flood protection elevation or otherwise protected from flood damage.

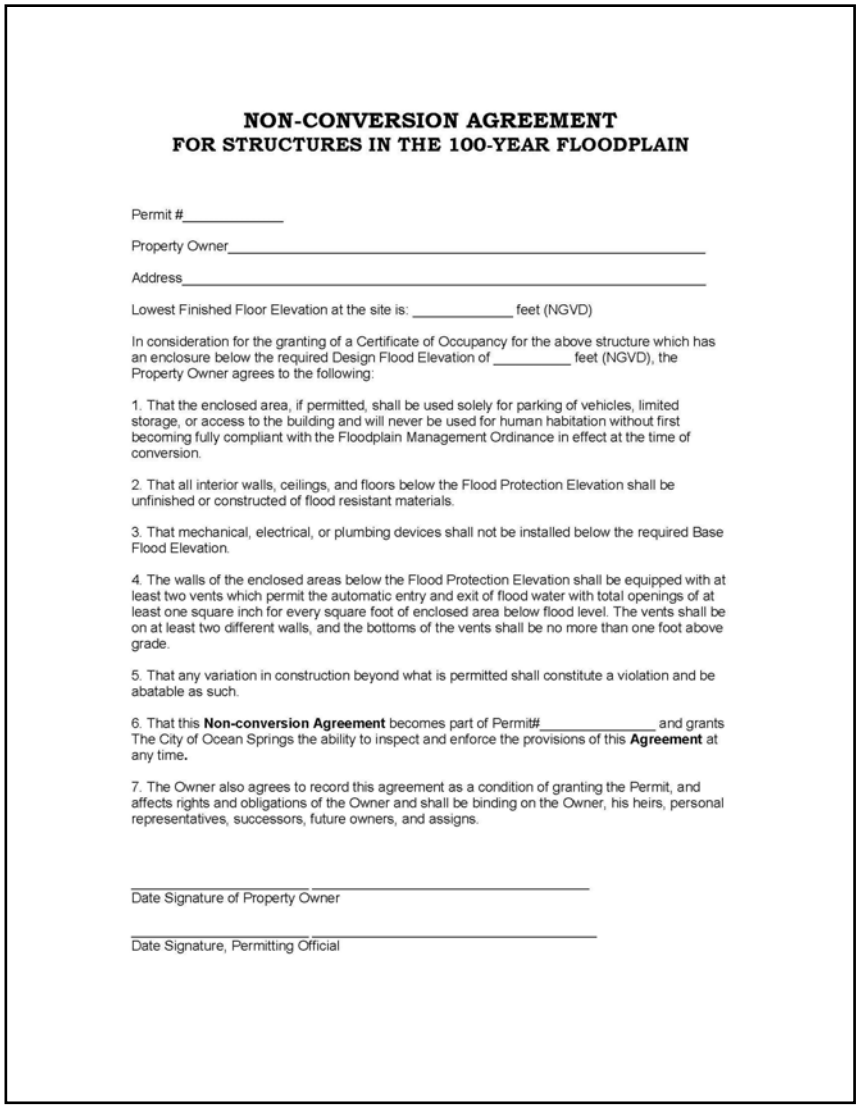
14.3.3. Review Engineering Documents

Have the community's engineer review engineering documents. If your community does not have a staff engineer, the DNR may be able to help review the data. As listed previously, depending on the type and location of the structure being proposed, an engineering document or certification may be needed to show compliance with NFIP requirements concerning floodproofing and enclosures below the lowest floor.

All engineering documents should be examined by your community's staff engineer or a consulting engineer available to perform reviews, to ensure that acceptable technical standards were used and that calculations are correct.

Non-Conversion Agreement

When elevating a structure with an enclosure that requires flood vents, having the applicant sign and record a non-conversion agreement should be required. This document will serve as a notice to the current owner that the enclosed area cannot be converted to a living space and what is and is not allowed in the enclosure. Further, because this document is recorded when the property is sold, there will be a notification to the new owners as to what is allowed in the enclosed area. The following non-conversion agreement is a general template.



NON-CONVERSION AGREEMENT
FOR STRUCTURES IN THE 100-YEAR FLOODPLAIN

Permit #_____

Property Owner_____

Address_____

Lowest Finished Floor Elevation at the site is: _____ feet (NGVD)

In consideration for the granting of a Certificate of Occupancy for the above structure which has an enclosure below the required Design Flood Elevation of _____ feet (NGVD), the Property Owner agrees to the following:

1. That the enclosed area, if permitted, shall be used solely for parking of vehicles, limited storage, or access to the building and will never be used for human habitation without first becoming fully compliant with the Floodplain Management Ordinance in effect at the time of conversion.

2. That all interior walls, ceilings, and floors below the Flood Protection Elevation shall be unfinished or constructed of flood resistant materials.

3. That mechanical, electrical, or plumbing devices shall not be installed below the required Base Flood Elevation.

4. The walls of the enclosed areas below the Flood Protection Elevation shall be equipped with at least two vents which permit the automatic entry and exit of flood water with total openings of at least one square inch for every square foot of enclosed area below flood level. The vents shall be on at least two different walls, and the bottoms of the vents shall be no more than one foot above grade.

5. That any variation in construction beyond what is permitted shall constitute a violation and be abatable as such.

6. That this **Non-conversion Agreement** becomes part of Permit#_____ and grants The City of Ocean Springs the ability to inspect and enforce the provisions of this **Agreement** at any time**.**

7. The Owner also agrees to record this agreement as a condition of granting the Permit, and affects rights and obligations of the Owner and shall be binding on the Owner, his heirs, personal representatives, successors, future owners, and assigns.

_____
Date Signature of Property Owner

_____
Date Signature, Permitting Official

Figure 14-9. Non-Conversion Agreement template

14.4. Application Approval or Denial

Once you complete your review of the permit application papers for completeness and technical compliance with the ordinance, a decision on the application is due.

14.4.1. Approval

If the proposed development is following regulations, issue a permit. (See example in Figure 14-3.) The permit becomes the official authorization from the community allowing the applicant to proceed, based on the information submitted in the application package.

Somewhere in the permit record, such as the approved plans, the application form, or the permit form itself, a record should be kept of the BFE and the required floor elevation. There should also be a general statement that all construction will be in accordance with all codes and ordinances. The DNR model application/permit forms provide such a record.

The day a permit is issued is the date of the "start of construction", provided construction begins within 180 days. Used for insurance rating purposes, this date determines what FIRM was in effect when the building was built, regardless of when ground was broken or construction was finished.

For regulatory purposes, a permit may be effective or valid for a certain period, according to the standard used in your other regulations. If at the end of this period the project is not complete, the permit technically expires. However, ordinances routinely provide for the permit officer to issue written extensions to allow completion of the development under the conditions of the original permit.

Another approach is to require that work continue to proceed over a given period. If work stops for a certain length of time, the permit is withdrawn.

No._____

FLOODPLAIN DEVELOPMENT PERMIT

Specify for what purpose the permit is issued—
New construction, alterations, fill, excavation, other

ISSUED TO:_____

ADDRESS:_____

PROJECT ADDRESS:_____
(if different from permittee's address)

ISSUED BY:_____
Floodplain Management Administrator

DATE:_____
(This permit expires 180 days from this date)

THIS PERMIT MUST BE POSTED ON THE PREMISES IN A CONSPICUOUS PLACE SO AS TO BE CLEARLY VISIBLE FROM THE STREET.

Figure 14-10. Sample permit form

14.4.2. Denial

If the application is not in compliance with local regulations, the permit should be denied. The applicant then can choose to:

- Withdraw the permit application
- Redesign the project to bring it into compliance with regulations
- Appeal to the Board of Adjustments or Board of Supervisors
- Ask for a variance to the regulations

While you may not be formally required to disclose the reasons for denying an application, it is a good policy to do so in writing. This tells the applicant what areas are non-compliant so that if he or she wishes to resubmit the application, appropriate corrections can be made.

Appeals and variances are covered in Section 16. Clarifying the deficiencies for the applicant can also help reduce the number of appeals of administrative and regulatory decisions you make.

15. Inspections

15.1.Why Inspect?

Now that you have issued the permit (Section 14), your job is still not done. Follow up conversations and inspections are vital to ensure that the applicant adheres to the permit's requirements. The most effective way to ensure compliance is to inspect the site frequently during construction. This is particularly important in the early phases of work on a building because that is when errors in the location or elevation of the lowest floor can be found and corrected. An inspection program also puts builders, developers, and property owners on notice that the community will insist that projects are completed in compliance with regulations.

A series of at least three inspections is recommended for every project, especially any project that involves construction of a building:

1. Pre-construction inspection
2. Elevation inspection
3. Final inspection

Figure 15-1. Building elevation inspection

The pre-construction inspection allows you to make sure the development is located correctly before construction begins, avoiding a floodway encroachment, or unpermitted fill in the floodplain.

The elevation inspection should be scheduled to check the proposed elevations before the installation of the lowest floor. If timed correctly, this inspection can identify elevation issues and avoid a very expensive error if the lowest floor is proposed below the flood protection level.

The final inspection ensures that all your permit requirements have been met and that the necessary certificates are in your files before the development is approved for use or occupancy. A checklist for this recommended approach is included in Figure 15-2.

It is recommended that with each inspection site photographs are taken to document existing conditions.

It is also recommended that you consider using some means of withholding approval if the permit conditions have not been met. A certificate of occupancy is an example of this. The certificate should be issued upon final approval. If a certificate has not been issued, some communities withhold services such as water or power. Read this section and determine what would work best for your community.

FLOODPLAIN INSPECTION REPORT

Date: .....

Inspector: .....

Permit #: _____ Applicant: _____

Project identifier/Address: _____

_____

Type of inspection: ☐ Pre-construction* ☐ Elevation ☐ Final ☐ Other:

Notes on back

Pre-Construction Inspection*

Office Work

☐ Review permit file before going to the field

☐ Ask permit reviewer any questions, if necessary

☐ Check for any necessary State or Federal permits

Field Work

☐ Check building or development location. Measure distances from waterway or landmarks. Locate floodplain and floodway boundaries.

Elevation Inspection

☐ Check elevation of the lowest floor. Is it at or higher than the permitted elevation?

☐ YES, development continues ☐ **NO**, TAKE IMMEDIATE ACTION

☐ If fill is used, check fill location, compaction, and side slopes.

Final Inspection

☐ Elevation or Floodproofing Certificate in files (if not required from owner prior to final acceptance).

☐ Check fill and grading for any floodplain or floodway encroachment.

☐ For enclosures below the BFE, check use, number, and size of openings (at least 2 openings on different walls; openings size totals 1 sq. in./1 sq. ft. of enclosure; openings no more than 12 in. above grade.

☐ Check that the furnace, air conditioner, etc. are elevated at or above the lowest floor elevation.

☐ For factory-built homes, check anchoring.

INSPECTION APPROVED? .....☐ YES

.....☐ NO, SEE NOTES ON OTHER SIDE

*If no pre-construction inspection was done, inspect these items at the time of the elevation inspection.

Figure 15-2. Sample inspection report

15.2.Pre-construction Inspection

Do the pre-construction inspection before the ground is broken. Ideally, this site visit should be after the site is staked out to allow you to check the plans in relation to the ground and lot boundaries. With plans in hand, you should determine that the site as identified on the proposed plans is consistent with actual ground conditions.

Figure 15-3. Pre-construction inspection

Check the following:

- The location of the floodplain and floodway boundaries
- Setbacks from lot lines, channel banks, etc.
- Floodway encroachments, if applicable
- Proposed elevation if building is surveyed and staked out

If the building, fill, etc., as staked out, are in violation of the approved plans or the ordinance requirements, you must tell the developer to make revisions. The project must not be allowed to proceed until you have gone back and verified that it is in compliance with the community's applicable floodplain management regulations.

It is recommended that you take photographs, document the problem in writing, and issue a stop work order to the builder until the problems have been corrected.

15.3.Elevation Inspection

The second inspection of a project involving a new building or addition to a building should be before installation of the lowest floor. You need to ensure that the lowest floor will be built at the height stipulated in the permit application and that the foundation is the type specified in the plans.

15.3.1. Timing

The type of foundation dictates your schedule:

- If the building is on a slab foundation, the inspection is best done when the forms are placed. You can check the proposed floor elevation by checking the elevation of the top of the forms. If the forms are high enough, you can approve the pouring of the slab.

- If the building is on an elevated foundation (crawlspace, piles, etc.), the inspection is best done when the foundation is completed. If the top of the foundation is high enough, you can approve the placement of the floor. Make sure the crawlspace floor is higher than the lowest adjacent grade, or the area will be considered a basement under the NFIP rules. For more information regarding crawlspace construction requirements see the FEMA Technical Bulletin 11 *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas*.

Making sure a structure is properly elevated is the key. Once the foundation is poured or laid, it can be very expensive for the property owner to change the building location or the elevation of the lowest floor.

Figure 15-15-4. FEMA Elevation Certificate packet

- If the building is to be floodproofed and the floodproofing technique is easy to identify—such as a reinforced concrete stem wall up to the flood protection elevation—this inspection should be conducted when that portion of the project is completed.

Making sure a structure is properly elevated is the key to the entire regulatory process. If this does not happen, the permit process is pretty much for naught. Therefore, an inspection at the point of initial construction, where changes to the height of the foundation can be made without major difficulty, is best. Once the foundation is poured or laid, it can be very expensive for the property owner to change the building location or the elevation of the lowest floor.

15.3.2. Checking Elevations

Floor elevations at this stage can be confirmed by requesting certified elevations from the applicant. This can be done by a surveyor or engineer completing an Elevation Certificate or a Floodproofing Certificate for a non-residential building being floodproofed). Section C1 of the Elevation Certificate or Section II of the Floodproofing Certificate allow the elevations to be based upon:

- Construction drawings

- Building under construction

- Finished construction

As with any submitted elevation data, either form must be certified by a licensed surveyor, P.E., or architect authorized to certify vertical elevation data. If the elevations are based on construction drawings or a building under construction, a new Elevation Certificate or Floodproofing Certificate will be required when construction of the building is complete.

> **Lowest Floor—***The lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure (that is not a basement) is not the lowest finished floor if the enclosure is built as required in the local ordinance.*

Note: This does not relieve the builder of having to provide an as-built Elevation Certificate or Floodproofing Certificate when the project is finished. This elevation check simply verifies that the building will be elevated or floodproofed to the proper elevation before it becomes extremely difficult to make changes.

15.3.3. Other Checks

During your elevation inspection, also check:

- Whether any placement of fill meets the necessary compaction, slope, and protection standards contained in your regulations
- The building's location matches the permit application plans
- The number and size of crawlspace or enclosure openings
- Whether any part of the project encroaches into the floodway

15.4. Final Inspection

15.4.1. Purpose

The final inspection is conducted as the project nears completion. The purpose of this inspection is to:

- Ensure that the foundation and floor elevations have not been altered since the second inspection and are elevated as per the permit.
- Obtain an as-built Elevation Certificate or Floodproofing Certificate.
- Verify that enclosures below the lowest floors have adequate openings.

Figure 15-5. Final elevation inspection

- Ensure that nothing subject to flood damage, such as a furnace, air conditioning unit, electrical, or ductwork, has been located below the lowest floor.

- Check for floodway encroachments, and if an Iowa DNR permit was issued, make sure the construction is in compliance with the permit.

- Check the anchoring system used in securing manufactured (factory-built) homes.

15.4.2. Certificate of Occupancy

After the project passes final inspection, many communities issue a document called a certificate of occupancy, certificate of compliance, or use permit.

This document allows the owner to move into the newly constructed building or addition. Usually, a new building cannot be sold until the seller has this document. Some utility companies will not start service until the document is presented. Therefore, if the project does not comply with the permit requirements, withholding the certificate of occupancy, certificate of compliance, or use permit can prevent the owner from using or occupying the building.

Before final occupancy or use of the building is granted, you must make sure that all needed documents are received and checked. You must have an as-built Elevation Certificate or Floodproofing Certificate, and the other forms noted in Section 18 on record keeping.

15.5. Future Inspections

15.5.1. Compliance Inspection

Certifying a structure for occupancy is the final step in the permit process. However, the property must remain in compliance with your floodplain ordinance and the conditions under which the permit was issued.

You should periodically drive through SFHAs, checking to ensure that properties continue to remain in compliance. Often, property owners are not aware of permitting requirements for additions and improvements. Later inspections are particularly important when a structure contains an enclosure below the lowest floor. Such areas can be easily modified and made into habitable spaces, in violation of your ordinance. See Section 14.1.3 regarding use of a **Non-Conversion Agreement**. A Non-Conversion Agreement is one method to ensure a property owner is clear on the unfinished requirements for an enclosure or full floor below the BFE.

Compliance Inspections

Periodic windshield tours of your SFHA will help ensure properties remain in compliance. Look for additions and enclosures below the permitted lowest floor.

In some cases, you may want to condition the issuance of a permit or certificate of occupancy on being allowed to make future inspections. Check with your community's attorney on appropriate language.

If you find an unpermitted activity, you need to take appropriate action to bring the structure back into compliance. This may mean requiring the homeowner to remove the unpermitted work or restoring an enclosure below the BFE to its original condition.

15.5.2. Post-damage Inspection

After a flood, fire, tornado, or other natural or human cause of damage, you need to inspect buildings in the SFHA. You need to move quickly, as most homeowners are quick to begin their repairs. During this inspection, you can hand out flyers letting the property owners know what repair work will require a building permit. You need to determine if the structure has been "substantially damaged" (see Section 12). In general, if the flood crested two feet above a building's adjacent grade, you should carefully check the building's foundation and flood damage.

Section 21 discusses in detail what you should do in the event of a flooding disaster. This information also applies to other disasters. A sample letter to the property owner and an inspection checklist are provided.

15.6.Checking Elevations in the Field

This section explains how elevations are shot and checked in the field—what is involved and what a surveyor does. While these are basic instructions for use with basic optical tools, today's surveyors will likely use Global Positioning System (GPS) equipment that works differently but is based on similar techniques.

15.6.1. Starting Elevation

Typically, the hardest part of field checking elevations is finding a point of known elevation from which to start. U.S. Geological Survey benchmarks are the best place to start, but they can be several miles apart. Often, the local engineer will keep elevation records from sewer or street projects that can be used as a starting elevation point.

15.6.2. Running the Level

A two-person team is needed. The first person places a rod on a point where the elevation is known, such as a reference mark from a Flood Insurance Study or a local reference mark (starting elevation). The second person levels the instrument and reads the height where the cross hairs show on the rod. This is called the **backsight**. Add it to the starting elevation to produce "HI" or the height of the instrument (Figure 15-6). The person holding the rod must hold it straight to get accurate readings.

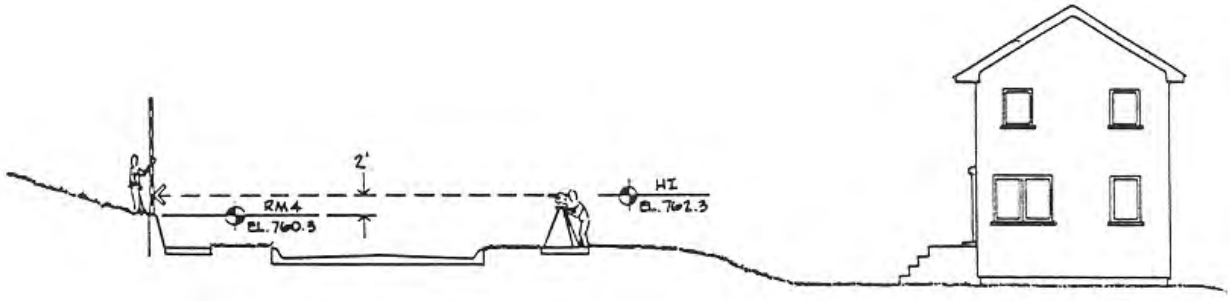


Figure 15-6. Starting elevation (760.3) + reading on rod (2') = height of instrument (HI) = 762.3

Next, the person with the rod places it on the lowest floor of the structure. Keeping the instrument level, the second person turns it to the rod and reads the height. This height is called the **foresight**. This number is subtracted from HI and gives the elevation of the lowest floor (Figure 15-7).

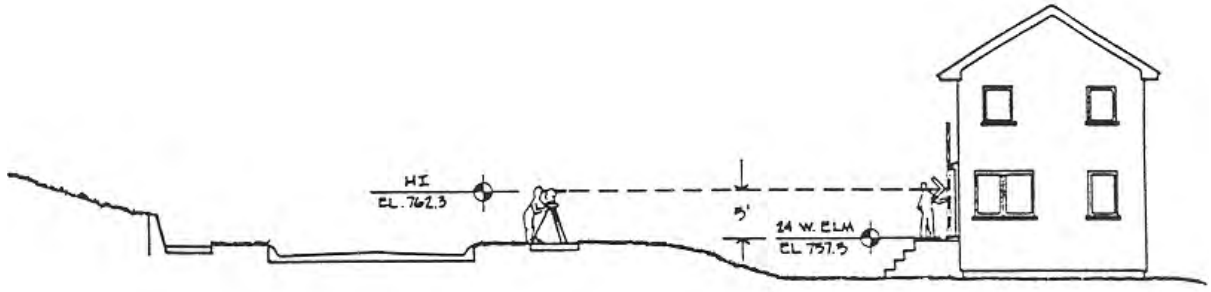


Figure 15-7. HI (762.3) minus foresight (5') = lowest floor elevation (757.3)

15.6.3. Running a Turn

When the starting elevation is too far to see from the site where the elevation needs to be measured, a “turn” must be run. This is simply shooting the foresight to a selected “turning point”. The level is then moved, and a backsight is read with the turning point acting as the new starting elevation (Figure 15-8).

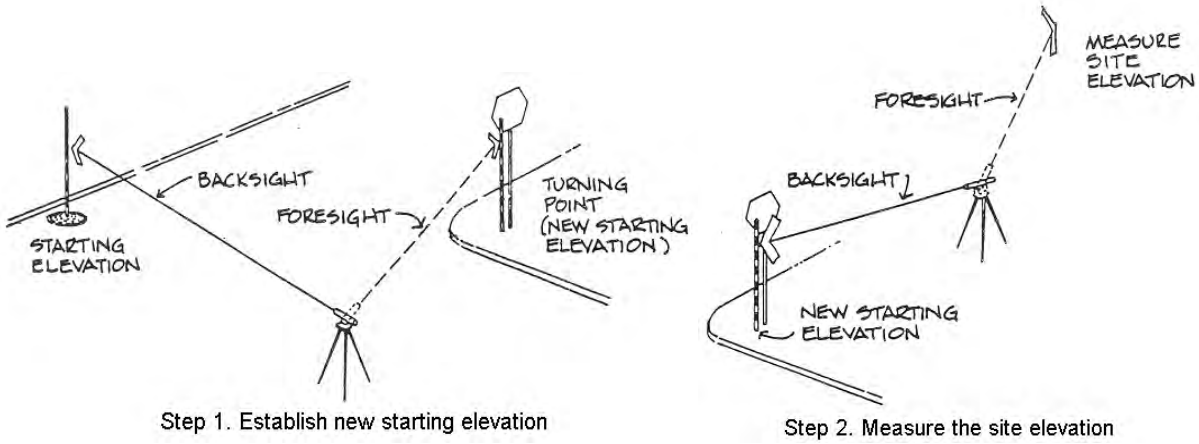


Figure 15-8. Running a turn

The required flood protection elevation is marked at the building site to show how high the structure must be built, and can be helpful if plans must be modified. It will also make checking the "as-built" elevation much quicker. A thorough record must be kept describing the mark to ensure that it will not be moved (e.g., "nail with red tape 4 feet from ground in largest oak tree in northeast corner of lot = flood protection elevation = 465.2 feet NAVD").

15.6.4. Records

There is a standard way of recording the figures obtained. The survey records must be kept as detailed as possible—especially the location of where the rod was placed—as this will help later field checks refer to the elevation records.

PERMIT NO. 85-12-03-11 BUILDING OFFICIAL Bill D. Best
SITE 24 West Elm FLOOD PROTECTION ELEVATION 756.0

Station	back-sight	HI	fore-sight	Elevation	Description
RM 4	2'	762.3		760.3	Flood Insurance Study Reference Mark
24 West Elm			5'	757.3	Top of Floor at Front Door

Figure 15-9. Standard surveying record format

15.6.5. Community Rating System (CRS) Credit

CRS credit is provided if a community maintains benchmarks so surveyors can find them and can depend on them to be accurate. CRS credits can also be gained if the community maintains a network of stations that support GPS surveying.

This credit can be found in Activity 440, Section 442.c (BMM) of the *CRS Coordinator's Manual* and the *CRS Application* (http://crsresources.org/quick-check).

16. Appeals and Variances

16.1. Appeals and Variances

Appeals, special uses, and variances require judgment calls involving several people, as ordinances typically do not allow only one person to decide these issues. Here is when they can occur and how they are usually handled:

16.1.1. Appeals

Ambiguous language or differing interpretations can lead the applicant and permit office to disagree. Your ordinance should have a process for referring these disagreements to a board, such as a Board of Adjustment, County Board of Supervisors, or City Council, which will interpret the ordinance and settle the dispute.

16.1.2. Conditional or Special Use

Some regulations use a conditional use, special use, or special exception process to allow some use of the floodplain. This process allows a community to review the project completely and place special conditions on the permit. An example of conditional uses in a floodway would be a carnival, which could be limited in the number of days it is open, or a marina, which could be limited in the size and use of any structures. A zoning board or other governing board is responsible for reviewing such requests. Before using this method of permitting, check with the Iowa DNR to determine when their approval is also required.

16.1.3. Variances

Zoning ordinances, building codes, and floodplain management regulations cannot be written to anticipate every imaginable situation. A process for issuing variances gives a developer or property owner a way to seek permission to vary from the letter of the rules because of a special situation.

A variance can mean that the minimum standards of the NFIP may not be met by a project due to a special local circumstance. Because of this, most of this section is devoted to variances. A variance from the floodplain management standards may have a negative impact on flood insurance rates.

16.1.4. Boards

In all three cases, appeals, special uses, and variances, the applicant submits a request to a knowledgeable board of arbiters. These boards do not have the authority to change the ordinance, just to apply or interpret the ordinance’s provisions. They may or may not have the authority to make a final decision. If not, they make recommendations to the governing board or a state agency which makes the final decision.

16.2. Variances

A variance is a grant of relief by a community from the terms of a land use, zoning, or building code regulation. Because a variance can create an increased risk to life and property, **variances from elevating above the flood protection elevation or other requirements in the flood ordinance should be rare.**

Granting variances is a local decision that *requires approval* from the DNR. The variance must be based on state law, NFIP criteria, and other provisions the community may wish to require. Your community's review board must consider the fact that every newly constructed building adds to the local government's responsibilities and remains a part of the community for the indefinite future. Figure 16-1 is provided as a guidance checklist to help board members determine if a variance should be granted.

Variances are based on the general principal of zoning law that they pertain to a piece of property and are not personal in nature. In general, a variance is granted for a parcel with physical characteristics so unusual that complying with the ordinance would create an exceptional hardship to the applicant or surrounding property owners. Those characteristics must:

- Be unique to that property and not shared by adjacent parcels
- Pertain to the land, not to any structure, its inhabitants, or the property owners

Characteristics that might justify a variance include an irregularly shaped lot, a parcel with unsuitable soils, or a parcel with an unusual geologic condition below ground level. It is difficult, however, to imagine any physical characteristic that would give rise to a hardship sufficient to justify issuing a variance to a flood elevation requirement for a new building. If the property is not unique, then other similarly situated land would also be eligible for the same variance.

Your community should grant variances based only on a structure-by-structure review. Never grant variances for multiple lots, phases of subdivisions, or entire subdivisions

16.2.1. NFIP Requirements

NFIP regulations do not address appeals, special uses, or conditional permits. However, because variances may expose insurable property to a higher flood risk, NFIP regulations set guidelines for granting them. The guidelines, which are designed to screen out situations in which alternatives other than a variance are most appropriate, appear in 44 CFR 60.6(a). The guidelines should be incorporated into your ordinance.

A review board hearing a variance request must not only follow the procedures given in the ordinance, but it must also consider the ordinance's criteria in making its decision. When the ordinance is followed, few situations qualify for variance.

Note that your ordinance includes things that are not minimum NFIP requirements. An example is your flood protection elevation, which requires new buildings to be protected to one foot (or greater) higher than the NFIP standard 1% annual chance flood level. FEMA expects

you to enforce your complete floodplain management ordinance. **Issuing variances is not a good practice,** even variances from your own higher local standard. FEMA considers a variance to your standards as a variance to the NFIP ordinance.

If your community makes a practice of varying from your ordinance's standards, you could be subject to the sanctions for non-compliance (see Section 2.6). If your community makes a practice of varying from your own higher standards (even though the projects meet the NFIP criteria), FEMA will advise you to revise your regulations rather than enforce them inconsistently.

Should You Issue a Floodplain Variance?

A city or county is authorized to approve variances from the letter of your floodplain regulations "that will not be contrary to the public interest where, owing to special conditions, a literal enforcement of the provisions of this Ordinance will result in unnecessary hardship."

The issuing of variances is guided strictly by the requirements of your local ordinance and State and Federal regulations. Variations to your flood protection regulations should be avoided and only issued because of special situations.

When considering a variance application, ask the following 10 questions:

1. Is the variance requested on land that is unique? Each variance request must be considered on a structure-by-structure and lot-by-lot basis. You must consider if the lot is unique. If it is not unique, then other similarly situated land would also be eligible for a variance for the same reasons.

2. Would failure to grant the variance result in exceptional hardship to the applicant? The key word is "exceptional." For example, physical handicaps and financial hardship **do not** qualify. Here are some examples of what **does not** meet exceptional hardship:

    - The land value will drop
    - The owner does not have enough money to comply
    - The house will be elevated and will look different from the neighbors
    - The homeowner cannot walk up steps into an elevated addition

3. Is the property in a floodway? If it is, no variance can be issued if any increase in flood levels would occur during the 1% annual chance flood (also known as the 100-year or base flood). The developer's engineer needs to provide the data to the satisfaction of your staff and DNR.

4. Will granting the variance increase flood heights and velocities?

5. Will granting the variance increase the threat to public safety? Can people get to safety during a flood? Can emergency vehicles reach the property during flooding? Will there be loose materials that will be swept downstream onto other properties?

6. Will granting the variance result in extraordinary public expense? You should consider that every new floodplain building adds to your community's responsibility during a flood. Consider the costs of maintenance and repair of public utilities, streets, and bridges.

7. Will granting the variance create nuisances, or cause fraud on or victimization of the public?

8. Will the water supply and sanitation systems still be able to operate and prevent disease, contamination, and unsanitary conditions?

9. Can the project be built in a flood-free location?

10. Is the project compatible with existing local plans, laws, or ordinances and with existing and anticipated development?

Your work should conclude with written **findings of fact** that address each of these 10 questions. If you do find that a variance is deserved, then make sure you:

- Issue the minimum variation necessary. A variance is a request to vary from the rules, not to ignore them. Any variance should allow only minimum deviation from the local requirements.

- Notify the applicant (in writing) that granting the variance will result in:

    - Increased risks to life and property; and
    - Increased flood insurance premium rates. In many instances, the variance-induced rates will be so high as to make the building essentially uninsurable because the owners cannot afford the premium.

- Record the findings and conditions with the county deed records so future owners or occupants will be told of the terms and conditions.

Remember: A variance to your State-approved ordinance needs to be approved by the DNR. For questions on variances, contact the DNR at (866) 849-0321.

Figure 16-1. Variance checklist

16.2.2. DNR Approval

All variance requests considered by your community must be reviewed and approved by the DNR prior to becoming effective. If the DNR issues an objection to the variance request, the variance is not valid even if the community approved the request. If you deny the request based on the DNR's denial, the applicant may file a notice of appeal with the DNR within 20 days of the local action.

The community may also choose to deny an application over a "no objection" ruling from the State. If so, the local appeals process would be used. The local government shall promptly notify the DNR of any local appeals process so the DNR may determine whether participation in the review is in the best interest of the State.

16.2.3. Hardship

The concept of unnecessary hardship is the cornerstone of all variance standards, whether or not the floodplain is involved. It is based on decisions reached through the courts. Strict adherence to this concept across the country has limited the granting of variances.

The applicant has the burden of proving unnecessary hardship. Reasons for granting the variance must be substantial; the proof must be compelling. The claimed hardship must be exceptional, unusual, and peculiar to the property involved.

Financial hardship, inconvenience, aesthetic considerations, physical handicaps, personal preferences, or the disapproval of one's neighbors do *not* qualify as exceptional hardships. Nor do problems caused from the previous action of the applicant or property owner.

The local board must weigh the applicant's plea of hardship against the purpose of the ordinance. Given a request for a variance from floodplain elevation requirements, the board must decide whether the hardship the applicant claims outweighs the long-term risk that the owners and occupants of the building would face. Additionally, the board must consider the community's need for strictly enforced regulations that protect its citizens from flood danger and damage.

When considering variances to flood protection ordinances, local boards continually face the difficult task of frequently having to deny requests from applicants whose personal circumstances evoke compassion, but whose hardships are simply not sufficient to justify deviation from community-wide flood damage prevention requirements.

These problems can be resolved through other means, even if the alternatives to a variance are more expensive or complicated than building with a variance, or if they require the property owner to put the parcel to a different use than originally intended or to build elsewhere.

The following are common claims of hardship, but they are ***not*** good and sufficient cause for a variance:

- The value of the property will drop somewhat
- It will be inconvenient for the property owner

- The owner does not have enough money to comply
- The property will look different from others in the neighborhood
- The owner started building without a permit, and now it will cost a lot to bring the building into compliance

16.2.4. Hardship Examples

Example 1: A small undeveloped lot is surrounded by lots on which buildings have been constructed at grade. The ordinance requires new buildings to be constructed several feet above grade.

If the owner were to build a new house, it would look different. Potential buyers would ask questions and find out about the flood problem in the area. If it were built on fill, the lot might drain onto the neighbors' property.

This situation probably would not warrant a variance because the owner does not face an exceptional hardship. Appearance is not a hardship, and no action should be taken to hide the hazard from others. There are ways to elevate a building without creating a drainage problem, such as elevating the building on pilings or a crawlspace or grading the fill to drain away from adjoining properties.

Example 2: A property owner seeks a variance because he or she would have to spend several thousand dollars to elevate a house to comply with the ordinance, and several thousand more to build a wheelchair ramp or an elevator to provide access for a handicapped member of the family.

While financial considerations are important to property owners and the needs of a handicapped person must be accommodated, these difficulties do not put this situation in the category of "exceptional hardships" because:

- The characteristics that result in the claimed hardship do not pertain to the property but are personal.
- A variance is not needed to provide day-to-day access to the building, which can be provided by building a ramp or elevator.
- Having a handicapped person occupy a flood-prone dwelling raises a critical public safety concern to both the residents and emergency responders.

If a variance is granted and the building is constructed at grade, the handicapped person must leave when floodwaters begin to rise, yet he or she may need help to do so. This poses an unnecessary danger to the handicapped person and places an extra demand on the community's emergency services personnel, who may be called upon to rescue the resident in the event of a flood.

On the other hand, if the building is properly elevated, the handicapped person either can be evacuated or can survive the flood simply by remaining at home safely above the floodwaters.

In effect, the variance would not relieve the property owner of his or her difficulty, but likely only postpone, and perhaps ultimately increase it. It would not help the community, either, as the building will be susceptible to damage long after the current owners are gone.

It would be more prudent for both the owner and the community if the variance was denied, and the home built at the proper elevation with handicapped access. This would ensure the safety of all family members when floodwater rises, as well as protect the property owner's and the community's investment in the property.

16.2.5. Other Concerns

Local authority. A local government does not have the authority to vary from State requirements. A community cannot issue a variance to a DNR or U.S. Army Corps of Engineers (USACE) permit or the standards required by the DNR. The DNR must concur with any local variance decision.

Findings of fact. The board reviewing the request for a variance should make a written record of all the facts, including the rationale for granting the request. A careful process should be followed that reviews all the criteria for granting or denying a variance, so the decision does not appear arbitrary.

Public safety and expense. Flood damage prevention ordinances are intended to help protect the health, safety, well-being, and property of the local citizens. Variances must not create threats to public safety or nuisances.

Because it would increase damage to other property owners, no variance may be issued within a regulatory floodway that will result in any increase in 1% annual chance flood levels (44 CFR 60.6(a)(1)).

> 44 CFR [Chapter 44 of the *Code of Federal Regulations*] 60.6(a)(1) Variances shall not be issued by a community within any designated regulatory floodway if any increase in flood levels during the base flood discharge would result;

Fraud and Victimization. Variances must not defraud or victimize the public. Any building permitted below the flood protection elevation faces increased risk of damage from floods, and future owners of the property—and the community—are subject to all the costs, inconvenience, danger, and suffering that those increased flood damages may bring. Future owners may purchase the property, unaware that because of a variance, it is subject to potential flood damage and can be insured only at high rates.

Minimum Variation Necessary. A variance is a request to vary from the rules, not to ignore them. Any variance should allow only a minimum deviation from the local requirements. For example, even if an applicant can justify not elevating a building above the flood protection elevation, the review board should not automatically allow the building to be built at grade. The board should still require as much elevation as possible to provide some flood protection without causing exceptional hardship.

In considering variances, the review board should use local technical staff expertise and recommendations from the building, planning, zoning, or engineering departments. The local

technical staff should consider varying other requirements to provide the needed flood protection. For example, it may be more appropriate to issue a variance to the front yard setback requirement to get the building out of the floodway.

16.2.6. Flood Insurance Rates

Flood Insurance Rates

A variance from elevation requirements—the most common kind of variance requested—increases the risk to a building, and that increased risk is reflected in higher annual insurance premiums.

While a variance may allow deviation from building standards specified in a local ordinance, flood insurance rates, and the flood insurance purchase requirement—which must be enforced by lending institutions—cannot be waived. This can create severe financial consequences for a property owner, as insurance rates for a building built below the flood protection elevation can be substantially higher than those for elevated buildings.

If a variance is requested to construct a building below the flood protection elevation, you must notify the applicant (in writing) that granting the variance will result in increased flood insurance premium rates, up to $25 per $100 of coverage, or more. In many instances, the variance-induced rates will be so high as to make the building essentially uninsurable because the owners cannot afford the premium.

The original owner who applied for a variance may not care, but if approved, the variance's impact may matter a great deal to subsequent potential owners who cannot afford the property's high insurance rates. The result may be owner abandonment, leaving your community with a vacant, flood-damaged, and essentially uninsurable building.

For more information on flood insurance rates, visit the Rate Explanation Guide on FloodSmart.gov. You can also contact your flood insurance agent.

16.2.7. Historic Buildings

A variance may be issued for the reconstruction, rehabilitation or restoration of historic structures if the variance is the minimum necessary to preserve the historic character and design of the structure (see Figure 16-3 for the definition of a "historic structure".)

Figure 16-2. Historic building

Changes to the structure must not destroy or alter the characteristics that made it a historic building. The State's historic building code shall be applied solely or in conjunction with a local building code. The variance review process should ensure that mitigation measures to reduce future flood damage are required, such as elevating an air conditioner or using flood resistant materials. More information on variances for historic building exclusions can be found in *FEMA's Floodplain Management Bulletin on Variances and the National Flood Insurance Program*.

Many older buildings are not considered historic, so the first thing to check is whether the structure proposed for an exemption is historic. Look for it on a list maintained by:

- The National Register of Historic Places
- The State Historical Society of Iowa's Historic Site Inventory
- A Federally certified local historic preservation board

Structures are listed in the National Register or on a federally recognized State or local inventory in one of two ways: as an individual building, or as a primary, secondary, or other contributing building in a designated historic district.

Structures are either listed or may be eligible to be listed. Only a federally certified State or local historic preservation program can make such determinations. The State historic preservation office in the Iowa Department of Cultural Affairs or a federally certified local historic preservation board should be consulted to determine if a structure proposed for the historic exemption is indeed historic.

Figure 16-3. Definition of "historic building"

16.2.8. Functionally Dependent Use

A variance may be issued for new construction, substantial improvements, and other development necessary for the conduct of a functionally dependent use. A functionally dependent use is one that must be located or carried out close to water—such as a docking or port facility necessary for the unloading of cargo or passengers, shipbuilding, and ship repair.

A functionally dependent use variance could be issued provided that:

- There is good and sufficient cause for providing the relief
- The variance will be the minimum necessary to provide relief
- The variance does not cause a rise in the 1% annual chance flood level within a regulatory floodway

The structure or other development must be protected by methods that minimize flood damage, such as elevating mechanical equipment, locating offices above the flood protection elevation, or using ground fault interrupt electrical circuits.

16.2.9. Records

The community must keep a record of all variances and the rationale for granting them. These are usually prepared as a "findings of fact" document. The findings are subject to review by FEMA during a Community Assistance Visit.

The records must include a copy of the written notification to the applicant that the issuance of a variance to construct a building below the flood protection elevation will result in increased

flood insurance premium rates as high as $25 per $100 of coverage, and such construction below the flood protection elevation increases risk to life and property.

It is recommended that the variance findings, conditions, and authorization be recorded in the county deed records. This provides a means of permanently notifying future or prospective owners about the terms and conditions of the variance.

17. Enforcement

17.1.Enforcement Actions

Adequate, uniform, and fair enforcement means two things:

- All development in a SFHA must have a permit.
- All development with a permit must be built according to the approved plans.

One important aspect of enforcement relates to good record keeping. You should be ready for a Community Assessment or CAV—an inspection of your community's permit files—and an elevation and building inspection survey by the FEMA or the Iowa DNR. The objective of the Compliance Audit is to review community record keeping and retention as it relates to the construction of buildings in SFHAs, and the objective of the elevation and building inspection survey is to determine if buildings built within the surveyed communities have been built to minimum NFIP standards.

Your community should maintain maps showing the regulatory floodplain for your office and the public to use. All map revisions should be recorded and denoted on administrative maps, with the details kept in an indexed file or in your GIS, as applicable.

To ensure that development meets these requirements, you must monitor the floodplain and, where necessary, conduct an inspection of a property. Be sure to review your authority to gain access to private property with your attorney. If you do not have permission to enter private property, do your inspection from the nearest right-of-way or public property. When you inspect property and note what appears to be a violation, take photos and date the photos: either by hand or using the date command on a digital camera.

Documenting the Violation

If you find a violation, you should take photographs, document the problem in writing, and issue a stop work order for projects still under development.

If you are the local enforcement officer and you discover development activities without permits or contrary to the approved plans, you must enforce your ordinance. You have several methods for enforcing your ordinance. This section explores these methods.

17.1.1. Voluntary Compliance

The best approach is to convince the developer that complying with the ordinance is in his or her own best interest. This may take some explanation of the flood hazard and how the rules protect the property (or neighboring properties) from that hazard.

If the issue is the protection of a building, a flood insurance rate table, such as the one captured in Figure 17-1, can show how expensive insurance could be for a non-compliant structure. Even if the developer is not interested in flood insurance, future owners may want it and probably will be required to purchase it as a

condition of a mortgage or loan. With the implementation of the new flood insurance rating methodology, structures that are built outside of compliance with your floodplain management requirements could face exorbitant insurance rates.

Should voluntary efforts not work, you have other compliance tools.

17.1.2. Administrative Steps

Your first steps in enforcement involve what you can do as an ordinance administrator. Be sure to review these with your community's attorney before you start:

1. Contact the property owner or building contractor ("responsible party") in person or by telephone to explain your concerns. Give them a deadline to respond to your concerns.

2. Follow up with a written notice, including the date by when you expect a specific response (a floodplain permit application, for example, or an Elevation Certificate). In this written notice, you do not need to mention the possibility of court action. However, in subsequent notices, you should notify the responsible party that court action may be pursued.

If the responsible party does not reply by the required date or in some manner makes clear his/her intent not to respond to the notice, send a Notice of Violation or Stop Work Order to whoever is the responsible party. If the responsible party is not the property owner, send the property owner a copy of the notice and make sure it is clear on the Notice of Violation that the property owner has been copied. (For an example of a Notice of Violation, see

Figure 17-1.) Send the Notice of Violation or Stop Work Order via certified mail, return receipt requested. You may post a copy of the Notice of Violation or Stop Work Order on the property. If a problem is found during the construction of a permitted project, you have additional tools:

- You may stop work and suspend all applicable permits. Examine your code of ordinances to make sure that this action is expressly stated in the "Penalties and Enforcement" language. This action allows you to dismiss any contractors and subcontractors that are on the site and notifies other workers who may arrive at the site at a later time or date that they may not commence work. Take photos of the posted notice and the conditions of the site when the notice is posted.

- If applicable, you can withhold the Certificate of Occupancy until the problem is corrected. For a new structure, particularly a residential building, this will delay a closing. For commercial structures, it is important to periodically inspect the building and ensure that business is not conducted before the Certificate of Occupancy is issued.

NOTICE OF VIOLATION

DATE: May 13, 2014

CHRONIC RULE-BREAKER
FLOOD CITY, IA

Case #: COM00-00000
Location of Violation: 123 River Road

Dear Property Owner:

According to the records of the tax assessor, you are an owner of the above-referenced property.

On 4/27/2014, I observed an apparent violation of the Code of Ordinances of the City of Flood City on your property.

Type of Violation: 14-5J-1 No person shall undertake development activity in a flood hazard area without first obtaining a permit from the Building Official.

Corrective Action Required: CEASE ALL ACTIVITY IN THE FLOOD HAZARD AREA. REMOVE FILL MATERIAL THAT WAS PLACED IN THE FLOOD HAZARD AREA. APPLY FOR A FLOODPLAIN DEVELOPMENT PERMIT.

VIOLATION MUST BE ABATED ON OR BEFORE: 5/30/2014

If you believe that you are not in violation of the City Code, please contact this office to review the situation. If you intend to bring the property into compliance with the Code, but cannot meet the stated deadline, please contact this office and we will attempt to work with you on a short extension.

If you do not take the requested action or make other arrangements with this office by the specified date, we will begin formal enforcement action. You will not receive an additional warning before we begin formal enforcement action. Enforcement action may include civil penalties, administrative remedies such as denial or revocation of City permits and licenses, criminal court proceedings, and/or action for an injunction or other court order directing elimination of the violation. An administrative fee of $XX will be assessed for a 1st offense violation that is not abated by the re-inspection date. **All subsequent violations cited under the same code section will be assessed a $XX administrative fee.**

If you wish to discuss any aspect of this order, please call me at 123-456-7890.

Sincerely,

Name
Title

Figure 17-1. Example of a Notice of Violation

17.2.Legal Recourses

If the administrative measures identified above or outlined in your code of ordinances do not bring results, go back to your community's attorney and discuss the next steps. Generally, the attorney will write a letter listing the violations and how the owner can comply. Your attorney may also pursue a municipal infraction or other claim that will be taken to court.

You can help the attorney by having complete records of all correspondence and meetings with the person accused of the violation. Provide your dated photographs showing the violation. Provide the attorney with your Notice of Violation, which identifies what section of the ordinance was violated, when and how, and if appropriate, summarize what was specifically allowed in the approved permit.

You should advise the attorney about what actions can be taken that would bring the project into compliance, in addition to those you cited in the Notice of Violation. Depending on the violation, these actions could include removing the building, retrofitting the building, applying for a variance, or applying for a map revision to remove the structure from the floodplain or floodway. Be cautious in your communications so that you do not represent yourself as a P.E. or surveyor unless you hold those certifications, and your city/county insures you against professional liability.

17.2.1. Fine

A violation of the floodplain ordinance is classified as a misdemeanor. The DNR model ordinances provide for the use of fines as a means of enforcement. Your ordinance should then establish a maximum fine per offense. A simple misdemeanor is punishable by a fine of at least fifty dollars but not to exceed five hundred dollars. The court may also order imprisonment not to exceed 30 days (Code of Iowa, Section 903.1).

Usually, each day a violation continues is considered a separate offense. This approach encourages a quick remedy to the problem. Some communities double the fee for violating the ordinance if construction begins without a permit. Check with your community's attorney for an acceptable fine for a misdemeanor and familiarize yourself with the language in the code for issuing fines. Some communities include "enhanced fines" in their penalties and enforcement language for violations of specific codes.

An appeals process must also be defined, and the procedure for making an appeal stated in the Notice of Violation. If your ordinance is based on zoning authority, the Code of Iowa states that a board of adjustments shall hear and decide appeals from and review any order, requirement, decision, or determination made by an administrative official charged with the enforcement. If your ordinance is not based on zoning authority, the Board of Supervisors or Council usually hears the appeal.

The person or party requesting an appeal must specify the grounds for appeal on a form approved by the city or county. There is no set time period in which the board must hear the appeal; however, the Code requires that a reasonable time be fixed and if there is a time limit for appeal, that information must be included in the Notice of Violation or Stop Work Order. Moreover, "due notice" must be given to the parties once the appeal is scheduled, and a

decision must be rendered within a reasonable time. Once the board has made a finding, it will constitute a final administrative decision, which is subject to judicial review. Note if the approval of an appeal requires variance from your ordinance, DNR approval or concurrence is required.

17.2.2. Recordation

Depending on your ordinance's authority, you may be able to record the violation in the property's deed records. This will inform potential purchasers as well as "cloud the deed", making it hard for the owner to sell the property. This approach is more appropriate for new developments that are likely to be sold in the near future. Another procedure is called *lis pendens*, which is a list maintained by the Clerk of Court of pending cases in which real estate is at issue. Your attorney can file an application and ask the judge for an order to put a case on the *lis pendens*. When a case is on the *lis pendens*, it will be a title objection, and the property will not be sold until the buyer is satisfied that the problem is addressed. A *lis pendens* requires a magistrate or judge to rule in favor of filing the *lis pendens*.

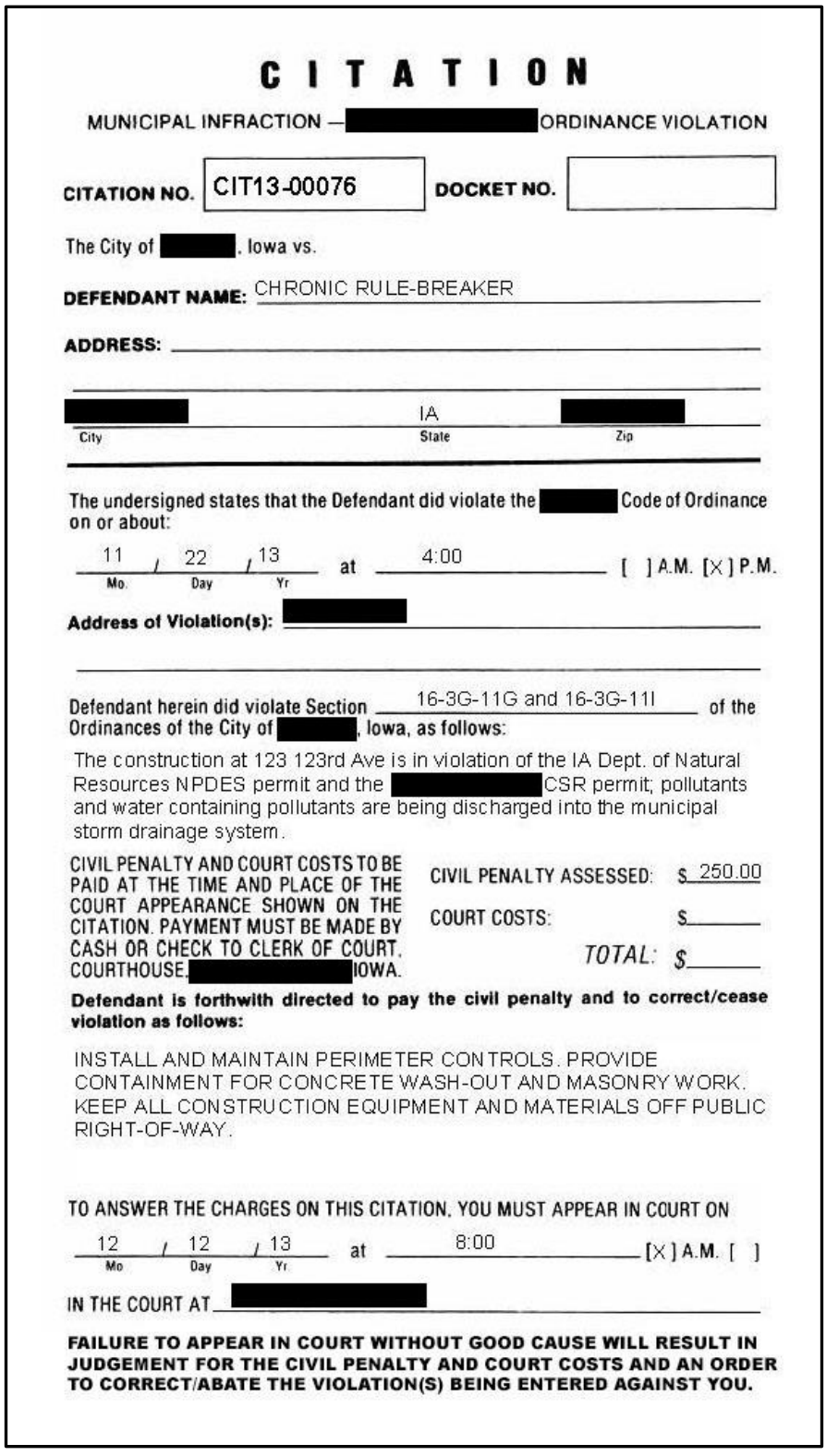
17.2.3. Restraining Orders

A restraining order is an order to stop further non-compliant conduct. A County Board of Supervisors may issue such an order if construction is in violation of any ordinances or other regulations (Code of Iowa, Section 335.23). A City Board of Adjustments must have a restraining order issued through the courts (Code of Iowa, Section 414.16).

17.2.4. Citations

A citation is like a traffic ticket. It contains a fine and cites the specific section of the zoning code or ordinance that was violated. It is a common approach for enforcing local zoning regulations and may be used to enforce floodplain regulations.

The Code of Iowa provides for both cities and counties to define by ordinance that an ordinance violation is a municipal or county *infraction*, which is more severe than a misdemeanor. The Code states that "a county infraction is a civil offense punishable by a civil penalty of not more than $750 for each violation, and if the infraction is a repeat offense a civil penalty not to exceed $1000 for each repeat offense". Cities have similar limits. To use the citation approach, your regulations need to include remedies for violations. The DNR model ordinance does not have this language, and a sample of a citation for violation of a floodplain regulation is included as Figure 17-2.



CITATION

MUNICIPAL INFRACTION — [redacted] ORDINANCE VIOLATION

CITATION NO. CIT13-00076 **DOCKET NO.**

The City of [redacted], Iowa vs.

DEFENDANT NAME: CHRONIC RULE-BREAKER

ADDRESS:

[redacted] IA [redacted]
City State Zip

The undersigned states that the Defendant did violate the [redacted] Code of Ordinance on or about:

11 / 22 / 13 at 4:00 [ ] A.M. [X] P.M.
Mo. Day Yr

Address of Violation(s): [redacted]

Defendant herein did violate Section 16-3G-11G and 16-3G-11I of the Ordinances of the City of [redacted], Iowa, as follows:

The construction at 123 123rd Ave is in violation of the IA Dept. of Natural Resources NPDES permit and the [redacted] CSR permit; pollutants and water containing pollutants are being discharged into the municipal storm drainage system.

CIVIL PENALTY AND COURT COSTS TO BE PAID AT THE TIME AND PLACE OF THE COURT APPEARANCE SHOWN ON THE CITATION. PAYMENT MUST BE MADE BY CASH OR CHECK TO CLERK OF COURT. COURTHOUSE, [redacted] IOWA.

CIVIL PENALTY ASSESSED: $ 250.00

COURT COSTS: $

TOTAL: $

Defendant is forthwith directed to pay the civil penalty and to correct/cease violation as follows:

INSTALL AND MAINTAIN PERIMETER CONTROLS. PROVIDE CONTAINMENT FOR CONCRETE WASH-OUT AND MASONRY WORK. KEEP ALL CONSTRUCTION EQUIPMENT AND MATERIALS OFF PUBLIC RIGHT-OF-WAY.

TO ANSWER THE CHARGES ON THIS CITATION, YOU MUST APPEAR IN COURT ON

12 / 12 / 13 at 8:00 [X] A.M. [ ]
Mo Day Yr

IN THE COURT AT [redacted]

FAILURE TO APPEAR IN COURT WITHOUT GOOD CAUSE WILL RESULT IN JUDGEMENT FOR THE CIVIL PENALTY AND COURT COSTS AND AN ORDER TO CORRECT/ABATE THE VIOLATION(S) BEING ENTERED AGAINST YOU.

Figure 17-2. Sample of a citation for violation of a floodplain regulation

With specific legal authority, a floodplain administrator or zoning administrator is delegated as authorized by the community to *issue* civil citations for infractions.

Upon writing a citation, the administrator may not *serve* the citation but must engage an official of the County in which the citation addressee resides or send the citation by certified mail return receipt requested or by publication in a newspaper. A citation must contain the following information:

- The name and address of the responsible party/defendant
- The description of the infraction attested to by the officer issuing the citation
- The location and time of the infraction
- The amount of civil penalty to be assessed or the alternate relief sought, or both
- The manner, location, and time at which the penalty may be paid
- The time and place of court appearance
- The penalty for failure to appear in court

Once the citation is issued, the matter is tried in the appropriate court based on the amount of the fine.

17.3.Section 1316

Section 1316 of the National Flood Insurance Act authorizes FEMA to deny flood insurance to a property declared in violation of the community's ordinance.

Section 1316 is used when the community has exhausted all other legal means to remedy the violation, and the structure is still non-compliant. Section 1316 is designed to supplement your enforcement work, not replace it. Check with DNR or the FEMA Regional Office on how 1316 has been used.

If invoked under Section 1316, denying flood insurance means:

- The property may be difficult to sell, and impossible to sell for those who rely on a federally insured loan to purchase the property.
- The market value of the property may fall.
- The cost of suffering flood damage without insurance may be too great a risk for the property owner.
- Lending institutions holding the property's mortgage may threaten to foreclose.
- Any permanent reconstruction will not be eligible for Federal disaster assistance. (Note: State funds might still be used if it is in a community's best interest to remove the

structure from the flood hazard area, in spite of any preceding violations of the floodplain regulations).

In some cases, a Section 1316 insurance denial will be sufficient to convince the property owner to correct the violation. Section 1316 also has the advantage of limiting any taxpayer liability if the building is damaged by a flood, as the owner will be ineligible for an insurance claim or disaster assistance.

17.4.Help

You are not alone in wanting your ordinance enforced. Help in dealing with violations is often available from other sources. Your first point of contact can be DNR. The staff will work with you to determine the best way to deal with a particular violation and to provide expert advice.

If the project is in a floodway (or a floodplain where no floodway has been mapped), construction without a DNR permit may be a violation of State law. If the project is in a wetland area, development without a Corps of Engineers permit may be a violation of Federal law. You should contact DNR and the Corps to ascertain whether the project is a violation. If so, discuss mutual enforcement actions.

It is important that you keep DNR and FEMA apprised of your problems and progress. DNR and FEMA staff can assist you in pursuing a violation.

17.5.Resolving Violations

What do you do when the owner of a property in violation of your regulations agrees (or is ordered by a court) to bring the project into compliance? Three scenarios are reviewed to show how problems could be resolved.

17.5.1. Example Violation #1 - Fill in the Floodway Without a Permit

The property owner placed fill into the floodway. Here are some ideas on how you could resolve this type of case.

Abatement Option 1: Remove the fill. If removal of the fill is the option that is used, it may entail more than removing a pile of dirt. If the fill has been graded and the original “natural” elevation can no longer be discerned, you will have to determine (as near as possible) the original elevations and slope. Then, you must require that the violator remove the fill only to that elevation and slope.

Abatement Option 2: Leave the fill and get a permit. You could agree to leave the fill in place and have the violator apply for a permit, supply a “no-rise certification”, and get a LOMR. If so, give them copies of all pertinent application forms and establish a specific date by which you must receive all applications and data. You then need to coordinate your response with all other applicable agencies and inform DNR and FEMA in writing of your actions. You may also want to contact your District Corps of Engineers to ensure that their permit requirements have been met, if applicable. You must monitor the situation and be ready to fall back to Abatement Option 1 if the violator fails to meet their part of the agreement.

If you do not receive the permit application and LOMR data as agreed, then the violation must be considered active, and all violation notices should remain in effect until the LOMR, and the permit application are received. You should inform the violator that the violation is still active, provide a second due date for the submission of the data, and inform them that if the information is not received, the community will issue a citation and pursue enforcement actions through litigation.

Abatement Option 3: Apply for a variance. If the developer can supply proof that even though the project increases flood heights, it will have no adverse impact on others, he could apply for a variance. He will still need to submit application forms, and the variance will need approval by DNR. If this option is pursued, the developer will need to apply for a LOMR to reflect the new flooding conditions.

17.5.2. Example Violation #2 - House Built too Low

A single-family dwelling was not constructed to the required elevation. The lowest floor is 3 feet below the minimum flood protection elevation and is 2 feet below the 100-year flood elevation (in violation of both the local ordinance and FEMA regulations).

Abatement Option 1: Elevate. If the structure was built on a crawlspace, elevation would be the best option. If the structure has been built on a slab, elevation may be an option, but it would probably be more expensive. Special care must be taken to ensure that the new elevation meets the elevation requirements of the ordinance.

If the structure is built over a basement, then the first floor may be at or above the minimum flood protection elevation. If this is the case, you may decide to require that the basement be abandoned and filled. This option could be accomplished by moving all heating, plumbing, and utilities and utility equipment to the first floor or higher, and backfill the basement. If the basement is filled in, the final elevation of fill must be at or above the lowest exterior ground elevation adjacent to the building.

Abatement Option 2: Allow to remain. If you agree that the structure should remain on the site as is, then several actions should be taken:

1. You must notify the property owner that their flood insurance premiums may increase, and increased premiums are possible for future buyers of the home.

2. The violator must be required to floodproof the structure to the maximum extent possible and submit a certified Elevation Certificate, a Floodproofing Certificate, and a copy of a letter requesting rating or re-rating of the structure for flood insurance purposes to the community and DNR. FEMA's Technical Bulletin series including *Non-Residential Floodproofing Requirements and Certification for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program* and *Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program* provide guidance on floodproofing techniques. Keep in mind, dry floodproofing is not an option for single-family homes or multifamily dwellings.

3. The violator should file a notice with the County Recorder notifying any future purchasers that the property does not conform to the floodplain development requirements of the community. A copy of the notice should also be filed with the title abstract. This option should be considered only if all the requirements of the ordinance cannot be met.

4. The community should submit the appropriate information to FEMA so the building will be a “submit for rate” property, i.e., its flood insurance premiums will reflect the true hazard that it is exposed to.

5. The variance procedure should be used, and records kept to document that the building is not a legal violation of your regulations. The variance will also need approval by DNR.

Abatement Option 3: Demolish. Although demolition would not normally be required for a structure with the lowest floor (including basement) only one or 2 feet below the BFE outside of a designated floodway, this is an option that must be considered. If the structure lies in a floodway or more than 2 feet below the BFE, demolition becomes a more appropriate option.

Note: If a pattern of a lack of enforcement is found during a CAV, FEMA may consider one of the compliance actions discussed in Section 2.6. You need to show that you are engaged in enforcing floodplain regulations in your community and not relying on the denial of a federally insured loan or denial of flood insurance to enforce State and local regulations.

18. Records

18.1. Introduction

Records show what you approved and what you told the developer, forming a paper trail needed for administrative or legal proceedings related to development projects. Such records are vital in case the project is built-in violation of your ordinance or the conditions of a permit. They also give future owners information about the property.

Records are also checked by FEMA or the Iowa DNR to determine if your community is in full compliance with the NFIP. Good record keeping is also part of the criteria used to award points in the CRS program.

This section reviews what records need to be maintained to meet your community's obligation to the NFIP and the DNR.

18.2. Permit File

Your community should have a permit record system that is keyed to a geographical identifier (not just a building permit number) such as: street address, subdivision, lot and block number, township, section and range, or county assessor's property ID number.

You should have a unique identifier for each permit application. The identifier may be a permit number or a case number.

18.2.1. Contents

Permit files and electronic records should contain copies of these items, as appropriate:

- The permit application form and all attachments, including the site plan;
- All correspondence pertinent to the project;
- Flood and floodway data prepared by the developer;
- Engineering analyses of floodway encroachments and watercourse alterations;
- Special engineering designs for enclosures below the base flood (also known as the 1% annual chance or 100 year flood);
- Any variances or appeals proceedings;
- Records of inspections of the project while under construction;

> ***Lowest Floor—****The lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure (that is not a basement) is not the lowest finished floor if the enclosure is built as required in the local ordinance.*

- Documentation of the “as-built” lowest floor elevation of all new and substantially improved buildings (ideally in the form of a FEMA Elevation Certificate);
- Documentation of the area of openings below the lowest floor, for structures built on crawlspaces and small accessory structures;
- Certification of the elevation to which any non-residential building has been floodproofed; and
- Certificates of compliance or occupancy.

Keeping these records is a requirement to participate in the NFIP; there is no statute of limitations as to how long they should be kept. You may want to keep a separate log, record, or file of floodplain permits so you can readily retrieve those floodplain projects to show FEMA or the DNR staff for CRS credit.

18.2.2. File Retention

It is not necessary to keep the entire building plans and other documents longer than is required for local code purposes. However, here are some reasons to keep floodplain permit related materials (in a retrievable format) indefinitely:

- If you allow below the BFE flood enclosures, you will need the approved ground floor plan of each building in case future owners modify that area (see Section 11.3);
- You need to keep track of each building addition or expansion so you can tell when the building has been increased by 25 percent or more (see Sections 12.2 and 12.3.3);
- If a flood insurance rating issue arises, you need to be able to show whether the building was originally built according to your regulations (see Section 19.3.2); and
- To maintain your current rating or achieve a higher rating, under the CRS (see Section 20).

Any of these situations could arise years from now, but they would impact your office’s obligation to the State and the NFIP.

18.3.Elevation Certificate

Your permit file needs an official record that shows how high new buildings and substantial improvements were elevated. This is needed to show compliance with the ordinance and for may assist the property owner with obtaining a more accurate policy rating.

18.3.1. FEMA’s Form

For new and substantially improved structures in your community’s flood hazard areas, use FEMA’s Elevation Certificate Form (FEMA Form 81-31). A blank copy of the latest form is in Section 27.

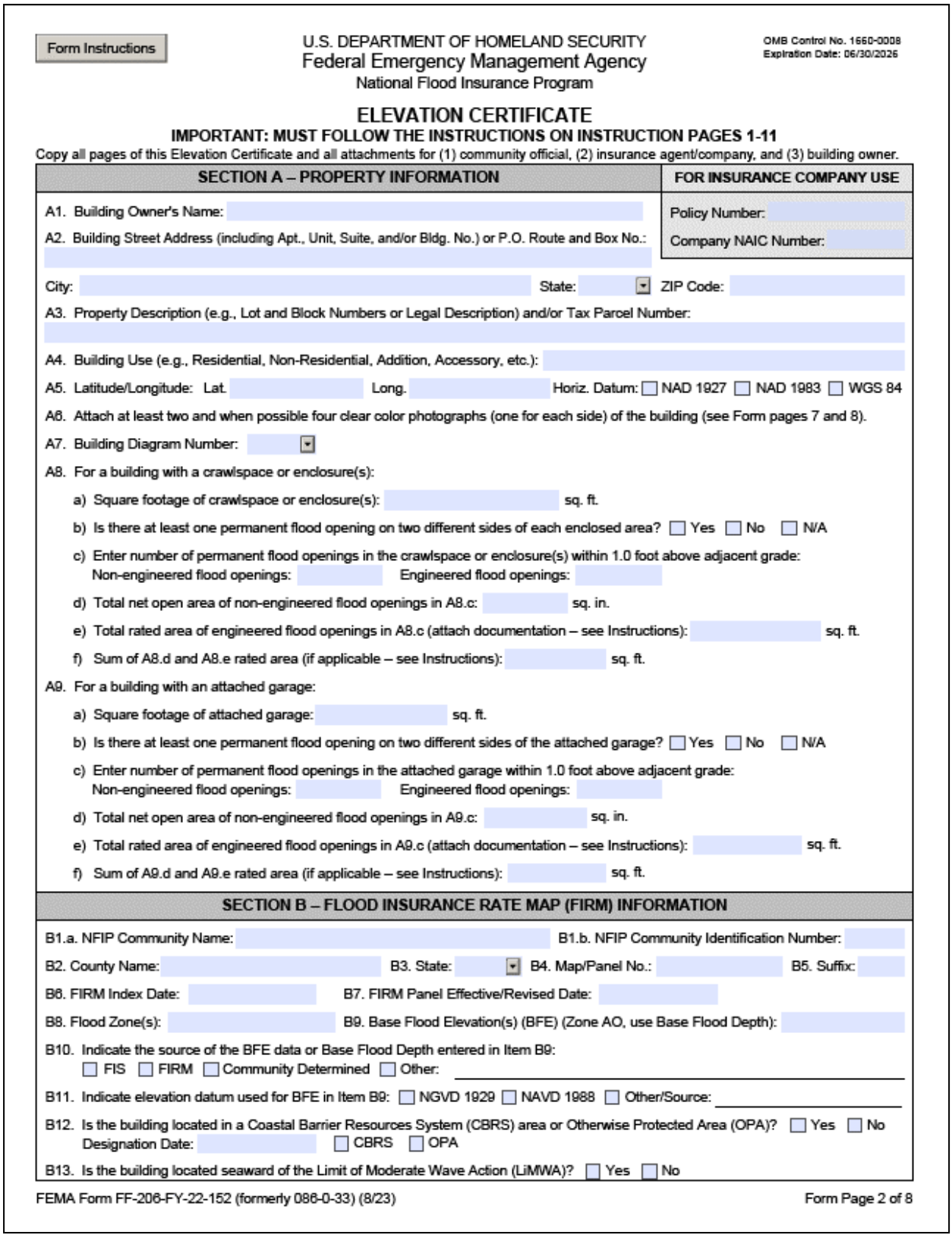
If your community is participating in the CRS, the most recent FEMA form must be used for new construction and substantial improvements to existing buildings. Insurance agents writing flood insurance policies may also use the form to properly rate buildings in the floodplain.

The FEMA Elevation Certificate is a multi-page packet, with 11 pages of instructions and illustrations dedicated to how to complete it. The elevation certificate itself is 8 pages long and includes sections for elevations, signatures, photos, and drawings to indicate building construction type. As a community official, you will not likely complete an elevation certificate, but you should understand the information that is found on one.

Figure 18-1. FEMA Elevation Certificate packet

Note: If you use the software version or keep elevation records on a computer database, you also need to keep the original signed hard copy of the surveyor's certification.

The Elevation Certificate is used for the purposes of certifying compliance with floodplain regulations for elevating and floodproofing; it is used to establish flood insurance premiums for structures in flood hazard areas; and it is used to obtain a LOMA when a property owner believes that a structure is incorrectly categorized as being in a flood hazard area. In cases where a property owner wants to apply for a LOMA, the Elevation Certificate only needs to record two elevations: the elevation of the lowest grade around the structure (LAG) and the elevation of the 1% chance annual flood.



Form Instructions

U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB Control No. 1660-0008
Expiration Date: 06/30/2026

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION

FOR INSURANCE COMPANY USE

Policy Number:

Company NAIC Number:

A1. Building Owner's Name:

A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: State: ZIP Code:

A3. Property Description (e.g., Lot and Block Numbers or Legal Description) and/or Tax Parcel Number:

A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.):

A5. Latitude/Longitude: Lat. Long. Horiz. Datum: ☐ NAD 1927 ☐ NAD 1983 ☐ WGS 84

A6. Attach at least two and when possible four clear color photographs (one for each side) of the building (see Form pages 7 and 8).

A7. Building Diagram Number:

A8. For a building with a crawlspace or enclosure(s):

a) Square footage of crawlspace or enclosure(s): sq. ft.

b) Is there at least one permanent flood opening on two different sides of each enclosed area? ☐ Yes ☐ No ☐ N/A

c) Enter number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade:
Non-engineered flood openings: Engineered flood openings:

d) Total net open area of non-engineered flood openings in A8.c: sq. in.

e) Total rated area of engineered flood openings in A8.c (attach documentation – see Instructions): sq. ft.

f) Sum of A8.d and A8.e rated area (if applicable – see Instructions): sq. ft.

A9. For a building with an attached garage:

a) Square footage of attached garage: sq. ft.

b) Is there at least one permanent flood opening on two different sides of the attached garage? ☐ Yes ☐ No ☐ N/A

c) Enter number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade:
Non-engineered flood openings: Engineered flood openings:

d) Total net open area of non-engineered flood openings in A9.c: sq. in.

e) Total rated area of engineered flood openings in A9.c (attach documentation – see Instructions): sq. ft.

f) Sum of A9.d and A9.e rated area (if applicable – see Instructions): sq. ft.

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1.a. NFIP Community Name: B1.b. NFIP Community Identification Number:

B2. County Name: B3. State: B4. Map/Panel No.: B5. Suffix:

B6. FIRM Index Date: B7. FIRM Panel Effective/Revised Date:

B8. Flood Zone(s): B9. Base Flood Elevation(s) (BFE) (Zone AO, use Base Flood Depth):

B10. Indicate the source of the BFE data or Base Flood Depth entered in Item B9:
☐ FIS ☐ FIRM ☐ Community Determined ☐ Other:

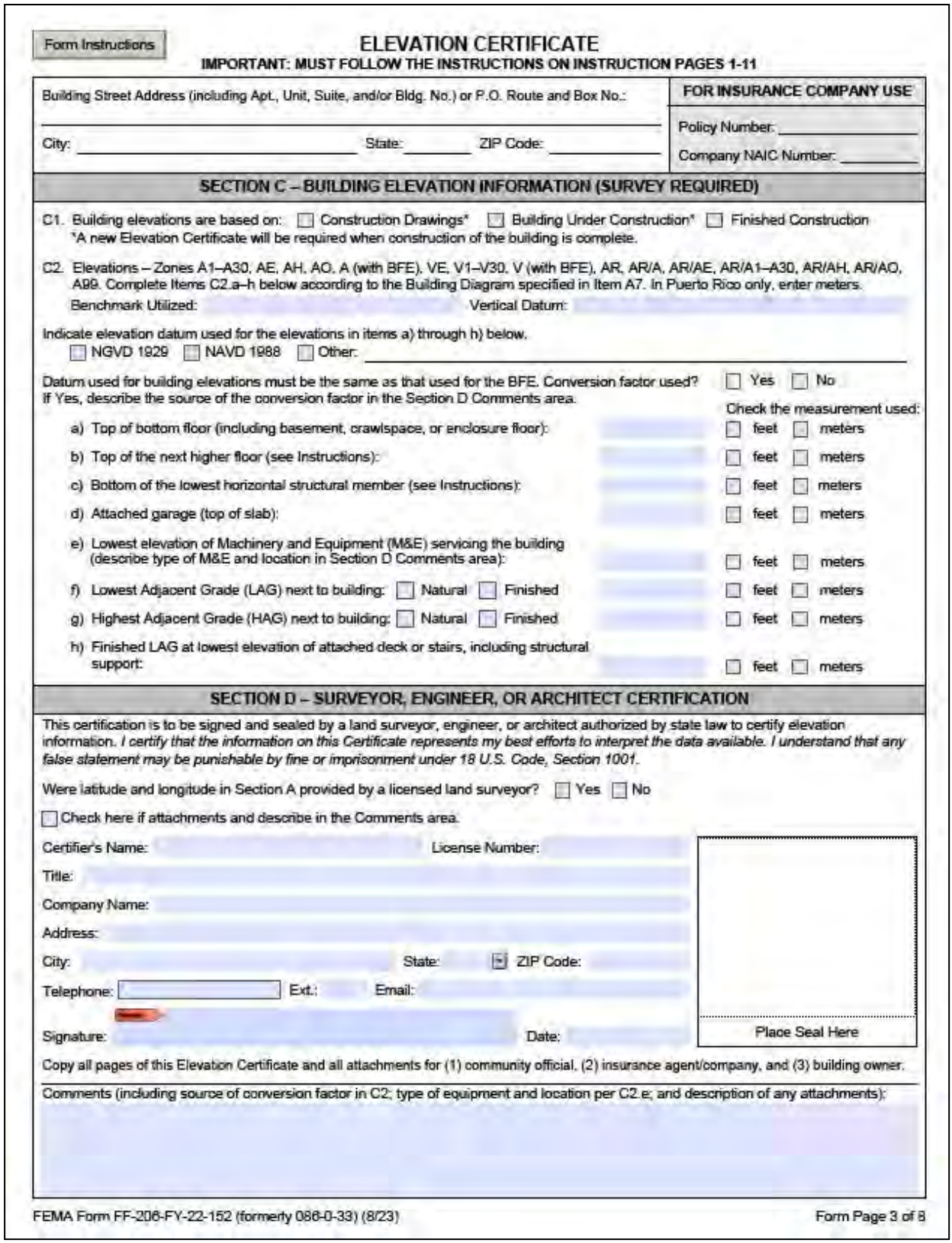
B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source:

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☐ No
Designation Date: ☐ CBRS ☐ OPA

B13. Is the building located seaward of the Limit of Moderate Wave Action (LiMWA)? ☐ Yes ☐ No

FEMA Form FF-206-FY-22-152 (formerly 086-0-33) (8/23) Form Page 2 of 8

Figure 18-2. FEMA Elevation Certificate (page 1)



Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: State: ZIP Code:

FOR INSURANCE COMPANY USE

Policy Number:

Company NAIC Number:

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, AO, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO, A99. Complete Items C2.a–h below according to the Building Diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: Vertical Datum:

Indicate elevation datum used for the elevations in items a) through h) below.
☐ NGVD 1929 ☐ NAVD 1988 ☐ Other:

Datum used for building elevations must be the same as that used for the BFE. Conversion factor used? ☐ Yes ☐ No
If Yes, describe the source of the conversion factor in the Section D Comments area.

	Check the measurement used:
a) Top of bottom floor (including basement, crawlspace, or enclosure floor):	☐ feet ☐ meters
b) Top of the next higher floor (see Instructions):	☐ feet ☐ meters
c) Bottom of the lowest horizontal structural member (see Instructions):	☐ feet ☐ meters
d) Attached garage (top of slab):	☐ feet ☐ meters
e) Lowest elevation of Machinery and Equipment (M&E) servicing the building (describe type of M&E and location in Section D Comments area):	☐ feet ☐ meters
f) Lowest Adjacent Grade (LAG) next to building: ☐ Natural ☐ Finished	☐ feet ☐ meters
g) Highest Adjacent Grade (HAG) next to building: ☐ Natural ☐ Finished	☐ feet ☐ meters
h) Finished LAG at lowest elevation of attached deck or stairs, including structural support:	☐ feet ☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by state law to certify elevation information. *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 fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No

☐ Check here if attachments and describe in the Comments area.

Certifier's Name: License Number:

Title:

Company Name:

Address:

City: State: ZIP Code:

Telephone: Ext.: Email:

Signature: Date:

Place Seal Here

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including source of conversion factor in C2; type of equipment and location per C2.e; and description of any attachments):

FEMA Form FF-206-FY-22-152 (formerly 086-0-33) (8/23) Form Page 3 of 8

Figure 18-3. FEMA Elevation Certificate (page 2)

The local permit official is responsible for ensuring that an Elevation Certificate is obtained from the property owner for all new or substantially improved buildings. Part or all of the form may be completed by a land surveyor, engineer, architect, or local official authorized by ordinance to provide floodplain management information. A registered surveyor must complete Section C – Building Elevation Information and provide their certification in Section D.

The permit official should review the certificate to ensure that it is complete and that Sections A and B (on property and map information) are correct. This is especially important for local officials in CRS communities. A community with a record of accepting incomplete and/or erroneous Elevation Certificates is at risk of losing CRS credits and potentially CRS eligibility if a clear pattern of issues is uncovered. Although it is optional, the local permit official may consider completing Section G as it contains information that helps determine if a building is compliant.

18.3.2. Annexations

The FEMA Elevation Certificate form is self-explanatory. One problem arises when a city annexes SFHAs in the unincorporated areas of the county. This situation can lead to considerable confusion as to flood zone determination, as well as knowing which community number and panel numbers should be used on Elevation Certificates and other NFIP documents.

Many newer flood maps are prepared in countywide format—that is, multiple communities share the same map panel. In cases where a countywide map has not been produced, use the following procedure for newly annexed properties in flood hazard areas:

- *Flood zone determination:* If the subject property is located within areas annexed from the county, use the county flood maps to determine the appropriate flood zone;

- *Community Identification Number:* In item B1 of Section B of the FEMA form (“NFIP Community Name & Number”), use the municipality’s NFIP ID number once a property is annexed; and

- *Flood Map Panel Number:* For property located in an annexed area, for item B4 of Section B (“Map and Panel Number”), use the entire county ID and panel number—“370087 0005”, not just “0005”. For sites within the “area not included”, state “No NFIP Map”. For items B5-B7, refer to the county’s map.

18.4. Floodproofing Certificate

Floodproofing means making a building watertight or substantially impermeable to floodwaters. It is an option only allowed for non-residential buildings. Buildings that are a mix of residential and non-residential are classified as non-residential, as long as the majority of the floor area is non-residential. Non-residential floor area includes enclosed parking areas as well as commercial floor area.

Designs for a floodproofed building must account for flood warning time, rate-of-rise of floodwaters, uses of the building, mode of entry to and exit from the building and the site, floodwater velocities, flood depths, debris impact potential, and flood frequency.

FEMA's Technical Bulletin 3-93, Non-Residential Floodproofing Requirements and Certification for Buildings Located in Special Flood Hazard Areas, has a detailed discussion on each of these considerations.

For insurance rating purposes, the building's floodproofed design elevation must be at least one foot above the 1% annual chance flood elevation to receive rating credit. If floodproofed only to the 1% annual chance flood elevation, the floodproofing credit cannot be used, resulting in higher flood insurance rates.

44 CFR Sections 60.3(B)(5) and (c)(4) require the community to obtain and maintain a licensed professional engineer's certification that a non-residential building was properly floodproofed. The one-page FEMA Floodproofing Certificate included in Section 27 fulfills NFIP insurance rating needs as well as floodplain management requirements.

Copy all pages of this Dry Floodproofing Certificate and all attachments for 1) community official, 2) insurance agent/ company, and 3) building owner. The dry floodproofing of non-residential buildings and the non-residential portions of mixed-use buildings may be permitted as an alternative to elevating to or above the Base Flood Elevation (BFE); however, a dry floodproofing design certification is required. This form is to be used for that certification. Dry floodproofing of a residential building does not alter a community's floodplain management elevation requirements or affect the insurance rating unless the community has been issued an exception by FEMA to allow dry floodproofed residential basements. The permitting of a dry floodproofed residential basement requires a separate certification specifying that the design complies with the local floodplain management ordinance.

PROPERTY INFORMATION

Building Owner's Name: _____

Building Street Address (Including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.: _____

City: _____ State: ____ ZIP Code: _____

Property Description (e.g., Lot and Block Numbers, or Legal Description) and/or Tax Parcel Number: _____

Building Use (e.g., Non-Residential, Mixed Use, Addition, Accessory, etc.): _____

Latitude/Longitude: Lat. _____ Long. _____

Horizontal Datum: ☐ NAD 1927 ☐ NAD 1983 ☐ WGS 84

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION I – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

NFIP Community Name: _____ NFIP Community Identification Number: _____

County Name: _____ State: ____ Map/Panel Number: _____ Suffix: _____

FIRM Index Date: _____ FIRM Panel Effective/Revised Date: _____ Flood Zone(s): _____

BFE(s) (Zone AO, use Base Flood Depth (BFD)): _____

Indicate the source of the BFE data or BFD entered above: ☐ Flood Insurance Study (FIS) ☐ FIRM

☐ Community Determined ☐ Other: _____

Indicate elevation datum used for BFE shown above: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

Is a Limit of Moderate Wave Action (LiMWA) shown on the FIRM? ☐ Yes ☐ No

If Yes, is the property located in the Coastal A Zone [area between the LiMWA and Zone V boundary (or shoreline)]? ☐ Yes ☐ No

Is the property located in a floodway? ☐ Yes ☐ No If Yes, provide the velocity at the building location: _____

Is the property located in an alluvial fan? ☐ Yes ☐ No

If Yes, provide the depth at the building location: _____ and velocity: _____

SECTION II – DRY FLOODPROOFED DESIGN CERTIFICATION

(By a Registered Professional Engineer or Architect licensed in the State where the building is located)

(**Note**: For insurance rating purposes in all zones except for B, C, D, or X, the building's dry floodproofed design elevation must be at least one foot above the BFE to be considered for floodproofing credit. For B, C, D, or X Zones, the building's dry floodproofed design elevation must be at least two feet above the natural HAG to be considered for floodproofing credit. If the building is not dry floodproofed to the above-mentioned standards, then the building will be ineligible for floodproofing credit. See the Instructions section for information on documentation that must accompany this certificate if being submitted for flood insurance rating purposes.)

Briefly list measures incorporated into the design to meet the performance criteria for dry floodproofing and attach calculations showing the structure is designed with structural components that have the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy and will be watertight and substantially impermeable to the passage of water.

Figure 18-4. FEMA Floodproofing Certificate

19. Flood Insurance

19.1.Introduction

One of the primary reasons for your community participating in the NFIP is to make insurance available for people who want to protect themselves financially from flood hazards. This section reviews how the insurance aspect of the NFIP works. Insurance rates and coverage are dependent on a number of variables related to how and where a building is constructed and whether or not it is in compliance with community floodplain management requirements. It also covers flood insurance policies: what's covered, what's not covered, when a policy must be bought, and other rules. This is important information for the local permit administrator to know because some construction decisions affect what is eligible for insurance coverage. The definitive source of flood insurance information will always be the insurance agent, or FEMA through www.FloodSmart.gov.

All of the 739 communities in Iowa that participate in the NFIP are in the Regular Phase. Because no communities remain in the Emergency phase, this section only discusses the Regular Phase provisions.

Check out these resources for more information:

Answers to Questions about the National Flood Insurance Program (questions 21–66 cover the topics in this section).

Local insurance agents should have additional references, including FEMA's NFIP *Flood Insurance Manual* and Agents.FloodSmart.gov.

The general public should use www.FloodSmart.gov to assist in finding an agent and for general insurance information.

19.1.1. Insurance Companies

Flood insurance policies are obtained through local property insurance agents. The agents may sell a policy through one of the Write Your Own insurance companies or a "direct" policy through FEMA. Both approaches will result in the issuance of a "Standard Flood Insurance Policy" (SFIP) that meets all the requirements and rates set by FEMA.

If an insured property is flooded, the property owner contacts his or her insurance agent. The agent arranges for an adjuster to review the damage and work with the insured to settle a claim.

Property owners always work through their insurance agents—they do not need to deal with FEMA.

19.2.Coverage

Flood insurance coverage is provided for insurable buildings and their contents.

19.2.1. Building Coverage

Building coverage is for the structure. This includes all things that typically stay with the building when it changes ownership, including:

- Utility equipment, such as a furnace or water heater;
- Wall-to-wall carpeting;
- Built-in appliances; and
- Wallpaper and paneling.

Ten percent of a residence's building coverage may apply to a detached garage or carport. Other appurtenant structures must be insured under a separate policy.

19.2.2. "Building" Defined

A "building" is defined for flood insurance purposes as:

- A structure with two or more outside rigid walls and a fully secured roof, that is affixed to a permanent site.
- A manufactured (aka a mobile) home—a structure built on a permanent chassis, transported to its site in one or more sections, and affixed to a permanent foundation.
- A travel trailer without wheels, built on a chassis and affixed to a permanent foundation, that is regulated under the community's floodplain management and building ordinances or laws.

To be insurable a building must be principally above ground. "Principally above ground" means at least 51 percent of the actual cash value of the structure, including machinery and equipment (but not land value), is above ground.

This definition is similar to, but not quite the same as, the definition for "building" or "structure" used for floodplain management and defined in Section 11.

Examples of things that are not considered insurable buildings include:

- Gas or liquid storage tanks
- A structure with more than 50 percent of its value underground, such as an underground pumping station, well, or septic tank
- Tents
- Tennis and swimming pool bubbles
- Swimming pools (indoor or outdoor)
- Open pavilions for picnic tables and bleachers
- Carports with open sides

- Sheds on skids that are moved to different construction sites
- Licensed vehicles, campers, and travel trailers (unless permanently attached to the site)
- A building declared in violation of a State or local law (see Section 17.3 on Section 1316)
- Buildings over water that were built after October 1, 1982
- Landscaping, crops, and other items outside of a building

19.2.3. Contents Coverage

Contents coverage is for the removable items inside an insurable building. A renter can purchase a policy for contents coverage, even if there is no structural coverage.

Certain contents are not insurable. These include:

- Animals and livestock
- Licensed vehicles
- Jewelry, artwork, furs, and similar items valued at more than $2,500
- Money or valuable papers
- Items in a structure that does not qualify as an “insurable building”, such as garden tools stored in an open carport

19.2.4. Enclosures

There is limited coverage in enclosures below the lowest floor of an elevated post-FIRM building (including factory-built housing):

- Contents coverage in these enclosures is limited to portable and window type air conditioning units, clothes washers and dryers and food freezers, other than walk-in, and food in any freezer.
- The only structural coverage is for the required utility connections and the foundation and anchoring system required to support the building.

It is therefore in the best interest of the permit official to ensure that furnaces and other items that can be damaged by floodwater are not allowed in a crawlspace or other enclosure below an elevated lowest floor.

Specific information about coverage in enclosures can be found in the Flood Insurance Manual on page 45, Section 2.13, and the NFIP Claims Manual on page 128.

19.2.5. Basements

A basement is a floor that is below grade on all sides. There is limited coverage for basements as listed in Figure 19-1.

The NFIP has limited coverage for basements and the below grade floors of tri-levels. The NFIP defines “basement” as “Any area of the building, including any sunken room or sunken portion of a room, having its floor below ground level (subgrade) on all sides” (Section II of the SFIP, August 1, 2009).

Coverage under building or structural coverage is limited to:

a. Any of the following items, if installed in their functioning locations and, if necessary for operation, connected to a power source:

1. Central air conditioners;
2. Cisterns and the water in them;
3. Drywall for walls and ceilings in a basement and the cost of labor to nail it, unfinished and un-floated and not taped, to the framing;
4. Electrical junction and circuit breaker boxes;
5. Electrical outlets and switches;
6. Elevators, dumbwaiters, and related equipment, except for related equipment installed below the Base Flood Elevation (BFE) after September 30, 1987;
7. Fuel tanks and the fuel in them;
8. Furnaces and hot water heaters;
9. Heat pumps;
10. Nonflammable insulation in a basement;
11. Pumps and tanks used in solar energy systems;
12. Stairways and staircases attached to the building, not separated from it by elevated walkways;
13. Sump pumps;
14. Water softeners and the chemicals in them, water filters, and faucets installed as an integral part of the plumbing system;
15. Well water tanks and pumps;
16. Required utility connections for any item in this list; and
17. Footings, foundations, posts, pilings, piers, or other foundation walls and anchorage systems required to support a building.

b. Clean-up. (Section III.A.8).

Coverage under personal property coverage “is limited to the following items, if installed in their functioning locations and, if necessary for operation, connected to a power source:

1. Air conditioning units, portable or window type;
2. Clothes washers and dryers; and
3. Food freezers, other than walk-in, and food in any freezer. (Section III.B.3.)

Figure 19-1. Flood insurance coverage for basements

19.2.6. Increased Cost of Compliance (ICC) Coverage

The SFIP includes coverage for the increased cost to repair/rebuild a structure that has been substantially damaged by flood so as to bring it into conformance with requirements of the community's local floodplain management ordinances.

> ICC coverage is mandatory for all SFIPs except for (1) those sold in Emergency Program communities, (2) contents-only policies, (3) Dwelling Forms on individual condominium units within a multi-unit building, and (4) Group Flood Insurance. In a multi-unit condominium building, ICC coverage is only available through the condominium association's flood policy.

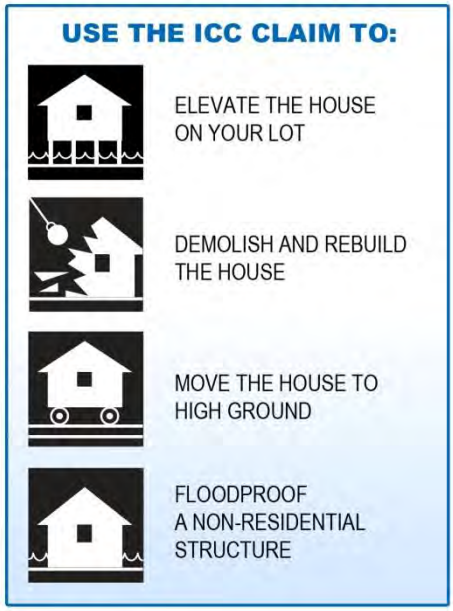


Figure 19-2. ICC claim use examples

The current ICC coverage limit is $30,000 per building or, for non-condominium townhouse construction, per unit, per policy. This coverage amount is in addition to the amount of building coverage purchased. However, for any base flood event, the amount of combined loss payment received from building coverage and ICC coverage cannot exceed the maximum program limits of $250,000 for residential structures and $500,000 for non-residential structures.

An ICC claim can be filed only if the structure has been substantially damaged by a flood. ICC coverage can be used for elevating, moving, or demolishing damaged structures that qualify for the coverage. More information on ICC coverage is available through FEMA's ICC webpage. FEMA has also developed the brochure, *Increased Cost of Compliance Coverage: How You Can Benefit*, which you may wish to distribute to your residents following a flood.

*For residents to be eligible to claim ICC funds for a **"repetitively damaged"** structures, your community's ordinance must include language addressing either "cumulative substantial damage" or "repetitive loss". Examples of acceptable language are shown in Figure 12-13.*

19.2.7. Amount of Coverage

Insurance maximum coverage varies in residential and non-residential structures. The maximum amounts available are shown in Figure 19-3.

Building Occupancy	Building Coverage	Contents Coverage
Single-Family Dwelling		
Single-Family Home	$250,000	$100,000
Residential Manufactured/Mobile Home	$250,000	$100,000
Residential Unit		
Residential Condominium Unit (in Residential Building)	$250,000	$100,000
All Other Building Descriptions	None	$100,000
Multifamily Building		
Two-to-Four Family Building	$250,000	$100,000
Other Residential Building	$500,000	$100,000
Residential Condominium Building		
Residential Condominium Building	Not to exceed the lesser of: The building's replacement cost value; or Total number of units x $250,000	$100,000
Non-Residential		
Non-Residential Building	$500,000	$500,000
Non-Residential Manufactured/Mobile Building	$500,000	$500,000
Non-Residential Unit	None	$500,000

Figure 19-3. Amount of available insurance

Note: This table is for communities in the Regular Phase of the NFIP. If your community has a FIRM and is participating in the NFIP, it is in the Regular Phase. Coverage amounts are as of October 1, 2024.

19.2.8. Waiting Period

In most cases, a 30-day waiting period follows the purchase of a flood insurance policy before it goes into effect. There are some exceptions when a policy goes into effect immediately, e.g., when a policy is purchased at the time of a new mortgage or title transfer and when a new FIRM puts a property into the SFHA.

The objective of the 30-day waiting period is to encourage people to keep a policy at all times. FEMA does not want people to wait for the river to rise before they buy their coverage. Also, to

be on a sound financial basis, the NFIP needs everyone at risk to pay their share of the premiums.

Many people have found out about the waiting period the hard way. Your community might want to consider publicizing the availability of flood insurance so residents can be protected when a flood comes.

19.3.Rating Buildings Under Risk Rating 2.0

Implementation of Risk Rating 2.0 began in October 2021 and was fully in effect for any new or renewed insurance policy on April 1, 2022. Risk Rating 2.0 represents a complete change in the methodology used to rate a policy from the legacy rating methodology, which was originally implemented in the 1970s and has not been updated much since. The intent of Risk Rating 2.0 is to calculate a flood insurance premium that reflects the actual risk posed to an individual property, to produce rates that are more equitable, and to inform policyholders of their true flood risk.

Under Risk Rating 2.0, the rating of structures considers the following parameters:

- Where it is built. The property address is used to determine the following:
    - A building's distance to flooding sources
    - The ground elevation
    - Other characteristics such as whether or not the community where the building is located participates in the CRS
- How it is built. Knowing the physical characteristics of a building helps to understand the risk and impacts it has to flood events
    - Building Occupancy
    - Foundation Type
    - First Floor Height
    - Number of Floors
    - Unit Location
    - Construction Type
    - Flood Openings
    - Machinery and Equipment
- What is Built and Covered
    - Building Replacement Cost Value

- Building and Contents Coverage
- Building and Contents Deductible

Understanding that the factors used to rate an NFIP policy are much more complex than they were under the legacy rating system. The best way to find out what a policy will cost is to contact an insurance agent who can sell an NFIP policy.

State profiles for Iowa and the current status of NFIP policies can be found on FEMA's website at: Iowa State NFIP Profile

More information on Risk Rating 2.0 can be found here: Risk Rating 2.0

19.4. The Mandatory Purchase Requirement

The Flood Disaster Protection Act of 1973 and The National Flood Insurance Reform Act of 1994 strengthened a key requirement of the NFIP: flood insurance is a prerequisite for receiving money from a Federal agency or a federally supported financial program.

19.4.1. Where It Applies

The mandatory purchase requirement applies to all forms of federal or federally related financial assistance for buildings located in SFHAs. This requirement affects loans and grants for the purchase, construction, repair, or improvement of any publicly or privately owned building in the SFHA, including machinery, equipment, fixtures, and furnishings contained in such buildings.

Financial assistance programs affected include loans and grants from agencies such as the U.S. Department of Veterans Affairs, U.S. Department of Agriculture Rural and Housing Services, Federal Housing Administration, Small Business Administration, and FEMA.

The requirement applies to secured mortgage loans from financial institutions, such as commercial lenders, savings and loan associations, savings banks, and credit unions that are regulated, supervised, or insured by Federal agencies such as but not limited to the Federal Deposit Insurance Corporation, the National Credit Union Administration, and the Farm Credit Administration. The requirement comes into play if a loan is made, increased, renewed, or extended—at any of those steps, the lender must check to see if the building is in an SFHA at that time. For example, a building in an X Zone when the original mortgage was taken out would be affected if the area is remapped in the SFHA and the loan is later refinanced. For example, a building in an X Zone when the original mortgage was taken out would be affected if the area is remapped in the SFHA and the loan is later refinanced. When new mapping projects go effective, lenders will review their portfolios to understand if any changes have occurred to SFHA status of properties with loans they manage.

The requirement also applies to all mortgage loans purchased by Fannie Mae or Freddie Mac in the secondary mortgage market.

19.4.2. How It Works

Before a person can receive a loan or other financial assistance from one of the affected agencies or lenders, there must be a check to see if the building is in an SFHA on the FIRM. It is the agency's or the lender's responsibility to check the FIRM to determine if the building is in an SFHA, although many communities provide assistance.

If the building is in an SFHA, the agency or lender is required by law to make the purchase of a flood insurance policy a condition of the loan. Federal law requires structural coverage equal to the amount of the loan (or other financial assistance) or the maximum amount available, whichever is less.

Note: Many people who were required to get building coverage do not realize that their contents are not covered unless they voluntarily purchase contents coverage. A local public information program would help residents by informing them of this and other basic facts, such as the 30-day waiting period and the availability of insurance for properties outside the floodplain.

The mandatory purchase requirement does not affect loans or financial assistance for items that are not covered by a flood insurance policy, such as vehicles, business expenses, landscaping, and vacant lots.

It also does not affect loans for buildings that are not in the SFHA, even though a portion of the lot may be flood-prone. While not mandated by law, a lender may require a flood insurance policy as a condition of a loan for a property in any zone on a FIRM and may require more coverage than the minimum required by Federal law.

19.4.3. Flood Insurance for Your Community

As a recipient of Federal financial assistance, your community may have been subject to the mandatory purchase requirement. You should determine if there are any insurable publicly owned or leased buildings in your SFHA. If so, see if they received Federal aid in the past. Likely prospects include:

- A wastewater treatment plant (typically located near a body of water) that received a grant from the Environmental Protection Division.
- Public housing or neighborhood center funded with help from the Department of Housing and Urban Development or the Community Development Block Grant.
- Any facility that received disaster assistance after a flood or other disaster declaration.

Whether there was a requirement to buy insurance or not, you should advise your risk manager or other appropriate office about the buildings exposed to damage from flooding. Many agencies find out too late that their "all risk" insurance policies do not cover flooding. Over the years, Congress has taken steps to encourage public agencies and private property owners to purchase flood insurance instead of relying on disaster assistance for help after a flood. As an example, a disaster assistance grant for a public building is reduced by the amount of insurance coverage (structural and contents) a community should carry on the building (regardless of whether the community is carrying a policy).

In effect, disaster assistance for public agencies now has a very large deductible equal to the insurance policy it should carry. Why wait for the disaster to be caught short? You should advise the appropriate people of the need to purchase flood insurance coverage on your community's buildings.

20. The Community Rating System

20.1.ntroduction

The NFIP CRS recognizes floodplain management and outreach activities performed by communities that exceed the NFIP minimum standards. CRS, a voluntary program, recognizes these efforts by reducing the cost of flood insurance premiums by 5 to 45 percent for flood insurance policies in communities that participate in the CRS.

20.1.1. Objective

The objective of the CRS is to recognize, encourage, and reward communities that are doing more than meeting minimum NFIP requirements. The CRS encourages, by the use of flood insurance premium adjustments, community and State activities beyond those required by the NFIP to:

- Reduce and avoid flood damage to insurable property both inside and outside mapped floodplains.
- Strengthen and support the insurance aspects of the NFIP.
- Foster comprehensive floodplain management.

20.1.2. Overview

The CRS recognizes 19 creditable activities organized under four categories: **Public Information, Mapping & Regulations, Flood Damage Reduction,** and **Warning & Response**. Communities can choose to undertake any or all of these activities. Based on the number of credit points received for each activity, a community is ranked in one of ten CRS classes, with Class 1 requiring the most credit points and giving the largest premium reduction (See Figure 20-1 below). Most communities have already implemented activities that will earn credit under the CRS. Additionally, in Iowa, communities are automatically awarded CRS credit points for freeboard, mandatory reporting of flood risk in real estate disclosure agreements, and other activities implemented as a result of Iowa State laws, regulations, and standards that support floodplain management.

Under the NFIP's pricing approach, the CRS discount is applied to the full-risk premium for all NFIP policies in a community participating in the Regular Phase of the NFIP, including policies outside the SFHA.

Credit Points	CRS Class	Premium Reduction for Full-risk Properties
4,500+	1	45%
4,000–4,499	2	40%
3,500–3,999	3	35%
3,000–3,499	4	30%
2,500–2,999	5	25%
2,000–2,499	6	20%
1,500–1,999	7	15%
1,000–1,499	8	10%
500–999	9	5%
0–499	10	0

Figure 20-1. CRS credit points and premium reductions

20.1.3. The Application Process

The CRS application is a multi-step process that includes coordination with the Iowa DNR, the FEMA Region VII, and Insurance Services Office, Inc. (ISO). The overall application timeframe will vary based on the extent and timeliness of follow up activities required. However, at a minimum, the entire process is likely to take one year to complete. Detailed information about the application process, including specific steps, is provided in the *CRS Toolkit for Iowa communities*.

The DNR has developed a CRS Toolkit (Iowa CRS Toolkit) to help Iowa's communities determine whether the CRS program may be a good fit for them. The Toolkit contains a workbook with information on the estimated level of effort and necessary documentation for each creditable activity. The workbook also calculates the potential CRS class rating based on the activities the community identifies as applicable.

Download the ***CRS Toolkit for Iowa Communities*** under the link named Community Rating System from the Iowa Department of Natural Resources' website today!

20.1.4. Community Responsibilities

Once a community receives its initial classification in the CRS, it must continue to implement its credited activities to keep its classification. Specifically, a community is responsible for:

- Designating someone who is familiar with the agencies that implement CRS activities as the community's CRS Coordinator.
- Cooperating with the ISO/CRS Specialist and the verification procedures.
- Recertifying each year that it is continuing to implement its activities.
- Ensuring that flood protection projects and drainage system maintenance activities are compliant with Federal environmental and historic preservation requirements.
- Submitting the appropriate documents with its recertification.
- Advising FEMA and its ISO/CRS Specialist of modifications in its activities.

- Maintaining Elevation Certificates, other permit records, and old FIRMs forever.
- Maintaining other records of its activities for five years, or until the next verification visit, whichever comes sooner.
- Participating in the cycle verification process, which is conducted every five years for Class 6-9 communities or every three years for Class 1-5 communities.

20.1.5. Costs and Benefits

Communities should prioritize and implement activities that best address their local flooding problems, whether or not they are creditable under the CRS. In considering whether to undertake a new floodplain management activity, a community should consider all the benefits the activity will provide (not just insurance premium reductions).

Costs

No fee is charged for a community to apply for participation in the CRS. The only costs the community incurs are those of implementing creditable floodplain management activities and the staff time needed to prepare the letter of interest, document activities, and prepare for and participate in the recertification process and verification visits. The *CRS Toolkit for Iowa Communities* does provide an estimate of the level of effort for each creditable activity. The toolkit can help identify which activities may be the best fit for a community-based on available resources and the types of floodplain management activities already being performed.

Benefits

Communities with a large number of flood-prone properties and flood insurance policies benefit from the greatest insurance premium reductions from participation in CRS. In addition, all communities and residents benefit from joining CRS, including the following reasons:

- Improved public safety through outreach, warning systems, and other projects.
- The opportunity for a community to evaluate the effectiveness of its floodplain management program against other State and nationally recognized benchmarks.
- Savings on flood insurance policies covering publicly owned and leased buildings.
- More money kept in the community versus spent on flood insurance.
- A reduction in flood damage through a comprehensive approach to floodplain management.
- Increased environmental protection including wetlands and open spaces.
- Awareness of residents that the community is working to reduce flood losses and lower insurance costs.

- More knowledgeable residents and greater support for flood protection measures as a result of outreach activities.

- Lower insurance costs, which may incentivize people on the fence about purchasing flood insurance.

CRS Specialists are available to assist community officials in applying to the program and in designing, implementing, and documenting the activities that earn even greater premium discounts. A week-long CRS course for local officials is free from FEMA at their training facility or locally.

20.2.Pre-requisites

The 2017 CRS Coordinator's Manual update and the 2017 addendum to the CRS Coordinator's Manual identified new class pre-requisites. Those pre-requisites are:

- Class 8:
    - Activity 430: Higher Regulatory Standards – Adopt and enforce the 1-foot freeboard for all residential buildings in the SFHA. This activity requires that the 1-foot freeboard be enforced for all Mechanical and Electrical (M&E) equipment within or attached to the building. Iowa's model ordinance for floodplain management requires all NFIP communities to enforce the 1-foot freeboard requirement for all M&E equipment, including ductwork, regardless of CRS participation.

- Class 6:
    - Building Code Effective Grading Schedule (BCEGS) rating of 5/5.

20.3.CRS Activities

The CRS Coordinator's Manual is a comprehensive resource for information about CRS, including details on recertification and verification visits and credited activities and documentation.

The *CRS Toolkit for Iowa Communities* describes the 19 floodplain management activities credited by the CRS and the documentation required to receive credit for each activity. The number of available credits and formulas used to calculate credit are also included. The activities are divided into four categories. More detailed information on each activity is also available in the 2017 *CRS Coordinator's Manual* and the 2021 addendum to the CRS Coordinator's Manual

Public information (300 Series): This series credits programs that advise people about the flood hazard, encourage the purchase of flood insurance, and provide information about ways to reduce flood damage through a variety of public outreach activities. Additional credit is available for certain CRS activities if performed as part of a comprehensive Program for Public Information (PPI) https://www.crsresources.org/files/300/developing_a_ppi_for_credit_under_the_crs.pdf.

Mapping and regulations (400 Series): This series credits programs that provide increased protection to new development. These activities include mapping areas not shown on the FIRM, preserving open space, protecting natural floodplain functions, enforcing higher regulatory standards, and managing stormwater. The credit is increased for growing communities.

Flood damage reduction (500 Series): This series credits programs for areas in which existing development is at risk. Credit is provided for a comprehensive floodplain management plan, mitigating areas prone to repetitive losses, relocating or retrofitting flood-prone structures, and maintaining drainage systems.

Warning and Response (600 Series): This series credits measures that protect life and property during a flood through flood warning and response programs. There are special credits for the maintenance of levees and dams and preparedness programs for their potential failure.

Communities are encouraged to submit alternative approaches or innovations for review to their ISO/CRS Specialist. The request should include documentation to support how the alternative approach or innovation meets the intent of or is equivalent to, the prerequisite or the element and/or activity credited in the *CRS Coordinator's Manual*.

CRS activities are not design standards for local floodplain management. The fact that credit is not available for certain activities does not mean that they should not be implemented by communities that will benefit from them.

Uniform minimum credit: Many communities can qualify for "uniform minimum credit" whereby a county or regional agency can apply for a CRS activity that it is implementing on behalf of its communities. If the community has its own program that deserves more credit points, it may apply for more than the uniform minimum credit points. This approach saves time and money for everyone involved and may result in lower insurance premiums for more people.

For example, CRS credit is provided if a community requires that a property's flood hazard must be disclosed to potential purchasers or renters (Activity 340). Under uniform minimum credit, Iowa communities receive credit for the State law that requires sellers to tell buyers if the property has flooded. The *CRS Toolkit for Iowa Communities* indicates which activities uniform minimum credit applies to the more stringent requirements enacted by the State of Iowa. A list of the Iowa State-Based Credits can be found here: Iowa CRS Credits

20.4. Credit Points

20.4.1. Activity Credit Points

Detailed information about credit points associated with each CRS activity is provided in the *CRS Toolkit for Iowa Communities* and in the *CRS Coordinator's Manual*. A summary of CRS activities and credit points is shown in Figure 20-2.

The fourth column in this table shows the average credit points received by previous years' applicants for each activity. The averages are based on the number of applicants for each activity, not the total number of applicants for the CRS. The fifth column shows the percentage of all applicants that received credit for each activity. Note the average credits for activities with a high percentage of credited communities. They provide a better indication of what an applicant can expect for an activity than the maximum points available.

Credit Points Awarded for CRS Activities *				
Activity	**Maximum Possible Points**	**Maximum Points Earned**	**Average Points Earned**	**Percentage of Communities Credited**
300 Public Information Activities				
310 Elevation Certificates	116	116	36	97%
320 Map Information Service	90	90	70	89%
330 Outreach Projects	350	350	118	97%
340 Hazard Disclosure	80	72	13	85%
350 Flood Protection Information	125	118	47	94%
360 Flood Protection Assistance	110	110	29	47%
370 Flood Insurance Promotion	220	185	9	20%
400 Mapping and Regulations				
410 Flood Hazard Mapping	802	584	22	26%
420 Open Space Preservation	2,020	1,739	443	92%
430 Higher Regulatory Standards	2,042	1,558	287	100%
440 Flood Data Maintenance	222	292	137	98%
450 Stormwater Management	755	690	97	80%
500 Flood Damage Reduction Activities				
510 Floodplain Management Planning	762	602	157	75%
520 Acquisition and Relocation	2,250	1,767	51	28%
530 Flood Protection	1,600	530	8	12%
540 Drainage System Maintenance	570	470	198	34%
600 Warning and Response				
610 Flood Warning and Response	395	370	56	22%
620 Levees	235	180	1	1%
630 Dams	160	117	13	34%

** Figures are based on the 2017 CRS Coordinator's Manual and the 2021 Addendum to the 2017 CRS Coordinator's Manual. The Average Points Earned and Percentage of Communities Credited are based on April 1, 2024, data. County Growth Adjustments are not included. Any changes after these dates will not be reflected in this document. Updates can be found at https://crsresources.org/*

Figure 20-2. Credit points awarded for CRS activities

20.4.2. Identifying CRS Creditable Activities

A minimum of 500 points is needed to receive a CRS classification of Class 9, which will reduce premium rates. If a community does not qualify for at least 500 points, it may want to initiate some new activities to attain Class 9. For example, some of the public information activities can be implemented for a very low start-up cost. It is recommended that communities complete Part 2 of the *Iowa CRS Toolkit*, the Toolkit Workbook, to identify activities that your community can receive credit for and, if necessary, to identify additional activities that can be performed to obtain additional credit points. Part 1 of the Toolkit includes detailed instructions for completing the Toolkit Workbook.

21. Disaster Operations

21.1.Disaster Operations

Floodplain managers agree: It is not *if* your community will be flooded. It is *when.*

Those who have been hit by a flood or other disaster usually regret that they were unprepared. Whether it is your house or your community, you can take steps to be ready for a flood event.

This section covers the steps and procedures that your permit office should follow after a disaster. The rules are the same for floods or any other kind of disaster. Remember, it does not matter what damaged the buildings in your floodplain. If they are damaged, you are responsible to see that they are repaired according to the standards in your floodplain management ordinance.

After a disaster, you can expect everyone to want you to respond quickly and efficiently, without regard to other priorities. You will have to take on emergency post-disaster responsibilities, often at the expense of not performing your normal duties.

There may be pressure from the public and elected officials to waive normal procedures and regulations to help people return to normal as fast as possible. In spite of the fact that "back to normal" means people and property could be exposed to the type of flooding that may have caused the disaster in the first place.

In short, your residents and businesses are primarily concerned with getting back to normal. Your stress level is high, patience can be low, the environment is unfamiliar, and there is never enough time, money, or workforce.

Figure 21-1. Iowa Flood Response Toolkit, a quick reference tool designed to help communities prepare, respond, and recover from flood emergencies

To help you prepare for disaster scenarios, your permit office should prepare procedures that will ensure full and fair enforcement of your regulations during this time of stress, confusion, and controversy. Mapping out your procedures will allow you to focus on the solutions to problems without having to draft the decision-making steps you will use to enforce your floodplain management ordinance.

21.1.1. Safety and Health Hazards

More than 8 million families in the United States live in floodplains. Millions more work in floodplains or drive through them every day. In an average year, floods kill 119 people and cause more than $5 billion in property damage. Nationally, average annual flood losses continue to increase. Knowing the impact of a potential hazard—and guarding against it—is integral to administering a floodplain management program.

Safety Hazards

Studies have shown that it does not take much depth or velocity to knock a person over. No areas with moving floodwater can be considered safe for walking, and 6 inches of fast-moving flood water can knock over an adult.

The Centers for Disease Control (CDC) reports that over half of all flood-related drownings occur when a vehicle is driven into hazardous flood waters. The hazards of driving in flooded waters are explained in Figure 21-3. A car will float in only one foot of moving water, and 2 feet of rushing water can carry away SUVs and trucks, which is one reason floods kill more persons trapped in vehicles than anywhere else. Often, victims put themselves in perilous situations by ignoring warnings about travel or mistakenly thinking that a washed out bridge is still open.

Electrocution is the second most frequent cause of flood deaths, claiming lives in a flooded area that is carrying a live current created when electrical components short. Floods can also damage gas lines, floors, and stairs, creating secondary hazards such as gas leaks and unsafe structures.

Fire can be a result of too much water—floods can break gas lines, extinguish pilot lights, and short-circuit electrical wiring, causing conditions ripe for a fire. Fire equipment may not be able to reach a burning building during high water.

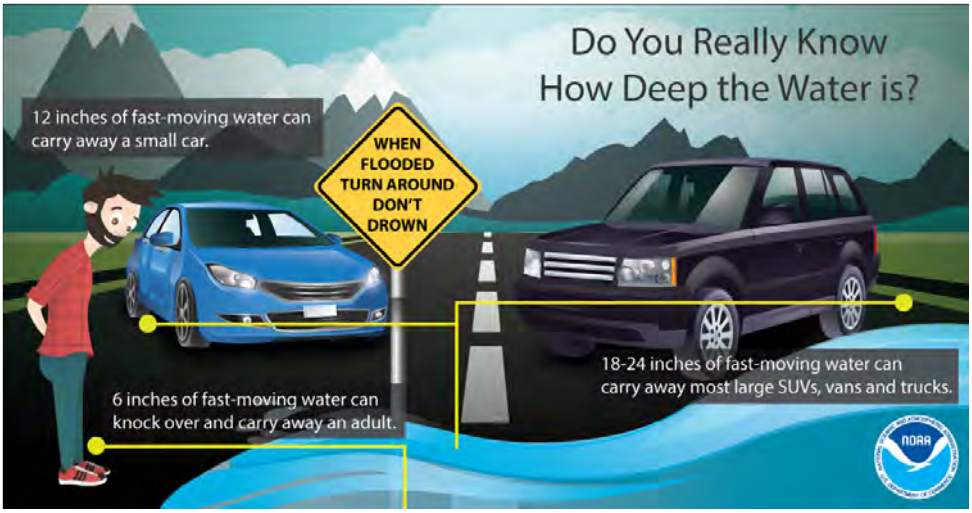
Health Hazards

Floods bring and leave hazards in the form of animal carcasses, garbage, and ponds that can become breeding grounds for germs and mosquitoes. Any flooded items that come in close contact with people must be thrown out, including such things as food, cosmetics, medicines, stuffed animals, and baby toys. Clothes and dishes need to be washed thoroughly.

Figure 21-2. Mold and mildew can grow quickly after a flood

If the water system loses pressure, a boil order may be issued to protect people and animals from contaminated water. Wells need to be tested by the local health department before the water is deemed safe to drink. Septic systems are put out of operation when underwater, adding to the health hazard of a flood.

Mold, mildew, and bacteria grow in damp, flooded areas (see Figure 21-2). One health hazard occurs when heating or air conditioning ducts in a forced-air system are not properly cleaned following inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants.



Source: *Flash Floods and Floods. The Awesome Power*, National Weather Service, 1992

Figure 21-3. Dangers of Flood Waters

Flood Safety Outdoors

Do not walk through flowing water. Drowning is the number one cause of flood deaths. Currents can be deceptive; 6 inches of moving water can knock you off your feet. Use a pole or stick to ensure that the ground is still there before you go through an area where the water is not flowing.

Do not drive through a flooded area. More people drown in their cars than anywhere else. Don't drive around road barriers; the road or bridge may be washed out. A car can float in as little as one foot of water.

Stay away from power lines and electrical wires. The number two flood killer after drowning is electrocution. Electrical current can travel through water. Report downed power lines to the power company.

Flood Safety Indoors

Turn off your electricity if your building is flooded. If you don't know how call an electrician. Some appliances, such as television sets, can shock you even after they have been unplugged. Don't use appliances or motors that have gotten wet unless they have been taken apart, cleaned, dried, and inspected by a professional.

Watch for animals. Small animals like rats and snakes that have been flooded out of their homes may seek shelter in yours. Use a pole or stick to poke and turn items over and scare away small animals.

Look before you step. After a flood, the ground and floors are covered with debris including broken bottles and nails. Floors and stairs that have been covered with mud can be very slippery.

Be alert for gas leaks. Use a flashlight to inspect for damage. Don't smoke or use candles, lanterns, or open flames unless you know the gas has been turned off and the area has been thoroughly aired out. If you have questions about gas, call the gas company.

Carbon monoxide exhaust kills. Use a generator or other gasoline-powered machine outdoors. The same goes for camping stoves. Fumes from charcoal are especially deadly—cook with charcoal outdoors.

Clean everything that got wet. Flood waters have picked up sewage and chemicals from roads, farms, factories, and storage buildings. Spoiled food and flooded cosmetics, and medicines are health hazards. When in doubt, throw them out.

Take good care of yourself. Wear gloves and boots. Wash your hands frequently during clean-up. Recovering from a flood is a big job. It is tough on both the body and spirit, and the effects a disaster has on you and your family may last a long time. Keep your eyes open for signs of anxiety, stress, and fatigue in you and your family.

Taken from *Repairing Your Flooded Home*

Mental Health

Flooding, especially repetitive flooding, takes a toll on people's mental health. Stress comes from facing the loss of time, money, property, and personal possessions such as heirlooms. This is aggravated by fatigue during clean-up and anxiety over lost income, health risks, and damage to irreplaceable items. Children and the elderly are especially susceptible to stress from the disruption of their daily routines.

Here are some warning signs of stress. If you see these in people after a disaster, advise them to get help through the local health department or disaster assistance counselors.

- Short tempers, frequent arguments
- Greater consumption of alcohol
- Smoking more than usual
- Getting upset over minor irritations
- Difficulty sleeping, bad dreams
- Aches, pains, stomach problems
- Apathy, loss of concentration
- Depression

Figure 21-4. Be prepared to face demands from the public for a speedy recovery

In addition, you may have personally suffered damage or loss. So, while you are at work helping others, you may not be getting the help you need. Add to this the need to be available at least 12 hours a day with few trained helpers. This may affect your mental health, so stay aware of your own mental health and well-being.

21.1.2. Emergency Operations

Remember, the emergency manager is responsible for disaster and emergency response activities, such as evacuation, rescue, sandbagging, and coordination with the county, state, and Federal emergency management agencies. Once the disaster proves to be big enough, the emergency manager will open up the Emergency Operations Center (EOC).

You may have a role during the emergency. The permit office is usually expected to have a representative in the EOC during the disaster.

When reviewing this section, you should meet with the emergency manager to review what they expect you to do before, during, and after the disaster. It is crucial to clarify your role as soon as possible. The emergency manager may need you for damage assessment right when you think you can start inspecting individual buildings.

At some point, you will move from the emergency phase to the recovery phase. That is where this section picks up. You also should review with the emergency manager what your office needs to be doing to help your community recover, and at what point you and your staff are free to pursue the activities covered in this section.

21.1.3. Building Condition Survey

A building condition survey is conducted to help the permit office manage time and resources most efficiently. The survey determines:

- If any building is so dangerous that it should not be reentered without a careful inspection.
- Which buildings will need a building permit before they can be repaired or reoccupied.

When possible, the building condition survey is done in conjunction with the emergency manager's initial damage assessment. If the area affected is relatively small, the survey may be skipped, and the permit office can immediately begin inspecting damaged buildings.

High water marks: High water marks should be marked with spray paint or another highly visible method on telephone poles, trees, etc. They prove to be very valuable records and will help residents relate the last flood to the regulatory protection level. For example, if the flood was estimated to be 2 feet below the 1% annual chance flood (also known as the 100-year or base flood), people can be told that if they were substantially damaged, they will have to elevate their homes at least 3 feet above the high water marks.

Substantial Damage

Substantial damage is a formal determination, made by a community floodplain manager, that the cost to repair a damaged building to its "before damage" condition would be 50 percent or more of the market value of the structure before the damage occurred.

See Section 12 for more information.

The water level at each building should also be measured and recorded at a uniform location (for example, water was 48" above grade measured at the right side of the front entrance door). Once building clean-up has begun, it is often difficult to determine what elements of a structure were above or below this line for salvage and repair purposes. If your community has a GIS with recent (or fairly recent) aerial photography, attribute data can be attached to the GIS with this information. This data can then be used to map the depth and extent of the flood. High water marks are also important for recording the extent of the flood and adding to the hydrologic record. If possible, aerial photography should be taken during the crest or high water point, since this has been a valuable tool for communities in previous flood events.

Work maps: Work maps that show the SFHA, buildings, addresses, and elevation contour lines could be very helpful. They should be on letter, legal, or tabloid-size paper for ease of use in a vehicle during the building survey. To save time and avoid delays, work maps should be made in advance of a disaster.

Before the survey, you should review the work maps for the affected area(s) and, using the high water mark data, determine which areas experienced the most significant flooding and, in all likelihood, the worst damage. This can be done by plotting known flood boundaries or matching high water marks to the elevation contour lines.

Any area where the flood crest was 2 feet or more above the building's adjacent grade should be outlined on the map and designated as the first priority for the building condition survey. Again, GIS can be a powerful tool in filtering addresses and parcel/building data for the field surveys.

The Survey team: If possible, a team including a building inspector, a utility specialist, or a fire department staff member, and one person to record information should be included in each survey team. Utility or fire department staff should carry gas sniffing equipment, when available, and should focus on identifying hazards that need immediate attention or disconnection. The building inspector is responsible for making an initial determination on the condition of the structure and can relay that information while the third team member takes notes on the conditions being determined by the other two team members. If a three-member team is not a possibility, for the safety of the members, a minimum of two individuals should be on each team.

Conduct a building condition survey: The building condition survey is conducted from the outside of all buildings. A basis condition form should be created for each structure and will include notes on the building's condition and issues noted by the survey team during the assessment.

Depending on the severity and duration of flooding, the survey may be conducted concurrently with the emergency manager's initial damage assessment. A photo should be taken of each building, showing any damage that is visible from the outside.

- Any structure that appears to be fully or partially collapsed or appears to be in danger of imminent collapse should be marked with a red placard. If the building is not safe to enter, clean-up, or work on without major structural repairs, post a "Keep Out – Uninhabitable" sign.

- Yellow placards should be placed on structures that are structurally sound but require any type of repair. If the building needs repairs that do not require a permit, post "Safe for Occupancy" and "Approved to Connect" (utilities) signs.

- Green placards are placed on structures that are unaffected. If a permit to make repairs is needed, post the "Habitable – Repairs Necessary" sign.

Appropriate colored signs can be obtained in volume from the model code organizations. The ones shown here are from the Building Officials and Code Administrators (BOCA) and are color-coded for easy viewing from the street.

In the case of a red or yellow placard, only a representative of the permit office may remove or replace the sign after all of the necessary state and local permits have been issued and repairs are made. The green "safe for occupancy" placards may be removed by the owners in

accordance with instructions issued by the community (for example, the permit office may want all signs to remain posted until all inspections have been completed).

When the fieldwork is done, summarize the survey findings and plot them on a master mitigation map using your GIS if available. Use color coding—green, yellow, or red—so those structures that are or may be substantially damaged will stand out.

Notice to owners: Upon completing the survey, send a letter to the owner of each property surveyed, including those assessed as apparently safe. The letter should identify what activities can and cannot proceed without a permit and share helpful links to resources and reference materials on flood recovery. Each letter should include the building's address, property identifier, and the owner's name. If the property owner's name and address cannot be located, a copy of the letter can be posted on the property. A sample letter is shown in Figure 21-5.

Keep copies of each letter in the permit office. It is helpful to start a file for all red and yellow placarded properties, as additional information will be acquired and filed throughout the flood recovery process.

With the letter include a link to a copy of the FEMA/Red Cross publication *Repairing Your Flooded Home*.

The permit requirements stated in the notice should be widely publicized, so residents have every opportunity to be made aware of when a permit is needed. Sometimes, well-meaning friends and organizations help people clean-up and repair so fast that they do not realize when a permit is needed. Recommended distribution methods include:

- Sharing information with local media outlets such as newspapers and radio stations.
- Posting information in a prominent location on your community's website.
- Posting messages periodically to your community's social media pages, including Facebook and Twitter.
- Printing out fact sheets on the permitting process and providing them to emergency management or other community staff who are canvassing neighborhoods for direct distribution to residents.
- Keeping copies available in municipal offices for residents to pick up.

Online Resources

The following online resources have additional information to help flood victims keep safe after a flood. Consider including links to this information on your website or sharing them through social media in the days following the flood.

Ready.gov's Flood page has information about preparing for a flood, staying safe during a flood, and staying safe after a flood.
The CDC has several pages of information about staying safe and healthy following a flood. Topics covered include preparing for a flood, floodwater safety, and returning home.

Dear [Name]

The permit office conducted a survey of flooded buildings in your neighborhood. A review of your building(s) indicates that the structure(s) was affected by the recent flood. Here are some things you should know:

1. Repairs to your building require a permit from the City's permit office. Before you remove, alter, or replace any of the following items, you **must** obtain a building permit: the roof, walls, siding, wallboard, plaster, insulation, paneling, cabinets, flooring, electrical system, plumbing, heating, or air conditioning.
2. The permit office will conduct a complimentary inspection of the damage to your building. This inspection will help you identify what needs to be repaired. It will also identify if a permit is needed and if your building could be substantially damaged. There is no cost for this inspection, but it must be taken before you begin your repairs or reconstruction. We will contact you when we plan to do the inspection. If you have a preferred time, please call us to arrange an appointment.
3. You may proceed with the following cleanup activities including:
    a. Removing and disposing of damaged contents, carpeting, wallboard, insulation, etc.
    b. Hosing, scrubbing, or cleaning floors, walls, ductwork, etc.
    c. Covering holes in roofs or walls and covering windows to prevent the weather from inflicting further damage.
    d. Removing sagging ceilings and shoring up broken foundations.
4. Some day in the future, your area will flood again. There are things you can do during repair and reconstruction to reduce damage from the next flood. Many of these are discussed in the attached book, *Repairing Your Flooded Home*. We will be glad to talk to you about protecting your property from future flooding. If we receive a disaster declaration, there may be some financial assistance to help pay for making your property safer than it was before. In the meantime, read Step 8 in *Repairing Your Flooded Home* for some ideas.
5. In order to screen out possible opportunists from taking advantage of the current situation, any contracted work must be done by a firm licensed to work in the [City/County]. Furthermore, residents are cautioned and warned *not* to sign blank contracts, agree to have work performed without first seeing the contractor's registration card, or allow work or alterations not authorized by the [City/County] permit office.

For further information, please contact the permit office at _____.

Sincerely,

[Name], Director
Permit Office

Attachment: *Repairing Your Flooded Home*

Figure 21-5. Sample letter to flood-damaged property owner

(Reword for other types of disasters)

21.1.4. Permit Requirements

As soon as possible after the flood, you should contact the Iowa DNR and FEMA Region VII Office to review regulatory requirements for the repair and reconstruction of flood-damaged structures and to see if there are any new guidance documents or data from claims adjusters. You must require floodplain development permits for the repair of damaged buildings located in the SFHA determine if those buildings have been substantially damaged.

Permit required: A floodplain development permit is needed for each building where repairs will involve removing, altering, or replacing the roof, walls, siding, wallboard, plaster, insulation, paneling, cabinets, flooring, electrical system, plumbing, heating, or air conditioning. These repair/reconstruction projects must meet the requirements of any applicable building code and your floodplain management ordinance.

The requirement for a permit cannot be waived, although your governing board may opt to waive permit fees. The community cannot ignore the NFIP substantial damage requirements. To do so will subject your community to potential NFIP sanctions (see Section 2.6).

If a permit is required, residents should be given the necessary forms and told which types of activities, if any, they can proceed with before the permit is issued.

21.1.5. Clean-Up and Emergency Repairs

You may allow clean-up and temporary emergency repairs to proceed without a permit. These include:

- Removing and disposing of damaged contents, carpeting, wallboard, insulation, etc.
- Hosing, scrubbing, or cleaning floors, walls, ductwork, etc.
- Covering holes in roofs or walls and covering windows to prevent weather from inflicting further damage.
- Making the building safe to enter by removing sagging ceilings, shoring up broken foundations, and other actions.

You may want to identify which buildings may need emergency work and review with the owner the benefits of having professional contractors do some of it.

Structural alterations, such as removing floors or studs, or replacing a furnace, are usually not allowed without a permit.

If your community **has not** adopted a building code, a **building permit** may not be required to repair a flood-damaged structure. However, any community that participates in the NFIP is required to issue a **floodplain development permit** to repair a flood-damaged building.

Owners of potentially substantially damaged buildings should be advised against making major repairs unless the building presents a safety hazard, because their buildings may have to be elevated, or may be purchased and/or demolished later.

21.2.Detailed Damage Assessments

As soon as possible after delivering the notices to property owners following the building condition survey, your office should perform a more complete assessment of each flooded property. During this review, document the needed repairs and the extent of the damage to each structure. This may be done with a checklist customized by your jurisdiction, or you may use the SDE program developed by FEMA. Properties in the SFHA may require additional modifications depending on the amount of damage to the structures. Floodplain ordinances incorporate the concept of substantial damage (i.e., damage equal to or greater than 50 percent of the pre-flood market value of the structure), and this assessment is key to this determination. A sample checklist is shown in Figures 21-6 and 21-7. Regardless of which method you use, remember to retain a copy for your records and give a copy of the completed inspection to the property owner, along with safety, health, and repair information.

21.2.1. Substantial Damage Estimates

The SDE software tool and supporting manual were developed by FEMA and are used to evaluate damage to structures after natural disasters. In many cases, FEMA estimators will arrive in disaster areas to conduct damage assessments as part of the total FEMA response to a Presidential Disaster Declaration. This estimation process and the SDE software, along with estimator training, are made available to jurisdictions and should be considered if you are in an area prone to flooding. SDEs use predetermined repair values of each element of a structure to estimate total damage to a structure. This repair estimate is then compared to the market value to reach the percentage of damage the structure has sustained. The FEMA publication *Substantial Damage Estimator* includes a User's Manual for the software and a Field Workbook. This document and other SDE resources are available on FEMA's website (http://www.fema.gov/media-library/assets/documents/18692).

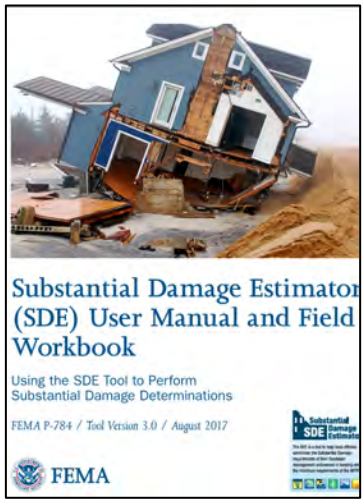


Figure 21-6. Substantial Damage Estimator User's Manual and Workbook

21.2.2. Damage Assessment Appeals

Regardless of what damage assessment process is utilized, a process of appeals should be put in place to allow property owners to appeal substantial damage determinations. Repair estimates from certified contractors can be used to determine a more accurate cost to repair a structure. Also, certified appraisals can be used for more accurate pre-flood market values. Property owners need to be given the opportunity to appeal a damage assessment, and any system of accurate valuation should be considered since the timely declaration that a structure is, or is not, substantially damaged is critical in the recovery process.

21.2.3. Follow Up

Here are some things to help with enforcement:

- As you develop procedures, check with your utility companies and appropriate community utility departments. Advise them of your enforcement procedures.
- If not in place, establish a policy that utilities may not turn service back on unless there is an “Approved to Connect” sign posted on the building. This will greatly help compliance with the regulations after a disaster.
- Instruct police and other community departments about the permit requirements and ask them to report to you any construction projects underway without posted permit signs.
- Within a week of issuing the notices to the owners, visit the notified properties to ensure that the owners are abiding by the requirements.
- Keep a master list and use your GIS capabilities (when available) to map and track your survey, inspection, and permit application findings.

Property address: _____ Date: _____

Owner: _____ Phone: _____

Check the appropriate column. Column 1 items note that the damage is minor, column 2 items can be expensive to repair, and column 3 items are indicators of substantial damage. Do not count cleanup costs or damage to contents (including plug-in appliances) and other items not part of the building's structure (detached structures, fences, sidewalks, swimming pools, etc.).

1	2	3	
			General condition
_____	___	___	Building appears sound and safe to enter, needs minor work to make habitable
_____	___	___	Apparently safe to enter, needs extensive cleaning/repairs
_____	___	___	Foundation, floor, wall, or ceiling damage such that building not safe to enter
			Depth of water
_____	___	___	In crawlspace, <2" in unfinished basement, not in building
_____	___	___	In unfinished basement, only affected contents and utilities
_____	___	___	< 3' in finished basement or over first floor
_____	___	___	3' over first floor or in finished basement
			Foundation
			Type of foundation: ____ Slab ____ Basement/split level ____ Crawlspace
_____	___	___	No signs of cracks or settling
_____	___	___	Cracks in basement or crawlspace walls
_____	___	___	Buckling of slab or basement floor, broken crawlspace, or basement wall
			Exterior
			Type of exterior walls: ____ Masonry ____ Wood/aluminum/vinyl siding
_____	___	___	No signs of cracks or swelling, doors/windows stick but work
_____	___	___	Some swelling or warping of walls, doors/windows may need to be replaced
_____	___	___	Deck, porch, balcony damaged
_____	___	___	Shifting of wall on foundation, wall broken
			Floors
_____	___	___	Concrete/tile/bare wooden floors: no signs of damage
_____	___	___	Tile/vinyl/linoleum coming loose, can be cleaned and re-glued
_____	___	___	Carpeting/vinyl/linoleum soaked, needs to be replaced
_____	___	___	Wooden floor or subfloor warped, broken, or needs replacement
			Interior
_____	___	___	Water did not reach any wallboard, paneling, or insulation; doors stick but work
_____	___	___	First four feet of wallboard, paneling, or insulation must be replaced
_____	___	___	All wallboard, paneling, or insulation in the lowest floor must be replaced
_____	___	___	Doors/molding/built-in bookcases swollen, warped, need to be replaced
_____	___	__	Studs/walls broken, shifted
_____	___	__	Ceiling sagging/collapsing

Figure 21-7. First page of sample building inspection checklist

1	2	3	
			Heating & central air conditioning
			Type of system: ____ Forced air ____ Electric baseboard ____ Other: _____
_____	___	___	Water did not reach any electrical parts, gas jets, or ductwork
_____	___	___	Ductwork needs to be disassembled and cleaned or replaced
_____	___	___	Gas jets and/or electrical parts need to be cleaned or replaced
_____	___	___	Propane/fuel tank needs to be reconnected and/or anchored
			Electrical
_____	___	___	Water did not reach any outlets, switches, meters, or fuse or breaker boxes
_____	___	___	Outlets, switches, breakers, lights, or other fixtures need to be replaced
_____	___	___	Meter or service box needs to be repaired or replaced by a professional
			Plumbing
_____	___	___	Drains and sewers need to be cleared
_____	___	___	Sump pump needs to be repaired or replaced
_____	___	___	Water heater needs to be replaced
_____	___	___	Water softener needs to be replaced
			Kitchen and bath
_____	___	___	Kitchen and bath(s) only need to be cleaned up
_____	___	___	Built-in appliances, ovens, etc., need cleaning by a professional
_____	___	___	Built-in appliances, ovens, etc., need to be replaced
_____	___	___	Cabinets/counters warped or otherwise need to be replaced
_____	___	___	Plumbing fixtures cracked, broken, or need to be replaced
_____	___	___	Number of checks in each column

Completed by: _____ .

If all checks are in column 1, no building permit is needed. If there are any checks in columns 2 or 3, a building permit must be applied for and a repair/reconstruction estimate (prepared and signed by a licensed contractor) must be submitted.

Except where professional cleaning is needed, any items checked in columns 1 or 2 can be performed by the owner.

A licensed contractor may charge for the repair/reconstruction estimate, especially if the owner intends to do the work.

Any item checked in column 3 and any alteration to the electrical or plumbing systems must be performed by a licensed contractor.

The owner should read *Repairing Your Flooded Home*, pages 15-29 for cleanup and repair guidance and pages 39-41 for mitigation suggestions to incorporate into the repairs.

For further information, please contact the Permit Office at _____.

Figure 21-8. Second page of sample building inspection checklist

A word of caution—*It is your community's responsibility to ensure that any substantially damaged buildings are brought into full compliance with your community's floodplain management regulations per the NFIP requirements.*

21.2.4. Flooded Buildings

Flooded buildings are harder to inspect than those damaged by other means. Much of the damage is hidden behind walls or under floors, so the owner may not recognize the long-term effects of water, moisture, and mold.

You should require that the wallboard/plaster and insulation be removed from a flooded building. Once the owner reports that the framing members are dry, conduct an inspection. Check the cleanliness and moisture content before allowing the walls to be recovered. If the studs are too wet, tell the owner to allow them to dry more before they are covered over.

The best way to measure the level of moisture in wood is with a moisture meter. You can get a moisture meter at home improvement stores or woodworking specialty companies. It needs to have a probe that can be inserted into the wood.

If the wood's moisture content exceeds normal levels for your area of the country (usually 10 to 15 percent), it is too wet to be covered by paint or wallboard. Re-inspect it later after it is allowed to dry some more. If the owner is anxious to rebuild, make sure they have a copy of *Repairing Your Flooded Home*. Step 4 of this resource reviews how to speed up the drying process.

21.2.5. Contractor Quality Control

After a disaster, not-so-honest or unqualified contractors offer to help disaster victims, sometimes offering reduced rates or special deals. Your community may want to control this by requiring that certain construction and reconstruction work be performed by qualified and licensed contractors.

The State of Iowa licenses electricians, mechanical contractors (heating, ventilation, and air conditioning), and plumbers. You can provide your residents with a list of licensed subcontractors. General contractors are not required to be licensed in the state, though individual communities may elect to require licensing for general contractors. You can also provide handouts with guidance on how to select contractors. See the *Iowa Flood Response Toolkit* for a sample fact sheet.

If you receive a sufficient number of complaints, you should relieve a contractor of their license to do business. You can also report unscrupulous contractors to state licensing agencies and/or the Consumer Protection Division in the Iowa Attorney General's office.

Engaging in price gouging in a time of disaster in an area declared by the Governor to be a disaster area is a violation of the Iowa Consumer Fraud Act. That Act allows the Attorney General to go to court to stop illegal practices and get refunds for consumers.

Your work does not have to be a series of confrontations with contractors. They can be your best ally when telling a property owner why things have to be done a certain way. They can

also help encourage property owners to retrofit and take additional steps to protect themselves from the next flood.

You may want to conduct workshops for contractors on flood repairs, mitigation measures, funding opportunities, etc.

21.3. Administration

21.3.1. Permit Forms

If a permit is required, the property owner should be given the forms needed and told what repairs, if any, can proceed before the permit is issued. Keep these forms in the property's file:

- Notice to the owner (
- Figure 21-5)
- Initial inspection checklist (Figures 21-7 and 21-8)
- Permit application
- Repair/reconstruction estimate
- Substantial damage worksheets
- Source of structure's market value
- Inspection records
- Photographs
- FEMA Elevation or Floodproofing Certificate if the building is required to be elevated or floodproofed
- Approved to Connect notice (if used by your community)
- Certificate of occupancy

21.3.2. Public Information

Your community needs to inform residents about the regulatory requirements and the need to carefully clean and rebuild. You should issue news releases and/or distribute materials to advise property owners about:

- Activities that need a permit
- Activities that do not need a permit (the language in
- Figure 21-5 could form the basis for a news release)

- The substantial damage rule
- The benefits of ICC flood insurance coverage (see Section 12.4.3)
- The need for licensed contractors, if required in your community
- The information provided in Steps 2, 3, and 4 in *Repairing Your Flooded Home*, such as taking pictures for insurance and disaster assistance claims before throwing things away, how to drain a basement without risking foundation damage, and health and safety precautions
- The need to include property protection measures (mitigation) as part of repairing homes or businesses. People need to recognize that "returning to normal" means returning to a building that could be similarly damaged by another flood

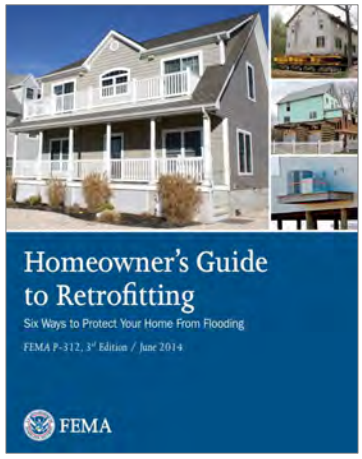


Figure 21-9. Homeowner's Guide to Retrofitting

21.3.3. Staff Assistance

If the disaster affected many properties, you likely would need more people to perform survey and inspection work. Staff assistance can come from:

- Iowa's Mutual Aid Compact: an intrastate mutual aid agreement that enables neighboring communities to share resources during disasters declared by the Governor.
- Other communities willing to offer help; check with the DNR.
- Your area building officials association, which may know of members available to help.

Figure 21-10. Temporary hires may provide needed support following a disaster

If there was a disaster declaration, check with your emergency manager. You may be able to get temporary hires with part of the cost eligible for reimbursement through disaster assistance.

Disaster assistance may also reimburse your community for inspectors to conduct habitability inspections and to determine if buildings are substantially damaged.

21.3.4. Technical Assistance

Many technical issues can arise during post-disaster permit operations, but you have many sources of assistance:

- Call the DNR and the FEMA Region VII Office first. If there was a disaster declaration, they may be able to provide technical assistance staff or workshops to clarify issues.

- The DNR also has many fact sheets available about flood clean-up for businesses and residents in rural areas:

  - *Flood Clean-up for Businesses*
  - *DNR Guide to Flood Clean-Up in Rural Areas*
  - *Disposing of Flood-Deposited Sand, Silt and Debris on Farmland*
  - *Proper Management of Flooded Grain and Hay*
  - *What Should I Do When My Well Floods?*


FLOOD CLEAN-UP IN RURAL AREAS

Figure 21-11. DNR Guide to Flood Clean-Up in Rural Areas

- The CDC have several web pages addressing flood clean-up:

  - *Reentering Your Flooded Home*
  - *Mold After a Disaster*

- The National Center for Healthy Housing has developed *Creating a Healthy Home: A Field Guide for Clean-Up of Flooded Homes*.

- FEMA has numerous documents available for assistance with repairing flood-damaged structures to be more resilient to future flooding, including *Homeowner's Guide to Retrofitting*.

- Ask your county health department or emergency manager for site-specific guidance on how to ensure that a building is fit for re-occupancy, water is drinkable, etc.

Iowa State Extension (http://www.extension.iastate.edu/topic/recovering-disasters) has post-disaster materials on many topics and can provide advice on technical matters. Check their website for the latest materials (see Section 28 Contacts).

Some communities require that a contractor certify that a building has been properly cleaned. This should be allowed only if the contractor is qualified to do so. Two organizations certify repair contractors. They can tell you who in your area is certified and what qualifications they have. They are the *International Institute for Cleaning and Restoration Certification (IICRC)* and the *Association of Specialists in Cleaning and Restoration (ASCR)*. Section 28 lists contact information.

Rebuilding Safer and Stronger

Floods create a window of opportunity to increase awareness of flood risk. Use this opportunity to encourage your residents to build back safer and stronger. Seize the opportunity to encourage property owners to voluntarily elevate utilities and other mechanical devices or even their entire home higher than the required elevation to keep them safe from future flooding.

The following resources will help you and your residents rebuild safer and stronger:

- FEMA P-312, *The Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home From Flooding*, is a valuable resource that can be used by residents to learn how to rebuild safer to avoid future flood losses. FEMA's Building Science web page has many additional resources to help you and residents build safer following a flood.

- The FEMA publication *Mitigation Ideas: A Resource for Reducing Risk from Natural Hazards* is available to help communities identify and evaluate potential mitigation actions for reducing risk from natural hazards and disasters.

- You can also learn about best practices that have been implemented by other communities during flood recovery through FEMA's Mitigation Best Practices search web page or FEMA's catalog of mitigation fact sheets.

22. Hazard Mitigation

22.1.Mitigation Measures

While this reference has focused in the previous sections on regulations directed toward new construction in the floodplain, most communities are more concerned about existing flood problems. This section tackles existing issues—reducing flood losses and making sure other activities do not make things worse.

Oftentimes communities use only one or two flood protection activities. One example of flood protection is that every community in the NFIP regulates new development to prevent flood risk from increasing. Another is that many communities tackle their local drainage problems with storm sewer or drainage construction projects. Additionally, communities in high hazard areas usually have flood warning and evacuation programs.

However, communities often do not realize the variety and range of other flood protection activities they could implement, nor do they know of all the Federal, state, local, and private agencies or organizations that can provide related flood assistance.

While flooding cannot always be stopped—and in many cases, should not be prevented—flood hazards can be reduced. As its definition attests, the phrase “hazard mitigation” means taking measures that minimize or reduce the impacts of flooding on human development. For the purposes of this reference, “**flood hazard mitigation**” is defined as “all actions that can be taken to reduce property damage and the threat to life and public health from flooding”.

“All” is the critical word, and each community should consider all possible measures for mitigating flood hazards. It is to each community’s benefit to seek support from a wide array of programs and agencies to build a more comprehensive and resilient flood hazard mitigation portfolio. However, when considering all actions, it is important to identify which measures are appropriate given their unique situations. To make “all actions” more manageable, flood hazard mitigation measures can be categorized under four types: planning and regulation, warning and redundancy, resilient systems and structures, and cooperation and awareness. These are the types that are referenced in the Iowa Hazard Mitigation Plan (2023 Update).

Examples of different flood hazard mitigation approaches

Structural flood control projects can be the most efficient way to protect an existing critical facility or a concentration of damage-prone buildings, but in developing areas, regulations, and acquisition make more sense, as they are inexpensive ways to limit creation of flood problems.

Figure 22-1 summarizes these mitigation types.

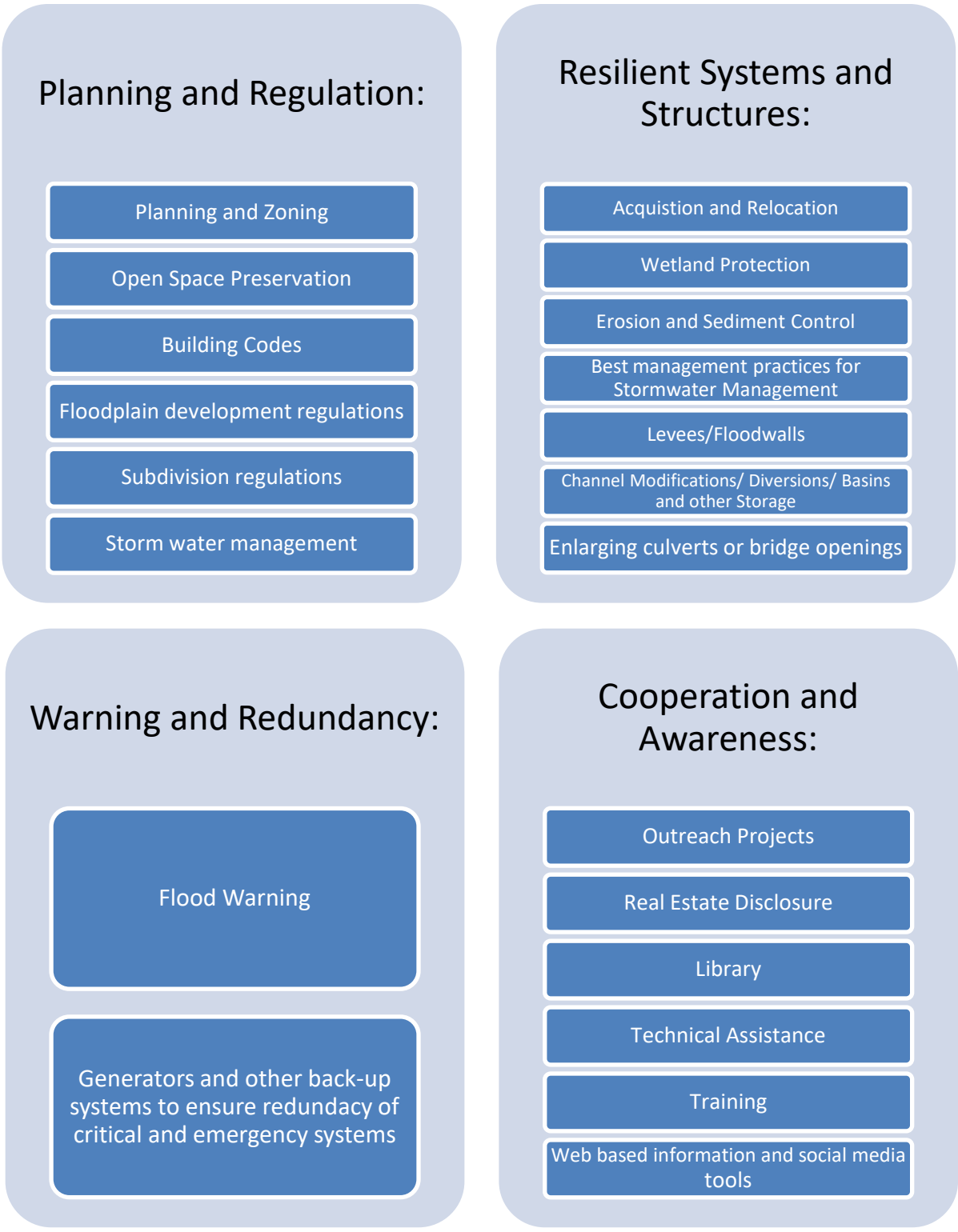


Figure 22-1. Mitigation strategies

22.1.1. Planning and Regulation

Mitigation actions in the planning and regulation category are preventive measures designed to keep the problem from occurring or getting worse. They ensure that future development does not increase flood damage. Such measures are usually administered by building, zoning, planning, and/or code enforcement offices. They include:

- Planning and zoning
- Open space preservation
- Building codes
- Floodplain development regulations
- Subdivision regulations
- Stormwater management

Figure 22-2. The best prevention measure is to preserve flood-prone areas as open space

22.1.2. Resilient Systems and Structures

Resilient Systems and Structure projects include measures modifying existing structures and infrastructure to protect them from flood damage. More resilient actions of this type may include green infrastructure, nature-based solutions, Engineering with Nature, and bioengineering to incorporate natural features or processes into the built environment. Resilient systems and structures measures include:

- Acquisition
- Relocation
- Building elevation
- Dry and wet floodproofing
- Sewer backup protection
- Wetland protection
- Green Infrastructure/Nature-Based Solutions
- Erosion and sediment control
- “Best management practices” for stormwater management
- Levees and floodwalls

- Detention and retention structures
- Channel modifications
- Enlarging culverts or bridge openings
- Diversions

22.1.3. Warning and Redundancy

One of the goals of the 2023 Iowa Hazard Mitigation Plan is:

- Through planning, improved warning systems, and redundancy, increase capabilities to ensure government operations, response, and recovery are not significantly disrupted by disaster events.

Measures aligned with such a goal include:

- Flood warning
- Plans and processes for the continuity of emergency flood response
- Back up power and systems to ensure the continuity of operations of critical facilities

22.1.4. Cooperation and Awareness Projects

Mitigation actions in the cooperation and awareness category include public information activities that advise property owners, potential property owners, and officials about flood hazards, ways to protect people and property from such hazards, and the natural and beneficial functions of floodplains. They also include activities that promote cooperation among different government entities in order to be more prepared for flooding. They can include:

- Floodplain mapping information
- Outreach projects
- Real estate disclosure
- Library resources
- Technical assistance
- Environmental education
- Web-based information and social media tools

Figure 22-3. Public information display to promote risk awareness

22.2.Flood Hazard Mitigation Plan

A flood hazard mitigation plan is a coordinated process that engages residents, property owners, local officials, and other stakeholders to assess their shared and unique flood risks, prioritize their vulnerabilities, and identify solutions. At times, different departments in a community may implement activities that are not coordinated or that may even conflict with one another. A flood hazard mitigation plan provides an opportunity to identify and purposefully foster some of the co-benefits and resolve some of the inherent conflicts.

Examples of dissonant community priorities:

- The street department extends or improves streets in the floodplain where the planning and zoning office discourages development
- The public works department straightens ditches and lines them with concrete to make them more efficient, while the parks department or neighborhood groups promote greenways and natural vegetative approaches to bank stabilization
- The engineering office collects valuable data on rainfall and stream levels, but the emergency manager cannot access the information to predict the timing or crest of a flood
- Property owners view a swamp as a place to be filled, farmed or developed without realizing the wetland's role in filtering and absorbing floodwaters and providing habitat

22.2.1. Benefits of Planning

The objective of planning is to produce an actionable program of activities that will best tackle the community's flood problem while meeting other community needs. A well-prepared plan will:

- Ensure that all possible activities are reviewed and that the most appropriate solutions are implemented to address the flood problem.
- Link floodplain management policies to specific activities.
- Ensure that activities are coordinated with other community goals, objectives, and activities, preventing conflicts and reducing the costs of implementing individual activities.
- Educate residents about the flood hazard, flood loss reduction measures, and the natural and beneficial functions of floodplains.
- Fulfill planning requirements for Federal assistance.
- Guide development away from hazardous areas.
- Build public and political support for projects that prevent new flood problems, reduce flood losses, and protect the natural and beneficial functions of floodplains.
- Facilitate implementation of floodplain management activities through an action plan that has specific tasks, staff assignments, and deadlines.

The flood hazard mitigation plan can guide your community's flood, stormwater, and related activities so that they are implemented more economically and aligned with the needs and

objectives of your community and its residents. The coordination to prepare the plan and the resulting actions can result in reducing flood losses and improving the protection of the floodplain's natural and beneficial functions.

22.2.2. The Planning Process

The planning process includes getting input from everyone who has relevant information, everyone who is affected by flooding, and everyone who will participate in implementing the plan. It works for all types of plans, such as those for land use, capital improvement, neighborhood redevelopment, and hazard mitigation.

Figure 22-4. Public involvement increases risk awareness and acceptance of mitigation activities

A hazard mitigation plan can take many forms, using a variety of formats and organizational styles. The format and organization of a plan are not as important as the *process* of planning. Because each community is different, the results of each floodplain management plan will vary. However, the process they follow should be similar with purposeful attention to local nuances.

The Disaster Mitigation Act of 2000 (also known as "DMA 2000" or "DMA 2K") set new planning requirements for FEMA's programs. Effective November 1, 2003, if a community wants FEMA pre-disaster mitigation funds, a Flood Mitigation Assistance (FMA) approved and locally adopted multi-hazard mitigation plan is required. The requirement went into effect for post-disaster Hazard Mitigation Grant Program (HMGP) funds on November 1, 2004.

FEMA recommends a 10-step planning process, summarized in Figure 22-5. This process provides a framework with which local officials, residents, planners, engineers, technical experts, and others can work out the details and reach an agreement on what should be done to mitigate the flood hazard.

NFIP/CRS

The 10-step planning process is credited under the Community Rating System, Activity 510 Floodplain Management Planning, in the *CRS Coordinator's Manual* and the *CRS Application.* It is explained in more detail in *Example Plans*. Plans developed according to this process are a prerequisite for funding under other FEMA programs.

One of the most legally defensible ways to manage your floodplain is to use the **No Adverse Impact (NAI)** approach. This approach is based on the premise that your floodplain management regulations are not taking away property rights; rather, the regulations are protecting them.

More information on the NAI approach to floodplain management can be found on the Association of State Floodplain Managers NAI website: ASFPM No Adverse Impact

DMA2K (44 CFR 201.6)	CRS Steps
Planning Process	
201.6(c)(1)	1. Organize
201.6(b)(1)	2. Involve the public
201.6(b)(2) & (3)	3. Coordinate
Risk assessment	
201.6(c)(2)(i)	4. Assess the hazard
201.6(c)(2)(ii) & (iii)	5. Assess the problem
Mitigation Strategy	
201.6(c)(3)(i)	6. Set goals
201.6(c)(3)(ii)	7. Review possible activities
201.6(c)(3)(iii)	8. Draft an action plan
Plan Maintenance	
201.6(c)(5)	9. Adopt the plan
201.6(c)(4)	10. Implement, evaluate, revise

Figure 22-5. FEMA planning guidance

22.3. Flood Mitigation with a Watershed Approach

Because water does not respect property lines or jurisdictional boundaries, comprehensive solutions to your community's flood problem should involve not just your community, but the entire watershed. Often, flood mitigation strategies employed by communities may do little to reduce flooding of buildings downstream but instead often make the situation worse for downstream properties. This is because certain flood mitigation measures end up either speeding the water along or pushing it off one protected area onto an unprotected area.

A more resilient flood mitigation option is a "watershed approach". A watershed approach to flood reduction is one in which practices or structures are installed upstream from the flood-prone area so that floodwaters either soak into the soil (i.e., infiltration) or are slowed down or held back (detention, storage, or diversion). Where it works, the benefits of the watershed approach to flood reduction include:

- Reducing losses from flood damage
- Greatly minimizing adverse impacts to those downstream (because the problem is not pushed downstream)
- Lowering flood elevations not only at the flood-prone area of focus but also in additional flood-prone areas further downstream

- Improving wildlife habitat
- Possibly improving soil health and sustainability (depending upon specific methods used)
- Compared to other flood mitigation methods, reducing ongoing maintenance through the use of nature-based methods
- Providing greater resiliency by making the community better able to withstand heavy rainfall events while reaping additional benefits

A “watershed approach” is also espoused by those seeking to improve water quality, because watershed approach practices are especially effective at reducing the loads of nitrates, phosphorus, and sediment in streams. Watershed approach practices can indeed provide benefits for water quality improvement and flood reduction (as well as providing wildlife habitat and soil health). Different practices can provide varying degrees of peak flow reduction in streams; some will be better for flow reduction, while others are evidently intended more for water quality improvement. When seeking to use different watershed approach methods for flood reduction, it is important to understand just how effective each method is in regard to peak flow reduction. Of course, the advantage of watershed approach practices is that they can “kill two birds with one stone”, and sometimes the practices selected will be determined by those which can achieve both a certain level of water quality improvement as well as flood reduction. Having a good understanding of the different practices will help those implementing a watershed approach determine which ones are best to use depending on the objectives for the watershed area. Therefore, what follows are explanations of many different watershed approach practices, which will hopefully elucidate the relative effectiveness of each in their respective abilities to reduce streamflow. Unless otherwise noted, the following descriptions and accompanying graphics are taken from publications prepared by the Iowa State University Extension, available for download at https://store.extension.iastate.edu/Topic/Environment/Water-Resources-and-Water-Quality?S=0&A=0&F=0.

22.3.1. Buffers (Including Riparian Buffers, Filter Strips and Grassed Waterways)

Buffers are established areas of permanent vegetation, within and around fields, and are designed to intercept and filter sediment and nutrients out of surface runoff and shallow groundwater before entering a water course. One of the primary functions of buffers is to slow surface runoff, trapping 41–100% of the sediment. By slowing surface runoff and promoting infiltration, buffers delay downstream flooding and reduce streamflow by 10%. There are many types of buffers that are distinguished by their design and vegetative species, including riparian forest buffers, filter strips, and grassed waterways.

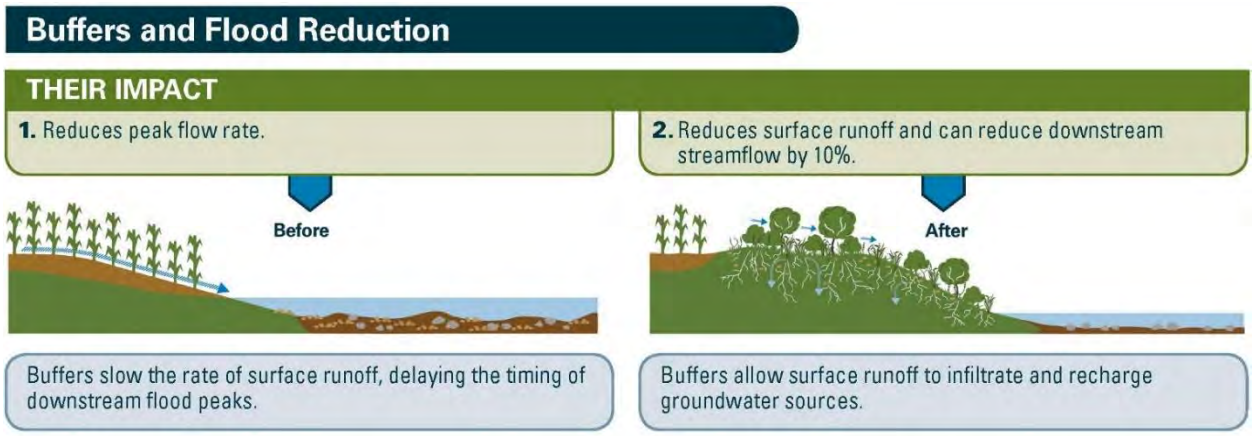


Figure 22-6. Buffers and Flood Reduction

22.3.2. Streambank/Channel Stabilization

Channel stabilization involves reshaping a streambank with a stable slope and installing structural and bioengineering techniques, such as riprap or permanent vegetation. By increasing infiltration, slowing surface runoff, and increasing water storage, channel stabilization reduces the streamflow by 5% and decreases the risk of downstream flooding.

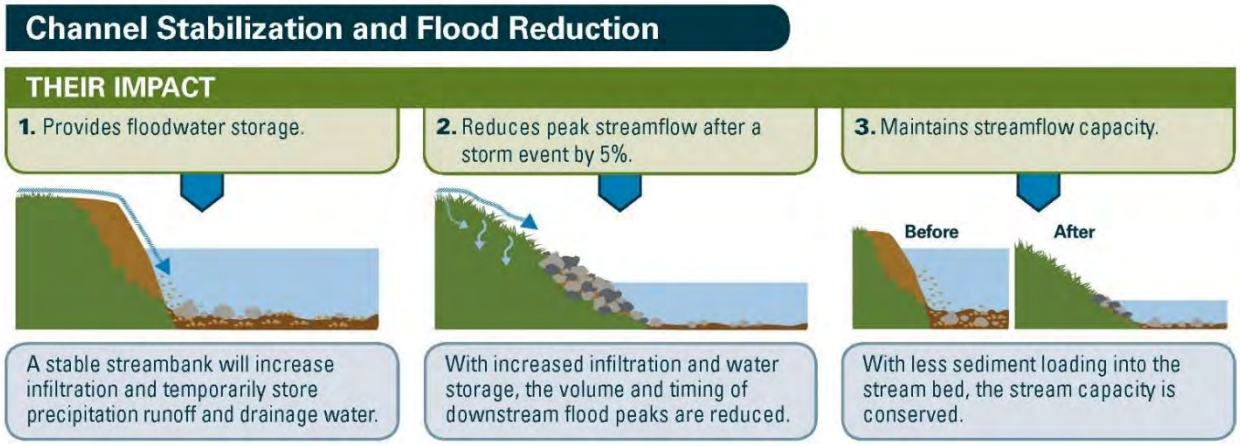


Figure 22-7. Channel Stabilization and Flood Reduction

22.3.3. Floodplain Restoration

Floodplain restoration involves reconnecting a river or stream to its natural floodplain, giving rivers more room to safely accommodate floodwater. Floodplains spread out and slow down flood water and surface runoff, reducing streamflow by 20%, recharging groundwater, and reducing the flooding risk to riverside and downstream communities.

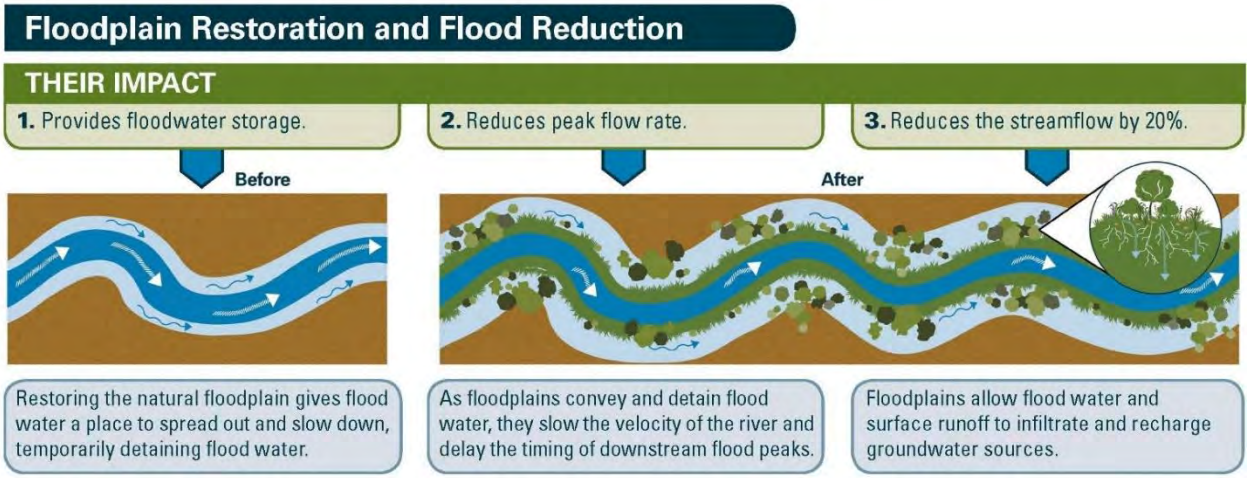


Figure 22-8. Floodplain Restoration

22.3.4. Ponds

Farm ponds are pools of water that are constructed using either a dam (embankment pond) or a pit (excavation pond). They collect and store surface runoff from a watershed area 10–20 times greater than their surface area, reducing the streamflow by 10–30%. Ponds can prevent soil erosion by eliminating gullies.

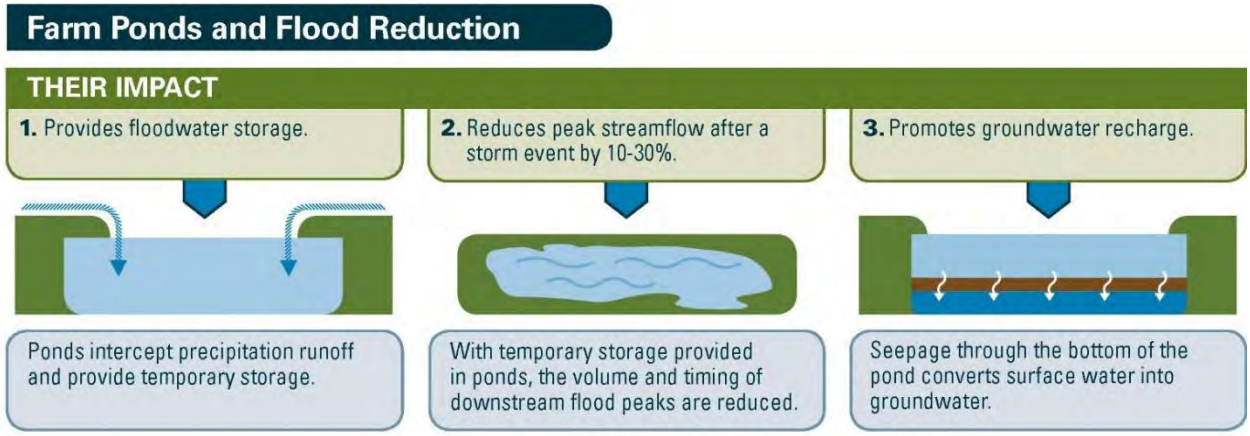


Figure 22-9. Farm Ponds and Flood Reduction

22.3.5. Oxbow Restoration

Oxbow features are remnant meanders of rivers and creeks, cut off from the main channel either by erosive forces or human alteration. When these features are restored and reconnected to the watercourse as a meander, they increase flood storage capacity and reduce sediment load.

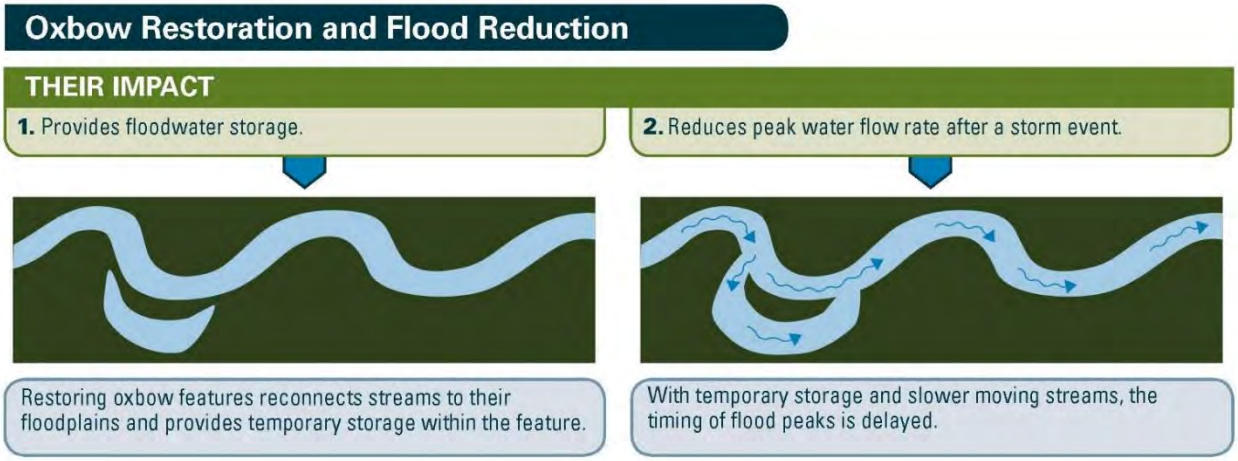


Figure 22-10. Oxbow Restoration and Flood Reduction

22.3.6. Perennial Cover

Perennial cover includes establishing and maintaining permanent vegetation, such as native or introduced grasses, legumes, and forbs. The enhanced root system increases water infiltration, reduces and slows surface runoff, and decreases the downstream flooding risk by reducing the streamflow by 40%. The perennial cover also prevents soil erosion and sedimentation.

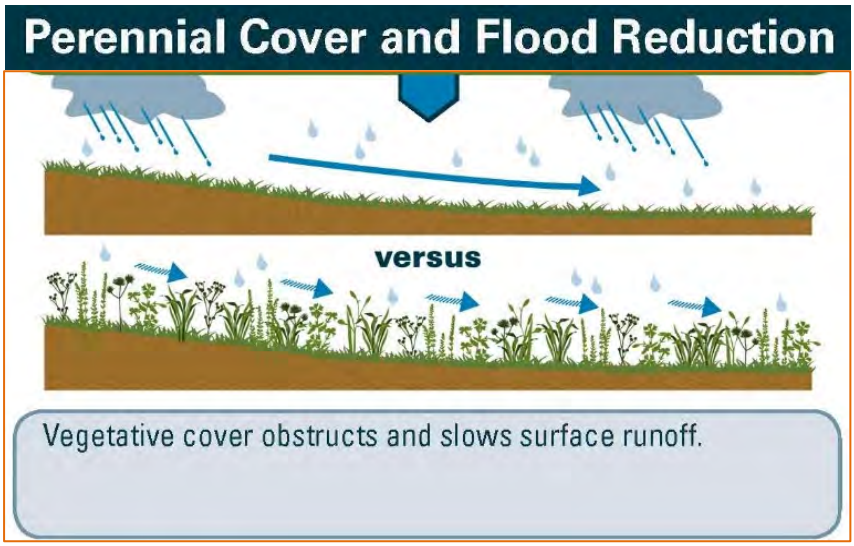


Figure 22-11. Perennial Cover and Flood Reduction

22.3.7. Wetlands (Restored or Created)

Wetlands are strategically placed to capture surface runoff and drainage water. They provide temporary storage for floodwater, which lowers downstream flood peaks and reduces streamflow by 10-20%. Additionally, they provide wildlife habitat and reduce nitrate concentration, and filter out chemicals from pesticides and insecticides.

Figure 22-12. Restored Wetland Adjacent to Big Sioux River in Northwest Iowa

22.3.8. Prairie Strips

Figure 22-13. Example of Prairie Strips

Prairie strips are an agricultural conservation practice that uses strips of native prairie vegetation in or at the edges of fields. In research conducted in Jasper County, Iowa, converting 10% of a row-cropped field to prairie strips reduced sediment transport by 95% and overland water flow by 42%. They also reduced nitrogen and phosphorus transport, and increased plant diversity and wildlife.

22.3.9. Terraces

A terrace is an earthen embankment constructed across a field slope, typically following the contour, and can be designed to temporarily store runoff or convey runoff to waterways. Terraces break up the slope length of the field into multiple shorter slope sections, slowing the flow rate of runoff, reducing sheet and rill erosion. As terraces temporarily store and slowly infiltrate or discharge runoff, they conserve soil moisture, reduce streamflow by 5%, allow sediment to settle out, and reduce phosphorus loads.

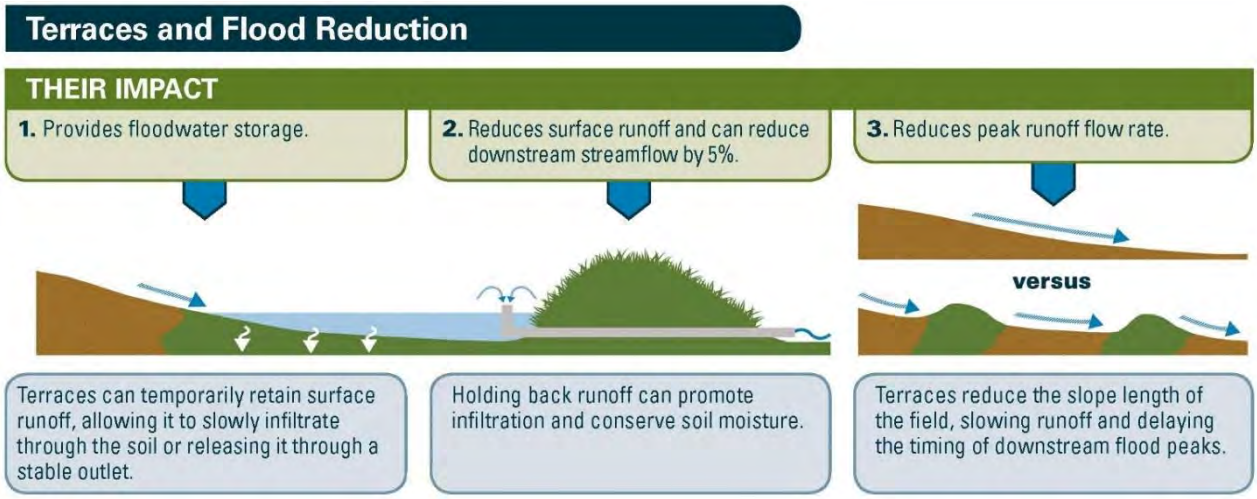


Figure 22-14. Terraces and Flood Reduction

22.3.10. Water and Sediment Control Basins (WASCOBs)

WASCOBs are designed along minor slopes or watercourses. They detain precipitation runoff during storm events and slowly discharge this water through a stable outlet, which reduces streamflow by 5%. Sediment in the runoff is deposited in the basin, removing 80% of total suspended solids in runoff, reducing the phosphorus load by 85%, and improving downstream water quality.

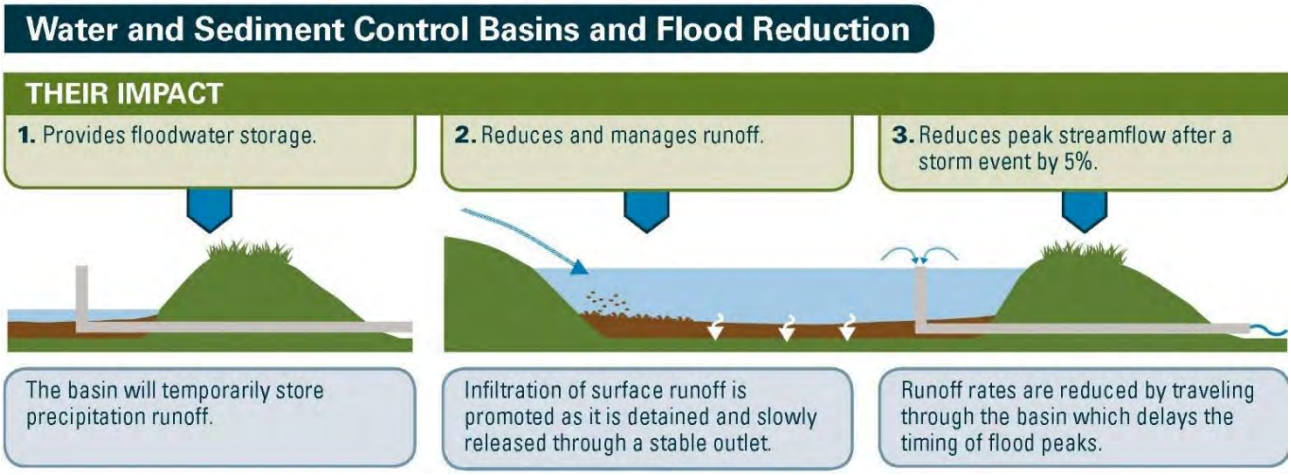


Figure 22-15. Water and Sediment Control Basins and Flood Reduction

The methods described above are just some of the many watershed approach practices; others include cover crops, saturated buffers, bioreactors, stream-diverted storage, “on-road” (or along road) detention structures, and other detention structures. Some of these practices are more effective than others at peak flow reduction. Some have little or no impact. For instance, practices that result in streamflow reduction of 5% or less include bioreactors, saturated buffers, and channel stabilization. Some, though, having little impact singly and alone, can have a much greater impact when used in tandem or combined with other practices. For instance, WASCOBs are often used in a series, with three or even as many as

seven placed along the same watercourse, and can result in significant peak flow reduction. Engineers who designed a project in the English River watershed, for example, found that to be the case when several WASCOBs were used together and with terraces[1]. And, as a single WASCOB is relatively inexpensive, stringing several together may be a very cost effective strategy to achieve effective streamflow reduction.

When considering which watershed approach practices to use to effectively achieve peak flow reduction, referring to the percent streamflow reduction, as shown in the descriptions above, can be very helpful. Other factors must be considered, like the cost of each practice. Oxbow restoration and installation of streamflow diversion structures illustrate other factors that need to be considered. These similar practices can vary greatly as to how much peak flow reduction can result. The amount of flow reduction will greatly depend on the size and specific design for intercepting and diverting streamflow into the oxbow or storage area. Design parameters can make a great difference in determining how effective many of these practices can be in reducing peak streamflow.

22.4. Mitigation Assistance Programs

A variety of federal, state, local, and private sources offer assistance in mitigation activities. Your community will benefit from a creative and resourceful approach. This section reviews the several programs available in Iowa.

22.4.1. Help Communities Understand Their Flooding to Explore Alternatives for Mitigation

For communities that experience flooding but do not know what to do about it, there is the initiative to Help Communities Understand Their Flooding To Explore Alternatives For Mitigation (Help CUT Flooding Team).

The Help CUT Flood Team is part of the Iowa Flood Risk Management Team (comprised of Iowa DNR, Iowa Homeland Security and Emergency Management, USACE and others). This group includes representatives from state and Federal agencies who bring top-notch technical resources, including advanced mapping and engineering analysis, to help communities understand their flood issues and options for mitigation.

Why Get Assistance from the Help CUT Flooding Team?

- Comprehensive Analysis: Experts provide detailed flood risk assessments and explore various mitigation options tailored to your community's needs.

[1] *Hydrology and Hydraulic Study: Iowa County F67 Bridge – Improvements to Contributing Drainage Area* by French-Reneker Associates, December 2020.

- Collaborative Approach: The team works closely with your community, requiring only your commitment to supply the necessary information for our analysis.

- Expertise at No Cost: Benefit from the combined knowledge of state and Federal agencies without any financial burden.

How It Works:

The team meets regularly to discuss and prioritize communities seeking assistance. While the team does not provide direct financial aid for implementation or construction, the insights and data provided will position your community to secure funding through programs like FEMA's HMA. To receive Help CUT Flooding assistance, a community representative should answer the brief online survey at https://arcg.is/0zmq8v.

What Help CUT Flooding Provides:

Help CUT Flooding (also known as Real-Time Technical Assistance, or RTTA) identifies flood mitigation actions that a community that would be feasible for a community. The intention of the program is that it will also provide information that a community could use to move forward with implementing some of the identified possible solutions by applying for grant funding from one of FEMA's HMA programs (with application through Iowa HSEM).

Help CUT Flooding (i.e., RTTA) Example

The images and narrative below show a good example of the type of assistance provided through Help CUT Flooding.

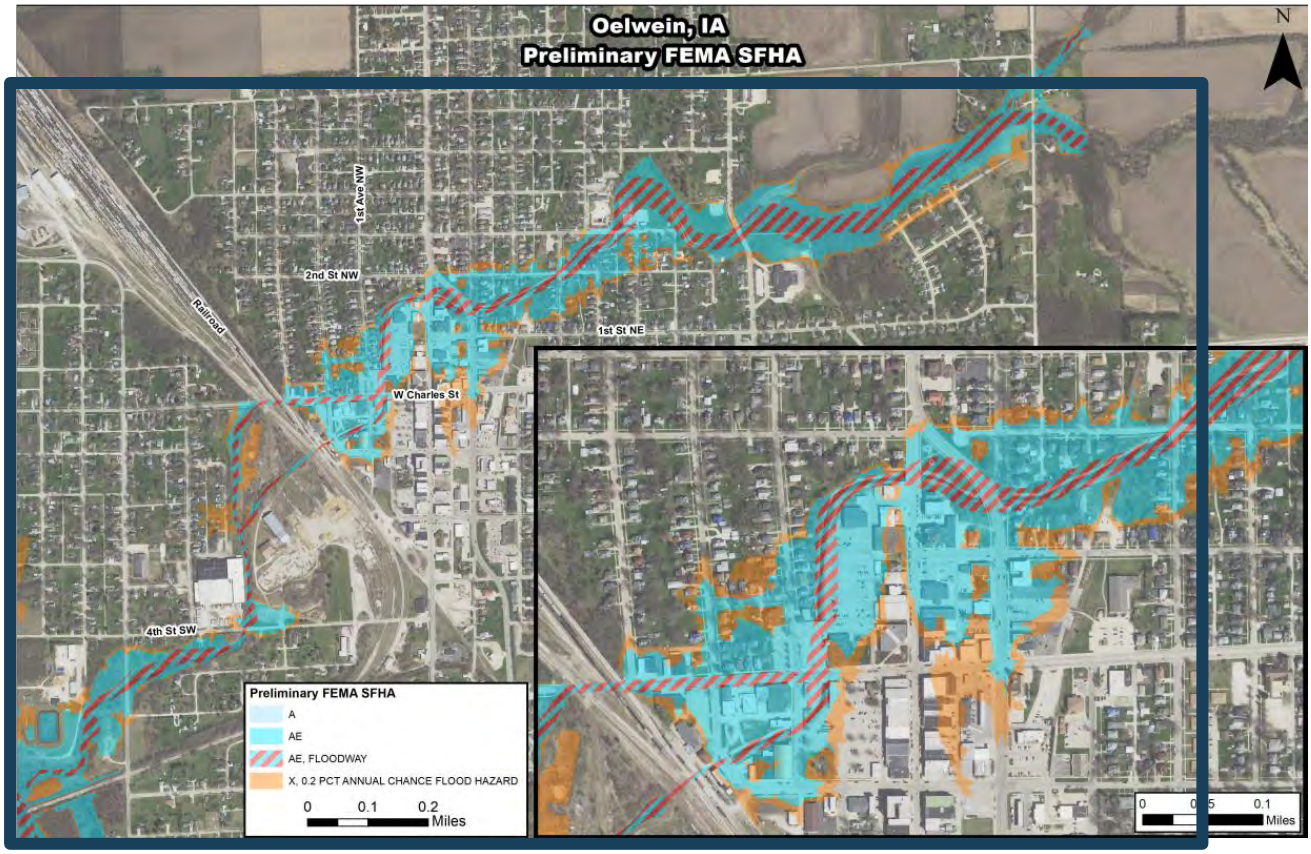
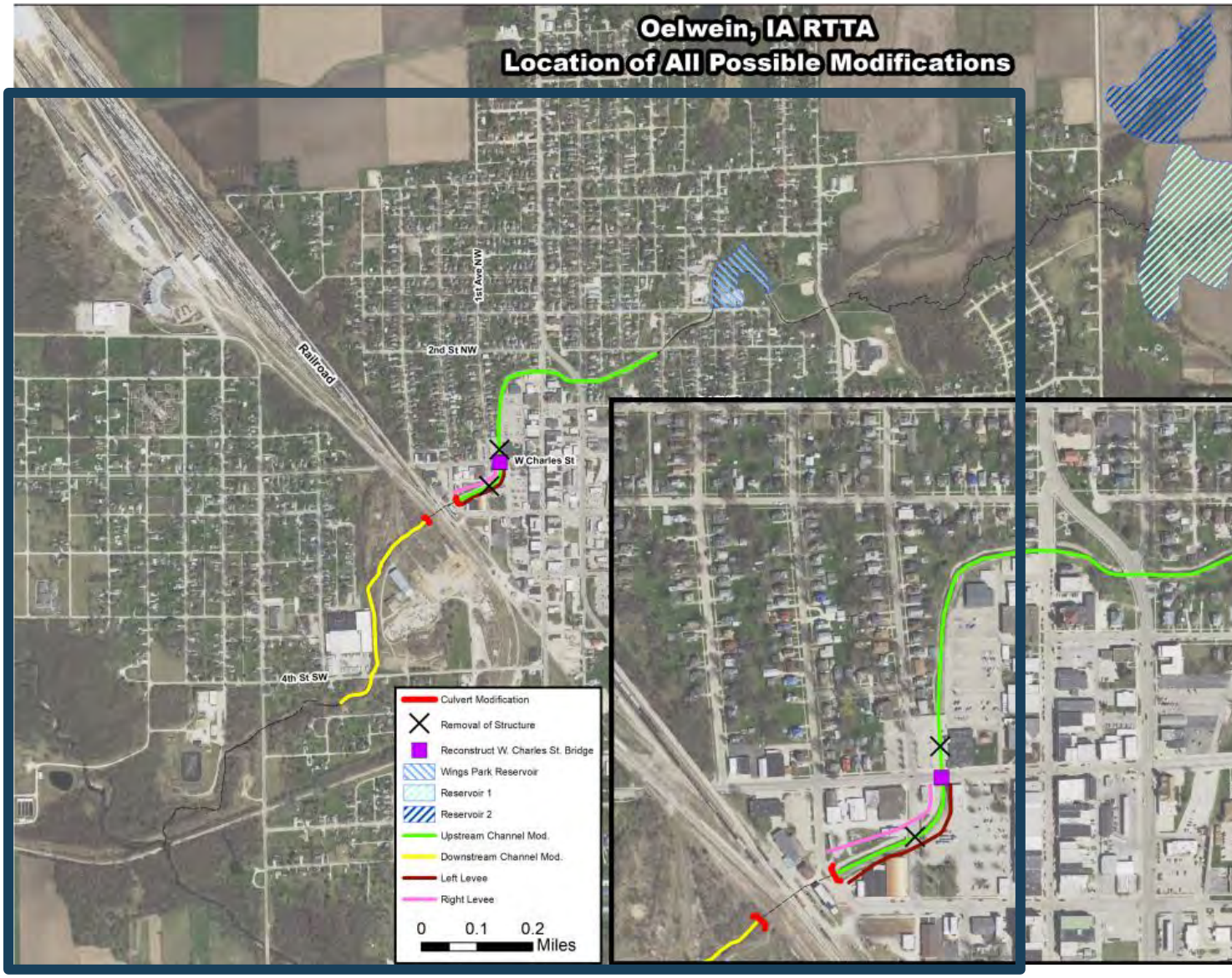


Figure 22-16. Preliminary FEMA SFHA

Dry Run Creek flows through a city with a population of about 6,500 people. The creek goes underneath a railroad, and it was thought that the culverts under the railroad were too small and thus made the water back up and flood the downtown and other parts of the city.

The city received assistance from Help CUT Flooding (aka RTTA) to investigate what was causing the flooding and what could be done about it. An engineering firm not only looked at modifying the culverts that went underneath the railroad, but they also looked at several other options to mitigate the flooding from Dry Run Creek, as shown below.



Feature	Option										
	1	2	3	4	5	6	7	8	9	10	11
Increased railroad culvert size	✓										
Removal of 1st Ave SW Bridge		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Removal of parking deck North of W. Charles Street		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reconfiguration & replacement of W. Charles Street Bridge		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Storage in Wings Park			✓								
Storage reservoirs upstream of Outer Rd				✓		✓	✓	✓	✓	✓	
Lined rectangular channel, upstream of railroad					✓	✓					
Deepened & Lined rectangular channel, upstream of railroad							✓	✓	✓	✓	✓
Deepened & Lined trapezoid channel, downstream of railroad									✓	✓	✓
Small flood wall on left side of channel upstream of railroad								✓			
Small flood wall on right side of channel upstream of railroad								✓		✓	
Recommended	X	X	X	~	X	~	~	✓	✓	✓	X

Figure 22-17. Options to mitigate flooding

As shown in these images, the other mitigation options investigated included modification of the creek channel at various places, removal of structures so that the creek could be “daylighted”, reconstruction of a bridge, construction of levees, and creation of retention and/or detention storage basins (aka “reservoirs”). Then, the engineer ran through several “what if” scenarios of what if the city did different combinations of those actions, which ones would be best at making the flooding go down? They provided a report of 11 different scenarios and indicated which ones would be recommended, as illustrated in the chart.

22.4.2. Watershed and Flood Prevention Operations (WFPO)

Once a community knows some basic options that could result in flood reduction, it will need to plan and design these methods and find funding to implement them. A community may seek to get funding before doing much design, but unless they intend to fund construction all on their own, significant planning and design are usually necessary to qualify for grants and other financial assistance for flood reduction. One reason for the need for substantial design work is to show that the project is technically feasible and that all factors (e.g., environmental impacts) have been adequately evaluated and considered.

Another reason is that many grant programs require evidence that a proposed project will be cost effective before the award of grant funds for construction. For instance, FEMA’s HMA and Natural Resource Conservation Service (NRCS) WFPO programs require, prior to funding construction, an analysis demonstrating cost effectiveness. Now, it is important to understand just what “cost effective” means when seeking funds from different grant programs. Most Federal initiatives seek to accomplish a goal in a “cost effective” manner. However, the definition or vision of “cost effective” can be different. In the world of water quality improvement, where a watershed approach is often espoused, “cost effective” typically means finding the “cheapest” way to accomplish a goal. For example, if the goal is to reduce nitrogen or Phosphorus by a certain percentage, then different alternatives to do that are examined, and the cheapest one is considered the most cost effective. FEMA’s vision on cost effectiveness is different: they compare the cost, in dollars, to the benefits, in dollars. If benefits, over time, are greater than the costs, then the project is cost effective. Water quality improvement does not measure the benefit in dollars the same way. It is assumed the benefit (e.g., the reduction in nitrogen) is worth it. FEMA has methods, incorporated into its Benefit-Cost Analysis (BCA) Toolkit (BCA Toolkit 6.0 is the version in currency at the time of this writing), that help measure all benefits in dollars, including environmental service benefits converted into dollar values, so their values can be compared to the costs.

A certain amount of design and engineering must be done in order to complete a benefit-cost analysis and have all the necessary documentation to back up the figures that need to be fed into the BCA Toolkit. In other words, a considerable amount of engineering and design is often required to even apply for grant funds. A community has no guarantee when it begins this process of engineering and design that they will get grant funds to implement their flood reduction project. As such, many communities, in particular smaller ones with little resources at their disposal, are not willing to spend the money needed to hire an engineer to complete the design work necessary for developing the project proposal. Thus, they are not able to finish a grant application, and the project stalls before it really ever gets started.

As for helping out with the funding of engineering and design, one possibility is that a community could request "project scoping" funds through FEMA's BRIC program in order to pay for engineering and design. Another avenue for engineering and design is the WFPO program through the NRCS of the U.S. Department of Agriculture.

This WFPO program, helps local governments (project sponsors) protect and restore watersheds up to 250,000 acres. The program provides Federal assistance (through the NRCS) to project sponsors for the development and implementation of watershed project plans. The program essentially breaks out into three phases. The first phase is the development of a "Preliminary Investigation Feasibility Report" (PIFR). Once the PIFR is completed and indicates project feasibility, the project sponsor can move on to the second phase and request NRCS planning assistance and authorization to develop a watershed project plan. The watershed project plan contains project actions, which are formally planned undertakings carried out within a specified geographic area by the project sponsors for the benefit of the general public.

During this second phase, the watershed plan development phase, some engineering and design can occur for the project(s) that are part of the chosen alternative for flood prevention or flood damage reduction. In the third phase, NRCS could authorize funds to install the measures or projects in the approved Watershed Plan – discussion of this opportunity for implementation funds will be discussed more below. If a local government can manage to get to the second phase and have NRCS fund the development of a watershed plan, they can very likely get the engineering and design needed to fulfill the requirements in the list above. Then, even if they are not able to get funding from NRCS for implementation of the projects (the third phase), the community would have the engineering they need to submit an application for a FEMA HMA grant.

22.4.3. Project Scoping (and Advance Assistance)

Other Federal programs through which communities may be able to get assistance with engineering and design are FEMA's HMA programs. These include the BRIC program, the FMA program, and the HMGP. Not only can these programs provide funding for the construction and implementation of projects, but they can also fund what are called "project scoping" projects (or in HMGP, they are referred to as "Advance Assistance"). Project scoping (or Advance Assistance) activities can include data collection for, and development of, applications for BRIC or other funding opportunities2. Project scoping can include engineering design and feasibility studies, environmental and historic preservation review, hydrologic and hydraulic studies, and collecting data for BCAs and conducting those BCAs.

It may be advantageous to integrate the use of project scoping and WFPO. For instance, a community could seek project scoping funds, and then use those funds to not only develop much of the required HMA application materials, but also to collect the information needed to complete the WFPO PIFR. Then, at the conclusion of its project scoping activity, a community would be poised to successfully request WFPO assistance from NRCS or apply for FEMA

[2] See FEMA Program Support Material "BRIC project scoping Activities" at https://www.fema.gov/sites/default/files/documents/fema_fy21-bric-project-scoping-psm.pdf

HMA funds, or both, depending on what is deemed feasible and most advantageous after project scoping.

22.4.4. BRIC Direct Technical Assistance

Through the BRIC Direct Technical Assistance (DTA) initiative, FEMA can provide holistic hazard mitigation planning and project support at the earliest stages to communities requesting assistance. This non-financial assistance helps communities in reducing disaster damage, building community resilience, and sustaining successful mitigation programs. FEMA offers wide-ranging non-financial support to BRIC DTA communities, including climate risk assessments, community engagement, partnership building, and mitigation and climate adaptation planning. Support for BRIC DTA communities can range from pre-application activities to grant closeout.

During the DTA process, FEMA will engage with each community to further explore and better understand their specific requests for technical assistance.

BRIC DTA and project scoping may seem very similar, and they are in some ways. But there are some key differences. The following chart summarizes the similarities and differences between the two programs.

Project Scoping (or Advance Assistance)	Direct Technical Assistance
Support to communities with some resources but unsure of the best solution (In Iowa, local match of 15% required, unless local is an EDRC)	Support to communities without resources (i.e., no local cost match required)
Funds studies, design work & application development	Resilience planning & project design (but not final design – no “stamped” engineering designs will be provided)
Ideally, drives future HMA grant applications	Enhances a community’s capacity and advances community-driven objectives (could be more planning-related)
Jurisdiction must find, choose, and procure a contractor to do the work	FEMA provides staff or contractor; jurisdiction does not choose
Jurisdiction must follow 2 CFR Part 200 procurement standards	Jurisdiction has no procurement responsibilities
Project Scoping proposals only compete with other C&CB proposals within the state, competing for the state’s BRIC set aside	DTA requests compete with other DTA requests from across the nation. Priority given to disadvantaged communities, such as: EDRCs or CDRZs Justice40 communities

Flood Mitigation Assistance Program

Flood Mitigation Assistance (FMA)

Congress, through FMA, provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the NFIP.

The National Flood Insurance Reform Act of 1994 authorized FEMA to provide grants to States and communities for planning assistance and for mitigation projects that reduce the risk of flood damage to structures covered by flood insurance. The FMA is a competitive program to fund cost effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other insurable structures.

FMA will pay 75% of the cost of these measures under its planning grants, project grants, and technical assistance grants. Each state receives annual funding for planning and project grants. The State's Emergency Management Division administers the program. All funding applications must go through the state to be accepted by FEMA (see Section 28, Contacts).

Planning grants: The purpose of a planning grant is to develop or update a Flood Mitigation Plan. To be eligible for an FMA or HMGP project grant, an eligible applicant must develop, and have approved by the FEMA Regional Director, a Flood Mitigation Plan that "will articulate a comprehensive strategy for implementing technically feasible flood mitigation activities for the area affected by the plan".

The regulations note that "existing plans, such as those credited through the Community Rating System ... may meet the requirements of FMA with few or no modifications".

Project grants: The following types of projects are eligible for funding through FMA, providing they meet all other eligibility criteria (per 44 CFR 78.12):

- Acquisition of insured structures and underlying real property in fee simple and easements restricting real property to open space uses.
- Relocation of insured structures from acquired or restricted real property to non-hazard-prone sites.
- Demolition and removal of insured structures from acquired or restricted real property.
- Elevation of insured residential structures in accordance with NFIP standards.
- Elevation or dry floodproofing of insured non-residential structures in accordance with NFIP standards.
- Other activities that bring an insured structure into compliance with the NFIP's floodplain management requirements.
- Minor physical flood mitigation projects that reduce localized flooding problems and do not duplicate the flood prevention activities of other Federal agencies.

To be eligible for a project grant, a project must be:

- In conformance with the approved hazard mitigation plan. The type of project being proposed must be identified in the plan.
- Cost effective, not costing more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future floods were to occur. Both costs and benefits are computed using net-present value.
- In conformance with Federal regulations on floodplain management, protection of wetlands, seismic safety, and applicable environmental laws and regulations.
- Technically feasible.
- In conformance with the minimum standards of the NFIP.
- Located physically in a participating NFIP community that is not on probation or must benefit such community directly by reducing future flood damage.

Get more information:

FEMA Flood Mitigation Assistance Program

Rural USDA Development Grants

22.4.5. Project Implementation Through Other Hazard Mitigation Assistance Programs

FEMA's HMA grants provide financial resources to help reduce susceptibility to damage from a future disaster. For grants appropriated annually (BRIC, HMA), FEMA makes funds available through a Notice of Funding Opportunity.

To be eligible, the community must have an accepted hazard mitigation plan (see discussion in Section 22.2.2). Projects should be consistent with the recommendations of the plan and the state's mitigation plans and strategies. Projects must be shown to be cost effective, and they may mitigate hazards other than the one that caused the Presidentially declared disaster.

FEMA's HMA grants include:

- **HMGP –** assists in implementing long-term hazard mitigation measures following disasters. Funding is available to implement projects in accordance with state, Tribal, and local priorities.
- **BRIC –** provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster.
- **FMA –** provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the NFIP. FMA now includes two former stand-alone programs.

- **Repetitive Flood Claims –** provides funds on an annual basis to reduce the risk of flood damage to individual properties insured under the NFIP that have had one or more claim payments for flood damages.

- **Severe Repetitive Loss –** provides funds on an annual basis to reduce the risk of flood damage to residential structures insured under the NFIP that are qualified as severe repetitive loss structures.

FEMA's Hazard Mitigation Assistance Guidance includes a comparison of programs, eligible activities, and application information. FEMA's HMGP web page contains additional reference materials about the programs. The Iowa Department of Homeland Security also provides information about the HMA grant program on its website.

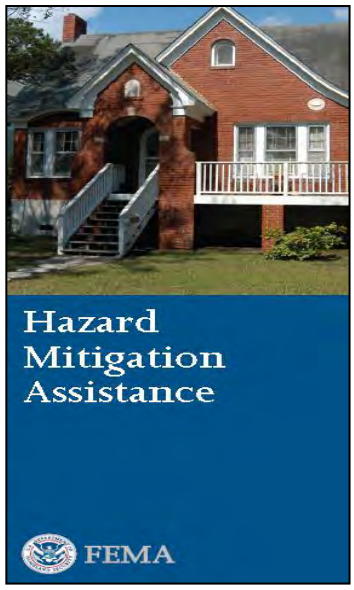


Figure 22-18. Hazard Mitigation Assistance fact sheet

22.4.6. Disaster Assistance

If your community is affected by a disaster and the area subsequently receives a Presidential disaster declaration, a variety of programs can provide mitigation assistance. Most of them are authorized by the Robert T. Stafford Disaster Relief and Emergency Act, known as the Stafford Act.

*Learn more about disaster response and available programs and assistance in the **Iowa Flood Response Toolkit**. Download it from the Iowa Department of Natural Resources' website today!*

Following the Presidential declaration, a Joint Field Office will be established under the guidance of a State Coordinating Officer and a Federal Coordinating Officer. They will be supported by mitigation staff and the State Hazard Mitigation Officer.

Two types of help will be provided: technical assistance and financial assistance. The Federal-State team will distribute up-to-date materials about these programs; this section provides a brief overview of them. Note that available assistance can be slightly different when implemented in your area.

Technical assistance: Disaster assistance staff are available to schedule time with your community's mitigation planners. They can review mitigation measures, techniques, and funding sources.

One of their prime concerns will be proper regulation during reconstruction (see Section 21). They can help analyze damage and identify areas prime for acquisition and clearance. They will also provide input on the prioritization of mitigation actions.

Figure 22-19. Post-disaster resources page on Iowa State University website

The disaster team may also provide technical assistance to property owners. Information on repairing and retrofitting is given through public meetings, handouts, and news releases. Sometimes mitigation tables are set up in disaster recovery centers or separate Reconstruction Information Centers are opened. They house architects, engineers, and other specialists who can work closely with owners to answer questions on the design of appropriate flood protection measures.

The International Council of Building Officials (ICBO) has publications related to disaster mitigation and building codes. They can be found on their website. Subjects covered include guidelines for damage mitigation, disaster-response management, immediate response, mutual aid and inspections, working with the media, repair and recovery policies, and public information bulletins.

Iowa State Extension (http://www.extension.iastate.edu/topic/recovering-disasters) also has post-disaster materials on many topics and can provide advice on technical matters.

Financial assistance: FEMA will widely publicize the assistance programs that are made available after a disaster declaration. Three main types of assistance are available, each of which can fund mitigation measures:

Figure 22-20. FEMA provides assistance with debris removal in the form of Public Assistance grants

Public Assistance (PA) is FEMA's largest grant program providing funds to assist communities after a disaster. It can provide 75%, up to 90% for certain disasters, of the cost of repairing or restoring facilities owned by public agencies and certain private nonprofit organizations. If an applicant prefers to relocate a facility out of the floodplain rather than replace it, FEMA may still provide funds.

FEMA takes the first step in obtaining PA funding by completing a Request for Public Assistance (RPA) within 30 days of the date of the disaster declaration. This initiates the PA process outlined in Figure 22-21 where the applicant, FEMA, and state will work collaboratively to identify and report disaster related impacts to damaged facilities/infrastructure.

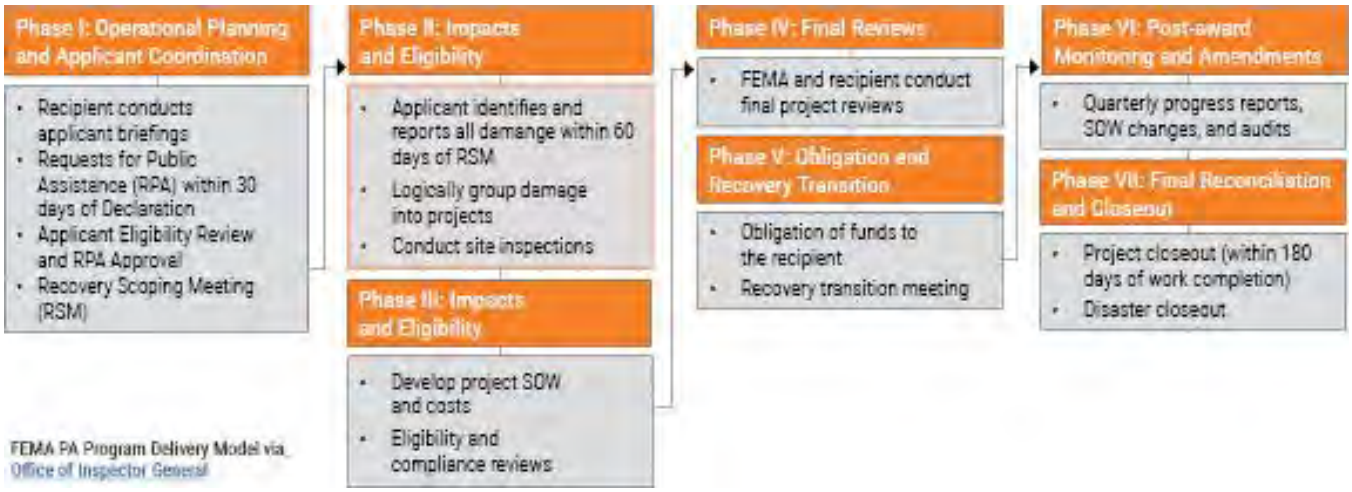


Figure 22-21. PA Process

The local Damage Survey Report (DSR) representative should be aware that this program provides an opportunity to incorporate hazard mitigation features while replacing or repairing some damaged property. FEMA can provide funding above and beyond the cost of repairing or replacing a public facility if it can be demonstrated that the proposed mitigation measure is technically feasible, cost effective, and required by a state or local regulation.

Mitigation example: A flood washes out a culvert that used to back up every time there was a 2-inch rain. FEMA and the State will estimate the cost to repair or replace it as it was. If someone points out that (1) a larger culvert can save more money than it costs by reducing future flood damage, (2) the larger culvert will not create a new flood problem, and (3) floodplain regulations prohibit obstructions in the floodway, then FEMA may share the expense of replacing the lost culvert with a larger one.

Similarly, funds from this program can be used to protect or relocate damaged water and sewer lines, floodproof pumping stations, or replace bridges with clear spans.

Insurance note: Some PA grants are subject to obtaining and maintaining insurance when funding is received for insurable facilities or property (buildings, contents, equipment, and vehicles). If the applicant does not maintain the required insurance and the facility or property is impacted by another disaster, it is ineligible for funding in the subsequent disaster.

For an NFIP-insurable facility located in an SFHA, FEMA must reduce PA funding when the facility is:

- Located in an area that FEMA has identified as an SFHA for more than 1 year
- Damaged by flooding
- Uninsured for flood loss

Per 44 CFR § 206.252(a), If the applicant does not have flood insurance for the facility or carries inadequate flood insurance for the insurable facility, FEMA reduces eligible project costs by the lesser of:

- The maximum amount of insurance proceeds that could have been obtained from an NFIP standard flood insurance policy for the building and its contents.

- The value of the building and its contents at the time of the incident.

Example: The maximum amount of structural flood insurance available for a non-residential building is $500,000. Floodville's $2 million city hall is flooded and receives $600,000 in damage. If the city hall is in a SFHA, the disaster assistance program will assume it's insured for $500,000. Federal aid to repair or rebuild the city hall will be 75% of $100,000 ($600,000-$500,000).

Floodville will receive $75,000 in disaster assistance for a building that suffered $600,000 in damage. If the city hall was not insured, Floodville's taxpayers are going to have to come up with the balance. If it was insured, the city would have $575,000 ($500,000 in insurance claim and $75,000 from disaster assistance) toward repairs and reconstruction.

Benefit-Cost Analysis (BCA)

Before funding a hazard mitigation project, FEMA requires a BCA. BCA is the method by which the future benefits of a mitigation project are estimated and compared to its cost. The end result is a benefit-cost ratio (BCR), which is derived from a project's total net benefits divided by its total project cost. The BCR is a numerical expression of the cost effectiveness of a project. A project is considered to be cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs.

Visit http://www.fema.gov/benefit-cost-analysis to learn about the BCA program and to access the Mitigation Benefit-Cost Analysis Toolkit, which includes all of the FEMA BCA software, technical guides, and tools to conduct a BCA.

Flood insurance is also a good idea because not every flood warrants a Federal disaster declaration. The moral of the story is to make sure that all publicly owned buildings subject to flooding have flood insurance.

Individual Assistance (IA) program provides financial assistance and direct services to eligible individuals and households who have uninsured and underinsured necessary expenses and serious needs. IA may include grants to help pay for temporary housing, emergency home repairs for the primary residence, uninsured and underinsured personal property losses, medical, dental, and funeral expenses caused by the disaster, along with other serious disaster related expenses. The IA fact sheet is a good resource for information about the program. IA Frequently Asked Questions

In addition to grants, the IA program may also provide direct assistance through mass care/emergency assistance (sheltering, feeding, etc.), disaster case management, crisis counseling, disaster legal services, disaster unemployment, and voluntary agencies. Hazard mitigation may be awarded as part of Home Repair Assistance for real property components that existed and were functional prior to the disaster. A link to the IHP fact sheet can be found

here: IHP Fact Sheet Specific mitigation measures are based on the cause and amount of damage to their home and include:

Wildfire	Wind/Tornado	Flood
Covering attic vents, crawlspace vents, and vents in enclosures below decks to prevent fire damage. Installing non-combustible gutters and leaf guards to prevent fire damage.	Roof repair to withstand higher winds and help prevent water infiltration.	Roof repair to withstand higher winds and help prevent water infiltration. Elevating a water heater or furnace to avoid future flood damage. Elevating or moving an electrical panel to avoid future flood damage.

Disaster survivors can apply for IA following a disaster in the following ways:

- Online at http://www.DisasterAssistance.gov
- Calling 1-800-621-FEMA or 1-800-462-7585 (TTY) for the hearing and speech impaired
- Visiting a FEMA Disaster Recovery Center set up in the vicinity. (Locations will be posted online

Answers to questions about the application process, including how to check on the status of an application, are available online through FEMA's website (Individual Assistance | FEMA.gov).

Hazard mitigation programs provide financial resources to help reduce susceptibility to damage from a future disaster. Section 404 of the Stafford Act makes money available to assist eligible applicants after a Presidential disaster declaration. Section 404's HMGP will pay up to 75% of the cost of such mitigation projects.

To be eligible, the community must have an accepted hazard mitigation plan (see discussion in Section 22.2.2). Projects should be consistent with the recommendations of the plan and the state's mitigation plans and strategies. Projects must be shown to be cost effective, and they may mitigate hazards other than the one that caused the Presidentially declared disaster.

You must have an accepted current hazard mitigation plan to be eligible for FEMA Hazard Mitigation Assistance Program funds.

Eligible projects include the acquisition of flood-prone properties and conversion to open space, elevation of flood-prone buildings, and minor drainage improvements.

Traditionally, the program has most often been used to acquire floodplain properties. In some communities, the property owners volunteered to help pay the non-Federal share of the cost.

Even if your community did not receive a disaster declaration, you may be able to receive a Hazard Mitigation Grant. In 1997, FEMA ruled that the funds could be spent on appropriate projects throughout a State that received a disaster declaration. However, priority funding is usually given to communities in the declared counties.

The U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant (CDBG) program may include appropriations for CDBG Disaster Recovery (CDBG-DR) grants. The funds can be used to rebuild areas affected by disasters and to provide crucial seed money to start the recovery process. Since CDBG-DR assistance may fund a broad range of recovery activities, HUD can help communities and neighborhoods that otherwise might not recover due to limited resources. If a CDBG-DR appropriation is not made for the disaster, grantees may be able to work with their local HUD office to amend their action plan to use existing grant funds for disaster related projects. CDBG-DR grants are often used to supplement disaster programs of FEMA, the U.S. Small Business Administration, and the US Army Corps of Engineers. The Iowa Economic Development Authority (IEDA) administers the CDBG program in Iowa. More information about the program is available through their website (http://www.iowaeconomicdevelopment.com/CommunityDevelopment/CDBG).

Small Business Administration (SBA) provides low-interest disaster loans to help businesses and homeowners recover from declared disasters. Types of disaster loans can range from physical damage loans, mitigation assistance, and economic injury disaster loans.

23. Glossary

Included below are technical terms used in the Desk Reference. Those that are not as commonly used throughout multiple sections include the section of the Desk Reference where the term is described in more detail. Note that the local floodplain management ordinance will likely have its own definitions section. The definitions in the legal ordinance take precedence over those in this section.

0.2% annual chance (500-year) floodplain: designated by black hatching on 2003 format FIRMs and orange hatching on 2011 format version. [Section 4]

1% annual chance (100-year) floodplain or SFHA: designated by blue hatching and labeled Zone A, AE, AH, or AO. [Section 4]

2-Dimensional (2D) Modeling: [Section 3]

404 Permit: A permit required by Section 404 of the Clean Water Act to protect rivers and adjacent wetlands from being filled. This permit program is administered by the U.S. Army Corps of Engineers. [Section 9]

A Zone: See Zone A.

A99: The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached a specific statutory milestone. No BFEs or flood depths are shown within this zone. [Section 4]

Actual cash value: The replacement cost for a building, minus a depreciation percentage based on age and condition. [Section 12]

Anchoring: Special connections made to ensure that a building will not float off or be pushed off its foundation during a flood. [Section 11]

Appeal: A request to higher authority such as a Board of Appeals or a City Council to overrule a permit denial because the applicant claims that the ordinance has been incorrectly interpreted. [Section 16]

Approximate studies: Flood mapping that shows the *approximate* outline of the base floodplain. An approximate study does not produce a Base Flood Elevation. [Section 4]

Base flood depth: A measurement of the base flood in feet above ground, used for shallow flooding. [Section 4]

Base flood: The 1% annual chance or 100-year flood adopted by the National Flood Insurance Program as the basis for mapping, insurance rating, and regulating new construction. [Section 3]

BFE: The elevation (above sea level or other datum) of the crest of the base flood. [Section 3]

Basement: Any floor level below grade on all sides. [Section 11]

Basin: See watershed.

Bench marks: Monuments on the ground that show the elevation of the spot above sea level. Also referred to as elevation reference marks. [Section 4]

Best Available Data: The most recent, approved hydraulic and hydrologic information to show what the 1% annual chance or 100-year flood elevations and floodplain boundaries are for a particular area. [Section 8]

BRIC: A grant program supporting states, local communities, tribes and territories as they undertake hazard mitigation projects to reduce their risk from hazards from natural disasters. Stands for Building Resilient Infrastructure and Communities.

Building: A walled and roofed structure that is principally above ground. The term includes manufactured homes, mobile homes, and gas or liquid storage tanks. In this reference, the term is the same as the term “structure” in the Federal regulations (44 CFR 59.1). [Section 11]

Building condition survey: A windshield survey conducted to obtain a preliminary evaluation of the extent and severity of damage to buildings after a disaster. [Section 21]

Catchment area: See watershed.

Cfs: cubic feet per second [Section 3]

Cubic feet per second (CFS): The unit by which discharges are measured (a cubic foot of water is about 7.5 gallons). [Section 3]

Closed basin lake: A lake that has either no outlet or a relatively small one, where rainfall can cause the lake’s level to rise faster than it can drain.

Coastal high hazard area: That part of the coastal floodplain where the wave heights during the base flood will be three feet or more.

Code of Federal Regulations (CFR): A master coding system to identify the Federal agency regulations that have been published in the Federal Register. 44 CFR includes all the regulations published by FEMA. [Section 2]

Community: A city, village, special town, or county with the statutory authority to enact floodplain regulations and participate in the National Flood Insurance Program. [Section 2]

Community Rating System (CRS): A program that provides a flood insurance premium rate reduction based on a community’s floodplain management activities. [Section 20]

Conditional Letter of Map Amendment (CLOMA): A statement that if a project is constructed as planned, a Letter of Map Amendment can be issued later. [Section 6]

Conditional Letter of Map Revision (CLOMR): A statement that if a project is constructed as planned, a Letter of Map Revision can be issued later. [Section 6]

Contour: A line of equal elevation on a topographic (contour) map.

Contour map: A map that shows points with the same elevation as connected by a contour line. [Section 3]

Conveyance shadow: An area upstream or downstream of an existing obstruction to flood flows. [Section 10]

Cross section: Surveyed information that describes the stream and the floodplain at a particular point along the stream. [Section 3]

Cross section line: representing the location of the surveyed cross sections used in the computer model that calculates the BFEs. The cross section locations and information align to similar data in the FIS (profile and FDT) and FIRM database. In 2011 FIRM formats, the cross sections include the BFE value shown to the nearest tenth of a foot. [Section 4]

DSR: A form completed by disaster assistance staff to determine the repair and reconstruction needs of public and private nonprofit facilities. [Section 22]

Dam breach inundation area: The area flooded by a dam failure. [Section 13]

Datum: A common vertical elevation reference point, usually in relation to sea level. [Section 3]

Detailed studies: Flood mapping that produces Base Flood Elevations, floodways, and other pertinent flood data. [Section 3]

Development: Any manmade change to improved or unimproved real estate. [Section 9]

Disaster Mitigation Act of 2000 (**DMA 2K, DMA 2000):** Legislation that requires a community to have a mitigation plan before it can receive mitigation funds from FEMA. [Section 22]

Discharge: The amount of water that passes a point in a given period of time. The rate of discharge is measured in cubic feet per second (cfs). [Section 3]

Elevation reference marks: See bench marks.

Emergency Operations Center (EOC): A facility that houses communications equipment that is used to coordinate the response to a disaster or emergency. [Section 21]

Eminent domain: Governmental power to acquire a property without the owner's consent. [Section 7]

Executive Order 11988 (EO 11988): A directive by the President that sets procedures Federal agencies must follow before they take or fund an action in the floodplain. [Sections 13 and 23]

Executive Order 11990 (EO 11990): A directive by the President to minimize the destruction, loss or degradation of wetlands from Federal actions [Sections 13 and 23]

Executive Order 12898 (EO 12898): A directive by the President that directs Federal agencies to prioritize environmental justice for Federal actions. [Sections 13 and 23]

Executive Order 13007 (EO 13007): A directive by the President that directs federal land management agencies to accommodate access to, and ceremonial use of, Indian sacred sites and to avoid adverse impacts on those sites. [Sections 13 and 23]

Executive Order 13690 (EO 13690): A directive by the President that establishes a Federal Federal Flood Risk Management Standard (FFRMS). Requires the use of one of three approaches for preparing for future flood risks. [Sections 13 and 23]

Factory-built home: Any structure designed for residential use, which is wholly or in substantial part, made, fabricated, formed, or assembled in manufacturing facilities for installation or assembly on a building site. Also referred to as manufactured home. [Section 11]

Factory-built home park: A parcel or contiguous parcels of land divided into two or more factory-built home lots for sale or lease. Also referred to as manufactured home park. [Section 11]

Federal Emergency Management Agency (FEMA): The Federal agency that administers the National Flood Insurance Program. Most of the NFIP field work and community coordination in Iowa are done by FEMA's Region VII Office.

Federal Insurance Administration (FIA): FIA was the part of FEMA that administers the National Flood Insurance Program. In 2002, it was folded into the Federal Insurance and Mitigation Administration.

Federal Insurance Administrator: FEMA Program administrator.

Federal Insurance and Mitigation Administration (FIMA): The part of FEMA that administers all aspects of the National Flood Insurance Program, including insurance, mapping, regulations and mitigation. [Section 2]

Federal Register: A daily publication of the Federal government used to publicize Federal agencies' rules.

FIRM database: [Section 4]

FIS report: includes supplemental information about the technical analysis used to perform the flood study and a summary of the community's flooding history and flood hazard areas. [Section 3]

Flash flood: A flood in hilly areas that may come scant minutes after a heavy rain. One can also occur in urban areas where impervious surfaces and drainage improvements speed runoff to a stream. [Section 1]

Flood: The National Flood Insurance Program's definition is "a general and temporary condition of partial or complete inundation of normally dry land areas". [Section 2]

Flood Boundary Floodway Map (FBFM): An official map of a community, on which FEMA has delineated the regulatory floodway. [Section 4]

Flood discharge: The rate at which the runoff reaches the stream and flows downstream [Section 3]

Flood Hazard Boundary Map (FHBM): A map published by FEMA that delineates the approximate boundary of the floodplain. [Section 4]

Flood fringe: See floodway fringe.

Flood hazard mitigation: All actions that can be taken to reduce property damage and the threat to life and public health from flooding. [Section 22]

Flood Insurance Rate Map (FIRM): An official map of a community, on which FEMA has delineated both the Special Flood Hazard Areas and the risk premium zones applicable to the community. [Section 4]

Flood Insurance Study (FIS): A report published by FEMA for a community in conjunction with the community's Flood Insurance Rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. [Section 4]

Flood Mitigation Assistance (FMA): A grant program funded by the National Flood Insurance Program. [Section 22]

Flood of record: The highest known flood level for the area, as recorded in historical documents. [Section 8]

Floodplain: Any land area susceptible to being inundated by flood waters from any source. [Section 1]

Floodproofing: Protective measures added to or incorporated in a building that is not elevated above the Base Flood Elevation to prevent or minimize flood damage. "Dry floodproofing" measures are designed to keep water from entering a building. "Wet floodproofing" measures minimize damage to a structure and its contents from water that is allowed into a building. [Section 11]

Flood risk datasets: [Section 3]

Flood risk products: [Section 3]

Floodway: The stream channel and portion of the adjacent floodplain that must remain open to permit passage of the base flood. [Section 3]

Floodway Data Table: The table in the Flood Insurance Study that provides detailed information for each cross section on streams studied in detail. [Section 5]

Floodway fringe: The portion of the floodplain lying on either side of the floodway. [Section 3]

Fluvial floodplain: An event that occurs when the water level in a river, lake, or stream rises and overflows onto the surrounding banks, shores, and neighboring land. The water level rise could be due to excessive rain, snowmelt, or ice jams.

Freeboard: A margin of safety added to the Base Flood Elevation to account for waves, debris, miscalculations, or lack of data. [Section 11]

Functionally dependent use: Development that must be located or carried out close to water, e.g., a docking or port facility. [Section 17]

Geographic information system (GIS): Computer-based map systems that allow the user to keep a map updated easily and to correlate geographic information with other data, such as tax records on properties. [Section 4]

Hazard Mitigation Grant Program: A FEMA disaster assistance grant that funds mitigation projects. [Section 22]

HEC-2: A computer model used to conduct a hydraulic study, which produces flood elevations, velocities, and floodplain widths. [Section 3]

HEC-RAS: A computer model used to conduct a hydraulic study, which produces flood elevations, velocities, and floodplain widths. [Section 3]

Historic structure: A building or other structure that has been declared worthy of preservation by a recognized agency. [Section 12]

Home rule: A community authorized to do anything that is not prohibited by statute. [Section 7]

Human intervention: Actions that must be taken by one or more persons in order for a building to be floodproofed before floodwaters arrive. [Section 11]

Hydraulics: The study of moving water. A hydraulic analysis in a Flood Insurance Study calculates how high and how fast a flood discharge flows. [Section 3]

Hydrodynamic force: The force of moving water, including the impact of debris and high velocities. [Section 1]

Hydrologic cycle: The natural cycle that circulates water throughout the environment to maintain an overall balance between water in the air, on the surface, and in the ground. [Section 1]

Hydrology: The science dealing with the waters of the earth. A flood discharge is developed by a hydrologic study. [Section 3]

Hydrostatic pressure: The pressure put on a structure by the weight of standing water. The deeper the water, the more it weighs and the greater the hydrostatic pressure. [Section 1]

Ice floe: Large chunks of ice that can cause a great deal of damage when a frozen river or lake begins to melt and break up. [Section 1]

Ice jam: Flooding that occurs when warm weather and rain break up frozen rivers and the broken ice floats downriver until it is blocked by an obstruction, creating an ice dam that blocks the channel and causes flooding. [Section 1]

Increased Cost of Compliance (ICC): An additional claim payment made to a flood insurance policyholder to help cover the cost of bringing a substantially damaged or repetitively damaged building into compliance with the National Flood Insurance Program construction standards for new buildings. [Section 12]

Individual and Family Grants (IFG): A disaster assistance grant that helps people with their unmet needs (i.e., needs not helped by other disaster assistance programs). [Section 22]

Inverse condemnation: See “taking”. [Section 7]

Insurance Services Office, Inc. (ISO): An insurance organization that administers the Community Rating System for FEMA. [Section 20]

Iowa Department of Natural Resources (DNR): The State agency responsible for conserving and enhancing Iowa’s natural resources.

Jurisdiction: the defined political boundaries and are usually incorporated locations recognized by the U.S. Census Bureau. Each jurisdiction on the FIRM (including unincorporated areas) are noted with a CID. [Section 4]

Lateral pressure: The amount of pressure imposed sideways by standing water. Deeper water exerts more lateral pressure than shallow water. [Section 1]

Letter of Map Amendment (LOMA): A change to a FEMA floodplain map that removes an area that was inadvertently included in the Special Flood Hazard Area. [Section 6]

Letter of Map Revision (LOMR): A change to a floodplain map based on new data submitted to FEMA. [Section 6]

Licensed Professional Engineer: An engineer who has been tested and registered by the Department of Commerce, Professional Licensing Bureau.

Lowest Floor: The lowest floor of the lowest enclosed area (including basement) of a building. [Section 11]

Manufactured home: A building that is transportable in one or more sections, built on a permanent chassis, and designed for use with or without a permanent foundation when attached to utilities. The term includes mobile home and “double wides”. [Section 11]

Market value: The price a willing buyer and seller agree upon. [Section 12]

Meander: A curve in a river. [Section 1]

Mitigation Directorate: The FEMA office that set national policy for the National Flood Insurance Program and administered the mapping program. In 2002, it was folded into the Federal Insurance and Mitigation Administration. [Section 2]

Multi-objective management (M O-M): An approach to planning and funding local programs that involves a variety of local interests and concerns. [Section 22]

National Environmental Policy Act (NEPA): A Federal law that requires agencies to evaluate the environmental impact of a proposed project. [Section 13]

National Geodetic Vertical Datum (NGVD) of 1929: The national datum used by the National Flood Insurance Program. NGVD is based on mean sea level. It was known formerly as the "Mean Sea Level Datum of 1929 (MSL)." [Section 3]

Non-Regulatory Products: Tools available for community use and are not tied to the regulatory development and insurance requirements of the National Flood Insurance Program, e.g., the Flood Risk Report, Flood Risk Map, and Flood Risk Database. [Section 5]

Non-structural flood protection measures: Administrative tools for controlling flooding and flood damage, including regulations on development, building codes, property acquisition and structure relocation, and modification of existing buildings. [Section 2]

North American Vertical Datum (NAVD): The national elevation datum that is replacing NGVD.

Overbank flooding: Flooding occurs when downstream channels receive more rain or snowmelt from their watershed than normal, or a channel is blocked by an ice jam or debris. Excess water overloads the channel and flows out onto the floodplain. [Section 1]

Planned unit development (PUD): A regulatory approach that allows a developer to design the entire area while individual requirements are relaxed to allow for open space, mixed land uses, and other variances to traditional zoning rules. [Section 13]

Pluvial flooding: An event that is caused by persistent, heavy rainfall and independent of an overflowing water body, occurring when the ground cannot absorb rainwater effectively or drainage systems are overwhelmed by excessive
water flow.

Ponding: Runoff that collects in depressions and cannot drain out, creating a temporary pond. [Section 1]

Post-FIRM building: For insurance rating purposes, a post-FIRM building was constructed or substantially improved after December 31, 1974, or after the effective date of the initial Flood Insurance Rate Map of a community, whichever is later. A post-FIRM building is required to meet the National Flood Insurance Program's minimum Regular Program flood protection standards. [Section 2]

Pre-FIRM building: A pre-FIRM building was constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Map of the community, whichever is later. Most pre-FIRM buildings were constructed without taking the flood hazard into account. [Section 2]

Probability: A statistical term having to do with the size of a flood and the odds of that size of flood occurring in any year. [Section 3]

Profile: A graph that shows elevations of various flood events. [Section 3]

Profile Baseline: Indicates the path of the riverine flood flows and is an accurate representation of the distance between the cross sections and structures within the hydraulic model. The profile baseline also aligns to the distances shown on the flood profile in the FIS report. [Section 4]

Public/Infrastructure Assistance: A disaster assistance grant that helps public agencies and nonprofit organizations finance repairs and reconstruction. [Section 22]

"Q": An abbreviation used by engineers to stand for discharge. [Section 3]

Q3 flood data product: A digital picture of some of the features shown on a Flood Insurance Rate Map. [Section 4]

Reconstruction: Building a new structure on the old foundation or slab of a structure that was destroyed, damaged, purposefully demolished, or razed. The term also applies when an existing structure is moved to a new site. [Section 12]

Recreational vehicle: A vehicle designed primarily for use as temporary living quarters. [Section 11]

Regular Program: The phase of community participation in the National Flood Insurance Program that begins on the date of the Flood Insurance Rate Map or when the community adopts an ordinance that meets the minimum requirements of the National Flood Insurance Program and adopts the technical data provided with the FIRM, whichever is later. All Iowa communities participating in the NFIP are in the Regular Program. Also called the Regular Phase. [Section 2]

Regular Phase: [Section 3]

Rehabilitation: An improvement made to an existing structure that does not affect its external dimensions. [Section 12]

Retrofitting: Modifications made to an existing building or its yard to protect it from flood damage. Retrofitting techniques include floodproofing, elevation, and construction of small levees.

Risk Mapping, Assessment, and Planning (Risk MAP): The FEMA program that provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens. [Section 4]

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains. [Section 1]

Riverine erosion: [Section 1]

Roughness: A measure related to ground surface conditions that reflects changes in floodwater velocity due to ground friction. [Section 3]

Runoff: Rainfall and snowmelt that reaches a stream. [Section 3]

Section 1316: A section in the National Flood Insurance Act of 1968 that authorizes local officials to request that FEMA deny flood insurance coverage on a building built contrary to a local ordinance. [Section 17]

Sheet flow: Floodwater that spreads out over a large area that does not have defined channels at a somewhat uniform depth. [Section 1]

Special Flood Hazard Area (SFHA): The base floodplain displayed on FEMA maps. It includes the A and V zones. [Section 4]

Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, which authorizes FEMA's current disaster assistance programs and the Hazard Mitigation Grant Program. [Section 22]

Stationing: Determining the distance along a stream. [Section 5]

Statutory authority: The powers granted to a local government by State law. [Section 7]

Stillwater: A single static Base Flood Elevation, usually associated with Lakes or large bodies of water. [Section 4]

Stormwater detention: Storing stormwater runoff for release at a restricted rate after the storm subsides. [Section 13]

Stormwater management: Efforts to reduce the impact of increased runoff that results from new development. [Section 13]

Stormwater retention: Storing stormwater runoff for later use in irrigation or groundwater recharge, or to reduce pollution. [Section 13]

Structural flood control: Measures that control floodwaters by construction of barriers or storage areas, or by modifying or redirecting channels. [Section 2]

Subdivision: The division of land into three or more parcels.

Substantial damage: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its undamaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. [Section 11 and 12]

Substantial improvement: Any reconstruction, rehabilitation, addition, or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. The definition of "substantial improvement" includes buildings that have been repaired after suffering substantial damage. [Section 11 and 12]

Taking: Obtaining private property without compensating the owner. The term also includes reducing the value of private property to such an extent that the owner is deprived of all economic interest. [Section 7]

Terrain: Ground contours.

Thalweg: The lowest points along the entire length of a stream bed or valley. A stream or river thalweg represents the area of deepest flow with the highest velocity. In the FEMA Flood Insurance Study, the “Stream Bed” elevations are almost always taken along the thalweg. [Section 1]

Topographic map: See contour map.

Uplift: Hydrostatic pressure placed on a floor as water below the floor tries to rise. [Section 1]

Urban drainage: [Section 3]

Variance: A grant of relief by a community from the terms of a land use, zoning, or building code regulation. [Section 16]

Velocity: The speed of moving water, a force that is measured in feet per second. [Section 1]

Watershed: An area that drains into a lake, stream, or other body of water. [Section 1]

Water surface elevations: [Section 3]

Wet floodproof: Protecting a building from flood damage by using flood resistant materials below the flood level and elevating things subject to flood damage above the flood level. [Section 11]

Write Your Own (WYO): An insurance company that has agreed to sell flood insurance policies on behalf of the National Flood Insurance Program. [Section 19]

X Zone: See “Zone X”.

Zone A: The Special Flood Hazard Area (except coastal V Zones) shown on a community’s Flood Insurance Rate Map. [Section 4]

There are five types of A Zones:

- A: SFHA where no Base Flood Elevation is provided.
- A# (numbered A Zones, e.g., A7 or A14): SFHA where the FIRM shows a BFEs in relation to NGVD. There are no maps in Iowa communities with Numbered A Zones.
- AE: SFHA where Base Flood Elevations are provided. AE Zone delineations are now used on new FIRMs instead of A# Zones.
- AO: SFHA with sheet flow, ponding, or shallow flooding. Base flood depths (feet above grade) are provided.

- AH: Shallow flooding SFHA. Base Flood Elevations in relation to NGVD are provided.

Zone B: Area of moderate flood hazard, usually depicted on Flood Insurance Rate Maps as between the limits of the base and 500-year floods. B Zones are used to designate base floodplains of little hazard, such as those with average depths of less than 1 foot. [Section 4]

Zone C: Area of minimal flood hazard, usually depicted on Flood Insurance Rate Maps as above the 500-year flood level. B and C Zones may have flooding that does not meet the criteria to be mapped as a Special Flood Hazard Area, especially ponding and local drainage problems. [Section 4]

Zone D: Area of undetermined but possible flood hazard. [Section 4]

Zone V: The Special Flood Hazard Area is subject to coastal high hazard flooding. There are three types of V Zones: V, V#, and VE, and they correspond to the A Zone designations. [Section 4]

Zone X: Newer Flood Insurance Rate Maps show Zones B and C (see above) as Zone X. [Section 4]

Zoning: A regulatory program that sets and enforces development standards for different zones or districts of a community. [Section 7]

24. References

Most of the documents listed here are available online or for free through government publication resource centers. Available websites are noted. Those with a ".pdf" extension require Adobe Acrobat Reader, which is free software available from www.adobe.com/acrobat.

Many FEMA publications can be ordered by calling 800-480-2520 or faxing your order to 250-699-0525. Hard copy or CD/DVDs are available for commonly requested publications, but many other publications are only available online. Easy access to FEMA publications is available through FEMA's Resource & Documents Library. The search function on the site allows you to enter keywords and filter by media type and a number of selection criteria.

The noted U.S. Army Corps of Engineers (COE) floodproofing publications can be found on the following website: USACE Publications - Engineer Regulations (army.mil). Hard copies may be available in some instances by contacting the COE by email at mailto:hqpublications@usace.army.mil.

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25. Buchanan County, Iowa and Incorporated Areas (Independence) – FIS and FIRM

This section supports the FIRM and FIS report exercises found in Section 5. It includes portions of the old format FIRM and FBFM for the City of Independence and portions of the new format countywide FIRM on which the City of Independence is now shown for comparison. It also includes a comparison of the old format for including Elevation Reference Marks and the approach used on new FIRMs.

This section concludes with the Flood Insurance Study for Buchanan County, Iowa and Incorporated Areas, which includes the City of Independence.

Title block – FIRM map index for Buchanan County, IA and Incorporated Areas

Title block – FIRM panel 284 for Buchanan County, IA and Incorporated Areas

Figure 25-1. FIRM title blocks

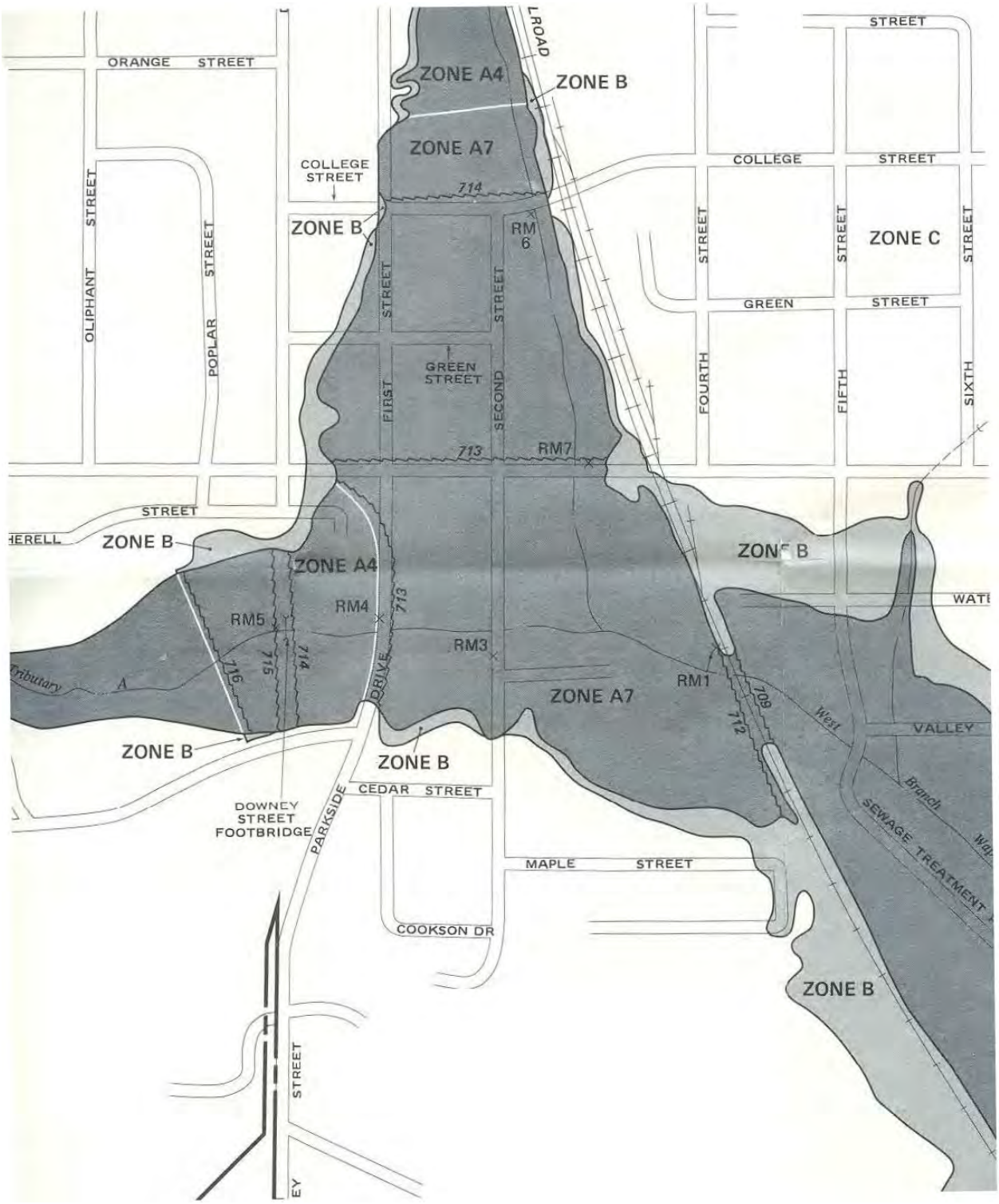

Figure 25-2. Old format FIRM for City of West Branch

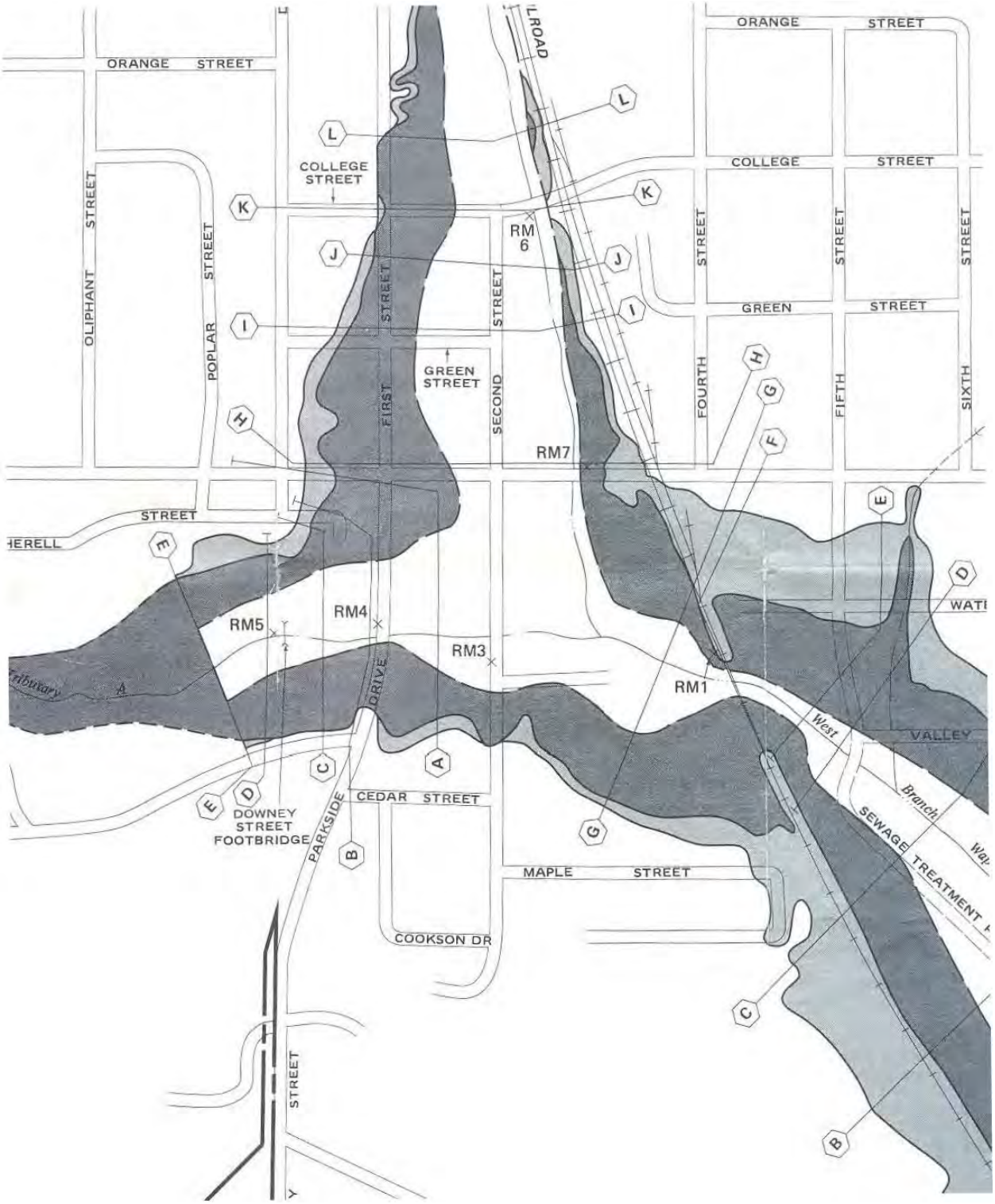

Figure 25-3. Old format FBFM

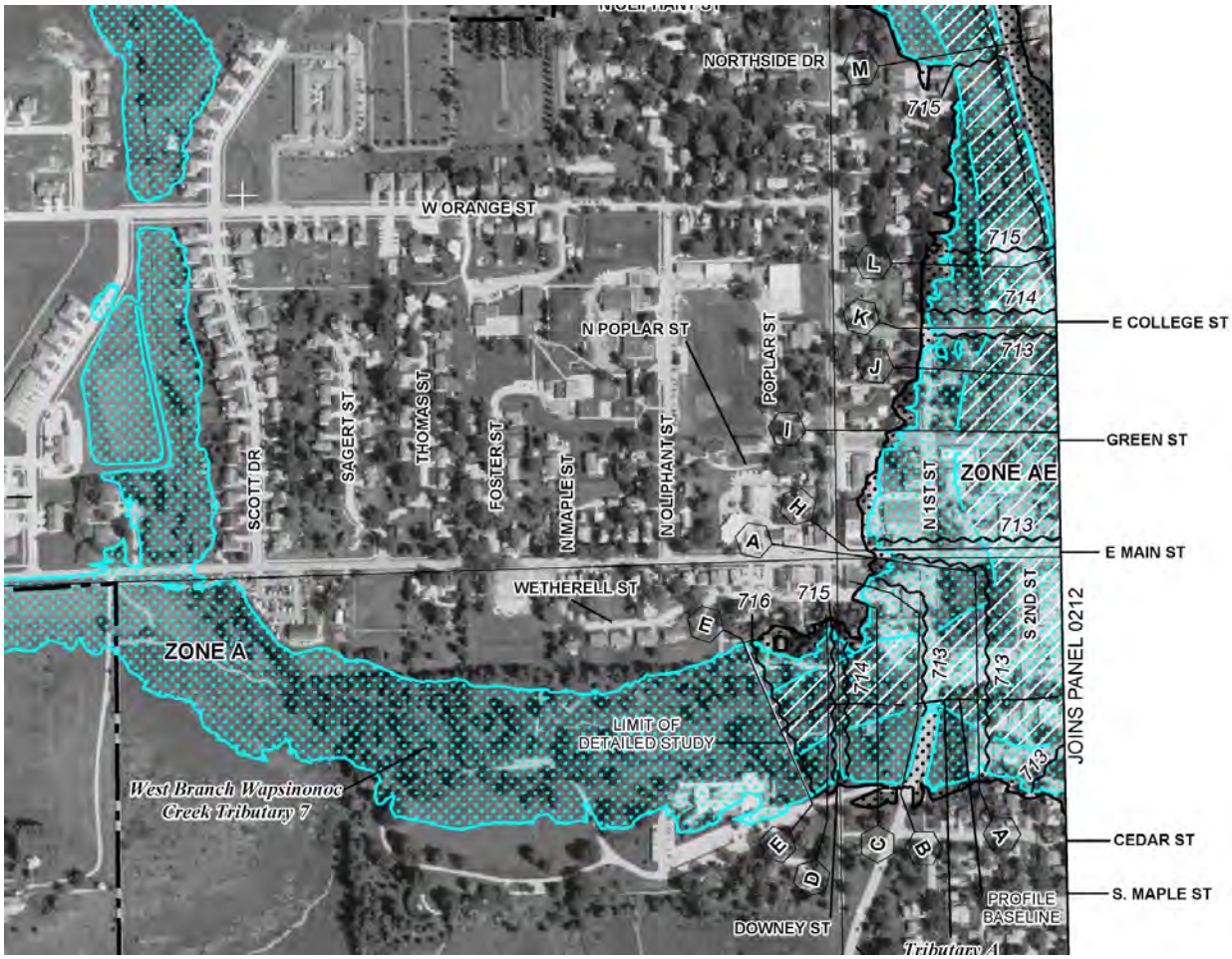

Figure 25-4. Portion of FIRM Panel 19031C0211C – Cedar County, IA and Incorporated Areas (New Format)

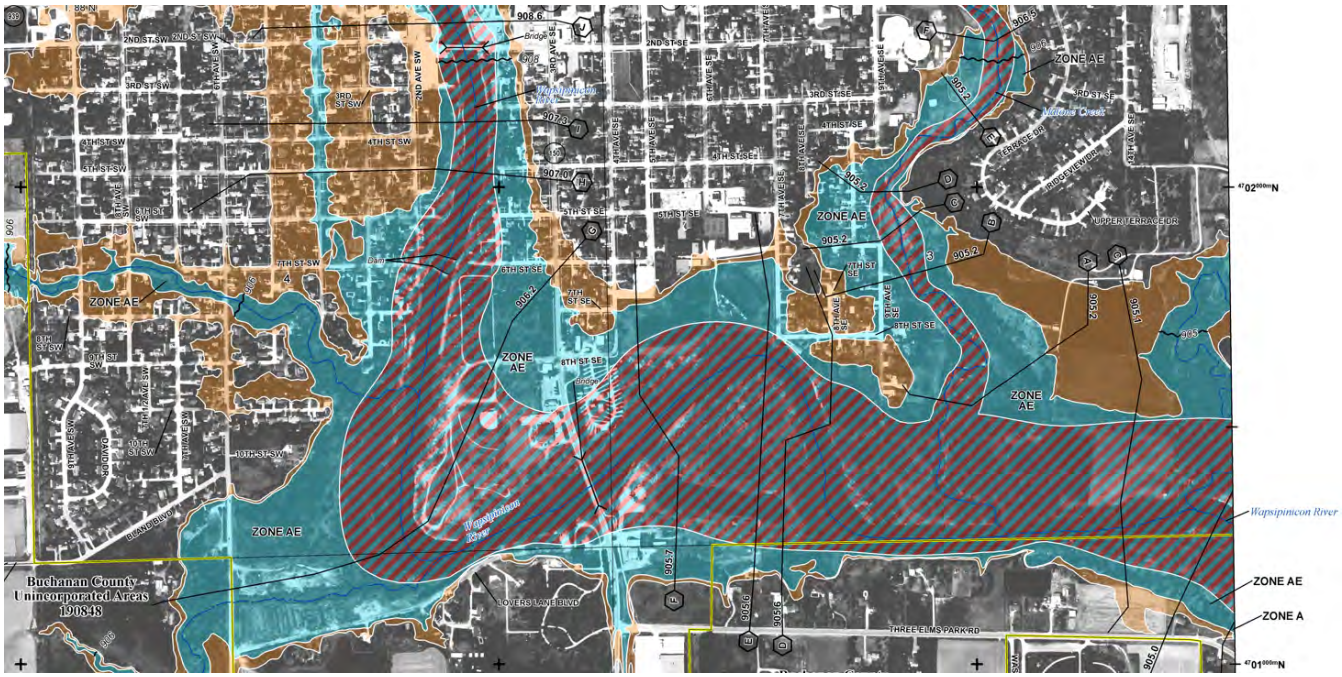

Figure 25-5. Portion of FIRM Panel 19019C0284F – Buchanan County, IA and Incorporated Areas (New Format)

Elevation Reference Mark Descriptions – Old Format FIRMs

REFERENCE MARKS	ELEVATION FEET (NGVD)	DESCRIPTION OF LOCATION
RM 1	709.67	U.S. Geological Survey standard disk "V 76" set in corner of northwest abutment of Chicago, Rock Island and Pacific Railroad bridge over West Branch Wapsinonoc Creek.
RM 2	706.36	A chiseled square in northeast corner of north headwall of the Interstate 80 culvert over West Branch Wapsinonoc Creek.
RM 3	711.18	Northwest bolt on fire hydrant collar located on west side of Second Street, about 75 feet south of Second Street bridge over Tributary A.
RM 4	712.54	Northwest corner of concrete slab for light pole b&:e located at northwest corner of Parkside Drive bridge over Tributary A.
RM 5	714.92	A chiseled square in northwest corner of the curb mil on west side of Downey Street footbridge over Tributary A.
RM 6	716.35	Nail with cap located in southwest piling cap of College Street bridge over West Branch Wapsinonoc Creek.
RM 7	711.17	A chiseled square located near a handrail post in northeast corner of Main Street bridge over West Branch Wapsinonoc Creek.
RM 8	755.75	60d spike in power pole located on west side of Fourth Street, about 700 feet north of the Orange Street and Fourth Street intersection.
RM 9	721.30	60d spike in power pole located in northeast corner of intersection of Downey Street and County Road at north end of the City of West Branch.
RM 10	722.25	60d spike in corner post located on north side of drive and west side of Downey Street, about 400 feet northwest of Chicago. Rock Island and Pacific Railroad bridge over West. Branch Wapsinonoc Creek.

Figure 25-6. Elevation reference marks

Bench Mark Descriptions – New FIRMs

Bench marks are still shown on the FIRM with an “X” (see MG0379 in Figure 25-5), but the identifying number used is a NGS bench mark number. To obtain current elevation, description, and/or location information for bench marks shown on the FIRM, you can visit the NGS website. Locate the Survey Mark Datasheets page (NGS Datasheet Page), click on *Datasheets* and then *PIDs*, and use the number shown on the FIRM (e.g., MG0379 on map 19031C0212C in Figure 25-5) to search for the details of a specific bench mark. Bench mark MG0379 has a variety of information listed in the NGS datasheet including:

- Latitude/Longitude;
- Location description;
- Elevation;
- Datum;
- Type of bench mark; and
- Condition of bench mark.

An example of a datasheet from the NGS website is shown on the following page. You can see near the bottom of the datasheet that in both 1998 and in 2000 the mark was not found. This does not always mean the mark has been destroyed but to avoid lost time a surveyor may choose another mark that has recently been located.

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.4
1 National Geodetic Survey, Retrieval Date = JANUARY 3, 2014
MG0379 ***
MG0379 DESIGNATION - U 76
MG0379 PID - MG0379
MG0379 STATE/COUNTY- IA/CEDAR
MG0379 COUNTRY - US
MG0379 USGS QUAD - WEST BRANCH (1965)
MG0379
MG0379 *CURRENT SURVEY CONTROL
MG0379 _____
MG0379* NAD 83(1986) POSITION- 41 40 16. (N) 091 20 33. (W) SCALED
MG0379* NAVD 88 ORTHO HEIGHT - 218.867 (meters) 718.07 (feet) ADJUSTED
MG0379 _____
MG0379 GEOID HEIGHT - -32.65 (meters) GEOID12A
MG0379 DYNAMIC HEIGHT - 218.783 (meters) 717.79 (feet) COMP
MG0379 MODELED GRAVITY - 980,235.3 (mgal) NAVD 88
MG0379 VERT ORDER - SECOND CLASS 0
MG0379.The horizontal coordinates were scaled from a topographic map and have an estimated accuracy of +/- 6 seconds.
MG0379.
MG0379.The orthometric height was determined by differential leveling and adjusted by the NATIONAL GEODETIC SURVEY in June 1991.
MG0379
MG0379.The dynamic height is computed by dividing the NAVD 88 geopotential number by the normal gravity value computed on the Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45 degrees latitude (g = 980.6199 gals.).
MG0379
MG0379.The modeled gravity was interpolated from observed gravity values.
MG0379
MG0379; North East Units Estimated Accuracy
MG0379;SPC IA S - 187,810. 679,650. MT (+/- 180 meters Scaled)
MG0379
MG0379 SUPERSEDED SURVEY CONTROL
MG0379 NGVD 29 (??/??/92) 218.909 (m) 718.20 (f) ADJ UNCH 2 0
MG0379
MG0379.Superseded values are not recommended for survey control.
MG0379
MG0379.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datum. See file dsdata.txt to determine how the superseded data were derived.
MG0379
MG0379_U.S. NATIONAL GRID SPATIAL ADDRESS: 15TXG379145(NAD 83)
MG0379
MG0379_MARKER: DB = BENCH MARK DISK
MG0379_SETTING: 36 = SET IN A MASSIVE STRUCTURE
MG0379_SP_SET: FOUNDATION
MG0379_STAMPING: U 76 1934
MG0379_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
MG0379
MG0379 HISTORY - Date Condition Report By
MG0379 HISTORY - 1934 MONUMENTED CGS
MG0379 HISTORY - 19980729 MARK NOT FOUND USPSQD
MG0379 HISTORY - 20000404 MARK NOT FOUND AERSVC
MG0379
MG0379 STATION DESCRIPTION
MG0379'DESCRIBED BY COAST AND GEODETIC SURVEY 1934
MG0379'AT WEST BRANCH.
MG0379'AT WEST BRANCH, CEDAR COUNTY, 200 FEET SOUTHEAST OF THE CHICAGO, ROCK ISLAND AND PACIFIC RAILWAY STATION, 21 POLES NORTHWEST OF MILEPOST 69, AT THE CROSSING OF MAIN STREET, AT THE EAST SIGNAL OF A CROSSING SIGN, AND IN THE TOP OF THE CENTER OF THE WEST CONCRETE FOUNDATION. A STANDARD DISK, STAMPED U 76 1934.
MG0379
MG0379 STATION RECOVERY (1998)
MG0379'RECOVERY NOTE BY US POWER SQUADRON 1998
MG0379'MARK NOT FOUND.
MG0379
MG0379 STATION RECOVERY (2000)
MG0379'RECOVERY NOTE BY AERIAL SERVICES INCORPORATED 2000 (KE)
MG0379'NOT FOUND.

Figure 25-7. NGS Data Sheet

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 1

BUCHANAN COUNTY, IOWA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
AURORA, CITY OF	190698
BRANDON, CITY OF	190328
BUCHANAN COUNTY, UNINCORPORATED AREAS	190848
FAIRBANK, CITY OF	190329
HAZLETON, CITY OF	190330
INDEPENDENCE, CITY OF	190031
JESUP, CITY OF	190599
LAMONT, CITY OF	190331
QUASQUETON, CITY OF	190332
ROWLEY, CITY OF*	190798
STANLEY, CITY OF	190333
WINTHROP, CITY OF	190690

*No Special Flood Hazard Areas Identified

FEMA

REVISED:

December 30, 2020

FLOOD INSURANCE STUDY NUMBER
19019CV000C

Version Number 2.4.3.0

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SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60, *Criteria for Land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would

be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these flood-prone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) Report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community's regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Buchanan County, Iowa.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the United States Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC-8) sub-basins affecting each, are shown in Table 1. The FIRM panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Aurora, City of	190698	07060006, 07080102	19019C0225E	
Brandon, City of	190328	07080205	19019C0384E 19019C0392E 19019C0403E 19019C0425E	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Buchanan County, Unincorporated Areas	190848	07060006, 07080102, 07080205	19019C0020E 19019C0025E 19019C0050E 19019C0064E 19019C0068E 19019C0075E 19019C0100E 19019C0125E[2] 19019C0150E 19019C0156E 19019C0157E 19019C0175F 19019C0200E 19019C0207E 19019C0225E 19019C0250E 19019C0275E 19019C0281F 19019C0282F 19019C0283F 19019C0284F 19019C0300F 19019C0301E 19019C0303F 19019C0319E 19019C0325E 19019C0338E 19019C0350E 19019C0375E 19019C0384E 19019C0392E 19019C0400E 19019C0403E 19019C0425E 19019C0450E 19019C0475E 19019C0500E	
Fairbank, City of	190329	07080102	19019C0020E 19019C0025E	
Hazleton, City of	190330	07080102	19019C0156E 19019C0157E	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Independence, City of	190031	07080102 07080205	19019C0281F 19019C0282F 19019C0283F 19019C0284F 19019C0300F 19019C0301E 19019C0303F	
Jesup, City of	190599	07080205	19019C0275E	
Lamont, City of	190331	07060006	19019C0207E 19019C0225E	
Quasqueton, City of	190332	07080102	19019C0319E 19019C0338E	
Rowley, City of[1]	190798	07080102 07080205	19019C0450E	
Stanley, City of	190333	07080102	19019C0064E 19019C0068E	
Winthrop, City of	190690	07080102	19019C0325E 19019C0350E	

[1] No Special Flood Hazard Areas Identified
[2] Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report.

Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 30, "Map Repositories," within this FIS Report.

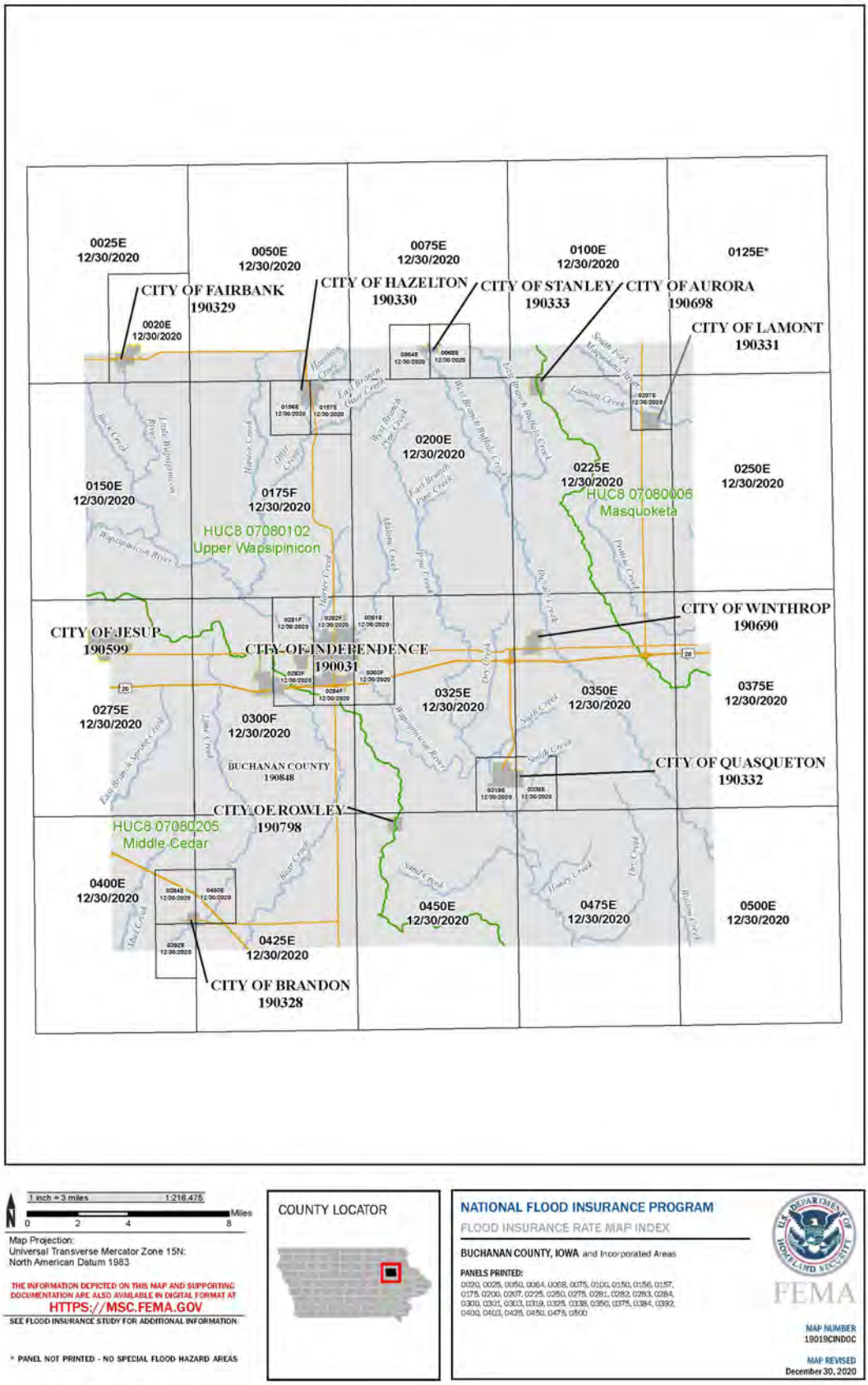
- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

  The initial Countywide FIS Report for Buchanan County became effective on 07/16/2008. Refer to Table 27 for information about subsequent revisions to the FIRMs.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at www.fema.gov/online-tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Buchanan County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, primary roads, and USGS HUC-8 codes.

Figure 1: FIRM Panel Index



Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Flood Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 27 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and FDTs may reflect stream channel distances that differ from what is shown on the map.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Non-Coastal Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

Figure 2: FIRM Notes to User

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 15N. The horizontal datum was the North American Datum of 1983 NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov.

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 30 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was derived from digital orthophotography collected by the Iowa Geological and Water Survey, Department of Natural Resources. This imagery was flown in 2010. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Figure 2: FIRM Notes to User

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Buchanan County, Iowa, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 27 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Buchanan County.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Figure 3: Map Legend for FIRM

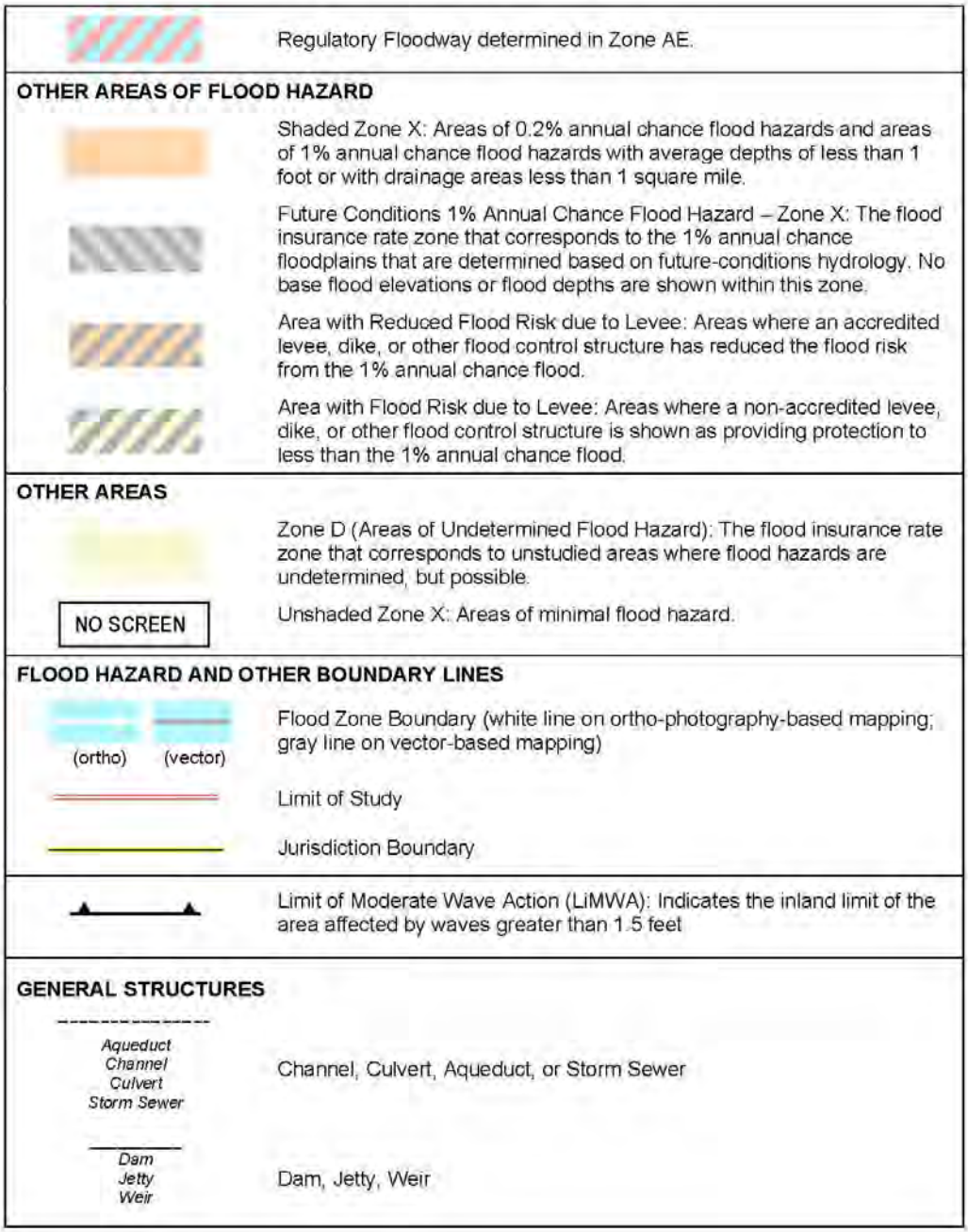


Figure 3: Map Legend for FIRM

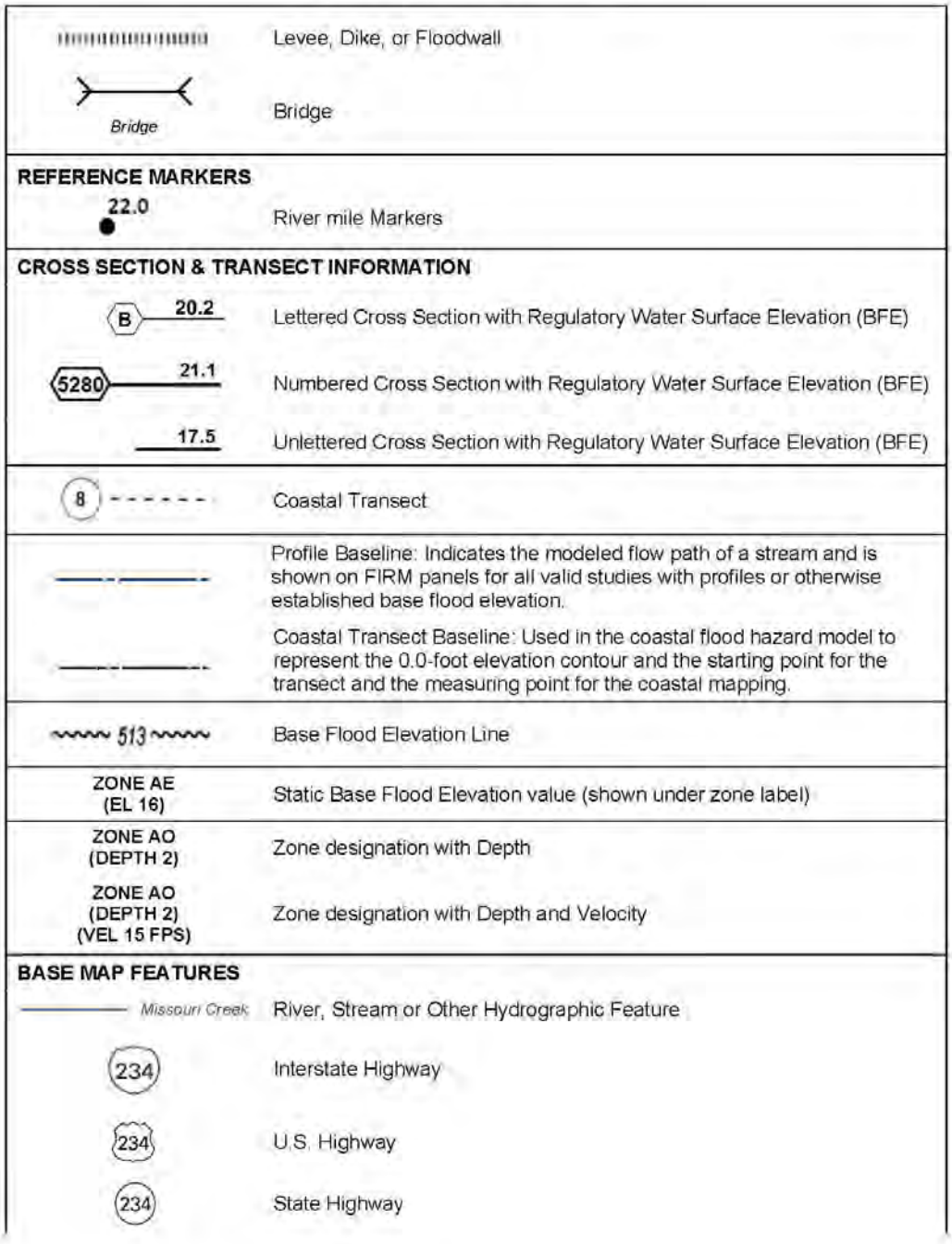


Figure 3: Map Legend for FIRM

234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
—	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}E$	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Buchanan County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, "Map Legend for FIRM", describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Buchanan County, respectively.

Table 2, "Flooding Sources Included in this FIS Report," lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 12. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic

data. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Malone Creek	Buchanan County, Unincorporated Areas; Independence, City of	At the Wapsipinicon River confluence.	Near 2nd Street NE within the City of Independence	07080102	2.2	*	Y	AE	1987
Wapsipinicon River	Buchanan County, Unincorporated Areas; Independence, City of	Approximately 138 feet upstream of the City of Independence community boundary	Approximately 1,900 feet upstream of the Chicago Central Pacific Railroad	07080102	3.3	*	Y	AE	2013
Zone A Flooding Sources	Aurora, City of; Brandon, City of; Buchanan County, Unincorporated Areas; Fairbank, City of; Hazleton, City of; Independence, City of; Jesup, City of Lamont, City of; Quasqueton, City of; Stanley, City of; Winthrop, City of	Within Buchanan County	Within Buchanan County	07060006, 07080205, 07080102	531.1	*	N	A	2015

*Data not available

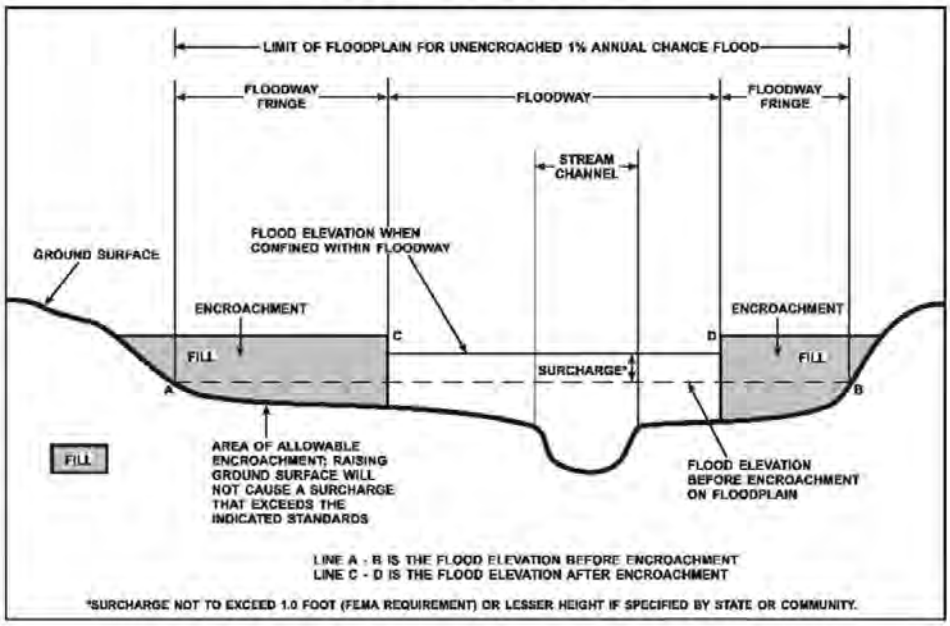
2.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard.

For purposes of the NFIP, a floodway is used as a tool to assist local communities in balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 23, "Floodway Data."

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM.

2.4 Non-Encroachment Zones

This section is not applicable to this Flood Risk Project.

2.5 Coastal Flood Hazard Areas

This section is not applicable to this Flood Risk Project.

2.5.1 Water Elevations and the Effects of Waves

This section is not applicable to this Flood Risk Project.

Figure 5: Wave Runup Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

This section is not applicable to this Flood Risk Project.

2.5.3 Coastal High Hazard Areas

This section is not applicable to this Flood Risk Project.

Figure 6: Coastal Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.4 Limit of Moderate Wave Action

This section is not applicable to this Flood Risk Project.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, "Map Legend for FIRM." Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in Buchanan County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Aurora, City of	A, X
Brandon, City of	A, X
Fairbank, City of	A, X
Buchanan County, Unincorporated Areas	A, AE, X
Hazleton, City of	A, X
Independence, City of	A, AE, X
Jesup, City of	A, X
Lamont, City of	A, X
Quasqueton, City of	A, X
Rowley, City of	X
Stanley, City of	A, X
Winthrop, City of	A, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Maquoketa	07060006	Maquoketa River	Watershed is located in eastern Iowa. It covers Fayette, Clayton, Buchanan, Delaware, Dubuque, Linn, Jackson, Jones, and Clinton Counties.	1,870
Middle Cedar	07080205	Cedar River	The largest watershed within Buchanan County. It is located in north central Iowa. Watershed spans across Franklin, Butler, Hardin, Grundy, Black Hawk, Marshall, Tama, Benton, Buchanan, and Linn Counties.	2,415
Upper Wapsipinicon	07080102	Wapsipinicon River	Watershed is located in Northeast Iowa. It covers Mitchell, Howard, Floyd, Chickasaw, Bremer, Fayette, Black Hawk, Buchanan, Delaware, Linn, and Jones Counties.	1,533

4.2 Principal Flood Problems

Table 5 contains a description of the principal flood problems that have been noted for Buchanan County by flooding source.

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Wapsipinicon River	Stream gage records have been maintained on the Wapsipinicon River at Independence (Station No. 05421000) by the USGS. Records are available from 1934 to 2005, a period of 71 years. Records indicate that past flooding on the Wapsipinicon River in Independence has occurred primarily between March and June as a result of a combination of spring snowmelt and rainfall or just heavy rainfall.

Table 6 contains information about historic flood elevations in the communities within Buchanan County.

Table 6: Historic Flooding Elevations

[Not Applicable to this Flood Risk Project]

4.3 Non-Levee Flood Protection Measures

Table 7 contains information about non-levee flood protection measures within Buchanan County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 7: Non-Levee Flood Protection Measures

[Not Applicable to this Flood Risk Project]

4.4 Levees

This section is not applicable to this Flood Risk Project.

Table 8: Levees

[Not Applicable to this Flood Risk Project]

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. A summary of the discharges is provided in Table 10. Stream gage information is provided in Table 12.

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Malone Creek	At the Wapsipinicon River confluence	10.2	2,300	*	3,930	4,770	7,200
Wapsipinicon River	At the downstream City of Independence boundary	1,070.5	17,500	24,100	29,300	34,900	48,900
Wapsipinicon River	At USGS Gage # 05421000	1,051.5	17,400	23,900	29,100	34,600	48,500
Wapsipinicon River	Approximately 0.17 miles upstream of the Harter Creek confluence	1,042.6	17,300	23,800	29,000	34,500	48,400

*Not calculated for this Flood Risk Project

Figure 7: Frequency Discharge-Drainage Area Curves
[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

[Not Applicable to this Flood Risk Project]

Table 11: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Pine Creek	5421100	USGS	Pine Creek Tributary near Winthrop, IA	0.33	05/05/1905	05/26/2012
Wapsipinicon River	5421000	USGS	Wapsipinicon River at Independence, IA	1,048	04/11/1934	05/09/2012
Wapsipinicon Tributary	5421300	USGS	Wapsipinicon Tributary at Winthrop, IA	0.7	07/26/1953	05/26/2012

5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed in Table 23, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine

water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Malone Creek	At the Wapsipinicon River confluence	Near 2nd Street NE within the City of Independence	Discharge-frequency equations	HEC-2 step-backwater	1987	AE w/ Floodway	The peak discharges for Malone Creek were computed from the discharge-frequency equations developed by the USGS for the State of Iowa found in "Floods in Iowa: A comparative Study of Regional Flood Frequency Methods." Starting water-surface elevations were obtained using the slope-area method. (FEMA 2015) Flood hazard information was redelineated based on newly developed topographic data in the 10/15/2020 revision. No new flood hazard analysis was performed.
Wapsipinicon River	Approximately 138 feet upstream of the City of Independence community boundary	Approximately 1,900 feet upstream of Chicago Central Pacific Railroad	Iowa Regression Equations	HEC-RAS Version 4.1	2013	AE w/ Floodway	In accordance with USGS WRIR 00-4233 and IIHR methodologies, weighted peak discharge values at the gaging station were computed by weighting Bulletin 17B peak discharge values with peak discharge values from Iowa Regression Equations. (FEMA 2015) Flood hazard information was redelineated based on newly developed topographic data in the 10/15/2020 revision. No new flood hazard analysis was performed.
Zone A Flooding Sources	Within Buchanan County	Within Buchanan County	Regression equations	HEC-RAS 4.0.0	2015	A	Peak flood discharges were calculated using USGS developed regionally-based regression equations in 1987 (Lara, O.G. 1987) and 2001 (Eash, D.A. 2001) to calculate annual exceedance discharges in Iowa streams.

Table 13: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Malone Creek	0.045-0.050	0.055-0.080
Wapsipinicon River	0.040	0.040-0.150

5.3 Coastal Analyses

This section is not applicable to this Flood Risk Project.

Table 14: Summary of Coastal Analyses
[Not Applicable to this Flood Risk Project]

5.3.1 Total Stillwater Elevations

This section is not applicable to this Flood Risk Project.

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas
[Not Applicable to this Flood Risk Project]

Table 15: Tide Gage Analysis Specifics
[Not Applicable to this Flood Risk Project]

5.3.2 Waves

This section is not applicable to this Flood Risk Project.

5.3.3 Coastal Erosion

This section is not applicable to this Flood Risk Project.

5.3.4 Wave Hazard Analyses

This section is not applicable to this Flood Risk Project.

Table 16: Coastal Transect Parameters
[Not Applicable to this Flood Risk Project]

Figure 9: Transect Location Map
[Not Applicable to this Flood Risk Project]

5.4 Alluvial Fan Analyses

This section is not applicable to this Flood Risk Project.

Table 17: Summary of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

Table 18: Results of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

All FIS Reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS Reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS Reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS Report and on the FIRMs are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at www.ngs.noaa.gov.

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please visit the NGS website at www.ngs.noaa.gov.

A countywide conversion factor of -0.08 feet was calculated for the previous Buchanan County FIS (FEMA 2008).

Table 19: Countywide Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

Table 20: Stream-Based Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM Database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Flood Risk Analysis and Mapping*, www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping

Base map information shown on the FIRM was derived from the sources described in Table 21.

Table 21: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
Digital Orthophoto	Iowa Geological and Water Survey, Department of Natural Resources	2010	*	Digital orthoimagery
Political boundaries	U.S. Department of Commerce, U.S. Census Bureau, Geography Division	2010	*	Municipal and county boundaries
Public Land Survey System (PLSS)	Iowa Department of Natural Resources	1998	1:24,000	PLSS data of Iowa
Transportation Features	Iowa Department of Transportation	2010	1:5,000	Road centerline features
Transportation Features	U.S. Census Bureau	2017	1:24,000	TIGER line road centerlines and railroad features

*Data not available

6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 22.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

The floodway widths presented in this FIS Report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 23, "Floodway Data."

Table 22: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Buchanan County	All Flooding Sources	Light Detection and Ranging data (LiDAR)	18.0 cm RMSEz	1 meter at 95% confidence level	IDNR 2010

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report.

Table 23: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,080	345	1,366	3.5	905.2	894.7[2]	895.7	1.0
B	2,330	164	863	5.5	905.2	899.5[2]	900.3	0.8
C	2,720	269	1,885	2.5	905.2	900.7[2]	901.7	1.0
D	3,010	121	811	5.9	905.2	901.1[2]	901.9	0.8
E	3,885	130	615	7.8	905.2	903.9[2]	904.7	0.8
F	4,510	197	1,254	3.8	906.5	906.5	907.5	1.0
G	5,020	120	828	5.8	907.5	907.5	908.4	0.9
H	5,970	74	751	6.3	911.2	911.2	911.3	0.1
I	7,245	160	1,008	4.7	913.7	913.7	914.4	0.7
J	8,875	250	873	5.5	916.2	916.2	917.2	1.0
K	10,180	200	622	7.7	925.0	925.0	925.0	0.0

[1]Stream distance in feet above mouth at Wapsipinicon River
[2]Elevation computed without consideration of backwater effects from Wapsipinicon River

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY BUCHANAN COUNTY, IOWA AND INCORPORATED AREAS	FLOODWAY DATA FLOODING SOURCE: MALONE CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	140	1,284	22,312	1.6	904.9	904.9	905.7	0.8
B	568	1,188	21,998	1.6	905.0	905.0	905.7	0.7
C	1,252	993	16,585	2.1	905.1	905.1	905.8	0.7
D	3,994	1,371	26,388	1.3	905.6	905.6	906.4	0.8
E	4,658	1,486	25,779	1.4	905.6	905.6	906.4	0.8
F	5,588	1,340	23,441	1.5	905.7	905.7	906.5	0.8
G	7,710	1,706	20,304	1.7	906.2	906.2	907.2	1.0
H	10,308	299	5,729	6.0	907.0	907.0	908.0	1.0
I	10,656	287	5,671	6.1	907.3	907.3	908.2	0.9
J	11,356	318	5,636	6.1	908.6	908.6	909.5	0.9
K	11,697	473	7,811	4.4	910.5	910.5	911.3	0.8
L	12,679	776	11,764	2.9	911.4	911.4	912.3	0.9
M	13,538	880	10,232	3.4	911.5	911.5	912.4	0.9
N	14,815	715	12,553	2.8	911.9	911.9	912.9	1.0
O	16,094	2,093	34,608	1.0	913.1	913.1	914.0	0.9
P	17,246	2,493	42,583	0.8	913.1	913.1	914.0	0.9

[1]Stream distance in feet above City of Independence community boundary

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUCHANAN COUNTY, IOWA

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: WAPSIPINICON RIVER

Table 24: Flood Hazard and Non-Encroachment Data for Selected Streams

[Not Applicable to this Flood Risk Project]

6.4 Coastal Flood Hazard Mapping

This section is not applicable to this Flood Risk Project.

Table 25: Summary of Coastal Transect Mapping Considerations

[Not Applicable to this Flood Risk Project]

6.5 FIRM Revisions

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 30, "Map Repositories").

6.5.1 Letters of Map Amendment

A LOMA is an official revision by letter to an effective NFIP map. A LOMA results from an administrative process that involves the review of scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in a SFHA.

To obtain an application for a LOMA, visit www.fema.gov/floodplain-management/letter-map-amendment-loma and download the form "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill". Visit the "Flood Map-Related Fees" section to determine the cost, if any, of applying for a LOMA.

FEMA offers a tutorial on how to apply for a LOMA. The LOMA Tutorial Series can be accessed at www.fema.gov/online-tutorials.

For more information about how to apply for a LOMA, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627).

6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA's determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

Information about obtaining an application for a LOMR-F can be obtained in the same manner as that for a LOMA, by visiting www.fema.gov/floodplain-management/letter-map-amendment-loma for the "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill" or by calling the FEMA Map Information eXchange, toll free, at 1-877-FEMA MAP (1-877-336-2627). Fees for applying for a LOMR-F, if any, are listed in the "Flood Map-Related Fees" section.

A tutorial for LOMR-F is available at www.fema.gov/online-tutorials.

6.5.3 Letters of Map Revision

A LOMR is an official revision to the currently effective FEMA map. It is used to change flood zones, floodplain and floodway delineations, flood elevations and planimetric features. All requests for LOMRs should be made to FEMA through the chief executive officer of the community, since it is the community that must adopt any changes and revisions to the map. If the request for a LOMR is not submitted through the chief executive officer of the community, evidence must be submitted that the community has been notified of the request.

To obtain an application for a LOMR, visit www.fema.gov/media-library/assets/documents/1343 and download the form "MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision". Visit the "Flood Map-Related Fees" section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the Buchanan County FIRM are listed in Table 26.

Table 26: Incorporated Letters of Map Change

[Not Applicable to this Flood Risk Project]

6.5.4 Physical Map Revisions

A Physical Map Revisions (PMR) is an official republication of a community's NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

The community's chief executive officer must submit scientific and technical data to FEMA to support the request for a PMR. The data will be analyzed and the map will be revised if warranted. The community is provided with copies of the revised information and is afforded a review period. When the base flood elevations are changed, a 90-day appeal period is provided. A 6-month adoption period for formal approval of the revised map(s) is also provided.

For more information about the PMR process, please visit www.fema.gov and visit the "Flood Map Revision Processes" section.

6.5.5 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards within a given community. FEMA accomplishes this through a national watershed-based mapping needs assessment strategy, known as the Coordinated Needs Management Strategy (CNMS). The CNMS is used by FEMA to assign priorities and allocate funding for new flood hazard analyses used to update the FIS Report and FIRM. The goal of CNMS is to define the validity of the engineering study data within a mapped inventory. The CNMS is used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. Visit www.fema.gov to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Buchanan County. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBMs) and/or Flood Boundary and Floodway Maps (FBFMs) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in Table 27, "Community Map History." A description of each of the column headings and the source of the date is also listed below.

- *Community Name* includes communities falling within the geographic area shown on the FIRM, including those that fall on the boundary line, nonparticipating communities, and communities with maps that have been rescinded. Communities with No Special Flood Hazards are indicated by a footnote. If all maps (FHBM, FBFM, and FIRM) were rescinded for a community, it is not listed in this table unless SFHAs have been identified in this community.

- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or "pending" (for Preliminary FIS Reports) is shown. If the community is listed in Table 27 but not identified on the map, the community is treated as if it were unmapped.

- *Initial FHBM Effective Date* is the effective date of the first FHBM. This date may be the same date as the Initial NFIP Map Date.

- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.

- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community.

- *FIRM Revision Date(s)* is the date(s) the FIRM was revised, if applicable. This is the revised date that is shown on the FIRM panel, if applicable. As countywide

studies are completed or revised, each community listed should have its FIRM dates updated accordingly to reflect the date of the countywide study. Once the FIRMs exist in countywide format, as PMRs of FIRM panels within the county are completed, the FIRM Revision Dates in the table for each community affected by the PMR are updated with the date of the PMR, even if the PMR did not revise all the panels within that community.

The initial effective date for the Buchanan County FIRMs in countywide format was 07/16/2008.

Table 27: Community Map History

Community Name	Initial Identification Date	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Aurora, City of[1]	07/16/2008	N/A	N/A	07/16/2008	12/30/2020
Brandon, City of	10/29/1976	10/29/1976	N/A	07/16/2008	12/30/2020
Buchanan County, Unincorporated Areas	06/07/1977	06/07/1977	N/A	09/01/1991	12/30/2020 06/16/2015 07/16/2008 07/21/1999
Fairbank, City of	07/25/1975	07/25/1975	N/A	08/19/1986	12/30/2020 07/16/2008
Hazleton, City of	05/28/1976	05/28/1976	N/A	07/16/2008	12/30/2020
Independence, City of	05/03/1974	05/03/1974	07/23/1976	05/16/1977	12/30/2020 06/16/2015 07/16/2008 10/18/1988
Jesup, City of[1]	07/16/2008	N/A	N/A	07/16/2008	12/30/2020
Lamont, City of	09/12/1975	09/12/1975	N/A	07/16/2008	12/30/2020
Quasqueton, City of	11/05/1976	11/05/1976	08/23/1977	07/02/1987	12/30/2020 07/16/2008 07/21/1999
Rowley, City of[1,2]	07/16/2008	N/A	N/A	07/16/2008	12/30/2020
Stanley, City of[1]	07/16/2008	N/A	N/A	07/16/2008	12/30/2020
Winthrop, City of[1]	07/16/2008	N/A	N/A	07/16/2008	12/30/2020

[1] This community did not have a FIRM prior to the first countywide FIRM for Buchanan County
[2] No SFHA Identified

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 28 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

Table 28: Summary of Contracted Studies Included in this FIS Report

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Malone Creek	10/18/1988	USACE, Rock Island District	EMW-86-E-2226	June 1987	Buchanan County, Unincorporated Areas; Independence, City of
Wapsipinicon River	06/16/2015	URS	EMK-2012-CA-1208	2013	Buchanan County, Unincorporated Areas; Independence, City of
Zone A	10/15/2020	IIHR – Hydroscience & Engineering	ESD7385SR ALST100332	2015	Aurora, City of; Brandon, City of; Buchanan County, Unincorporated Areas; Fairbank, City of; Hazleton, City of; Independence, City of; Jesup, City of Lamont, City of; Quasqueton, City of; Stanley, City of; Winthrop, City of

*Data not available

7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and previous Flood Risk Projects are shown in Table 29. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

Table 29: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Aurora, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Brandon, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Buchanan County, Unincorporated Areas	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, Stantec, and the community
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Fairbank, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Hazleton, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Independence, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, Stantec, and the community
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Jesup, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Lamont, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, Stantec, and the community
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor

Table 29: Community Meetings (continued)

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Quasqueton, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Rowley, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Stanley, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, and Stantec
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor
Winthrop, City of	12/30/2020	05/11/2017	DFHP Review Meeting	IDNR, INRCOG, Stantec, and the community
		02/05/2019	CCO Meeting	FEMA, the community and the study contractor

SECTION 8.0 – ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see www.fema.gov.

Table 30 is a list of the locations where FIRMs for Buchanan County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 30: Map Repositories

Community	Address	City	State	Zip Code
Aurora, City of	City Office 313 Main Street	Aurora	IA	50607
Brandon, City of	City Hall 400 North Street	Brandon	IA	52210
Buchanan County, Unincorporated Areas	Buchanan County Courthouse Zoning Office 210 5th Avenue Northeast, Suite I	Independence	IA	50644
Fairbank, City of	City Hall 116 East Main Street	Fairbank	IA	50629
Hazleton, City of	City Hall 111 3rd Street North	Hazleton	IA	50641
Independence, City of	City Hall 331 1st Street East	Independence	IA	50644
Jesup, City of	City Hall 791 6th Street	Jesup	IA	50648
Lamont, City of	City Hall 644 Bush Street	Lamont	IA	50650
Quasqueton, City of	City Hall 113 Water Street North	Quasqueton	IA	52326
Rowley, City of[1]	City Clerk's Office 109 Oak St	Rowley	IA	52329
Stanley, City of	Mayor's Office 128 East Main Street	Stanley	IA	50671

Table 30: Map Repositories (continued)

Community	Address	City	State	Zip Code
Winthrop, City of	City Clerk's Office 354 Madison Street	Winthrop	IA	50682

[1] No Special Flood Hazard Areas Identified

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM Databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 31.

Table 31 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the State NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of State and local GIS data in their state.

Table 31: Additional Information

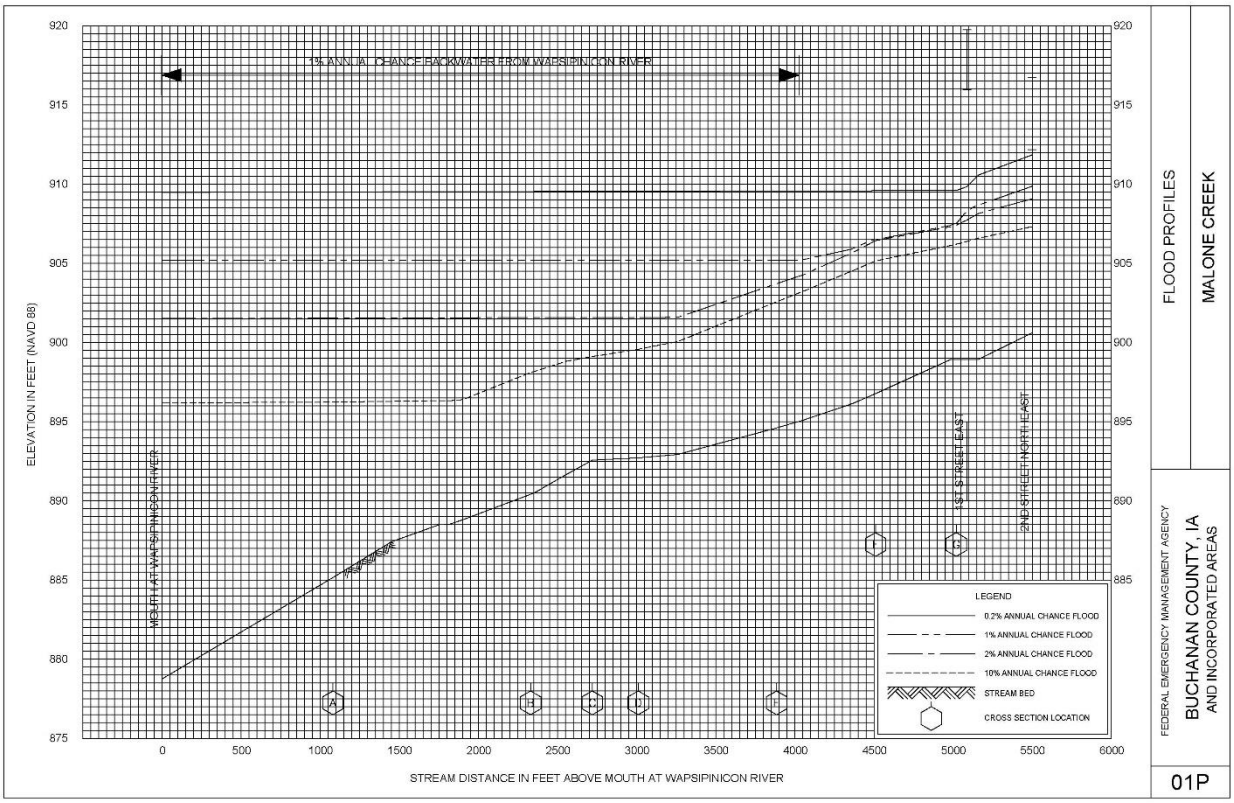
FEMA and the NFIP	
FEMA and FEMA Engineering Library website	www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/engineering-library
NFIP website	www.fema.gov/national-flood-insurance-program
NFHL Dataset	msc.fema.gov
FEMA Region VII	FEMA Region VII 9221 Ward Parkway, Suite 300 Kansas City, MO 64114 (816) 283-7073
Other Federal Agencies	
USGS website	www.usgs.gov
Hydraulic Engineering Center website	www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Bill Cappuccio Iowa Dept. of Natural Resources Wallace State Office Building Des Moines, Iowa 50319 (515) 281-8942 bill.cappuccio@dnr.iowa.gov
State GIS Coordinator	Chris Ensminger Iowa Dept. of Natural Resources 502 E. 9th Street Des Moines, Iowa 50319 Phone: (515) 281-4216 chris.ensminger@dnr.iowa.gov

SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

Table 32 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

Table 32: Bibliography and References

Citation in this FIS	Publisher/ Issuer	*Publication Title*, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
Eash, D.A. 2001		*Techniques for Estimating Flood Frequency Discharges for Streams in Iowa. Unites States Geologic Survey Water Resources Investigation Report 00-4233*	Eash, D.A.		2001	
FEMA 2008	Federal Emergency Management Agency	*Flood Insurance Study of Buchanan County Iowa (19019CV000A)*		Washington, D.C.	2008	FEMA Flood Map Service Center msc.fema.gov
2015 FIS	Federal Emergency Management Agency	*Flood Insurance Study of Buchanan County Iowa (19019CV000B)*		Washington, D.C.	2015	FEMA Flood Map Service Center msc.fema.gov
IDNR 2010	Iowa Geological and Water Survey, DNR	*LiDAR Datasets*			2010	
Lara, O.G. 1987		*Method for Estimating the Magnitude and Frequency of Floods at Ungaged Sites on Unregulated Rural Streams in Iowa. United States Geologic Survey Water Resources Investigation Report 87-4132*	Lara, O.G.		1987	


1% ANNUAL CHANCE BACKWATER FROM WAPSIPINICON RIVER
MOUTH AT WAPSIPINICON RIVER
1ST STREET EAST
2ND STREET NORTH EAST
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE MOUTH AT WAPSIPINICON RIVER
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
MALONE CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
BUCHANAN COUNTY, IA
AND INCORPORATED AREAS
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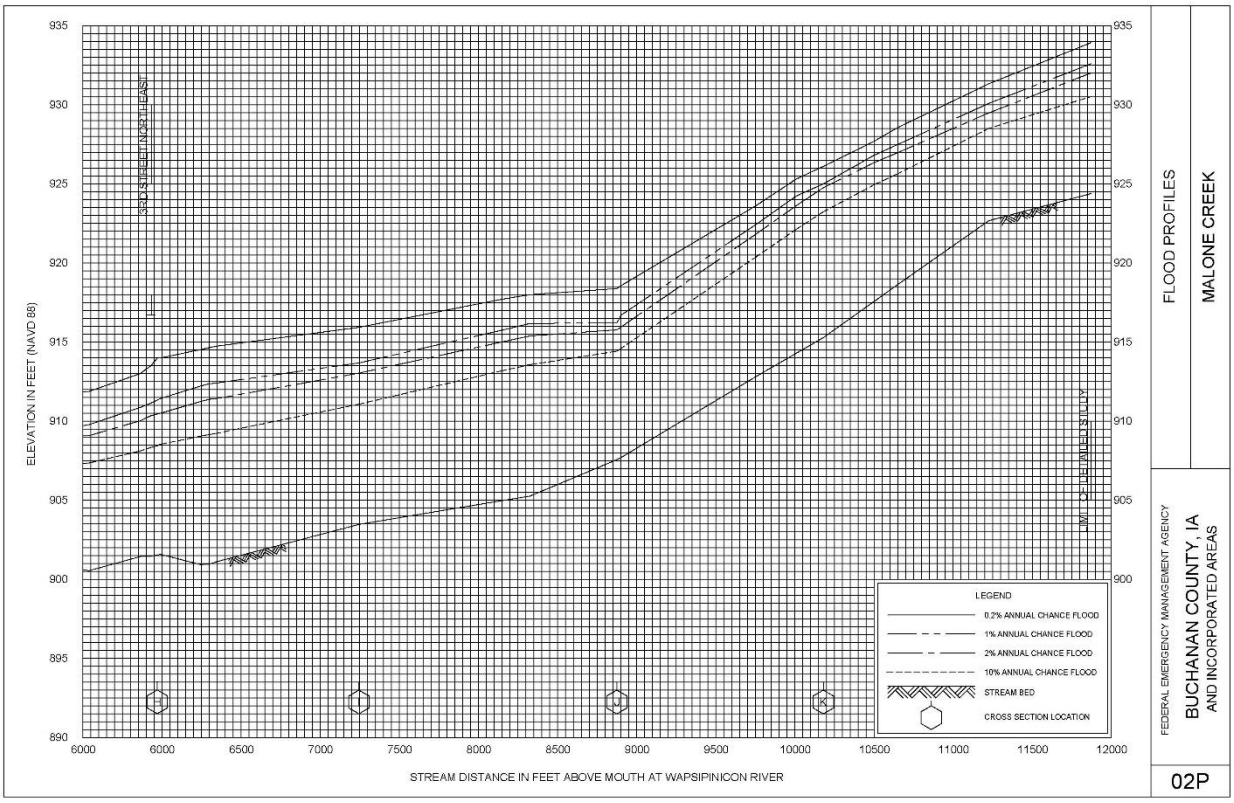
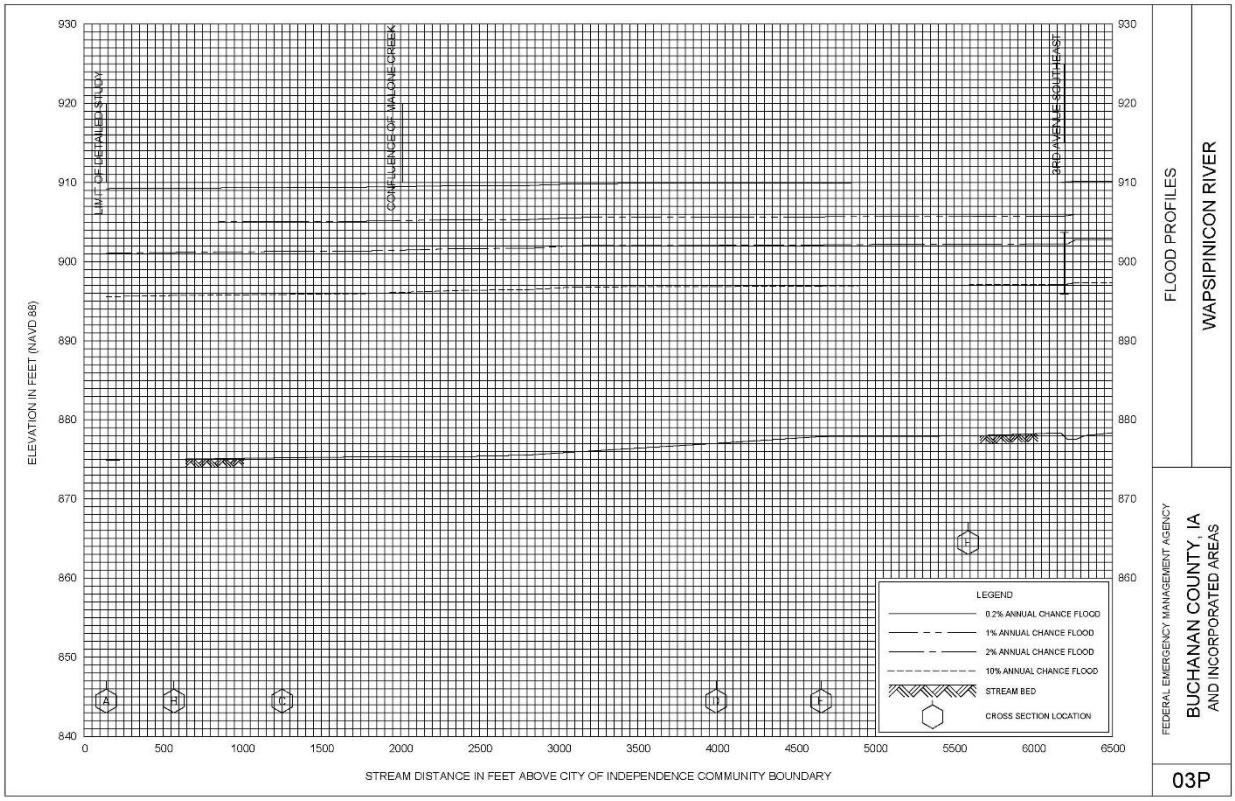
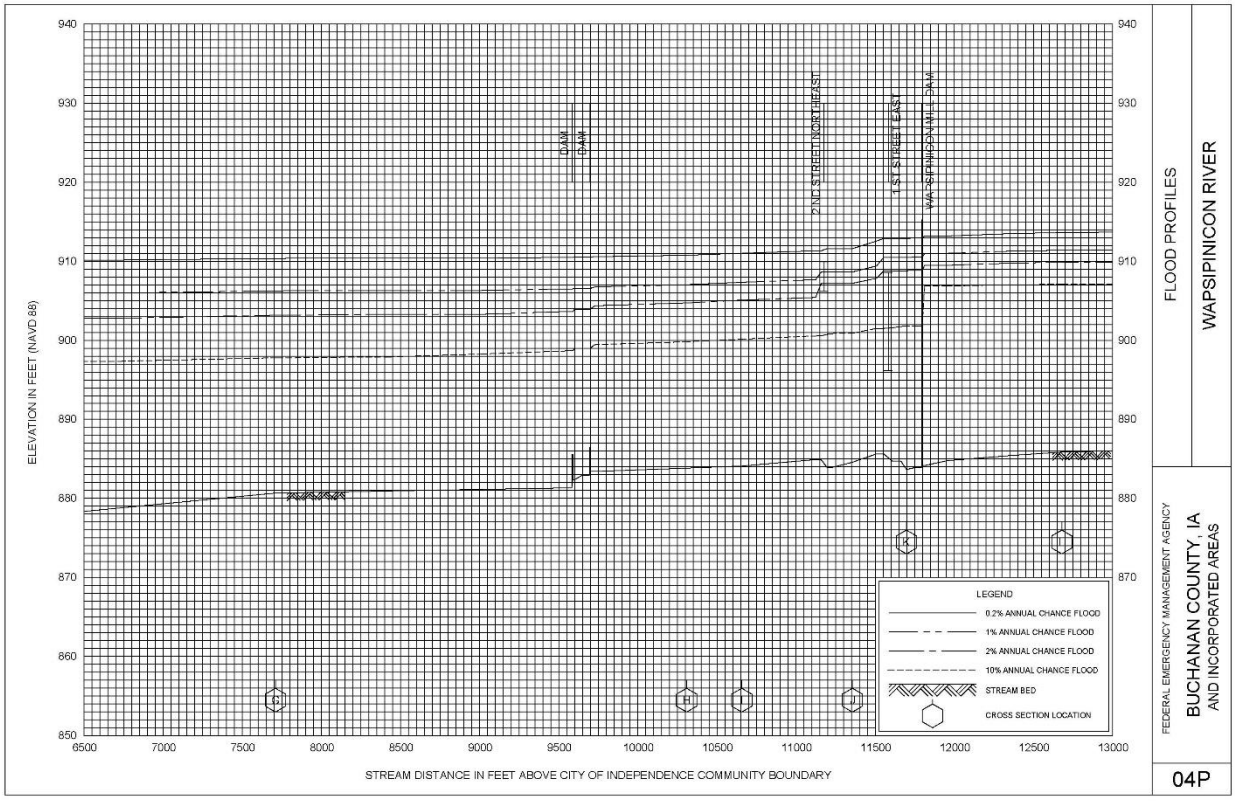

3RD STREET NORTH EAST
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE MOUTH AT WAPSIPINICON RIVER
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
MALONE CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
BUCHANAN COUNTY, IA
AND INCORPORATED AREAS
02P


930
920
910
900
890
880
870
860
850
840
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CITY OF INDEPENDENCE COMMUNITY BOUNDARY
LIMIT OF DETAILED STUDY
CONFLUENCE OF MALONE CREEK
3RD AVENUE SOUTHEAST
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
WAPSIPINICON RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
BUCHANAN COUNTY, IA
AND INCORPORATED AREAS
03P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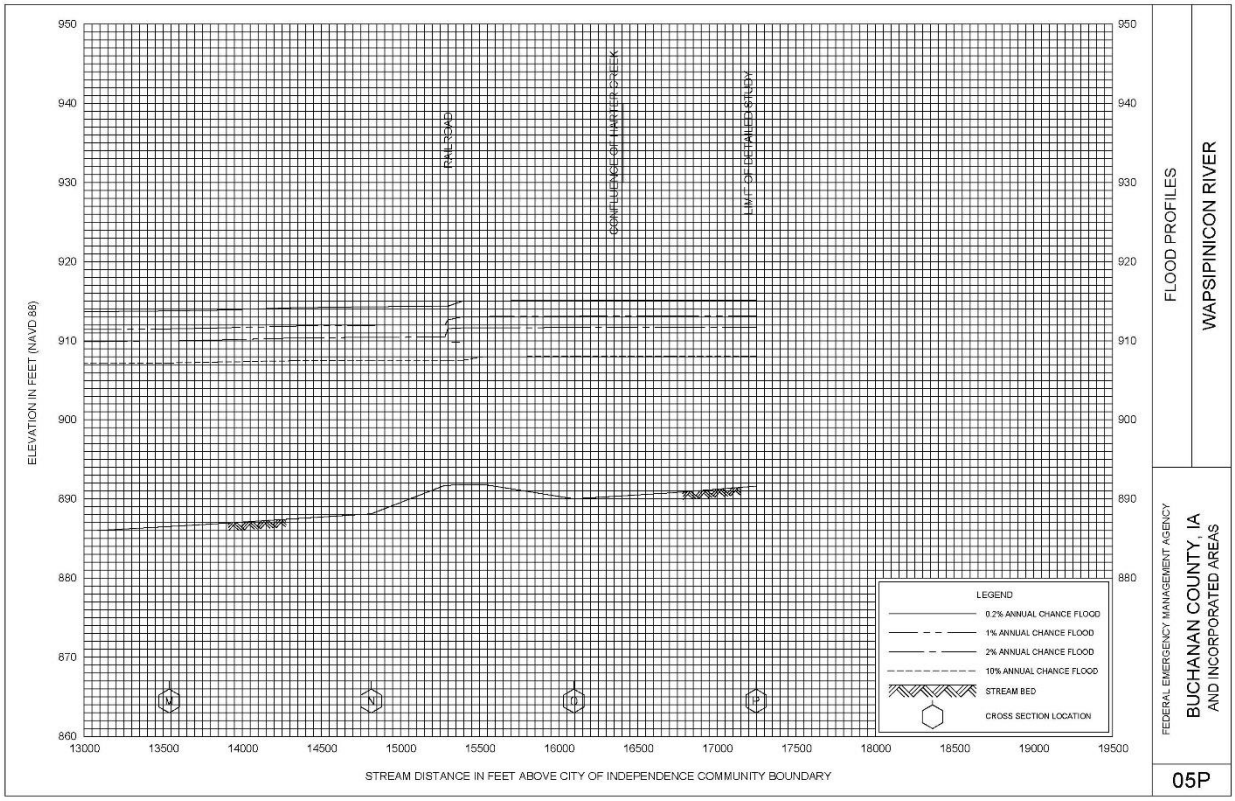
11000
11500
12000
12500
13000
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CITY OF INDEPENDENCE COMMUNITY BOUNDARY
DAM
DAM
2ND STREET NORTHEAST
1ST STREET EAST
WAPSIPINICON TWO CHANNEL DAM
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
WAPSIPINICON RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
BUCHANAN COUNTY, IA
AND INCORPORATED AREAS
04P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17500
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18500
19000
19500
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CITY OF INDEPENDENCE COMMUNITY BOUNDARY
RAILROAD
CONFLUENCE OF HARTER CREEK
LIMIT OF DETAILED STUDY
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
WAPSIPINICON RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
BUCHANAN COUNTY, IA
AND INCORPORATED AREAS
05P

26. FEMA Forms

This section contains five FEMA forms that are useful to a local regulatory program.

MT-EZ –Application Form for Single Residential Lots or Structure Letter of Map Amendment explained in Section 6.
https://www.fema.gov/flood-maps/change-your-flood-zone/paper-application-forms/mt-ez

MT-1 – Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill explained in Section 6.
https://www.fema.gov/flood-maps/change-your-flood-zone/paper-application-forms/mt-1

MT-2 – Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision https://www.fema.gov/flood-maps/change-your-flood-zone/paper-application-forms/mt-2

The FEMA Elevation Certificate is explained in Section 18. It can be downloaded from FEMA's web site at http://www.fema.gov/library/viewRecord.do?id=1383

https://agents.floodsmart.gov/sites/default/files/fema_form-ff-206-fy-22-152.pdf.pdf

The FEMA Floodproofing Certificate is explained in Section 18. It can be downloaded from FEMA's web site at
https://www.fema.gov/sites/default/files/documents/fema_form-ff-206-fy22-153.pdf