400 MAPPING AND REGULATIONS

The Community Rating System (CRS) provides credit to communities that enact and enforce regulations that exceed the National Flood Insurance Program's (NFIP's) minimum standards so that more flood protection is provided for new development.

The activities in this series affect only certain portions of the community and, in some cases, only portions of the floodplain. Therefore, the credit points are adjusted to reflect the area affected. These activities are also adjusted to reflect the community's growth rate. Section 710 explains this credit.

Contents of Series 400

List of Figures

401 Special Hazard Areas

The Department of Homeland Security's Federal Emergency Management Agency (FEMA) and many communities in the United States have long recognized that the mapping and regulatory standards of the NFIP do not adequately address all of the flood problems in the country. There are many special local situations in which flooding or flood-related problems do not fit the national norm. Therefore, there are situations where the NFIP's floodplain management criteria do not adequately protect property from flood damage.

To encourage communities to address these hazards, the CRS provides credit for mapping, preserving open space, and regulating new development in areas subject to these seven special flood-related hazards:

1. Uncertain flow paths: alluvial fans, moveable bed streams, and other floodplains where the channel moves during a flood.
2. Closed basin lakes: lakes that have a small or no outlet that may stay above flood stage for weeks, months, or years.
3. Ice jams: flooding caused when warm weather and rain break up a frozen river. The broken ice floats downriver until it is blocked by an obstruction, such as a bridge or shallow area, creating a dam.
4. Land subsidence: lowering of the land surface caused by withdrawal of subsurface water or minerals or by compaction of organic soils.
5. Mudflow hazards: a river, flow, or inundation of liquid mud down a hillside, usually as a result of a dual condition of loss of brush cover and the subsequent accumulation of water on the ground, preceded by a period of unusually heavy or sustained rain.
6. Coastal erosion: areas subject to the wearing away of land masses caused primarily by waves on the oceans, Gulf of Mexico, and the Great Lakes.
7. Tsunamis: large ocean waves caused by an underwater earthquake or volcano.

These special flood-related hazards are addressed in separate publications that discuss credit points and impact adjustment and credit calculation formulae for each hazard and include the worksheets needed for special hazards credit (see Appendix E).

The credit points for mapping, preserving open space, and regulating new development in the areas affected by these hazards are calculated on special hazards worksheets. The credits are added to the other elements in each regular activity.

402 Impact Adjustment for Areas

The activities in the 400 series provide credit for programs that improve regulatory maps or regulate areas to higher standards than the minimum NFIP program requirements. The effectiveness, or impact, of a mapping or regulatory program depends upon the area affected by that program.

In many cases, some elements of a community's program will not cover all of its floodplain or all of its watersheds. In these cases, an impact adjustment ratio must be determined based upon the ratio of the affected area to the total area.

> In order to measure the impact of Activities 410, 420, 430, and 440, the community must determine how much of its floodplain area is affected by each element of its mapping or regulatory program. In order to measure the impact of Activity 450, the community must determine how much of its watershed area is affected by each element of its stormwater management program.

Sections 402 through 404 discuss determining the impact adjustment ratios for these activities:

410 (Additional Flood Data)

420 (Open Space Preservation)

430 (Higher Regulatory Standards)

440 (Flood Data Maintenance)

450 (Stormwater Management).

> Impact adjustment ratios are variables with a lower case "r" preceding the acronym for the element.

Example 402-1. The acronym for freeboard credit is FRB. The acronym for the impact adjustment ratio for freeboard credit is rFRB.

> A few elements do not have impact adjustment ratios. If these elements are not effective throughout the community, no credit is provided.

In Activity 440 (Flood Data Maintenance), a minimum requirement is established for ERM (Elevation Reference Marks). There is no credit for ERM if this requirement is not met.

In Activity 450, there is no credit for ESC (Erosion and Sediment Control Regulations) unless it is effective throughout the community. There is no credit for FRX (Freeboard) unless it is effective throughout the B, C, and D or X Zones.

A community has three options for determining the values of most of the impact adjustment ratios that are based on area. A community may use one option for some elements and another option for other elements. Options may not be mixed within an element.

a. (Option 1) Where an element is effective throughout the area of the denominator, the impact adjustment ratio = 1.0 for that element.

If an element is effective throughout the area represented by the denominator in the formula for calculating that activity's credit points, it is not necessary to determine the area. The impact adjustment ratio for that element is 1.0, which gives the highest possible credit for that element.

Elements in Activities 430 (Higher Regulatory Standards), 440 (Flood Data Maintenance), and 450 (Stormwater Management) are most likely to have impact adjustment ratios of 1.0. Although most regulatory programs cover the entire floodplain, sometimes a standard applies only to part of the floodplain. For example, different freeboard requirements may be applied to coastal and riverine floodplains.

Example 402.a-1. A community's only request for credit in the 400 series is for regulation of a freeboard requirement in Activity 430. The freeboard requirement is applied to all of the Special Flood Hazard Area (SFHA) shown on its Flood Insurance Rate Map (FIRM). Using Option 1, rFRB = 1.0.

Example 402.a-2. Another community requires freeboard in all riverine floodplains, but not in coastal floodplains. This community cannot use Option 1 for FRB because the element is not effective throughout the entire regulated floodplain.

NOTE: *If a community applies for credit for Activity 420 (Open Space Preservation), it is saying that certain areas are preserved from development. Higher regulatory standards have no impact in those open space areas. Therefore, the impact adjustment ratios for the elements in Activity 430 (Higher Regulatory Standards) cannot be 1.0 if the community receives credit for open space preservation in Activity 420.*

In other words, a community that applies for credit in both Activities 420 and 430 cannot have an impact adjustment ratio of 1.0 for either of them. The Option 1 impact adjustment ratio formula for Activity 430 accounts for this by subtracting the impact adjustment ratio used in Activity 420.

Example 402.a-3. A community applies for credit for open space (OS). It has a freeboard requirement (FRB) for development throughout its floodplains. It determines that 25% of its floodplain is open space. Therefore, it can only receive FRB credit for 75% of its floodplain. The Option 1 formula for freeboard in Activity 430 is 1.0 - 0.25 = 0.75.

b. (Option 2) A community may use a "default value" for one or more of its impact adjustment ratios. The Impact Adjustment section for each activity lists the default value for each element in that activity.

Each of these activities has default values for its elements. A community may use one or more of these default values if:

1. It cannot or chooses not to measure the areas necessary to calculate the impact adjustment ratio(s) as discussed in Section 401.c., below; or

2. It concludes that the default value for the impact adjustment ratio(s) is greater than the calculated value(s).

Example 402.b-1. Someburg has a city park in its floodplain that qualifies for OS (open space preservation) credit in Activity 420. However, Someburg does not have time to measure the areas affected before applying for the CRS. Someburg uses the default value, rOS = 0.05, in its application for CRS credit.

Example 402.b-2. Gulf Beach County has many square miles of floodplain, including two county parks within the SFHA. The parks qualify for OS (Open Space Preservation) in Activity 420. The default value for rOS (the impact adjustment ratio for open space preservation) is given as 0.05 in Section 423. The County estimates that the area of the parks (aOS) is about 3% of the area of its regulated floodplains (aRF). Gulf Beach County uses the default value rOS = 0.05 because it provides more credit for Activity 420.

c. (Option 3) The value of an impact adjustment ratio is determined by dividing the area affected by an element by the appropriate denominator. The denominator for the elements in each activity is specified in the Impact Adjustment section for the activity.

For each element with an impact adjustment ratio, the area affected by the element is designated by a lower case "a" followed by the acronym for that element. The area of the denominator is designated as aSFHA (for the area of the SFHA), aRF (for the area of the regulated floodplain, or aW (for the area of the watershed).

In each of these activities there is an Impact Adjustment section. The denominator and formulae for impact adjustment ratios for each element in that activity are listed in that section. A brief description of the denominators follows.

410 (Additional Flood Data): aSFHA, the area of the Special Flood Hazard Area (on the community's FIRM);

420 (Open Space Preservation): aRF, the total area of regulated floodplain within the community;

430 (Higher Regulatory Standards): aRF, the total area of regulated floodplain within the community;

440 (Flood Data Maintenance): aRF, the total area of regulated floodplain within the community; and

450 (Stormwater Management): aW, the total area of watershed affecting the community.

Example 402.c-1. In its floodplain, a city has a park that covers 47 acres. This park qualifies for OS (open space preservation) credit in Activity 420 (aOS = 47). Using Option 3, the city determines that the area of its regulated floodplain (aRF) is 175 acres (aRF = 175). For this city,

$$rOS = \frac{aOS}{aRF} = \frac{47}{175} = 0.27$$

In summary, there are three ways to determine impact adjustment ratios based upon the area affected for Activities 410, 420, 430, 440, and 450.

Example 402.c-2. North Shore requests credit for OS (open space preservation) in Activity 420. The city cannot use Option 1 because its open space areas do not cover the entire floodplain. It could use Option 2 for an impact adjustment ratio of 0.05. As explained in Example 404-2, North Shore uses Option 3 to obtain a higher impact adjustment ratio of 0.42.

In Activities 430 (Higher Regulatory Standards) and 440 (Flood Data Maintenance), North Shore uses Option 1 because the higher standards apply throughout its floodplain and it has digitized parcel data for all of the lots in its floodplain.

In Activity 450 (Stormwater Management), the city uses Option 2 to determine the values of the impact adjustment ratios. Even though much of the watershed area affecting North Shore is regulated by neighboring communities, the city cannot obtain documentation from these communities in order to calculate a higher impact adjustment ratio.

403 Impact Adjustment Map (Option 3)

a. If a community uses Option 3 as discussed in Section 402.c for Activities 410, 420, 430, and/or 440, it must prepare an Impact Adjustment Map showing the area affected by each element of those activities and the area of the denominator (aSFHA for Activity 410, aRF for the other activities).

The Impact Adjustment Map needed for Activities 410, 420, 430, and 440 shows the community's floodplains and the areas where each element in these activities is effective. This map may also be helpful if the community applies for credit for Activity 620 (Levee Safety).

An Impact Adjustment Map may be prepared on any convenient base map, as long as the scale is suitable for the determination of the areas. If the FIRM or other floodplain map is not used as the base map, the floodplain boundaries and the areas of each element must be drawn on the map with sufficient accuracy that the areas may be verified.

No new studies are required to produce an Impact Adjustment Map. The areas are identified and marked on the map based upon the areas under the jurisdiction of the community's regulatory programs. Many communities have developed a map that meets the requirements of Option 3 for their own management purposes. Previous CRS applicants have found the Impact Adjustment Map they developed for CRS credit helpful as a visual presentation of their floodplain management programs. It identifies where the problems are and where the community is dealing with those problems.

Selection of an appropriate base map for the Impact Adjustment Map depends on the size of the community and the elements for which it is requesting credit.

- If a community is relatively small, a copy of the FIRM may be the best base map. This approach is used by Floodville (see Figure 410-3).

- If a community is large in geographic area and its FIRM includes many panels, it may use a base map with a smaller scale so that the Impact Adjustment Map fits on a few sheets. The floodplains may already be drawn on the base map (e.g., a zoning map

with the regulated areas shown), or they may have to be drawn on the base map. This approach is used by North Shore (see Figure 400-3).

- If the community is requesting credit for mapping and regulation of areas outside the SFHA shown on its FIRM, these areas must be drawn on the Impact Adjustment Map.
- If a community has a geographic information system that includes its flood data, it may produce maps from that system.
- If a community is large and has different standards for urban and rural areas, maps of differing scales may be needed.
- A community applying for credit under a number of different elements may choose to use overlays to display the elements separately. The Watertown example shows a base map (see Figure 400-1) and one overlay (see Figure 400-2).

Deciding what base maps to use depends upon the detail required and the overall bulk of the maps. If maps other than the FIRM are used as base maps, all appropriate NFIP zones should be transferred from the FIRM to the base maps (see Figure 400-2).

The Impact Adjustment Map for Activities 410, 420, 430, and/or 440 must show areas that are excluded from the impact adjustment calculations. Four types of areas are excluded from the mapped and regulated areas, even if they are within the SFHA shown on the FIRM:

1. Open waters larger than 10 acres, such as lakes, bays, and large rivers;
2. Lands larger than 10 acres that are either owned by the federal government, such as military installations and national parks, or where development is prohibited by the federal government;
3. At the community's option, areas beyond the community's regulatory jurisdiction. The community may include or exclude non-federal areas it does not have the authority to regulate, including land owned by the state or another community and Indian reservations, provided such areas are treated consistently for all of these activities; and
4. A99 and AR Zones. These zones are not considered part of the regulatory floodplain for CRS purposes. Floodplain management requirements in these zones are less than those required in other zones and these areas already receive substantially reduced flood insurance premiums, which would duplicate CRS discounts.

The intent of these exclusions is to remove from CRS credit calculations areas that are not actually affected by the community's floodplain management program. The test for exclusion for the first three areas is whether the community has authority to regulate these areas, and whether they are actually subject to development.

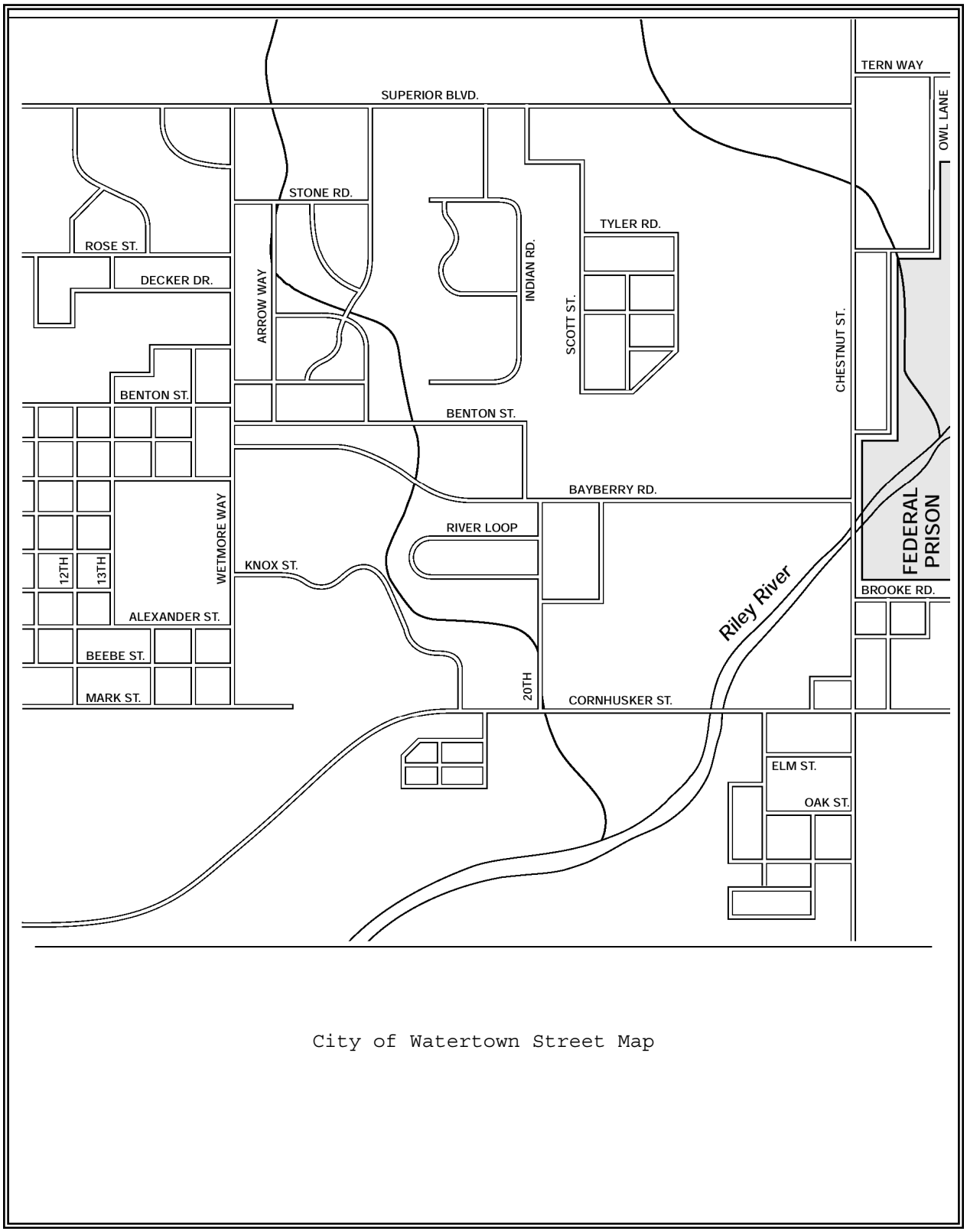
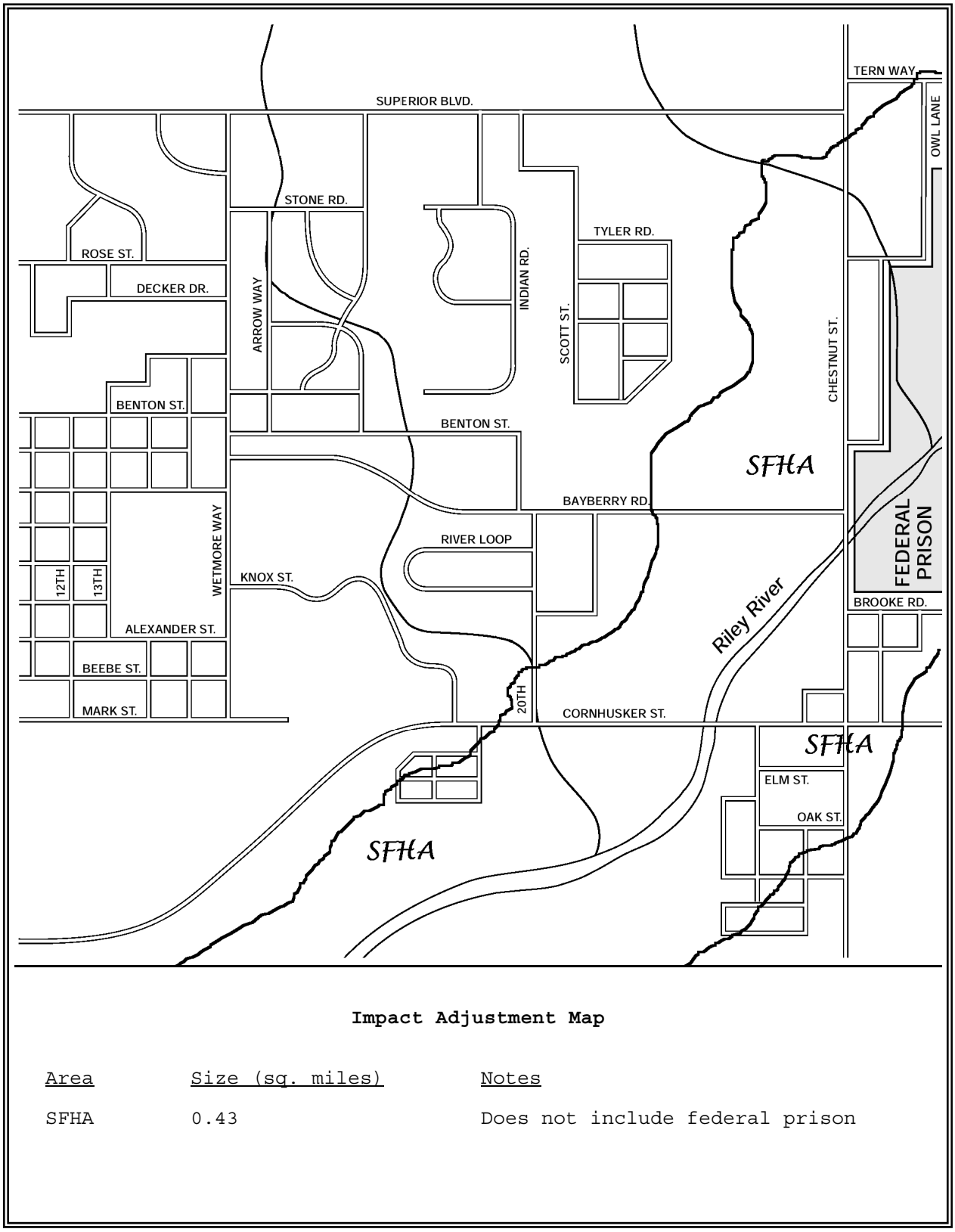


Figure 400-1. Watertown's base map.



Impact Adjustment Map

Area	Size (sq. miles)	Notes
SFHA	0.43	Does not include federal prison

Figure 400-2. Watertown's base map with an overlay.

Excluding water bodies and land over which the community has no regulatory control will generally increase the community's CRS credit because the denominator will be reduced. However, if a community can provide documentation that non-federal land over which it has no regulatory jurisdiction is eligible for CRS credit, it may include such areas.

> **Example 403.a-1.** North Shore's corporate limits extend one-half mile into Lake Michigan. Although a portion of this area is included in the SFHA shown on the FIRM, it is excluded from aRF on North Shore's Impact Adjustment Map (see Figure 400-3).

If these excluded areas are within the floodplains shown on the base maps, they should be identified with a distinctive shading or color. Otherwise, they should be excluded from the base map (see Figure 400-3). The following guidelines may help.

- To determine the extent of large water bodies, use the shoreline shown on the FIRM.
- For large rivers, designate reaches where the average width (bank to bank) shown on the FIRM exceeds 500 feet.
- Large areas of federal lands and Indian reservations are probably already shown on the FIRM as "Areas Not Included." If these areas have mapped SFHAs, and if they are larger than 10 acres, they must be excluded. Smaller parcels, such as post offices and federal office buildings, need not be excluded.
- In a few areas, federal regulations prohibit development. These may include coastal wetlands and lands leased from a federal agency. Because federal regulations allow development that meets certain criteria in upland wetlands and designated coastal barriers, these areas should not automatically be excluded from the regulatory floodplain.
- Land owned by the state, county, or other jurisdiction is probably exempt from the community's regulatory authority. These lands must be treated consistently. If they are included in the floodplain for open space credit, they must be included in the floodplain for all activities. If they are open space, the community will generally receive more credit if they are included. These areas are included in the area of regulation and the denominator only if the community can document that a regulatory standard is in force under the appropriate jurisdictional authority.

> **Example 403.a-2.** The corporate limits for the town of Riverpark include a state park with 120 acres in the SFHA shown on its FIRM. The town obtains a letter from the State Park Commission stating that the park will be maintained as open space. Riverpark includes the state park in its aRF.
>
> Without the park, aOS = 0, so rOS = 0 and c420 = 0.

With the park included in its aRF, aRF = 150, aOS = 120, rOS = 0.80, and c420 = 580 credit points. If Riverpark applies for credit in Activity 430 (Higher Regulatory Standards), that credit will be reduced, because the impact adjustment ratios for elements in that activity will be smaller (see Sections 432 and 632).

The Impact Adjustment Map for Activities 410, 420, 430, and/or 440 must show the areas affected by each element for which CRS credit is applied. Each area must be marked with the acronym for that element.

Example 403.a-3. OS is the acronym for open space preservation in Activity 420. Each area for which OS credit is requested must be designated on the Impact Adjustment Map (see Figure 400-3).

In some cases, a note on the map or in the legend may be simpler and clearer than shading. For example, if a community regulates all of its area of regulatory floodplain for freeboard (FRB), it could use the note "aFRB = aRF - aOS," since regulatory credit is not given for areas of open space (see Figure 400-3).

Example 403.a-4. North Shore excludes areas of Lake Michigan beyond the shoreline and places a note on its Impact Adjustment Map stating "Lake Michigan not included as floodplain" (see Figure 400-3).

All appropriate areas for numerators and denominators for impact adjustment ratios must be included in a legend on the Impact Adjustment Map.

b. If a community uses Option 1 or 3 as discussed in Sections 402.a and 402.c for Activity 450 (Stormwater Management), it must prepare a Stormwater Impact Adjustment Map that shows the area affected by its stormwater management program and the watersheds that affect the community. This map and the areas needed to develop it are discussed in Section 452.

Because Activity 450 (Stormwater Management) is adjusted according to watershed areas rather than floodplain areas, a separate Impact Adjustment Map is required. However, the requirement for this map is unrelated to the options a community uses for its other impact adjustment ratios. Instructions for preparing the map are in Section 452.

c. A community may use a different option for each element for which it requests credit under Activities 410, 420, 430, 440, and/or 450. If the community uses the default values in Option 2 for its application, but has prepared an Impact Adjustment Map(s) before the verification visit (see Section 232) that provides more credit for some or all of the elements, the higher credit will be used for the community's verified CRS classification.

Example 403.c-1. Floodville prepares its modification requesting credit for open space preservation. The CRS Coordinator does not have time to prepare the Impact Adjustment Map, so she uses Option 2: rOS = 0.05 (the default value in Section 422).

rOS = 0.05, and cOS = OS x rOS = 725 x 0.05 = 36.25

Before the verification visit, she prepares the Impact Adjustment Map (see Figure 420-1), showing the area of regulated floodplain (aRF) in Floodville and the area of open space preservation (aOS). She determines the areas using the techniques discussed in Section 404. She determines that aOS = 87.5 and aRF = 396, so using Option 3 gives:

$$rOS = \frac{aOS}{aRF} = \frac{87.5}{396} = 0.22, \text{ and } cOS = OS \times rOS = 725 \times 0.22 = 159.5$$

Floodville's initial default credit of 36.25 points in its modification is increased to 159.5 points for the requested credit.

404 Area Calculations

Determination of the size of areas for the Impact Adjustment Map(s) may be done by any method that yields reasonably accurate results. The community must document the method or methods used to determine the areas. The areas will be recalculated at each cycle verification if there are changes in the community, such as annexations or revisions to floodplain boundaries.

Any method that provides measurements of the areas affected may be used. The community should not spend an inordinate amount of time measuring areas solely for determination of CRS impact adjustment ratios. The following approaches are acceptable:

- Mechanical or computerized planimetry methods (including a geographic information system);
- Areas computed by HEC-2 or other standardized step-backwater methods;

- Known property dimensions, such as those for a city park; or
- Use of a grid overlay: a transparent grid is placed on the map, the grid squares within an area are counted, and the map scale is used to determine the actual area.

Rural communities may request help from the U.S. Natural Resources Conservation Service in preparing the Impact Adjustment Map and measuring the areas. Requests should be submitted to the local Soil and Water Conservation District, which is usually located in the county seat.

> All area calculations must use the same units, either acres or square miles.

Smaller communities will probably find it easier to measure in acres, while a larger community, such as a county, may prefer to use square miles. The following formulae may be helpful:

- To convert acres to square miles, divide the number of acres by 640.
- To convert square miles to acres, multiply the number of square miles by 640.
- To convert square feet to acres, divide the number of square feet by 43,560.
- To convert square feet to square miles, divide the number of square feet by 27,878,400 (that is, $5{,}280^2$).

Example 404-1.

$$32 \text{ acres} = \frac{32}{640} = 0.05 \text{ square miles}$$

2.2 square miles = 2.2 x 640 = 1,408 acres

2,500 feet x 3,600 feet = 9,000,000 square feet

$$\frac{9{,}000{,}000}{43{,}560} = 207 \text{ acres}$$

$$1{,}000 \text{ feet} \times 2{,}142.5 \text{ feet} = 2{,}142{,}500 \text{ square feet} = \frac{2{,}142{,}500}{27{,}878{,}400}$$

= 0.077 or 0.08 square miles

The following example discusses how the fictitious city of North Shore developed its Impact Adjustment Map for Activity 420 (Open Space Preservation). It shows how the community selects a base map and uses various methods to determine the areas affected by the activity.

Example 404-2. North Shore is a city on Lake Michigan subject to flooding from the Lake and from North Shore Channel. It is applying for credit under Activity 420 using Option 3 and an Impact Adjustment Map.

North Shore's FIRM is on four panels, so the city uses a street map prepared for the city by a commercial map firm in 1992. This map is current and shows the city parks, for which open space credit is requested (see Figure 400-3).

Using features on the base map, including street intersections and the Lake Michigan shoreline, the CRS Coordinator transfers the floodplains from the FIRM to the base map. The city does not regulate any areas outside the SFHA shown on its FIRM, so the SFHA (excluding Lake Michigan beyond the shoreline) is the area of regulated floodplain (aRF).

Next, the CRS Coordinator locates all open space within the floodplains. Only open space areas that meet the requirements of Section 421.a are designated on the Impact Adjustment Map. City parks are shown as shaded areas on the original base map. The CRS Coordinator has shown the other open space areas with crosshatching.

The CRS Coordinator uses a grid square overlay to calculate the area of regulated floodplain within the city. The base map is at a scale of 3,000 feet per inch. Using a grid with six squares to the inch, the side of each square is 3,000'/6 = 500'. 1 grid square = 500' squared = 250,000 square feet. There are 43,560 square feet to an acre, so the number of acres per grid square is 250,000 divided by 43,560 = 5.74 acres per grid square.

In 10 minutes, the CRS Coordinator counts 211 grid squares in the aRF.

$$\text{aRF} = 211 \text{ grid squares} \times \frac{5.74 \text{ acres}}{\text{grid square}} = 1{,}211 \text{ acres}$$

There is an area of open space that runs along North Shore Channel from the southern corporate limits to Central Park. This area was purchased and cleared by the City to be developed as a greenway. The grid overlay includes 37 grid squares within this area, so this portion of aOS = 37 x 5.74 = 212 acres.

North Shore's CRS Coordinator uses the city's parcel records to determine the amount of city parkland in the floodplain (in acres):

Sheridan Park	5.1
Gillison Park	74.6
Central Park	68.6
Centennial Park	46.0
	194.3

The Lakefront Golf Club is entirely in the floodplain. The parcel records show that it is 48 acres.

Lake Michigan University reports that 80 acres of its campus are athletic fields and woodland and will remain so. Approximately 2/3 of it is in the floodplain.
80 x 2/3 = 53 acres.

The open space areas on North Shore's Impact Adjustment Map are (in acres):

North Shore Channel Greenway lands	212.0
City parks	194.3
Lakefront Golf Club	48.0
Lake Michigan University	53.0
Total area of open space (aOS)	507.3

North Shore cannot use Option 1 for its impact adjustment because it does not have 100% of its floodplain as open space.

If North Shore uses Option 2, the impact adjustment ratio for open space, rOS, would be 0.05.

Using Option 3, $rOS = \frac{aOS}{aRF} = \frac{507.3}{1,211.0} = 0.42$

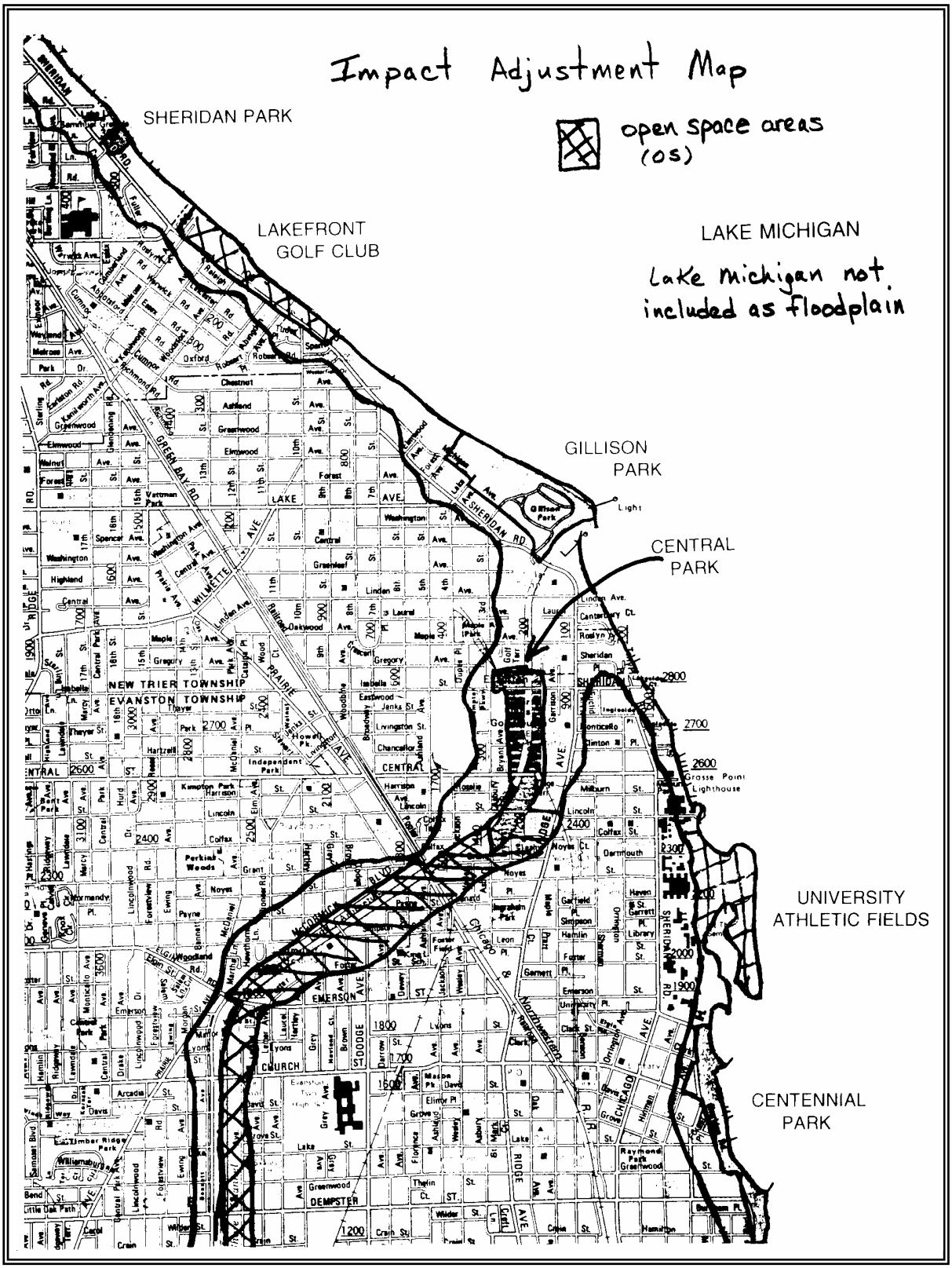


Figure 400-3. North Shore's Impact Adjustment Map.

410 ADDITIONAL FLOOD DATA

Summary of Activity 410

411 Credit Points. Additional flood data (AFD) credit is provided for portions of the floodplain that are mapped and managed to standards exceeding the minimum requirements of the National Flood Insurance Program (NFIP). Six elements make up AFD for a maximum of 1,346 points.

a. New study (NS): Up to 410 points are provided for new flood studies that produce base flood elevations or floodways, with additional credit for studying repetitive loss areas.

b. Leverage (LEV): The points for NS are multiplied by a ratio that reflects how much of the study was financed by non-FEMA funds.

c. Higher study standards (HSS): Up to 160 points are provided if the new study was done to one or more higher standards than the FEMA mapping criteria.

d. More restrictive floodway standard (FWS): Up to 200 points are provided based on the allowable floodway surcharge used in the study.

e. Additional flood data for special hazards (AFDSH): Up to 50 points are provided if the community maps and regulates areas of special flood-related hazards.

f. Cooperating Technical Partner (CTP): Up to 141 points are provided if the community, appropriate regional agency, or state has a signed, qualifying CTP agreement with FEMA.

412 Impact Adjustment. The credit points for each element are adjusted in one of three ways.

a. Under Option 1, if the standards apply throughout the Special Flood Hazard Area (SFHA), the impact adjustment ratio for an element is 1.0.

b. Under Option 2, if the standards do not apply throughout the SFHA, a default impact adjustment ratio of 0.25 may be used.

c. Under Option 3, the impact adjustment ratios may reflect the proportion of the SFHA affected by the element. The ratio may be as high as 1.5 if the community maps and regulates floodplains outside of the SFHA.

413 Credit Calculation. The credit points for each element are multiplied by the impact adjustment ratios and the products are totaled.

414 Credit Documentation. The community must have the following available to verify implementation of this activity.

a. The ordinance or law that adopts the map or standard.

b. A copy of the study or technique used, an explanation of the technique used, and a licensed engineer's statement that the study was based on a technique approved by FEMA, or documentation that the study or technique has been reviewed and accepted by FEMA.

c. [If applying for NS credit for independent review under Section 411.a] Documentation that the study or analysis technique has been reviewed and accepted.

d. [If applying for LEV credit under Section 411.b] Documentation of the non-FEMA share of the flood study.

e. [If the impact adjustment factors were based on Option 3 (412.c)] The Impact Adjustment Map.

f. [If the community is requesting credit for CTP2 under Section 411.f] Documentation of the relation between the study or standard and the CTP agreement.

g. [If the community has received credit for a new study (NS)] At the cycle verification visit, a certification by the community's engineer that the maps are still current.

415 For More Information.

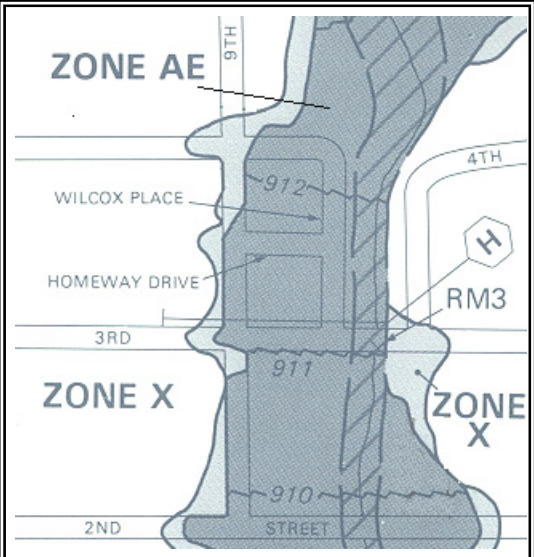
410 ADDITIONAL FLOOD DATA

Credit is provided for developing floodplain maps and flood data in areas where the Department of Homeland Security's Federal Emergency Management Agency (FEMA) did not provide such data.

Background: Regulation of new development depends on good floodplain mapping and related flood hazard data. Most communities in the National Flood Insurance Program (NFIP) have a Flood Insurance Rate Map (FIRM). Most FIRMs have detailed data for at least some of the communities' flood hazard areas. However, many communities still have flood problem areas where detailed data were not provided by FEMA with the FIRM. As a result, new development in those areas is often less well-protected from flood damage.

In other cases, communities have data not shown on their FIRM, desire to prepare new maps in unmapped areas, or want to replace older maps that no longer show the current flood hazard. This activity is designed to encourage these communities to prepare new maps and/or enter into cooperative mapping agreements with FEMA.

There are three types of areas shown on FIRMs: those with detailed mapping of the Special Flood Hazard Area (SFHA), those with approximate mapping of the SFHA, and those areas shown as being outside the SFHA. The primary difference between the first two is that detailed maps include the base flood elevations needed to set minimum protection levels for new buildings. In most riverine situations, NFIP detailed mapping also includes floodway delineations (Figure 410-1). In coastal areas, detailed mapping may include delineation of a velocity or VE Zone.



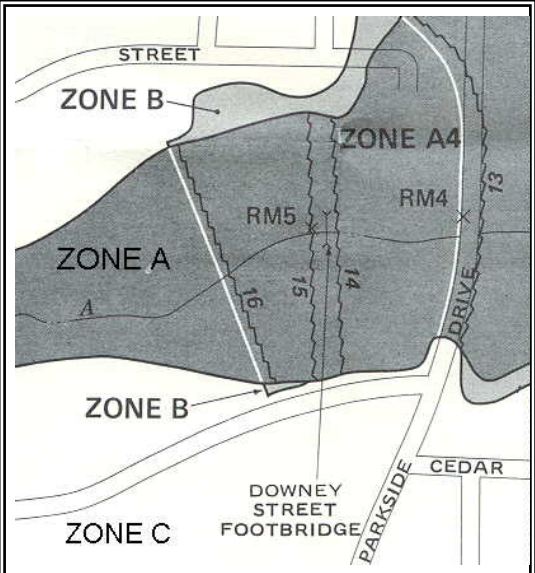
A FIRM with a detailed flood study shows the SFHA as Zone AE or VE. The map includes base flood elevations and a floodway (shown with the slanted lines). Areas outside the SFHA are designated Zone X.

Figure 410-1. FIRM terminology.

NFIP regulations for areas with approximate mapping, also known as "unnumbered A Zones" (44 *CFR* 60.3(b)), are not as effective in reducing flood damage as regulations for areas with detailed map data (Figure 410-2). Because no base flood elevations have been determined in areas with approximate mapping, many of the regulatory requirements are left to the judgment of community officials. Flood elevations are required only for large subdivisions or if a flood study has already been done. These areas are often on the urban fringe and therefore can be subject to development before the traditional Flood Insurance Study approach can provide the needed data.

Flood hazard areas that were not mapped as SFHAs during the preparation of the community's FIRM (i.e., B, C, D and X Zones) have no floodplain management requirements under the NFIP. Additional mapping may have been prepared by or for the community for several reasons:

- New delineations were necessary because conditions changed since the Flood Insurance Study was done;
- Development in a floodplain since the Flood Insurance Study warranted additional mapping or more accurate data;
- The community wanted to regulate areas that were not mapped by FEMA because they did not meet the NFIP mapping criteria (e.g., the drainage area was less than 1 square mile); or
- Areas that may or may not have been mapped as part of the Flood Insurance Study have hazards that were not adequately mapped (e.g., alluvial fans or areas subject to subsidence).



FIRMs do not provide base flood elevations in B, C, D, X and approximate or "unnumbered" A Zones. This CRS activity provides credit to encourage communities to obtain flood elevations in those areas and ensure that new development is protected from the base flood.

Figure 410-2. FIRM terms for areas without base flood elevations.

This activity's credit is for the adoption of new maps or floodplain data that are not provided under the normal activities of the NFIP. This activity does not credit or supplant the minimum requirement of the NFIP that a participating community is obligated to submit new or revised map information to FEMA when it becomes available.

Section 65.3 of chapter 44, *Code of Federal 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 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.

Activity Description: This activity provides credit for regulating areas based on flood data not provided with the community's FIRM or on a flood study conducted to a higher standard than FEMA's Flood Insurance Study criteria. Credit is also provided if the community shared in the cost of a Flood Insurance Study.

All higher-standard mapping receives credit, even if it is included in the community's FIRM. For example, many states require floodway regulations to be based on criteria more restrictive than the NFIP mapping standard. In those states, any Flood Insurance Study that meets the requirements of state law and the higher-standard mapping can be credited under this activity (Section 411.d).

Additional flood data (AFD) credit is provided for portions of the floodplain that are mapped and managed to higher standards than the NFIP minimum requirements. Each floodplain area that receives mapping credit is marked on an Impact Adjustment Map and designated "AFD1," "AFD2," etc.. This is explained more fully in Sections 403 and 412.

Example 411.1 Examples of areas that could be identified on the Impact Adjustment Map and marked "AFD1," "AFD2," etc. include the following.

- Unnumbered A or V Zones for which the community has base flood elevations and regulates new construction using those elevations.
- A riverine floodplain where FEMA did not define a floodway, but the community has mapped and adopted one.
- Unnumbered A or V Zones within which the community calculates or requires developers to calculate base flood elevations and/or floodways for their sites as a condition of permit approval.
- A floodplain in a B, C, D, or X Zone that the community has mapped and regulates using base flood elevations.
- Areas covered by studies that have been reviewed and approved by the state.
- A floodplain mapped on the FIRM with a technique that exceeds FEMA's guidelines, e.g., using future conditions hydrology.
- Any flood hazard data that are based on a technique that results in regulations more restrictive than FEMA's guidelines, e.g., a floodway based on a smaller surcharge than FEMA's 1-foot standard.
- A floodplain mapped on the FIRM, if the community helped pay for the mapping.
- An area for which additional flood mapping was done to account for one of the special flood hazards, such as migrating stream beds.

AFD is the sum of the credits for how the map was prepared. The credits points are based on:

- The scope of the new study (scored in Section 411.a, NS),
- The original FIRM zone where the new study was conducted (scored in Section 411.a, NS),
- Whether a riverine study included a floodway delineation or a coastal study included a velocity zone (scored in Section 411.b, HSS),
- Whether the study included the community's repetitive loss areas (scored in Section 411.a, NS),
- Whether the study received a quality control review (scored in Section 411.a, NS),
- How much of the study costs were leveraged by non-FEMA funding sources (scored in Section 411.b, LEV),
- Whether the study was conducted using study standards higher than FEMA's (scored in Section 411.c, HSS),
- The floodway mapping standard used (scored in Section 411.d, FWS),
- Whether the study mapped one of the special flood-related hazards, such as coastal erosion or subsidence (scored in Section 411.e, AFDSH),
- Whether the community or its state or a regional agency is a Cooperating Technical Partner (scored in Section 411.f, CTP), and
- How much of the community's SFHA is affected by the new study (scored in Section 412, the impact adjustment).

411 Credit Points

Maximum credit for Activity 410: 1,346 points

Prerequisites: There are four prerequisites for CRS credit for a new study.

1. The study must be based on a FEMA-approved technique or specifically approved by the FEMA Regional Office.
2. The community must use the new data in its floodplain development regulations.
3. If the study affects a length of stream or shoreline, it must be submitted to FEMA to revise the community's FIRM. This prerequisite does not apply to small scale studies.

4. At each cycle verification, the community must certify whether its regulatory floodplain maps and related data still reflect current conditions.

The four prerequisites ensure that the CRS credits studies that are properly prepared and are used in the community's regulatory program.

1. The technique used in the study or the ordinance language must meet the minimum standards explained in *Guidelines and Specifications for Flood Hazard Mapping Partners*. If a study technique is not listed as an acceptable one in *Guidelines and Specifications*, it must be submitted to and approved by the FEMA Regional Office.

2. A study that sits on a shelf has no impact on floodplain development and is not credited. The CRS does not credit studies conducted for drainage improvements or the design of a flood control project if they are not also used for regulatory purposes.

   The community's floodplain regulations must either be amended to adopt the new study or authorize a local official, such as the community's engineer, to approve new base flood elevations, floodways and velocity zones in unstudied areas. If the latter, there must be a record showing that the new study has been approved by the official. Section 414.a has sample regulatory language.

3. If the study affects a length of stream or shoreline, it must be submitted to FEMA to revise the community's FIRM. This prerequisite is not met if FEMA denies the request because the study was not prepared in accordance with FEMA mapping standards. However, the prerequisite is met even if FEMA does not immediately publish the map revision, as long as it does not deny the request.

   The prerequisite does not apply to studies done for a single site at the time of development and similar small-scale studies, such as bridge computations. However, studies that would revise existing base flood elevations, floodways, or FIRM zone boundaries must be submitted for a FIRM revision.

4. At each cycle verification, the community must conduct an assessment of its regulatory floodplain maps. This is done to help determine if the community would benefit from a revised or updated map that reflects current conditions or better data. This is explained in more detail in Section 414.g.

a. New study (NS) (Maximum credit: 410 points)

Study scope	Original FIRM Zone					
	B, C, D, or X		A or V		AE, VE, A#	
	Without review	With review	Without review	With review	Without review	With review
1. Delineation of an approximate A Zone	50	–	25	–	–	–
2. Flood elevations for a site at time of development	100	150	75	115	–	–
3. New profile or length of shoreline, base flood elevations/depths in AH and AO zones.	200	300	150	225	125	190
4. New profile with floodway, length of shoreline with coastal velocity zone delineation, or converting coastal A Zones to V Zones	240	360	180	270	150	225
5. If the study includes new data for repetitive loss area(s) (add to the score for 1–4)	50	50	25	25	25	25

For each type of FIRM zone, the credit varies according to four main factors: the study scope, the previous FIRM zone, including repetitive loss areas, and whether the study received an independent review.

Study scope: The first column identifies how detailed the study effort is. As noted by the other columns, the points depend on the FIRM zone in effect before the study was adopted.

1. As shown in line 1, the lowest value for NS is for delineating an approximate A or V Zone in a B, C, D, or X Zone. This would designate an SFHA where the FIRM does not show one. For approximate A and V Zones, base flood elevations are not provided. Credit is also provided if an approximate A or V Zone is remapped without the publication of base flood elevations.

2. Between 75 and 200 points are provided if the community ensures that flood elevations are obtained for a single site at the time of development. Many floodplains without base flood elevations have low development potential and do not warrant extensive detailed studies. Many communities regulate these areas by requiring developers to calculate a flood elevation for the site at the time of application for a development permit.

   This credit is based upon the regulatory requirement. If the appropriate language is in the community's ordinance, the credit is provided, even if the areas have not yet been studied. What counts is that a regulatory flood elevation will be provided before the areas are developed.

   Sometimes the calculations are done by the community or another agency. In some cases the community has the developer provide some data, such as a topographical survey, and

then a municipal engineer or other person calculates the base flood elevation for the site. These are creditable approaches. It does not matter who does the work as long as a regulatory flood elevation is available in time to have new buildings protected to or above the base flood elevation.

There is no credit for meeting the minimum NFIP requirements to ". . . obtain, review and reasonably utilize available data . . ." or that developers of subdivisions larger than 5 acres or 50 lots provide flood elevation data. These are minimum requirements of the NFIP (44 *CFR* 60.3(b)(3) and (4)). To receive this credit for NS, the ordinance must require the data for all applications for development permits to build or substantially improve buildings in the regulated floodplain.

3. More points are obtained if the elevations are provided for a large area in advance of development. This would be in the form of a profile prepared for a relatively long reach of a stream, elevations for a length of shoreline, depths for AO Zones, and elevations for AH Zones. For this credit, the area is studied before an application for a development permit and the study covers a larger area.

   To receive this higher credit, the community must adopt the study and regulate development to the same standards as in an SFHA for which FEMA provided base flood elevations (e.g., as if the area were an AE or VE Zone, or A, V, or AO Numbered Zone).

4. There is a 20% increase in the credit for a profile if the study includes a delineation of a floodway. If the floodway delineation is based on a higher standard than the NFIP's 1 foot allowable surcharge, then additional credit is provided in Section 411.d. There is also a 20% increase in credit if a coastal study includes a coastal high hazard area, similar to a V Zone.

5. As shown in line 4, the score for NS is increased by an additional 50 or 25 points if the study covers one or more of the community's repetitive loss areas. Repetitive loss areas are discussed in Section 503. If the FIRM showed a repetitive loss area as an X Zone and the community maps the area, provides a profile, and regulates it to the same standards as it applies to its SFHA, the score would be 200 points (without review). Because the area has repetitive loss properties, the score would be increased by 50 points, for a total NS score of 250.

Independent review: The "with review" and "without review" columns reflect whether the study was given an independent quality assurance review. There are two types of reviews that would qualify:

- A review by a state or regional organization whose review program has been designated as qualifying for CRS credit by the FEMA Regional Office. Note that the existence of an approved review program does not mean the community will automatically receive this credit. Each study credited must have been reviewed and approved by the review program. There may be studies conducted before the program began and there may be some types of studies that the state or regional agency does not review.

To obtain credit if elevations are provided for a single site at the time of development, either each study must be reviewed and approved or the study TECHNIQUE must have been reviewed and approved.

- An independent quality assurance/quality control review as specified in activity numbers 5, 7, 9, 11, 13A, and 14B in the Cooperating Technical Partners' Mapping Activity Statement.

There are five quality assurance/quality control reviews: topographic data, hydrologic analysis, hydraulic analysis, mapping, and DFIRM production. As shown in the table earlier in this section, the credit for a study that has passed all of these reviews is 50% more than the credit for a study without such a review. If only part of the study process was reviewed (e.g., the state review only approves the hydrology), the increase in credit is prorated.

Example 411.a-1. (See Figure 410-3.) Floodville has a recurring flood problem from a small ditch that was not mapped as SFHA on its FIRM. The City paid a consulting firm to prepare a new detailed study for this ditch as part of a plan to reduce flooding in this area. The study showed a floodplain one to two blocks wide in an area delineated as Zone C in the FIRM. It also included a floodway delineation.

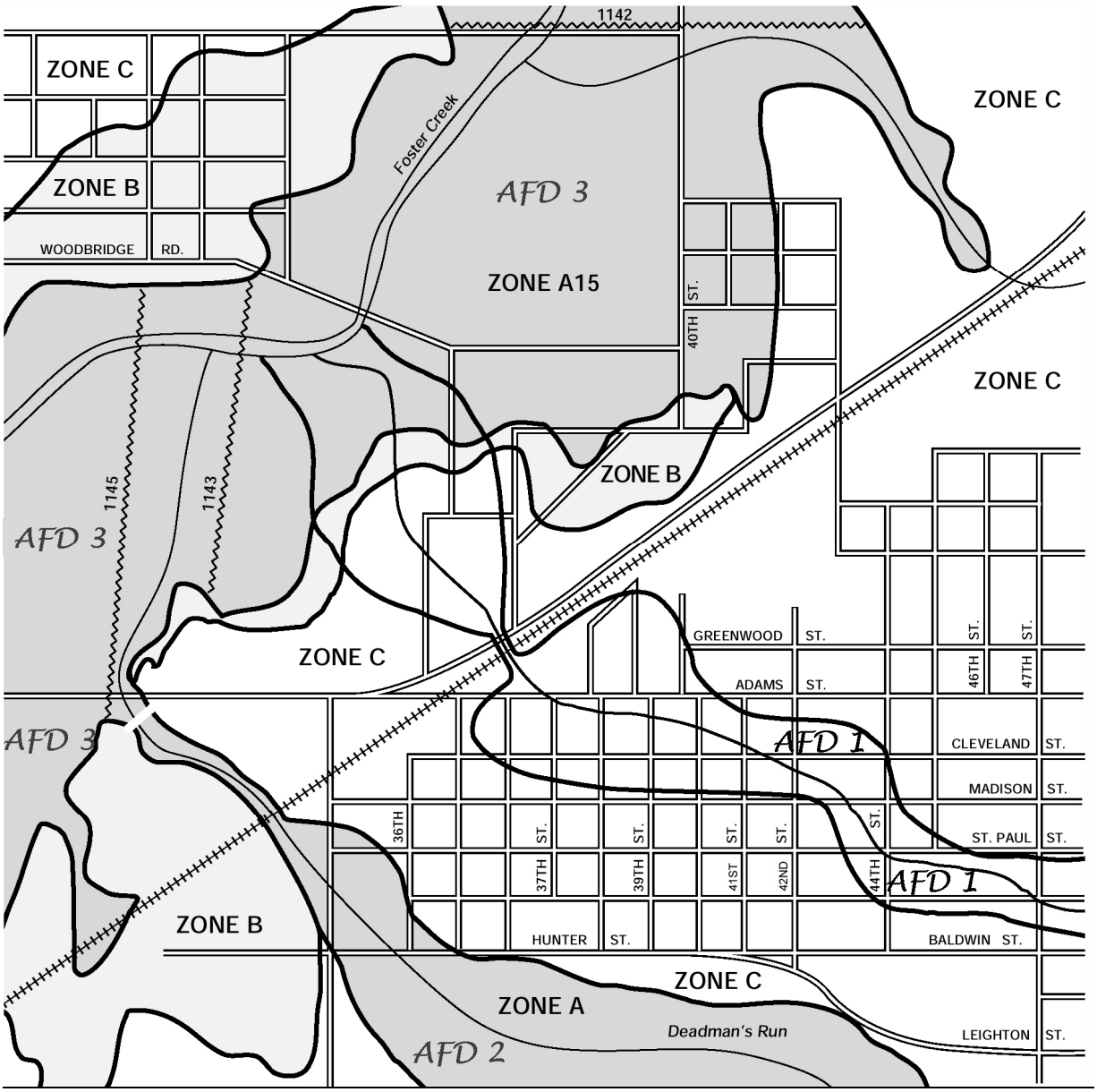
The City adopted this area as a regulatory floodplain, and its floodplain management ordinance requires that new buildings be protected to the new regulatory flood elevation. The City submitted the study to FEMA with a request that the FIRM be revised to include it as an AE Zone with a floodway.

This area is designated as AFD1 on the Impact Adjustment Map. Because a relatively long reach of the stream was studied to produce base flood elevations and a floodway, the credit is based on line 4. The original FIRM Zone was "C" and there was no separate review, so the study warrants 240 points.

Because this area is also one of Floodville's repetitive loss areas (see Figure 500-2), the study warrants 50 more points. NS1 = 290.

Floodville also has an unnumbered A Zone mapped for Deadman's Run. Because this area has few buildings in it and because there is no development expected, the City decided not to finance a detailed study. Instead, its floodplain management ordinance requires that an applicant for a development permit in the Deadman's Run A Zone determine a base flood elevation for the proposed development site. The applicant's calculations are reviewed by the City Engineer for consistency with other elevations that have been calculated for the stream.

This area is designated AFD2 on the Impact Adjustment Map. The base flood elevations are provided at the time of development, so line 2 is used. The original FIRM Zone is "A." The City Engineer's review does not qualify as a separate review by an independent agency. NS2 =75.



Impact Adjustment Map

Area	Size (acres)	Notes
aAFD1	71	Newly mapped problem ditch (C Zone)
aAFD2	58	Deadman's Run floodplain (A Zone)
aAFD3	267	Foster Creek floodplain (A15 Zone)
aSFHA	325	Deadman's Run and Foster Creek floodplains

Figure 410-3. Floodville's additional flood data Impact Adjustment Map.

Example 411.a-2. (See Figure 410-4) Watertown's Engineering Department conducts a site-specific analysis for any development within 100 feet of any open channel with a drainage area larger than 40 acres (line 2). In order to calculate the impact adjustment, the area affected must be drawn on the Impact Adjustment Map. The community locates all open channels that drain 40 acres or more and designates them as "AFD1" on its Impact Adjustment Map (see Figure 410-4). The channels are in the X Zone and there is no separate review, so NS1 = 100.

Because the Riley River map was prepared as part of the original FEMA-funded Flood Insurance Study, that area does not qualify for credit. However, the City has signed a Cooperating Technical Partner agreement with FEMA to restudy the river. The City will receive NS credit when the new study is completed and adopted in its floodplain management regulations.

FEMA recognizes the benefits of new studies done with better techniques or based on better data, and will revise FIRMs to reflect them. The NFIP also provides a flood insurance benefit when the new maps are published.

There are two types of flood insurance benefits when a new study results in a revision to a FIRM:

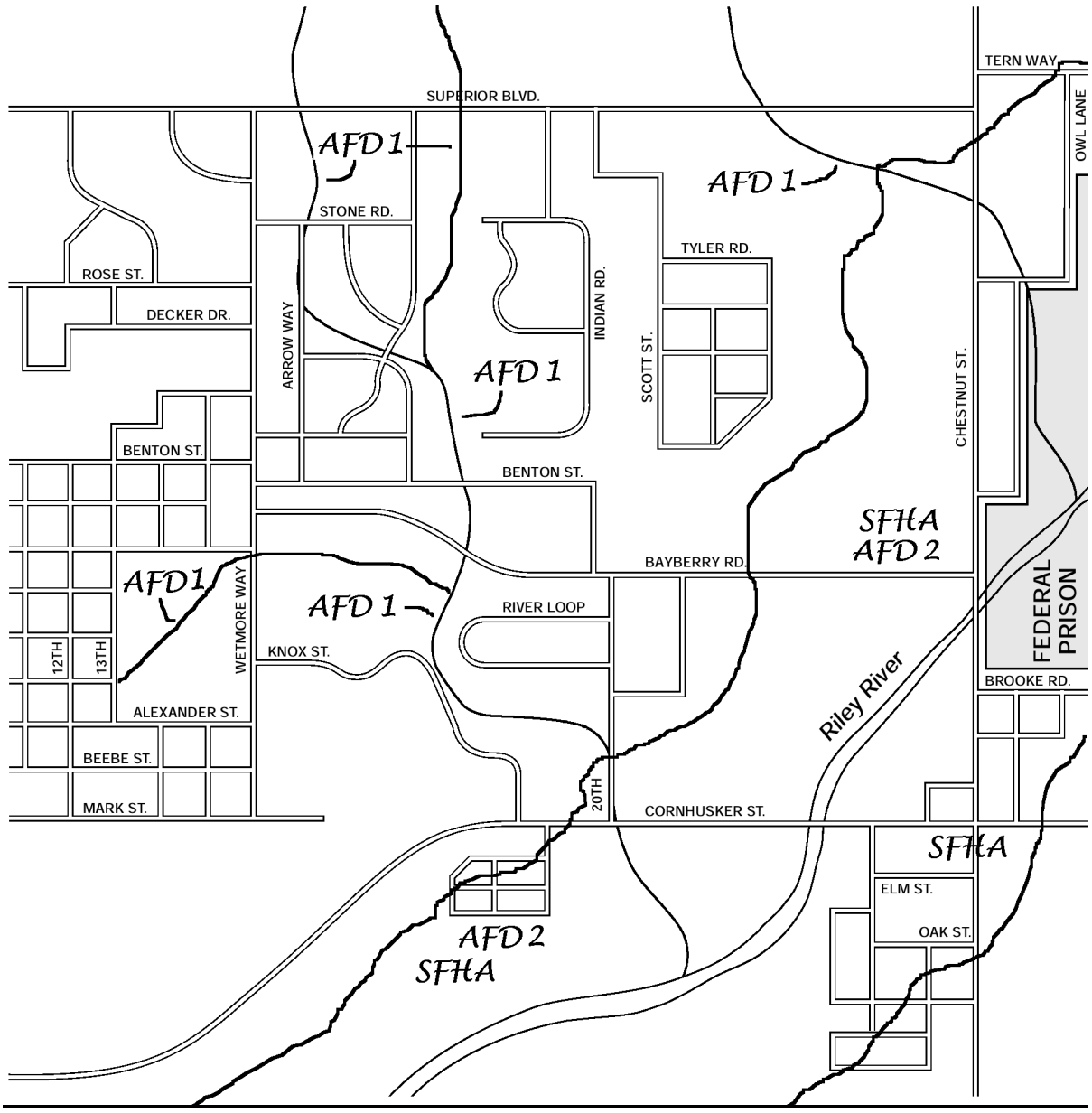
1. If the new study lowers the base flood elevations of the existing study, the affected properties still in the SFHA can receive lower actuarial premium rates. Properties that are remapped into the X Zone can obtain the less-expensive X Zone rates and Preferred Risk Policies. Those properties are also relieved of the requirement to purchase flood insurance as a condition of federally-backed financial assistance.

2. If the new study raises the base flood elevation (or provides a base flood elevation in a B, C, D, X, or approximate A Zone where there was no elevation), the community can receive a reduction in flood insurance premiums through the CRS.

In order to prevent the duplication of the two types of flood insurance benefits for new flood studies, CRS credit for new studies (NS) is limited to:

1. Studies that produce a base flood elevation in a B, C, D, X or approximate A Zone where there was no elevation shown on the FIRM.

2. Studies in AE and VE Zones and A and V Numbered Zones that result in base flood elevations higher than those shown on the existing FIRM.



Impact Adjustment Map

Area	Size (sq. miles)	Notes
SFHA	0.43	Does not include federal prison
aAFD1	0.09	Non-SFHA channels that drain > 40 acres
aAFD2	0.43	Riley River floodplain (same as SFHA)

Figure 410-4. Watertown's additional flood data Impact Adjustment Map.

If a site-specific or local study is conducted for an area shown on the FIRM as a numbered A or V Zone or AE or VE Zone, then the only way to receive Community Rating System (CRS) credit for a new study is if the base flood elevation is raised. If it is lowered, the map revision will mean a reduction in the size of the SFHA and lower flood elevations. The map revision will reduce flood insurance premiums more than a CRS classification. The CRS does not provide additional or duplicate credit.

There may be cases where a new profile is higher than the old base flood elevations in some areas and lower in other areas. In such cases, the reaches that qualify for credit must be identified on the impact adjustment map and scored accordingly. The reaches with new base flood elevations that are lower than the old elevations are not credited under NS.

If a new detailed study resulted in a floodplain larger than the previously mapped SFHA, then the community should mark the new floodplain as "AFD1" and "AFD2." AFD1 would be coterminous with the FIRM's SFHA. AFD2 would be the area outside the SFHA where base flood elevations are used to regulate development in B, C, D, or X Zones. The points for NS2 will be higher than for NS1.

b. Leverage (LEV) (Range: from 0 to 1.0)

1. If the community has data on the study costs:

$$\text{LEV} = \frac{\text{Non-FEMA share of the study cost}}{\text{Total cost of the study}}$$

2. If the community does not have financial data on the study costs, then LEV = the total of the following:

(a) 0.25, if a better topographic map was contributed to the study effort,

(b) 0.15, if other contributions were made to the study effort.

LEV is a ratio with a range of 0 to 1.0. If the study was financed entirely by non-FEMA resources, LEV = 1.0. Non-FEMA resources include the community, the state, a regional agency, the property owner, a developer, the Corps of Engineers, the Natural Resources Conservation Service, and any other agency or organization other than FEMA or a FEMA-funded program.

If the study was fully funded by FEMA, then LEV = 0. Communities do not receive NS or LEV credit for Flood Insurance Studies and FIRMs that are fully funded by FEMA.

If the community is a Cooperating Technical Partner, there should be readily available figures on how much the study cost and the amounts paid by FEMA, the community, and other involved agencies. If the Cooperating Technical Partner agreement is for the community to contribute 20% of the cost of a new study, then LEV = 0.2.

If the community, state, or other agency made an in-kind contribution, such as staff time or base maps, it can be converted to a dollar value on the Cooperating Technical Partner Mapping Activity Statement using FEMA "Blue Book" values. If the effort cannot be converted to dollars, then LEV = 0.25 or 0.15, according to the formula. If the dollar value results in a ratio lower than 0.25 or 0.15, then the higher figure can be used.

Flood Insurance Studies or restudies cost shared with a state agency, the U.S. Army Corps of Engineers, the Tennessee Valley Authority, the Natural Resources Conservation Service, or other federal agency are credited PROVIDED that the agency was not paid by FEMA for the work. Many studies are conducted by a state or federal agency under contract to FEMA or under the Limited Map Maintenance Program. In these instances, no LEV or NS credit is given.

Generally, if the additional flood data can be found in the original Flood Insurance Study, then FEMA paid the full cost, and LEV = 0. In some areas, the community, state, or regional district helped fund the study or paid for better topographic base mapping that was then included in the Flood Insurance Study. In these cases, the community must document its contribution. Often, the community's contribution is mentioned in the Flood Insurance Study text and a copy of the appropriate page is sufficient.

Example 411.c-1. Floodville paid all of the costs for its study of the problem ditch in the C Zone, AFD1. LEV1 = 1.0. Developers pay for calculating base flood elevations in the A Zone along Deadman's Creek, AFD2. LEV2 = 1.0.

Example 411.c-2. Watertown's Engineering Department analyses are funded by the City. LEV1 = 1.0.

Watertown signed a Cooperating Technical Partner agreement with FEMA to restudy the Riley River. The agreement has the City funding $50,000 toward the study and contributing its GIS contour map. These contributions are calculated to equal $150,000. The total cost of the study is $250,000.

$$\text{LEV2} = \frac{\$150{,}000}{\$250{,}000} = 0.6$$

Watertown's efforts equate to 60% of the cost of the Riley River restudy. In Section 413, the values for NS for this study are multiplied by 0.6, resulting in 60% of the credit for those elements. Note that Watertown will not receive this credit for the restudy until it is completed and adopted in the City's floodplain management regulations.

c. Higher study standard (HSS) (Maximum credit: 160 points)
HSS credit is provided for the following higher study standards:

- Using future conditions hydrology,
- Using a higher confidence limit when calculating the 100-year discharge, and
- Using better topographic data.

Additional higher study standards may be submitted by the community. FEMA will determine if they warrant credit for HSS.

The credit points are cumulative for each study, not to exceed the maximum listed.

Study scope	Original FIRM Zone			Max per Study
	B, C, D, or X	A or V	AE, VE, A#, V#	
1. Delineation of an approximate A Zone	20	10	–	40
2. Flood elevations for a site at time of development	40	30	–	80
3. New profile or length of shoreline	80	60	50	160

The points for HSS are cumulative. For example, a new profile (line 3) in an X Zone that used future conditions hydrology and better topographic data would receive 80 + 80 = 160 points for HSS. If the study also used a higher confidence limit when calculating the 100-year discharge, the total for HSS (80 + 80 + 80) would exceed the maximum allowed per study and the score would be capped at 160. This is added to the NS score in Section 413, Credit Calculation.

A community may receive credit for HSS in areas where it does not receive credit for NS. For example, credit can be provided if the FIRM (or a later map adopted for regulatory purposes) was based on future conditions hydrology, provided the community's floodplain development regulations use base flood elevations based on future conditions.

Some background on the listed higher standards.

- Using future conditions hydrology: Future-conditions hydrology means that flood discharges associated with projected land use conditions are based on a community's zoning maps and/or comprehensive land use plans and without consideration of projected future construction of flood detention structures or projected future hydraulic modifications within a stream or other waterway, such as bridge and culvert construction, fill, and excavation. When the hydrologic study is based on future land use conditions, discharges will be higher than those from a study based on current development conditions.

If a long-range plan is used, its target date must still be at least five years away. For example a study done in 1985 based on land use in the year 2010 will not receive credit after 2005. However, if the hydrology was based on a fully developed watershed, there is no expiration of the credit.

- Using a higher confidence limit when calculating the 100-year discharge: Hydrology studies produce "estimates" of peak flows. The estimates used are the "best" estimates, which means that they are high 50% of the time and low 50% of the time. Using a higher confidence interval means that the estimates are too high more often and too low less often. For example, a 90% confidence limit means that the quantity of flow used to map a floodplain will be too high 90% of the time and too low 10% of the time. The result is a more dependable estimate of the 100-year flow.

- Using better topographic data: This credit is for using a base map that has topographic data better than what is available from the U.S. Geological Survey. Either:
  - The map has contour intervals smaller than what is available from the U.S. Geological Survey's digital orthophoto quarter quads (DOQQs), or
  - In those areas where there are no DOQQs, the credit is provided if the contour interval is smaller than that on the area's USGS quadrangle maps.

Example 411.b-1. Because Floodville expects that a large proportion of its drainage areas will be urbanized, its problem ditch study (AFD1) used a base flood discharge based on full watershed development (future conditions hydrology). AFD1 credit is based on line 3 and the original FIRM Zone was "C." (HSS1 = 80 points).

The City's floodplain management ordinance requires developers on Deadman's Run (AFD2) to use future conditions hydrology. AFD2 credit is based on line 2 and the original FIRM Zone was "A." (HSS2 = 40 points).

Example 411.b-2. Watertown's site-specific analyses do not include any higher study standards. HSS1 = 0.

d. More restrictive floodway standard (FWS) (Maximum credit: 200 points)

FWS credit is based on the allowable floodway surcharge used to prepare the floodway map. The community or the state must document that a state or local law sets a maximum allowable surcharge.

1. FWS = 200, if the floodway delineation was based on no allowable rise in the flood elevation,

2. FWS = 150, if the allowable rise was from 0.01 to 0.2 feet,

3. FWS = 100, if the allowable rise was from 0.21 to 0.5 feet, or

4. FWS = 50, if the allowable rise was from 0.51 to 0.99 feet.

Figure 410-5 shows the standard approach to mapping a floodway. If the floodway was based on the FEMA surcharge standard of 1.0 foot, then there is no credit for this element. If a floodway map is based on some other standard (such as a limitation on velocity or a change in velocity) to determine more restrictive floodways, the community must determine the actual reduction in floodway surcharge that results. Since floodway analysis is almost always performed by the step-backwater method, the data provided for each cross section should be used to determine the actual average floodway surcharge.

Many times a floodway study prepared according to the minimum NFIP guidelines produces a floodway surcharge of less than 1 foot at some cross sections. The fact that the average floodway surcharge is less than 1 foot does not qualify the community for FWS credit. The floodway surcharge must be reduced by a mapping standard that can be documented by the community.

Example 411.c-1. Floodville's state law requires that all floodway delineations be based on a 0.5-foot allowable floodway surcharge. In areas with floodways delineated according to this standard, FWS = 100.

This standard was used in the study for the problem ditch (AFD1): FWS1 = 100. There is no floodway study required for the site-specific analyses on Deadman's Run (AFD2): FWS2 = 0.

On Foster Creek the City uses the floodway provided with the Flood Insurance Study. That floodway was based on the state's 0.5-foot surcharge standard. Because state law required that it be prepared to a higher standard than that specified in *Guidelines and Specifications for Flood Hazard Mapping Partners,* the Foster Creek floodway can be credited. The area affected is the A15 Zone, which is designated as AFD3. Therefore, FWS3 = 100.

NOTE: *Credit for FWS should not be confused with the minimum NFIP requirement that new development in the floodway may not result in any increase in flood heights. The FWS credit is for using a more restrictive standard to delineate the floodway.*

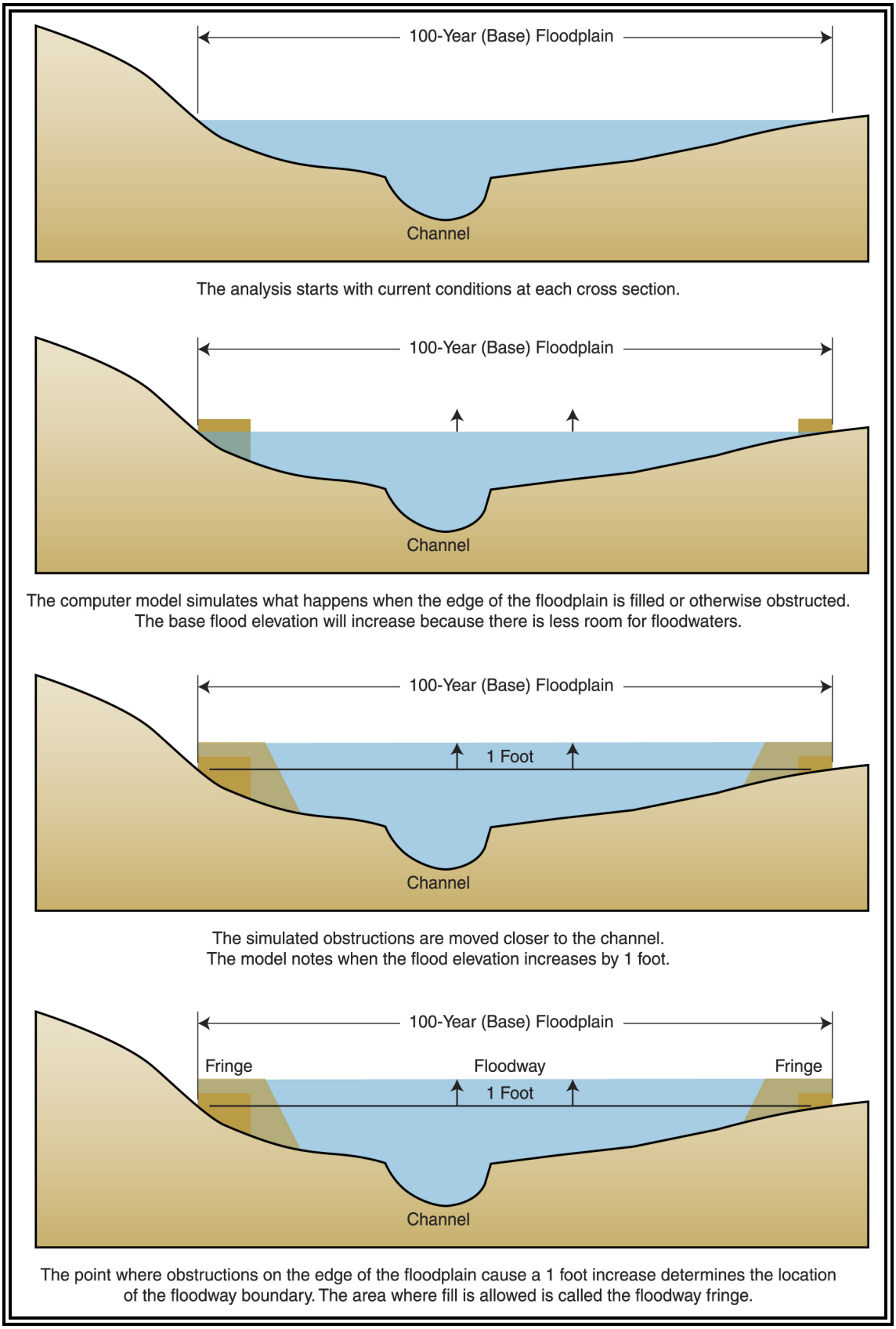


Figure 410-5. Standard approach to floodway delineation.

Example 411.c-2. (See Figure 410-4.) When Watertown's Engineering Department conducts site-specific analyses to calculate base flood elevations for permit applicants in certain areas outside the SFHA (AFD1), it also conducts an encroachment study to see if the applicant's project will increase flood heights . A 0.1-foot surcharge is required by state law. This standard is used for these studies: FWS1 = 150.

Watertown designates the floodplain on the Riley River as AFD2. Watertown's Flood Insurance Study on the Riley River used the state standard: FWS2 = 150.

e. Additional flood data for special hazards (AFDSH): (Maximum credit: 50 points)

Credit for mapping areas of special flood-related hazards is described in separate CRS publications on special hazards.

If a community is applying for credit for mapping and regulating any of the special flood-related hazards, described in Section 401, it should turn now to the appropriate publications that are listed in Section 415.b. The credit points for mapping these areas are calculated separately. The resulting credit points, AFDSH, are then transferred to this activity.

f. Cooperating Technical Partner (CTP) (Maximum credit: 141 points)

(1) CTP1 = the total of the following

10, if the community is a Cooperating Technical Partner. The community must have signed a Cooperating Technical Partner agreement with FEMA.

10, if the community is in a regional agency OR state that has signed a Cooperating Technical Partner agreement with FEMA. This credit is provided only for Cooperating Technical Partner agreements that relate to new studies or study standards. No credit is provided for agreements that only provide information on existing studies and data.

Cooperating Technical Partners are communities, regional agencies, or states that have the interest and capability to be active partners in FEMA's flood mapping program. Regional agencies that would qualify are those that are active in floodplain mapping, such as regional drainage or sanitary districts. They may also include county agencies active in preparing maps for both unincorporated and municipal floodplains.

Cooperating Technical Partners enter into an agreement that formalizes their contribution and commitment to flood mapping. The objective of the program is to maximize limited funding by combining resources and to help maintain consistent national standards.

Each Cooperating Technical Partner enters into an agreement with FEMA, specifying what mapping activities it will implement. These could be as varied as:

- Refinement of approximate Zone A boundaries,
- Hydrologic and hydraulic modeling and floodplain mapping,
- DFIRM preparation and maintenance,
- Redelineation of detailed flood hazard information using updated topographic data,
- Digital base map data sharing,
- Hydrologic and hydraulic review of requests for map revision, or
- Adoption of specific technical standards or processes appropriate for local conditions.

(2) CTP2 =

1.1, if the study or standard was prepared pursuant to the Cooperating Technical Partner program. This provides a 1.1 multiplier that increases the additional flood data credit by 10%.

1.0, if the study or standard was not prepared pursuant to the Cooperating Technical Partner program or if it was prepared before the community, regional agency, or state signed the Cooperating Technical Partner agreement. The multiplier of 1.0 means that the credit points are not changed.

CTP1 provides credit for participating in the Cooperating Technical Partners program. When the program produces new studies or revises mapping standards, the community should receive credit under the other elements of Activity 410.

CTP2 increases the credit received under Activity 410 by 10% to recognize the extra benefits of the Cooperating Technical Partner program. CTP2 is a multiplier of the total score for each study or standard (AFD). If the study or standard was not done pursuant to a Cooperating Technical Partner agreement, then the score is multiplied by 1.0 and does not change.

Example 411.f-1. Watertown signed a Cooperating Technical Partner agreement with FEMA to restudy the Riley River. The state NFIP coordinating agency also signed a Cooperating Technical Partner agreement to review flood studies and provide other mapping support services.

CTP1 = 10 + 10 = 20

Watertown can receive CTP1 credit now. After the restudy for the Riley River is completed and adopted in the City's floodplain management regulations, CTP2 will = 1.1. Watertown's score for the restudy will then receive a 10% credit bonus.

412 Impact Adjustment

a. Option 1:

rAFD: If the standards in the area of AFD apply throughout the SFHA as shown on the community's FIRM, rAFD = 1.0.

Under Option 1, only one set of standards may be credited for AFD.

This option for rAFD can be used only if ALL of the area in the community's SFHA is under the standards of AFD. This would be the case, for example, if all of a community's SFHA is a numbered A Zone with a higher floodway standard. However, if part of the community's SFHA is unnumbered A Zone or coastal, this option cannot be used. If the community regulates areas outside its SFHA, it may get more credit by using Option 3.

Example 412.a-1. Singletown is affected by only one source of flooding: Single Creek. The Flood Insurance Study for Single Creek used the state's standard of a 0.1-foot floodway surcharge. Because the Single Creek floodplain covers the entire SFHA, Singletown uses Option 1: rAFD = 1.0.

b. Option 2:

rAFD: If a single set of standards for AFD does not apply throughout the SFHA, the community may use an impact adjustment of rAFD = 0.25. If there is more than one set of standards for AFD, the community should choose the area with the highest value for AFD when using Option 2.

A community may opt to use the default value of 0.25 for rAFD if it does not want to take the time to prepare an Impact Adjustment Map or if it estimates that it would receive more points by using the minimum value of Option 2.

c. Option 3:

rAFDi: The size of the area to which the standards of AFDi apply (aAFDi) must be determined in order to adjust the credit points to reflect its impact. This impact is the ratio of aAFD to the area of SFHA (aSFHA).

$$rAFDi = \frac{aAFDi}{aSFHA}$$

The maximum value for $\sum rAFDi = 1.5$.

All areas must be mutually exclusive.

Because all of a floodplain benefits from a more restrictive floodway surcharge, aFWS includes the entire width of that reach of the floodplain, not just the area of the floodway.

The Impact Adjustment Map is explained in Section 403. If there is more than one area, each done to a different standard, each area is marked separately, i.e., AFD1, AFD2, etc. If several areas were mapped or studied to identical standards, they are marked with the same acronym and number (see Figures 410-3 and 410-4).

The area of the SFHA (aSFHA) is the same for all instances of AFD. It is calculated based on the SFHA of the FIRM being revised by the newly adopted data. However, if a map revision reduces the size of the SFHA, the area calculations may be based on the new area (which will be to the community's benefit, because it increases the value of rAFD).

ΣrAFDi stands for the sum of all of the impact adjustment ratios for AFD (i.e., rAFD1 + rAFD2 + rAFD3 + . . .). The sum of all rAFDi cannot be greater than 1.5. In this activity, an impact adjustment ratio greater than 1.0 reflects the fact that the community is regulating floodplain development in areas not identified on the FIRM. It is presumed that this will provide significant savings in future flood damage and NFIP claims, so the impact adjustment ratio for this activity may go up to 1.5.

NOTE: *All areas marked AFDi must be mutually exclusive. If the community does not regulate outside of the SFHA, then ΣrAFDi cannot be greater than 1.0.*

Example 412.c-1. In Floodville, the floodplain for the unnamed ditch is marked as AFD1 on the city's Impact Adjustment Map shown in Figure 410-3. The Deadman's Run A Zone is marked AFD2, and the Foster Creek floodplain is marked AFD3. Floodville's CRS Coordinator uses the grid square overlay method to determine the areas affected. He estimates these areas in acres:

aAFD1 = 71 aAFD2 = 58 aAFD3 = 267

aSFHA = 58 + 267 = 325

$$rAFD1 = \frac{aAFD1}{aSFHA} = \frac{71}{325} = 0.22$$

$$rAFD2 = \frac{aAFD2}{aSFHA} = \frac{58}{325} = 0.18$$

$$rAFD3 = \frac{aAFD3}{aSFHA} = \frac{267}{325} = 0.82$$

$\Sigma rAFDi = 0.22 + 0.18 + 0.82 = 1.22$, so $\Sigma rAFDi \leq 1.5$.

Note that on Figure 410-3, AFD1 overlaps with AFD3. Because all areas must be mutually exclusive, Floodville can only count the overlapped area once. It should count the overlapped area under the AFD with the higher flood elevation, the elevation that takes precedence in the floodplain management regulations. Therefore, the overlapped area is counted under AFD3.

Example 412.c-2. (See Figure 410-4.) Watertown's Impact Adjustment Map shows the areas outside the SFHA where site-specific analyses are required as AFD1. The Riley River floodplain is designated as AFD2.

Watertown's engineer used a planimeter to measure the area of the SFHA (which is also the area of AFD2).

aSFHA = 0.55 square miles. When the area covered by the federal prison is removed from consideration, aSFHA = 0.43 square miles. aAFD2 = aSFHA = 0.43.

The city's regulations requiring site-specific analyses (AFD1) cover 12,000 feet of stream channel. The area of AFD1 is the length times the width. Since the area regulated is 100 feet on each side of the channel, the width is 100 x 2 = 200.

aAFD1 = 12,000 x 200 = 2,400,000 square feet or 0.09 square miles (see Section 404 for the conversion of square feet to square miles).

Using Option 3, $rAFD1 = \frac{aAFD1}{aSFHA} = \frac{0.09}{0.43} = 0.21$

$$rAFD2 = \frac{aAFD2}{aSFHA} = \frac{0.43}{0.43} = 1.0$$

$\Sigma rAFDi = 0.21 + 1.0 = 1.21$, so $\Sigma rAFDi \leq 1.5$.

413 Credit Calculation

a. AFDi = ((NSi x LEVi) + HSSi + FWSi) x rAFDi x CTP2i

b. c410 = ΣAFDi + (AFDSHi x CTP2i) + CTP1

Example 413.b-1. In Floodville (see Figure 410-3):

1. AFD1 = detailed study of the problem ditch in the C Zone.

   NS1 = 290 HSS1 = 80 LEV1 = 1.0 FWS1 = 100 rAFD1 = 0.22

   Floodville does not receive any CTP credit, CTP1 = 0, CTP2 = 1.0.

   AFD1 = ((290 x 1.0) + 80 + 100) x 0.22 x 1.0 = 470 x 0.22 x 1.0 = 103.4

2. AFD2 = the site-specific analyses required for Deadman's Run.

   NS2 = 75 HSS2 = 40 LEV2 = 1.0 FWS2 = 0 rAFD2 = 0.18 CTP2 = 1.0

   AFD2 = ((75 x 1.0) + 40 + 0) x 0.18 x 1.0 = 115 x 0.18 x 1.0 = 20.7

3. AFD3 = the more restrictive floodway prepared for Foster Creek. This higher floodway standard was included in the City's original Flood Insurance Study, so there is no NS, HSS, or LEV credit.

   NS3 = 0 HSS3 = 0 LEV3 = 0 FWS3 = 100 rAFD3 = 0.82 CTP2 = 1.0

   AFD3 = ((0 x 0) + 0 + 100) x 0.82 x 1.0 = 100 x 0.82 x 1.0 = 82.0

4. Floodville does not receive any CTP credit, CTP1 = 0,

   c410 = AFD1 + AFD2 + AFD3 + CTP1 = 103.4 + 20.7 + 82.0 + 0 = 206.1

Example 413.b-2. Watertown has two areas with additional flood data as shown on its Impact Adjustment Map in Figure 410-4.

1. AFD1 = the site-specific analyses conducted by the city's Engineering Department on all streams with a drainage area larger than 40 acres.

   NS1 = 100 HSS1 = 0 LEV1 = 1.0 FWS1 = 150 rAFD1 = 0.21 CTP2 = 1.0

   AFD1 = ((100 X 1.0) + 0 + 150) x 0.21 x 1.0 = 250 x 0.21 x 1.0 = 52.5

2. AFD2 = the Riley River floodplain covered by the original Flood Insurance Study. The City receives no NS, HSS, LEV or CTP2 credit at this time. However, it will when the restudy is completed and adopted in the City's floodplain management regulations. Watertown receives credit for the state's higher floodway standard (FWS).

   NS2 = 0 HSS2 = 0 LEV2 = 1.0 FWS2 = 150 rAFD2 = 1.0 CTP2 = 1.0

   AFD2 = ((0 x 0) + 0 + 150) x 1.0 x 1.0 = 150 x 1.0 x 1.0 = 150

3. Because the City and the state have signed Cooperating Technical Partner agreements, CTP1 = 10 + 10 = 20, even though the Riley River restudy has not been completed.

   c410 = ΣAFDi = AFD1 + AFD2 + CTP1 = 52.5 + 150 + 20 = 222.5

414 Credit Documentation

The community must submit the following:

a. The ordinance or law language that adopts the flood study for regulatory purposes or that requires site-specific flood elevation or floodway studies to be conducted at the time of permit application.

The ordinance or law should either specify what standard is to be used or adopt the studies or maps for regulatory purposes.

Example 414.a-1. Appropriate regulatory language could read:

The floodplain delineation map for Skunk Creek, dated January 15, 1998, is adopted and included in the area of jurisdiction of this ordinance. OR

The flood protection elevation shall be the base flood elevation shown on the flood profiles in the Flood Insurance Study for the County. In floodplains where the Flood Insurance Study does not provide a profile, the applicant shall calculate the base flood elevation and submit it to the County Engineer for approval and use as the flood protection elevation. OR

The areas of mudflow hazard subject to the management requirements of this ordinance shall be as shown on the Geologic Hazard Maps produced by the State Geological Survey.

NOTE: *This* ***Coordinator's Manual*** *contains examples of certifications and ordinance language. Communities are advised to have all certifications and proposed ordinances reviewed by their attorneys or corporation counsels.*

b. Either:

   (1) A copy of the study or an explanation of the technique used and a licensed professional engineer's statement that the study was based on a technique approved by FEMA; OR

(2) A copy of the Flood Insurance Study pages or Letter of Map Revision (LOMR) that show that the study has been accepted by FEMA to revise the FIRM.

Only those pages of the study that explain the elements for which the community is applying need to be submitted. For example, if the community is applying for credit for a higher floodway standard, the page from the Flood Insurance Study explaining the standard used and an excerpt from the Floodway Data Table would suffice.

Under b.(1), the documentation must also include a statement signed by a licensed professional engineer that the technique used in the study or the ordinance language has been accepted by FEMA. It is not necessary to have the FEMA Regional Office specifically approve the study, if the technique is listed as an acceptable one in *Guidelines and Specifications for Flood Hazard Mapping Partners*.

Example 414.b-1. Engineer's language for a study could read:

The attached study for Unnamed Ditch #1 was prepared using hydrological and hydraulic engineering methods that have been approved by FEMA. The hydrology was prepared using HEC-1 and the flood profiles were prepared using HEC-2, techniques that are listed in FEMA's *Numerical Models Meeting the Minimum Requirement of the NFIP.* The study was submitted on November 12, 2004, with a request for a Letter of Map Revision. The LOMR was issued on January 14, 2005.

Example 414.b-2. Engineer's language for an ordinance requirement could read:

Section 123.4 of Ordinance No. 89-23 requires all applicants for a development permit in unnumbered A Zones to calculate a base flood elevation and delineate a floodway for their development sites. The ordinance states that the applicant may use any method listed as acceptable in the current edition of FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners*.

c. [If the community requested credit for the independent review under Section 411.a] Documentation that the state or other agency reviewed and accepted the study or analysis techniques for which credit is being requested.

Documentation will usually be a letter from the responsible agency, stating that the review was done and/or that the data were approved.

The community must have the following documentation available to verify implementation of this activity:

d. [Required only if the community is applying for credit under Section 411.b] For Flood Insurance Studies that were partly paid by FEMA, documentation that describes the non-FEMA share and who paid for it.

This documentation may be included in the engineer's statement described in Section 414.b. Note that many flood insurance studies and restudies were conducted by federal agencies and private consulting firms under contract to FEMA. This activity credits only the share of a study that FEMA did not finance.

Many communities are eligible for this credit if they shared in the cost of preparing the original Flood Insurance Study or subsequent revisions. The non-FEMA contribution may be in the form of direct financial participation or in-kind services, such as hydrologic studies or topographic mapping. The community must be able to document the non-FEMA participation.

e. [If the community determines the impact adjustment ratios using Option 3 (412.c)] The Impact Adjustment Map with the appropriate acronyms marking the areas affected by the additional flood data. Each area with the same standard(s) should be marked "AFD." If more than one standard was used, the areas should be marked "AFD1," "AFD2," etc. Different areas mapped to the same standards should all be marked with the same acronym.

The Impact Adjustment Map is discussed in Section 403. If the community has additional flood data that affect more than 25% of its floodplain, then it will receive more points if it uses Option 3 as discussed in Section 412.c.

f. [If the community is requesting credit for CTP2, Cooperating Technical Partner, under Section 411.f] Documentation that shows the relation between the study or standard and the Cooperating Technical Partner agreement.

The community must have the following documentation available at its cycle verification visit:

g. [If the community has received credit for a new study (NS) under Section 411.a] A statement by the community's engineer that its regulatory floodplain maps and related data reflect current conditions. This statement need only address the maps that are credited by this activity.

The community's engineer must sign a statement that addresses the following issues:

(1) Whether the precipitation data used for the study's hydrology are still appropriate and have not been replaced by new data, such as a new publication of standard precipitation data.

(2) Whether the basis for the hydrology still reasonably reflects the current watershed conditions.

(3) Whether the method used for the study is still considered appropriate, given current techniques and technology.

(4) Whether construction, filling, and other development in the floodplain have made the maps obsolete.

(5) If any of the flood studies or floodplain maps credited under this activity are not current, what needs to be done to bring them up to date (e.g., restudy a stream where the watershed has undergone a lot of development, revise a study to reflect a revised official precipitation data publication, or conduct a new study where a bridge has been replaced).

If any of the community's flood studies or floodplain maps are not current, the engineer must identify what needs to be done to bring them up to date, e.g., restudy a stream where the watershed has undergone a lot of development, revise a study to reflect a revised official precipitation data publication, or conduct a new study where a bridge has been replaced.

415 For More Information

Additional information, reference materials, and examples can be found at the CRS Resource Center at **http://training.fema.gov/EMIWeb/CRS/**.

a. More information on FEMA mapping criteria can be found on the FEMA website, **http://www.fema.gov/fhm/**.

   More information on the Cooperating Technical Partner program can be obtained from the FEMA Regional Office (see Appendix A) and from the website at **http://www.fema.gov/fhm/ctp_main.shtm**.

   To contact the FEMA map specialist for each region of the country, see **http://www.fema.gov/fhm/fp_key.shtm**.

   For technical data on past FEMA maps, see **http://www.fema.gov/fhm/st_order.shtm**.

FEMA's *Numerical Models Meeting the Minimum Requirement of the NFIP* can be found at **http://www.fema.gov/fhm/en_modl.shtm**.

b. See Appendix E to order free copies of the following publications.

Special Hazards Supplement to the CRS Coordinator's Manual

CRS Credit for Management of Coastal Erosion Hazards

CRS Credit for Management of Tsunami Hazards.

c. The following publications may be obtained from

FEMA Distribution Center
P.O. Box 2010
Jessup, MD 20794-2012
800-480-2520
Fax: (301) 362-5335

Guidelines and Specifications for Flood Hazard Mapping Partners, Federal Emergency Management Agency, 2003. (Also available from FEMA's website at **http://www.fema.gov/fhm/gs_main.shtm**.)

Use of Flood Insurance Study (FIS) Data as Available Data, FEMA Floodplain Management Bulletin 1-98, 1998. (Also available from FEMA's website at **http://www.fema.gov/fima/fis_data.shtm**.)

Estimating the Value of Partner Contributions to Flood Mapping Projects "Blue Book," Federal Emergency Management Agency, 2002

The following can provide guidance on technical standards for studies in areas where base flood elevations were not provided with the FIRM:

Managing Floodplain Development in Approximate Zone A Areas, FEMA-265, July 1995. (Also available from FEMA's website at **http://www.fema.gov/fhm/dl_zonea.shtm**.)

d. Communities may check on past FIRMs and obtain background data by calling 1-877-FEMA MAP. They can also submit a written inquiry through this link: **http://www.fema.gov/fhm/tsd_emap.shtm**.

e. The following publications may be obtained from

Hydrologic Engineering Center
U.S. Army Corps of Engineers
609 Second St.
Davis, CA 95616

Effects of Flood Plain Encroachments on Peak Flow, U.S. Army Corps of Engineers, September 1980.

HEC-2 Water Surface Profiles—Users Manual, U.S. Army Corps of Engineers, January 1981.

f. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which is usually located in the county seat.

420 OPEN SPACE PRESERVATION

Summary of Activity 420

421 Credit Points. There are four elements in this activity for a maximum of 900 points (excluding special hazards credit).

a. Preserved open space (OS): Up to 725 points are provided for keeping vacant floodplain lands open. This can be done by keeping the land publicly owned (e.g., a park or golf course), by keeping it as a private preserve (e.g., hunting club lands), or by regulating development so that there will be no new buildings or filling on the land.

b. Deed restrictions (DR): Up to 75 points are provided if the deeds for the parcels preserved as OS have restrictions that prevent future owners from developing them.

c. Natural and beneficial functions (NB): Up to 100 points are provided if the parcels preserved as OS are in an undeveloped natural state, have been restored to a natural state, or protect natural and beneficial floodplain functions.

d. Special hazard areas preserved as open space (SHOS): Up to 50 points are provided if the open space is also in an area subject to one of the special flood-related hazards listed in Section 401.

422 Impact Adjustment. The credit points for each element are adjusted in one of three ways.

a. Under Option 1, where the entire regulatory floodplain is affected, the impact adjustment ratio for an element is 1.0.

b. Under Option 2, where at least 5 acres of regulatory floodplain are affected, the impact adjustment ratio for an element is 0.05 for OS and 0.1 for DR and NB.

c. Under Option 3, the impact adjustment ratios reflect the proportion of the regulatory floodplain affected by an element.

423 Credit Calculation. The credit points for each element are multiplied by the impact adjustment ratios.

424 Credit Documentation. The community must have the following available to verify implementation of this activity.

a. [Required only if credit for OS is based on a prohibitory regulation] A copy of the regulatory language.

b. Documentation showing the development restriction for each parcel to be credited under OS. If Option 2 was used, then documentation is only needed for 5 acres.

c. Documentation showing the deed restriction for each parcel to be credited under DR. If Option 2 was used, then documentation is only needed for 5 acres.

d. Documentation, signed by a professional in a natural science, that parcels credited under NB have been preserved in or restored to an undeveloped natural state. If Option 2 was used, then documentation is only needed for 5 acres.

e. The Impact Adjustment Map, showing the areas designated for credit.

f. [Required only if credit is requested for areas outside the Special Flood Hazard Area (SFHA) shown on the Flood Insurance Rate Map (FIRM)] Documentation showing that floodplain regulations are in effect in those areas.

425 For More Information. Additional credit for open space in special hazard areas is discussed in the supplements on special hazards.

420 OPEN SPACE PRESERVATION

Credit is provided for having floodprone property that is preserved as publicly owned or controlled open space.

Background: One of the best ways to prevent flood damage is to keep floodprone areas free of development. Preserving open space is therefore recognized as a regulatory activity. In addition to the flood protection benefits, preserving open space can greatly enhance the natural and beneficial functions that floodplains serve.

Activity Description: Credit is given for areas that are permanently preserved as open space. Additional credit is given for parcels of open space that are protected by deed restrictions or that have been preserved in or restored to their natural state.

Under this activity, several different methods of preserving floodplain lands as open space (OS) are recognized. To be termed "open space," the land must be free from buildings, filling, or other encroachment to flood flows. The objective is to prevent or minimize development that obstructs floodwaters, exposes insurable buildings to damage, or adversely affects water quality or quantity or other floodplain functions. This activity recognizes programs that have preserved wetlands, beaches, and other critical areas from development, even though they may not have been intended as floodplain regulatory activities.

If an open space parcel has a deed restriction or other permanent legal attachment that prohibits buildings or fill from ever being placed on the land, it is given the designation "DR" and additional credit. If it has been preserved in or restored to its natural state, it is designated "NB" and given additional credit.

Additional credit is provided for preserving open space in areas subject to one of the hazards discussed in the appropriate CRS publications on special hazards.

The Community Rating System (CRS) encourages communities to devote special attention to areas affected by any of the special flood-related hazards listed in Section 401. Communities affected by one or more of these hazards should obtain a copy of the appropriate CRS publication on special hazards and/or coastal hazards (see Appendix E). That publication shows how to increase credit points for areas that are designated open space in this activity if they are also affected by one of these special hazards.

421 Credit Points

Maximum credit for Activity 420: 900 points (excluding special hazards credit)

a. Preserved open space (OS) (Maximum credit: 725 points)

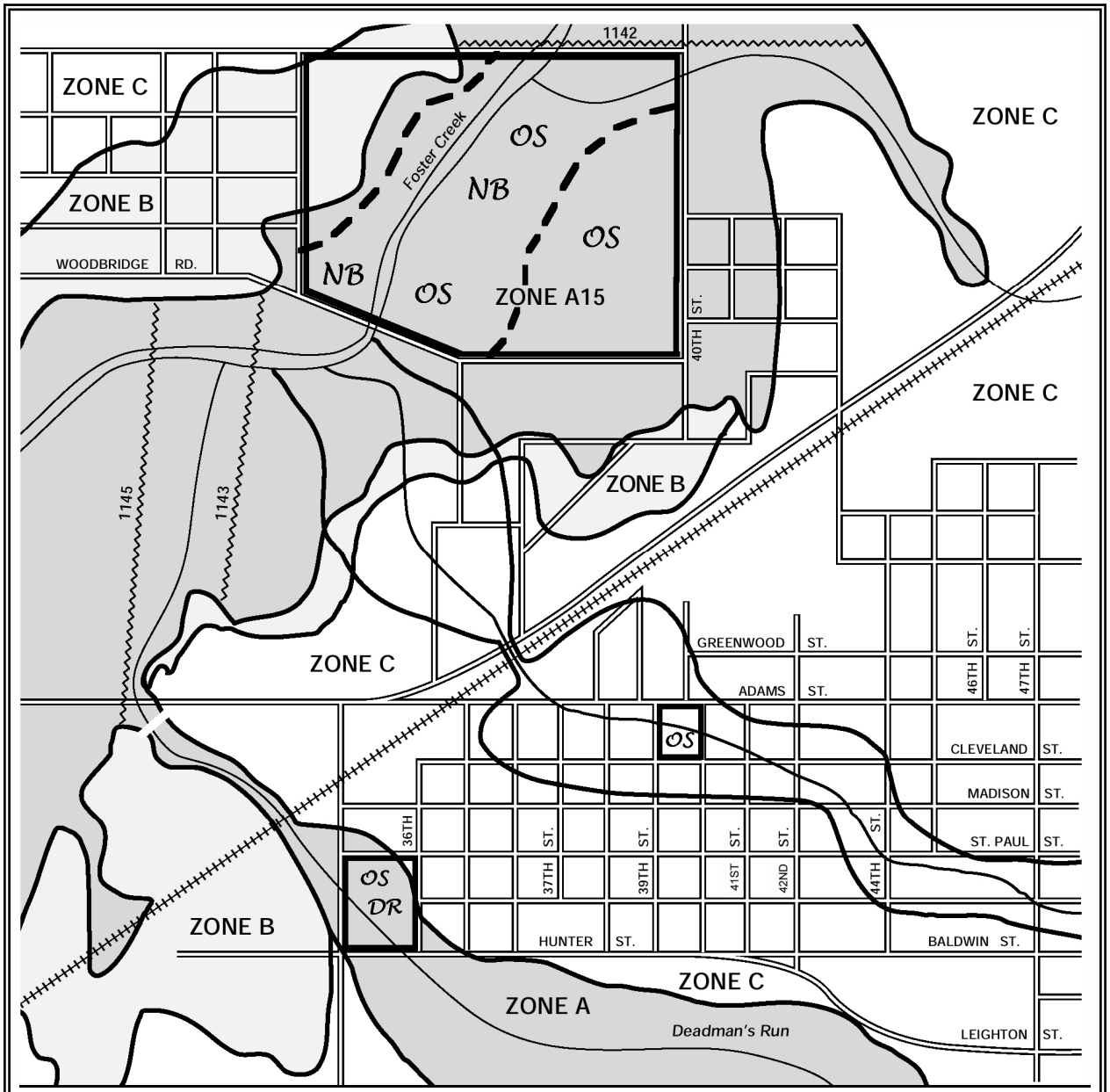
OS = 725, for that portion of the regulatory floodplain which is preserved as open space. To qualify for credit, there must be an assurance that the property will remain open, that is, without buildings, fill, obstruction to flood flows, or loss of floodplain storage.

This requirement may be met in one of three ways:

1. Public land such as state and local parks and easements: However, as noted in Section 403, there is no open space credit for federal lands. All portions of city and county parks, forest preserves, state parks and state forests, publicly owned beaches, or natural areas that are within the regulatory floodplain may be counted for open space credit. Separate parcels owned by a school district or other public agency can be counted, provided there are no buildings on them within the regulatory floodplain. See Section 301 for the definition of "buildings."

Example 421.a-1. Floodville has three publicly owned open space areas that qualify. They are marked "OS" on the Impact Adjustment Map in Figure 420-1. Foster Creek Park is a nature preserve along Foster Creek. It is 90 acres, with 10 acres in the B Zone and 80 acres in the SFHA. The Hunter Street School has a 6-acre playing field in the Deadman's Run floodplain. The City's Adams Street Park is 1.5 acres. All of it is in the newly mapped floodplain for the unnamed ditch.

2. Preserve land: private wildlife or nature preserves that are maintained for open space purposes. Examples would be church retreats, hunting club lands, Audubon Society preserves, and similar privately owned areas that are set aside and not intended to be developed. A parcel set aside by a developer as a temporary "preserve" until the area develops is not considered permanent open space.



Impact Adjustment Map

Area	Size (acres)	Notes
OS	80.0	Foster Creek Park (floodplain portion)
OS, DR	6.0	Hunter Street School playing field
OS	1.5	Adams Street Park
aOS	87.5	All open space areas
aNB	50.0	Bottomland hardwoods in Foster Creek Park

Figure 420-1. Floodville's open space.

3. Restrictive development regulations: privately owned lands subject to state or local regulations that prevent construction of buildings or the placement of fill or other obstructions. Credit is only given for such regulated lands that are vacant at the time of application for CRS credit. Some examples are coastal construction setback lines, wetlands or natural areas regulations, or any state or local law that prohibits new buildings from a defined area. The regulations must also prohibit fill, grading, or other activities that obstruct flood flows or remove flood storage in areas subject to riverine flooding. Maintenance of existing levees and engineered dune and beach nourishment programs may be allowed.

A wetlands regulation that is dependent upon site analysis to define whether a property is a wetland is not acceptable. The area where buildings are prohibited must be mapped or defined by lots or a legal description so it can be mapped. The Coastal Barrier Resources Act is not acceptable because it does not prevent construction of buildings, it only denies federal support for new development.

Ordinance language prohibiting structures that may cause obstructions in the floodway is not granted CRS credit because such a prohibition is a National Flood Insurance Program (NFIP) requirement. It allows a building in the floodway if the applicant can show that it causes no obstruction.

If an ordinance prohibits residential development of a floodplain, the community may request OS credit for all floodplain areas that are zoned for residential use only.

Open space subdivision design, cluster development, transfers of development rights, and planned unit developments are regulatory approaches that can require or encourage developers to set aside floodplains and other areas as dedicated open space. The areas may be deeded to the community or permanently protected under a conservation easement and maintained by the owner or a homeowners association.

Unless the local regulations specifically identify certain undeveloped floodplains and mandate that they be set aside, there is no automatic OS credit for these regulations because there is no assurance that the developer will set aside specific areas. However, once a plat has been accepted and the open space is deeded over or otherwise preserved, the sites can be credited as public or preserved open space. More information on these regulatory techniques can be found in *Subdivision Design in Flood Hazard Areas.*

NOTE: *The CRS does not call for prohibiting all use of private property. Communities are advised to have their attorneys or corporation counsels ensure that their regulations that prevent construction of buildings or the placement of fill in hazardous areas do not constitute a taking of private property.*

Five types of properties are not counted for this activity:

1. Properties not counted in any calculations for the 400 series.

2. Areas with buildings on them. Insurable buildings on parcels larger than 10 acres will not disqualify a lot, provided the building is "a necessary appurtenance" of the open space use.

3. Streets, pavement, and other impervious surfaces; and parkway, railroad, levee, canal, ditch, and channel rights of way less than 100 feet wide unless they are the principal drainage feature in the area. Such rights of way with pervious surfaces may be included in the open space calculation if they are an integral part of a larger open space area or a designated public greenway.

4. Parcels where filling or other encroachments may be placed.

5. Publicly owned property that is not intended for open space use, such as a vacant lot in an industrial park.

The five types of properties that are not counted are discussed in more detail below.

1. Properties not counted in any calculations: As noted in Section 403, certain areas are not considered part of the regulatory floodplain, and these areas are not counted toward either open space or aRF:

   a) Open water larger than 10 acres, such as lakes, bays, and large rivers;

   b) Lands larger than 10 acres that are either owned by the federal government, such as military installations and national parks, or where development is prohibited by the federal government;

   c) At the community's option, areas beyond the community's regulatory jurisdiction; and

   d) A99 and AR Zones.

   See Section 403 for a discussion of excluding these areas from the Impact Adjustment Map.

2. Areas with buildings on them: See Section 301 for a discussion of "buildings." Insurable buildings on parcels larger than 10 acres will not disqualify a lot, provided the building is "a necessary appurtenance" of the open space use.

Example 421.a-2.

1. If a large city park has a swimming pool, the park can be counted even though it may have a building with restrooms, lockers, and clothes-changing areas. However, if it has a paved parking lot, the area of impervious surface must be deleted from the credited area of open space.

2. A 12-acre park that includes the first settler's home or other historical building that is an integral part of the park can be considered OS.

3. A ranger's cabin will not disqualify a state forest for OS credit.

4. Floodville's Foster Creek Park can be credited even though it has a nature center because the park is larger than 10 acres.

5. A strip of single-family lots along a stream has a house in the floodplain fringe of each lot. There are no buildings in the floodway, and the community's regulations prohibit filling and the placement of new buildings in the floodway. The open space area, the floodway, is currently vacant and the regulations will keep it vacant, so it can be credited.

6. Floodville's Hunter Street School playing field can be credited. None of the structures on it, like the bleachers and fence, are "buildings" as defined in Section 301. Impervious surfaces, such as a basketball court and parking lot, are not credited.

3. Street, parkway, railroad, levee, canal, ditch, and channel rights of way less than 100 feet wide: Such narrow, linear strips of utility easements or publicly owned property are excluded from consideration as open space because they are necessary for any type of development or use of an area. These areas are not deleted if they are an integral part of a larger open space area or a designated public greenway.

   On the other hand, greenways and parks that parallel a river or shoreline that are at least as deep as the normal lots in the area may be counted as open space.

   Streets, parking lots, and other impervious surfaces are not included in the area to be credited. Roads and parking lots in a park can be credited if they have pervious surfaces, such as gravel or porous pavement and support the open space use. Otherwise, paved roads, parking lots, and other large areas of impervious surface are deleted from the area calculations. Small paved areas, such as a sidewalk in a designated greenway, can be counted toward OS.

4. Parcels where filling or other encroachments may be placed: For example, an open area used for temporary storage of rock or construction materials does not qualify as open space. Plowing and other alterations of the ground are not counted as filling provided they do not create obstructions to the flow or loss of storage of floodwaters.

The objective of preserving open space is to prevent increased flood damage from future development. Even though insurable buildings may not be allowed, filling, dumping, or storage on a lot can aggravate flood problems on other properties.

5. Publicly owned property that is not intended for open space use, such as a vacant lot in an industrial park: One of the keys to the open space credit is the fact that the area will remain open space, not just that it is owned by a public agency. Therefore, areas set aside by a developer or a public agency only until future economic or other conditions allow it to be developed, are excluded.

b. Deed restrictions (DR) (Maximum credit: 75 points)

DR = 75, for those parcels of the community's open space which have deed restrictions. Only areas that qualify for OS credit can be considered for DR credit.

Just because a lot is a city park today, there is usually no legal restriction that keeps a city council from building on it or selling it for development. The exact language for a legal arrangement or deed restriction will vary from state to state and should be prepared by a local attorney. It should include the following factors:

- No new buildings may be allowed on the property,
- The restriction runs with the land, and
- The restriction cannot be changed by a future owner; rather, it can only be amended by a court for just cause.

A community, other agency, or organization may attach such a restriction to its existing parks and other public open areas in order to receive the deed restriction credit.

Example 421.b-1. Property often is donated for park purposes with the stipulation that it be used only for public recreation. Properties purchased under FEMA's Hazard Mitigation Grant Program qualify for this credit because the titles have a deed restriction that prohibits buildings.

Example 421.b-2. The Hunter Street School playing field in Floodville was purchased with financial assistance from a state agency. The agency required a deed restriction that limits future use of the site to recreation or education. Because the site was in the floodplain, the deed restriction also prohibits construction of any buildings. On Floodville's Impact Adjustment Map (Figure 420-1), the CRS Coordinator designated this site with "DR" as well as "OS" to show that it is open space subject to a deed restriction.

c. Natural and beneficial functions (NB) (Maximum credit: 100 points)

NB = 100, for those parcels of the community's floodplain open space which are in an undeveloped natural state, have been restored to a natural state, or protect natural and beneficial floodplain functions. Credit is available for NB only in areas that qualify for OS credit. The area must be located in the community's floodplain and must be preserved in its natural state either by commitment of the owners or through development regulations.

The following types of open space can receive NB credit.

1. Areas in their undeveloped natural state (i.e., areas that have not been built on, graded, or farmed).

2. Areas that have been farmed or otherwise developed but have been restored to a state approximating their natural, pre-development conditions.

3. Areas designated as worthy of preservation for their natural or beneficial functions by a federal, state, or nationally recognized private program. Such programs include, but are not limited to:

   - The U.S. Fish and Wildlife Service's Threatened and Endangered Species' Critical Habitat Designations;

   - A Habitat Conservation Plan approved by the U.S. Fish & Wildlife Service or the National Marine Fisheries Service. (The Habitat Conservation Plan can also support credit under Sections 431.g and 511.b);

   - State sensitive-areas programs that place development restrictions on designated properties; and

   - The Nature Conservancy's Heritage Program Inventory.

   NB credit is only provided for open space land designated for some natural and beneficial floodplain function as defined in Section 130, Glossary. Areas designated only as "scenic," as historically significant, or as outstanding canoeing or boating streams would not qualify for this credit.

To qualify for NB credit, the property must meet all the criteria for OS. For example, a forest preserve with a building on it could still be credited if the building is a nature center or a restroom that is a "necessary appurtenance of the open space use."

Although any open space area may qualify for OS, to qualify as NB the area not only must be in a natural state but also must be preserved in such a state. This must be documented with a letter from a professional in a natural science such as botany or biology. For example, a state

forest may qualify for OS but would not qualify for NB if clear cutting is allowed. Similarly, a recreational beach with cabanas, changing facilities, temporary concession stands, etc., may qualify as OS but would not meet the credit criteria for NB credit.

If a property is also protected by a deed restriction, DR credit can be provided. A property may be marked on the Impact Adjustment Map for credit under all three elements. In such cases, the credit points for all three elements, OS, DR, and NB, are cumulative (i.e., worth 725 + 75 + 100 = 900 points before the impact adjustment).

Example 421.c-2. When it prepared its comprehensive plan, Floodville recognized the value of preserving the bottomland hardwoods in the floodplain of Foster Creek. A joint public and private venture acquired bottomland areas adjacent to the city's park. The park was expanded and nature trails and an interpretive center were established in the newly acquired area.

The floodplain portion of the park is designated "OS" on the Impact Adjustment Map (Figure 420-1). Within the area designated OS, those bottomlands still in a natural state are marked with a dashed line and designated "NB."

The entire park is 90 acres; the floodplain area designated as OS covers 80 acres. Some of the park includes ball fields, picnic pavilions, and other areas that do not qualify for NB credit. The area that qualifies for NB is 50 acres.

d. Special hazard areas preserved as open space (SHOS) (Credit points vary.)

   Credit for preserving areas subject to special flood-related hazards is described in the appropriate CRS publications on special hazards. The credit points, cSHOS, are then transferred to this activity.

422 Impact Adjustment

a. Option 1:

   1. rOS: If all of the area of the regulatory floodplain is preserved as open space, rOS = 1.0.

   2. rDR: If all of the regulatory floodplain is open space and has deed restrictions, rDR = 1.0.

   3. rNB: If all of the regulatory floodplain is open space that also qualifies for NB credit, rNB = 1.0.

Option 1 can be used only if ALL of the area in the community's regulated floodplain is currently undeveloped and is preserved as open space.

b. Option 2:

1. rOS: If at least 5 acres of regulatory floodplain are preserved as open space, the community may use the default value for the impact adjustment ratio rOS = 0.05.
2. rDR: If at least 5 acres of regulatory floodplain qualify for OS and DR credit, the community may use the default value for the impact adjustment ratio rDR = 0.10.
3. rNB: If at least 5 acres of regulatory floodplain qualify for OS and NB credit, the community may use the default value for the impact adjustment ratio rNB = 0.10.

Example 422.b-1. Singleton has one 7-acre park in its regulatory floodplain. Rather than prepare an impact adjustment map, Singleton decides to use Option 2 and rOS = 0.05.

c. Option 3:

1. rOS: The size of the area preserved as open space (aOS) must be determined in order to adjust the credit points to reflect its impact. This impact is the portion of open space in the total area of regulated floodplain in the community (aRF).

   $$rOS = \frac{aOS}{aRF}$$

2. rDR: The size of the area with deed restrictions (aDR) must be determined in order to adjust the credit points to reflect its impact. This impact is the portion of the area with deed restrictions within the total area of regulated floodplain in the community (aRF).

   $$rDR = \frac{aDR}{aRF}$$

3. rNB: The size of the area preserved for natural and beneficial functions (aNB) must be determined in order to adjust the credit points to reflect its impact. This impact is the portion of the area preserved for its natural and beneficial floodplain functions within the total area of regulated floodplain in the community (aRF).

   $$rNB = \frac{aNB}{aRF}$$

See Section 403 for a discussion of the Impact Adjustment Map. In these formulae, the "a" variables are the sizes of the areas marked on the Impact Adjustment Map. aOS is the size of all of the areas marked "OS." It is divided by the value for aRF that was calculated according to the instructions in Section 404.

Example 422.c-2. As shown in Figure 420-1, Floodville has three areas that qualify for OS: Foster Creek Park (80 acres in the SFHA), the Hunter Street School playing field (6 acres in the Deadman's Run floodplain) and the Adams Street Park (1.5 acres). The area of Floodville's regulatory floodplain (aRF) is the area of all three regulated floodplains: 396 acres.

Because the regulatory floodplain is not all in open space, Floodville cannot use Option 1. Option 2 is not used for OS because the City has calculated the areas affected and found that more than 5% of the regulatory floodplain is in open space. Therefore it uses Option 3:

aOS = 80 + 6 + 1.5 = 87.5 acres

$$rOS = \frac{aOS}{aRF} = \frac{87.5}{396} = 0.22$$

The only area affected by a deed restriction is the 6-acre playing field at Hunter Street School. Because this is less than 10% of the area of the regulatory floodplain, Floodville will receive more credit points by using Option 2: rDR = 0.10.

The area preserved in its natural state in Foster Creek Park is 50 acres. As with OS, Option 3 will produce the highest score for NB:

aNB = 50

$$rNB = \frac{aNB}{aRF} = \frac{50}{396} = 0.13$$

423 Credit Calculation

a. cOS = OS x rOS

b. cDR = DR x rDR

c. cNB = NB x rNB

d. cSHOS from Section 424SH

e. c420 = cOS + cDR + cNB + cSHOS

Section 424SH is part of a separate CRS publication on special hazards, necessary to apply for CRS credit for special hazard areas (see Appendix E).

Example 423-1. Floodville calculates its credit for Activity 420.

cOS = OS x rOS = 725 x 0.22 = 159.5

cDR = DR x rDR = 75 x 0.1 = 7.5

cNB = NB x rNB = 100 x 0.13 = 13

cSHOS = 38

The credit for SHOS is discussed in a separate publication on special hazards.

c420 = cOS + cDR + cNB + cSHOS =

159.5 + 7.5 + 13 + 38 = 218.0 = 218

During the verification visit, the ISO/CRS Specialist notes that a significant portion of the 6-acre playing field at the Hunter Street School recently has been filled in preparation for development. Credit is not verified for this parcel. This reduces the area of verified open space from 87.5 acres to 81.5 acres, which reduces the impact adjustment factor rOS from 0.22 to 0.21. This reduces the credit for open space from 159.5 to 152.25. Since this was the only parcel eligible for credit for deed restrictions, cDR = 0. Floodville's verified credit for this activity is

c420 = cOS + cDR + cNB + cSHOS =

152.25 + 0 + 13 + 38 = 203.25, which is rounded to 203.

424 Credit Documentation

The community must submit the following:

a. [Required if OS credit is requested for prohibitory ordinance language] The ordinance language that prohibits structures and fill in part or all of the floodplain. The acronym OS must be marked in the margin of the sections pertaining to this activity.

The ordinance must specifically prohibit both structures and fill in all or part of the floodplain to qualify for OS credit.

The community must have the following documentation available to verify implementation of this activity:

b. 1. [If the community determined rOS using Option 1 (Section 422.a) or Option 3 (Section 422.c)] Documentation showing the development restrictions for each parcel not owned by the community for which OS credit is applied. In the case of parks, golf courses or other recreation or preserve areas owned by the state or another public agency, a letter from the owning agency will suffice. In the case of privately owned land, a charter for the preserve land or other written statement that demonstrates that the owner will preserve the land as open space is needed.

2. [If the community determined rOS using Option 2 (Section 422.b)] Documentation showing the development restrictions for at least 5 acres for which OS credit is applied.

c. 1. [If the community determined rDR using Option 1 (Section 422.a) or Option 3 (Section 422.c)] For parcels of open space for which deed restriction (DR) credit is requested, copies of the deed restrictions for each parcel.

2. [If the community determined rDR using Option 2 (Section 422.b)] For parcels of open space for which deed restriction (DR) credit is requested, copies of the deed restrictions for at least 5 acres.

d. 1. [If the community determined rNB using Option 1 (Section 422.a) or Option 3 (Section 422.c)] For parcels of open space for which protection of natural and beneficial functions (NB) credit is requested, documentation signed by a professional that the parcels have been preserved in or restored to an undeveloped natural state.

2. [If the community determined rNB using Option 2 (Section 422.b)] For parcels of open space for which protection of natural and beneficial functions (NB) credit is requested, documentation signed by a professional that at least 5 acres have been preserved in or restored to an undeveloped natural state.

NOTE: *DR and NB can only be marked in areas designated OS. There is no credit for DR or NB on lands that are not open space.*

Copies of the documentation should be readily available at the verification visit. The ISO/CRS Specialist will not be able to go to the courthouse to review property records. DR credit can only be documented with a copy of the actual deed restriction. An ordinance requiring deed restrictions or dedication of easements is not adequate documentation that there is a permanent legal restriction that prevents future owners from developing that property.

NB documentation may be a page from a recognized natural areas inventory, or a letter from a professional in a natural science such as botany or biology.

e. The Impact Adjustment Map prepared according to Section 403. Each area of open space must be designated on the map and in the map key.

The community's Impact Adjustment Map and its key must show the regulatory floodplain and the areas designated for credit under this activity. The map will be reviewed during the verification visit and there will be a visit to a sample of the sites to confirm that they are open. If impact adjustment Option 2 is used, the map only needs to be prepared for the part of the community that has the area(s) to be credited.

f. [If the community is applying for credit for open space outside the SFHA] Documentation that shows that floodplain regulations are in effect in the area outside the SFHA.

If aRF is greater than aSFHA, i.e., if the community's regulatory floodplain includes areas outside the SFHA shown on the Flood Insurance Rate Map (FIRM), then the community must show that the areas outside the SFHA are subject to floodplain regulations. Often this documentation is supplied with the application for Activity 410 (Additional Flood Data). This documentation ensures that OS credit is provided only for parks that are actually in floodplains.

425 For More Information

Additional information, reference materials, and examples can be found at the CRS Resource Center at **http://training.fema.gov/EMIWeb/CRS/**.

a. Additional credit for open space in special hazard areas and coastal areas is discussed in the appropriate publications. See Appendix E to order these free publications, which are necessary to apply for CRS credit for special flood-related hazards.

   Special Hazards Supplement to the CRS Coordinator's Manual

   CRS Credit for Management of Coastal Erosion Hazards

   CRS Credit for Management of Tsunami Hazards.

b. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which is usually located in the county seat.

c. The Rivers and Trails Conservation Assistance Program of the National Park Service provides planning assistance to communities interested in setting flood protection goals and identifying nonstructural options. The Park Service provides experienced staff to help communities focus on the grass-roots involvement of residents when developing a plan. For more information, contact

National Park Service
Center for Recreation and Conservation
1849 C St., N.W.
Washington, D.C. 20240-0001
(202) 565-1200

d. More information on planning and regulatory techniques to preserve floodplain open space can be found in *Subdivision Design in Flood Hazard Areas,* Planning Advisory Service Report # 473. Copies can be ordered for $32 ($16 for APA members) from

American Planning Association
122 South Michigan Ave, Suite 1600
Chicago, IL 60603
(312) 431-9100

430LD LAND DEVELOPMENT CRITERIA

Summary of Activity 430LD

431LD Credit Points. This activity has two elements that provide up to 700 points for managing the development of land in ways that minimize construction of buildings in the floodplain.

a. Land development criteria (LDC): Up to 100 points for regulations that require or encourage appropriate uses in the floodplain and/or discourage construction of buildings in floodprone areas. Additional credit is provided under Activity 420 (Open Space Preservation) as open space is set aside through the regulations credited here.

b. Low density zoning (LZ): Up to 600 points are provided for low density zoning. Low density is considered a minimum of 1 acre per building or unit. Maximum credit is provided for a 10-acre or larger minimum lot size. The credit points are calculated by multiplying the minimum lot size by 60. Credit is provided for up to three different zoning densities.

432LD Impact Adjustment. The credit points for each element are adjusted in one of three ways.

a. Under Option 1, if the same requirement is implemented throughout the regulatory floodplain, the impact adjustment ratio is 1.0, minus the ratio for open space.

b. Under Option 2, if part of the area of regulatory floodplain is zoned for low density, the community may use the default value of 0.10 for each of its two lowest density zones.

c. Under Option 3, the impact adjustment ratio for each element reflects the proportion of the regulatory floodplain affected (excluding open space areas).

433LD Credit Calculation. The credit points for each element are multiplied by the impact adjustment ratios and the products are totaled.

434LD Credit Documentation. The community must submit the following.

a. The ordinance language that adopts the land development criteria and/or low density zoning standard.

The community must have the following documentation available to verify implementation of this activity:

b. The Impact Adjustment Map.

c. An explanation of the community's enforcement procedures.

d. Examples of developments constructed in accordance with the ordinance language.

435LD For More Information

430 HIGHER REGULATORY STANDARDS

Summary of Activity 430

431 Credit Points. There are 16 elements in this activity for a maximum of 2,740 points (excluding special hazards credit):

a. Freeboard (FRB): Up to 300 points for a freeboard requirement.

b. Foundation protection (FDN): Up to 35 points for engineered foundations.

c. Cumulative substantial improvements (CSI): Up to 110 points for counting improvements cumulatively.

d. Lower substantial improvements (LSI): Up to 90 points for a substantial improvement threshold lower than 50%.

e. Protection of critical facilities (PCF): Up to 100 points.

f. Protection of floodplain storage capacity (PSC): Up to 80 points.

g. Natural and beneficial functions regulations (NBR): Up to 40 points.

h. Enclosure limits (ENL): 300 points for prohibiting first-floor enclosures.

i. Other higher standard (OHS): Up to 100 points for other regulations.

j. Land development criteria (LD). Up to 700 points, as calculated in Section 430LD.

k. Special hazards regulations (SH): Credit points vary for regulations keyed to special flood-related hazards.

l. State-mandated regulatory standards (SMS): Up to 45 points.

m. Building code (BC): Up to 190 points, based on the community's classification under the Building Code Effectiveness Grading Schedule and adoption of the International Code Series.

n. Staffing (STF): Up to 50 points, based on certification and training of the community's staff.

o. Manufactured home parks (MHP): Up to 50 points for certain anchoring and elevation requirements.

p. Coastal AE Zones (CAZ): Up to 650 points for construction standards in certain coastal zones.

432 Impact Adjustment. The credit points for each element are adjusted in one of three ways:

a. Under Option 1, if the standards apply throughout the regulatory floodplain, the impact adjustment ratio for an element is 1.0 minus the ratio for open space.

b. Under Option 2, if the standards do not apply throughout the regulatory floodplain, a default impact adjustment ratio of 0.25 may be used; for CAZ credit, the impact adjustment is 0.1.

c. Under Option 3, the impact adjustment ratios may reflect the proportion of the regulatory floodplain affected by the element (excluding open space areas); the adjustment for PCF is based on the 500-year floodplain.

433 Credit Calculation. The credit points for each element are multiplied by the impact adjustment ratios and the products are totaled.

434 Credit Documentation. The community must have the following available to verify implementation of this activity.

a. The portion of the state or local law or ordinance that adopts the regulatory standard.

b. [If impact adjustment factors are based on Option 3 (432.c)] The Impact Adjustment Map.

c. An explanation of the community's enforcement procedures.

d. [If requesting credit for STF (431.n)] A copy of the certification of graduation or floodplain manager certification.

435 For More Information.

430 HIGHER REGULATORY STANDARDS

NOTE: *A separate publication,* ***CRS Credit for Higher Regulatory Standards****, provides an example of a community program and application documentation. Communities are encouraged to obtain and read this document before applying for this activity. It will improve the quality of the application and reduce the need to provide additional documentation later. To order a free copy, see Appendix E.*

Credit is provided for regulations that require that new development be provided more protection than that of the National Flood Insurance Program's (NFIP's) minimum requirements.

Background: Current NFIP riverine regulatory standards require that new residential buildings in the Special Flood Hazard Area (SFHA) have their lowest floor at or above the base flood elevation. Non-residential buildings may be floodproofed to the base flood elevation. NFIP coastal rules require that new buildings be above the base flood elevation and, in V (velocity) Zones, be built on engineered piles or columns. Existing buildings can be improved or reconstructed as long as the project does not exceed 50% of the building's value.

Although the NFIP minimum standards provide a great deal of flood protection, damage can still result for many reasons:

- Estimates of flood heights are subject to various errors, especially in areas without long-term flood and rainfall records;
- Buildings may be damaged by floods that exceed the predicted 100-year flood;
- Urbanization and other changes in the watershed can increase the flood hazard; and
- Filling and other development in the fringe can reduce storage capacity.

Activity Description: Under this activity, numerous approaches are credited. These include freeboard, foundation protection, more stringent building improvement rules, protection of critical facilities, preservation of floodplain storage, protecting the natural and beneficial functions of floodplains, limiting building enclosures below the flood level, mapping and regulating areas subject to special flood hazards, and low density zoning. Additional measures proposed by a community will be evaluated and scored accordingly.

Many standards have been adopted by communities across the nation to provide more protection to new development and redevelopment.

- Requiring lowest floors of residences to be higher than the base flood not only reduces damage if a larger flood occurs but also at least partially offsets uncertainties in the hydrologic and hydraulic computations of the base flood elevation;

- Protecting foundations reduces damage resulting from scour and settling;

- Maintaining floodplain storage by prohibiting fill or by requiring compensatory storage reduces downstream flood peaks;

- Requiring full compliance with floodplain management regulations when proposed improvements or repairs are less than 50% of a building's value brings more nonconforming buildings up to flood protection standards;

- Protecting critical facilities to higher levels reduces damage to those facilities and improves the community's ability to respond to the needs of citizens during a disaster;

- Identifying and regulating areas subject to special flood-related hazards reduces damage within those areas; and

- Zoning to maintain a low density of floodplain development reduces the damage potential within the floodplain and helps maintain storage capacity and conveyance capacity.

NOTE: *A community should not amend its ordinances solely to earn Community Rating System (CRS) credit points, nor should it necessarily adopt the examples used in the* ***CRS Coordinator's Manual.*** *Ordinance language should be carefully written to support the community's goals and the purposes of its regulatory program. All such language should be reviewed by the community's legal counsel before adoption.*

431 Credit Points

Maximum credit for Activity 430: 2,740 points (excluding special hazards credit)

a. Freeboard (FRB) (Maximum credit: 300 points)

FRB (Freeboard) credit is based on the required freeboard (FB) (in feet) in relation to the base flood elevation:

1. FRB = 100 x FB.
2. For FB of 3.0 feet or more, FRB = 300.
3. If the ordinance uses the encroached elevation, add 0.5 to FB.
4. For FRB credit, the 500-year flood elevation is considered to be 1 foot higher than the base flood elevation, unless the community demonstrates that it is higher. If freeboard is based upon the 500-year flood, add 1.0 to FB.

5. For FRB credit outside of V Zones, if the ordinance uses "lowest horizontal structural member" or similar language instead of "lowest floor," add 1.0 to FB.

6. A community may use the following to receive more credit in AO1, AO2, and AO3 Zones:

   a. In AO1 and AO2 Zones, add 2 to FB.

   b. In AO3 Zones, add 1 to FB.

7. If the requirement for freeboard is limited to areas where there are base flood elevations, or otherwise does not apply to all new construction, then an impact adjustment must be made using Option 2 or 3 (see Sections 432.b and 432.c).

8. If the community requires that electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork) be elevated or made of flood-resistant materials above the base flood elevation, but does not require these facilities to be elevated or protected to the freeboard level, multiply FB by 0.75. If the community does not require that these facilities (including ductwork) be elevated or protected to or above the base flood elevation, there is no credit for FRB.

The NFIP rules require that the lowest floor of residential structures be elevated to or above the base flood elevation and that non-residential structures be elevated or floodproofed to or above the base flood elevation. Attached garages and utilities (including electrical, heating, ductwork, ventilating, plumbing, and air conditioning equipment) must also be protected to the base flood elevation (44 CFR 60.3(a)(3)). This can be done by elevating them or constructing them of flood-resistant materials.

A freeboard requirement adds height above the base flood elevation to provide an extra margin of protection to account for waves, debris, miscalculations, or lack of data. A freeboard requirement of 1 foot would require the same standards at 1 foot above the base flood elevation.

For CRS credit, freeboard must be applied not just to the elevation of the lowest floor of the building or to the elevation to which a non-residential building is dry floodproofed, 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 flood-damage-resistant materials. If the garage floor is below the freeboard level, the garage must meet the opening requirements for enclosures. Two references on these requirements are *Protecting Building Utilities from Flood Damage*, FEMA-348, and *Flood-Resistant Materials Requirements*, FIA-TB-2. Base flood and 500-year flood elevations can be found in the community's Flood Insurance Study profiles. More details about items 3–8 are provided below.

3. Detailed riverine flood studies that produce a floodway provide a flood elevation based upon the floodway encroachment. In a flood insurance study, these elevations are listed in the "With Floodway" column in the Floodway Data Table. They are

generally higher than the "Without Floodway" or "Regulatory" flood elevations. As noted in Section 431.a.3, if the community's ordinance requires that the building be protected to at least 1 foot above this encroached elevation, FB = 1.5, FRB = 150.

4. A community may use the actual height of the 500-year flood if it is at least 1 foot above the base flood elevation.

5. If the requirement is that the bottom of the floor joists, duct work, etc., be at least 1.0 feet above the base flood elevation, FB = 2, FRB = 200.

6. In AO Zones, base flood depths are provided instead of base flood elevations in relation to mean sea level. Where depths are not provided, the NFIP regulations require new buildings to be elevated 2 feet above the highest adjacent grade. Some communities misinterpret this requirement as 2 feet of freeboard. Elevating 2 feet above the base flood depth is a creditable freeboard requirement. Elevating 2 feet above the highest adjacent grade in an AO Zone where no base flood depth is provided is a minimum requirement of the NFIP and is not eligible for credit.

7. If the freeboard requirement does not affect all buildings, then the Option 2 or Option 3 impact adjustment must be used. For example, many ordinances require freeboard only where a base flood elevation is provided. Others only require freeboard for elevated buildings (non-residential buildings may be floodproofed to the base flood elevation without freeboard). Often the requirements for manufactured homes are in a different part of the ordinance and have different standards than other types of structures. If so, the community can either identify and measure the areas affected for Option 3 or use Option 2. Impact adjustments are discussed in Section 432.

8. Sections 60.3a(3)(ii) and (iv) of the NFIP regulations require that buildings "(ii) be constructed with materials resistant to flood damage" and "be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding."

   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 flooded. Flooded ductwork can add thousands of dollars to an insurance claim. This is primarily a concern for buildings on crawlspaces. Buildings on slab foundations, on pilings, and in V Zones normally have the utility facilities waterproofed or elevated high enough.

   Therefore, to receive full credit for this element, electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork) must be elevated or waterproofed to the base flood elevation plus freeboard. A community can receive 75% of the appropriate credit if it requires the utility facilities (including ductwork) to be elevated to or above the base flood elevation, but not necessarily to the freeboard level. If the utilities and ductwork are not required to be elevated, floodproofed, or otherwise protected to the base flood elevation, there is no credit for FRB. These alternatives are illustrated in Figure 430-1.

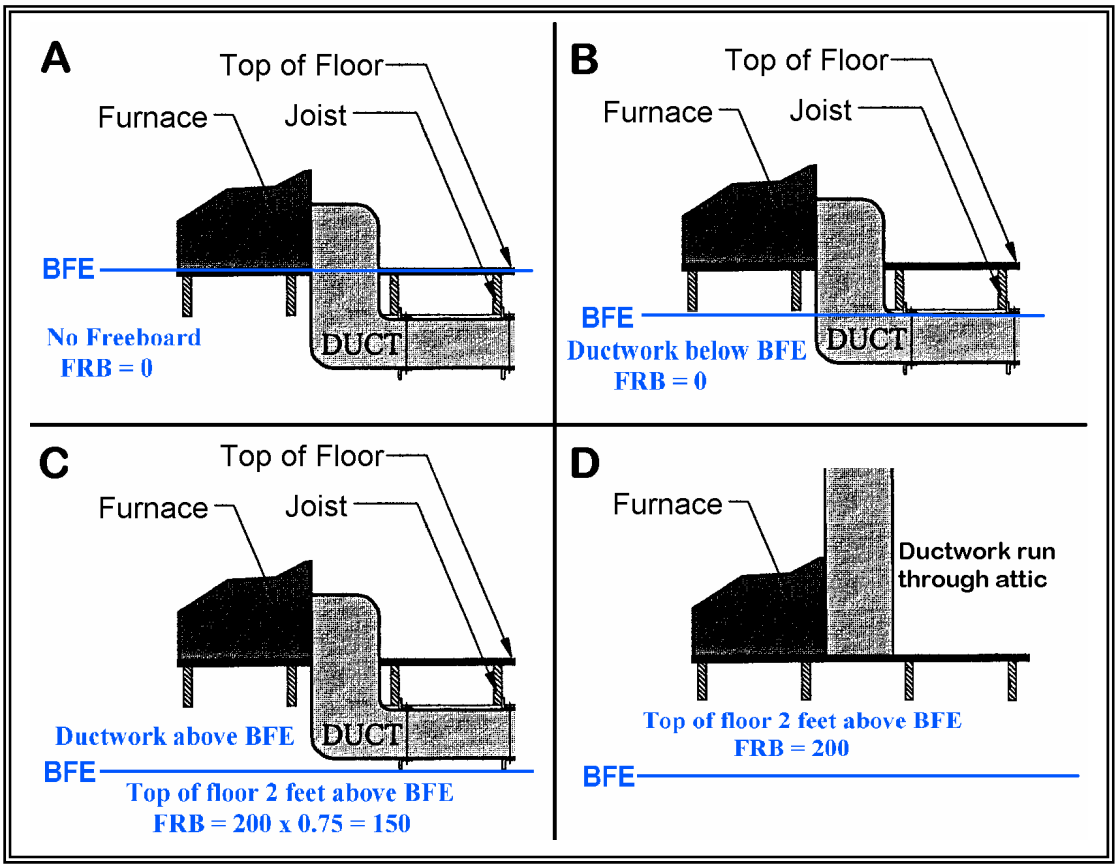


Figure 430-1. Adjusting freeboard credit based on the location of ductwork.

If the community has different freeboard standards in different areas, it may use the lowest value for FRB for all areas. This may eliminate the need for an Impact Adjustment Map and separate calculations for various values of FRB.

Example 431.a-1. Sample ordinance language could read:

a. "New construction or substantial improvement of any residential or non-residential structure shall have the lowest floor, including basement, together with attendant utility and sanitary facilities, elevated no lower than 18 inches above the base flood elevation." [FB = 1.5, FRB = 100 x 1.5 = 150]

b. "The Flood Protection Elevation is 2 feet above the base flood elevation as determined in the Flood Insurance Study and other floodplain studies. In areas of shallow flooding, it is 2 feet above the depth shown on the Flood Insurance Rate Map (FIRM)."

Instead of regulating to the "base flood elevation" the ordinance would regulate to the "Flood Protection Elevation." [FB = 2, FRB = 200]

c. "All structures, together with attendant utility and sanitary facilities, shall be elevated 2 feet above the 500-year flood elevation as determined in the Flood Insurance Study." [FRB = 300]

d. "Within areas of shallow flooding (Zones AO1 and AO2 on the FIRM), new construction or substantial improvement of any structure shall have the lowest floor, together with attendant utility and sanitary facilities, elevated no lower than 2 feet above the depth number." [FB = 2 + 2 = 4, FRB =300]

e. "All structures, together with attendant utility and sanitary facilities, shall be elevated 1 foot above the elevation of the 100-year flood with encroachments as determined by the Flood Insurance Study." [FB = 1.5, FRB = 150]

b. Foundation protection (FDN) (Maximum credit: 35 points). This credit is not available in V Zones because foundation protection is a minimum NFIP requirement in V Zones.

1. FDN = 35, if ALL new buildings must be constructed on foundations that are approved by a licensed professional engineer; OR

2. FDN = 35, if ALL new buildings must be constructed on properly designed and compacted fill (ASTM D-698 or equivalent) that extends beyond the building walls before dropping below the base flood elevation and has appropriate protection from erosion and scour. The fill design or the fill standard must be approved by a licensed professional engineer; OR

3. FDN = 20, if ALL new buildings built on fill must be

   (a) constructed on properly designed and compacted fill (e.g., ASTM D-698 or equivalent),

   (b) that extends at least five feet beyond the building walls before dropping below the base flood elevation, AND

   (c) the fill has appropriate protection from erosion and scour.

The three items for credit for FDN are mutually exclusive. The credit is for any one of the three approaches, not a combination or total of two or three of them.

Foundation protection may provide protection against differential settling as well as scour and erosion. An engineer's certificate is not needed for each structure if the community has adopted an engineered standard and requires compliance with that standard. ASTM (American Society for Testing and Materials) Standard D-698 requires compaction to 95% of the maximum density obtainable using the Standard Proctor Test method.

Under this element, 35 points are provided if all new buildings have engineered foundations. Twenty points are provided if new buildings that will be built on fill have specific standards for the compaction and design of the fill (and the community has no special standards for buildings that are not built on fill).

See also *Ensuring that Structures Built on Fill in or near Special Flood Hazard Areas are Reasonably Safe from Flooding*, FIA-TB-10, 2001 (also available from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) website at **http://www.fema.gov/pdf/fima/tb1001.pdf)**.

c. Cumulative substantial improvement rules (CSI) (Maximum credit: 110 points)

CSI is the total of the following points, not to exceed the maximum credit:

1. One of the following:

   (a) 45, if the regulations require that improvements, modifications, and additions to existing buildings are counted cumulatively for at least 10 years, or

   (b) 25, if the regulations require that improvements, modifications, and additions to existing buildings are counted cumulatively for at least five years.

2. One of the following:

   (a) 45, if the regulations require that reconstruction and repairs to damaged buildings are counted cumulatively for at least 10 years, or

   (b) 25, if the regulations require that reconstruction and repairs to damaged buildings are counted cumulatively for at least five years.

3. 20, if the community adopts regulatory language that qualifies properties for Increased Cost of Compliance insurance coverage for repetitive losses.

4. 20, if the regulations require that any addition to a building be protected from damage from the base flood.

The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements. Over the years, a community may issue a succession of permits for different repairs or improvements to the same structures. This can greatly increase the overall flood damage potential within a community as well as the insurance liability to FEMA.

This element provides credit to a community that ensures that the total value of all improvements or repairs permitted over the years does not exceed 50% of the value of the

structure. When the total value does exceed 50%, the original building must be protected according to the ordinance requirements for new buildings.

This element may require no specific ordinance language, but simply a policy decision to interpret the 50% improvement threshold as cumulative. In such cases, the documentation must include a legal opinion or directive from the community's legal counsel stating how the ordinance is to be interpreted. Either way, the community needs to maintain permit records by parcel number or address, so that the history of improvements or repairs to a particular structure is checked before the next permit is issued.

If a community does not regulate for cumulative substantial improvements, it may still receive credit for regulation of additions. Additions within the footprint of the original building would have to be to a floor above the base flood elevation. Additions outside the footprint of the original building would have to be elevated (or, for non-residential structures, floodproofed) above the base flood elevation.

d. Lower substantial improvement threshold (LSI) (Maximum credit: 90 points)

LSI credit is based upon the regulatory threshold. Use only one of the following:

1. 90, if the regulatory threshold is less than 10%;
2. 70, if the regulatory threshold is 10% to 24%;
3. 50, if the regulatory threshold is 25% to 39%;
4. 30, if the regulatory threshold is 40% to 44%;
5. 10, if the regulatory threshold is 45% to 49%; or
6. 20, if the regulatory threshold is no more than 25% of the bulk or square footage of the building's first floor.
7. If the lower substantial improvements threshold applies to EITHER improvements, modifications, and additions OR reconstruction and repairs, but not both, the value for LSI is multiplied by 0.5.

This element has the effect of requiring more structures to come into compliance after a disaster because damage repair is included in "improvements" under the NFIP rules. Since a community participating in the NFIP already has a threshold, it is only necessary to change the number specified in its ordinance or regulations. A community must be sure that a minimum threshold is not set by state law before it adopts a different standard.

Under some circumstances the NFIP flood insurance policy may pay a portion of the cost of bringing a substantially flood-damaged building into compliance with the community's

floodplain management ordinance. This Increased Cost of Compliance coverage is described in Figures 430-5a and b.

Example 431.d-1.

Watertown's ordinance has a section on protecting buildings from flood damage. It applies

a. When a new building is constructed,

b. When an existing building is substantially improved or substantially damaged, and

c. When an existing building is structurally altered such that the first floor area is increased by more than 20%.

Sections a and b are minimum requirements of the NFIP but Section c exceeds the NFIP criteria and will result in more buildings being treated as substantial improvements: LSI = 20.

e. Protection for critical facilities (PCF) (Maximum credit: 100 points)

For CRS credit purposes, critical facilities are defined in Section 130. Use either:

1. PCF = 100, where new critical facilities are prohibited from the 500-year floodplain; or

2. PCF = 50, where new and substantially improved critical facilities are required to be protected from damage and loss of access as a result of the 500-year flood or the flood of record, whichever is higher.

Note that credit is provided only if there is regulatory language that protects critical facilities. The fact that there are currently no critical facilities in the regulated floodplain may indicate community policy, but adopted regulations are required for PCF credit.

Requiring protection for critical facilities serves several purposes: it reduces damage to vital public facilities; it reduces pollution of flood waters by hazardous materials; and, most importantly, it ensures that the facilities will be operable during most flood emergencies.

To receive full credit for this element, the regulations must be enforced in the 500-year floodplain. On older FIRMs, the 500-year floodplain is shown as the SFHA plus the B Zone. The ordinance can simply specify the types of facilities prohibited from or protected within the A and B Zones. On newer FIRMs with AE and X Zones, the 500-year floodplain is shown as the SFHA plus the shaded X Zone. In either case, the 500-year flood elevation becomes the "flood protection elevation" for critical facilities. If the community enforces critical facility

protection regulations in only part of its flood hazard area, e.g., in the floodway or V Zone, the impact adjustment is based on the 500-year floodplain rather than aRF, the area of the regulatory floodplain.

f. Protection of floodplain storage capacity (PSC) (Maximum credit: 80 points)

PSC is EITHER:

1. 80, where regulations prohibit fill within floodplains or flood fringes, including construction of buildings on fill; OR

2. 70, where regulations require that new developments provide compensatory storage at hydraulically equivalent sites.

Credit is not provided for protection of storage capacity in floodways only. Credit is not provided in coastal floodplains.

Although a building built on fill and elevated above the base flood elevation meets the NFIP rules, filling a substantial portion of the floodplain reduces storage for flood water and tends to increase peak flows downstream. Prohibiting fill will reduce this problem, as will requiring the provision of a similar volume of compensatory storage if fill is placed in the floodplain.

Credit is not provided for protection of storage capacity in floodways only. The minimum NFIP requirement that nothing be allowed in floodways that will increase the flood elevation generally protects storage in floodways. This element is most effective in fringe areas. Similarly, credit is not provided in coastal floodplains where flood storage has no impact on flood heights.

Example 431.f-1. Sample ordinance language could read:

> Whenever any portion of a floodplain is authorized for use, the space occupied by the authorized fill or structure below the base flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood elevation. All such excavations shall be constructed to drain freely to the watercourse.
>
> PSC = 70

Example 431.f-2. Floodville's regulations prohibit fill in the floodplain.

PSC = 80

g. Natural and beneficial functions regulations (NBR) (Maximum credit: 40 points)

NBR is the total of the following points:

1. EITHER:

   (a) 10, where regulations prohibit ALL activities in the floodplain that may be hazardous to public health or water quality; OR

   (b) 5, where regulations prohibit one or two specific activities in the floodplain that may be hazardous to public health or water quality, such as sanitary landfills or septic systems.

2. 15, where regulations require new floodplain developments to avoid or minimize disruption to shorelines, stream channels, and their banks.

3. EITHER:

   (a) 15 for regulations adopted pursuant to a Habitat Conservation Plan or similar plan that has been credited under Section 511.b., OR

   (b) 10, for regulations that protect aquatic or riparian habitat from new development.

Public health regulations restrict activities in the floodplain that could harm the natural and beneficial functions of floodplains. Water quality is degraded and health hazards result when septic systems malfunction or when septic water and surface water mix during a flood.

Another approach that allows development but minimizes its impact is to prevent or minimize channel modifications and other disturbances to river, stream, or ditch channels and lake and ocean shores. A setback requirement that prevents development from an area adjacent to a channel or shoreline should receive additional credit under Activity 420 (Open Space Preservation).

Section 511.b in Activity 510 (Floodplain Management Planning) provides CRS credit for adopting a plan to protect threatened aquatic or riparian species. If the community receives credit for such a plan in Activity 510, and enacts development regulations recommended by that plan, it would receive the 15 points under Section 431.g.3.

Example 431.g-1. Floodville is concerned about the bottomland hardwood forest that is not in the City Park. To protect it, the City amended its ordinance to require a landscaping plan as a condition for a permit to construct, regrade, or otherwise develop in the bottomland. The landscaping plan is subject to approval by the City's Environment Conservation Commission before a permit is issued.

NBR = 15.

h. Enclosure limits (ENL) (Maximum credit: 300 points)

ENL is either:

1. 300, if regulations prohibit any building enclosures, including breakaway walls, below the base flood elevation; or

2. The total of the following points:

   (a) 100, if regulations prohibit enclosures of areas of 300 square feet or greater, including breakaway walls, below the base flood elevation. The area enclosed must still meet all NFIP requirements for openings, anchoring, and flood-resistant materials.

   (b) 50, if regulations require that the owner of a building sign a nonconversion agreement, promising not to improve, finish, or otherwise convert the area below the lowest floor and granting the community the right to inspect the enclosed area.

Regulations to limit enclosures below the base flood elevation have two objectives. First, they minimize a potential source for debris that may hit other buildings. Second, they discourage finishing the area below the base flood elevation and storing valuable or hazardous items in that area.

These regulations are particularly useful in V Zones and other coastal areas subject to wave damage and where flood depths result in the lowest floor's being 8 feet or more above grade. In the latter case, there is a tendency for the lower areas to be enclosed. Eventually, these enclosed areas are converted to bedrooms, family rooms, or other finished areas, in violation of floodplain management regulations. Breakaway walls are enclosures and must be prohibited in order to receive the 300 points under Option 1. Screening and open lattice-work are not considered enclosures.

The community may opt to enforce these enclosure limits only where the lowest floor is more than five feet above grade. Where the lowest floor is less than five feet above grade, a crawlspace with the proper openings may be more appropriate than an open area elevated on columns or piles. With less than five feet in height, the lower area is not likely to be improved or modified into a livable space and the enclosure limits are not needed.

Under a nonconversion agreement, the owner agrees to not modify the enclosed area to make it more susceptible to flood damage. Because this area is not visible from the street, the agreement must also allow the community the right to enter the property and inspect the inside of the enclosure periodically. An example nonconversion agreement appears as Figure 430-6. As with all legal documents, the community should have such an agreement approved by its attorney before it is used.

If the community also requires that the nonconversion agreement be filed with the deed and other property records, it would receive credit under Activity 340 (Hazard Disclosure), Section 341.b, other disclosure requirements (ODR).

i. Other higher standard (OHS) (Maximum credit: 100 points)

OHS = up to 100 points for higher regulatory standards that prevent flood losses or protect natural and beneficial floodplain functions that are not otherwise credited in another element. The community's regulatory language is reviewed by FEMA to determine the credit points.

This element provides CRS credit for regulatory approaches and standards that are not addressed in the other elements of this or other activities. Each submittal for credit is individually reviewed and scored. Examples of possible submittals include, but are not limited to:

- Prohibiting floodproofing as a flood protection measure for any new building (i.e., requiring all new buildings, including non-residential buildings, to be elevated);
- Requiring new streets in the floodplain to be at or above the base flood elevation to provide access for emergency vehicles during a flood; and
- Requiring all new multi-family and commercial buildings to provide access to dry land.

j. Land development criteria (LD) (Maximum credit: 700 points)

Credit for land development criteria and low density zoning is described in Section 430LD. The credit points, cLD, are added to the other elements in Activity 430.

Example 431.j-1. As explained in the examples in Section 430LD, Watertown receives credit for its floodplain protection and zoning regulations. The credit, cLD = 160.95, is added to the scores for the other elements.

k. Special hazards regulations (SH) (Credit points vary.)

Credit for regulating areas subject to special flood-related hazards is described in the separate publications on special hazards.

The CRS encourages communities to devote special attention to areas affected by the special flood-related hazards listed in Section 401. Communities affected by one or more of these hazards must obtain a copy of the appropriate publication (see Appendix E), which shows how to increase credit points for regulating development in areas affected by these special hazards.

Example 431.k-1. Floodville manages Foster Creek's 500-year floodplain for ice jam hazards. Using the publication *CRS Credit for Management of Ice Jam Hazards*, it determines its credit . As explained in the example in that publication, cSH = 16.92.

l. State-mandated regulatory standards (SMS) (Maximum credit: 45 points)

SMS = the sum of the following:

1. Floodplain management regulatory standards (maximum credit: 25 points):

   0.1 x the equivalent credit for each state-mandated regulation credited in the 400 series of CRS activities.

2. Insurance agent training (maximum credit: 20 points):

   (a) 5, if the state mandates that property insurance agents must attend at least one hour of training per year on flood insurance as a condition of obtaining or maintaining their license.

   (b) 10, if the mandate is for two hours of flood insurance training.

   (c) 20, if the mandate is for three or more hours of flood insurance training.

This element recognizes the benefit received by the NFIP for a state-required measure that is implemented in both CRS and non-CRS communities in that state. State-mandated regulations also benefit from better staff training and state oversight than other regulatory provisions.

A community should contact the ISO/CRS Specialist to obtain its SMS credit. The credit may apply differently to different communities within a state, depending on the requirement. For example, only coastal communities receive SMS credit for a state requirement for a coastal setback line.

Each submittal for credit is individually reviewed and scored with a value of 1 to 25 points. There is no credit if the activity is not verified locally. Examples of possible submittals include, but are not limited to:

- State-mandated freeboard,
- State floodway mapping standards, and
- State coastal setback regulations.

Example 431.l-1. Floodville's state requires a floodway mapping standard of a 0.5-foot allowable surcharge and Floodville's floodways were calculated to this standard. The equivalent credit for this under Activity 420 (Additional Flood Data), Section 411.c, More Restrictive Floodway Standard (FWS), is 100 points.

SMS = 0.1 x 100 = 10

m. Building code (BC) (Maximum credit: 190 points)

BC = the sum of the following. These credits are reduced if the community adopts only parts of each code or if the community adopts a stand-alone floodplain management ordinance instead of adopting the flood provisions (including ASCE 24) of the International Code Series (I-Codes).

1. 15 x (7 - BCEGS) where BCEGS is the class attained by the community under the Building Code Effectiveness Grading Schedule. There is no credit for BCEGS classes 7, 8, 9, or 10.

2. Up to 100 points for adopting a complete set of the codes. This credit is the sum of the following points:

   (a) 40, if the community has adopted the current edition of the International Building Code, the National Fire Protection Association's Building Construction and Safety Code (NFPA 5000), or their equivalent;

   (b) 40, if the community has adopted the current edition of the International Residential Code, the National Fire Protection Association's Building Construction and Safety Code (NFPA 5000), or their equivalent;

   (c) 20, if the community has adopted the current edition of all of the following codes (or their equivalent):

   (1) International Plumbing Code or Uniform Plumbing Code,
   (2) International Mechanical Code or Uniform Mechanical Code,
   (3) International Fuel Gas Code , and
   (4) International Private Sewage Disposal Code.

Even though a CRS community has been deemed to be in full compliance with the NFIP, it may not have a building code. Many communities meet their NFIP obligations through a stand-alone ordinance that may be administered by the zoning, planning, engineering, or other office, separate from the building department. A floodplain management program can work without a code, but implementation may not be as effective.

Coordinating floodplain management with a local building code has several advantages, which are summarized in Figure 430-2. Because of these advantages, the CRS provides credit for building codes in two ways: crediting the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and recognizing those communities that have adopted the current editions of the appropriate codes.

BCEGS: A community must adopt and enforce a building code to qualify for a CRS class 7 or better (see Sections 211.b and c). The BCEGS, developed and operated by the Insurance Services Offices, Inc. (ISO) assesses the building codes in effect in a community and how a community enforces them, with special emphasis on mitigation of losses from natural disasters.

The insurance industry began the BCEGS project after determining that the catastrophic losses from Hurricane Andrew were compounded by poor building code enforcement. The insurance goal is that the prospect of lessening catastrophe-related damage (and ultimately lower insurance costs) provides an incentive for communities to enforce their building codes more rigorously.

In its BCEGS program, ISO assigns each community a grade of 1 (best) to 10 (no recognized program). Ratings are based on community answers to an extensive mailed questionnaire and a follow-up community verification visit with the cognizant building department by ISO.

BCEGS ratings are provided for all communities that do code enforcement, whether it be for themselves or for smaller jurisdictions. When a smaller community's code enforcement program is administered by a larger jurisdiction, the smaller community will receive the larger jurisdiction's classification.

There are two ratings for each jurisdiction, personal (residential) and commercial. If they are different, the CRS prerequisite and this element's credit are based on the higher number of the two ratings. For example, if a community has a class 6 residential BCEGS rating and a class 5 commercial, the CRS considers it a class 6 BCEGS community.

Under this element, the credit for BC is determined by subtracting the BCEGS class from 7 and multiplying the result by 15. There is no credit for BCEGS classes 7, 8, 9, or 10. For example, if a community has a BCEGS class 4, BC = 15 x (7 - 4) = 15 x 3 = 45.

Interfaces between Building Codes and Floodplain Management

Permits. The building code is a built-in measure to assure that permits are obtained for structures. The code can also extend to permits for "other development," such as requiring permits for grading, paving, and excavation. In the absence of an "automatic" building permit requirement, it is often difficult for people to know they are in the floodplain, thereby triggering a floodplain permit. The code requirement process especially helps capture any rehabilitation, addition, or other improvement, especially in the case of older buildings, as it relates to substantial improvement requirements to elevate floodplain buildings.

Inspections. A separate floodplain management ordinance may specify a staff of floodplain inspectors. However, experience has shown this kind of staff, unless specially trained, would not necessarily be qualified to assess building practices. A building code usually requires certain mandatory kinds of inspections that dovetail with inspections for flood purposes (e.g., at the time of a foundation inspection, which is quite routine per a building code, elevation certifications can be required before further construction proceeds). The trained eyes of a building inspector are a definite advantage when looking for construction methods and materials to reduce flood losses, as is required in the NFIP.

Permits for Other Development and Inspector Observations. Although building codes do not necessarily regulate "other development," such as grading, paving, or excavation that can result in increased flood losses, the presence of trained building inspectors in the field, who can observe all development, is effective in identifying such activities so that action can be taken if needed. Any local floodplain management program that does not have the benefit of regular building inspectors would have to establish a comparable field presence.

Post-Flood Inspections. After a flood, there is a strong desire to rebuild. Communities with a building code and inspectors are generally better able to enforce the permit requirement for damaged buildings in the floodplain.

Floodplain Management Requirements. A number of NFIP floodplain management requirements relate to how a building is constructed and what materials are to be used. These areas of construction are normally governed by building codes. Examples include constructing buildings with foundations that are anchored to resist flotation, collapse, or lateral movement; use of flood-resistant materials; placement of utilities and mechanical equipment; and special construction requirements in V Zones. Having a building code in place will help ensure that these requirements are properly implemented.

Special Certifications. Without the expertise of building inspectors, it is much more difficult for a community to review special construction-related certifications that are required in the NFIP. These include floodproofing certifications, certifications of lowest floor elevations (or lowest horizontal structural members in V Zones), certifications for openings that are designed differently from minimum NFIP criteria, design and methods of construction of pile and column foundation elements in V Zones, and breakaway walls in V Zones when the design strength exceeds minimum criteria.

Construction Quality. In the absence of a building code, there is no assurance that buildings placed in floodplains, even though elevated, will survive. Buildings that are improperly constructed in floodplains can be subject to significantly more damage than those built to code. Use of improper materials, unsafe foundations, and inadequate connections are examples of causes for possible failures. The increased damage will often be paid for either through insurance or disaster aid, thereby working contrary to good mitigation practices and to CRS principles.

Existing Buildings. Building departments routinely handle permits for existing buildings, yet planning and zoning departments, which are often responsible for administering community floodplain management ordinances, rarely deal with proposals to modify sites that are already developed. This has been known to lead to gaps in enforcement of the substantial improvement and substantial damage requirements of the NFIP.

Figure 430-2. Interfaces between building codes and floodplain management.

If a community is in a state that has does not have a formal BCEGS program, a courtesy review may be conducted to obtain an equivalent BCEGS class for CRS purposes. More information on BCEGS can be obtained from ISO through the ISO/CRS Specialists listed in Appendix G.

Example 431.I-1. Floodville has kept its building code current. Its BCEGS class is 4 commercial and 5 residential. The 5 is used for CRS credit:

BC = 15 x (7 - 5) = 15 x 2 = 30

I-Codes: 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 these codes and 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 a companion ordinance or regulation.

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

Because of the advantages of incorporating the I-Codes into the community's floodplain management program and addressing other hazards, the CRS provides up to 100 points for adoption of the complete series. To receive full credit, the entire code must be adopted by the community.

If the following sections are not adopted or are adopted with amendments, the language will be reviewed to determine the credit:

- International Building Code: Chapters 3−7, 14−18, and 21−24.
- International Residential Code: Chapters 3−6, 8, and 9.

In some states, communities are required to adopt state codes or state versions of the I-Codes. In those cases, the provisions of the mandated code will be compared to the I-Codes and scored appropriately.

For more information on the links between the I-Codes, the NFIP, and CRS credit, see *Reducing Flood Losses Through the International Code Series*.

NFPA 5000: The same provisions apply to the NFPA codes. If they are adopted with amendments, the language will be reviewed to determine the credit.

n. Staffing (STF) (maximum credit: 50 points):

1. STF = 50, if all staff involved in reviewing plans and issuing permits for floodplain development and conducting field inspections are Certified Floodplain Managers (CFMs); OR

2. STF = 25, if all proposed development projects in the floodplain and all final inspections and project approvals are reviewed and approved by a CFM; OR

3. STF = 5, for each CFM or graduate of an approved course on managing floodplain development through the NFIP employed in the office that regulates floodplain development. The maximum credit for this item is 25 points. If a CFM also graduated from the NFIP course, it is counted once as 5 points.

The Association of State Floodplain Managers (ASFPM) and several states have created floodplain manager certification programs with requirements similar to the EMI course graduation criteria. More points are provided if the staff person has been certified by ASFPM (or by a state certification program that has been accredited by ASFPM) because the staff must fulfill a continuing education requirement to maintain their certification.

Credit under Sections 431.n.1 and 431.n.2. is dependent on the CFMs' being directly involved in permit review. A CFM must review each project in the floodplain before it is permitted and must conduct an inspection or review inspection reports after the project is completed (e.g., before a certificate of occupancy is issued). The CFM may be a consultant or employee of a regional agency. The credit is provided as long as no new floodplain development project is used or occupied without the review and approval of a CFM.

If the head of the regulatory office is (1) responsible for all permits issued, (2) is a CFM, and (3) establishes procedures that ensure that all floodplain development projects are properly constructed, then the community would qualify for the 25 points under Section 431.n.2. Otherwise, if some members of the regulatory staff are CFMs, but some floodplain development projects are approved by non-CFMs, then 5 points are provided for each CFM on staff.

This credit will be removed if the staff person leaves the community or does not maintain his or her certification.

Five credit points are provided under this element if the staff responsible for floodplain permits have graduated from the "Managing Floodplain Development through the National Flood Insurance Program" course at the Emergency Management Institute (EMI), the four- or five-day field-deployed version of this course, the home study version, or other equivalent training. If a CFM also graduated from the NFIP course, it is counted once as 5 points.

Coastal communities' staff may be credited for graduating from the EMI course "Residential Coastal Construction" or the four- or five-day field-deployed version. The credit for training is based on the number of courses taken. If two people take the "Managing Floodplain Development" course, the community receives 10 points, the same credit provided if one person took both the "Managing Floodplain Development" and "Coastal Construction" courses. If a CFM took the Coastal Construction course, it is worth 10 points. More information on EMI courses can be found in Section 435.

The maximum credit under Section 431.n.3 is 25 points for any combination of CFMs or EMI course graduates. The only way to get more than 25 points under this element is if all regulatory staff are CFMs.

If the community is seeking credit for having the person responsible for floodplain permits graduated from EMI's floodplain management course, a copy of the certificate of graduation must be provided. It should be noted that an EMI certificate of ATTENDANCE is not sufficient. An EMI CERTIFICATE OF GRADUATION is provided only if the student passed the final examination.

Example 431.n-1: Someburg has one person handling all floodplain management activities. That person becomes and stays certified: 50 points.

Example 431.n-2: Gulf Beach County has five people involved in building and development permitting. Two are certified and one of the others has been to the EMI coastal construction course. Procedures require that one of the CFMs review all proposed projects in the SFHA and review the final inspection report before a certificate of occupancy is issued. The score would be 25 + 5 for the two CFMs and 5 for the EMI graduate. The community would receive 25 + 5 + 5 = 35 points.

o. Manufactured home parks (MHP) (Maximum credit: 50 points)

1. Prerequisites:

   (a) The community has one or more existing manufactured home parks or subdivisions in its regulatory floodplain.

   (b) Base flood elevations are greater than three feet deep in the parks or subdivisions.

2. MHP = 50, if regulations require that new and replacement manufactured homes placed in existing manufactured home parks or subdivisions be properly anchored and elevated to or above the base flood elevation plus any required freeboard.

An "existing manufactured home park or subdivision" is a park or subdivision that was established before the adoption of floodplain management regulations by the community. The NFIP regulations (44 *CFR* 60.3(c)(12)) allow communities to site manufactured homes in existing manufactured home parks or subdivisions on reinforced piers or other foundation elements that are not less than 36 inches above grade. In some cases this results in manufactured homes elevated above the base flood elevation, but where flooding is deeper than three feet, it exposes them to substantial damage.

This element credits regulations that do not differentiate between manufactured homes and conventional "stick built" buildings or between existing and new manufactured home parks and subdivisions. However, the prerequisites limit this credit to those communities that have existing manufactured home parks where the base flood is greater than three feet deep. In other words, the credit is limited to those communities where these regulations will have an impact. Because of this, there is no impact adjustment for this element.

This ordinance language was a requirement of the NFIP before 1989. When communities were given the option of the 3-foot standard, many kept the higher standard and did not revise their regulations. The creditable language is also included in the new International Building Code. Therefore, it is possible that a community's current ordinance already has the language that is credited by this element.

p. Coastal AE Zones (CAZ) (Maximum credit: 650 points)

1. Prerequisites:

   (a) The community must have a coastal floodplain on the Atlantic, Gulf of Mexico, Pacific, or Great Lakes coasts.

   (b) This credit is not available in a V Zone because it credits regulatory standards that are minimum NFIP requirements for V Zones.

   (c) The community must map or otherwise designate its coastal AE Zone. The coastal AE Zone is the coastal SFHA that is not mapped as V Zone. A community may declare all of its coastal SFHA inland from the V Zone as coastal AE Zone (as may be the case for a barrier island) or it may use some other standard, such as identifying all areas where breaking waves are higher than one foot.

2. The credit for this element is in addition to the community's credit for enclosure limits (ENL) under Section 431.h.

   CAZ = the total of the following points:

   (a) 500, if all new buildings in the coastal AE Zone must meet the requirements for buildings in V Zones and for openings in A Zones (44 *CFR* 60.3(e) and 60.3(c)(5)). If only some of the V-Zone regulations are enforced in the coastal AE Zone, the points are prorated according to the following schedule:

(1) 225, if all of the following V-Zone foundation standards (found in 44 *CFR* 60.3(e)) are required by the community:

(a) New construction and substantial improvements are elevated on piles and columns (§60.3(e)(4));

(b) The pile or column foundation and the structure attached thereto are anchored to resist floatation, collapse, and lateral movement due to the effects of wind and water loads (§60.3(e)(4)(ii));

(c) New construction and substantial improvements have the space below the lowest floor free of obstruction or enclosed with non-supporting breakaway walls, open wood lattice work, or insect screening (§60.3(e)(5)), and have openings (§60.3(c)(5)); and

(d) Use of fill for structural support is prohibited (§60.3(e)(6)).

(2) 100, if the bottom of the lowest horizontal structural member and the electrical and mechanical equipment servicing the building must be elevated to or above the base flood elevation (§60.3(e)(4)(i));

(3) 125, if a registered professional engineer or architect must develop or review the structural design, specifications, and plans and certify that the designs and methods of construction to be used meet accepted standards of practice for meeting the provisions of §60.3(e)(4)(ii) and breakaway walls (§60.3(e)(5)).

(4) 25, provided all new construction is located landward of the reach of mean high tide (§60.3(e)(3)). These points are available only if the designated area includes shoreline).

(5) 25, if the community prohibits the human alteration of ANY sand dunes or mangroves that would increase flood damage (§60.3(e)(7)). These points are available only if the designated areas include sand dunes or mangroves.

(b) EITHER

(1) 150, if regulations prohibit any building enclosures, including solid breakaway walls, below the base flood elevation; OR

(2) 50, if regulations prohibit enclosures of areas of 300 square feet or greater, including breakaway walls, below the base flood elevation. The area enclosed must still meet all NFIP requirements for openings, anchoring, and flood-resistant materials.

FEMA has concluded that its criteria for construction in A Zones do not provide adequate protection in coastal AE Zones subject to wave effects, velocity flows, erosion, scour, or combinations of these forces. Wave tank studies conducted by FEMA show that breaking waves less than the 3-foot criterion used to designate VE Zones can cause considerable damage. Post-disaster evaluations and insurance claims data also support this conclusion, particularly for those buildings with enclosures below the elevated floor. FEMA's new *Coastal Construction Manual* strongly encourages use of some or all of the VE Zone construction methods in coastal AE Zones, depending on the hazard.

Credit under Section 430.p.2(a)(2) can be given where the top of the lowest floor is used as the reference point and the community regulations require two or more feet of freeboard in the coastal AE zone. However, a community cannot receive both freeboard (FRB) and CAZ credit for the same two feet of freeboard. To receive freeboard credit the community would need to prorate the credit for freeboard greater than two feet for the area in the regulated coastal AE Zone.

This element has an impact adjustment. Therefore, coastal communities can only receive the maximum 650 points if their entire regulatory floodplain (aRF) is treated as a VE Zone.

Example 431.p-1. Gulf Beach County's floodplain regulations state that all lands seaward of the Coastal Highway shall be considered V Zones for building protection purposes. It also states that no new buildings or substantial improvements seaward of the Coastal Highway shall have enclosures below the level of the base flood elevation plus two feet.

CAZ = 500 + 150 = 650.

Note that the credit for CAZ will be multiplied by the impact adjustment so the final credit (cCAZ) will reflect how much of the County's regulatory floodplain is affected by these regulations.

432 Impact Adjustment

The area affected by a regulatory standard must exclude areas designated as open space that are receiving OS credit under Activity 420 (Open Space Preservation). There is no impact adjustment for the following elements:

Section 431.l State-mandated regulatory standards (SMS)

Section 431.m Building code (BC)

Section 431.n Staffing (STF)

Section 431.o Manufactured home parks (MHP)

The impact adjustment for Section 431.e, protection of critical facilities (PCF), is based on the area of the 500-year floodplain.

a. Option 1:

1. If new development within the entire area of regulated floodplain (aRF) is regulated by an element, and no credit was requested for OS in Activity 420, the impact adjustment ratio for that element = 1.0 (rXXX = 1.0).

2. If new development within the entire area of regulated floodplain (aRF) is regulated by an element, and credit was requested for OS in Activity 420, the impact adjustment ratio for that element = 1.0 - rOS (rXXX = 1.0 - rOS).

The elements in this activity are usually implemented throughout the floodplain. Where this is the case, the community should use Option 1. Unless the community has applied for credit under Activity 420 (Open Space Preservation), the applicant can fill in the blanks on the activity worksheet for the "r" variables with "1.0." If the community requested credit for OS in Activity 420, the impact adjustment ratios under Option 1 are reduced by rOS.

Note that some elements are not enforced throughout the floodplain or for all types of development. For example, there is no credit for protecting storage capacity (PSC) in V Zones and some ordinances do not require freeboard (FRB) for floodproofing nonresidential buildings. In these cases, Options 2 or 3 must be used.

Example 432.a-1.

1. Watertown enforces its lower substantial improvement threshold (LSI) throughout its regulatory floodplain. Watertown did not apply for open space preservation credit under Activity 420. Under Option 1, rLSI = 1.0.

2. Floodville enforces its regulation to preserve storage capacity (PSC) throughout its regulatory floodplain. Floodville applied for open space preservation credit under Activity 420. As shown in the example in Section 422.c, rOS = 0.22. Under Option 1, rPSC = 1.0 - rOS = 1.0 - 0.22 = 0.78.

b. Option 2:

1. If new development within part of the area of regulated floodplain (aRF) is regulated by an element, default values of 0.25 may be used for the impact adjustment ratios (rXXX = 0.25).

2. For coastal AE Zone credit (CAZ), under option 2, rCAZ = 0.1.

Where the standard is enforced in only some of the regulatory floodplain, the community must use either Option 2 (the default value) or Option 3. The community may use Option 2 if it results in more points than Options 1 or 3 (e.g., if more than 75% of the regulatory floodplain is preserved as open space, rOS > 0.75 and Option 2 would provide more credit than Option 1).

Example 432.b-1. Someburg has some open space and requires freeboard only for residential buildings. Rather than prepare an Impact Adjustment Map, Someburg uses Option 2 for Activity 430:

rFRB = 0.25

c. Option 3:

The impact adjustment ratio for each element is computed by dividing the area affected by the area of the regulatory floodplain (aRF).

1. $rFRB = \frac{aFRB}{aRF}$ 2. $rFDN = \frac{aFDN}{aRF}$ 3. $rCSI = \frac{aCS\ I}{aRF}$

4. $rLSI = \frac{aLSI}{aRF}$ 5. $rPCF = \frac{aPCF}{a500}$, where a500 = the area of the 500-year floodplain

6. $rPSC = \frac{aPSC}{aRF}$ 7. $rNBR = \frac{aNBR}{aRF}$ 8. $rENL = \frac{aENL}{aRF}$

9. $rOHS = \frac{aOHS}{aRF}$ 10. $rCAZ = \frac{aCAZ}{aRF}$

The area affected by a regulatory standard must exclude areas designated as open space that are receiving OS credit under Activity 420 (Open Space Preservation).

If Option 3 is used, each variable for which credit is requested must be appropriately designated on the Impact Adjustment Map described in Section 403. In many communities, these regulatory standards will be applicable throughout the community's floodplains, so a note on the key will be adequate.

Where an element applies differently to different areas, the impact adjustment ratios for each area must be computed separately.

Example 432.c-1. See Figure 430-3. Floodville's regulation requiring a landscaping plan is only in effect in the bottomland portion of the floodplain. The bottomlands are marked "NB" in the City's park where they receive open space credit.

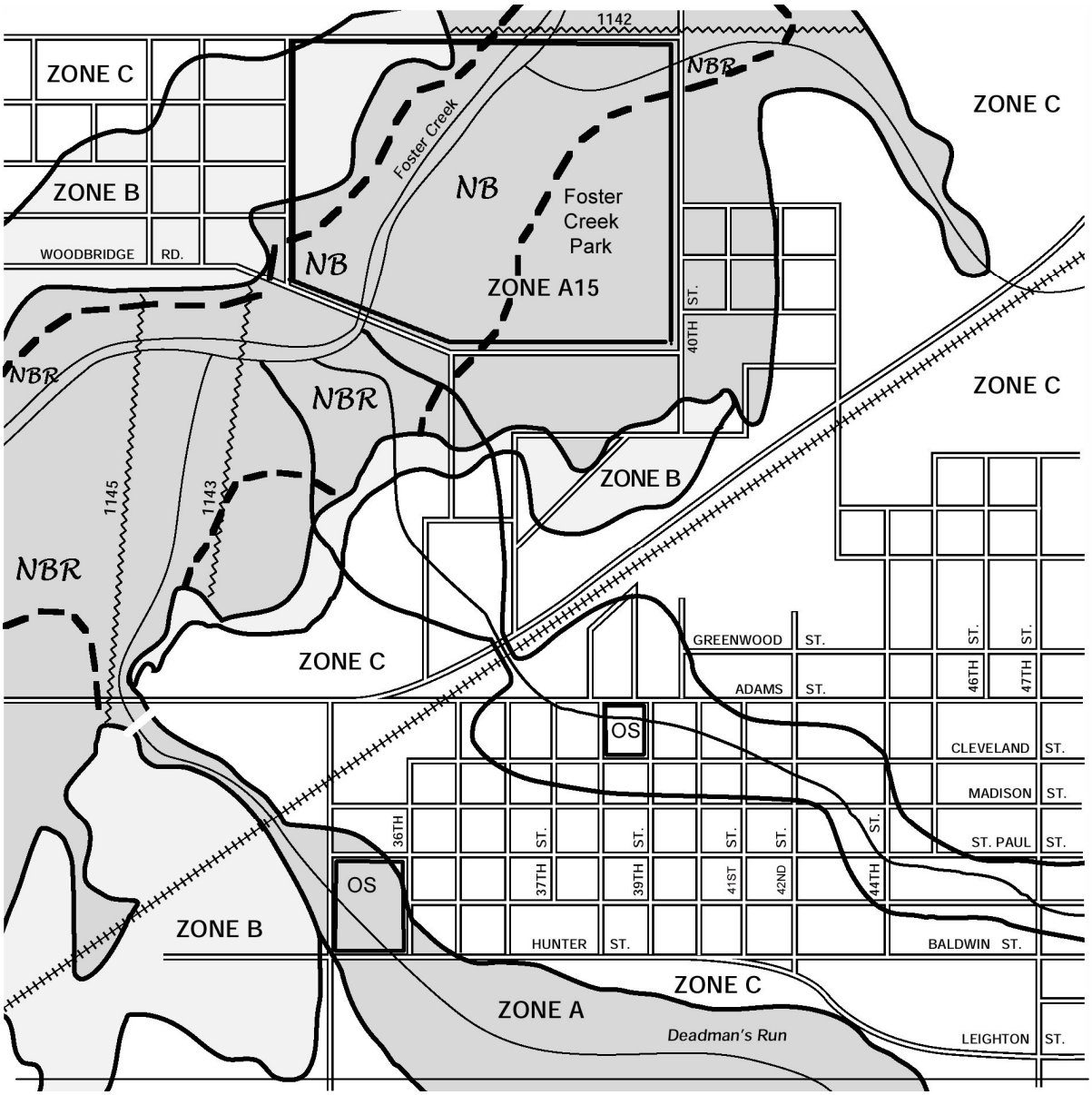
They are marked "NBR" outside of the park where future development is subject to the regulation. The area of the bottomlands outside of the park, aNBR, is 91 acres.

$$rNBR = \frac{aNBR}{aRF} = \frac{91}{396} = 0.23$$

If Floodville used Option 2, rNBR = 0.25 - (0.25 x rOS) = 0.25 - (0.25 x 0.22) = 0.25 - 0.06 = 0.19. rNBR will be smaller under Option 2, so Floodville uses Option 3, and rNBR = 0.23.

Example 432.c-2. See Figure 430-4. Watertown requires 2 feet of freeboard (FRB2) in the Riley River floodplain. This is the entire mapped regulatory floodplain, so aFRB2 = aSFHA = 0.43 square miles. The City requires 1 foot of freeboard on the tributaries. These are marked FRB1 on the Impact Adjustment Map. aFRB1 = 0.09. aRF for Watertown = 0.52.

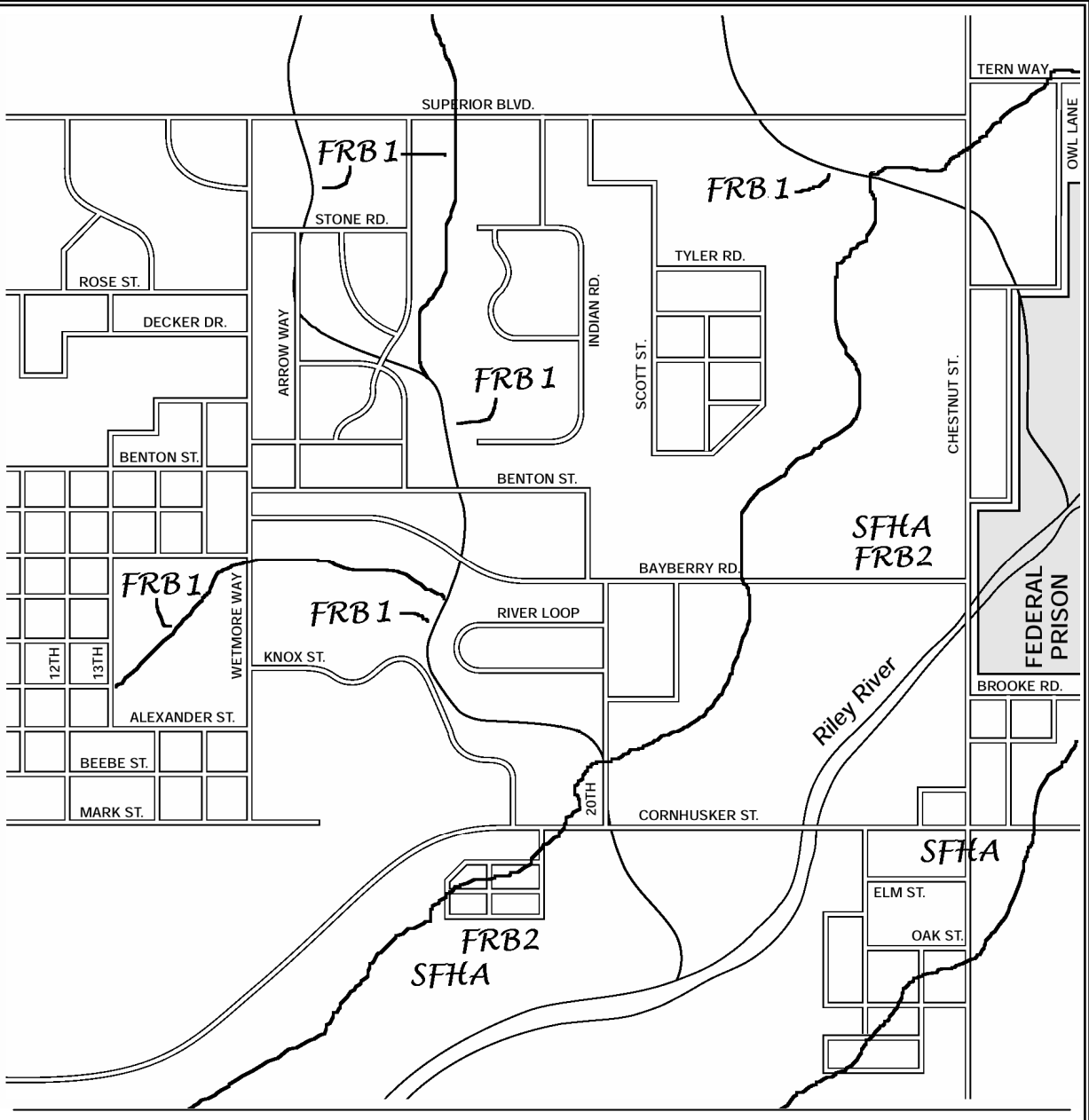
$$rFRB2 = \frac{aFRB2}{aRF} = \frac{0.43}{0.52} = 0.83 \qquad rFRB1 = \frac{aFRB1}{aRF} = \frac{0.09}{0.52} = 0.17$$



Impact Adjustment Map

Area	Size (acres)	Notes
aRF	396	Foster Creek, Deadman's Run and problem ditch floodplains
aNBR	91	Foster Creek bottomlands outside of park

Figure 430-3. Floodville's Impact Adjustment Map.



Impact Adjustment Map

Area	Size (sq. miles)	Notes
aFRB1	0.09	1 foot freeboard
aFRB2	0.43	2 feet freeboard
aRF	0.52	All floodplains draining ≥ 40 acres

Figure 430-4. Watertown's Impact Adjustment Map.

433 Credit Calculation

a. cFRB = FRB x rFRB

b. cFDN = FDN x rFDN

c. cCSI = CSI x rCSI

d. cLSI = LSI x rLSI

e. cPCF = PCF x rPCF

f. cPSC = PSC x rPSC

g. cNBR = NBR x rNBR

h. cENL = ENL x rENL

i. cOHS = OHS x rOHS

j. cLD = c430LD from Section 434LD

k. cSH = cSH from Section 434SH

l. cSMS = SMS

m. cBC = BC

n. cSTF = STF

o. cMHP = MHP

p. cCAZ = CAZ x rCAZ

q. c430 = cFRB + cFDN + cCSI + cLSI + cPCF + cPSC+ cNBR + cENL + cOHS + cLD + cSH + cSMS + cBC + cSTF + cMHP + cCAZ

Example 433-1. Floodville's values for higher regulatory standards are zero except for the following:

cPSC = PSC x rPSC = 80 x 0.78 = 62.4.

cNBR = NBR x rNBR = 15 x 0.23 = 3.45

cSMS = SMS = 10

cBC = BC = 30

cSH = 16.92 (from example in Section 434SH in *Special Hazards Supplement to the CRS Coordinator's Manual*)

c430 = cFRB + cFDN + cCSI + cLSI + cPCF + cPSC + cNBR + cENL + cOHS + cLD + cSH + cSMS + cBC + cSTF + cMHP + cCAZ

= 0 + 0 + 0 + 0 + 0 + 62.4 + 3.45 + 0 + 0 + 0 + 16.92 + 10 + 30 + 0 + 0 + 0 = 122.77, which is rounded to 123.

During the verification visit, the ISO/CRS Specialist reviews a sample of 10 recent developments and discovers that one of the 10 received a variance from the PSC requirement. Credit for PSC is reduced by 1/10 from 80 to 72. The Specialist also noted that the value for rOS was changed from 0.22 to 0.21 when Activity 420 was verified. This increases the value for rPSC from 0.78 to 0.79. Floodville's verified credit for cPSC = 72 x 0.79 = 56.88.

c430 = 0 + 0 + 0 + 0 + 0 + 56.88 + 3.45 + 0 + 0 + 0 + 16.92 + 10 + 30 + 0 + 0 + 0 = 117.25, which is rounded to 117.

Example 433-2. See Figure 430-4 for Watertown. Watertown's values for higher regulatory standards are zero except for the following:

cFRB = cFRB1 + cFRB2 = (100 x 0.17) + (200 x 0.83) = 17 + 166 = 183.

cLSI = LSI x rLSI = 20 x 1.0 = 20

Watertown has credit for land development criteria and two areas of low density zoning in the Riley River floodplain. cLD = 217 (from example in Section 433LD).

c430 = cFRB + cFDN + cCSI + cLSI + cPCF + cPSC + cNBR + cENL + cOHS + cLD + cSH + cSMS + cBC + cSTF + cMHP + cCAZ

c430 = 183 + 0 + 0 + 20 + 0 + 0 + 0 + 0 + 0 +217 + 0 + 0 + 0 + 0 + 0 + 0 = 420

During the verification visit, the ISO/CRS Specialist examines samples of building permits and areas of low density zoning. There are apparently no variances to the FRB or LSI requirements or the low density zoning.

434 Credit Documentation

The community must submit the following:

a. The state or local law or ordinance language that adopts the regulatory standard. The appropriate acronym(s) (FRB, FDN, etc.) must be marked in the margin of the sections of the ordinance that apply to this activity. For CRS credit, the regulatory language must be adopted and in full force at the time of application for CRS credit.

A photocopy of the appropriate pages of the ordinance is sufficient and should be attached to the activity worksheet. The CEO's certification is considered to include a certification that the ordinance or statute has been enacted and is being enforced (see Section 212.a).

The community must have the following documentation available to verify implementation of this activity:

b. [If the community determines impact adjustment ratios using Option 3 (Section 432.c)] The Impact Adjustment Map prepared in accordance with Section 403. Each area for which an impact adjustment ratio is calculated must be designated on the Impact Adjustment Map and in the map's key.

c. An explanation of the procedures followed for enforcement of the regulatory standard and copies of relevant permit records.

d. [If applying for credit for staffing under Section 431.n] A copy of the certificate of graduation or floodplain manager certification must be provided.

For freeboard (FRB), the community should explain its general building permit inspection process, demonstrating that this process ensures that structures are actually protected to the level required by the ordinance. Relevant permit records would include elevation certificates and floodproofing certificates that show the level to which the building is protected.

For cumulative substantial improvements (CSI), the community must demonstrate that its permit process tracks permits for a structure to ensure that the regulatory requirement is met.

435 For More Information

Additional information, reference materials, and examples can be found at the CRS Resource Center at **http://training.fema.gov/EMIWeb/CRS/**.

a. Most state NFIP coordinating offices have prepared model ordinances with provisions that exceed the minimum NFIP standards. Additional help on regulatory provisions may be available from state planning or community affairs agencies and regional planning commissions.

b. See Appendix E to order free copies of the following publications.

Special Hazards Supplement to the CRS Coordinator's Manual

CRS Credit for Management of Coastal Erosion Hazards

CRS Credit for Management of Tsunami Hazards.

.

c. The following documents are available from FEMA Publications by calling 1-800-480-2520 or faxing a request to (301) 362-5335.

Reducing Losses in High Risk Flood Hazard Areas—A Guidebook for Local Officials, FEMA-116, Federal Emergency Management Agency, 1987.

User's Guide to Technical Bulletins, FIA-TB-0, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/guide01.pdf**.)

Openings in Foundation Walls, FIA-TB-1, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job2.pdf**.)

Flood-Resistant Materials Requirements, FIA-TB-2, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job4.pdf**.)

Non-Residential Floodproofing—Requirements and Certification, FIA-TB-3, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job6.pdf.**)

Elevator Installation, FIA-TB-4, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job8.pdf**)

Free-of-Obstruction Requirements, FIA-TB-5, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job10.pdf**.)

Below-Grade Parking Requirements, FIA-TB-6, April 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job12.pdf**.)

Wet Floodproofing Requirements, FIA-TB-7, December 1993 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/job14.pdf**.)

Corrosion Protection for Metal Connections in Coastal Areas, FIA-TB-8, 1996 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/corr.pdf**)

Coastal Construction Manual, FEMA-55, Third Edition, 2000 (available in three-volume hard copy or on CD).

Protecting Building Utilities From Flood Damage, FEMA-348, 2000.
http://www.fema.gov/hazards/floods/pbuffd.shtm

Ensuring That Structures Built on Fill in or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding, FIA-TB-10, 2001 (also available from FEMA's website at **http://www.fema.gov/pdf/fima/tb1001.pdf**).

Increased Cost of Compliance Coverage: Guidance for State and Local Officials, FEMA, 2003.

National Flood Insurance Program (NFIP) Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials, FEMA 480, February 2005.

FEMA's regulations can be found at:

http://www.access.gpo.gov/nara/cfr/waisidx_99/44cfrv1_99.html

The NFIP regulations for communities are in parts 59 through 73. The primary regulations for local floodplain management are in parts 59 and 60.

d. The Emergency Management Institute (EMI) is a FEMA training center located in Emmitsburg, Maryland. Stipends to cover travel, registration, and rooms are usually available from FEMA. EMI conducts a home study version of "Managing Floodplain Development through the National Flood Insurance Program." For more information, call EMI at 1-800-238-3358 or the state emergency management agency's training office.

e. More information on building codes, including the International Codes, can be obtained from the International Code Council (founded by the three former national model code organizations) at 1-800-422-7233 or **http://www.iccsafe.org/.**

Reducing Flood Losses Through the International Code Series, May 2000, was published jointly by the model code organizations, FEMA, the Association of State Floodplain Managers, and the American Society of Civil Engineers. Hard copies can be ordered for $15.00 from the International Code Council at **http://www.iccsafe.org/dyn/prod/7320S1.html**. It can also be downloaded free from **http://www.fema.gov/hazards/floods/fldlosses.shtm**.

f. For more information on floodplain manager certification, contact the Association of State Floodplain Managers at (608) 274-0123 or see **http://www.floods.org**.

Increased Cost of Compliance

On June 1, 1997, the NFIP began offering "Increased Cost of Compliance" (ICC) coverage for buildings covered under the Standard Flood Insurance Policy (SFIP). ICC coverage provides for the payment of a claim to help pay for the cost to comply with community floodplain management ordinances after a flood event in which a building has been declared substantially damaged or repetitively damaged.

When an insured building is damaged by a flood and the community declares the building to be substantially or repetitively damaged, ICC will help pay for the cost to elevate, floodproof, demolish, or relocate the building up to a maximum of $30,000. This coverage is in addition to the building coverage for the repair of actual physical damage from flood under the SFIP. An ICC claim can be filed whether or not a community has received a Presidential disaster declaration.

The following conditions must be met for a substantially damaged building to be eligible for an ICC claim: A building is eligible for an ICC claim payment if it is in a Special Flood Hazard Area and if the community determines it has been damaged by a flood whereby the cost of restoring the building to its before-damaged condition would equal or exceed 50% of the market value of the building before the damage occurred, as determined by the community. All NFIP communities must have, at a minimum, a substantial damage provision in their floodplain management ordinance in accordance with the NFIP criteria.

The Flood Insurance Reform Act of 2004 expanded the definition of what qualifies as substantial damage. Section 105(b)(4) of the Act reads, "the term 'substantially damaged structure' means a structure covered by a contract for flood insurance that has incurred damage for which the cost of repair exceeds an amount specified in any regulation promulgated by the Director, or by a community ordinance, whichever is lower." After FEMA regulations are published to implement this provision, regulations with substantial damage thresholds lower than 50% that qualify for LSI credit may also be able to trigger ICC claim payments. Communities with LSI credit should check with their FEMA Regional Offices (Appendix A) to confirm this.

The following conditions must be met for a repetitively damaged building to be eligible for an ICC claim payment: A building is eligible for an ICC claim payment if it is in a Special Flood Hazard Area and is a repetitive loss structure and is subject to a community floodplain management ordinance. Two conditions must be met for an ICC claim to be paid under the SFIP for a repetitive loss structure:

1. The state or community must have adopted and be currently enforcing a repetitive loss provision or a cumulative substantial damage provision requiring action by the property owner to comply with the community's floodplain management ordinance, and

2. The building must have a history of NFIP claim payments that satisfies the statute's definition of "repetitive loss structure." A repetitive loss structure means "a building covered by a contract for flood insurance that has incurred flood-related damage on 2 occasions during a 10-year period ending on the date of the event for which a second claim is made, in which the cost of repairing the flood damage, on the average, equaled or exceeded 25% of the market value of the building at the time of each such flood event." *Note that this statutory ICC definition is not the same as the CRS definition of a repetitive loss property.*

Figure 430-5a. Increased Cost of Compliance flood insurance coverage.

Increased Cost of Compliance (cont.)

The date on which the first loss occurred, even if the loss occurred before June 1, 1997, is immaterial to eligibility for an ICC claim payment, as long as the state or community enforced a repetitive loss or cumulative substantial damage requirement on the building and the insured building satisfies the definition of the "repetitive loss structure" defined above.

CRS NOTE: *Communities receiving CSI credit for a cumulative substantial improvement regulation must be aware that there may be instances in which the community's criteria may require compliance with its floodplain management ordinance, but the building may not qualify for an ICC claim payment (e.g., if a building is damaged three times, with each flood averaging 20% damage).*

Below are two options for ordinance language that is consistent with the definition of "repetitive loss structure" under the NFIP. The language would receive 20 points under CSI—fewer points than the more restrictive language of Sections 431.c.1(a) and (b).

Additional guidance on ICC coverage can be found in I*ncreased Cost of Compliance Coverage: Guidance for State and Local Officials*, FEMA 2003**.**

Option 1:

A. Adopt the Following Definition:

"Repetitive loss" means flood-related damage 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% of the market value of the structure before the damage occurred.

B. And modify the "substantial improvement" definition to read as follows:

"Substantial improvement" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the "start of construction" of the improvement. This term includes structures that have incurred "repetitive loss" or "substantial damage," regardless of the actual repair work performed.

Option 2: Modify the "substantial damage" definition to read as follows:

"Substantial damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damage condition would equal or exceed 50% of the market value of the structure before the damage occurred. Substantial damage also means flood-related damage 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% of the market value of the structure before the damage occurred.

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 430-5b. Increased Cost of Compliance flood insurance coverage (page two).

NONCONVERSION AGREEMENT
FOR CERTAIN STRUCTURES IN THE FLOODPLAIN

Application has been made for a Permit from the City of _____, _____*[state]*.

Permit # _____
Property Owner _____

Address _____
Deed dated _____, Recorded _____
Tax map _____, block _____, parcel _____

Base Flood Elevation at the site is _____ feet (NGVD).
Map Panel Number _____, effective date _____

In consideration for the granting of a permit for the above structure, the property owner agrees to the following:

1. That the enclosed area below the base flood elevation 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 flood damage prevention ordinance in effect at the time of conversion.
2. That all interior walls, ceilings, and floors below the base flood elevation shall be unfinished or constructed of flood-resistant materials.
3. That mechanical, electrical, or plumbing devices shall not be installed below the base flood elevation.
4. The walls of the enclosed areas below the base flood elevation shall be equipped with at least two vents which permit the automatic entry and exit of floodwater 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 of this agreement and Section ____of Ordinance #_____ .
6. That this Nonconversion Agreement becomes part of Permit # _____.

_____
Signature of Property Owner Witness Date

_____
At a minimum, the following has been recorded on the deed to the above property**:** "This structure has received special permission to be constructed in the Special Flood Hazard Area. The lowest floor shall not be finished or converted to a habitable space unless the enclosed area below the Base Flood Elevation becomes fully compliant with Ordinance #_____ in effect at the time of conversion. At this site, the Base Flood Elevation is ____ feet, National Geodetic Vertical Datum."

_____
Signature, Recorder of Deeds Date

Figure 430-6. Example nonconversion agreement.

[This page intentionally blank.]

430LD LAND DEVELOPMENT CRITERIA

Credit is provided for managing the development of land so that new projects avoid floodplains or minimize the amount of construction in floodplains. Credit is provided for two approaches: regulations that require or encourage appropriate development and zoning that restricts the use or density of floodplain development.

Background: Appropriate development criteria and low density zoning, like open space preservation, reduce the potential for flood damage by reducing the amount of development in the floodplain. They can also enhance natural and beneficial values and maintain floodplain storage capacity.

Activity, 420 (Open Space Preservation), credits keeping vacant areas vacant. This is done through measures such as public ownership and legal restrictions on future construction. The credit is based on the percentage of floodplain land that is preserved as open space.

Most communities have undeveloped areas that are not preserved as open space through one of the means recognized in Activity 420. However, there are many tools that can encourage the owners to keep the floodplain open when a site is developed. Activity 430LD (Land Development Criteria) provides credit for those tools—it recognizes local efforts to minimize the construction of buildings in the floodplain.

Activity, 430 (Higher Regulatory Standards), picks up where 420 and 430LD leave off. It credits construction standards for development that is allowed in the floodplain. In other words, these three activities recognize three approaches to floodplain development:

420 (Open Space Preservation) credits keeping development out of the floodplain entirely.

430LD (Land Development Criteria) credits avoiding the floodplain or minimizing what is done in it.

430 (Higher Regulatory Standards) credits more restrictive construction rules for the buildings and other development that are allowed in the floodplain.

The most credit points for any single element in these three activities is for preserving floodplains as open space (OS). That is considered the best way to deal with floodplain development. The second highest possible credit points is to minimize the amount of construction in the floodplain through land development criteria or low density zoning—if you have to build in the floodplain, do as little as possible. Examples of ways that development can avoid the floodplain are shown in Figure 430LD-1.

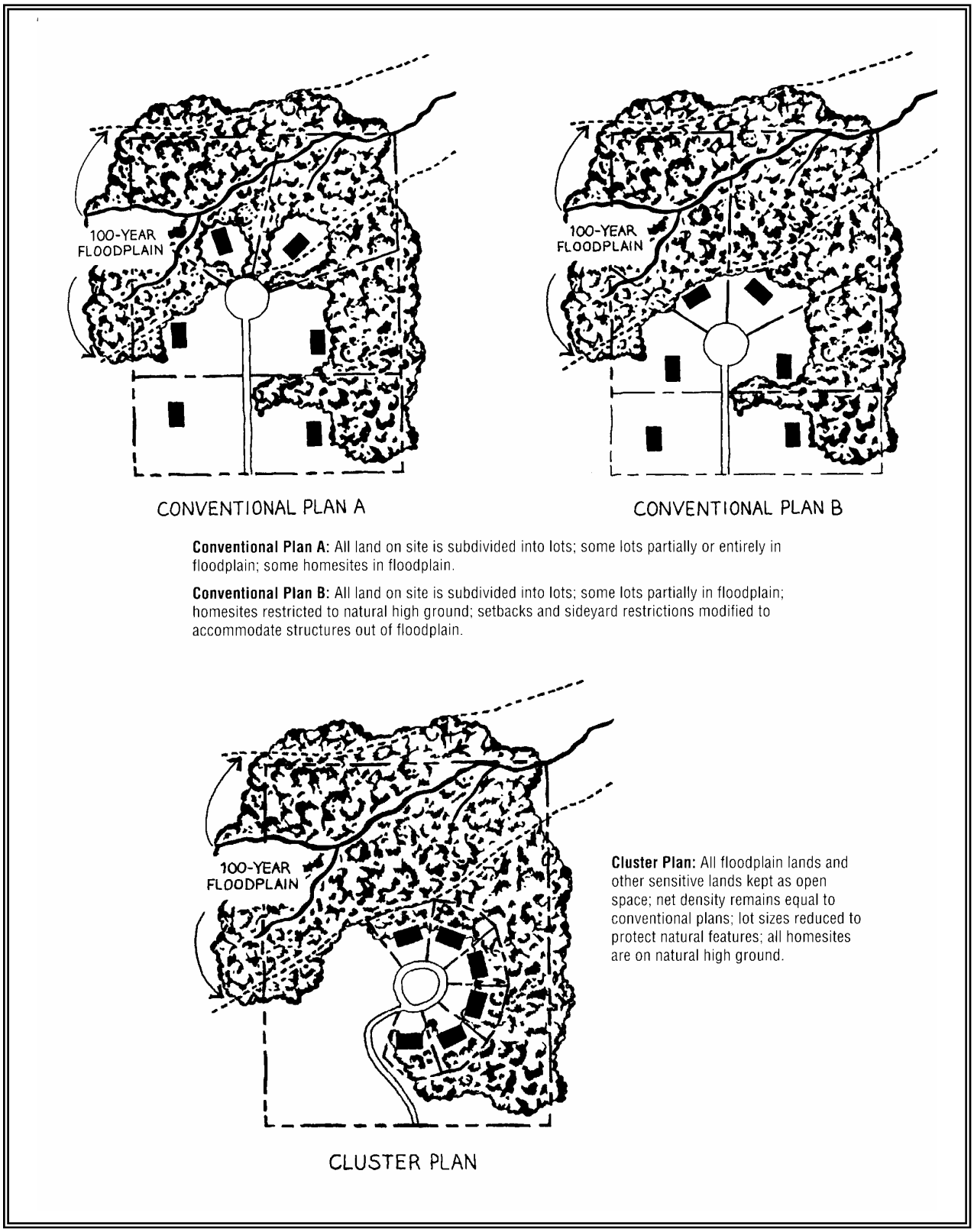


Figure 430LD-1. Examples of subdivisions that avoid floodplain development.
Source: *Subdivision Design in Flood Hazard Areas*, page 19.

Activity Description: The land development criteria element recognizes a variety of planning and regulatory tools that encourage developers to avoid or minimize development in floodplains. Low density zoning credit is provided for limiting development to no more than one building per acre. Credit increases as the allowable density decreases to one building per 10 acres.

The land development criteria credits are in addition to any open space credit a property may qualify for under Activity 420 (Open Space Preservation). For example, a community can receive 430LD credit for regulations that encourage subdividers to set aside floodprone areas as flowage easements. Once a parcel is appropriately deeded, the community can receive credit under Activity 420 for that site.

Activity 420's credits for open space and this activity's credit for low density zoning are keyed to areas that are currently vacant and preserved as open space or developed at the credited density. The credits are adjusted with an impact adjustment to reflect the amount of floodplain that is affected by the element.

The land development criteria element is treated differently. Even though no areas may qualify as open space, credit is provided for the regulations that require certain review procedures or offer developers incentives to avoid the floodplain. If a parcel is preserved as open space as a result of the regulations, the community can document it and receive open space preservation credit under Activity 420.

There are, in effect, two credits: first for the land development criteria that encourage avoidance of the floodplain, and later for those parcels that are legally kept vacant as a result of the regulations.

431LD Credit Points

a. Land development criteria (LDC): (Maximum credit: 100 points)

1. Prerequisite. The community must have vacant floodprone areas where the regulations will have a benefit. A community with a completely developed regulatory floodplain is not eligible for this credit.

2. LDC is the total of the following points:

(a) 100, if the regulations require new subdivisions and other developments to set aside all floodprone lands as open space, drainage or flowage easements, back yards, or otherwise keep them free from development. This credit is pro-rated based on the percentage of floodplain kept open by the regulations.

(b) 75, if the regulations require that each lot in a new subdivision provide a building site that is on natural high ground, out of the regulatory floodplain. This credit is not provided if filling the floodplain (or cutting and filling) is allowed to meet the building site requirement.

(c) 50, if the regulations provide for incentives, such as density transfers, bonuses, or other mechanisms to encourage developers to avoid developing in the regulatory floodplain.

(d) 25, if the regulations require developers to submit more than one site plan and one of those alternative plans must keep buildings out of the regulatory floodplain.

(e) 10, if the community's zoning or subdivision regulations allow cluster development or other alternatives to traditional subdivision patterns.

(f) 10, if the community has a land use plan that recommends open space use or low density development of floodprone areas.

Under item 2(a), if the community requires that floodprone lands be kept undeveloped when an area is subdivided, it could receive 100 points. This does not qualify for credit under Activity 420, because unsubdivided floodprone lands could be built on. If the community requires that 50% of the floodplain be kept open, then 50% of the credit is provided here. If the requirement is limited to one or two zoning districts, the credit will be pro-rated accordingly. After a subdivision's final plat is recorded, the areas set aside could also qualify for open space credit.

There is a variety of other approaches to minimizing the number of buildings allowed in a floodplain that would be credited under this element. *Subdivision Design in Flood Hazard Areas* (see Section 435LD) describes the following:

- Density transfers,
- Transfers of development rights (TDRs),
- Bonuses for avoiding the floodplain,
- Open space subdivision design,
- Mandating more than one site plan, one of which must avoid the floodplain entirely,
- Planned unit developments (PUDs),
- Cluster development,
- Greenway and setback rules, and
- Open space ratio credits for open space in the floodplain.

These approaches may be administered differently, but have a similar result: developers are required, encouraged, or rewarded for keeping buildings out of floodprone areas. Buildings, streets, and other damage-prone infrastructure are grouped on high ground (or the area of

shallowest flooding), while the more hazardous floodplain is used for open space or recreational land.

These regulations do not have to be enacted for floodplain management purposes. Many communities have adopted them for farmland preservation, protection of sensitive areas, and even for economic reasons. For example, developments such as the example cluster plan in Figure 430LD-1 have shorter streets, resulting in lower maintenance, cleaning, and snow plowing costs for the community.

If a community's program uses an approach to minimize development or disturbance in the floodplain that is not described here, it should be submitted for scoring in accordance with Section 221. If a community's regulatory program effectively prohibits new buildings from the floodplain, the community should apply for open space preservation credit under Activity 420.

3. Duplicate credit. A regulatory provision may meet the credit criteria of more than one element. The community may receive the credit for one regulatory provision under the element with the highest points, but not under more than one element.

Under the duplicate credit rule in Section 430LDa.3., one regulatory provision can only be credited once by the CRS. For example, requiring small setbacks along streams (e.g., 10- or 15-foot buffers) is credited under Section 431.g.2, natural and beneficial functions regulations (NBR) under Activity 430 (Higher Regulatory Standards). Prohibitory setback requirements can also be credited as preserved open space under Activity 420. The community should calculate which approach gives it the most points (after the impact adjustment). In a small community with narrow floodplains, a 15-or 25-foot setback on both sides of a stream may provide more points than an open space provision.

On the other hand, an area can benefit from more than one regulatory provision. A site may be subject to cluster development rules and low density zoning under 430LD and freeboard, setback, and compensatory storage requirements under Activity 430. The community would receive CRS credit for all of these regulatory provisions in all areas where they are in effect (except in areas that are credited as open space (OS) under Activity 420 (Open Space Preservation)—there is no duplicate credit for areas designated as OS because the regulatory standards have no impact where development is prohibited).

Example 431LD.a-1. Watertown enacted regulations designed to protect new floodplain development, preserve its remaining natural bottomlands, and help recharge groundwater supplies. It requires new subdivisions and other developments greater than five acres to set aside areas that are below the elevation that corresponds to the boundary of its bottomlands (roughly the 25-year flood elevation).

LDC = 75

This provision does not receive open space (OS) credit because buildings are not prohibited in unsubdivided or previously subdivided developments in this area. In other words, a house can be built in the 25-year floodplain on a 20-acre parcel. But, if the owner wants to subdivide that parcel or otherwise develop it more intensely, the designated area must be set aside from filling, paving, or construction of buildings.

b. Low density zoning (LZ): (Maximum credit: 600 points)

1. Credit points. Credit up to 600 points is given for low density zoning. Credit is given for those portions of the floodplain subject to zoning rules that require a minimum of 1 acre per building or unit. Maximum credit is provided for a 10-acre or larger minimum lot size.

   s = the minimum lot size in acres.

   LZs = 60 x s

Credit is provided for zoning areas to keep them substantially open. This credit is available for undeveloped land within low density zoning districts, as well as for areas developed in accordance with the density requirements. Zoning an area for agriculture, conservation, or large residential lots preserves more open space than allowing more intensive development. For this element, it does not matter why an area is zoned for low density; what counts is the minimum lot size allowed in the zoning district.

The maximum credit for this element is 83% of the credit provided for Activity 420 (Open Space Preservation), because some disruption and damage are expected even at a density of one building per 10 acres.

The credit for low density zoning is based upon the traditional zoning approach of setting minimum lot sizes for different zoning districts. The bigger the lot size, the less dense the floodplain development.

For the credit calculation, density is measured in terms of acres per building. A zoning district with a minimum lot size of 2 acres allows a density of 2 acres per building. For this area, s = 2, and the area would be designated "LZ2" on the regulatory floodplain map.

"s" may have any value from 1.0 to 10.0. That is, the highest allowable density is one building per acre (s = 1.0), and minimum lot sizes larger than 10 acres are credited as 10 acres (s = 10.0).

Where minimum lot sizes are in units other than acres, they must be converted to acres to calculate the credit for this element. A minimum lot size from 40,000 to 43,560 square feet may be counted as 1 acre if the lots are exclusive of rights of way.

2. Requirements.

   (a) A minimum lot size required by a public health ordinance for septic tanks is not counted toward low density zoning.

   (b) Except in areas zoned for single family residential use, lot coverage must not exceed 10% including buildings and fill.

For example, an area with a zoning density of five structures per acre, where development is restricted due to lack of a sanitary sewer, may develop to its full potential if a sewer is installed. An industrial subdivision might allow only one structure per acre, but it might allow 90% lot coverage. This type of development would not meet the objectives of low density zoning credit for the CRS.

Example 431LD.b-1.

A zoning district with 5-acre minimum lots gives:

s = 5 LZ5 = 60 x 5 = 300.0

A minimum lot size of 100,000 square feet gives:

$$s = \frac{100{,}000}{43{,}560} = 2.30 \qquad LZ2.3 = 60 \times 2.30 = 138.0$$

Separate calculations are made for each zoning density, and the credits are added together in Section 433LD.

Example 431LD.b-2. See Figure 430LD-1. Watertown allows a minimum lot size of 1 acre in part of its floodplain and a minimum lot size of 10 acres in another portion.

LZ1 = 60 x 1 = 60 LZ10 = 60 x 10 = 600

432LD Impact Adjustment

The area(s) affected by low density zoning must exclude areas designated as open space that are receiving OS credit under Activity 420 (Open Space Preservation). There is no impact adjustment for LDC.

a. Option 1:

1. If new development within the entire area of regulated floodplain (aRF) is regulated by an element, and no credit was requested for OS in Activity 420, the impact adjustment ratio for that element = 1.0 (rXXX = 1.0).
2. If new development within the entire area of regulated floodplain (aRF) is regulated by an element, and credit was requested for OS in Activity 420, the impact adjustment ratio for that element = 1.0 - rOS (rXXX = 1.0 - rOS).

As with other regulatory elements, areas for which open space credit (Activity 420) is requested must be excluded from the area credited for low density zoning.

b. Option 2:

The community may use the default value rLZs = 0.05 for up to two of its low density zones, provided each zone covers at least 5 acres of the regulatory floodplain.

Option 2 is limited to two zoning densities. Use of the two lowest density (highest "s") zones will provide the most credit for low density zoning using the default values for rLZs.

Example 432LD.b-1. A community has 10-, 5-, and 1-acre zoning districts within its regulated floodplain. Each of these districts covers more than 5 acres. The CRS Coordinator uses Option 2. Since LZ10 gives 600 points, LZ5 gives 300 points, and LZ1 gives 60 points, the community uses rLZ10 = 0.05 and rLZ5 = 0.05 to calculate the credit cLZ.

c. Option 3:

The impact adjustment ratio for each low density zoning district is computed by dividing the area affected by the area of the regulatory floodplain (aRF). Any area for which OS credit is requested must be excluded from the element's area measurements.

$$rLZs = \frac{aLZs}{aRF}$$

If there is more than one low density zoning district within the regulatory floodplain, each must be appropriately designated on the Impact Adjustment Map (see Section 403) and the area of each must be determined in order to calculate the impact adjustments.

Example 432LD.c-1. See Figure 430LD-1. The area of Watertown's LZ1 zoning district is 0.14 square miles: aLZ1 = 0.14. The area of the LZ10 zoning district is 0.11 square miles: aLZ10 = 0.11. aRF = 0.52.

$$rLZ1 = \frac{0.14}{0.52} = 0.27 \qquad rLZ10 = \frac{0.11}{0.52} = 0.21$$

433LD Credit Calculation

a. $cLZ = \Sigma(LZs \times rLZs)$

b. $c430LD = cLDC + cLZ$

Example 433LD-1. Using the values calculated in 432LD above, Watertown calculates its credit for this element:

cLDC = LDC = 75

cLZ = {(LZ1 x rLZ1) + (LZ10 x rLZ10)}

= {(60 x 0.27) + (600 x 0.21)} = {16.2 + 126.0} = 142.2

c430LD = cLDC + cLZ = 75 + 142.2 = 217.2, which is rounded to 217

During the verification visit, the ISO/CRS Specialist visits several areas of low density zoning in Watertown's floodplains. All of the areas visited appear to comply with the zoning density on the zoning maps.

The value for c430LD is used in Example 433-2.

434LD Credit Documentation

The community must submit the following:

a. The ordinance language that adopts the land development criteria or low density zoning standard. The appropriate acronym(s) (LDC, LZ1, LZ5, etc.) must be marked in the margins of the sections that pertain to the element. For CRS credit, the regulatory language must be adopted and in full force at the time of application for CRS credit.

A photocopy of the appropriate pages of the ordinance is sufficient and should be attached to the activity worksheet. The CEO's certification of the application or modification is considered to include a certification that the ordinance or statute has been enacted and is being enforced (see Section 212.a).

The community must have the following documentation available to verify implementation of this activity:

b. The Impact Adjustment Map prepared in accordance with Section 403. Each area listed in Section 431LD for which credit is being requested must be designated on the Impact Adjustment Map and in the map's key.

Areas subject to low density zoning are designated as "LZs" on the Impact Adjustment Map (see Section 403), where the "s" designates the minimum lot size (in acres). An area of 5-acre zoning would be designated "LZ5"; an area in which one structure is allowed on a 100,000-square-foot lot would be designated "LZ2" (100,000 square feet is 2.30 acres).

c. An explanation of the procedures followed for enforcement of the regulatory standard.

d. Examples of developments constructed in accordance with the ordinance language.

During the verification visit, the ISO/CRS Specialist will need to see site plans and final plats that will document how the land development criteria or zoning density is applied. The ISO/CRS Specialist will also visit a sample of new developments to verify that they have been constructed in accordance with the approved plans.

435LD For More Information

Additional information, reference materials, and examples can be found at the CRS Resource Center at **http://training.fema.gov/EMIWeb/CRS/**.

a. Most state NFIP coordinating offices have prepared model ordinances with provisions that exceed the minimum NFIP standards. Additional help on regulatory provisions may be available from state planning or community affairs agencies and regional planning commissions.

b. More information on planning and regulatory techniques to preserve floodplain open space can be found in Subdivision Design in Flood Hazard Areas, Planning Advisory Service Report # 473. Copies can be ordered for $32 from

   American Planning Association
   122 South Michigan Ave, Suite 1600
   Chicago, IL 60603
   (312) 431-9100

c. Often local governments and regional agencies have guidebooks for some of the planning or regulatory tools encouraged by this activity, such as low-impact development design manuals and handbooks on best management practices (BMPs).

440 FLOOD DATA MAINTENANCE

Summary of Activity 440

441 Credit Points. There are four elements in this activity for a maximum of 239 points (excluding special hazards credit).

a. Additional map data (AMD): Up to 129 points are provided for implementing digital or paper systems that improve access, quality, and/or ease of updating flood data within the community. Each system must be used by the local regulatory staff on a regular basis. The data in the system must be updated at least annually.

b. Elevation reference mark maintenance (ERM): Up to 90 points are provided if a community maintains its elevation reference marks.

c. Erosion data maintenance (EDM): Points are provided for maintaining coastal erosion data as described in *CRS Credit for Management of Coastal Erosion Hazards*.

d. FIRM maintenance (FM): Up to 20 points for maintaining copies of all Flood Insurance Rate Maps (FIRMs) that have been issued for the community.

442 Impact Adjustment. The credit points for each element are adjusted in one of three ways.

a. Under Option 1, if the program is implemented throughout the Special Flood Hazard Area (SFHA), the impact adjustment ratio for an element is 1.0.

b. Under Option 2, if the program is not implemented throughout the SFHA, a default impact adjustment ratio of 0.25 may be used.

c. Under Option 3, if the program is not implemented throughout the SFHA, the impact adjustment ratios may reflect the proportion of the SFHA affected.

443 Credit Calculation. The credit points for each element are multiplied by the impact adjustment ratios and the products are totaled.

444 Credit Documentation. The community must have the following available to verify implementation of this activity.

a. A summary of all elements of its flood data maintenance program and a description of how these elements are used and updated on a regular basis.

b. [If the community calculates impact adjustment factors using Option 3 (Section 442.c)] The Impact Adjustment Map discussed in Section 403.

c. Copies of the digitized mapping, parcel records, and/or overlay maps, elevation reference mark data, erosion data, shoreline erosion records, and/or old FIRMs, as appropriate.

d. [If the community is applying for credit for maintaining elevation reference marks (ERM)] A copy of the master list of elevation reference marks and documentation that shows when they are inspected and repaired or replaced.

The community must submit the following documentation with its annual CRS recertification:

e. Identification of any reference marks that appear on the FIRM that were found to be missing or inaccurate.

445 For More Information.

440 FLOOD DATA MAINTENANCE

Credit is provided for making the community's floodplain maps more current, useful, or accurate in order to improve local regulations, planning, disclosures, and property appraisals.

Background: Outdated mapping hinders good floodplain management. A Flood Insurance Rate Map (FIRM) can and should be updated frequently to account for study revisions, site-by-site analyses, better ground elevation data, annexations, and incorporation of new hazard data. To keep a FIRM updated at minimal cost, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) publishes Letters of Map Revision. However, these do not provide local officials and other map users with a meaningful picture of the floodplain.

Activity Description: Under this activity, credit is provided for putting National Flood Insurance Program (NFIP) FIRM and Flood Boundary and Floodway Map delineations on a digitized mapping system or other method that allows quick revision and reprinting of a floodplain map. Flood hazard data could also be maintained on computerized parcel records. This activity also includes credit for adding and/or maintaining elevation reference marks and overlaying the community's floodplain mapping (including the FIRM) on the zoning map, the assessor's map, or other map used regularly by community staff.

A computerized parcel system is often easier to use than a map. With such a system, a building official, real estate agent, or anyone interested in the flood hazard on a property can quickly find data such as flood zone number, flood elevations, and lowest floor elevation. In most cases, flood data are maintained for a community's entire floodplain. Where this is not the case, the areas affected must be adjusted by an impact adjustment ratio based upon the area of regulated floodplain with the community.

Maintaining current elevation reference marks makes it easier and less expensive for developers and property owners to determine ground, floor, and base flood elevations for construction and flood insurance purposes.

NOTE: *This activity only credits maintenance of the community's regulatory flood data. The paper FIRM is still the document used for flood insurance rates and the mandatory purchase requirement. However, if the community's flood data maintenance program finds an error in the FIRM, it should be reported to FEMA so it can be included in the next map revision. If the error would remove a property from the SFHA, it is assumed that the owner will be motivated to request a map amendment.*

441 Credit Points

Maximum credit for Activity 440: 239 points.

a. Additional map data (AMD) (Maximum credit: 129 points)

This element credits digital or paper systems that improve access, quality, and/or ease of updating flood and FIRM data.

1. Prerequisites.

(a) The system must be used regularly by the community regulatory staff.

(b) New data, including annexations, new subdivision maps, flood insurance restudies, letters of map revision, letters of map amendment, and studies performed for site-specific analyses, must be added at least annually to the data base or overlay map.

(c) Digitized data must be made available annually to FEMA at no cost (if requested).

Three different types of flood data maintenance systems are usually eligible for credit:

- Map overlays, such as overlaying the regulatory floodplain on the zoning map, aerial photograph, or more detailed street map; or using clear plastic sheets over the FIRM to record map changes.

- A geographic information system (GIS), computer aided design (CAD), or other digitized system that updates information electronically and can display or print a current map.

- A database management program for parcel records that maintains the appropriate flood data for each property. Some communities have master parcel record systems that can be accessed for building permit records, property tax information, FIRM data, and other purposes. Sometimes these systems are tied into a GIS. Credit is given if parcels in this system are designated as "in" or "out" of the floodplain.

Data available from these three systems improve the community's administration of its floodplain management program. Credit is dependent on the map data being used in the community's regulatory program. There is no credit for a map system that is used only for planning drainage projects or other non-regulatory purpose. The objective of this requirement is to encourage more community offices to be familiar with the local flood problems and to reduce the likelihood that land use or development decisions will be made without

considering the hazard. Using the system to provide map determinations to the permit office is considered a regulatory purpose.

The data from a digitized mapping or parcel system must be provided to FEMA if it is requested. A fee may be charged to other requestors based on the actual cost of retrieval or reproduction.

The Community Rating System (CRS) encourages communities to devote special attention to areas affected by the special flood-related hazards listed in Section 401. Communities affected by one or more of these hazards should obtain a copy of the appropriate CRS publication (see Appendix E), which shows how to increase credit points for regulating development in areas affected by these special hazards. Regulating such areas is a prerequisite to receiving credit for including the area in this activity.

2. Credit points: AMD = the total of the following points based on the types of data included in the data maintenance system, except that no credit is provided unless item (a) is included:

   (a) 32, for showing the regulatory floodplain boundaries, corporate limits, streets, and parcel or lot boundaries (a database management program must show whether a parcel is in the regulatory floodplain);

   (b) 15, for a GIS layer that shows buildings, building outlines, or building footprints (a database management program must show whether the primary building on the lot is in the regulatory floodplain), and the building data is kept up to date to reflect new construction;

   (c) 8, for showing floodways or coastal high hazard areas (a database management program must show whether either the parcel or the primary building is in the floodway or coastal high hazard area);

   (d) 8, for showing base flood elevations;

   (e) 6, for including FIRM zone attributes (e.g., A3, VE, etc.);

   (f) 8, for showing the 500-year floodplain elevations or boundaries (a database management program would show whether the parcel is in the 500-year floodplain);

   (g) 8, for showing areas of the community subject to other natural hazards (a database management program would show whether the parcel is subject to another hazard);

(h) EITHER:

(1) 10, if the community's GIS includes topographic contour lines; OR

(2) 20, if the system includes topographic contour lines at a smaller contour interval than that provided on available U.S. Geological Survey digital orthophoto quarter quads (DOQQ);

(i) 8, for including updated floodplain data in the tax assessment data base;

(j) 8, for including overlays or layers for all FIRMs in effect after the date of the community's application to the CRS; and

(k) 8, for other overlays or databases used for regulation or mitigation programs, including incorporating and maintaining layers from HAZUS-MH and the community's repetitive loss areas.

Most of the credited items are important to provide the regulatory staff the latest FIRM data for a property. The CRS wants to encourage users of the community's system, including tax assessors and property appraisers, to be aware of the flood hazard. The CRS also wants to encourage keeping old FIRMs to help track substantial improvement requirements and eligibility for grandfathered flood insurance premiums. Old maps are hard to obtain, so keeping them on record would provide a valuable service to residents.

Item 2(g) credits showing areas of the community subject to other natural hazards. Local permitting and planning should be aware of all hazards to which a property is exposed. These could include landslide-prone areas, areas subject to subsidence or stream migration, and areas with soils unsuitable for septic fields. Including these hazards in GIS layers that are seen when permits are reviewed or when plans are being drafted will remind everyone involved of the need to protect people and property from those hazards.

For item (h), credit is provided for including a layer with contour lines in the community's GIS. If the layer has contour intervals smaller than what is available from the U.S. Geological Survey's DOQQs, then 20 points are provided. In those areas where there are no DOQQs, the credit is provided if the contour interval is smaller than that on the area's USGS quadrangle maps.

HAZUS-MH (Hazards U.S.–Multi-Hazard) is FEMA's standard, nationally applicable methodology and software program for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH uses ESRI's ArcGIS geographic information system software platform to analyze, map, and display potential damage and losses. The CRS encourages the use of HAZUS-MH to promote a greater understanding and awareness of hazard risk and for keeping the HAZUS-MH database updated. See Figure 510-1 for more information on HAZUS-MH.)

Identifying and mapping the community's repetitive loss areas is discussed in Sections 502 and 503. A repetitive loss community must also develop a list of addresses of the improved properties in its repetitive loss areas. This work can be greatly facilitated by the use of a GIS. Once a repetitive loss area layer is developed, it should be used during mitigation planning and other activities focused on reducing the community's flood problems.

NOTE: *If a community maintains data on its repetitive loss properties, it must be remembered that such data may be subject to the Privacy Act. Information such as the names of people and addresses of properties that have received repetitive flood insurance claims and the amounts of such claims may only be used by the community in furtherance of local flood loss reduction. Communities are prohibited from releasing such information to the public and from using it for solicitation or other purposes. Such information should be marked "For internal use only. This information is legally privileged and confidential. Its use is protected by the Privacy Act of 1974." Generic information, such as total claim payments for an area or data not connected to a particular property, may be made public.*

Example 441.a-1. Floodville has overlaid the regulatory floodplain and floodway boundaries, with base flood elevations, onto the zoning and land use plan maps used to administer the zoning ordinance, the building and health codes, and the regulations for new subdivisions. The maps are updated at least annually. The maps include streets, corporate limits, and parcels.

AMD = 32 + 0 + 8 + 8 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 48

b. Elevation reference mark maintenance (ERM) (Maximum credit: 90 points)

This element credits a program that maintains elevation reference marks so surveyors can find them and can depend on them to be accurate.

1. Prerequisites:

(a) The reference marks must be in the same datum as the base flood elevations on the community's FIRM or a datum that is readily convertible to the FIRM's datum.

(b) The community must have a master list of the reference marks and clear descriptions of their locations in a publication that is readily available for surveyors and other interested parties. This may be a publication kept by another agency and there may be a reasonable charge for it.

2. Credit points: Credit is provided under one of two approaches to maintaining elevation reference marks:

   (a) (Maximum credit: 90 points) If the community initiates the maintenance of elevation reference marks by periodically checking their location and elevation, then ERM =

      (1) $\frac{120}{YCM}$, if the elevation reference marks are of a type similar to those shown on the FIRM; or

      (2) $\frac{150}{YCM}$, if the elevation reference marks are permanent monuments; or

      (3) $\frac{180}{YCM}$, if the elevation reference marks are tied in to the National Geodetic Reference System.

      YCM = the number of years between checks of every elevation reference mark used in the community's regulatory program The minimum value for YCM is 2 (i.e., checks are run at least every two years). There is no credit if YCM is greater than 5.

   (b) (Maximum credit: 30 points) If the community maintains, replaces, and/or adds to its elevation reference marks whenever it is notified that one is missing or otherwise unusable, then ERM =

      (1) 20, if the elevation reference marks are of similar type to those shown on the FIRM; or

      (2) 25, if the elevation reference marks are permanent monuments; or

      (3) 30, if the community has at least three elevation reference marks listed in the National Spatial Reference System; or

      (4) 30, if every developable site in the Special Flood Hazard Area is within ½ mile of a permanent monument.

Communities subject to subsidence are not eligible for credit under the second approach (Section 441.b.2(b)).

"Permanent monuments" are engraved metal discs at least 2 inches in diameter set in concrete or similar markers that are recognizable, durable, and immovable. Chiseled squares in sidewalks, parts of fire hydrants, nails in telephone poles, "PK nails" in pavements, etc., are not "permanent monuments."

Under the first approach, if the reference marks are permanent monuments and the community confirms the location and elevation of every mark every three years, ERM = 150 ÷ 3 = 50.

Credit may be received for maintaining the elevation reference marks shown on the community's FIRM or for maintaining at least the same number of elevation reference marks as there are on each panel of the FIRM. For example, if a FIRM panel shows eight elevation reference marks, the community must maintain a total of at least eight elevation reference or bench marks at the datum of the FIRM or at a datum that can be equated to the FIRM datum.

Because the maintenance of elevation reference marks is critical in areas with land subsidence, full credit (90 points) is given only if a community checks the location and elevation of each elevation reference mark at least every two years.

c. Erosion data maintenance (EDM)

Credit for maintaining coastal erosion data is described in *CRS Credit for Management of Coastal Erosion Hazards*. The credit points, EDM, are calculated separately and transferred to this activity.

This credit is for including coastal erosion rates and similar data in a GIS, digitized parcel data, or overlay map. More information and credit point calculations can be found in *CRS Credit for Management of Coastal Erosion Hazards* (see Appendix E).

d. FIRM maintenance (FM) (Maximum credit: 20 points)

Credit is provided for maintaining earlier editions of flood insurance maps. The maps must be readily available and the community must allow inquirers access to them.

FM = the total of the following points:

1. 15, for maintaining copies of all FIRMs, Flood Insurance Studies, and Flood Boundary Floodway Maps that have been issued for the community. There is no credit if the FIRM has never been revised.

2. 5, for maintaining copies of all Flood Hazard Boundary Maps that were issued for the community.

To receive credit under Activity 320 (Map Information Service), the community must maintain copies of old FIRMs that have been in effect since 1999 or the date the community applied to the CRS, whichever is later. Under this element, credit is provided for maintaining copies of ALL FIRMs, i.e., each FIRM that appears on the list of FIRM revisions in the legend of each FIRM. Keeping the community's current FIRM is a minimum requirement of the

NFIP, so if the community has only been issued one FIRM, there is no credit under this element.

Additional credit is provided for maintaining copies of the Flood Hazard Boundary Maps (FHBMs), i.e., the FEMA maps published before the community received its first FIRM.

This credit is provided for maintaining the FIRMs and FHBMs in paper, microfilm, or other format. They do not have to be part of the system credited under Section 441.a (AMD).

Copies of old FIRMs and FHBMs may be available from the Map Coordination Contractors (see Section 445.e).

442 Impact Adjustment

The area included in AMD (aAMD) is adjusted according to its portion of the area of regulatory floodplain (aRF):

a. Option 1:

   If the data for the entire regulatory floodplain have been entered into the system or included on the overlay map, rAMD = 1.0.

This activity is usually implemented throughout the floodplain. Where this is the case, the community can use Option 1 to determine the impact adjustment ratio for AMD.

b. Option 2:

   If the data for only part of the regulatory floodplain have been entered into the system or included on the overlay map, the community may use the default values: rAMD = 0.25.

c. Option 3:

   The impact adjustment ratio is computed by dividing the area for which data have been entered into the computer or added to the overlay map by the area of the regulatory floodplain (aRF):

$$rAMD = \frac{aAMD}{aRF}$$

If the program is implemented in only a portion of the regulatory floodplain, the community may use either Option 2 or Option 3. For example, if a county has only entered flood data for

its urbanized areas into a GIS, it may use the default value rAMD = 0.25, or it may determine aAMD and aRF to calculate rAMD and designate the areas on its Impact Adjustment Map.

Example 442-1. Floodville's overlay map covers the entire community and includes all floodplains. Using Option 1, rAMD = 1.0.

If a community has different systems for different areas of the community, it should designate and score each one separately and the total score will be corrected through the impact adjustment.

Example 442-2. Gulf Beach County has a GIS for the developed area along the coast. For inland rural areas, the staff refers to map overlays. The GIS would be designated "AMD1" and the area not covered by the GIS would be "AMD2." The two systems would be scored and, if together they covered the entire county, rAMD1 plus rAMD2 would equal 1.0.

d. There is no impact adjustment for ERM or FM.

There is no credit for maintaining fewer elevation reference or bench marks than the number on the community's FIRM. Therefore, there is no impact adjustment for ERM. If the program covers fewer elevation reference marks than the number provided on the FIRM, then ERM = 0.

443 Credit Calculation

a. cAMD = AMD x rAMD

b. c440 = cAMD + ERM + EDM + FM

Example 443-1. As noted above, AMD for Floodville = 48 and rAMD = 1.0.

cAMD = 48 x 1.0 = 48

Floodville has no coastal erosion areas: EDM = 0.

The City Council adopted a policy to replace any missing elevation reference marks as needed. Floodville does not experience subsidence, ERM = 20.

c440 = cAMD + ERM + EDM + FM = 48 + 20 + 0 + 0 = 68

444 Credit Documentation

The community must submit the following:

a. A short summary of all elements of its flood data maintenance program, or a sample copy of the item for which credit is requested, which clearly shows all of the items to be credited.

For credit for computerized data, the summary should briefly discuss the computer system used, the types of data included in the system, access to the data, and how the system is used for floodplain management. For the other systems, the summary should consist of a short narrative description of the procedure and how it is used by the community for floodplain management.

The community must have the following available to verify implementation of this activity:

b. [If the community calculates impact adjustment ratios using Option 3 (442.c)] The Impact Adjustment Map discussed in Section 403. Each area listed in Section 441 for which credit is being requested must be shown on the Impact Adjustment Map and in the key.

c. Copies of the digitized mapping, parcel records, overlay maps, shoreline erosion records, and/or old FIRMs, as appropriate.

If the community has a GIS or a database management program for parcel records, it should be able to prepare a printout or a disk with the addresses of all the properties in the floodplain. This would facilitate mailing its outreach project to floodplain residents (OPF) under Activity 330 (Outreach Projects).

d. [If the community is applying for credit for maintaining elevation reference marks (ERM)] A copy of the master list of elevation reference marks and documentation that shows when they are repaired or replaced.

The community must submit the following documentation with its annual CRS recertification:

e. Identification of any reference marks that appear on the FIRM that were found to be missing or inaccurate.

If any elevation reference marks are found to be listed incorrectly, the community should provide FEMA with the correct elevations or information on other reference marks. Otherwise, revised FIRMs will continue to show the incorrect information.

445 For More Information

Additional information, reference materials, and examples can be found at the CRS Resource Center at **http://training.fema.gov/EMIWeb/CRS/**.

a. The following documents are available from

FEMA Distribution Center
P.O. Box 2010
Jessup, MD 20794-2012
1-800-480-2520
Fax: (301)-362-5335

National Flood Insurance Program Standards for Digital Flood Insurance Rate Maps, October 1993.

Flood Insurance Study Guidelines and Specifications for Flood Hazard Mapping Partners, 2003, or **http://www.fema.gov/fhm/gs_main.shtm**.

b. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which is usually located in the county seat.

c. The U.S. Army Corps of Engineers can provide assistance with elevation reference marks and mapping issues. Requests for assistance should be submitted to the Flood Plain Management Services Coordinator at the appropriate District Office of the Corps.

d. The Emergency Management Institute (EMI) is a FEMA training center located in Emmitsburg, Maryland. Three or four times each year, it offers the "Digital Hazard Data Course" on digital FIRMs and other computer databases. Stipends to cover travel, registration, and rooms are usually available from FEMA. For more information, call EMI at 1-800-238-3358 or the state emergency management agency's training office.

e. Communities may check on past FIRMs and obtain background data by calling 1-877-FEMA MAP. They can also submit a written inquiry through this link: **http://www.fema.gov/fhm/tsd_emap.shtm**.

   For Regions I—V, contact Dewberry & Davis at (703) 849-0100 or see the website at **http://www.Dewberry.com**.

   For Regions VI—X, contact Michael Baker, Jr., at (703) 329-3023 or see the website at **http://www.bakerprojects.com/fema**.

[This page intentionally blank.]

450 STORMWATER MANAGEMENT

Summary of Activity 450

451 Credit Points. There are five elements in this activity for a maximum of 670 points.

a. Stormwater management regulations (SMR): Up to 225 points are provided for regulating developments on a case-by-case basis to ensure that the peak flow of stormwater runoff from each site will not exceed the predevelopment runoff. SMR credit is the sum of three subelements:
   1. Size of developments regulated (SZ): Up to 25 points.
   2. Design storms used in regulations (DS): Up to 90 points.
   3. Public maintenance of required facilities (PUB): Up to 110 points.

b. Stormwater management master plan (SMP): Up to 225 points are provided for regulating development according to a stormwater management master plan.

c. Freeboard for new buildings in B, C, D, and X zones (FRX): Up to 150 points are provided for requiring all new buildings (not just those in floodplains) to be protected from local drainage problems.

d. Erosion and sedimentation control regulations (ESC): Up to 45 points are provided for regulations to minimize erosion from land disturbed due to construction or farming.

e. Water quality regulations (WQ): 25 points are provided for regulations that improve the quality of stormwater runoff.

452 Impact Adjustment. The credit points for SMR and SMP are adjusted in one of three ways. The standards for the other elements must apply throughout the community, so there is no impact adjustment for them.

a. Under Option 1, if the standards apply throughout all watersheds affecting the community, the impact adjustment ratio for an element is 1.0.

b. Under Option 2, if the standards do not apply throughout all watersheds affecting the community, a default impact adjustment ratio of 0.25 may be used.

c. Under Option 3, if the standards do not apply throughout all watersheds affecting the community, the impact adjustment ratios may reflect the proportion of the watersheds affected.

453 Credit Calculation. The credit points for each element are multiplied by the impact adjustment ratios and the products are totaled.

454 Credit Documentation. The community must submit the following:

a. [If requesting credit for SMR] A copy of the language from the ordinance or law that tells how surface water runoff from new development is regulated.

b. [If requesting credit for SMP] Certification and appropriate pages from the stormwater master plan.

c. [If requesting credit for FRX] A copy of the language from the ordinance or law that requires elevation of the lowest floor or lowest opening of new buildings.

d. [If requesting credit for ESC] A copy of the erosion and sediment control ordinance or law.

e. [If requesting credit for WQ] A copy of the language from the ordinance or law that requires new developments to implement appropriate best management practices.

f. [If impact adjustment ratios use Options 1 or 3] An Impact Adjustment Map showing the watershed boundaries and stormwater management jurisdiction.

g. [If impact adjustment ratios include areas regulated by another community(ies)] Documentation of the other community's (or communities') regulation.

h. [If requesting credit for PUB] A copy of inspection and maintenance procedures for drainage facilities.

The community must have the following available to verify implementation of this activity:

i. Development and building permit records that demonstrate enforcement of the regulations.

j. An evaluation report on the effectiveness and currency of the stormwater management plans.

455 For More Information.

450 STORMWATER MANAGEMENT

NOTE: *A separate publication,* ***CRS Credit for Stormwater Management****, provides an example of a community program and application documentation. Communities are encouraged to obtain and read this document before applying for this activity. It will improve the quality of the application and reduce the need to provide additional documentation later. To order a free copy, see Appendix E.*

Credit is provided for regulating new developments to minimize their impact on surface water drainage and runoff.

Background: One of the greatest problems of floodplain management in urbanizing areas is the increase in peak flow caused by watershed development. As forests, fields, and farms are covered by impermeable surfaces, such as streets, rooftops, and parking lots, more rain runs off at a faster rate. When an area is urbanized, the rate of runoff can increase five-fold or more.

A great deal of damage from local drainage problems can be avoided by requiring all structures to be elevated. Sediment from disturbed ground can reduce the capacity of the drainage system and adversely affect water quality.

This problem is compounded by changes in the surface drainage system. Stormwater runoff travels faster on streets and in storm drains than under pre-development conditions. As a result, flooding is more frequent, happens more quickly, and is more severe.

Activity Description: This activity credits five approaches to regulating new development in the watershed:

1. Regulating developments on a case-by-case basis to ensure that the peak flow of stormwater runoff from each site will be no greater than the runoff from the site before it was developed;
2. Regulating developments according to a stormwater management master plan that analyzes the combined effects of existing and expected development on drainage through and out of the watershed;
3. Requiring all new buildings (not just those in the floodplain) to be elevated to protect them from local drainage problems;
4. Regulating activities throughout the watershed to minimize erosion that results in sedimentation; and
5. Regulating the quality of stormwater runoff.

These five approaches are discussed in more detail below.

1. Because the amount of runoff is generally increased by development, stormwater management usually requires that a volume of flood water be stored during the storm. It is released after the runoff subsides (stormwater DETENTION). A developer may store this excess runoff for a short time so that it may be used for irrigation or groundwater recharge or to reduce pollution (stormwater RETENTION). Where retention is used for stormwater management, the detained runoff is not discharged until after the storm has passed and the receiving body can carry the discharge without causing damaging peak flows anywhere downstream.

   Detention does not reduce the amount of water flowing downstream, it simply lets it out over a longer period of time to reduce the peak flow. This can still cause flooding problems farther downstream and the extra flows can destabilize channel banks and cause other problems. Therefore, stormwater retention is preferred over detention. If stormwater retention is allowed, the community must ensure that adequate storage is again available within a reasonable time should another storm occur.

   Maintenance of these facilities is vital—if they silt in or become clogged, they provide no flood protection benefits.

2. Watershed master plans can be used to determine the appropriate amount of detention or retention necessary to prevent an increase in runoff as development occurs within the watershed. A master plan coordinates the timing and total volume of peak flows from subwatersheds in order to provide better data for development standards.

   Although there is no doubt that stormwater regulation reduces the future flood threat from a developing area, a master plan goes much further in predicting the rainfall/runoff relationships within the watershed and in locating and dealing with specific problems as development progresses.

3. Much of the nation's flood damage (including one-third of all flood insurance losses) occurs in B, C, and X Zones. A large portion of this damage would be prevented by requiring ALL new development to be elevated. This is usually done by requiring lowest floors or basement openings to be elevated above street level.

4. Sediment control is especially important in watersheds where land is being disturbed by construction or farming. Drainage systems cannot operate as designed if they are choked with sediment washed in from construction sites. Sedimentation has also been called the largest source of water pollution in the country.

5. Stormwater runoff picks up dirt, road oil, salt, farm chemicals, and other substances. Unlike sewage, stormwater is not treated before it enters rivers, lakes, estuaries, and other receiving bodies of water. Regulations that require developers to install or implement measures that improve the quality of stormwater are credited.

451 Credit Points

Maximum credit for Activity 450: 670 points.

a. Stormwater management regulations (SMR) (Maximum credit: 225 points)

SMR credit is provided if new developments are required to prevent or reduce the increase in runoff that results from urbanization of the watershed. To receive SMR credit, the watershed must be subject to a regulation that requires the peak runoff from new developments to be no greater than the runoff from the site in its pre-development condition. Credit may be provided for other approaches to managing the impact of development on runoff where the community can show that there is no increase in flood damage downstream.

SMR credit is the sum of the credit for three sub-elements:

SMR = SZ + DS + PUB.

If SZ = 0, then SMR = 0.

1. Size of development (SZ) (Maximum credit: 25 points)

   SZ is based upon the minimum size of areas regulated. Use either:

   (a) 25, if all development is regulated;

   (b) 20, if all development is regulated except for single-family residences, parcels of 1/2 acre or less, or increases in impervious area of 5,000 square feet or less;

   (c) 15, if all development is regulated except for parcels of 1/2 acre or less or increases in impervious area of 10,000 square feet or less; or

   (d) 5, if all development is regulated except for parcels of 5 acres or less or increases in impervious area of 20,000 square feet or less; or

   (e) 0, if the regulations only affect development of parcels larger than 5 acres or increases in impervious area of more than 20,000 square feet. If the regulations only cover such large development projects, there is no credit for SZ or SMR.

SZ provides different credit for different types of development. For example, if the community regulates commercial developments that are larger than 1 acre (SZ = 15) and residential developments larger than 5 acres (SZ = 5), an impact adjustment using Options 2 or 3 must be used to reflect the percentage of land use in each category. A similar adjustment must be made if the regulations do not apply to government agency developments.

If developments are exempt from regulation for some reason other than size, the community must relate this to one of the standards given. For example, the community could calculate the average size of such exempted developments over the last several years. The ISO/CRS Specialist should be contacted for assistance on this.

The CRS does not credit regulations that apply only to large developments (larger than 5 acres or more than 20,000 square feet of impervious surface) because the cumulative effect of a number of small, unregulated developments could have just as significant an impact on runoff in the watershed as a large development could.

Credit may be provided for requiring developers to pay fees in lieu of constructing facilities, if the fees collected go toward construction of the necessary facilities.

Example 451.a-1. As a condition of subdivision, planned unit development, or other permit approval, Watertown requires that all developments larger than 1 acre ensure that the post-development stormwater discharge will not exceed the amount of runoff under pre-development conditions.

SZ = 5

2. Design storms (DS) (Maximum credit: 90 points)

   DS is the total of the following points based on the design storms used in the regulations (i.e., the storms used to measure the impact of new developments). For DS credit, the community's regulations must require pre- and post-development hydrology calculations and post-development runoff must be limited to pre-development levels. The standard used may be peak flow, volume, or a combination of the two.

   (a) 60, if detention/retention is designed for the 100-year storm;

   (b) 20, if detention/retention is designed for a storm larger than the 10-year but smaller than the 100-year storm; and

   (c) 10, if detention/retention is designed for a 10-year storm.

Although the 100-year flood is the basis for floodplain management, many communities use a lesser standard for stormwater management. A lower standard may meet many community needs, but management of smaller storms does not necessarily result in reduced peak flows or volume from a major storm.

The community must require management of at least a 10-year storm. A regulation designed to retain or detain only the "first flush," the first inch of rainfall, or less than a 10-year storm,

is not credited under SMR. However, it may qualify as a water quality regulation (WQ) and be credited under Section 451.e.

DS credit of 90 points is provided if the regulation clearly states that all discharges UP TO AND INCLUDING the 100-year storm discharge must be released at rates not exceeding the pre-development peak discharge.

Example 451.a-2. Watertown's stormwater management ordinance used to require regulation of the 2- and 10-year storms to prevent increases in runoff. Under that ordinance, DS = 10. Similarly, if the ordinance had been based on the 25- and 50-year storms, DS would be 20.

Watertown's current ordinance requires determination of a proposed development's effects on the 10- and the 100-year storms to ensure that downstream peak flows are not increased.

DS = 10 + 60 = 70

Example 451.a-3. Gulf Beach County requires all new developments to retain the runoff from all storms up to and including the 100-year storm.

DS = 10 + 20 + 60 = 90

3. Public maintenance (PUB) (Maximum credit: 110 points)

   Credit for PUB is provided if the community assumes maintenance responsibility for all new stormwater facilities or if the community inspects all new stormwater facilities at least annually and has regulatory authority to require the owners to perform appropriate maintenance.

   PUB = 110, for public maintenance of all stormwater facilities.

Because experience has shown that private maintenance of stormwater management facilities is not as reliable in the long term, credit is provided to encourage maintenance by a public agency, or inspections by a public agency and maintenance as indicated by the inspections.

A community can receive PUB credit through any one or combination of three ways:

1. At least once each year, the community (or other stormwater management agency) inspects all stormwater management facilities constructed after the date of adoption of the regulation and orders maintenance when needed. If the owner fails to perform the maintenance, the community (or agency) does the job and bills the owner;

2. At least once each year, the owners of all stormwater management facilities constructed after the date of adoption of the regulation have the facilities inspected by a licensed professional engineer and perform the maintenance recommended by the engineer. The owners must provide the engineer's inspection reports and documentation of the maintenance performed at least annually; or

3. All stormwater management facilities constructed after the date of adoption of the regulation (including basins built by private developers) are required to be deeded to the community (or other stormwater management agency), and the community (or agency) inspects the facilities at least annually and provides maintenance as needed.

Whichever approach is used, it must be supported by an ordinance or other regulatory authority. For example, holding the owner responsible for maintenance must be based on clear legal authority, such as the subdivision ordinance, that was known to the developer at the time of construction of the stormwater facility. Credit is not provided for a policy or a statement that the community has been able to get compliance in the past.

If inspection is performed by the community, the community must document its inspection program with all documentation required for channel debris removal (CDR) in Section 544.

Example 451.a-4. Watertown maintains all detention facilities in all developments:

PUB = 110

Watertown's other values were calculated above: SZ = 5 and DS = 70.

SMR = SZ + DS + PUB = 5 + 70 + 110 = 185

b. Stormwater management master plan (SMP) (Maximum credit: 225 points)

1. Prerequisites:

(a) The community must have adopted a stormwater management master plan for one or more of the watersheds that drain into the community.

(b) The community has adopted regulatory standards for new construction in the watershed based on the plan.

(c) The plan's regulatory standards manage future peak flows so that they do not increase over present values.

(d) The plan's regulatory standards require management of runoff from all storms up to and including the 25-year event.

(e) In order to maintain SMP credit for any plan that is more than five years old, the community must evaluate the plan to ensure that it remains applicable to current conditions. The evaluation must address whether the dates used for the plan are still appropriate and whether the plan effectively manages stormwater runoff. If a stormwater management master plan is obsolete, the community must update the plan or the SMP credit will be revised accordingly.

A stormwater master plan is the result of a hydrologic and hydraulic study of the watershed, usually under both existing conditions and future development conditions with different management scenarios. It usually includes recommendations for a set of management controls and/or construction projects to solve existing flooding problems and to prevent the development of new problems.

A good stormwater master plan that uses future conditions to develop hydrology for planning purposes should have a relatively long shelf life. However, actual development, major projects like interstate highways and industrial complexes, changes in acceptable methods for doing hydrology, changes in the precipitation data used for hydrology, and other factors may make these plans obsolete. If a stormwater master plan is obsolete, it will not receive CRS credit for SMP. This evaluation may require the community to update some or all of its stormwater master plans to make them more effective in managing runoff from watershed development. More details are provided in Section 454.j.

2. SMP = the total of the following points. Credit must be received for item (a).

   (a) 80, if the stormwater management plan meets all of the prerequisites listed in Section 451.b.1.

   (b) 25, if the plan manages the runoff from all storms up to and including the 100-year event.

   (c) 40, if the plan provides management of future peak flows AND VOLUMES so that they do not increase over present values. If the community can demonstrate that its stormwater management plan prevents damaging increases in peak flows at all points within its watershed(s) and downstream, it will receive this credit.

(d) 25, if the plan manages the runoff from all storms up to and including the 5-day event. If a community can demonstrate that an event shorter than five days is the locally appropriate "worst-case" runoff event for stormwater management, it may receive the credit if it uses that event for its regulatory standard.

(e) 15, if the plan identifies existing wetlands or other natural open space areas to be preserved from development to provide natural attenuation, retention, or detention of runoff.

(f) 10, if the plan prohibits development, alteration, or modification of existing natural channels.

(g) 10, if the plan requires that channel improvement projects use natural or "soft" approaches rather than gabions, rip rap, concrete, or other "hard" techniques.

(h) 20, if the plan was prepared in coordination with or as a part of the community's floodplain management plan credited under Activity 510.

Credit is provided if the community develops and implements surface water runoff regulations through a stormwater master plan that ensures that flood damage within and downstream from the watershed is not increased by future development. Eighty points are provided for the plan, providing its standards:

- Have been adopted in the community's regulatory program,
- Require that the peak flows of runoff from future development will not increase beyond the present peak flows, and
- Manage all storms up to and including the 25-year storm (no credit is provided for SMP for management of storms smaller than the 25-year storm).

Communities that receive 80 points for the stormwater master plan can then receive additional points under subsections (b) through (h).

(b) Twenty-five points are added if the community's regulations manage all storms up to and including the 100-year storm. "All storms" includes specifically listed storms, such as the 2-, 10-, 25-, 50-, and 100-year storms.

(c) Forty points are added if the plan's regulatory standards prevent all increases in downstream flood peaks AND VOLUMES, regardless of the size of the watershed or its location within a larger basin. A community can receive the maximum credit if it detains runoff from a 25-year or larger storm and discharges it to groundwater or irrigation or if it detains the runoff long enough to discharge it after the peak flow in the receiving body has subsided so the discharge will not increase downstream peak flows anywhere in the receiving stream.

Communities that discharge directly into an ocean or a Great Lake may receive this credit if they have adopted a watershed master plan that models their watershed(s) and prevents increased peak flows within those watershed(s). Communities with watersheds that discharge into other large lakes or rivers must demonstrate that their discharges will not increase flood elevations in the lake or anywhere downstream on the receiving river.

(d) Twenty-five additional points are provided for assuring that the most appropriate modeling techniques are used for the location. This is assumed to be a 5-day event unless the community can show that a shorter event is more appropriate for local conditions. In some areas this may require continuous-simulation modeling. If a community, regional, state, or federal agency can demonstrate that, say, the 72-hour event provides the "worst case" runoff for a watershed, the 72-hour event would be credited for communities in that area.

(e)—(g) These additional points recognize communities that preserve their remaining "natural" channels, floodplains, or upland wetlands for stormwater conveyance or storage. "Soft" or "green" approaches are encouraged over "hard" or concrete measures.

(h) The last 20 possible additional points are dependent on the community's receiving credit for a floodplain management plan under Activity 510. A floodplain management plan developed for Activity 510 (Floodplain Management Planning) probably will not qualify for SMP credit, but a stormwater master plan may qualify for credit under Activity 510. A community may be eligible for these 20 points if:

- The Floodplain Management Plan is mentioned prominently in the stormwater master plan, and if references in the stormwater master plan demonstrate that it is intended to help implement the Floodplain Management Plan; and/or
- Hydrologic output from the stormwater master plan is used as input for the Floodplain Management Plan.

c. Freeboard for new buildings in B, C, D, and X Zones (FRX) (Maximum credit: 150 points)

FRX is determined by the type and amount of freeboard required in B, C, D, or X Zones (FX). FRX credit is not provided for a freeboard requirement above the base flood elevation. FRX credit is not provided to communities that are entirely Special Flood Hazard Area (SFHA). FRX = one of the following:

1. 50 x FX (the height in feet that the lowest floor (including basement) must be above the crown of the nearest street or the highest grade adjacent to the building); or

2. 25 x FX (the height in feet that the lowest opening or point of entry must be above the crown of the nearest street or the highest grade adjacent to the building); or

3. 50, if the regulations require that as a condition for a building permit, the applicant must prepare a site plan that accounts for local drainage from and onto adjoining properties and that protects the building from local drainage flows; or

4. 20, if the regulations require that the applicant provide positive drainage away from the building site.

FX is reduced by 0.5 feet if the standard is an elevation above the gutter rather than the crown of the street.

The FRX regulatory language is usually found in the building code, rather than in the ordinance with the floodplain or stormwater management regulations. Several of the national model codes require site plans or positive drainage.

Under items c.1. and 2., the maximum credit is provided for 3 feet of freeboard. The highest adjacent grade or other datum may be used as an alternative to the crown of the nearest street. If the street gutter is used, 0.5 feet is subtracted from the amount of freeboard.

There is no impact adjustment for FRX because it must be enforced throughout either the entire community or the B, C, D, and X Zones.

A community may request credit for FRX even if it does not apply for credit for the other elements of this activity.

Example 451.c -1. Watertown has adopted a version of the Uniform Building Code that requires the lowest floor to be at least 14" above the crown of the adjacent street.

$$FRX = 50 \times FX = 50 \times \frac{14"}{12"} = 50 \times 1.17 = 58.5$$

d. Erosion and sedimentation control regulations (ESC) (Maximum credit: 45 points)

ESC is based upon the areas regulated. ESC = one of the following:

1. 45, if regulations control erosion and soil loss from any disturbed land, including agricultural lands, greater than 1,000 square feet;

2. 35, if regulations control erosion and soil loss from construction sites as small as 1/2 acre;

3. 30, if regulations control erosion and soil loss from construction sites as small as 1 acre; or

4. 15, if regulations control erosion and soil loss only from construction sites greater than 5 acres.

This credit is provided because drainage systems cannot perform to their design standards if they are choked with sediment, a particular problem when the ground has been disturbed by development. This credit is for regulations that are applied throughout a community, not just in floodprone areas.

"All construction sites" in subsections d.2, 3, and 4 means all sites subject to construction of buildings, roads, etc., regrading, or other non-agricultural land-disturbing activity. An erosion and sedimentation control regulation that is part of a floodplain ordinance or a building code and does not affect ALL construction sites in the community does not receive full credit under this element.

A community may have regulations that exempt agricultural uses from erosion and sediment control requirements. For example, the state enabling legislation may not allow regulation of farms. In such cases, the community may apply for ESC = 45 if it can document that there are no agricultural zones and no existing agricultural uses within its corporate limits and all other projects (except those smaller than 1,000 square feet) are regulated.

Example 451.d-1. Appropriate ordinance language might read:

> Prior to any grading or other earthwork that affects a land area larger than 500 square feet, the person performing such earthwork shall submit an erosion control plan. The plan shall be designed to prevent sediment from leaving the site during storms up to and including the 100-year storm and recover the ground after construction or other work to prevent or minimize erosion. [ESC = 45]

or

> Application for any grading and/or building permit (except for single-family dwellings on existing platted lots) must include an erosion control plan designed to prevent sediment from leaving the site during the 100-year storm and recover the ground after construction to prevent or minimize erosion. [ESC = 35]

e. Water quality regulations (WQ) (Maximum credit: 25 points)

WQ = 25, if regulations require new developments of 5 acres or more to include in the design of their stormwater management facilities appropriate "best management practices" that will improve the quality of surface water.

Most states' environmental protection or pollution control offices have recommended best management practices (BMPs) appropriate for that state. Best management practices may include grass filter strips at retention basin inlets or outlets, velocity dissipators and baffles, basin dimensions that encourage settling of suspended solids, aeration, infiltration trenches, skimmers, vegetated swales, and other techniques that clean stormwater. It should be noted that this credit is not for BMPs required during the course of construction, but rather for measures that are permanently incorporated in the development's stormwater management facilities.

For WQ credit, the stormwater management regulations must either specify one or more measures or refer to best management practices as published in an official government reference. A mention of water quality or reduction of nonpoint sources of pollution in the purpose section of the regulations is not sufficient for credit.

Example 451.e-1. Watertown is located in a state-designated estuarine protection area. The plans for all new developments larger than 1 acre must be sent to the state coastal zone management agency for approval. The state regulations stipulate best management practices to improve the quality of the stormwater entering the estuary.

WQ = 25

452 Impact Adjustment

There are no impact adjustment ratios for FRX, ESC, or WQ because they must be enforced throughout the community. Credit for FRX is provided if the regulation applies only to areas outside the regulatory floodplain.

a. Option 1:

1. Stormwater management regulation (SMR): If the community, separately or along with upstream communities, regulates development within all of the watersheds that affect it, rSMR = 1.0.

2. Stormwater management master plan (SMP): If the stormwater management master plan regulates all development within all of the watersheds that affect the community, rSMP = 1.0.

A community may choose to exclude watersheds larger than 50 square miles. If such large watersheds are outside the community's jurisdiction, or are not regulated, the community will receive more credit by excluding them. If they are regulated, the community will receive more credit by including them.

The two "r" variables are used to reflect the ratio of the area covered by the community's basic regulations and the area covered by the community's stormwater management plan. aSMP must be included in aSMR. If all regulated areas are included in the stormwater management plan, rSMP = 1.0.

Few communities will be able to use Option 1 to determine their impact adjustments because few communities have regulatory jurisdiction over areas that coincide with their watershed boundaries. The only cases that have arisen so far are:

- Communities that are islands,
- Communities subject to state or regional stormwater regulations that affect their entire watersheds, and
- Communities, usually counties, whose corporate boundaries are formed entirely by watershed divides (ridges), or bodies of water.

b. Option 2:

1. Stormwater management regulation (SMR): If the community does not regulate development within all of the watersheds that affect it, it may use the default value rSMR = 0.25.

2. Stormwater management master plan (SMP): If the stormwater management master plan does not regulate all development within all of the watersheds that affect the community, it may use the default value rSMP = 0.25.

Many communities find it difficult to determine the size of the watersheds. Therefore, 25% of the credit is given for cSMR if no rSMR is calculated. A community that regulates less than 25% of its watersheds may also use Option 2 to determine the minimum value of rSMR.

Example 452.b-1. Watertown regulates all watersheds within its corporate limits. However, areas outside the corporate limits are not regulated. Watertown uses Option 2: rSMR = 0.25.

c. Option 3:

1. Stormwater management regulation (SMR): If the community does not regulate development within all of the watersheds that affect it, it may develop a Stormwater Impact Adjustment Map to determine the areas required to calculate rSMR:

   $$rSMR = \frac{aSMR}{aW}, \text{ where}$$

   aSMR = the area of stormwater management regulation, and

   aW = the area of all watersheds affecting the community.

2. Stormwater management master plan (SMP): If the stormwater management master plan does not include all areas of stormwater management regulation within the community, it may use the Stormwater Impact Adjustment Map to determine the areas required to calculate rSMP:

   $$rSMP = \frac{aSMP,}{aW} \text{ where}$$

   aSMP = the area covered by a stormwater management master plan.

If a community can demonstrate that the upstream portion of its watershed is managed to a similar standard, either by other communities separately or by a regional entity like a drainage or flood control district, aSMR and aSMP may be increased. The community must document such management in accordance with Section 454.

Because this activity only affects watersheds under the jurisdiction of stormwater management regulations, impact adjustment ratios must be determined for stormwater management regulation and the stormwater management master plan.

In order to use Option 3 and determine aSMR, aW, and aSMP, the community must prepare a Stormwater Impact Adjustment Map. Although the purpose of this map is similar to the Impact Adjustment Map discussed in Section 403, it may be quite different in appearance. The base map for the Stormwater Impact Adjustment Map should be a small-scale map that can show all of the watersheds affecting the community. A community may choose to exclude watersheds larger than 50 square miles. If such large watersheds are outside the community's jurisdiction, or are not regulated, the community will receive more credit by excluding them. If they are regulated, the community will receive more credit by including them.

The entire watershed for each watercourse draining into or through the community should be shown on this map (except those with drainage areas over 50 square miles, if they are excluded from the calculations). The total area of these watersheds is aW. With appropriate documentation, aW may be reduced in two ways:

1. If upstream watersheds are effectively reduced by flood control structures that control the base flood, the size of aW is reduced accordingly.

   NOTE: *Only structures designed to control the base flood can be used for this type of adjustment to aW.*

2. If portions of the watersheds are unlikely, because of their ownership, to be developed, those portions may be excluded from aW. Areas that might be excluded are national forests, state parks, or privately owned land dedicated to open space use.

Communities are encouraged to cooperate with adjacent communities to manage stormwater. If a community only has regulatory jurisdiction over a portion of its watersheds, it cannot ensure that properties will be safe from increased runoff in the future. However, if upstream communities also manage future development, either independently or through county-wide or watershed planning, all communities can benefit. Therefore, if a community can demonstrate that upstream communities have similar watershed management programs for the upper portions of their watersheds, it can include those areas in aSMR and aSMP.

Communities are encouraged to check with their state or regional stormwater management agency to see if they can apply for "uniform minimum credit," i.e., credit based on the stormwater management program implemented by the regional agency.

453 Credit Calculation

a. cSMR = SMR x rSMR

b. cSMP = SMP x rSMP

c. c450 = cSMR + cSMP + FRX + ESC + WQ

Example 453-1. Watertown's credit points are discussed above:

SMR = 185, rSMR = 0.25, cSMR = 185 x 0.25 = 46.25

FRX = 58.5

WQ = 25

c450 = 46.25 + 0 + 58.5 + 25 = 129.75, which is rounded to 130

During the field verification, the ISO/CRS Specialist examined a selection of public and privately owned facilities and they appeared to be properly maintained.

454 Credit Documentation

The community must submit the following:

a. [Required if the community is applying for credit for SMR under Section 451.a]: A copy of the ordinance or law language regulating surface water runoff from new developments in the watershed. For SMR credit, the language must require that peak runoff from new developments be no greater than the runoff from the site in its pre-development condition. The margin next to where this appears in the ordinance must be marked "SMR."

   The language submitted must include those factors that are credited: size of developments regulated, design storms to be used, and how the maintenance of drainage and retention facilities is handled. The appropriate acronym(s) (SZ, DS, and PUB) must be marked in the margin of the ordinance sections that pertain to each element.

   The community may also be asked to complete an activity worksheet that helps identify where the credits are due.

As an alternative to such a performance standard, the language may be based on criteria designed to produce the same result on a regional basis (e.g., a standard allowable discharge per acre based on a regional study). If such language is used, the community must provide an estimate of the design storm controlled and a comparison of the pre-development runoff and the permitted discharge.

For CRS credit, the regulations must be legally enforceable. Policies and guidelines are not acceptable unless the community's legal counsel states that they are enforceable.

A photocopy of the appropriate pages of the ordinance(s) (e.g., subdivision and/or zoning ordinances) or statute, including the cover page to identify the document, is sufficient and

should be attached to the activity worksheets. The Chief Executive Officer's (CEO's) certification is considered to include a certification that the ordinance or statute has been enacted into law and is being enforced (see Section 212.a).

Example 454.a-1. Sample ordinance language might read:

> All new development within the Little River watershed shall be designed to prevent any increase in peak flow, velocity, or total runoff volume during the 5-year and 100-year rainfall events. Prior to development, the developer must submit hydrologic and hydraulic studies showing the nature and extent of runoff under present conditions and with the proposed development for those two rainfall events.

b. [Required if the community is applying for SMP credit under Section 451.b] Copies of the pages of the stormwater master plan that show the following:

   1. Management of peak flows and volumes so that they do not exceed present values. The plan must include either regulations that meet these criteria, or must be based on a rainfall/runoff model that achieves these results;

   2. The recurrence interval of the storm used for the regulations and/or model;

   3. The duration of the storm used for the regulations and/or model;

   4. [Required if the community is applying for credit for Section 451.b.2(e)—(g)] How the plan utilizes or protects the existing natural stormwater features within the watershed; and

   5. [Required if the community is applying for credit for Section 451.b.2(h)] A statement by the community official responsible for implementation of the stormwater master plan that it was prepared in coordination with or as part of the community's Floodplain Management Plan credited under Activity 510. This documentation may be provided from either plan if it is contained there.

   The community may also be asked to complete an activity worksheet that helps identify where the credits are due.

A stormwater management plan is usually a complex, bulky document. It may have an introduction or summary describing the area covered by the plan, its objectives, and the regulation of surface water runoff. This summary is probably adequate documentation for some or all of this credit. If no such summary is available, it must be developed to document this credit.

There are three ways for the community to document its credit for SMP:

- Mark the appropriate sections of the plan with the section numbers in Section 451.b (451.b.1(b), 452.b.2(c), etc.);
- Write a memo listing the credits requested and giving the pages and sections where the language can be found; or
- Complete the activity worksheet that identifies where the credits are found.

c. [Required if the community is applying for FRX credit under Section 451.c] A copy of the ordinance or law language that requires elevation of the lowest floor or lowest opening of new buildings. The acronym FRX must be marked in the margin of the section that pertains to this element.

This documentation may be in the community's building code. If the community has adopted one of the national model building codes, documentation of that adoption, as well as the code language, must be provided.

d. [Required if the community is applying for ESC credit under Section 451.d] The ordinance or law language that requires developers or property owners to use techniques that prevent erosion and soil loss from exposed land. The ordinance(s) or law must designate an office or official responsible for receiving complaints and monitoring compliance and it must include enforcement and abatement provisions.

The acronym ESC must be marked in the margin of the ordinance section that pertains to this element.

e. [Required if the community is applying for WQ credit under Section 451.e] The ordinance or law language that requires new developments to implement appropriate best management practices to improve water quality.

The acronym WQ must be marked in the margin of the ordinance section that pertains to this element.

A copy of the appropriate pages of the ordinance or statute is sufficient. The CEO's certification is considered to include a certification that the ordinance or statute has been enacted into law and is being enforced (see Section 212.a).

f. [Required if the community calculates the impact adjustment ratio for one or more elements by using Option 1 (Section 452.a) or Option 3 (Section 452.c)] An Impact Adjustment Map showing watershed boundaries and stormwater management jurisdiction.

The Impact Adjustment Map is explained in the *Commentary* text following Section 452.c. If either Option 1 or 3 is used, the map is needed to verify the impact adjustment calculations.

g. [Required if the community determines the area of stormwater management regulation (aSMR) or the area covered by the stormwater management plan (aSMP) to include watershed areas regulated by other communities] Documentation that watersheds outside the jurisdiction of the community are regulated to similar standards or are subject to the same plan as those within the community.

The applicant can provide the actual ordinance language from the community(ies) or written assurance from a county, regional, or state agency that similar standards are in effect in the upstream communities.

h. [Required if the community is applying for PUB credit under Section 451.a.3] The procedures used to inspect and maintain drainage facilities.

The inspection and maintenance procedures for this activity must include the same five items needed for Activity 540's drainage system maintenance as specified in Section 544.a. It is recommended that the stormwater management facility maintenance procedures be part of the drainage system maintenance program because Activities 450 and 540 are closely related.

The community must have the following documentation available to verify implementation of this activity:

i. Development and building permit records that demonstrate enforcement of the regulations. If the community applied for credit for public maintenance under Section 451.a.3, records that demonstrate implementation of the inspection and maintenance requirements.

If it has received credit for a stormwater management master plan (SMP) under Section 451.b, the community must provide the following documentation at the time of its cycle verification:

j. An evaluation report that addresses whether the community's stormwater management plans that are more than five years old are still based on appropriate data and effectively manage stormwater runoff. In lieu of a formal report, the community may submit a letter signed by a licensed professional engineer that addresses the following issues:

   (1) The "future conditions" at the time the plan was completed: Do these conditions still reasonably reflect the actual watershed conditions today?

   (2) The precipitation data used for the plan's hydrology: Does the community or agency still use the same precipitation that was used in the report?

   (3) Method used for the plan(s): Is the method used to develop the plan(s) considered appropriate today by the agency?

   (4) Construction: Has construction of stormwater infrastructure altered actual conditions in ways that make the plan(s) obsolete?

   (5) Other factors: Are there other aspects of the plan(s) that make it obsolete or otherwise of questionable applicability?

455 For More Information

Additional information, reference materials, and examples can be found at the CRS Resource Center at **http://training.fema.gov/EMIWeb/CRS/**.

a. See Appendix E to order a free copy of *CRS Credit for Stormwater Management*.

b. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which is usually located in the county seat.

c. Most states' environmental protection or pollution control offices have recommended best management practices (BMPs) appropriate for that state. The U.S. Environmental Protection Agency has developed BMPs for coastal areas that are appropriate throughout the country.

   Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, 840-B-92-002, January 1993, can be obtained from

   U.S. Environmental Protection Agency
   Office of Water
   Washington, D.C. 20460

[This page intentionally blank.]