Local Flood Proofing Programs

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US Army Corps of Engineers

Flood Proofing

NATIONAL FLOOD PROOFING COMMITTEE

This report was prepared for the U.S. Army Corps of Engineers' National Flood Proofing Committee by French & Associates, Ltd., 153 Nanti, Park Forest, Illinois, 60466 (708/747-5273). It is based on research findings, site visits and interviews with local officials who have designed or implemented flood proofing financial assistance programs. The cost data information reflects costs associated with the period, or year, in which the indicated programs were designed or implemented.

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Table of Contents

1. Introduction 1

   1.1 Background 1
   1.2 Purpose 1

2. Flood Proofing 2

   2.1 Elevation 2
   2.2 Barriers 3
   2.3 Dry Flood Proofing 5
   2.4 Wet Flood Proofing 6
   2.5 Sewer Backup and Basement Protection 7
   2.6 For More Information 9

3. General Considerations 11

   3.1 Appropriate Projects 11
   3.2 Funding Sources 13
   3.3 Community Interest 14
   3.4 Property Owner Involvement 17
   3.5 Statutory Authority 18
   3.6 Liability 20

4. Funding Arrangements 23

   4.1 Full Funding of Projects on Public Property 23
   4.2 Full Funding of Projects on Private Property 23
   4.3 Cost Sharing with State or Federal Funds 25
   4.4 Cost Sharing with the Property Owner 27
   4.5 Low Interest Loans 28

Appendix A. Program Summaries

   A.1 Des Plaines, Illinois A-1
   A.2 Fairfax County, Virginia A-4
   A.3 Homewood, Illinois A-5
   A.4 Mount Prospect, Illinois A-6
   A.5 Prince George's County, Maryland A-9
   A.6 River Grove, Illinois A-17
   A.7 St. Charles, Michigan A-21
   A.8 Other Communities A-24

1. Introduction

1.1 Background

Flood proofing is a relatively new approach to reducing flood damage. As detailed in this report, it involves altering an existing building or its immediate area to prevent or minimize damage during a flood. Alterations may range from minor changes to the utilities, to waterproofing walls, to elevating the building above flood levels.

The potential for flood proofing to reduce flood losses is significant. Many people have flood proofed their homes or businesses, often by using common sense or self-taught approaches. In the last 10 years, Federal, State and local agencies have been researching techniques, promoting flood proofing as a viable flood protection measure, and assisting property owners in implementing projects.

Studies have shown that financing is often the greatest impediment to implementing a flood proofing project. While surveys showed that many people want to flood proof, lack of funds was listed as the most important reason why they did not. Further, flooded homeowners who received assistance from the government were more likely to flood proof and spend more money to do a more thorough job.

Statutory authority and limited resources keep the Federal programs from reaching many people. More funding assistance is needed from agencies and other levels of government.

A few local governments have financed or provided financial support for flood proofing projects. Each community's program was developed differently and is administered differently. However, all believe flood proofing is important enough to deserve local funding. The experiences of these communities can be very helpful in guiding other flood prone communities in developing their own approaches to flood proofing, and in equipping Federal and State staffs who help local governments implement flood proofing programs.

1.2 Purpose

This report identifies lessons learned that can help communities interested in financing flood proofing projects. It is not a recipe for developing a model program, because each community must design its own approach based on local flood hazards, building conditions, financial needs and resources.

This report provides examples and photographs of projects financed by local governments. Appendix A summarizes local programs that have funded more than one flood proofing project. The experiences of other communities are mentioned but are not summarized in Appendix A because they have not funded any projects or they have not established an ongoing program. In those instances, the local contacts are listed at the end of Appendix A.

2. Flood Proofing

Two approaches may be used to protect a property from flood damage: structural and nonstructural. Structural methods are intended to prevent flooding by altering the flow of floodwater; these include constructing levees or dams, or modifying a waterway's channel. Nonstructural methods are intended to reduce damage from encroaching floodwater by altering the property; these include acquiring and/or relocating a building, preparing emergency measures, such as sandbagging, and flood proofing structures.

Flood proofing is defined as "any combination of changes or adjustments incorporated in the design, construction, or alteration of individual buildings or properties that will reduce flood damages." Unlike a structural approach, the building site remains subject to flooding; it is the building or the area adjacent to it that is modified to prevent or minimize flood damage.

Some approaches to flood proofing rely on human intervention. "Human intervention" is the need for one or more people to be present to take the right steps to make a flood proofing system work. For example, if a floodwall will provide protection only if someone installs a closure or activates a pump, it is considered to need human intervention. Measures that need human intervention are considered less dependable, especially if little warning of flood conditions can be expected, since failure to perform human intervention tasks can result in flood damage.

The community programs described in this report funded five approaches to flood proofing. They are summarized in the following sections:

2.1 Elevating the building, so that floodwaters do not reach any damageable portions of it.

2.2 Constructing barriers between the building and floodwaters ("barriers").

2.3 Making the building walls and floor watertight so water does not enter ("dry flood proofing").

2.4 Modifying the structure and relocating the contents so that when floodwaters enter the building there is little or no damage ("wet flood proofing").

2.5 Preventing sewer backups and basement flooding.

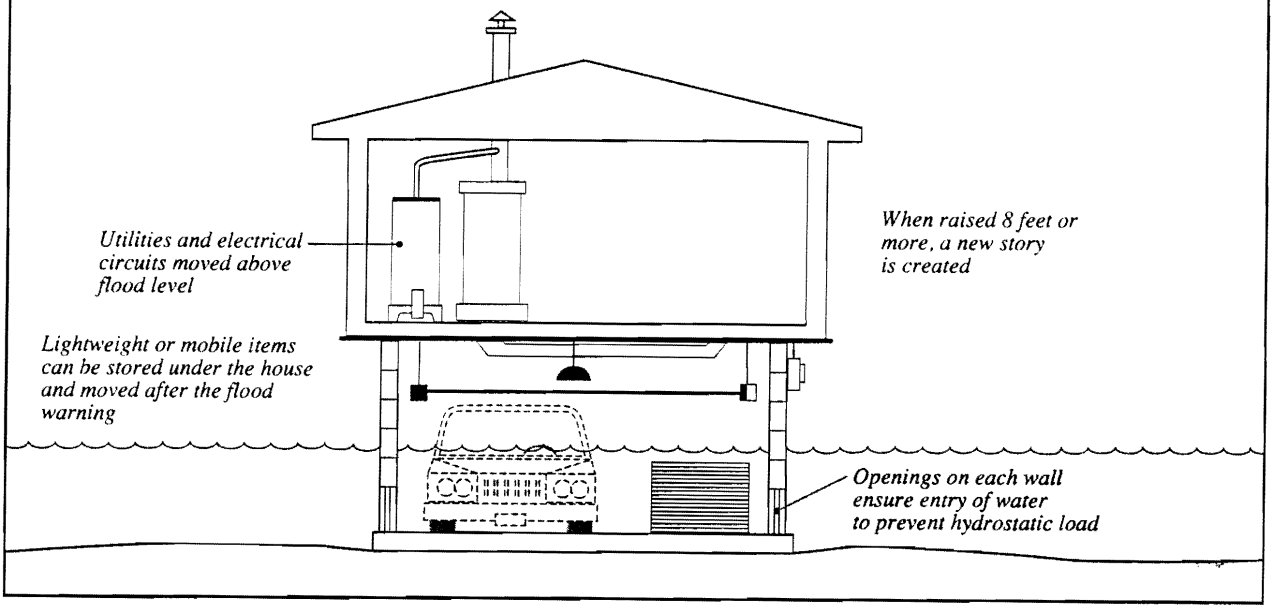
2.1 Elevation

The best way to protect a house from surface flooding, short of removing it from the flood plain, is to raise it above the design flood level. This allows floodwaters to flow under a building, causing little or no damage. Most communities have building codes for new and substantially improved buildings located in flood plains that require that this method be used. It is commonly practiced in flood prone locations throughout the country.

Many qualified house-moving contractors know the techniques for elevating a building. The structure is jacked up and temporarily set on cribbing while a new foundation is built underneath. The foundation walls are raised to the flood protection level and the house is lowered onto the new foundation. Utility lines are extended and reconnected, steps are built and, in some cases, the perimeter is backfilled or landscaped to mask the change.

The walls of the new foundation must have openings to allow floodwaters to pass under the building. Otherwise, hydrostatic pressure will be placed on the walls and floor, and the foundation would be in danger of cracking or breaking. In areas subject to wave action or higher velocity flooding, elevation on columns or pilings is recommended to minimize the exposure to these hazards.

Figure 1. House Elevated over Garage



If the flood protection level is low, the result can be similar to building a house over a 2- or 3-foot crawlspace. If the house is raised 2 feet, the front door would be 3 steps higher than before. Examples of such low elevation projects are shown in Figure 12 on page 26. If the house is raised 8 feet, the lower area can be wet flood proofed for use as a garage, to provide access to the building, or for storage of items not subject to flood damage (see Figure 1.).

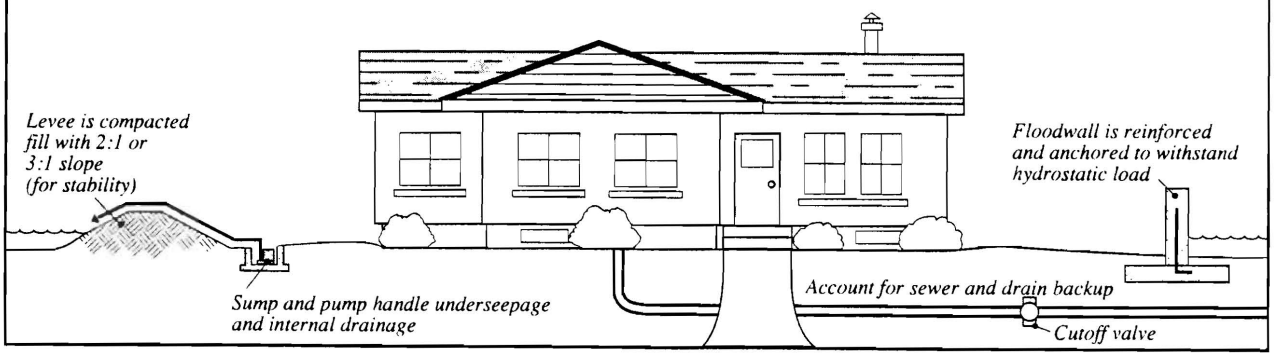
Cost: $8,000 to $50,000, depending primarily on the type of building.

2.2 Barriers

Barriers keep floodwaters from reaching a building. They can be made of earth, concrete, masonry or steel. Large earth barriers are called levees. In shallow flooding areas, a common approach is to construct a berm, which is a small levee, usually built from locally available fill.

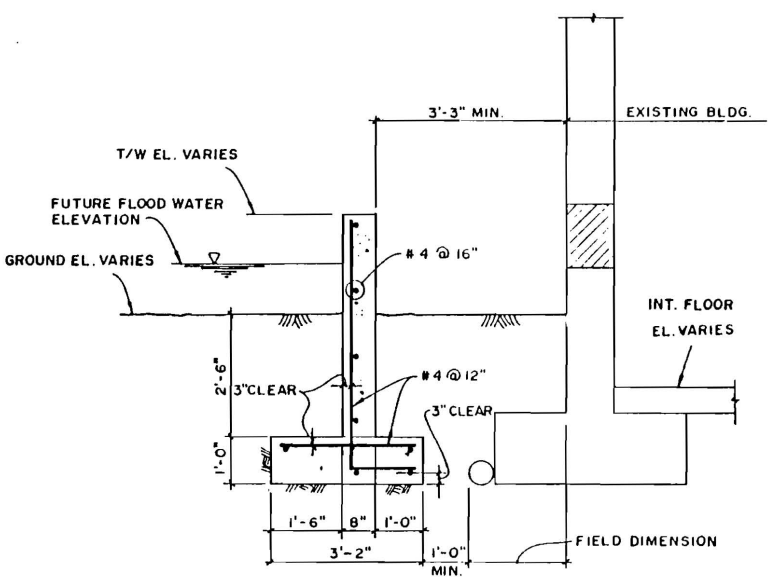
Sheer mass gives berms and levees their strength. A typical design has 3 horizontal feet for each vertical foot (3:1 slope), so at least 6 feet of ground is needed for each foot in height. Thus, berms and levees need a lot of room (see Figures 2 and 10 on pages 4 and 24).

Figure 2. Barriers



Where there is not enough room for a berm or levee, concrete, masonry or steel structures are used. Concrete and masonry walls should be built with internal reinforcing bars for strength, and to resist cracking and settling over time. They must be properly anchored to withstand lateral hydrostatic pressure; care must be taken to ensure they are watertight. Figure 3 depicts an example of a design for a concrete floodwall.

Figure 3. Floodwall Design



This is part of the specifications for a floodwall around a public housing site in Rosemont, Illinois. The project was funded by the Village's general revenues after a 1986 flood caused $1.3 million in damage.

The reinforcing bars and footing are needed to ensure that the wall will resist the hydrostatic pressures of floodwaters.

The wall has openings at sidewalks to allow the elderly residents easy access. Human intervention is required to sandbag the openings. Maintenance crews are on site around the clock and sandbags are stacked on pallets for quick installation.

Providing access into the area protected by a wall or levee can be complicated. If the slope is not too steep, pedestrians and vehicles can go over the wall, as in the case of the levee illustrated in Figure 10 on page 24. Some barriers have openings for driveways and sidewalks. Closing these openings is dependent on human intervention, so their use is not appropriate where there is little warning time. If the wall is high, a stairway can be built over it to provide access without human intervention. An example of this approach is illustrated in Figure 11 on page 25.

Barrier design needs to account for leaks, seepage of water under the wall, and drainage of rainwater that falls inside the barrier perimeter. A sump and/or drain tile is needed to collect the internal ground and surface water. A pump and pipe are also needed to pump the internal drainage over the wall as illustrated in Figures 2 and 9 on pages 4 and 22.

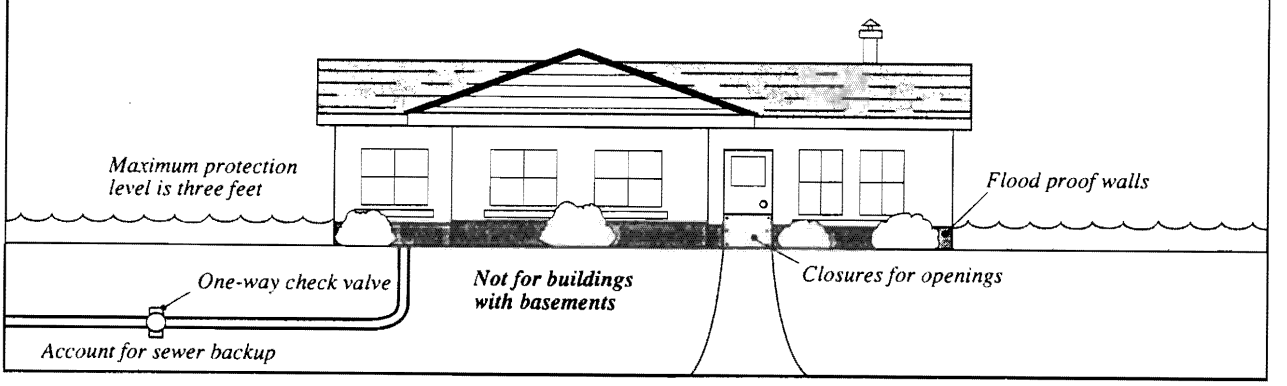
Floodwalls, levees and berms can either surround the building (as in a ring levee) or connect to high ground. Several communities have funded construction of berms or floodwalls that run from high ground adjacent to one end of a house to high ground at the other end to protect a below-grade patio or walkout basement (see Figures 9 and 13 on pages 22 and 28).

Cost: Minimal to $20,000+. The cost can range from practically nothing, as when the homeowner regrades the yard or builds a berm with local fill, to $20,000 or more depending on the complexity of the project and the materials used. Landscaping, backfilling and building brick facades to match the structure can greatly increase costs.

2.3 Dry Flood Proofing

Sealing a building to ensure that floodwaters cannot get inside it is called dry flood proofing. All areas below the flood protection level are made watertight. Walls are coated with a waterproofing compound, or plastic sheeting is placed around the walls and covered. Openings, such as doors, windows, sewer lines and vents, are closed -- temporarily, with sandbags or removable closures, or permanently.

Figure 4. Dry Flood Proofing



Dry flood proofing is only appropriate for buildings on slab foundations that are free of cracks. Because most building walls and floors are not strong enough to withstand the hydrostatic pressure from more than 3 feet of water, the design flood should be less than 3 feet above the slab. The technique is not recommended for houses with floors below grade, such as basements and garden apartments, because hydrostatic pressure can collapse the walls or buckle the floor.

This technique is not as desirable as a barrier, which will keep floodwaters from reaching the building. However, where there is not enough space on the lot for a barrier separate from the building, dry flood proofing may be the only alternative.

Proper maintenance of materials used in dry flood proofing is a concern. Waterproofing compounds can deteriorate over time, especially if they are exposed to sunlight. Removable

closures can be misplaced. To be dependable, a dry flood proofed building should be inspected periodically, and its owner should conduct drills to ensure that the closures can be located and put into place in time.

Several communities have funded projects that combine dry flood proofing with a barrier. The building walls are made watertight and small floodwalls are built around the windows and doorways. This provides permanent protection that does not need human intervention to close the openings. An example of this is illustrated in Figure 11 on page 25.

Cost: Minimal to $20,000+. The cost ranges from $100 for the waterproofing compound/sandbag approach, to $20,000 for a more secure and attractive approach that does not need human intervention and blends in with the building's appearance.

2.4 Wet Flood Proofing

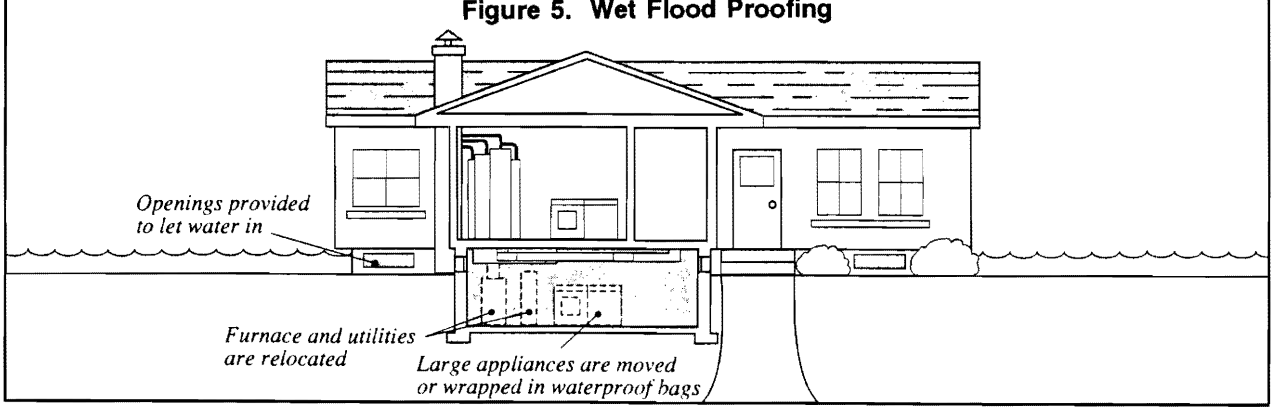
Hydrostatic water pressure increases with the depth of water. Depths over 3 feet have been shown to collapse the walls of a typical house. Basements can be subject to 6 or 7 feet of water pressure when the ground is saturated. As a result, watertight walls and floors may crack, buckle or break from shallow surface flooding.

One way to deal with this is simply to let the water in and remove or protect everything that could be damaged. This approach is called wet flood proofing. It employs several techniques to modify a building to ensure that floodwaters are allowed inside, but damage to the building and contents is minimal. Such techniques range from moving a few valuable items to rebuilding the area that might be subject to flooding.

In the latter case, structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher level (see Figure 5). Where flooding is not deep, these items may simply be raised on blocks or platforms.

Wet flood proofing is usually not used for one-story houses because the flooded areas are the living areas. However, many people wet flood proof their basements, garages and accessory buildings simply by relocating all hard-to-move items, such as heavy furniture and electrical

Figure 5. Wet Flood Proofing



outlets. Light or movable items, such as lawn furniture and bicycles, can be relocated after a flood warning is issued.

Cost: Minimal to $20,000. In one hour a property owner can accomplish some wet flood proofing by moving valuables out of the floodable area. Costs can range from $3,000 for relocating the furnace, water heater, etc., to as high as $20,000 to rebuild the floodable area with water-resistant materials and to relocate all utilities to a new addition.

2.5 Sewer Backup and Basement Protection

A sewer backup occurs during heavy rains. Stormwater flows into combined or separate sanitary sewers, overloading the system's capacity to carry the water to the sewage treatment plant. The water backs up through house service lines into floor drains and then into basements.

Many basements are protected from groundwater problems by drain tiles that direct groundwater into sumps. Sump pumps move the water from the sump out to the ground, away from the building. Very heavy rains can overload this system; power outages and maintenance problems may knock out a sump pump. Should this happen, the system designed to keep groundwater out can act as a conduit to bring water into a basement.

In some communities, sewer backup and basement flooding are bigger problems than overbank or surface flooding. Often they occur at the same time, so many property owners are not sure how the water entered their homes. Barriers and dry flood proofing projects need to account for backflows through sewer lines, and seepage of groundwater under the protective barrier during surface flooding.

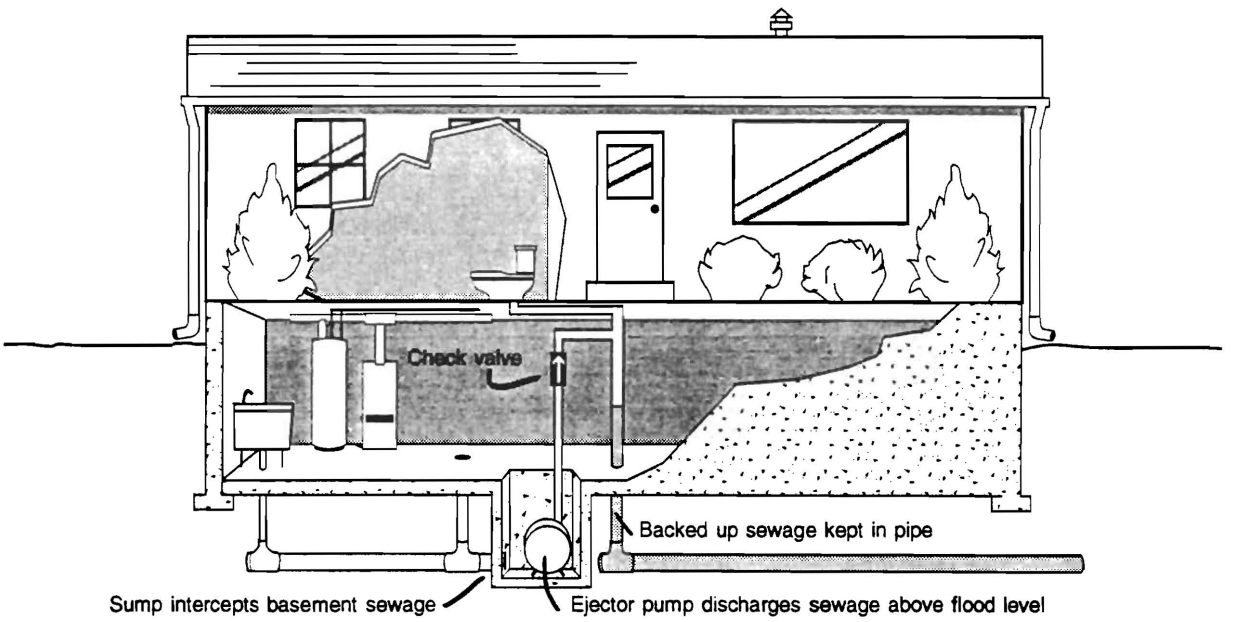
There are some inexpensive and usually effective measures for sewer backup, such as plugs and standpipes for the basement floor drain. This report, however, covers the more expensive approaches, where the owner may need financial assistance. The two most common measures funded by the communities interviewed are overhead sewers and backup valves.

Overhead Sewer: An overhead sewer restricts backed-up sewer water to the plumbing system. A sump is installed under the basement floor to intercept sewage flowing from basement fixtures and the basement floor drain. The sewage is pumped out by an ejector pump in the sump (see Figure 6 on the next page). Plumbing fixtures on the first floor are not affected. They continue to drain by gravity to the sewer service line.

It is unlikely that sewers will back up above the level of the overhead sewer line. If water does go higher, a check valve in the pipe from the ejector pump keeps it in the pipes. Backed up sewage is contained in the sewer pipes so there is no worry about overflowing laundry tubs or basement toilets. An overhead sewer is also illustrated in Figure 14 on page 29.

Cost: $2,000 to $5,000 for a plumbing contractor to reconstruct the pipes in the basement and install the ejector pump.

Figure 6. Overhead Sewer



Backup Valve: A backup valve stops the water inside the sewer pipes. Older versions of this approach were located in the basement and relied on gravity to close the valve. If debris caught in the flapper, the valve did not close securely. Because of their unreliability, use of valves was discouraged and even prohibited in some communities.

The "balanced valve" has corrected these design shortcomings. A system of counterweights keeps it open all the time so debris won't catch and clog it. When the sewer backs up, instead of relying on gravity, floats force the valve closed. A balanced valve is usually installed in a manhole in the yard so there is less disruption during construction. This is also preferred for older buildings which may not have cast iron sewer pipes under the basement. An outside location prevents water pressure from breaking the pipes under the basement floor.

As with overhead sewers, a valve is fully automatic. It can even work when there is surface flooding. The installation is outdoors, so there is minimal disruption in the basement during construction. The owner still can use the sanitary sewers during flooding, as long as there is power to run the ejector pump which ejects wastewater when the valve is closed.

Cost: $3,000 to $4,500 for an automatic backup valve located outside the building.

Basement Flooding: Basement flooding caused by saturated ground can be corrected by installing drain tile around the foundation. The tile drains into a sump and water is pumped out, usually onto the ground away from the building. Depending on local conditions, the pipe and pumping system may have to handle large volumes of water. In some parts of the country, all new houses with basements are built with drain tile and sump pumps.

As noted in Section 2.5 on page 7, if the sump pump does not operate, this system can be a conduit directing water into the basement. On the other hand, a properly installed system can protect basements during surface flooding. As long as there is a barrier that keeps surface water from reaching the building, a drain tile and sump pump should keep the underseepage from building up water pressure on the basement walls and floor.

Installing or correcting these drain tile systems and sump pumps is considered flood proofing in many communities. Correction projects include larger or additional sump pumps, backup sources of electricity for the pumps during power outages, and redirecting the outfall.

Cost: $50 - $15,000. Lower cost projects include adding a second sump pump or power backup source. The most expensive approach would entail retrofitting a house with a drain tile and sump pump and waterproofing basement walls.

2.6 For More Information

Several good references on flood proofing techniques are available from the U.S. Army Corps of Engineers. The following may be obtained free from:

U.S. Army Corps of Engineers
ATTN: CECW-PF
20 Massachusetts Avenue, NW
Washington, D.C. 20314

Flood Proofing Techniques, Programs and References, February 1991: an introduction to flood proofing and the government programs and manuals that can help a community.

Flood Proofing Systems & Techniques, December 1984: a well-illustrated review of different techniques that have been built around the country.

Flood Proofing - How to Evaluate Your Options, July 1993: a guidebook on selecting the most appropriate and cost effective protection measure.

Flood-Proofing Regulations, EP 1165-3-314, March 1992: detailed specifications for various dry and wet flood proofing measures.

Flood Proofing Technology in the Tug Fork Valley, April 1994: a detailed report on the flood proofing techniques used to protect many homes in this Corps project in West Virginia and Kentucky.

A Flood Proofing Success Story along Dry Creek at Goodlettsville, Tennessee, September 1993: a review of a Corps project to elevate homes which includes contracting documents and other guides for financing flood proofing.

Raising and Moving the Slab-on-Grade House, 1990: an illustrated review of the techniques used to elevate and relocate houses on slab foundations, keeping the slab attached.

Flood Proofing Tests, August 1988: a review of tests of waterproofing materials and dry flood proofing systems conducted by the Corps' National Flood Proofing Committee.

Except as noted, the following documents are available free from:

Federal Emergency Management Agency
ATTN: Publications
P.O. Box 70274
Washington, D.C. 20024

Design Manual for Retrofitting Flood-prone Residential Structures, FEMA-55, February 1986: an extensive review that discusses all aspects of protecting an existing house from flood damage, including technical design criteria.

Elevated Residential Structures, FEMA-54, March 1984: includes concepts, examples, performance criteria, architectural drawings, photographs, cost calculation forms and sources of information and assistance.

Floodproofing Non-residential Structures, FEMA-102, May 1986: an overview of flood proofing new and existing buildings, designed to familiarize the reader with a variety of techniques.

Best Build 3: Protecting a Flood-prone Home, FEMA/National Association of Home Builders: a 30-minute video overview of flood proofing techniques ($5).

3. General Considerations

Before initiating a flood proofing funding program, certain factors need to be considered by community officials. Six of the most important factors are covered in the following sections of this chapter:

3.1 Ensure that the projects to be funded are appropriate for the flood hazard.

3.2 Identify the source of the funds.

3.3 Get others in the community interested in and supportive of flood proofing.

3.4 Involve the property owners in the flood proofing and funding decisions.

3.5 Ensure that the community has the legal authority to fund the projects.

3.6 Ensure that local staff will be free from liability.

The "how to" aspects of the funding arrangements are covered in Chapter 4. More information on local experiences can be obtained from the contacts listed in Appendix A.

3.1 Appropriate Projects

The financial benefits of flood proofing can be very attractive to community officials. It is usually cheaper to protect a building in place than to acquire and/or remove it. However, flood proofing techniques that leave a building in the flood plain are not appropriate in areas subject to the high hazards of deep flooding, erosion, flash flooding, high velocity flooding or heavy debris flows.

In many places the only safe approach is to remove buildings from harm's way. Flood proofing should be undertaken only where the occupant is not left in a life-threatening situation.

Flood proofing is an appropriate flood protection measure only for certain flood hazards and particular types of buildings. A community should develop criteria to decide which properties should be protected by which measures. The Corps publication, Flood Proofing - How to Evaluate Your Options, provides detailed guidelines on determining the most appropriate measure for an individual building (to order a copy, see page 9).

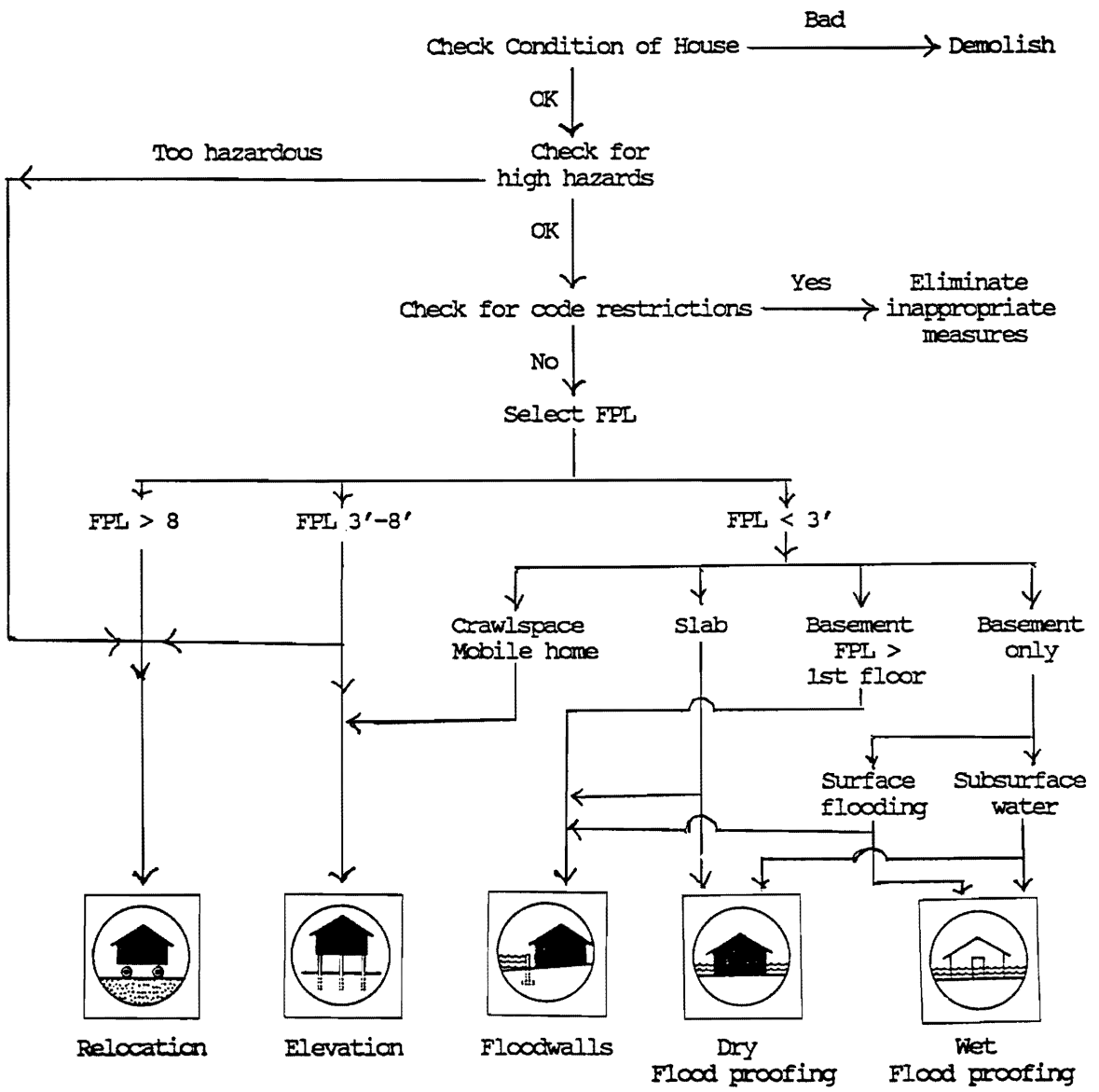
Communities should generally restrict flood proofing projects to areas subject to low velocity and/or shallow flooding. Some limit their funding to the safest types of projects as seen by these examples:

-- Des Plaines, Illinois, restricts its funding to sewer backup protection projects.

-- The flood protection plan developed by Homewood, Illinois, recommended funding only elevation projects rather than cheaper dry flood proofing projects, because the Village could not be sure that a dry flood proofed building would be properly maintained by the owners over time.

-- The Illinois Department of Transportation, Division of Water Resources, helped establish a low interest loan program for communities in 1988. It gave the communities guidelines to determine which types of projects could be funded based on the flood depths and building types. The guidelines are summarized in the flow chart in Figure 7, below.

Figure 7. Illinois Division of Water Resources' Flood Proofing Decision Tree



("FPL" = flood protection level)

-- Prince George's County, Maryland, established guidelines for its funding program based on 100-year flood levels developed by the County, assuming a fully developed watershed. The result is a higher flood protection level, i.e., an extra margin of protection. Generally, if the building is subject to more than 3 feet of flooding, acquisition or elevation are the usual options. If the building is subject to less than 1 foot of flooding, only flood proofing is considered. The County and the owner jointly decide the best solution for flood depths of 1 to 3 feet.

3.2 Funding Sources

Wanting to finance flood proofing projects is one thing; having the money to do it is quite another. Communities may encounter one or two problems in devoting funds to flood proofing: having adequate funds to start a new program, and/or having the legal authority to spend the money on flood proofing. This section reviews the wide variety of funding sources that have been used in communities around the country. The question of legal authority is discussed in Section 3.5.

Property Taxes: Property taxes are the mainstay of most local governments. There are two kinds of property taxes, general and special purpose. Most communities have a "general corporate fund" or "general revenue fund" that may be used to finance many kinds of activities, especially staff and administrative expenses. Frankfort, Kentucky; Rosemont, Illinois; and Fairfax County, Virginia, identified this kind of fund as one of their sources for the money.

A special purpose storm drainage property tax finances the program in Prince George's County, Maryland. Revenue from this separate State-approved tax is deposited in a discrete fund. Money from this fund may be spent only on storm drainage projects (including flood proofing). Impact fees (see page 14) are also collected by the County and placed in this fund.

King County, Washington, has a special County-wide property tax levy that goes into its River Improvement Fund. It can be used for various river maintenance and flood protection purposes.

Sales Tax: Some states authorize communities to levy sales taxes for special purposes. The Economic Development Council of Kemah, Texas, is supported by a 0.5 percent sales tax. The Council funds various community improvement activities including drainage projects, flood plain acquisition and flood proofing. Using its home rule powers, Mount Prospect, Illinois, levies a sales tax of 0.25 percent for flood and stormwater purposes.

Every five years, the citizens of Tulsa, Oklahoma, vote on extending a 1 percent sales tax. Each referendum includes a list of projects to be financed by the bonds. The last one included several flood control projects and specifically set aside $600,000 for flood proofing and acquisition. (While the City found a source of funds, as noted on page 19, the City Attorney later ruled that the funds could not be used on private property.)

Bond Issue: Bonds are usually issued to pay for large public works projects, including flood and drainage improvements. Fairfax County, Virginia, and Homewood, Illinois, identified bonds sold for stormwater or drainage improvement purposes as one of their funding sources.

Impact Fees: Some drainage projects in Fairfax County, Virginia, are paid by contributions from developers. They are required to contribute to the cost of handling the increased stormwater runoff produced by their developments. The fees are put in a fund for drainage projects. Flood proofing can be funded when it is shown to be a more economical way to handle a drainage problem.

Creative Financing: A community is limited only by its imagination. Several have found "creative" ways to find funds for flood proofing. For example, Illinois levies an income tax which it shares with local governments. For a few years the share was increased. The City of Des Plaines appropriated $200,000 from this "extra" money to establish a fund for its flood proofing rebate program. The fund still has a balance to support more projects, even though the income tax revenue sharing was decreased back to the old level.

Frankfort, Kentucky, plans to set up a revolving loan fund by augmenting general revenue with the proceeds from the sale of land that had been purchased for low income housing and the phasing out of a housing corporation. Since these two programs were designed to improve housing, there are no problems with using their assets to improve the City's housing stock by flood proofing flood prone homes.

State Support: Some states have had special appropriations to support local programs. The Amite River Basin Commission will be funding a portion of the pilot project in Denham Springs, Louisiana, through its annual appropriation from the State. In 1988, the Illinois Housing Development Authority set aside $500,000 for low interest loans for flood proofing. Eighteen Chicago suburbs and one county were authorized to approve loans from their allocation. This program is explained in more detail on page A-17 in Appendix A.

Federal Support: Several federal agencies, such as the U.S. Army Corps of Engineers and the Tennessee Valley Authority, have directly supported flood proofing projects. The lessons learned from this work is often transferrable to local government programs. One example of this is the Corps' publication, A Flood Proofing Success Story (see page 9), which provides documents on dealing with property owners and contractors that are applicable to all financing programs.

The Department of Housing and Urban Development's Community Development Block Grant and FEMA's Public Assistance and Hazard Mitigation Grant Programs provide funds for communities to administer. These are discussed in Section 4.3 on pages 25-27.

3.3 Community Interest

What motivates a community to fund flood proofing projects? Those that have investigated or implemented funding programs cited one or more of five broad reasons: economics, comprehensive planning, external impact, the Community Rating System, and post-flood mitigation funding. These five items are discussed in detail in this section.

Economics: The most frequently cited reason for funding flood proofing was cost - it was shown to be less expensive than other flood protection measures. In some cases, as in Fairfax County, Virginia; Homewood, Illinois; and King County, Washington, studies of local flood problem areas reviewed a variety of structural and nonstructural alternatives. Where flood proofing was found to be the most economical solution, the community favored it instead of a more expensive structural project.

Flood proofing is also less expensive than acquisition, especially where property values are high. As shown in Figure 8, below, King County estimated that it could elevate eight homes for the price of acquiring and relocating one. Part of this large difference in cost is due to the high cost of housing in the Seattle area.

Two cautions must be noted. First, communities must remember that flood proofing does not stop street and yard flooding, damage to infrastructure, traffic disruption and other problems that accompany floods. Protecting buildings is often only one goal of a flood protection program. Thus, using dollars only may not produce an accurate comparison.

Second, predicting the actual costs of projects in areas with little flood proofing experience may be difficult. A homeowner may construct a project at a relatively small out-of-pocket cost. The same project will cost substantially more if it is fully funded by a government agency that pays for engineering design and prevailing wages for the contractor. For example, the first bids received by Homewood, Illinois, were twice the original estimates. This report includes the costs of the projects described to show the great range of prices in different parts of the country.

Comprehensive Planning: Some communities have prepared comprehensive flood plain management or flood damage reduction plans. During the planning process, they concluded that flood proofing should be a part of the program, especially in isolated areas that won't be protected by structural projects. The plan may recommend a variety of ways to implement flood proofing projects, such as providing technical assistance and funding.

King County, Washington, prepared such a comprehensive plan. It includes preliminary project recommendations for over 120 flooding and erosion problem sites in the County. The plan looked at home elevation along with other flood protection measures, such as retrofits of existing flood control facilities, relocation of homes, construction of new flood or erosion control facilities, and improved flood hazard education and flood warning.

Figure 8. Total Needs Identified in King County, Washington's Flood Hazard Reduction Plan

Cost	One-time Cost	Annual
Structural capital improvements	$265,000,000	$300,000
Relocation and elevation		240,000
Elevate 168 houses	4,000,000	
Acquire 234 houses	42,100,000	
Acquire 113 mobile homes	7,300,000	
Maintenance and monitoring	383,000	2,400,000
River planning	4,850,000	0
Flood hazard education	106,000	15,000
Warning and emergency response	97,000	62,000
Complaint response and enforcement	0	216,000
Interlocal coordination	64,000	15,000
Administration	0	150,000
	$323,900,000	$3,398,000

The resulting King County Flood Hazard Reduction Plan identifies a need for more than $300 million in flood hazard reduction efforts (see Figure 8). The plan identifies 168 homes as possible candidates for elevation, at an estimated cost of $4 million. Although the average cost of elevating a home is much less than the cost of acquiring and relocating it, elevation was recommended only in areas with very low velocity flows and where a home would not be at risk from undercutting through erosion. It should be noted that costs vary greatly around the country, depending on building types, how many non-flood related items (such as stairs and landscaping) are included, and local economic conditions.

Frankfort, Kentucky, was scheduled to have a large portion of its downtown protected by a levee constructed by the Corps of Engineers. The project would leave several hundred properties exposed to flooding by the Kentucky River. The City created a task force which conducted a building-by-building survey. The resulting mitigation plan recommended acquiring properties in the high velocity floodway, flood proofing others, revising the City-County comprehensive plan, assisting in locating new low and moderate income housing, constructing some small protection projects, and publicizing flood insurance.

While not preparing comprehensive plans, other communities have opted for flood proofing as part of comprehensive approaches to help all flood prone properties. In some cases, flood proofing was chosen as a way to help areas not protected by planned structural measures. For example, two Illinois communities, Mount Prospect and Des Plaines, initiated rebate programs to help people who would not be protected by major sewer improvements.

External Impact: Sometimes flood proofing is selected because other flood protection measures have adverse impacts on other properties or the environment. Structural projects can increase flood heights and destroy habitats. Except for barriers, flood proofing projects do not alter flood flows or affect habitats; they just modify existing buildings.

Flood proofing can also be less disruptive to a neighborhood than, for example, removing houses or building a large wall. Fairfax County, Virginia, and Tulsa, Oklahoma, had proposed channel improvements at public meetings. Residents objected to having their back yards disturbed by bigger and wider ditches. These two communities have since redirected their planning efforts to focus on flood proofing solutions in these neighborhoods.

Community Rating System: The Community Rating System (CRS) is a part of the National Flood Insurance Program (NFIP). Flood insurance rates are reduced in communities that apply to the CRS and show that they are implementing flood plain management activities that exceed the minimum requirements of the NFIP. There are 18 credited activities, including public information programs, technical assistance to residents, higher standard regulations, acquisition and relocation, flood proofing and flood warning. These activities and their credit points are explained in the CRS Coordinator's Manual for local officials.

Most communities apply because they have already implemented some of the credited activities. However, once in the CRS, some want to improve their insurance rate reduction, so they initiate new programs to receive more credit for more activities. For example, officials in Kemah, Texas, and South Holland, Illinois, became interested in flood proofing after reading the manual. They have implemented public information programs and have planned funding programs, in part to receive CRS credit, but primarily to offer an additional form of assistance to help protect flood prone properties.

Post-flood Mitigation Programs: Usually a community becomes interested in flood protection programs after a flood. Not only is there interest in trying new approaches, there may be funds available to support new programs. In the last few years, Federal disaster assistance programs have promoted and funded flood proofing as a way to reduce future disaster assistance payments.

For example, while processing the applications for grants to repair flooded wastewater treatment plants or other public buildings, FEMA staff identify flood proofing or other mitigation alternatives. They encourage the local applicants (and provide 75% of the cost) to incorporate flood proofing instead of returning the building to its pre-disaster, flood prone condition. Many communities have found the funds needed to match the FEMA grant for flood proofing.

The Department of Housing and Urban Development's Community Development Block Grant program also has a post-disaster funding program. A State agency administers this program in rural areas. The Village of St. Charles, Michigan, took advantage of this program to fund a comprehensive flood damage reduction program after it was flooded in 1986. The program included dike construction, bridge improvements, sanitary sewer protection and elevation of homes. The cost of home elevation was shared with the property owners on a 75/25 basis.

3.4 Property Owner Involvement

Voluntary property owner involvement is vital to the initiation and long-term operation and maintenance of a flood proofing project. However, flood proofing is often viewed by property owners as a poor alternative to a flood control project that keeps water away from them. They would rather have the problem corrected than have to modify their homes or lots, especially if they think the resulting appearance will affect their property values. Many times residents perceive a flood proofing proposal as evidence that local officials are giving up on them and are leaving the residents to fend for themselves.

Flood proofing can be a major disruption to people's houses. Planning for a flood protection project can be a tense time for the owners, who may not know whether the community will be stopping the flooding, altering their houses, or relocating their families out of the neighborhood. Therefore, flood proofing projects may begin with the owners suspicious of, or opposed to, the idea.

Keeping residents informed was the recommendation most frequently voiced by communities experienced in implementing flood protection plans. A guiding principal for Prince George's County, Maryland, calls for developing a personal relationship and mutual trust with the property owner. This requires both the right attitude and sound technical data that can be explained in lay terms.

To gain support and cooperation for any flood protection proposal, the experienced communities recommend citizen participation early in the planning process. Tulsa, Oklahoma, South Holland, Illinois, and King County, Washington, all used existing standing committees to represent the interests of flood plain residents.

Other communities formed temporary committees for specific areas. Homewood, Illinois, and Frankfort, Kentucky, developed their plans during a series of public meetings with representatives from the affected neighborhoods. The planning process reviewed the costs and benefits of all alternatives to help residents understand why their preferred projects might not be feasible.

In some cases, residents may promote the idea of flood proofing. In Denham Springs, Louisiana, residents had been waiting for years for State and Federal agencies to decide if a large reservoir would be built. Planning for the reservoir had taken a long time because of economic and environmental problems. Some residents felt that "they won't see a flood control project before they die." They went to the Amite River Basin Commission, which responded by starting a pilot project to demonstrate how to elevate homes and train local contractors in the techniques.

Once there is general support for a flood proofing project, continuous contact with the owners must be maintained. Details of the project plans must be worked out and their participation in this task is vital. Homewood, Illinois, held a general meeting with just the residents who would be assisted, followed by one-on-one meetings between the owners and the architects during the design stage.

Prince George's County, Maryland, spends a great deal of time with the affected residents. Construction plans account for the appearance of the final product and landscaping as well as flood protection. A few minor projects, such as correcting utility line violations, may be included at the County's expense to continue the good will with the owners. Contact with the owners and their neighbors is continuous throughout planning and construction. One contractor's supervisor estimated that each day he spent two hours on project supervision and six hours on public relations.

3.5 Statutory Authority

Two legal questions sometimes arise when considering government involvement in flood proofing: the statutory authority to spend public money on improving private property, and liability for protecting private property. In some communities, legal challenges have prevented implementation of well-planned programs.

The problem of statutory authority arises from Dillon's Rule, a Nineteenth Century court ruling that found that because they are created by State government, local governments can do only what State laws specifically authorize. If an action is not authorized by statute, a community cannot do it. In some states, larger communities may be granted "home rule." A home rule community is authorized to do anything that is not prohibited by statute.

Prince George's County, Maryland, does not have a statutory authority question because Maryland law authorizes local governments to spend public funds on "stormwater management" which is defined as

> ...the planning, designing, acquisition, construction, demolition, maintenance, and operation and disposition, practices, and programs for the control and disposition of storm and surface waters, including floodproofing and flood control and navigation programs.

Most states do not have laws that address flood proofing so clearly. A few communities reported either that it was against State law or that there was not specific authority to use public money to improve private property. In Tulsa, the City Attorney issued an opinion that read:

> Under the Oklahoma Constitution ... expenditure of tax dollars must be for a public purpose. ...
>
> Flood proofing will increase a building's value with primary benefit to the individual property owner rather than the community and therefore does not constitute a public purpose. ...
>
> It is our opinion that the City of Tulsa may not use sales tax funds to finance or construct flood proofing projects on private property since such expenditure would be for a private rather than public purpose. Opinion 92-36

Legal reports in two other states reached different conclusions. In response to a request from the Amite River Basin Commission, Louisiana's Attorney General issued an opinion that read:

> We see no reason why the Commission cannot conduct such projects in cooperation with other public and private entities, who will also be benefited thereby. That this project will be conducted upon and thereby benefit private property, does not, in our opinion, obviate the public character of this project as encompassed within the Commission's authority to develop flood protection plans. It occurs to us that most, if not all, flood protection facilities, works and plans benefit private property and the owners thereof.
>
> The fact that the expenditure of public funds for projects in the public interest may result in the enhancement of private property does not denigrate the public nature of such projects and the public purposes served thereby. Opinion 93-193

The authority under which Illinois communities without home rule could act was researched by Professor Clyde Forrest, Jr., an attorney and professor of planning at the University of Illinois. He concluded:

> ... a review of Illinois Revised Statutes has disclosed many provisions relating to municipal drainage works and housing repair programs. When the necessary actions to achieve flood proofing are viewed as serving a public purpose, protecting the health and safety of citizens of the municipality, current statutes yield an interesting array of enabling authority. ...
>
> It is my opinion that authority exists for a non-home rule municipality to undertake the restoration of housing areas and construction of improved storm drainage projects and to use unrestricted public funds for such purposes.

Professor Forrest cites five statutes and one section of the Illinois Constitution. The strongest authority comes from statutory authorizations for communities to undertake community development activities, to bring buildings up to safe and sanitary conditions, and to protect their residents from the health and safety problems of flooding. In Illinois, as in most states, there is authority to spend local funds on activities whose costs are shared with a State or Federal agency.

3.6 Liability

What if a flood proofed property is later damaged by a flood? What if the owner failed to maintain a protection measure? These questions have been debated nationally for some time. The topic has been studied extensively by Jon Kusler, nationally known attorney in flood plain management law. Mr. Kusler summarized his most recent findings in Floodplain Management in the United States: An Assessment Report, Volume 2, prepared for the Federal Interagency Floodplain Management Task Force, 1992.

Excerpts from that report are quoted here. However, each community's legal department should provide more specific guidance. While no court cases involving flood proofing were found, the following general findings apply:

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

   > Except in a few instances, governments are not liable for naturally occurring flood damages. Government has, in general, no duty to construct dams, adopt regulations, or carry out other hazard reduction activities unless required to do so by a statute. It is only where a government unit causes flood damages or increases natural flood damages that liability may arise.
   >
   > As a result, some government attorneys have recommended, in some instances, that agencies or local governments 'do nothing' with regard to flood loss reduction as a way of reducing potential liability. This is increasingly poor advice....
   >
   > As a practical matter, it is often impossible or impractical for a City or State to 'do nothing' with regard to hazard areas in order to avoid liability. Cities have usually already undertaken a broad range of activities that may increase natural flood damages on private property. These activities include construction of roads and bridges, storm drains, dikes and levees, sewage treatment and water supply plants, and various public buildings in the flood plain. Given the high risk of liability associated with these activities, it may be far more appropriate to install a flood warning system with the slight chance that liability may result if the system is incorrectly designed or maintained than it is to face unmitigated flood damages resulting from the earlier activities. (pages 10-12 - 10-13)

2. Liability is based on negligence. A community is well defended by a properly designed and maintained project.

   > In general, government units are not 'strictly or absolutely' responsible for increased flood damages. Liability usually results only where there is a lack of reasonable care. ...
   >
   > Where the standard of reasonable care is judicially applied to an activity, the seriousness of foreseeable threat to life or economic damage is an important factor in determining reasonableness of conduct. In general, the more serious the anticipated threat, the greater the care the government entity must exercise. (page 10-13)

3. Policy or discretionary actions are more defensible than nondiscretionary, ministerial actions.

   > As a general rule, courts do not hold legislative bodies or administrative agencies liable for policy decisions or errors in judgment where the legislature or agency exercises policy-making

> or discretionary powers. But they often hold agencies responsible for failure to carry out nondiscretionary duties or for negligence in carrying out ministerial actions. (page 10-13)

4. Government employees are usually protected from liability suits.

> Although governments may be liable for increased flood or drainage losses in a broad range of contexts, government employees are usually not personally liable for planning, permit issuance, operation of dams, adoption of regulations or other activities. ... No personal liability results where a government employee acts in good faith, within the scope of his or her job, and without malice. Successful lawsuits for hazard-related damages against government employees under common law theories or pursuant to Section 1983 of the Civil Rights Act are apparently nonexistent. (pages 10-13 - 10-14)

Based on these findings, a community has five ways in which it can protect itself from lawsuits:

1. Staff should become technically competent in the field. The community won't be sued if the project is correctly designed or if staff give the right advice and no one is damaged by flooding.

> ... 'liability can be avoided if flood damages are avoided.' From a legal perspective, this is a sound philosophy. (page 10-17)

2. Staff should limit flood proofing advice and projects to areas where it is appropriate, i.e., areas of lower velocities and flood depths. This will reduce the dangers of failure and the level to which "reasonable care" must be applied. For example, as noted in Figure 9 on the next page, Prince George's County has decided to avoid more complicated projects.

3. The community should enter into a contract or agreement with each property owner. The agreement should specifically exempt the local government from liability due to damage or loss that may result from failure of the project. An example of such an agreement is on Figures A-8 through A-10 on pages A-14 through A-16.

4. Staff should follow nationally recognized flood proofing guidelines. Almost all professions have a set of accepted practices or standards. For example, accountants do not certify that a company's finances are straight, they say that they have reviewed the company's books in accordance with "Generally Accepted Accounting Principles."

   Building officials do not review plans to see if the building will be protected from flood damage, although that is the ultimate objective. They review plans to see if they meet minimum flood plain management or building code standards for flood plain construction.

   A professional is normally not held liable if he or she acted in accordance with the accepted standards of the profession. A set of flood proofing standards or guidelines would greatly help flood protection staffs. Unfortunately, such standards do not exist yet. In the meantime, the community can use the Corps' manual Flood Proofing: How to Evaluate Your Options (see page 9) or FEMA or state guidance to prepare its own standards and have them adopted by its governing board.

... from a legal perspective it may be desirable to submit proposed standards ... to a community's legislative body (e.g., community council) for debate and approval. Due to the special way legislative decisions are treated by the courts, legislative judgments, particularly those of a discretionary nature, are less likely to result in a successful liability suit than are agency decisions. Courts generally defer to legislative judgment. (page 10-17)

5. The Community may want to purchase liability insurance or establish a self-insurance pool or plan to protect itself.

Figure 9. High Floodwall

This floodwall protects a walk out basement and was financed by Prince George's County, Maryland.

This example shows how attention to detail is critical in flood proofing. Being five feet high, the design must account for over 300 pounds of water pressure per square foot. A watertight connection to the building wall is vital. Improperly designed connections have been shown to be a major cause of failure of this type of project.

Note the sump to handle internal drainage and the electrical supply for the sump pump. The local building code requires a railing for walls higher than 30 inches. These and other complications have led Prince George's County to decide not to fund any more walls higher than three feet except where technically feasible and cost-effective.

4. Funding Arrangements

The previous chapter reviewed the factors that a community should consider in establishing a program to fund flood proofing projects. This chapter discusses how funds actually have been managed. The local programs reviewed fall into one of five categories of funding arrangements which are discussed in the following sections:

4.1 Full funding of projects on public property.

4.2 Full funding of projects on private property.

4.3 Cost sharing with State or Federal funds.

4.4 Cost sharing with the property owner.

4.5 Low interest loans.

4.1 Full Funding of Projects on Public Property

Under this approach, a community selects flood proofing as the best way to protect its public facilities from flooding. Projects are managed as with any other public works project on public property. This is the easiest approach to implement, as it avoids the problems of coordinating activities with a property owner, the legal complications of how public money should be spent, and most concerns about liability.

The research found numerous examples of flood proofing to protect existing public buildings. These include sewage and water treatment plants, bus stations, public housing, an auditorium and a city office building (illustrated in Figure 10 on the next page). Tulsa, Oklahoma, intends to use some of the $600,000 it can't use on private property to flood proof public buildings as demonstration projects.

4.2 Full Funding of Projects on Private Property

Under this approach, the community assumes full responsibility for designing, contracting, funding and managing the flood proofing project. It is similar to full funding on public property except that there needs to be a great deal of coordination with the property owner. This is the approach used by Prince George's County, Maryland. Kemah, Texas, has used City crews to make drainage improvements on private property.

The biggest shortcoming to this approach is the cost. Five factors make projects fully funded by the community more expensive than other funding arrangements:

1. It is labor intensive. Community staff must coordinate every step with the owner.

2. Government projects may cost more when statutes require that contractors be paid at prevailing wages for the area.

Figure 10. Flood Proofed Office Building in Elk Grove Village, Illinois

The library in Elk Grove Village, Illinois, was built on floodprone land donated by a developer. After flooding in 1986, 1987, 1989, and 1990, the library was relocated. The building was given to the fire department for a headquarters and training facility.

Capital improvement funds paid to surround the building with a levee that is up to 10 feet high. The top of the levee is two feet above the 100-year flood.

The total cost was $232,000 including $40,000 for engineering. However, over one-third of the cost was for compensatory storage excavation to meet state and local floodplain management regulations.

Other large cost items include a reinforced concrete core where site limitations restrict the slope of the levee, a pump station, and landscaping.

3. Government projects normally require contractors to carry insurance and post surety bonds that add to project costs.

4. Most communities want the work they are responsible for to be foolproof. Therefore, they often pay engineering and architectural fees for projects where many property owners will use a contractor. A good example of this is elevating a house. When paid for privately, few owners hire an architect because contractors are so experienced in the work. However, government agencies prefer the "insurance" provided by professional design. The result raises the total cost by 5 percent to 10 percent.

5. Fully funded government projects will usually cover all expenses. If the owner was paying for the project, he or she might do without some of the appearance items or not replace all the landscaping removed during the project.

One way to reduce the cost of this approach is to select several buildings to be protected by the same flood proofing method at the same time. This would take advantage of economies of scale in the design and construction of the projects. Also, property owners will feel more comfortable knowing that they are not alone in trying a different method to protect their homes.

Prince George's County takes advantage of economies of scale by bidding its flood proofing projects in groups. To date, three groups have been funded, covering 27, 18 and 5 buildings. Of these 50 projects, 37 have been for floodwalls/dry flood proofing with an average cost of $30,000 and 13 projects were for wet flood proofing of crawlspaces, with an average cost of $15,000 per building. Examples of the floodwall/dry flood proofing projects are in Figure 9 on page 22 and Figure 11, below.

Figure 11. Combination Project

This floodwall/dry flood proofing project was built on private property and funded by Prince George's County, Maryland. The building walls not protected by the floodwall are waterproofed. The stairway over the wall ensures that there are no openings so the project is not dependent on human intervention to work.

4.3 Cost Sharing with State or Federal Funds

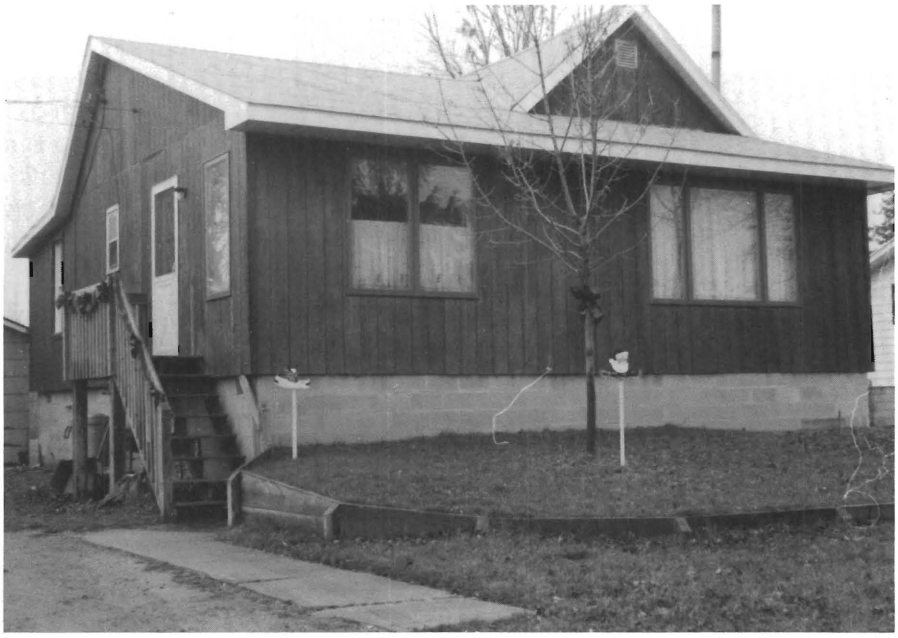
Another way to reduce the direct cost to the community is to piggyback with another agency's program. The two most common programs are the Department of Housing and Urban Development's Community Development Block Grants (CDBG) and FEMA's post-disaster Hazard Mitigation Grants.

The CDBG has funded 100 percent of the cost to elevate homes in Terrebonne Parish, Louisiana; Kampsville, Illinois; and St. Charles, Michigan (illustrated in Figure 12 on the next page). Some CDBG funds can be used as a local match for other Federal programs, including FEMA's grants. Both programs are being used to help pay for elevating homes in Oakdale, Tennessee.

Figure 12. Elevated Homes in St. Charles, Michigan

St. Charles, Michigan, conducted a program that used Community Development Block Grant funds to elevate eight homes on crawlspaces. The change in appearance was minimal.

This house was elevated a little over one foot. Note the elevated gas meter.



This home was elevated 4 feet. Note the backfill and landscaping to reduce the visual impact of an elevated building.

Cost estimates for elevation projects need to include the cost of new stairs, porches and landscaping.

FEMA's Hazard Mitigation Grants are provided on a 50-50 basis following a Presidential disaster declaration. Oakdale, Tennessee, will be elevating 12 homes with this program at a cost of $196,000 (average cost: $16,300 per structure). The local match is being covered with funds from CDBG and the Tennessee Housing Development Authority.

FEMA's Public Assistance Program provides disaster aid on a 75/25 Federal/non-Federal cost share to help restore damaged public properties. It can be used to fund mitigation projects that are found to be feasible. A good number of wastewater treatment plants, pump stations and other flood prone public buildings have been protected from future flooding under this program.

Several communities have used "soft matches" to meet the local share for State or Federal funding programs. "Soft matches" are contributions other than cash, such as in-kind services, which are given a dollar value and credited toward the local share. Denham Springs, Louisiana, is counting staff time, utility fee waivers, and legal and inspection services toward its share of the FEMA Hazard Mitigation Grant. An additional non-Federal soft match is provided by the Louisiana Cooperative Extension Service, which is developing educational materials for contractors and homeowners.

From the property owner's perspective, cost sharing with a Federal program looks the same as full funding by the community. As long as the owner qualifies for the Federal funds, he or she usually does not pay a share of the cost.

This approach has the same shortcoming as full funding by the community: the cost may be higher than under other approaches, for the same reasons. The administrative cost may be even higher due to the need to manage Federal funds under Federal criteria. The delays and staff time needed to process a Federal grant application can also be expensive.

4.4 Cost Sharing with the Property Owner

Having the owner of the protected property contribute to the project's cost has two advantages. First, the community's funds will go farther. Second, it gives the property owner a stake in the project. By having an investment in flood proofing, the owner will have an incentive to make sure the property is properly maintained.

The owner's share should be large enough to be a meaningful investment but not so large that the owner cannot afford to flood proof. The Village of Homewood, Illinois, could have paid the full $25,000 that each elevation project was expected to cost. However, for the reasons stated above, it decided to have each property owner pay $1,500. This figure is based on the costs the owner would have to pay if the building were insured and flooded: $500 for the structural deductible, $500 for the contents deductible, and $500 for uninsurable items. None of the owners has balked at paying this amount, which equals 6 percent of the total cost.

The Denham Springs elevation project is estimated to cost $20,000 to $40,000 per building. The cost is high partly because particularly difficult examples were selected, and because the pilot will use a contractor from Florida experienced in raising slab foundations. Property owners' shares will be 35 percent to 40 percent of the costs.

Des Plaines and Mount Prospect, Illinois, have had successful programs with owners paying 80 percent of the total cost. As described on pages A-1 and A-6, these communities provide a "rebate" of 20 percent of the project cost or $1,000 (whichever is less) after property owners install the flood proofing measures. Most of the measures have been related to sewer

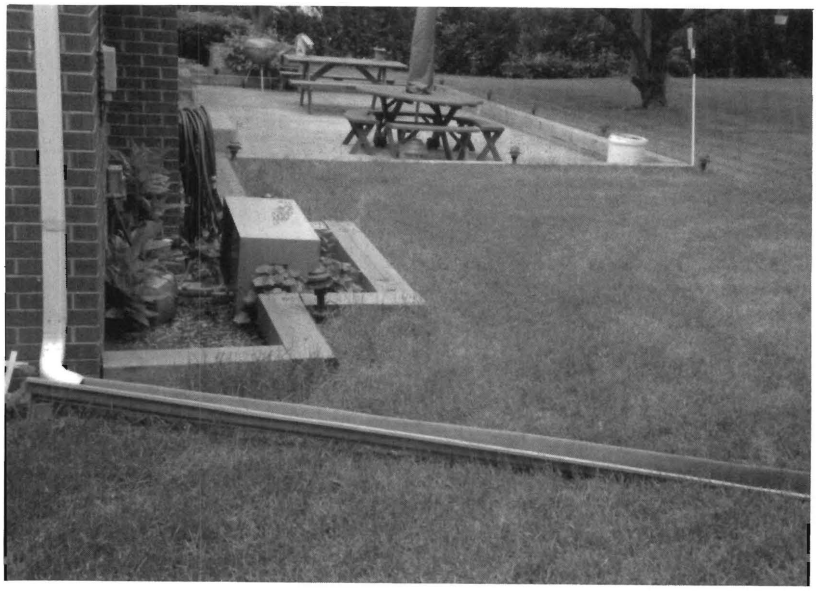
backup and flooded basements. Because these projects cost less than $5,000, few rebates have been as high as $1,000.

The Des Plaines and Mount Prospect programs have been quite popular, funding more than 200 projects to date. Their application procedures are relatively simple. Applicants submit:

-- a description of the work,
-- contractor's invoice or other evidence of the cost,
-- proof of payment,
-- proof of ownership or residency, and
-- a City permit for the project.

The procedures are included in Figures A-1 to A-4 on pages A-2, A-3, A-7 and A-8. Des Plaines has additional arrangements for projects that are funded with commercial loans and for projects that were built before the program went into effect. Some applications have been denied because they did not have a permit or the improvements were not flood-related.

Figure 13. Berm Financed by Mount Prospect, Illinois', Rebate Program



This site had been bothered by nuisance flooding for 30 years. Water flows from the right across the back-yard to the house. Mount Prospect, Illinois' rebate program was the catalyst for the owner to finally correct the problem.

A landscaping company regraded the yard and backfilled against timbers to form a one foot high berm. The barrier runs the width of the back of the house around the air condition-ing unit and the patio. Note also the downspout drain extension which carries stormwater well away from the building. Total cost: $3,860. Village share: $772. Owner 's share: 80 percent.

4.5 Low Interest loans

Low interest loans look attractive to a funding agency. Eventually, the funds will be repaid so they can be loaned to flood proof other properties. Loans also avoid the challenge that the community is "giving" money to improve private property.

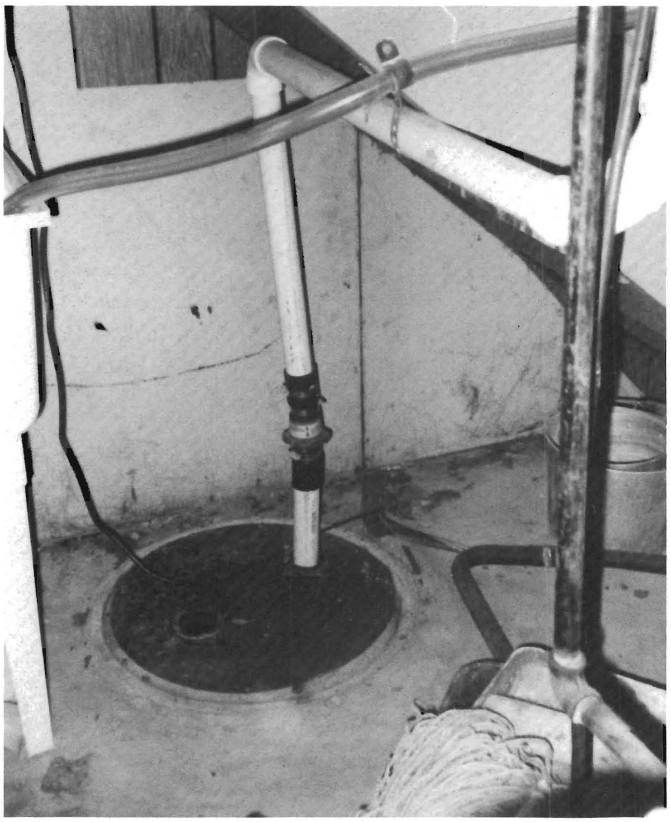
However, flood proofing loan programs have yielded mixed results. Michigan and Illinois offered them before floods had occurred, but there were few takers. In both cases, most of

the appropriation was not used. On the other hand, the Small Business Administration's 4 percent disaster assistance loans have been widely used to flood proof properties. A recent study of Illinois' 2 percent loan program recommended that in spite of the low usage, low interest loans did help people and may be the only financial assistance program a local government can afford.

Frankfort, Kentucky, is establishing a "revolving forgivable flood proofing loan" program. Loans for flood proofing purposes would be made available to anyone in the community. As a revolving program, loan payments put back in the fund are used to fund more loans. With a "forgivable" loan, the recipient is not required to pay the loan back provided the property is not sold for a certain time period, e.g., five years. If the property is held, the loan is "forgiven" and thus serves as a grant. If the property is sold within that period, the owner must repay the principal and interest. This funding mechanism was modeled after an existing rental-rehabilitation program in Frankfort.

In 1988, Illinois experimented with a low interest flood proofing loan program. Loans of up to $5,000 were made available at 2 percent interest. The program was established after a major flood in 1987 when it was expected that there would be a lot of interest in flood proofing. Because so much of the flooding had been sewer backup and basement flooding outside the flood plain, the $5,000 limit was expected to cover most projects, such as the overhead sewer in Figure 14, below.

Figure 14. Overhead Sewer in Chicago Suburb



Overhead sewers cost $2,000 to $5,000 to install as a retrofitting project. Their price made them popular projects for the Des Plaines and Mount Prospect, Illinois, rebate programs and the Illinois Housing Development Authority's loan program used in River Grove.

A hole or sump is cut in the basement floor to intercept the sanitary sewer service line that runs from the floor drain to the sewer main in the street. All basement wastewater flows into the sump. Waste is pumped out of the sump by an ejector pump (hidden under the manhole) to a pipe overhead. Upstairs sewage flows by gravity into the service line.

Note the check valve in the pipe to prevent waste from flowing back into the sump. Sewer backups are kept in the pipes instead of flowing through the floor drain into the basement.

The loans were made through cooperating banks with the interest rate subsidized by the Illinois Housing Development Authority (IHDA). IHDA's statutory authority limited its funds to housing assistance for low or moderate income families. "Low and moderate family income" was set at $35,000.

Eighteen Chicago suburbs, one suburban county and five banks participated in the program. In its first year only 14 loans were issued, in eight communities. Only $50,000 of the $500,000 set aside was used. It is suspected participation was low because the income limit made most suburban families ineligible.

In spite of the low turnout, loan recipients rated the program as a success. Most would not have flood proofed without the assistance; one called it "a godsend." A recent analysis of the program recommended that more loan programs should be tried, but without the income limitation and with simpler application procedures.

Figure 15. Projects Funded by the Illinois Loan Program

Sewer backup protection:	
Overhead sewers	4
Sewer backup valve	8
Basement flooding protection:	
Sump pump improvements	3
Dry flood proofing	3
Surface flooding protection:	
Yard regrading	1

River Grove was the most active participant in Illinois' 1988 low interest flood proofing loan experiment. The materials it used are included in Figures A-11 to A-13 on pages A-18 to A-20. A recent report, Analysis of the IHDA Floodproofing Loan Program, can be ordered from the Illinois Division of Water Resources, 310 South Michigan, Room 1606, Chicago, Illinois 60604.

Appendix A. Program Summaries

A.1 Des Plaines, Illinois

Funding Arrangement: Residents may apply for a rebate of 20 percent of the cost of their project up to $1,000.

Types of Projects Funded: Sewer backup protection projects, specifically overhead sewers, repairs to existing overhead sewers, and removing downspout connections to sanitary sewers. Projects are limited to single family homes. All projects require a City building permit and may require an inspection to confirm that the flood proofing measure is appropriate for the hazard.

Source of Funds: One-time City appropriation of $200,000 from State shared income tax surcharge.

Program History: Floods and extensive sewer backup problems in 1986 and 1987 led the City leadership to create the rebate program in 1990. It was concluded that retrofitting projects would be cheaper than large-scale sewer separations. They also provide a greater degree of protection.

Initially the program was reserved for new projects, but resident concern expanded it to include projects installed between 1986 and 1990. Different procedures are used for three different situations:

1. Projects that have not been started which the owner will finance without a bank loan,

2. Projects that have not been started which the owner will finance with a bank loan, and

3. Projects that were completed since 1986 but before the rebate program began.

In the first two cases, the property owner must pay a $75 application fee. More details on the papers required for application processing are in the public information brochure shown in Figures A-1 and A-2 on pages A-2 and A-3.

From 1990 through July 1993, the program had provided rebates for 198 properties. The majority of the applications came in the first year. In the first half of 1993 there were only six applications.

A total of $146,811 was rebated for an average of $741 per property. The smallest rebate was for $110; 25 rebates (13 percent) were for the maximum of $1,000.

Local Contact: Greg Peters
Comptroller
City of Des Plaines
1420 Miner
Des Plaines, IL 60015
708/391-5300

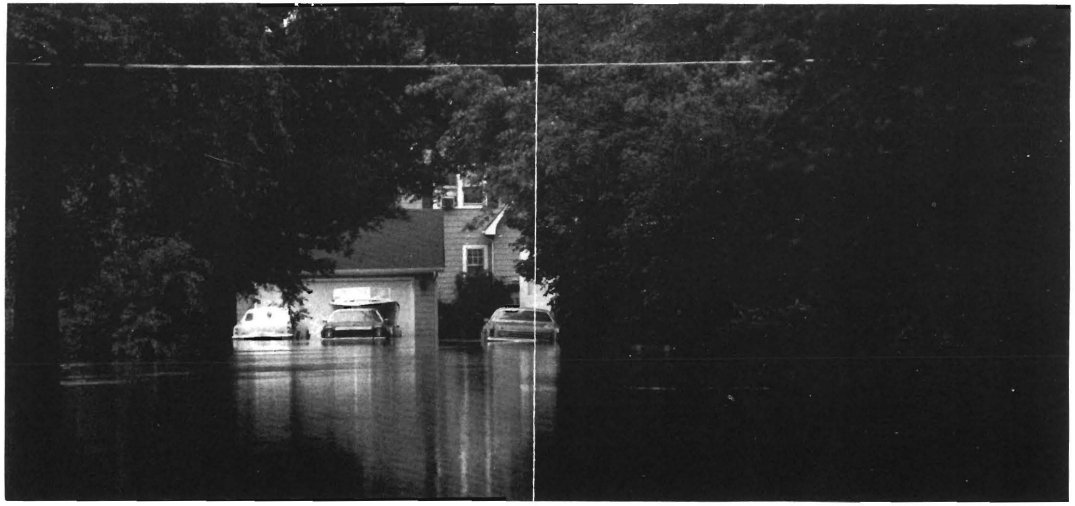
INFORMATION YOU SHOULD KNOW ABOUT THE DES PLAINES FLOOD REBATE PROGRAM

WHAT IS THE FLOOD REBATE PROGRAM?

Des Plaines single family homeowners who have had, or plan to have, flood mitigation and/or prevention construction work performed on their dwelling should fill out an APPLICATION FOR CITY OF DES PLAINES FLOOD REBATE PROGRAM, available from the **Finance Department, 1st Floor, Civic Center, 1420 Miner St., weekdays, 8:30 am - 5:00 pm. For more information call 391-5325.**

HOW MUCH OF A REBATE?

The Flood Rebate Program allows up to a maximum $1000 rebate based on 20% of the actual cost of the verifiable construction of flood mitigation/prevention projects performed on a residence dating back to January 1, 1986. Several homes in Des Plaines were affected by the severe flooding that occurred locally around this time, forcing many individuals to perform unforseen home improvement projects.



Brought to you by the
City of Des Plaines
1420 Miner St.
708-391-5300

D. Michael Albrecht
Mayor

Figure A-1. Brochure on Des Plaines' Rebate Program

THREE PROGRAMS AVAILABLE

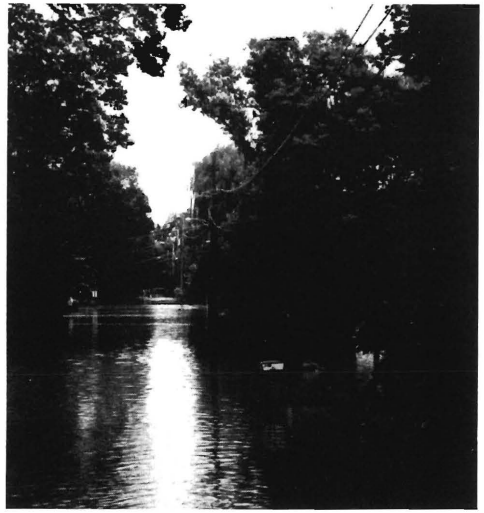
There are three types of Rebate Programs available. Those projects that have **previously** been contracted for and paid for by the homeowner; anticipated projects that the homeowner pays for without bank financing and anticipated projects where the homeowner will use bank financing.

***

The City of Des Plaines' Community Development and Engineering Departments will make inspections before construction and after completion of the project.

In the case where work has already been completed and the homeowner is seeking a rebate, the following **must** be provided:

- A copy of the most recent Real Estate Tax Bill or other proof of residence
- Short description of work performed
- Contractor's invoice of project performed
- City permit or permit number
- Proof of payment (copy of canceled check or stamped - paid invoice)



In the case where work **has not yet been completed,** the following **must** be provided by the homeowner:

- A copy of the most recent Real Estate Tax Bill or other proof of residence
- Short description of work performed
- Proposed Contractor's Estimate
- Payment of $75.00 to offset administrative costs and permit fees. In the case where financing is being applied for from a bank . . . the application will be reimbursed if the bank financing is not secured.

  A reimbursement may take up to six weeks and may require a City inspection to determine the appropriateness of the project.

***

Whether the work has already been performed or is anticipated, applicants must be single family home owners.

Figure A-2. Brochure on Des Plaines' Rebate Program (Continued)

A.2 Fairfax County, Virginia

Funding Arrangement: The County designs, constructs and funds 100 percent of the cost of flood proofing projects. They are administered in the same manner as other drainage projects designed and implemented by the County.

Types of Projects Funded: Flood control projects, drainage improvements, floodwalls and relocation of buildings. No financial assistance for groundwater or bad lot drainage problems.

Source of Funds: Projects may be funded from one of three sources: general revenue, storm sewer bond issue, and developer contributions for stormwater management facilities.

Program History: The County investigates 1,250 drainage complaints annually. In most cases, County staff advises the property owner on how to handle the problem. Where the problem comes from the public system (e.g., overbank flooding or an undersized County storm sewer), staff will study the feasibility of a project.

Most projects involve drainage or storm sewer improvements. Where flood proofing is found to be more economical, it is discussed with the owner. Sometimes there is neighborhood opposition to regrading and removing trees in order to enlarge ditches. In these cases flood proofing may be the most viable option.

Local Contact: Stephen W. Aitcheson, P.E.
Chief, Program Planning Section
Department of Public Works
12000 Government Center Parkway
Suite 449
Fairfax, VA 22035-0052
703/324-5800

A.3 Homewood, Illinois

Funding Arrangement: The Village plans to design, construct and fund flood proofing projects with a small cost share by the owner (5 percent - 10 percent)

Types of Projects Funded: Elevation of homes where elevation was found to be the most cost effective approach.

Source of Funds: Village bond issue sold for street and drainage improvements.

Program History: Several areas with chronic drainage problems had been studied over the years. The studies found no cost-effective structural solutions, so nothing was done. Following back-to-back floods in 1990 and 1991, the Village implemented a pilot project to determine if nonstructural measures would work.

A series of meetings was held with residents over a period of six months. Engineers and flood plain managers reviewed a variety of possible solutions in lay terms. Costs were reviewed in terms of total costs, possible outside funding, and actual cost to the property owners themselves. The pros and cons and level of protection provided by each project were discussed. Residents' suggestions were explored and reported on at the next meeting.

While the area was subject to surface water ponding, sanitary sewer surcharging, localized drainage and groundwater seepage, most attention was focused on the ponding problem. Structural alternatives ranged in cost from $930,000 to $1,850,000 and most of them provided only 10-year flood protection.

The benefits of elevation and dry flood proofing became apparent to the residents. The final plan recommended elevating 14 homes and dry flood proofing seven others in the ponding area, providing technical and financial assistance to other properties affected by local drainage and sewer problems, and establishing a flood warning and response program.

Based on these recommendations, the Village opted to finance a pilot project to elevate eight homes. It has proceeded with the flood warning and response program and is investigating ways to provide technical and financial assistance to others.

A consulting engineer prepared specifications for the elevation project which were reviewed at several one-on-one meetings with the owners. The Village advertised for bids in August 1993. The bids were more than double the $25,000 budgeted per building. Homewood is reinvestigating structural alternatives and is pursuing ways to reduce the cost, such as eliminating some items and extending the time schedule.

Local Contact: Charles Foulkes
Director of Public Works
17755 Ashland Avenue
Homewood, IL 60430
708/206-3470

A.4 Mount Prospect, Illinois

Funding Arrangement: Residents may apply for a rebate of 20 percent of the cost of their project up to a maximum rebate of $1,000.

Types of Projects Funded: Surface flooding and sewer backup protection measures, including drainage improvements, basement wall sealing and drain tile improvements, overhead sewers, repairs or improvements to existing overhead sewers, backflow valves, and standpipes. Limited to owner-occupied houses.

Source of Funds: A 0.25 percent sales tax for flood and stormwater purposes, enacted under the Village's home rule powers.

Program History: Following floods in 1986 and 1987, the Village passed a $14 million bond issue to fund major storm and sanitary sewer projects. Several areas with problems would not be helped by these large projects. The original impetus for the program was to help these areas with flood proofing support. However, the Village soon made the program available to all owner-occupied homes.

The program was modeled after neighboring Des Plaines' rebate program, although funding was limited to projects completed after the program started in May 1991. Figures A-3 and A-4 on pages A-7 and A-8 are public information handouts that explain the application procedures.

Up through 1993, $82,500 had been budgeted but only $22,000 had been spent. Rebates have been given for 26 projects at an average cost of $846. The following list adds up to more than 26 because two projects included more than one flood protection measure:

- 11 sewer backup valves
- 3 overhead sewer projects
- 9 drain tile/sump pump improvements
- 2 glass block basement windows
- 1 basement waterproofing
- 1 berm/yard grading (see Figure 13 on page 28)
- 1 drain line for seepage entering heating ducts

Nine applications have been denied for one of three reasons: the projects were completed before May 1991, they did not have a Village permit, or they were not flood-related, such as sewer rodding.

Local Contact: Charles Bencic
Director of Inspection Services
100 South Emerson
Mount Prospect, IL 60056
708/392-6000

Figure A-3. Informational Flyer on Mount Prospect's Program

VILLAGE OF MOUNT PROSPECT

Flood Prevention Rebate Program

Village residential property owners may be eligible for a rebate of up to a maximum of $1,000 based upon 20% of the actual cost of verifiable flood mitigation/prevention projects of a permanent nature. The program is limited to improvement projects of a permanent nature to owner-occupied single family dwelling units within the Village. The rebate applies to any eligible projects completed after April 30, 1991.

Typical projects which will qualify for the rebate include:

1. Overhead sewer installation.
2. Repair or improvements to existing overhead sewers.
3. Backflow valves and standpipes.
4. Any other flood mitigation/prevention project of a permanent nature approved by the Director of Inspection Services.

To qualify for a rebate the following information must be supplied with the attached application:

1. A description of the work performed.
2. A detail invoice from the contractor or other evidence of the project costs incurred.
3. Proof of payment of the project costs.
4. A final inspection and approval by the Department of Inspection Services.
5. Proof of ownership of property.

The above information must be provided along with a completed application to the Department of Inspection Services, Village of Mount Prospect, 100 South Emerson Street, Mount Prospect, Illinois. For more information please call 392-6000, ext. 291.

Figure A-4. Application for Mount Prospect's Rebate Program

VILLAGE OF MOUNT PROSPECT

Application for Flood Prevention Rebate Program

I/We hereby make application for a rebate for the flood mitigation/prevention work performed at the following address in Mount Prospect:

Name: _____

Address: _____

_____

Telephone: _____

The following information must be supplied with this application:

_____ 1. A description of the work performed.

_____ 2. A detail invoice from the contractor or other evidence of the project costs incurred.

_____ 3. Cancelled check or other proof of payment of the project costs.

_____ 4. Village permit number and date of final inspection.

_____ 5. Copy of most recent real estate tax bill or other proof of ownership of the property.

Upon approval by the Village, a rebate of 20% of the total applicable project costs and permit fees up to a maximum of $1,000 will be paid to the property owner. Please allow four weeks for processing of payment.

I/We hereby attest that the attached documents are true and correct copies of original documents of the actual project costs incurred, and that I/We are the owner-occupants of the above property.

_____ Date

_____ Property Owner

For Village Use Only

Approved: Date:

Inspection Services _____ _____

Finance Department _____ _____

A.5 Prince George's County, Maryland

Funding Arrangement: The County designs, constructs and funds 100 percent of the cost of flood proofing projects.

Types of Projects Funded: The County investigates a variety of structural and nonstructural measures and funds those most appropriate and cost-effective. Nonstructural projects that have been funded include acquisition, floodwalls, and wet and dry flood proofing of residential properties.

Source of Funds: Property tax dedicated to storm drainage and developer impact fees.

Program History: The County has been involved in flood protection projects since Hurricane Agnes in 1972. Every year, analyses of watersheds and subwatersheds are conducted to develop optimum solutions to their flooding problems. Flood plains are delineated based on a fully developed watershed. Each building in the flood plain is surveyed to identify its low entry point and to confirm that it is subject to flooding.

The watershed studies' conclusions are usually a mix of structural and nonstructural projects. For example, the Henson Creek study recommended:

- Construction of two regional detention ponds,
- Flood proofing of about 30 homes, and
- Acquisition of about 20 other homes.

Projects are designed to the 100-year flood (based on ultimate land use) unless past floods have been higher. The selection of flood protection measures is based on the hazard and the aesthetic impact of a project on the neighborhood. Generally, if a building is subject to less than one foot of flooding, only flood proofing is considered. If the 100-year flood is more than three feet deep, acquisition or elevation are the usual options. However, so far, all owners have opted for acquisition instead of elevation.

The County and the owner jointly decide the best solution for flood depths between one and three feet. Acquisition may be preferred if the site is adjacent to an undeveloped or publicly owned area. On the other hand, flood proofing may be preferred over removing only one structure from a developed area.

The results of these plans are reviewed in neighborhood meetings. In many cases, the studies are the first time people are told that they are in a flood plain. Many have not been flooded. Figures A-5 and A-6 on pages A-11 and A-12 include the informational handout that explains flood proofing to residents.

One-on-one meetings are held with the property owners. If they are willing to pursue flood proofing, they are asked to sign a request that the County do the detailed design. The form used is included in Figure A-7 on page A-13. During this process, some owners have backed out.

While County staff prepare the concept plans, flood proofing projects are designed by consulting engineers. Designs account for the appearance of the final product and landscaping. The parts of the buildings affected by the projects must be brought up to code, so a few minor improvements, such as correcting utility line violations, may be included at the County's expense to continue the good will with the owners.

Once the plans and specifications are agreed to, a covenant is signed by the owner and the County. A copy appears in Figures A-8 through A-10 on pages A-14 to A-16. As with all County projects, photographs or a video are taken to document pre-project conditions. There is continuous contact with the owners and their neighbors throughout the planning and construction.

The projects include a two-year contractor's warranty and a one-year guarantee on site restoration. The owners are responsible for maintenance of the project.

Projects are bundled and bid together. To date, three major flood proofing projects have been conducted covering 27, 18 and 5 buildings. Of these 50 projects, 37 have been for floodwalls/dry flood proofing and 13 for wet flood proofing of crawlspaces. The County has also acquired 52 houses, two of which were moved, the rest demolished.

The average cost of the floodwall/dry flood proofing projects has been $30,000. Most of these projects have been short walls to protect walk-out basements. In one case, a wall encircled the entire building. Examples of these projects are in Figures 9 and 11 on pages 22 and 25. The expenses include moving utility lines that are under the wall; wall construction; stairs over the walls; sump pumps, drains and backflow valves for internal drainage; and landscaping. Walls are designed to be one foot above the 100-year flood level based on ultimate land use.

Wet flood proofing has averaged $15,000 per building. The expenses include moving crawlspace furnaces to a new addition/utility shed; raising ductwork; and installing crawlspace openings to allow for equalization of hydrostatic pressure on the foundation walls.

Local Contact: Timothy W. Case
Watershed Protection Branch
Department of Environmental Resources
Inglewood Center Three
9400 Peppercorn Place
Landover, MD 20785
301/925-5929

Figure A-5. Prince George's County Informational Handout

THE PRINCE GEORGE'S COUNTY GOVERNMENT

DEPARTMENT OF ENVIRONMENTAL RESOURCES
WATERSHED PROTECTION BRANCH

1. What is Floodproofing?

Basically floodproofing involves any number of methods which modify the outside of a home or its surroundings to prevent water from entering. It can include such measures as building floodwalls around entrance ways, installation of sump pumps, regrading of yards, and construction of water tight doors or windows. Floodproofing does not include modifications to the stream or to the floodplain in order to prevent flooding. The floodproofing measures can usually be incorporated into the existing house architecture or landscaping so as not to detract from the aesthetics of the property.

2. What level of protection will it provide?

Like all other methods of flood control, it reduces the potential for loss of life and damage to a home. However, it does have its limitations. The primary purpose of floodproofing is to provide for an early return to normalcy after a flood by significantly reducing the level of damage to a home. Damage to yards and non-habitable flood prone structures will still occur.

As in the case of all flood prone areas protected by flood control projects, one should not develop a false sense of security. All flood control structures are designed only to protect from flooding within certain limits such as the 100-year flood event. When these limits are exceeded, flood damage can occur.

3. What are the legal requirements and responsibilities?

In July of 1987, Governor William Donald Schaffer signed into law House Bill 754. This bill gives the County the authority to expend funds for the construction of individual floodproofing facilities on private property. However, before the County can construct a floodproofing facility, the property owner must sign a document which agrees to hold the County harmless from liability from any and all damages that may result from:

1) The construction of floodproofing facilities,

Figure A-6. Prince George's County Informational Handout (Continued)

2) The failure of the floodproofing facility to operate as planned or designed, and

3) The failure of the property owner to properly maintain and operate the floodproofing facility.

This agreement shall run with the County land and be recorded among the land records. It will be required that the homeowner sign a right-of-entry document allowing the County to enter onto the property to construct the floodproofing facility.

Basically, the County is responsible for providing funds and constructing the floodproofing facilities for the property owner. The property owner would then assume all responsibility and liability for the maintenance and operation of the floodproofing facility at no further cost or expense to the County.

4. What's next after the planning phase?

Before the project is transferred to the Construction Support Section, a pre-design meeting will be held with the property owners in order to reach an agreement on the nature of the floodproofing required for the home. After the homeowner has agreed in principle to floodproofing, the work will begin on the preliminary designs. The preliminary designs will be presented to the property owner for his approval before they are finalized. The project will then be transferred to Construction Support Section after all the necessary documents are signed.

5. How will the facility be constructed?

The County will normally enter into a service contract with a private contractor to perform the construction work. The floodproofing facilities will be inspected by the County before being handed over to the homeowner.

6. Where can I call to get more information?

At various stages in a project the lead role or responsibility for the project changes hands. The following is a list of stages and the office who has the lead role from which you can get information.

Figure A-7. Prince George's County's Request for Assistance Form

THE PRINCE GEORGE'S COUNTY GOVERNMENT

Watershed Protection Branch
Department of Environmental Resources

I/WE, _____ am/are the owner(s) of the property located at _____ _____ which has been identified as a property prone to flooding during major storms. The County has outlined possible alternatives for improvements which will prevent or reduce flooding of my home. These improvements would be done by the County at the County's cost.

I/We hereby request the County to undertake design of flood-proofing measures for my property. I/We understand that prior to any construction, I/we will be asked to enter into agreements approving the plans, accepting future maintenance of the improvement, and holding the County harmless from damage resulting from the failure to properly maintain the improvement or from the failing of the improvement to operate as designed. These agreements will be filed in the land records and be binding on future owner(s).

_____
Homeowner's signature Date

_____
Homeowner's signature Date

Figure A-8. Prince George's County - Property Owner Agreement

DECLARATION OF COVENANTS

FOR STORMWATER MANAGEMENT FACILITY

THIS DECLARATION OF COVENANTS made this _____ day of _____, 1990, by _____ of _____ (the "Covenantor") for the benefit of Prince George's County, Maryland (the "County").

WITNESSETH:

WHEREAS, the County has the responsibility of stormwater management within the County's stormwater management district pursuant to Article 29, Section 3-201 et seq. of the Annotated Code of Maryland and Section 10-262, et seq. of the Prince George's County Code; and

WHEREAS, the Covenantor is the owner of certain property within the stormwater management district more particularly described as:

being all or part of the land Covenantor acquired by deed dated _____, recorded among the Land Records of Prince George's County, Maryland, in liber _____, folio _____, (the "Property"); and

WHEREAS, the Covenantor desires the County to construct certain improvements on the Property for the purpose of stormwater management, said improvements being more fully described and identified as:

Modifications to the exterior of the residence to raise the low point of entry into the residence.

Figure A-9. Prince George's County - Property Owner Agreement (Continued)

NOW, THEREFORE, in consideration of the benefits received by the Covenantor as a result of the County's construction of stormwater management improvements on the Property, the payment of ten dollars ($10.00), the receipt and sufficiency of which is hereby acknowledged, and other good and valuable considerations, the Covenantor covenants as follows:

1. The Covenantor represents and warrants that it is the legal owner of the entire fee simple interest in the Property.
2. The Covenantor grants the County a right of entry upon, through, and over the Property for purposes necessary for the County, its representatives, contractors, to perform any and all services or work needed to accomplish the construction of the stormwater management facility as per Contract No. _____.
3. The Covenantor, and its heirs, successors, and assigns, covenants and agrees and it will indemnify and save harmless the County from and against any and all loss and damage and and all demands, suits, liabilities, or payments that may result from or be caused by:
   a. The maintenance and operation of the proposed stormwater management facility; or
   b. The failure of the stormwater management facility to operate as planned or designed; or
   c. The failure of the Covenantor or its heirs, successors, or assigns to properly maintain or operate the proposed stormwater management facility.
4. The Covenantor, and its heirs, successors and assigns, agree and accept full responsibility and liability for the maintenance, repairs upkeep and operation of the stormwater management facility on the Property at no cost or expense to the County.

Figure A-10. Prince George's County - Property Owner Agreement (Continued)

5. Upon execution, this Declaration shall be recorded among the Land Records of the County and shall run with the land and be binding upon the Covenantor, and its heirs, successors, or assigns.

WITNESS COVENANTOR

_____ _____

PRINT NAME: _____

STATE OF :
:
COUNTY OF :

On this _____ day of _____, 1990, before me, a Notary Public for the State of Maryland, personally appeared _____ known or satisfactory proven to me to be the person named as Covenantor in the attached Declaration and he/she/they acknowledged that he/she/they executed the same for the purposes therein contained of their free act and deed.

IN WITNESS WHEREOF, I hereby set my hand and official seal.

_____
NOTARY PUBLIC

My Commission Expires:

_____

A.6 River Grove, Illinois

Funding Arrangement: Low interest loans at 2 percent for a maximum of $5,000. The loan must be paid off in five years.

Types of Projects Funded: Four projects were funded: three overhead sewers and a sewer backup valve at an average cost of $3,500. Projects funded in other communities that participated in this State program are listed in Figure 15 on page 30.

Source of Funds: $500,000 set aside by the Illinois Housing Development Authority (IHDA) as a one-time pilot project. A recent report, Analysis of the IHDA Floodproofing Loan Program, can be ordered from the Illinois Division of Water Resources, 310 South Michigan, Room 1606, Chicago, IL 60604.

Program History: The program was initiated following a Presidential disaster declaration for flooding in the western and northwestern Chicago suburbs in 1987. It took six months to develop the program and sign up participating communities and banks. The participants were organized geographically into five groups, with one bank and from two to six communities in each group. Three groups were in northern and western Cook County and two were in DuPage County, which is west of Cook County.

IHDA dealt directly with interested banks. The banks processed the loan application, making sure the project was approved by the community and that there was an ability to repay. The banks treated the loan as a second mortgage, although no appraisal was required. Once the loan was completed, IHDA purchased it from the bank. The banks collected the monthly payments from the loan applicants and made quarterly payments to IHDA. All the loans were paid off, many of them early when the owners refinanced their homes to take advantage of lower interest rates.

The Village of River Grove, hit by the second flood in 12 months, was the most active community in the program. It was responsible for publicizing the program, ensuring that the projects were appropriate for the flood hazard, and sending approved applicants to the bank. River Grove's procedures are explained in Figures A-11 through A-13 on pages A-18 through A-20. The Village also had to prepare a flood hazard mitigation plan for the Village to qualify for participation.

Village staff processed 18 applications but most were denied because the applicants exceeded the maximum allowed family income ($35,000). Some dropped out because they didn't think the hassle and delays in processing were worth the loan. Village staff believe they would have had twice as many applications if the income limitation had been higher. They also recommended more publicity and allowing buyers of homes to pick up the loans.

Local Contact: Tony Collucci
Flood Control Coordinator
Village of River Grove
2621 N. Thatcher
River Grove, IL 60171
708/453-8000

Figure A-11. River Grove's Loan Program Informational Handout

L O A N P R O G R A M I N F O R M A T I O N

A. Village Obligations

1. A $250.00 application fee with the "Midwest Bank" will be paid by the Village.
2. Send a Village Building Inspector out to approve or disapprove the applicants .....Flood Control Plan,Contractors Proposal and Sketch Layout
3. Provide the name of the Bank and name of their Loan Representative.

****

B. Applicants list of requirements for getting a 2% loan for flood controls.

1. Proof of Mortgage Liability including any 2nd. Mortgage.
2. Household Income under $35,000.00 (combined total of everyone living in bldg.
3. 1987 Federal Income Tax Forms for all who live in building.
4. Proof of charge card liabilities.
5. Proof of auto loan liabilities.
6. Credit Bureau check. (bank will do this)
7. Title and Tax search cost of approximately 75.00 if qualified.
8. Service fee of 1/8 of 1% of the loan amount.
   (Example: $ 3,000.00 loan x 1/8 of 1% = $ 37.50)

****

C. The Bank and their obligations

1. Provide a 2% loan program to qualified Households.
2. Assist the applicant with filling out bank forms.
3. Explain all costs that will be paid by the applicant and by the Village.
4. Provide a maximum loan of $ 5,000.00 per qualified household.

****

T O T A L L O A N P R O G R A M - M O N I E S A V A I L A B L E F O R

**********R I V E R G R O V E I S $ 20,000.00**********

F I R S T C O M E F I R S T S E R V E I F Q U A L I F I E D

Figure A-12. River Grove's Notice to Residents

To: _____

_____

Re: Flood Control Loan Program

Dear Resident,

The 2% Loan Program for flood controls to Qualifying residents of River Grove has recently been approved by the Illinois Dept. of Water Resources. The "Midwest Bank" Loan division at 1606 N. Harlem Ave. has agreed to be the lending institution. The Loan Officer is Mr. Steve Conti,(456-4700)ext.250. He will be accepting applications starting June 2nd.1988;however the following steps must be taken before calling him for a appointment, to loan monies under this program.

Step 1. Secure a written cost proposal signed by a licensed contractor with his License No

Step 2. Secure a building sketch of plumbing work to be performed by contractor. (8½ x 11 sheet

Step 3 Fill out Village flood control application, numbers 1 through 11.

Step 4 Bring Step 1,2, and 3 papers to Village Offices as soon as possible in order to be approved by Building Inspectors.

Step 5 Allow a few days to inspect your property and review the forms. (you will be notified)

Step 6 Follow Section B of the Loan Program Information - Applicants list of Requirement

Step 7 Be ready to take these required papers,flood control application and approved papers to the "Midwest Bank" no sooner than June 2,198

Sincerely,

_____

Flood Loan Program coordinator

Figure A-13. River Grove's Loan Program Application Form

V I L L A G E   O F   R I V E R   G R O V E

F L O O D   C O N T R O L

APPLICATION   DATE ____________

1. Name of Applicant ____________________
2. Flood Control Address ____________ Phone ______
3. Type of Flood Control ____________________

%%%

4. Contractors Name ____________________
5. Contractors Address & Town ____________________
6. Contractors Phone No. ____________________
7. Contractors Price ____________________
8. Contractors License No. ____________________

%%%

Circle one

9. Does this Building have a Basement or Crawlspace   Yes   No
10. Are you the Owner of this building   Yes   No
11. What is the Outside dimension of this building in sq.ft. ____________

%%%

Village Building Inspector's Review

(check one)

- ____ Overhead Sewers
- ____ Inside backup valve system
- ____ Outside Backup valve system
- ____ Basement Water proofing
- ____ Sump pumps

%%%

A P P R O V E D ☐   D I S A P P R O V E D ☐

Inspectors - Comments ____________________

____

____

Building Inspectors Signature ____________________

Plumbing Inspectors Signature ____________________

A.7 St. Charles, Michigan

Funding Arrangement: Grants to individuals to cover 75 percent of the cost of elevating their homes.

Types of Projects Funded: House elevation. The funds were also used to acquire three properties, two for levee right-of-way and one because it could not be flood proofed.

Source of Funds: The U.S. Department of Housing and Urban Development's Community Development Block Grant, administered by the Michigan Department of Commerce.

Program History: After severe flooding in September 1986 and in anticipation of continued high levels of the Great Lakes, the Village developed a flood protection plan for the community. A Block Grant award for $765,100 was allocated to the Village for the following projects:

Dike construction and right-of-way	$397,000
Property acquisition	75,500
Floodgates/emergency pumps	30,500
House raising	176,000
Bridge improvements	27,000
Sanitary sewer flood proofing	52,000
Administration	7,100
	$765,100

The Village's application requested $10,000 each to elevate 22 homes. The request was cut to $176,000, leaving only $8,000 per building.

Participation was voluntary. The Village did not mandate what contractors they should use and left it up to the owner to obtain 3 bids. The Village's handout explaining the procedures and eligible and ineligible costs is included as Figure A-14 on page A-22. An example of a submitted bid is in Figure A-15 on page A-23. It notes that one item was excluded as ineligible.

All elevated buildings were on crawlspaces, some were up to 2,500 square feet. Eight homes were elevated from one-half foot to three feet. The costs averaged $8,000 - $10,000. It is believed that the costs were held down after the Village announced that the maximum grant would be $8,000. It should be noted that costs vary greatly around the country, depending on building types, how many non-flood related items (such as stairs and landscaping) are included, and local economic conditions.

Local Contact: Kris Neumann
Acting Village Manager
Village of St. Charles
110 West Spruce Street
St. Charles, MI 48655
517/865-8287

Figure A-14. St. Charles' Program Informational Handout

"Gateway to the Shiawassee Flats"

Village of St. Charles

110 WEST SPRUCE STREET, ST. CHARLES, MICHIGAN 48655
PHONE (517) 865-9791

June 11, 1987

House Raising Program Outline

I. All eligible homeowners interested in having their homes raised should sign the sign-up sheet being passed around the room this evening.

II. Spicer Engineering will be marking elevations Monday, June 15 and Tuesday, June 16.
   A. Top of foundation to be set at an elevation of 594.00 ft. (2 ft. above the September 1986 flood level).

III. Homeowners to obtain 3 itemized bids and return to the Village office by 5:00 p.m., Friday, July 10, 1987.

   --Please request the contractor to itemize what his bid includes and the cost of each item.

IV. Eligible costs initial bids should include:
   A. Raising house to required level
   B. Foundation work to the 594.00 level
   C. Any necessary extensions needed to re-connect existing utilities
   D. Necessary modifications to existing entry ways.

--Let bidders know if you want the work to be completed this construction season.

NOTE: Please request a 90 day hold on bid prices.

V. Ineligible costs:
   A. Raising unattached buildings
   B. Landscaping and fill dirt
   C. Any new construction or exspansion

NOTE: The Village will not be responsible for any damage done to your home or its contents during or related to house raising procedures.

VI. After bids are submitted to Village:
   Village staff will tabulate bids. These bids will determine the total cost of the house raising project. It is to your benefit to obtain and select the lowest qualified bid. Should the total construction costs for house raising exceed the grant amount it is likely that the flood mitigation program will only cover a percentage of your cost.

A second meeting with all concerned homeowners will be held Thursday, July 16, 1987 at 7:00 p.m.

Should you have any questions please contact the Village office. The Flood Mitigation Committee meets every Tuesday morning at 10:00 a.m.

Figure A-15. Example Estimate from St. Charles' Program

October 26, 1987

For: Estimate for the raising of existing house and instalation of a foundation and block wall

The contractor agrees to perform the following:

1. Pin and raise house house to new flood level----------$4,175.00
2. Dig and pour 8"x16" concrete footings 42" below level---$1,560.00
3. Lay 8" concrete blocks to fit existing levels of house. $2,100.00
4. Pour approx. 21 peir pads under house and lay block peirs $ 635.00
5. Install new 8"x6" wood timbers inbetween existing wood timbers for floor joist supports----------$ 722.00
6. Install new 4 x 4 treated porch supports under exterior of porches and cover with 3/8" treated lattis. (Two porches on West side and one on East side.) ----------$ 600.00

\# 7. Construct new porch in front (South) 4' x 8' deck with 4' wide stairway complete with hand rails. All treated lumber with lattice finish around bottom.---------- $ 683.00

8. Install three access doors in foundation walls,3/4" treated plywood hinged to 2 x 8 treated rough buck jamb.---------$ 225.00
9. Install four cast aluminum vents 8" x 16".----------$ 40.00
10. Install new sill plates where needed.
11. Back fill dirt removed from diging of foundation and rough grade yard. Owner to final grade and plant grass seed. $ 250.00

The contractor feels the floors in this house should be reinforced prior to raising. In raising of buildings the floor joist as well as support timbers are used to distribute the weight of the house equallty. The floor joist in this house are inadequate.

Total cost complete with labor and materials $10,990.00

\# No. 7: Deleted as ineligible for funding

A.8 Other Communities

The following communities have investigated and/or designed flood proofing financing programs. However, these communities have not funded or established ongoing programs at the time of this report. Because various aspects of their work have been discussed in this report, the names of the local contacts are included here.

Denham Springs, Louisiana
Pat Skinner
Amite River Basin Commission
P.O. Box 1683
Denham Springs, LA 70727-1685
504/665-3395

Elk Grove Village, Illinois
James D. MacArthur
Fire Chief
901 Bryantwood Avenue
Elk Grove Village, IL 60007-3905
708/734-8000

Frankfort, KY
Jo Shockley
Community Development Specialist
City of Frankfort
315 West Second Street
P.O. Box 697
Frankfort, KY 40602
502/875-8500

Kemah, Texas
Frank Jones
Building Official
Department of Public Works
602 Bradford
Kemah, TX 77565
713/334-1611

King County, Washington
Megan Smith
Program Manager
Surface Water Management Division
Department of Public Works
700 Smith Ave, Suite 2200
Seattle, WA 98104
206/296-8374

Oakdale, Tennessee
Joe Sullenberger
Barge Waggner Sumner & Cannon
Suite 2400
Plaza Tower
Knoxville, TN 37929
615/637-2810

Rosemont, Illinois
Christopher Burke
Christopher B. Burke Engineering
10275 W. Higgins, Suite 460
Rosemont, IL 60018
708/296-0500

South Holland, Illinois
Richard Zimmerman
Assistant to the Mayor
Village of South Holland
16226 Wausau Avenue
South Holland, IL 60473
708/210-2900

Terrebonne Parish, Louisiana
Patrick Gordon, Director
Planning & Economic Development
Terrebonne Parish Consolidated Gov't.
P.O. Box 2768
Houma, LA 70361
504/873-6563

Tulsa, Oklahoma
Dianna K. Phillips
Department of Public Works
2317 South Jackson
Tulsa, OK 74107
918/596-9549

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