COMMUNITY ASSISTANCE
PLANNING REPORT NO. 269

FLOOD MITIGATION PLAN FOR KENOSHA COUNTY, WISCONSIN

KENOSHA COUNTY HOUSING AUTHORITY

AND THE

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION

KENOSHA COUNTY
Leon T. Dreger
Thomas J. Gorlinski
Sheila M. Siegler

RACINE COUNTY
Richard A. Hansen
James E. Moyer
Jean M. Jacobson,
Secretary

MILWAUKEE COUNTY
Daniel J. Diliberti
William R. Drew,
Vice-Chairman
David A. Novak

WALWORTH COUNTY
Anthony F. Balestrieri
Allen L. Morrison,
Treasurer
Robert J. Voss

OZAUKEE COUNTY
Leroy A. Bley
Thomas H. Buestrin
Chairman
Gustav W. Wirth, Jr.

WASHINGTON COUNTY
Daniel S. Schmidt
Patricia A. Strachota
Peter D. Ziegler

WAUKESHA COUNTY
Duane H. Bluemke
Kenneth C. Herro
Paul G. Vrakas

KENOSHA COUNTY BOARD OF SUPERVISORS

Douglas J. Noble, Chairman
Richard A. Kessler, Vice-Chairman

Anne Bergo
Eunice Boyer
Robert R. Carbone
Dennis Elverman
Thomas J. Gorlinski
Darrel P. Haen
James Huff
Thomas W. Kerkman
Wayne E. Koessl
Ronald L Johnson
Irving Larsen
Ava D. Marelli
Brenda Carey-Mielke
Mark S. Modory
Mark Molinaro, Jr.
Joe Montemurro
John J. O'Day
Robert W. Pitts
Maureen Reed
Terry W. Rose
John A. Ruffolo
David C. Singer
Don Smitz
Gordon West
Mark Wisnefski

County Executive

Allan K. Kehl

KENOSHA COUNTY LAND USE COMMITTEE

Donald Smitz, Chairman
Mark Molinaro, Jr., Vice-Chairman
Gordon West, Secretary
Thomas J. Gorlinski
Irving Larsen

George E. Melcher, Director of Planning and Development

KENOSHA COUNTY HOUSING AUTHORITY

Earl W. Hollister, Chairman
Gloria L. Bailey, Vice-Chairman
Mark A. Starzyk, Secretary
Ronald L. Johnson
Gordon West

SOUTHEASTERN WISCONSIN REGIONAL
PLANNING COMMISSION STAFF

Philip C. Evenson, AICP ..... Executive Director
John R. Meland ..... Chief Economic Development Planner
Tina M. Rodziewicz ..... Economic Development Planner

Special acknowledgment is due to Mr. Garry M. Werra, former SEWRPC Senior Economic Development Planner, for his effort in gathering data for this study.

COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 269

FLOOD MITIGATION PLAN FOR KENOSHA COUNTY, WISCONSIN

Prepared by the

Kenosha County Housing Authority
and the
Southeastern Wisconsin Regional Planning Commission

September 2001

Inside Region $10.00
Outside Region $20.00

(This page intentionally left blank)

TABLE OF CONTENTS

LIST OF TABLES

Chapter I

INTRODUCTION AND PLANNING PROCESS

On December 1, 1997, the Kenosha County Housing Authority, with staff assistance from the Southeastern Wisconsin Regional Planning Commission (SEWRPC), began the preparation of a flood mitigation plan for Kenosha County. The planning effort was coordinated with the related activities of other concerned units and agencies of government in and outside of Kenosha County. This plan is designed to set forth updated flood mitigation recommendations for the County, current information regarding the status of flooding problems and planning for their mitigation, and public involvement that has been undertaken as a part of the flood mitigation planning process.

The preparation of this plan is an important step in minimizing flood damages in the County and is a condition of the County's receiving grant funding administered by the Wisconsin Department of Military Affairs, Division of Emergency Management, under the Flood Mitigation Assistance Program and the Hazard Mitigation Grant Program.

Study Area

The study area encompassed by this plan includes those portions of three watersheds that lie within the unincorporated areas of Kenosha County—the Fox River watershed, the Des Plaines River watershed, and the Pike River watershed (see Appendix 1). In addition, the study area includes that portion of the Fox River watershed that lies within the Village of Silver Lake. The latter portion of the study area was considered because of the severe flooding that occurs within the 100-year recurrence interval floodplain in the Village.

Need for the Plan

Flooding of the stream system of the study area watersheds has been, and, in the absence of artificial flood control measures, may be expected to continue to be, a common and natural occurrence. In portions of the watersheds, the streams leave their channels and occupy adjacent natural floodplains almost annually as a result of late winter-early spring snowmelt or snowmelt-rainfall events or in response to spring, summer, and fall thunderstorms. Damage from this flooding has been largely a consequence of the failure to recognize and understand the relationships that should exist between the use of land—in both floodland and non-floodland areas of the basin—and the natural behavior of the stream system. Unnecessary occupancy of the floodlands by flood-vulnerable land uses, together with development-induced changes in the flow characteristics of the streams, has produced flood problems in some areas of these watersheds.

Comprehensive watershed planning is the first step in achieving or restoring a balance between the use of land and the hydrologic-hydraulic regimen of the watershed. To ensure that future flood damage will be held to a minimum, plans for the proper utilization of the riverine areas of the watershed must be developed so that control of land uses in flood hazard areas, public acquisition of floodlands, and river engineering can be used to properly direct new development into a pattern compatible with the demands of the river system on its natural floodlands and to achieve an adjustment or balance between land use development and floodwater flow and storage needs.

Floodwaters can directly damage buildings and other structures in numerous ways. The most common types of damage include hydrostatic pressure leading to the collapse of building foundations, basement slab

heaving, and loss of mortar; erosion of foundations and soil; heaving of sidewalks and slabs; saturation of insulation; wood rot; deterioration of masonry and concrete, including soluble salt damage and freezing and thawing damage; damage to metal structural components, including fasteners, exposed metals, and embedded iron; damage to interior finishes, including drywall, plaster, wood floors and trim, interior paint, wallpaper, and floor coverings; exterior paint problems; and damage to utilities, appliances, equipment, merchandise, and personal belongings. In addition to personal losses arising from such damage, businesses damaged by floodwater can suffer economic losses arising from being forced to suspend operations as a result of the flooding and its aftermath. In addition to direct flood damage, indirect damages, such as the cost of temporary evacuation or relocation and lost wages, as well as intangible damages, such as psychological stress and health hazards, can occur.

Plan Development Process

This plan was developed through a collaborative effort involving a number of agencies and organizations under the overall direction of the Kenosha County Housing Authority. The Kenosha County Board of Supervisors created the Housing Authority in February 1981 in response to a finding and declaration by the County Board that unsanitary and unsafe inhabited dwelling accommodations existed in the County. The Housing Authority is comprised of a board of five commissioners—two County Board Supervisors and three citizen members who have knowledge of housing-related issues in the County.

In preparing this plan, the Housing Authority sought input from the Office of the Kenosha County Executive, the Kenosha County Department of Planning and Development, the Kenosha County Division of Land Information, the Kenosha County Division of Emergency Services, and the Southeastern Wisconsin Regional Planning Commission. Housing Authority staff also held individual meetings in May 1999 with the Chairman of the Town of Salem, the Clerk of the Town of Wheatland, and the President of the Village of Silver Lake to obtain local officials' input on flooding in the Fox River watershed. Two public hearings were held to obtain citizen input into the planning process at the Wheatland Town Hall on December 16, 1997, and July 9, 1999. Minutes of these hearings are attached as Appendix 2. Finally, the Housing Authority relied on past planning studies that were undertaken for the study area by the Southeastern Wisconsin Regional Planning Commission and the U.S. Army Corp of Engineers. A draft copy of this plan was transmitted to the Office of the Kenosha County Executive, the Kenosha County Department of Planning and Development, the Kenosha County Division of Emergency Services, the Towns of Salem and Wheatland, and Village of Silver Lake in October 1999 for local review and comment.

Prior to the commencement of the planning process, the Kenosha County Housing Authority verified whether any other public or private agency or organization was engaged in flood mitigation projects that could impact the County's mitigation proposals. The Southeastern Wisconsin Regional Planning Commission, which assists in planning efforts for the seven-county Southeastern Wisconsin Region, informed the County that no other agency or organization was currently engaged in or was planning a project that would impact this plan.

Plan Adoption

The flood mitigation plan for Kenosha County was adopted by the Village of Silver Lake Board of Trustees on November 7, 2001, and by the Kenosha County Board of Supervisors on December 4, 2001.

Chapter II

STUDY AREA INVENTORY AND ANALYSIS

Kenosha County is located in southeastern Wisconsin, and is bordered on the east by Lake Michigan, on the north by Racine County, on the west by Racine and Walworth Counties, and on the south by Lake and McHenry Counties in Illinois. The impacts of urbanization in the Milwaukee and Racine metropolitan areas, and in particular, in northeastern Illinois, are increasingly affecting the County.

The County covers about 278 square miles and contains one city, all or parts of five villages, and seven towns as shown in Appendix 1. The County is bisected by the subcontinental divide in roughly a north-south direction, into the Great Lakes-St. Lawrence River drainage basin and the Mississippi River drainage basin. These two drainage basins, in turn, are comprised of five major watersheds and a total of about 4,800 acres of inland surface waters within the County. Three of these watersheds lie east of the subcontinental divide and drain to the Great Lakes—the Pike River watershed, the Root River watershed, and minor streams tributary to Lake Michigan, while the other two watersheds drain to the Mississippi River—the Fox River watershed and the Des Plaines River watershed. The Fox River watershed encompasses a total area of 2,582 square miles within the States of Wisconsin and Illinois. The portion of the watershed that lies within Kenosha County includes an area of approximately 96 square miles, or 35 percent of the total land area in the County. The Des Plaines River watershed encompasses 2,111 square miles in Wisconsin and Illinois and approximately 122 square miles in Kenosha County, or 44 percent of the total land area within the County. The Pike River watershed encompasses 52 square miles in Wisconsin and approximately 30 square miles in Kenosha County, or 11 percent of the total land area within the County. The Root River watershed encompasses 196 square miles in Wisconsin and approximately three square miles in Kenosha County, or 1 percent of the total land area. Minor streams tributary to Lake Michigan encompass approximately 27 square miles in Kenosha County, or 10 percent of the total land area. Portions of each of the watersheds lie in the unincorporated areas of the County except for streams tributary to Lake Michigan, which lie within the City of Kenosha and the Village of Pleasant Prairie.

The majority of the population resides in the eastern portion of Kenosha County, within the City of Kenosha, the Village of Pleasant Prairie, and the Town of Somers. However, population centers are also found in the vicinity of some of the major lakes, including the Villages of Paddock Lake, Silver Lake, and Twin Lakes and in the partially urbanized town areas. Much of the land in the County remains in agriculture, but the dairy industry has steadily declined. The primary form of agriculture involves cash-grain farming for corn and soybeans. Additionally, as urban and nontraditional rural development has expanded into rural areas, the horse industry has grown significantly, and the number of small-scale and hobby farms has greatly increased. The major industries within the County are generally located east of IH 94, with smaller industrial development being located in nearly all of the other urban centers.

Kenosha County is undergoing significant urban growth and development, and faces the challenge of balancing this growth in conjunction with protecting and maintaining its natural resources. The County has a rich and diversified natural resource base, including the Lake Michigan nearshore area, several inland lakes, as well as major river systems. Additionally, the County contains significant areas of quality wetlands, woodlands, and grasslands, the most important of which are incorporated into areas designated as environmental corridors.

Study Area

As referenced in Chapter I, the study area encompassed by this plan includes all of the unincorporated areas that lie within the Fox River, Des Plaines River, and Pike River watersheds, as well as that portion of the Fox River watershed that lies within the Village of Silver Lake. Areas that are not included in this plan include the Root River watershed, minor streams tributary to Lake Michigan, and the portions of the three study watersheds that lie in the City of Kenosha and the Villages of Paddock Lake, Pleasant Prairie, and Twin Lakes.

Historic Flooding

The 100-year recurrence interval floodplain adjacent to the Fox River has a history of riverine flooding that was recorded as early as 1894, with at least nuisance levels of inundation occurring periodically from spring snowmelt and summer thunderstorms. Flooding most often occurs as a result of snow and ice thaws in late winter and early spring. Major flooding has occurred in 1938, 1960, 1962, 1965, 1973, 1979, 1986, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000 and 2001. Federal disaster declarations were promulgated as a result of flooding and severe storm damage in March 1973, September 1986, April 1993, February 1994, August 1998, and June 2000. During 1993, in the most severe flooding in recent history, over 100 dwellings in the Fox River floodplain were evacuated and the U.S. Coast Guard assisted local emergency response teams with the evacuation of residents.

Overland flooding also occurs around the lakes in the Fox River watershed—Camp Lake, Center Lake, Dyer Lake, Lilly Lake, Flanagan Lake, Silver Lake, Rock Lake, Peat Lake, Elizabeth Lake, Powers Lake, and Benedict Lake. However, relatively little property damage has been reported from this flooding.

Land use within the Des Plaines River and Pike River watersheds is primarily rural, with some commercial and residential development within the Pike River watershed. The most common types of problems reported have been damage to croplands and flooding of roadways due to major flood events in riverine areas. Historically, damage to structures and to their contents as a result of overland and attendant secondary flooding within the unincorporated areas of the Des Plaines River watershed has not been widely reported. Within the Pike River watershed, relatively few residences have been flooded in the past. However, uncontrolled urbanization and lack of adequate floodplain management measures could result in significant increases in flooding damage to not only existing but also future rural development in the watershed.

Related Existing Plan and Practices

This plan is intended to set forth the most appropriate, feasible, and effective flood mitigation strategy for Kenosha County. One of the first steps to be undertaken in the planning process is the inventory, collation, and review of the recommendations of relevant previously prepared reports and plans.

A number of plans currently exist which focus on the natural resources of Kenosha County. These plans include programs which address the interconnectedness of the natural resources of Kenosha County with those of the related watersheds and the Southeastern Wisconsin Region, as well as the immediacy and importance of natural resources at the County and community level. Plans prepared at the local level, include local land use plans, park and open space plans, lake and water quality management plans, and sewer service area plans prepared for individual communities or for specific waterbodies. All of these documents provide the basis for developing an integrated scheme for the sustainable management of the natural resource base of Kenosha County through the coordinated efforts of State, County, and local governments, special-purpose units of government, and community groups.

Two of the three study area watersheds in the County have an adopted and published watershed plan and the third has a plan that is in the process of being completed. SEWRPC Planning Report No. 12, *A Comprehensive Plan for the Fox River Watershed*, Volumes One and Two, April 1969 and February 1970, provides detailed planning information and recommendations for the Fox River watershed. SEWRPC Planning Report No. 35, *A Comprehensive Plan for the Pike River Watershed*, June 1983, provides detailed planning information and recommendations for the Pike River watershed. Finally, SEWRPC Planning Report No. 44, *A Comprehensive Plan for the Des Plaines River Watershed*, is currently in production and when completed will provide detailed planning information and recommendations for the Des Plaines River watershed. These documents permit the integration of actions at the local level within the broader programs aimed at the management of resources at the watershed and Regional level. In this way, the flood mitigation plan provides an opportunity to promote detailed action at the local level while achieving strategic objectives within the boundaries of Kenosha County, its watersheds, and the Southeastern Wisconsin Region.

Areas of Low Priority for Flood Mitigation Planning

The following perennial streams and lakes within the study area have floodplains that experience minimal flooding and are undeveloped or contain a limited number of residential or commercial structures: 1) within the Pike River watershed—the Pike River and its unnamed tributary, Sorenson Creek, Nelson Creek, Pike Creek and its unnamed tributaries, School Tributary, and Somers Branch; 2) within the Des Plaines River watershed—the Des Plaines River and its unnamed tributaries, Kilbourn Road Ditch and its unnamed tributaries, Center Creek and its unnamed tributaries, Brighton Creek and its unnamed tributaries, Salem Branch of Brighton Creek and its unnamed tributaries, Dutch Gap Canal and its unnamed tributaries, Mud Lake Outlet, as well as League Lake, Friendship Lake, Shangrila Lake, Benet Lake, Hooker Lake, Cross Lake, Voltz Lake, Montgomery Lake, George Lake, and Mud Lake; and 3) within the Fox River watershed—New Munster Creek, Palmer Creek, Bassett Creek, Hoosier Creek, Peterson Creek, Silver Lake Outlet, as well as Camp Lake, Center Lake, Dyer Lake, Lilly Lake, Flanagan Lake, Silver Lake, Rock Lake, Peat Lake, Elizabeth Lake, Powers Lake, and Benedict Lake.

These areas require minimal flood mitigation planning and have been given a low priority in this plan. However, the County will continue to monitor these areas in future updates of the plan, and will reprioritize these areas if necessary, based upon future development and flooding conditions.

Area of High Priority for Flood Mitigation Planning

The 100-year recurrence interval floodplain adjacent to the Fox River has a history of creating life-threatening conditions during flooding events. Due to the topography of the area, strong, swift moving currents and deep river channels present challenges and life threatening situations to residents of the area and the rescue workers who must provide evacuation services.

Because of the severity of flooding and the high density of residential development, flood mitigation in the Fox River floodplain has been given a high priority in this plan. The primary flood hazard is located in an area where the Fox River flows through a contiguous area of medium-density residential development. This residential area is located on three peninsulas that are formed by sharp horseshoe bends in the River. During times of flooding, these peninsulas are submerged by floodwaters and experience high velocity currents. Debris, such as fallen tree limbs and yard debris, propelled by the swift currents flow across the peninsulas making evacuation and rescue efforts extremely dangerous. Flooding events occur at all times of the year, with winter flooding being particularly hazardous. During winter flooding, the floodwater surrounding the homes freezes, foundations collapse, and residents are forced to evacuate or walk to their homes over frozen

or partially frozen surfaces. A flooding event in 1994 resulted in one home being knocked off its foundation when it was struck by an ice floe.

The frequency of recent flooding demonstrates the continuing need for a comprehensive and cooperative strategy for mitigating existing flooding problems in this area. In the absence of adequate planning, the County may be expected to continue to experience repetitive flooding problems. A systematic plan to address existing flooding problems and avoid the creation of new problems is therefore critical to the sound development of the area.

The need for flood mitigation planning in the Fox River floodplain was identified as early as 1966 when Kenosha County requested that the Southeastern Wisconsin Regional Planning Commission prepare the comprehensive plan referenced above for the Fox River watershed. This Plan identified 160 houses within 10-year recurrence floodplain that were targeted for acquisition and removal. Due to a lack of public sector funding, the removal of homes from the floodplain was not initiated until the area was included as a part of a Federal disaster declaration in 1993.

Beginning in 1995, Kenosha County initiated a voluntary acquisition and relocation program in the Fox River floodplain (the Fox River Flood Mitigation Program) that was funded through the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant (CDBG) Program administered by the Wisconsin Department of Administration and the Federal Emergency Management Agency (FEMA) Public Assistance Program. The Flood Mitigation Program was continued with a CDBG award in 1998. In 1999, the CDBG program provided grants to Kenosha County and the Town of Wheatland and FEMA and the Wisconsin Department of Military Affairs provided grant funds through the Hazard Mitigation Grant Program (FEMA-1238-DR-WI) and the Flood Mitigation Assistance (FMA) Program to Kenosha County. Since 1995, these funding sources have assisted the County and Town in purchasing and removing 35 properties from the floodplain at a cost of $2.9 million (see Appendix 3). Twelve additional properties will be purchased in 2001 and 2002 with remaining FEMA-1238-DR-WI funds. In 2001, Kenosha County also secured $1.1 million in CDBG, FMA, and HMGP funds (FEMA-1332-DR-WI) that will be used to acquire an estimated 14 properties.

Damage to Housing Stock

Primarily vacationers from the Chicago metropolitan area built the residential structures within the Fox River floodplain. The units constructed were small and designed as seasonal summer cottages. As such, these units commonly have insufficient heating, electrical, and plumbing systems; lack insulation and living space; and are of a generally poor quality. Over time, low-income families and retirees, attracted by the low cost of buying in the area, began to occupy these properties and modify them to suit their needs. Many homes also contain add on rooms which were often built without a foundation or in conformance with proper building standards. In addition, homes in the Fox River floodplain suffer from repeated flood damage that makes many of the properties unsuitable for year-round occupancy.

The most common damage occurs to residential structures as high water undermines the structural integrity of the dwellings. On the interior, electrical and HVAC systems are damaged; floors and floor coverings are destroyed and must be replaced; and walls, furniture, and appliances are damaged beyond repair. In addition, there are health risks associated with flooding. Septic systems fail and leach effluent into the floodwaters. Homes lose their water supply as unprotected wells become contaminated by floodwater. Standing water that remains after the flooding has receded creates a breeding ground for mosquitoes and other insects.

A survey conducted by the Kenosha County Housing Authority during September of 1997 confirmed the

destructive effects of flooding on the housing stock in the Fox River floodplain. The survey area was limited to the Town of Wheatland—the peninsula west of 312th Avenue along 76th and 77th Streets and the channel located south of STH 50 along 71st Street. Survey results indicate that 50 percent of the respondent properties sustained flood damage from flooding events along the Fox River. Based on the survey results, it is estimated that 80 percent of the area's housing units are substandard by Wisconsin Department of Administration standards.

Economic Impact

The economic impact of flooding along the Fox River includes decreased property values, difficulty selling property, an increased demand for public services, and damage to public infrastructure. Property values in the area are substantially lower than those for similar properties located outside of the floodplain. As referenced above and shown in Appendix 3, Kenosha County has acquired 35 properties as a part of the Fox River Flood Mitigation Program. Twenty-five of these properties were owner-occupied. The average cost to acquire these owner-occupied properties was $53,376, while the average cost for comparable replacement housing was $77,764. For these acquisitions, the study area's real estate values are 31 percent lower than the market for comparable properties located outside of the floodplain. These decreased property values, combined with minimal appreciation relative to the balance of the County, discourages investment in the area. Investment is further hampered by the County's zoning ordinance, which severely limits the amount of structural improvements that can be made to floodplain properties.

As a result of the publicity that flooding events have received in the local and national media, perception of the floodplain as an undesirable place to live has increased. This perception, along with the poor quality of the structures located in the floodplain, makes it difficult for property owners to sell. However, a limited market still exists for low-and moderate-income buyers who cannot afford a home outside of the floodplain, as well as seasonal buyers who spend limited periods of time in the area during the dry summer months.

Public services are often needed during flooding events. Local law enforcement, along with volunteer rescue personnel and the Red Cross, work overtime to provide rescue services and shelter for local residents. The increased demand for public services is best demonstrated by the flooding event of 1993 when the County Sheriff's Department, local volunteer fire departments, rescue personnel, and U.S. Coast Guard worked overtime performing rescues and securing the area. Local funds expended by these agencies were estimated to be $500,000.

Municipal damages also occur during periods of severe flooding. Kenosha County and its constituent municipalities are often required to repair or replace public infrastructure following a flood event. The most recent example is the flooding that occurred in June 2000, when Kenosha County, six of the seven towns in the County, and the Village of Silver Lake applied for $160,564 from the FEMA Public Assistance Program for a reimbursement of costs incurred during this flooding event.

Past Hazard Mitigation Activities

As referenced above, Kenosha County has successfully completed the voluntary acquisition of 35 flood-damaged properties in the Fox River floodplain (see Appendix 3). All of these properties have been demolished. Funding permitting, the County intends to continue acquiring additional floodplain properties on a voluntary basis until the potential for flood-related injury and damage is eliminated.

Section 87.30 of the *Wisconsin Statutes* requires that cities, villages, and counties, with respect to their unincorporated areas, adopt floodland zoning to preserve the floodwater conveyance and storage capacity

of the floodplain areas and to prevent the location of new damage-prone development in flood hazard areas. The minimum standards that such ordinances must meet are set forth in Chapter NR 116 of the *Wisconsin Administrative Code*. The required regulations govern filling and development within a regulatory floodplain, which is defined as the area subject to inundation by the 100-year recurrence interval flood event. Under Chapter NR 116, local floodland zoning regulations must prohibit nearly all forms of development within the floodway, which is that portion of the floodplain required to convey the 100-year recurrence peak flood flow. Local regulations must also restrict filling and development within the flood fringe, which is that portion of the floodplain located outside of the floodway that would be covered by floodwater during the 100-year recurrence flood. Permitting the filling and development of the flood fringe area reduces the floodwater storage capacity of the natural floodplain, and may thereby increase downstream flood flows and stages.

The Kenosha County Shoreland and Floodplain Zoning Ordinance was adopted on May 7, 1983, and applies in all of the unincorporated areas of the towns in Kenosha County. That ordinance, desirably, exceeds the minimum requirements of the State by regulating the floodplain area in the County. The implementation of this ordinance has prevented the loss of floodwater storage and has helped to prevent new development in flood hazard areas.

The Village of Silver Lake has its own general floodplain zoning ordinance that was adopted on February 7, 1996. The ordinance was developed as a mitigation strategy to provide for sound floodplain management consistent with the *Statutes*. The Village's zoning ordinance allows for development, as permitted, within the floodplain fringe. Additionally, the Village of Silver Lake allows for structures in the floodway, provided that they are used for nonresidential purposes and are anchored in place, the longitudinal axis is parallel to the flow of water, and the structure does not increase the flood elevations by 0.01 foot or more.

Chapter III

INVENTORY OF STRUCTURES AT RISK FOR FLOODING

The Kenosha County Housing Authority has inventoried and mapped the location of structures that are located within the study area floodplains in the Village of Silver Lake and the Towns of Brighton, Bristol, Paris, Randall, Salem, Somers, and Wheatland. Appendix 4 includes maps for each of these areas that identify the general location of the properties. There are no critical facilities (fire and police stations, hospitals, and schools) located in any of the floodplains.

Table 1 provides inventory data on properties within the 100-year recurrence interval floodplain adjacent to the Fox River. This area has been given a high priority for flood mitigation planning because of the potential for significant damage to personal property, as well as the threat to the lives of the area's residents and the emergency rescue personnel who provide evacuation services during flooding events. Table 1 includes information on the location of the property, the year the structure was built, the type of structure, the grade and flood elevation for each structure, and the estimated fair market value for each tax parcel. The estimated fair market value is based on the local assessor's estimate of value in the year 2000 and includes the value of both the land and improvements.

The inventory data for the Fox River shows that there are 141 tax parcels with primary structures in the floodplain. This inventory does not include the 35 properties that Kenosha County and the Town of Wheatland have purchased and removed as a part of the Fox River Flood Mitigation Program referenced above. The inventory data show that two of the properties are commercial and 139 are residential. These properties have a total estimated fair market value of $8.9 million. None of the structures included in this survey have been identified by the Federal Emergency Management Agency as a repetitive loss structure. Appendix 5 includes detailed parcel maps that show the location of each of the properties in the Fox River floodplain.

The Housing Authority has also completed a preliminary inventory of properties that are located in 100-year recurrence interval floodplains of low-priority waterways and lakes in the County. This inventory data is presented in Appendix 6 and includes information on the location of the property, the type of structure, and the estimated fair market value for each tax parcel. The inventory data shows that there are 219 tax parcels, with an estimated fair market value of $31.3 million. As indicated previously, these areas have been given a low priority because of the minimal flooding and limited amount of development that is present. As such, flood elevations have not been included in the inventory. Each of the tax parcels included in Appendix 6 is located in a 100-year floodplain. However, additional refinement of the data is needed to determine if the structural improvements on these parcels are located within the floodplain boundaries. This refinement is included as a part of the flood mitigation program described in Chapter VII of this plan.

Damage estimates for individual structures is not included in this inventory of low priority floodplains because the only area that has reported significant property damage due to flooding is a mobile home park located adjacent to the Kilbourn Ditch in the Town of Somers. These mobile homes are located on leased parcels.

Table 1

Kenosha County Floodplain Inventory: Fox River Floodplain

Parcel No.	Property Address	Year Built	Type of Structure	Grade Elevation	Flood Elevation	Estimated Fair Market Value
Town 2 North, Range 19 East, Section 35-- Wheatland						
95-4-219-351-0516	4856 330th Avenue	1955	Residential	751.0	751.1	$ 106,417
95-4-219-351-0525	4832 330th Avenue	1955	Residential	751.0	751.1	$ 89,922
Town 1 North, Range 19 East, Section 1-- Wheatland						
95-4-119-012-0710	32310 Geneva Road	N/A	Commercial	749.0	750.0	$ 135,043
95-4-119-012-0720	32214 Geneva Road	N/A	Commercial	749.0	750.0	$ 113,760
95-4-119-013-0425	6718 Wheatland Road	1940	Residential	746.0	749.9	$ 60,126
95-4-119-014-0740	31610-71st Street	1965	Residential	748.0	749.2	$ 97,159
95-4-119-014-0745	7013-317th Avenue	1965	Residential	748.0	749.2	$ 77,365
95-4-119-014-0761	6941-317th Street	1979	Residential	748.0	749.2	$ 70,448
95-4-119-014-0810	6904-317th Avenue	1949	Residential	748.0	749.2	$ 73,853
95-4-119-014-0820/0825	6920-317th Avenue	1965	Residential	748.0	749.2	$ 51,931
95-4-119-014-0831	6932-317th Avenue	1939	Residential	748.0	749.2	$ 88,432
95-4-119-014-0845	6940-317th Avenue	1949	Residential	748.0	749.2	$ 57,572
95-4-119-014-0850	31708-71st Street	1951	Residential	748.0	749.2	$ 88,539
95-4-119-014-0855	6940-318th Street	1955	Residential	748.0	749.2	$ 94,392
95-4-119-014-0860	31808-71st Street	1939	Residential	748.0	749.3	$ 33,841
95-4-119-014-0870/0865	31822-71st Street	1952	Residential	746.0	749.3	$ 73,002
95-4-119-014-0875	6932-318th Avenue	1955	Residential	748.0	749.3	$ 71,406
95-4-119-014-0885	6922-318th Street	1950	Residential	746.0	749.3	$ 53,634
95-4-119-014-0895	6912-318th Street	1950	Residential	746.0	749.3	$ 43,099
95-4-119-014-0905	6900-318th Street	1974	Residential	746.0	749.3	$ 70,874
95-4-119-014-0915	6803-319th Street	1948	Residential	748.8	749.4	$ 60,977
95-4-119-014-0925	6815-319th Avenue	1952	Residential	748.0	749.4	$ 68,000
95-4-119-014-0945	6913-319th Avenue	1955	Residential	746.0	749.4	$ 50,761
95-4-119-014-1025	6804-319th Street	1950	Residential	748.0	749.4	$ 80,451
95-4-119-014-1100	31913-71st Street	1950	Residential	746.0	749.4	$ 80,345
95-4-119-014-1105	31905-71st Street	1954	Residential	746.0	749.4	$ 59,806
95-4-119-014-1110	31901-71st Street	1950	Residential	746.0	749.4	$ 59,168
95-4-119-014-1140	31715-71st Street	1953	Residential	746.0	749.2	$ 42,886
95-4-119-014-1145	31711-71st Street	1953	Residential	746.0	749.2	$ 47,781
95-4-119-014-1155	31701-71st Street	1951	Residential	746.0	749.2	$ 73,215
95-4-119-014-1160	31633-71st Street	1950	Residential	746.0	749.2	$ 55,656
95-4-119-014-1165	31627-71st Street	1946	Residential	746.0	749.2	$ 74,705
95-4-119-014-1170	31621-71st Street	1954	Residential	746.0	749.2	$ 68,852
95-4-119-014-1175	31613-71st Street	1952	Residential	747.0	749.2	$ 70,554
95-4-119-014-1180	31605-71st Street	1950	Residential	748.0	749.2	$ 46,611
95-4-119-014-1185	31601-71st Street	1954	Residential	748.0	749.2	$ 57,146
95-4-119-014-1190	31525-71st Street	1952	Residential	748.0	749.2	$ 60,232
95-4-119-014-1195	31517-71st Street	1955	Residential	748.0	749.2	$ 75,875
95-4-119-014-1200	31507-71st Street	1965	Residential	747.3	749.2	$ 96,946
Town 1 North, Range 19 East, Section 12-- Wheatland						
95-4-119-121-0250	31224-77th Street	1954	Residential	746.0	749.0	$ 62,892
95-4-119-121-0255	7607-313th Street	1957	Residential	746.0	749.0	$ 48,420
95-4-119-121-0310	7522-313th Avenue	1971	Residential	748.0	749.1	$ 74,066
95-4-119-121-0320	7536-313th Avenue	1975	Residential	747.0	749.0	$ 75,130
95-4-119-121-0325	7600-313th Avenue	1960	Residential	746.0	749.0	$ 45,227

Table 1 (continued)

Kenosha County Floodplain Inventory: Fox River Floodplain

Parcel No.	Property Address	Year Built	Type of Structure	Grade Elevation	Flood Elevation	Estimated Fair Market Value
95-4-119-121-0345	7506-314th Avenue	1950	Residential	746.0	749.2	$ 51,506
95-4-119-121-0361	7512-314th Avenue	1955	Residential	746.0	749.2	$ 61,190
95-4-119-121-0375	7538-314th Avenue	1939	Residential	744.9	749.2	$ 47,356
95-4-119-121-0435	31602-76th Street	1957	Residential	744.1	749.2	$ 47,036
95-4-119-121-0440	31608-76th Street	1935	Residential	744.1	749.2	$ 40,226
95-4-119-121-0490	31722-76th Street	1939	Residential	744.6	749.1	$ 44,908
95-4-119-121-0525	31826-77th Street	1938	Residential	745.0	749.1	$ 41,290
95-4-119-121-0560	31932-77th Street	1969	Residential	744.0	749.1	$ 47,994
95-4-119-121-0615	31911-77th Street	1950	Residential	744.0	749.0	$ 44,908
95-4-119-121-0650	31809-77th Street	1945	Residential	744.0	749.0	$ 34,160
95-4-119-121-0660	31733-77th Street	1950	Residential	744.0	749.0	$ 49,377
95-4-119-121-0665	31727-77th Street	1934	Residential	744.0	749.0	$ 36,182
95-4-119-121-0690	31709-77th Street	1945	Residential	744.2	749.0	$ 39,268
95-4-119-121-0700	31701-77th Street	1935	Residential	744.2	749.0	$ 35,650
95-4-119-121-0705+	31641-77th Street	1940	Residential	744.2	749.0	$ 38,842
95-4-119-121-0730	31617-77th Street	1950	Residential	744.0	749.0	$ 39,268
95-4-119-121-0745	31601-77th Street	1962	Residential	744.0	748.9	$ 46,930
95-4-119-121-0750	31533-77th Street	1936	Residential	744.0	748.9	$ 22,348
95-4-119-121-0775	31509-77th Street	1954	Residential	744.0	748.9	$ 44,589
95-4-119-121-0900	31421-77th Street	1952	Residential	744.0	748.9	$ 41,503
95-4-119-121-0905	31417-77th Street	1954	Residential	744.0	748.9	$ 68,107
95-4-119-121-0925	31315-77th Street	1925	Residential	744.0	748.9	$ 39,268
95-4-119-122-0150	32114-77th Street	1965	Residential	746.0	749.0	$ 49,697
95-4-119-122-0155	32120-77th Street	1948	Residential	745.7	749.0	$ 49,165
95-4-119-122-0175	32142-77th Street	1955	Residential	745.4	749.1	$ 44,589
95-4-119-122-0235	32025-77th Street	1955	Residential	744.5	749.0	$ 43,418
95-4-119-122-0250	32005-77th Street	1954	Residential	744.0	749.0	$ 55,762
Town 1 North, Range 20 East, Section 7 -- Salem						
65-4-120-072-0520	7916 Shorewood Dr	1955	Residential	748.0	748.5	$ 75,855
65-4-120-072-0525	7934 Shorewood Dr	1935	Residential	747.0	748.5	$ 80,829
65-4-120-072-0530	7942 Shorewood Dr	1952	Residential	747.0	748.5	$ 112,021
65-4-120-072-0535	7952 Shorewood Dr	1965	Residential	746.0	748.5	$ 52,332
65-4-120-072-0540	7954 Shorewood Dr	1930	Residential	745.1	748.5	$ 44,456
65-4-120-072-0550	7933 Shorewood Dr	1935	Residential	748.0	748.5	$ 59,482
65-4-120-072-0556	7943 Shorewood Dr	1930	Residential	747.0	748.5	$ 69,119
65-4-120-072-0576	30536 80th Street	1955	Residential	745.0	748.5	$ 62,073
65-4-120-072-0581	30522 80th Street	1930	Residential	745.0	748.5	$ 44,974
65-4-120-072-0591	30510 80th Street	1930	Residential	746.5	748.5	$ 55,026
65-4-120-072-0605	7954 305th Ave	1948	Residential	746.0	748.5	$ 39,482
65-4-120-072-0626	30521 79th Street	1945	Residential	747.0	748.5	$ 66,736
65-4-120-072-0695	7965 305th Ave	1960	Residential	747.1	748.5	$ 42,487
65-4-120-072-0700	7957 305th Ave	1945	Residential	747.0	748.5	$ 43,834
65-4-120-072-0705	7953 305th Ave	1960	Residential	747.0	748.5	$ 42,073
65-4-120-072-0715/0720	7937 305th Ave	1965	Residential	748.0	748.5	$ 75,130
65-4-120-073-0100	7962 Shorewood Dr	1952	Residential	744.0	748.5	$ 48,705
65-4-120-073-0131	8032 Shorewood Dr	1948	Residential	743.0	748.5	$ 93,886
65-4-120-073-0145	8118 Shorewood Dr	1949	Residential	744.7	748.4	$ 66,632
65-4-120-073-0155	8122 Shorewood Dr	1949	Residential	745.0	748.4	$ 63,731
65-4-120-073-0160	8142 Shorewood Dr	1949	Residential	745.0	748.4	$ 45,389

Table 1 (continued)

Kenosha County Floodplain Inventory: Fox River Floodplain

Parcel No.	Property Address	Year Built	Type of Structure	Grade Elevation	Flood Elevation	Estimated Fair Market Value
65-4-120-073-0165	8156 Shorewood Dr	1948	Residential	745.0	748.4	$ 45,285
65-4-120-073-0175	Shorewood Drive	1949	Residential	745.0	748.4	$ 25,803
65-4-120-073-0220	8029 Shorewood Dr	1945	Residential	745.0	748.5	$ 59,067
65-4-120-073-0240	8115 Shorewood Dr	1952	Residential	746.0	748.4	$ 53,368
65-4-120-073-0270	8210 Riverside Dr	1966	Residential	744.3	748.1	$ 84,145
65-4-120-073-0280	8200 Riverside Dr	1952	Residential	744.3	748.1	$ 60,311
65-4-120-073-0290	8168 Riverside Dr	1952	Residential	744.0	748.1	$ 42,902
65-4-120-073-0315	8200 Shorewood Dr	1948	Residential	743.0	748.2	$ 28,705
65-4-120-073-0400	30600 82nd Street	1974	Residential	746.5	748.3	$ 123,005
65-4-120-073-0595	30418 82nd Street	1966	Residential	746.8	748.0	$ 69,016
65-4-120-073-0610	8213 Riverside Dr	1954	Residential	746.0	748.0	$ 66,321
65-4-120-073-0620	8197 Riverside Dr	1964	Residential	746.1	748.1	$ 87,254
65-4-120-073-0630	8175 Riverside Dr	1957	Residential	746.0	748.1	$ 94,715
65-4-120-073-0640	8161 Riverside Dr	1950	Residential	745.0	748.1	$ 69,534
65-4-120-073-0665	8128 305th Ct	1968	Residential	747.0	748.1	$ 73,575
65-4-120-073-0801	8230 Riverside Dr	1935	Residential	744.0	748.0	$ 135,337
65-4-120-073-0815	857 N. Riverside Dr	1945	Residential	743.0	748.0	$ 61,969
Town 1 North, Range 20 East, Section 7 -- Silver Lake						
75-4-120-074-3241	515 Oak St	1938	Residential	747.0	748.0	$ 67,859
75-4-120-074-3320	851 N. Riverside Dr	1940	Residential	745.0	748.0	$ 35,163
75-4-120-074-3325	843 N. Riverside Dr	1952	Residential	745.0	748.0	$ 94,880
75-4-120-074-3335	833 N. Riverside Dr	1949	Residential	746.0	748.0	$ 89,944
75-4-120-074-3345	821 N. Riverside Dr	1943	Residential	746.0	748.0	$ 89,944
Town 1 North, Range 20 East, Section 18 -- Silver Lake						
75-4-120-181-3140	415 S. Riverside Dr	1940	Residential	743.0	747.8	$ 50,463
75-4-120-181-3155	431 S. Riverside Dr	1947	Residential	743.0	747.8	$ 35,287
75-4-120-181-3170	445 S. Riverside Dr	1948	Residential	743.0	747.8	$ 51,696
75-4-120-181-3180	501 S. Riverside Dr.	1940	Residential	743.0	747.8	$ 50,216
75-4-120-183-1005	511 S. Riverside Dr.	1933	Residential	743.0	747.8	$ 19,741
75-4-120-183-1015	523 S. Riverside Dr.	1944	Residential	744.0	747.8	$ 39,235
75-4-120-183-1025	607 S. Riverside Dr	1930	Residential	744.0	747.8	$ 40,469
75-4-120-183-1035	617 S. Riverside Dr.	1948	Residential	743.0	747.8	$ 61,197
75-4-120-183-1045	625 S. Riverside Dr	1940	Residential	743.0	747.8	$ 27,144
75-4-120-183-1060	633 S. Riverside Dr	1945	Residential	743.0	747.8	$ 51,326
75-4-120-183-1100	Wisconsin Ave	1930	Residential	742.0	747.8	$ 30,969
75-4-120-184-1255	118 Elm Street	1947	Residential	747.0	747.7	$ 97,594
75-4-120-184-1265	210 Elm Street	1943	Residential	747.0	747.7	$ 75,262
75-4-120-184-1620	710 6th Street	1961	Residential	747.0	747.7	$ 101,666
75-4-120-184-1625	209 Elm Street	1960	Residential	747.0	747.7	$ 98,334
75-4-120-184-1635	123 Elm Street	1936	Residential	747.0	747.7	$ 43,430
75-4-120-184-1675	202 Spruce Street	1945	Residential	747.0	747.7	$ 43,800
75-4-120-184-1785	230 Larch Street	1961	Residential	747.0	747.4	$ 140,901
75-4-120-184-2000	306 Larch Street	1935	Residential	746.0	747.4	$ 52,807
75-4-120-184-2015	813 6th Street	1935	Residential	745.0	747.5	$ 53,177
75-4-120-184-2021	809 6th Street	1942	Residential	745.0	747.5	$ 85,503
75-4-120-184-2030	729 6th Street	1954	Residential	745.0	747.5	$ 63,418
75-4-120-184-2035	719 6th Street	1948	Residential	744.0	747.7	$ 82,912
75-4-120-184-2040	715 6th Street	1957	Residential	744.0	747.7	$ 77,360

Table 1 (continued)

Kenosha County Floodplain Inventory: Fox River Floodplain

Parcel No.	Property Address	Year Built	Type of Structure	Grade Elevation	Flood Elevation	Estimated Fair Market Value
75-4-120-184-2050	701 6th Street	1935	Residential	747.0	747.7	$ 59,223
75-4-120-184-4001	307 Larch Street	N/A	Residential	747.0	747.4	$ 148,057
Town 1 North, Range 20 East, Section 31 -- Salem						
67-4-120-312-0500	11905 306th Ct	1960	Residential	742.0	744.4	$ 122,280
Total						$ 8,936,866

Footnote #1: Grade elevation for the residenital structures is estimated based upon topographic mapping at a scale of 1 inch = 200 feet. For properties near the margins of the 100-year recurrence interval floodplain, individual building surveys will need to be performed to determine grade elevation relative to the flood elevation.

Footnote #2: The estimated fair market value is based on the local assessor's estimate of value in the year 2000 and and includes the value of both the land and improvements.

Footnote #3: There are no repetitive loss structures included in this inventory.

Source: Kenosha County, Village of Silver Lake, and SEWRPC.

07-Nov-01

#43291v3

(This page intentionally left blank)

Chapter IV

ALTERNATIVE FLOOD MITIGATION STRATEGIES

Floodland management includes the planning and implementation of measures intended to assist with eliminating loss of life, lessening the danger to human health and safety, minimizing monetary damage to property, reducing the cost of utilities and services, and minimizing disruption in community affairs. Floodland management also attempts to avoid the intensification of existing land use and the creation of new hazards in floodprone areas.

Potential Flood Mitigation Strategies

Floodland management techniques are divided into two categories—structural measures and nonstructural measures. Structural measures include floodwater storage facilities such as reservoirs and impoundments; diversion facilities such as dikes and channels; floodwater containment facilities such as earthen dikes and concrete floodwalls; floodwater conveyance facilities, such as major channel modification; and bridge and culvert modifications or replacements. Nonstructural measures include reservation of floodlands for conservation, recreation, and other open space uses; floodland use regulations; land use controls outside the floodlands; structure floodproofing and elevation; structure removal; channel maintenance; community education programs; flood insurance; lending institution policies; real-estate-agent policies; community utility policies; and emergency programs. Structural measures tend to be more effective in achieving the objectives of floodland management in riverine areas that have already been urbanized, while nonstructural measures, being preventive, are generally more effective in riverine areas that have not yet been converted to flood-damage-prone development, even in cases where such areas have the potential for such development.

Comprehensive Plan Preparation: Fox River Watershed

In preparing its comprehensive plan for the Wisconsin portion of the Fox River watershed as referenced in Chapter II of this Plan (SEWRPC Planning Report No. 12, *A Comprehensive Plan for the Fox River Watershed*), the Southeastern Wisconsin Regional Planning Commission made a concerted effort to offer for public evaluation alternative plan elements. Each alternative plan element was evaluated in terms of engineering, economic, and legal feasibility and with respect to the satisfaction of the watershed development objectives. The alternative plan elements included various combinations of land use patterns and water control facilities.

In preparing the Fox River watershed plan, three types of structural measures were considered—levee construction and channel improvement, reservoir construction, and lake level control facility alternatives. These three basic types of structural measures were used to develop eight alternative structural flood control elements for the plan. A description of each structural plan element along with a discussion of anticipated performance, an evaluation of the costs and benefits, and an evaluation of the effect of the proposal on watershed development objectives and standards are included in Chapter IV of the SEWRPC plan (see Appendix 7).

Additionally, the plan identifies and discusses nonstructural measures, such as the removal of existing residences from the floodlands, floodproofing of residences, land use regulations, and open space and floodland preservation. Each of the alternatives was evaluated according to their applicability to flooding problems in the watershed, as well as to their costs and benefits.

As a follow-up to the preparation and adoption of the SEWRPC plan, the U.S. Army Corp of Engineers prepared a feasibility study that evaluated alternative plans for flood damage reduction along the entire length of the Fox River in both Wisconsin and Illinois. The study is documented in two reports: *Stage 2 Documentation Report, Fox River, Illinois-Wisconsin Flood Control*, September 1981, and*Final Feasibility Study for Fox River and Tributaries, Illinois and Wisconsin*, August 1984. This feasibility study evaluated nine structural and nonstructural alternatives for flood damage reduction within the Fox River watershed. The evaluation was based on the economic, environmental, and social impacts of the proposed alternatives (see Appendix 7).

For the Kenosha County portion of the Fox River watershed, SEWRPC and the U.S. Army Corp of Engineers determined that structural measures were not economically viable and the only viable alternatives were nonstructural—floodproofing, the protection of floodplain areas through floodland regulations, and limited acquisition of homes.

Alternative Strategies: Flood Mitigation Plan

In preparing this flood mitigation plan, the Kenosha County Housing Authority sought input from residents through the conduct of public hearings and evaluated selected alternatives with regard to reducing or eliminating the hazards to floodprone properties in the Fox River floodplain. These alternatives are described below.

Floodproofing Structures: Floodproofing measures that were suggested by local residents included elevating at-risk structures to a height at least two feet above the regional flood elevation and installing permanent closures and sealants. Closures and sealants would consist of filling windows and doors with a water-resistant material, such as concrete, to prevent water from entering the living space.

Due to the nearly annual flooding experienced in this area and the costs attendant to such activities, floodproofing of structures is not feasible. The area is isolated and during flooding events many of the homes are surrounded by water which severely limits ingress and egress. Also this alternative does not address the issue of emergency rescue, where local law enforcement officers and volunteers are placed at risk in assisting with the evacuation of local residents during a flooding event. Closures and sealants are not feasible because most of the properties are substandard as a result of water damage due to repeated flooding and neglect and likely could not withstand the resulting hydrostatic loads. Further, existing County floodplain and zoning ordinances place significant restrictions on these types of improvements, in order to curb development in floodprone areas.

Straightening the River: The construction of a river channel that would run roughly parallel to 313th Avenue in the Town of Wheatland was suggested by local residents. This channel would cut off the 77th Street peninsula thereby eliminating a bottleneck at 313th Avenue and reducing flooding in the area.

This alternative would be difficult to implement. In addition to the costs of redirecting the River, there would be additional costs attendant to the construction and maintenance of at least one access bridge and the acquisition, relocation, and demolition of households in the path of the channel.

No study has been completed to determine whether this option would prevent or reduce flooding in the study area. SEWRPC and the Army Corp of Engineers did not consider this alternative as a part of their comprehensive watershed planning. This alternative also has the potential to increase downstream flooding in the Town of Salem, the Village of Silver Lake, and Lake County, Illinois.

Channelization: Some residents of the area believe that as a result of the horseshoe bend located at 77th Street, the flow of the river slows and causes sediment and other debris to be deposited. This sediment is thought to restrict flow in the River resulting in a higher flood stage. It has been suggested that, by dredging the River bottom and removing the sediment, the flow of the river would improve and significantly reduce the severity of flooding in the area.

This alternative was considered by SEWRPC and the Army Corp of Engineers and rejected for the Kenosha County portion of the Fox River because of its limited value.

Upstream Dam Control: The timing of the opening and closing of upstream dams was offered by residents as an alternative. The operating water level ranges of upstream dams are established by the Wisconsin Department of Natural Resources.

No study has been completed to determine whether this option would prevent or reduce flooding in the study area. SEWRPC and the Army Corp of Engineers did not consider this alternative as a part of their comprehensive watershed plan.

Acquisition of Residential Structures: The acquisition and removal of residential structures from the floodplain was considered. By actively pursuing State and Federal funding, the County could eventually acquire all those dwellings that present the greatest risk to the health and safety of its occupants. The acquisition of dwellings and relocation of residents would eliminate the potential for additional flood damage to those acquired properties. However, properties not acquired would continue to be exposed to the flood hazard.

The acquisition and removal of properties is currently the most cost effective alternative being considered and was the recommended alternative in the afore-referenced SEWRPC comprehensive watershed plan and Army Corp of Engineers feasibility study.

Do Nothing: A do nothing alternative was considered by Kenosha County. In this scenario, the County would not pursue any mitigation activities, but would instead take a reactive stance to the problem, only responding to emergency situations as they arise.

This alternative was deemed unrealistic since the problem is too severe, health and safety concerns too high, and the disaster response costs too great to be ignored.

(This page intentionally left blank)

Chapter V

FLOOD MITIGATION FUNDING SOURCES

There are several options available to Kenosha County for the financing of a local flood mitigation program. The identification of potential funding sources, including sources other than solely local-level sources, is an integral part of the implementation of a successful mitigation plan. The following description of funding sources includes those that appear to be potentially applicable for Kenosha County in 2001. However, funding programs and opportunities are constantly changing. Accordingly, the involved County staff will continue to familiarize itself with the potential funding sources and programs that the County may utilize as such sources and programs become available. It is intended that the following list facilitate the implementation of the flood mitigation activities recommended in this plan. Some of the programs may not be available to the County or to its residents and/or property owners for a variety of reasons, including eligibility requirements or lack of funds at a given time in Federal and/or State budgets. Nonetheless, the list should provide a starting point for identifying possible funding sources for implementing this plan.

Federal Emergency Management Agency-Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) can provide up to 75 percent of the costs attendant to the floodproofing or acquisition and relocation of floodprone properties, or to the elevation of structures in compliance with National Flood Insurance Program (NFIP) standards. Under the HMGP, the balance of the costs is shared by the State of Wisconsin (12.5 percent) and the grantee (12.5 percent). Communities in Wisconsin can apply through the State for HMGP funds only after a Presidential disaster declaration is issued. The State of Wisconsin is required to apply for HMGP funds within 60 days of the declaration. The State, as HMGP grantee, is responsible for identifying and prioritizing projects. Eligible projects must meet cost-benefit criteria established by FEMA. As a condition of receiving HMGP funding, the recipient community is required to develop a flood mitigation plan. Although State and local units of government are eligible applicants, HMGP funds can be provided to individuals for eligible projects. The HMGP gives priority to FEMA-identified, repetitive-loss properties.

Kenosha County has obtained funds under this program for structure purchase and removal, and is continuing to use the program. Funding is available only in set amounts. There is no ongoing program for structure acquisition within the County once all HMGP funds are expended.

Federal Emergency Management Agency-Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program is a Federal Emergency Management Agency-funded grant program, administered by the Wisconsin Division of Emergency Management, which can provide up to 75 percent of the costs attendant to the acquisition, relocation, elevation, or dry floodproofing of structures insured under the NFIP. FMA funds are also available for the development of local flood mitigation plans as well as to assist with the implementation of mitigation projects that are identified in the flood mitigation plan. Eligible projects must be included as a part of the grantee's flood mitigation plan and must meet cost-benefit criteria established by FEMA. Kenosha County is eligible to apply for funding under the FMA program, but based upon recent indications, it appears that the amount of funding available under this program has been relatively small.

Kenosha County has obtained funds under this program for structure purchase and removal, as well as a planning grant for the development of this flood mitigation plan.

Federal Emergency Management Agency-Public Assistance Program

The Public Assistance Program can provide limited assistance with respect to structure elevation and relocation. For example, if entire portions of a community were to be relocated outside of a floodplain, this program can assist in rebuilding the necessary infrastructure in the new location. Funding under this program is provided for repair of infrastructure damaged during a flood that results in a Presidential disaster declaration. If a community determines that a badly damaged facility is not to be repaired, the estimated damage amount may be used to fund hazard mitigation measures. Public Assistance funding can also be used in FEMA buyout projects to finance demolition costs when 50 percent or more of the structures are determined to be substantially damaged under the local floodplain zoning ordinance.

Kenosha County has obtained funds under this program for reimbursement of public infrastructure repair and replacement and for the demolition of single-family residences in the Fox River floodplain There is no ongoing program at this time.

Wisconsin Community Development Block Grant Program

The Wisconsin Community Development Block Grant (CDBG) program is funded by the U.S. Department of Housing and Urban Development and administered by the Wisconsin Departments of Administration and Commerce. The CDBG Program can provide funding for a variety of mitigation activities, including disaster relief and acquisition and relocation activities. CDBG housing grants are awarded annually through a competitive application process. Eligible projects must have sustained damage and must benefit low- and moderate-income persons. In addition, CDBG emergency assistance grants may be provided for mitigation activities following a local disaster (no declaration required). All general-purpose units of government in the County are eligible to apply for CDBG funds, except for the City of Kenosha that has its own CDBG-funded program.

Kenosha County and the Town of Wheatland have obtained funds under this program for structure purchase and removal, and the County is continuing to use this program. Funding is available through this program only in set amounts. There is no ongoing program for structure acquisition within the County once all CDBG funds are expended.

U.S. Small Business Administration

The U.S. Small Business Administration (SBA) provides disaster loans to homeowners and businesses to repair or replace property damaged in a declared disaster. SBA loans are granted only for uninsured losses. Loans may be used to meet required building codes, such as the NFIP requirements. SBA may also provide loans for involuntary relocations out of special flood hazard areas when such relocations are required by local officials. While SBA's enabling legislation generally prohibits the agency from making disaster loans for voluntary relocations, there are exceptions that can be made, including relocations of homeowners, renters, and business owners out of a special flood hazard area. These loans would be limited to the amount necessary to repair or replace the damage at the disaster site. SBA loans may also be used to refinance existing mortgages. SBA funding is also available for up to 20 percent of the amount of a SBA loan to implement mitigation measures for the loan recipient's residence.

Wisconsin Department of Natural Resources-Urban Green Space Program

The Wisconsin Department of Natural Resources provides 50 percent matching grants through the Urban Green Space (UGS) program to cities, villages, towns, counties, public inland lake protection and rehabilitation districts, and qualified nonprofit conservation organizations for the acquisition of land. The intent of the program is to provide natural open space within or near urban areas and protect scenic or ecological features. Kenosha County is eligible to apply for grants under the UGS program.

Wisconsin Department of Natural Resources-Urban Rivers Grants Program

The Wisconsin Department of Natural Resources provides 50 percent matching grants through the Urban Rivers Grant Program (URGP) to municipalities to acquire land or rights to land on or adjacent to rivers that flow through urban areas, in order to preserve or restore urban rivers or riverfronts for the purposes of economic revitalization and the encouragement of outdoor recreational activities. Kenosha County is eligible to apply for grants under the URGP.

Grant Procurement and Administration

The eligibility and local contribution requirements associated with each of the aforementioned programs varies from program to program. The Kenosha County Housing Authority, with staff support from the Kenosha County Department of Planning and Development and the Southeastern Wisconsin Regional Planning Commission, shall be the lead agency responsible for identifying potential flood mitigation funding sources. In addition, the Kenosha County Housing Authority, with staff support from the from the Kenosha County Department of Planning and Development and the Southeastern Wisconsin Regional Planning Commission, will continue to be the administrative agency responsible for acquiring and administering grant awards attendant to ongoing mitigation efforts in floodplain areas.

(This page intentionally left blank)

Chapter VI

HAZARD PREPAREDNESS

The Wisconsin Division of Emergency Management develops and maintains a Hazard Analysis for the State of Wisconsin. The Hazard Analysis describes hazards, which have or are most likely to occur, including frequency of occurrence, their potential impacts, and suggested actions to mitigate. The document is updated and distributed on a biennial basis to county emergency management directors and other interested parties.

The Kenosha County Emergency Services Director develops and annually maintains a listing of all hazards in the County. The definition, frequency of occurrence, and actions to mitigate are described for each identified hazard.

Hazard Preparedness Planning

The Kenosha County Department of Social Services coordinates with the County's Division of Emergency Services, the American Red Cross, and others to identify the schools within Kenosha County that are best suited as public congregate care shelters. This planning includes the development of floor plans showing various shelter operations and room usage as well as traffic flow, reception, decontamination, and other considerations. These agencies also participate in drills and exercises as necessary to demonstrate the ability to activate staff and manage public congregate care shelters as required.

The Kenosha County law enforcement group is responsible to implement public evacuation where necessary. The law enforcement group members will work with the Division of Emergency Services to pre-plan primary and secondary evacuation routes that may be required for all areas of Kenosha County. This includes the initiation and staffing for all traffic control points as well as expedient signage and barricade placement. The Public Works Director identifies potential problem areas along evacuation routes, such as weight restrictions, narrow bridges, road sections susceptible to secondary effects of an incident, and so forth.

The Kenosha County law enforcement group will work with the Division of Emergency Services to participate in any drills or exercises that may be required or necessary to improve the capability of the Emergency Management Organization to order and implement large- and small-scale evacuation of citizens to congregate care shelter sites or neighboring communities.

Other support functions for evacuation and shelter operations are emergency warning and communications and emergency public information.

Procedures for Warning and Evacuating Residents

The Kenosha County Division of Emergency Services is the lead agency responsible for the organization and coordination of emergency public protective actions, including the evacuation of residents from endangered areas. The following information is taken from the *Kenosha County Emergency Operations Plan*, revised June 1994, and provides examples of the most common types of public protective actions available in a major emergency or a disaster when the health and well being of citizens are threatened.

In-Place Shelter: Used when conditions occur too rapidly to allow any other reasonable choice. The protective action includes advising citizens to remain indoors whether in a public building or at home. Citizens are

advised to close windows and doors, shut off heating and air conditioning which could draw in outside air, close off chimneys, vents, and other outside passageways, and remain indoors until given further instructions are provided by local officials. This public protective action is used for hazardous materials or radioactive releases into the atmosphere that could impact the health of citizens if ingested or inhaled.

Public Congregate Care Shelter: Used when sufficient time is available to allow the orderly evacuation of residents from an impacted or potentially impacted area. The Kenosha County Division of Emergency Services, in conjunction with the Department of Social Services and the American Red Cross maintains a list of congregate and fallout shelter spaces within Kenosha County.

Evacuation: This public protective action will be chosen when the option to remain in the impacted area presents a greater health risk than moving citizens out of the impacted area. While congregate care shelters are normally set up near the impacted communities and for short periods of time, large-scale evacuation could involve movement of citizens far from their home communities and for long periods of time—several days to several weeks. Public shelters may be chosen within Kenosha County or may involve neighboring counties or other areas in Wisconsin or Illinois. Destination sites are chosen and explained to the public by local officials during the response phase of the disaster or emergency situation.

Although most citizens have been known to wait for instructions from their local officials, it is expected that some citizens will spontaneously evacuate an area before public instructions are given. This spontaneous evacuation could include up to 30 percent of the impacted population.

In many documented disaster and emergency situations, it has been shown that some citizens will refuse to evacuate an endangered area. In Kenosha County, incident commanders may choose to allow these citizens to remain, provided they have been given adequate warning of the dangers of remaining in the area. In a local or state declaration of emergency, citizens can be ordered out of an impacted area because of the extreme health risks associated with remaining.

Operation of public congregate care shelters will be the responsibility of Kenosha County Department of Social Services with the assistance of the American Red Cross, the County Health Department, and other agencies.

More detailed information on specific pre-planned evacuation and shelter options may be found in the *Kenosha County Zion Nuclear Emergency Plan* and the *Kenosha County Hazardous Materials Plan.*

Flood Hazard Evacuation Plan

The Kenosha County Division of Emergency Services maintains frequent contact with the National Weather Service in Sullivan, Wisconsin. When the potential for severe weather and/or flooding is present, the National Weather Service issues a warning to the Division.

The flood stage of the Fox River in Kenosha County is 10 feet. When the river is predicted to rise to a level between 10 and 12 feet, the County is put on flood alert, evacuation preparation is initiated, and the situation is monitored. When the river level is predicted to exceed 12 feet, three inches, an evacuation order is issued. An evacuation of the Fox River floodplain may be issued by any one of the following: the Division of Emergency Services, the Kenosha County Executive, the Kenosha County Sheriff, the Towns of Salem and Wheatland, the Village of Silver Lake, or the Governor of the State of Wisconsin.

The County Public Information Officer will, when appropriate, inform local media of all evacuation or

potential evacuation information. In addition, the Sheriff's department and local emergency personnel place high water barricades at critical roadways and perform a door-to-door warning of local residents, including the placement of warning notices on doors. In the event that floodwaters rise too rapidly for these warnings to be implemented, the County will use its emergency sirens to warn residents.

The Kenosha County law enforcement group handles all traffic and population movements for evacuation and also provides security at public congregate shelters.

The County Department of Social Services and human services group is responsible for the implementation of public congregate care shelters, including management, registration, food, clothing, and shelter logistical needs, as well as other health needs encountered by relocated citizens in public congregate care shelters.

Congregate Care/Shelter Locations

Shelter Name and Location	Feeding Capacity	Spaces: School in Session	Spaces: School Out
Bradford High School 3700 Washington Road	700	1,083	2,209
Gateway Technical College 3520 – 30th Avenue	400	1,455	4,143
Tremper High School 8650 – 26th Avenue	900	1,187	3,380
Carthage College 2001 Alford Drive	600	1,000	2,151
University of Wisconsin, Parkside Wood Road - 30th Avenue	1,179	3,000	11,000
Pleasant Prairie 9208 Wilmot Road (C)	160	212	606
Brighton Consolidated 1200 – 248th Avenue	140	139	384
Westosha Central High 24617 – 75th Street, Salem	240	743	1,514
Paris Consolidated 1901 – 176th Avenue	200	260	531
Randall Consolidated County Trunks 0 & F	200	356	726
Salem Grade School County Trunk AH & Hwy 83	250	662	1,349
Riverview School 300 Prosser Street, Silver Lake	200	336	686
Trevor Grade School 26325 Wilmot Road, Trevor	80	143	291
Lakewood School 1218 Wilmot Avenue, Twin Lakes	0	167	341
Wheatland Center School 6606 – 368th Avenue	250	297	605
Wilmot High School 11112 – 308th Avenue	150	757	1,509

Critical Facilities

There are no critical facilities (fire and police stations, hospitals, and schools) located in the Fox River floodplain. However, the following local facilities are available in the event of life threatening hazards.

Hospitals: Kenosha Hospital and Medical Center, 6308-8th Avenue, Kenosha (315 beds), and St. Catherine's Hospital, 3556-7th Avenue, Kenosha (250 beds). Kenosha Hospital and Medical Center also has an Emergency Medical Center located in the Village of Silver Lake at Second and Larch Streets, and St. Catherine's Hospital has a Medical Campus located at 7201 Green Bay Road. Aurora Health Care and Kenosha Health Care Partners have opened large HMO facilities in 1994 and a Midwest Urgent Care Center Walk-In Clinic opened in 1998. In addition, reciprocal agreements, for the transfer of critical patients, exist between Kenosha County and hospitals in Racine County, Wisconsin, and Lake County, Illinois. Kenosha County has 12 nursing/residential care homes.

Schools: Emergency shelter is available during a disaster at Carthage College, University of Wisconsin/Parkside, Gateway Technical College, seven high schools (four in the City of Kenosha and three in the County), plus one alternative high school in the City. There are also numerous elementary and junior high schools located in the rural areas of the County.

Hazard Recovery Plan

The decision to allow re-entry of residents into a previously-evacuated area is made by the field incident commander and/or Emergency Management Group after the health threat has ceased and the evacuated area has been inspected by public health, fire, or other appropriate officials. The law enforcement group implements re-entry of citizens with assistance from the fire, health/medical, and public works/engineering group members. Coordination with the County Public Works Department will be made to ensure the safety of evacuation routes following an event.

An official statement to authorize evacuees to return to their homes is issued by the incident commander and/or Emergency Management Group. The statement is provided through the Public Information Officer to the local media, and if necessary, printed and handed to evacuees upon their re-entry into the previously evacuated area.

Other Natural Hazards

Kenosha County is subject to many hazards and types of disasters that could create the need for evacuation or sheltering of County residents. Among the most probable natural or man-made disasters that could require public protective action are tornadoes, floods, hazardous material spills, and nuclear incidents, including nuclear power plant accidents and nuclear attack. Due to the random occurrence of these hazards and the fact that they can occur anywhere within the County, these types of hazards have not been mapped.

For the purpose of this flood mitigation plan, only life threatening natural disasters will be discussed. For a more detailed explanation of all hazards that can impact Kenosha County, refer to the *Kenosha County Hazard Analysis Plan* on file with the Kenosha County Division of Emergency Services. The following excerpts are from this Hazard Analysis Plan.

Thunderstorms: Thunderstorms develop through three distinct stages: birth, growth, and maturity. In the first stage of development, an updraft drives warm air up beyond condensation levels where clouds form and where continued upward movement produces the Cumulus formation. The second stage of development

occurs as water vapor in the expanding cloud is raised to saturation levels, the air is cooled sufficiently to liberate solid and liquid particles of water, and rain and snow begin to fall within the cloud. A thunderstorm's mature stage is marked by a transition of wind direction within the storm cells. The prevailing updraft, which initiated the cloud's growth, is joined by a down draft generated by precipitation. Lightning occurs soon after precipitation begins. Hail and tornadoes may also occur during this stage. On the ground directly beneath the storm system, the mature stage is initially felt as rain, which is soon joined by the strong downdraft. The downdraft spreads out from the cloud in gusting divergent winds, and brings a marked drop in temperature. Even where the rain has not reached the ground, the thunderstorm's mature stage can be recognized by this cold air stream flowing over the surface. This is nature's warning that the thunderstorm is in its most violent phase.

Even as the thunderstorm reaches maturity, the storm begins to die. The violent downdraft initially shares the circulation with the sustained updraft, then precipitation weakens, stops, and the cold downdraft ceases. A thunderstorm often is born, grows, reaches maturity, and dies in a 30-minute period. The individual thunderstorm cell travels frequently between 30 and 50 miles per hour. Strong frontal systems, though, may send one squall line after another composed of many individual thunderstorm cells. These fronts can often be tracked completely across the state from west to east with a constant cycle of birth, growth, maturity, and death of individual thunderstorm cells. Thunderstorms can occur throughout the year, although their highest frequency is during the months of May through September. They occur most often between the hours of Noon and 10:00 p.m.

Lightning: Lightning is a secondary effect of electrification within a thunderstorm cloud system. As a thunderstorm induces the growing positive charge on the ground, the negative charges in the cloud become great enough to overcome the resistance of insulating air and force a conductive path for current to flow between the two charges. Lightening strikes represent a flow of current and may proceed from cloud to cloud, cloud to ground, or where high structures are involved, from ground to cloud. The temperature in the lightening strike channel rises to 50,000 degrees Fahrenheit, producing a bright flash of light in a loud clap of thunder caused by the sudden expansion of air.

Tornadoes: A tornado is a violently rotating column of air, pendant from a cumulonimbus cloud. It is nearly always visible as a funnel, although its lower end does not always touch the ground. Average winds in the tornado, although never accurately measured, are probably between 175 to 250 miles per hour. Tornadoes may produce winds exceeding 300 miles per hour. Typical tornadoes produce damage in an area that does not exceed one-quarter mile in width or 16 miles in length. A tornado's average speed is 30 miles per hour and can be on the ground for as long as 20 minutes. Tornadoes with track lengths greater than 150 miles have been reported, although such tornadoes are rare.

Winter Storms: Winter storms encompass a wide variety of weather phenomena including, heavy snow, blizzards, sleet, and ice storms. A snowfall accumulation of four or more inches is considered a heavy snowfall. A blizzard is defined as the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snow or large amounts of blowing and drifting snow. An ice storm occurs when rain falls out of the warm and moist layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. A sleet storm differs from an ice storm in that sleet is actually frozen raindrops or pellets that do not cling to surfaces.

(This page intentionally left blank)

Chapter VII

FLOOD MITIGATION PROGRAM

The preceding chapters of this plan have: 1) examined the need for a flood mitigation plan, 2) provided an inventory and analysis of the study area, 3) identified structures at risk for flooding, 4) set forth alternative flood mitigation strategies, 5) identified flood mitigation funding sources, and 6) described hazard preparedness planning in the County. The purpose of this chapter is to identify and recommend a flood mitigation program for adoption and implementation by Kenosha County and the Village of Silver Lake.

Goal of the Flood Mitigation Program

A flood mitigation program will be successful only if the program has a clear long-term goal that can guide the development and implementation of the program. This goal should reflect the type of flood mitigation program that is desired in the County, and to which specific flood mitigation program objectives and activities can be related. Only in this way can an effective flood mitigation program be formulated for the County and its effectiveness measured over time.

The following long-term goal has been established to guide the flood mitigation program in the County:

> *To reduce flood damage and protect the public health, safety, and welfare of the residents who live in 100-year recurrence interval floodplains in Kenosha County.*

Flood Mitigation Objectives and Activities

This section presents the objectives and activities that should be undertaken to enable the County to accomplish its flood mitigation goal. In this regard, the objectives and activities are intended to alleviate the flood mitigation problems that were identified in this plan.

Objective One
Continue the voluntary acquisition/relocation program in the Fox River floodplain that was initiated in 1995.

Activity One: During 2001 and 2002, purchase and remove an estimated 12 residential structures from the Fox River floodplain with funding provided by the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) (FEMA-1238-DR-WI). The Kenosha County Housing Authority, with staff support from the Southeastern Wisconsin Regional Planning Commission, will be the lead agency responsible for this activity.

Activity Two: During 2001 and 2002, purchase and remove and estimated 14 residential structures with funding from HMGP (FEMA-1332-DR-WI), the FEMA Flood Mitigation Assistance (FMA) Program, and the Community Development Block Grant Program (CDBG) Emergency Assistance Program. The Kenosha County Housing Authority, with staff support from the Southeastern Wisconsin Regional Planning Commission, will be the lead agency responsible for this activity.

Activity Three: Continue to monitor the availability of State and Federal funding for the Fox River Flood Mitigation Program. This activity will focus primarily on FEMA-funded programs—HMGP and FMA—and the CDBG Emergency Assistance Program. The Kenosha County Housing Authority, with staff support from

the Southeastern Wisconsin Regional Planning Commission, will be the lead agency in the pursuit of State and Federal funding sources. Implementation of this objective is immediate and ongoing.

Activity Four: Encourage owners of vacant parcels in the Fox River floodplain to donate their property to the County for inclusion in the Flood Mitigation Program. The Kenosha County Housing Authority, with staff support from the Southeastern Wisconsin Regional Planning Commission, will be the lead agency responsible for this activity.

Objective Two
Ensure that all property acquired in the Fox River floodplain is setaside as permanent open space.

Activity Five: File deed restrictions on all land parcels purchased as a part of the Fox River Flood Mitigation Program. All deed restrictions will include the following language:

> *Kenosha County accepts this conveyance and, by causing its duly authorized representative to sign this instrument on its behalf, agrees to hold the herein described real property subject to the terms of the Stafford Act, regulations promulgated thereunder (44 CFR 206.434), as they read now and may be amended in the future, and the Grant Agreement, which documents and regulations include, among other provisions, the following conditions and restrictions:*
>
> 1. *Kenosha County agrees that the real property shall be used only for the purposes compatible with open space, recreational, or wetlands management practices per State and local floodplain management ordinances;*
> 2. *Kenosha County agrees that no new structures or improvements shall be erected on the real property other than a restroom or a public facility that is open on all sides and functionally related to the open space use;*
> 3. *Kenosha County acknowledges that no future disaster assistance from any federal source for any purpose related to the real property may be sought nor will such assistance be provided;*
> 4. *Kenosha County agrees that it shall convey the real property, or any interest therein, only to another public entity and only with prior approval from Wisconsin Emergency Management and the Regional Director of the Federal Emergency Management Agency ("FEMA") or any successor political subdivision. Such conveyance shall be made expressly subject to the above-referenced conditions and restrictions, which shall run with the real property in perpetuity.*

The Kenosha County Housing Authority, with staff support from the Southeastern Wisconsin Regional Planning Commission, will be the lead agency in the implementation of this activity. Implementation is immediate and ongoing.

Objective Three
Maintain stringent zoning regulations that prohibit the expansion of existing and the development of new residential and commercial structures in 100-year recurrence interval floodplains.

Activity Six: The Kenosha County Department of Planning and Development employs full time staff in the enforcement of the Kenosha County Shoreland and Floodplain Zoning Ordinance and the issuance of building permits. This ordinance prohibits new development in 100-year recurrence interval floodplain areas, severely limits modifications to existing structures, and prohibits the replacement of structures that are

destroyed. Implementation is immediate and enforcement is ongoing.

Activity Seven: The Village of Silver Lake employs full time staff in the enforcement of its general floodplain zoning ordinance and the issuance of building permits. This ordinance restricts new development in 100-year recurrence interval floodplain areas and limits modifications to existing structures. Implementation is immediate and enforcement is ongoing.

Objective Four
Maintain an inventory of structures at risk of flooding.

Activity Eight: The inventory of structures located in the 100-year recurrence interval floodplain of the Fox River as shown in Table 1 of this plan will be maintained on an annual basis. As the County acquires and removes structures, the inventory will be updated. In addition, the database that is used to provide computerized maps of the Fox River floodplain will be updated as the inventory changes. The Kenosha County Housing Authority, with staff support from the Southeastern Wisconsin Regional Planning Commission and the Kenosha County Department of Planning and Development, shall be responsible for the annual maintenance of this inventory. Implementation is immediate and ongoing.

Activity Nine: The inventory of structures located in the floodplains of low-priority streams and lakes as shown in Appendix 6 of this plan will be refined to determine if the primary structures situated on these parcels are located within the boundaries of a 100-year recurrence interval floodplain. Once this inventory is updated, it will be maintained and reprioritized, based upon future development and flooding conditions. The Kenosha County Housing Authority, with staff support from the Southeastern Wisconsin Regional Planning Commission and the Kenosha County Department of Planning and Development, shall be responsible for the annual maintenance of this inventory. The inventory will be refined prior to June 1, 2002. Implementation of the remaining portion of this activity is immediate and ongoing.

Objective Five
Disseminate information related to floodprone properties.

Activity Ten: Provide information about local zoning regulations and building permit requirements to local residents upon request. Particular attention shall focus on the Fox River floodplain, as this area contains the highest concentration of residential structures (approximately 39 percent of all structures within floodplains in the County). The Kenosha County Department of Planning and Development shall be responsible for the dissemination of this information. Information will be provided at the Department's office located at 19600-75th Street, Bristol, Wisconsin on a walk-in basis. Implementation is immediate and ongoing.

Activity Eleven: Educate residents about the County's flood warning system, and rescue and relief capabilities. The Kenosha County Division of Emergency Management shall be responsible for the implementation of this activity. On an ongoing basis, the Division will make information available to residents regarding area flooding, availability of temporary shelter during flooding events, and other information pertaining to flooding or disaster relief. Implementation is immediate and ongoing.

Activity Twelve: Educate property owners about the importance of flood insurance. The unincorporated areas of Kenosha County and the Village of Silver Lake participate in the National Flood Insurance Program. The Kenosha County Department of Planning and Development assists property owners and potential buyers in determining whether property is located in a floodplain and encourages people to purchase flood insurance. In addition, the Kenosha County Housing Authority regularly counsels homeowners and prospective owners about the importance of flood insurance. These activities are ongoing, and provided on an as-needed basis.

Activity Thirteen: Establish a system to warn potential homebuyers of the area's flooding history and likelihood of future flooding, including the installation of signs identifying the location of the Fox River floodplain and warning citizens of the flood hazard. The Towns of Salem and Wheatland and the Village of Silver Lake will be encouraged to install these informational signs, at their discretion, as soon as possible. This activity will be implemented over the next two-year period.

Activity Fourteen: The Kenosha County Housing Authority will work with area real estate brokers to educate them regarding proper conduct and ethical practices attendant to the disclosure of the area's flood history. The Kenosha County Housing Authority will continue to provide information to area real estate brokers on flood hazards. Implementation is immediate and ongoing.

Program Evaluation

It is recommended that, at a minimum, the following evaluations of the program be conducted by the Kenosha County Housing Authority annually:

1. The overall goal and objectives of the flood mitigation plan should be evaluated relative to their appropriateness for guiding the program during a five-year time period.

2. The degree to which the program activities have led to the accomplishment of the specific flood mitigation objectives should be evaluated. In addition, the problems encountered in the implementation of specific flood mitigation strategies should be identified and this information utilized to refine the flood mitigation activities.

3. The Housing Authority should hold periodic public information meetings to explain the results of the evaluation process and identify the proposed program activities for the forthcoming year. The Housing Authority should invite the general public to the informational meeting, as well as representatives of organizations and agencies interested in flood hazard mitigation, to comment on the program activities that have been implemented over the past year and receive information on activities that have been identified for the forthcoming year. The Housing Authority should consider comments received at the public informational meeting and, when appropriate, alter program activities based upon the public comments received.

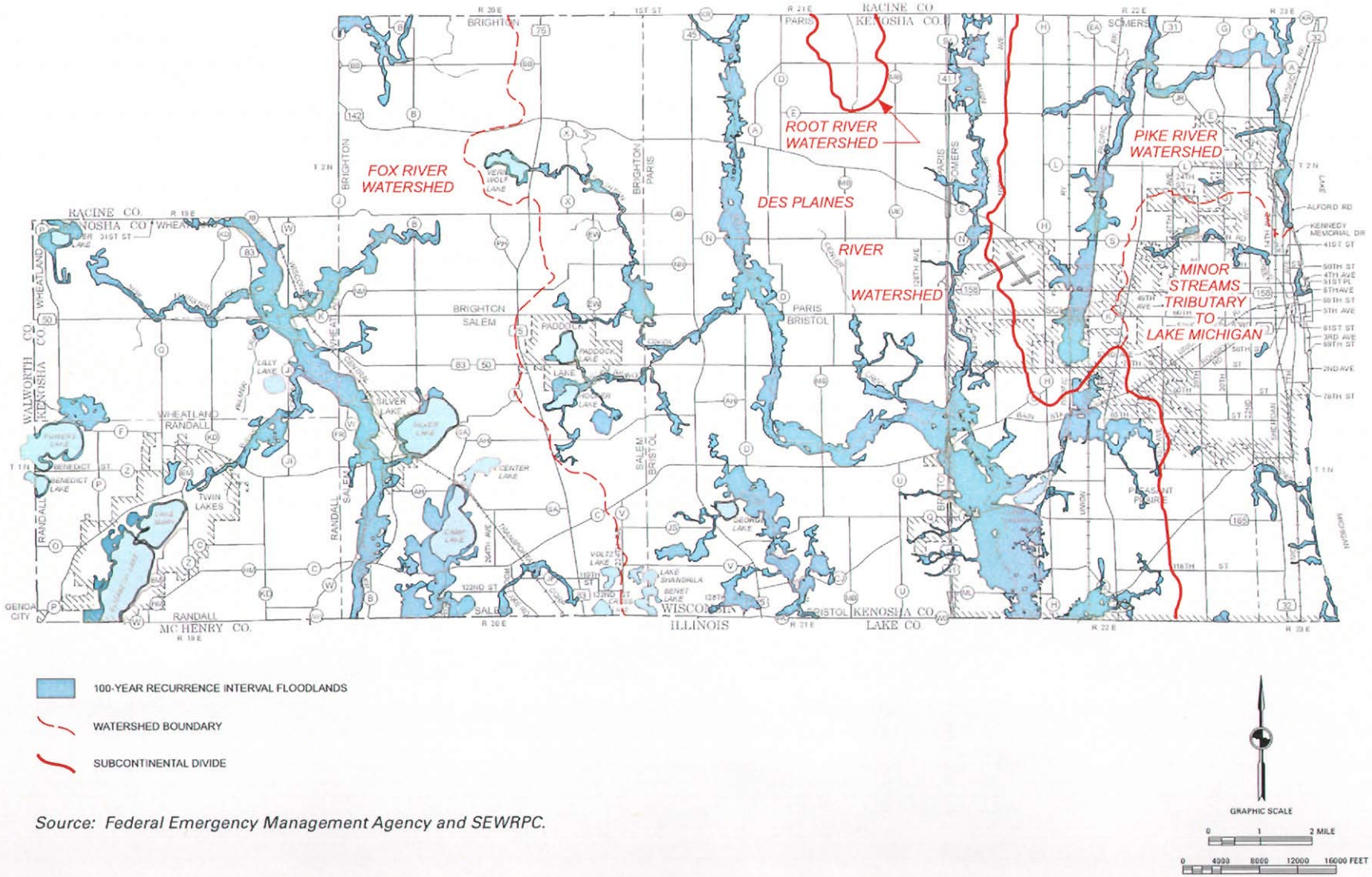
Following a disaster or emergency, Kenosha County will review and update this flood mitigation plan to reflect the status of its current mitigation efforts; to expand the plan as necessary; and to address new issues, recommendations, and activities based on the current disaster. In addition to reviewing and updating this Plan, the County will continue to implement the recommendations as identified in the Plan.

APPENDICES

(This page intentionally left blank)

Appendix 1

SURFACE WATER RESOURCES AND WATERSHED BOUNDARIES OF KENOSHA COUNTY



Source: Federal Emergency Management Agency and SEWRPC.

(This page intentionally left blank)

Appendix 2

Minutes of Public Hearings

(This page intentionally left blank)

MEETING MINUTES

Kenosha County Public Hearing
Wheatland Town Hall
34315 Geneva Road
December 16, 1997, 7:00 p.m.

Vice Chairman Hollister called the public hearing to order at 7:05 p.m. Vice Chairman Hollister welcomed all present, and introduced Gloria Bailey and Mark Starzyk of the Kenosha County Housing Authority and Garry Werra and John Meland of the Southeastern Wisconsin Regional Planning Commission (SEWRPC).

Mr. Werra provided an update regarding the status of the Wisconsin Small Cities Community Development Block Grant application, which was submitted by the County on October 13, 1997. If funded, the grant would be used to acquire and relocate households from the Fox River Floodplain and to assist renters with down payment and closing costs in order to purchase a home. Mr. Werra stated that $400,000 was requested for acquisition and relocation, and $32,000 was requested for the homeownership program. Grant awards will be announced by the Wisconsin Department of Administration in early March of 1998, with the likelihood of Kenosha County receiving funding being approximately one in three.

Mr. Werra provided a summary of the previous acquisition and relocation program administered by Kenosha County from 1994 to 1997. Mr. Werra stated that through the Wisconsin Disaster Recovery Assistance Program, the County was able to acquire and relocate 10 households from the Fox River Floodplain in the Towns of Wheatland and Salem, and the Village of Silver Lake. These 10 owners had voluntarily participated in the buyout program. In addition, during the administration of this program, the County acquired 2 additional properties through tax deed proceedings (for a total of 12 households). All properties were demolished using Federal Emergency Management Agency monies, and returned to a natural state. Mr. Werra advised the public that no further development will be allowed on these County-owned floodplain properties.

Mr. Werra said that Kenosha County has received funding from the Federal Emergency Management Agency (FEMA) to help pay for costs attendant to the preparation of a Flood Mitigation Plan (FMA). The FMA plan is being prepared by the Kenosha County Housing Authority, with staff assistance from the Southeastern Wisconsin Regional Planning Commission. Mr. Werra said that the County must have a FEMA approved mitigation plan on file in order to be eligible to receive future acquisition and relocation monies. The preparation of a FMA plan is the County's first step in becoming eligible for any future money that FEMA will make available for flood mitigation activities, such as buyouts. Mr. Werra also stated that preliminary discussions with County staff have indicated that the plan should focus on the "points" in the Towns of Wheatland

and Salem and the Village of Silver Lake. Mr. Werra said that these areas are the hardest hit by flooding and also pose the greatest threat to the health and safety of the residents.

Mr. Werra stated that the County has identified two goals, one being the reduction of flood damage and the protection of the public health, safety, and welfare of the residents who live in the 100-year floodplain of the Fox River.

Mr. Werra stated that the following objectives to achieve this goal are being considered: 1) Continue to actively pursue State and Federal funding for a voluntary program to acquire and remove dwellings in the Fox River Floodplain; 2) Place all acquired property in permanent open space through the filing of deed restrictions; 3) Maintain stringent zoning regulations which prohibit future development of the floodplain; and 4) Develop and maintain an inventory of structures at risk of flooding.

Mr. Werra stated that the County has also identified a second goal of disseminating information related to floodprone properties. He also stated that the following objectives to achieve this goal are being considered: 1) Educate property owners about zoning regulations that are intended to reduce risks to life and property in floodplain areas; 2) Educate residents about the County's flood warning system, and rescue and relief capabilities; and 3) Educate property owners about the importance of flood insurance. Mr. Werra asked for citizen comments on these two planning goals and their corresponding objectives, as well as citizen recommendations for additional goals and objectives.

Lawrence Loeffler stated that fallen trees in the river are restricting the flow of water. He asked why the Army Corps of Engineers, or the Wisconsin Department of Natural Resources (WDNR) do not do anything to improve the flow of the river such as controlling locks and dams upstream and removing debris, such as fallen trees. He feels that improving the flow of the river should be added as a goal in the County's FMA plan.

Chris Gustafson asked whether the County has considered forming a water resource maintenance organization to oversee activities along the Fox River. Ms. Gustafson also asked whether there would be changes to the County's zoning and floodplain ordinances as a result of this plan. Mr. Werra responded that there are no plans to change the zoning or floodplain ordinances.

Mr. Loeffler stated that the County places restrictions on residents in the floodplain, but is doing nothing to solve the flooding problem. Mr. Werra advised him that these restrictions are a local zoning issue that neither the KCHA or SEWRPC have any control over.

Nancy Jackson stated that her property value continues to drop so that the County can acquire her property for a lower price. Mrs. Jackson also stated that people should be prevented from buying homes in the floodplain and that potential buyers should be educated about the area's flooding.

Mr. Loeffler asked why the County is not purchasing homes that are for sale so that they can purchase them at a lower cost. John Meland responded that the County currently has no money available to buy any homes. Mr. Werra added that State Relocation Law would apply whether a purchase was negotiated by the County or if the home was already on the market.

Mrs. Jackson stated that she is next on the list to be bought out and requested that staff verify this. Mr. Meland responded that no decision has been made about how properties will be prioritized and purchased should the County receive future buyout funds.

Mr. Loeffler stated that County staff should travel the river to see how the flow is restricted by debris.

Mr. Werra summarized the suggested goals and objectives that were discussed so far. A third goal to improve the flow of the river was suggested. This goal could be achieved by removing debris that restricts the river's flow, controlling upstream factors, and reducing development. An additional objective related to the goal of disseminating information related to floodprone properties was suggested. It was suggested that a system to warn potential buyers of the flooding history and potential in the area be implemented. In addition, the plan should include the identification of areas where the flow of the river is regularly restricted due to ice floes and debris.

Mark Starzyk suggested that flood information could be added to the warranty deeds of homes in the floodplain.

Ms. Gustafson asked whether it was possible to amend the ordinances so that when a property is sold flood information would be added to the warranty deed.

Mr. Loeffler asked why the Department of Natural Resources and Army Corps of Engineers do not hold monthly meetings anymore and whether they could have another meeting to explain the flooding in the area and inform residents about flood control measures. Mr. Meland said that staff would investigate and attempt to bring those agencies together for a future public hearing.

Vice Chairman Hollister acknowledged that the flooding problem is bound to worsen due to increased development in the County.

Ms. Gustafson requested information regarding eligibility requirements for the Community Development Block Grant program.

Mr. Loeffler asked who was responsible for initiating the previous buyout program and why it became available. Mr. Meland responded that SEWRPC had recommended the removal of properties from the floodplain as early as 1970. The buyout was initiated based on this recommendation and the availability of acquisition and relocation monies made available as a result of the County's 1993 disaster declaration.

Mr. Loeffler stated that the new bridge at Highway C was much more narrow than the previous bridge, and that it significantly restricts the flow of the river. He suggested that another objective be that new bridges should be built so that they are wider than the ones they replace.

Vice Chairman Hollister adjourned the public hearing at 8:00 p.m.

Citizens Present:

Chris Gustafson	24001 - 119th Street, Salem	(414) 862-2874
Erwin Pagels	7013 - 316th Avenue, Salem	(414) 537-4787
Lawrence Loeffler	32142 - 77th Street, Wheatland	(414) 537-2582
Dennis and Nancy Jackson	31628 - 76th Street, Wheatland	(414) 537-3474

Minutes Prepared by Garry M. Werra

c:\data\kenosha\fema\fmaplan\ph121697

MEETING MINUTES

Kenosha County Public Hearing
Wheatland Town Hall
34315 Geneva Road
July 9, 1999, 3:00 p.m.

The public hearing was called to order at 3:00 p.m. by Earl Hollister, Kenosha County Housing Authority Chairman.

Werra provided a summary of the 1998 Community Development Block Grant (CDBG) award and the program accomplishments to date.

Werra stated that the primary component of the 1998 CDBG program was the acquisition, relocation, and demolition of four homes located in the 100-year recurrence interval floodplain of the Fox River. Werra reported that, through the current CDBG program, the County has acquired four owner-occupied low- and moderate- income properties and had sufficient funding leftover to acquire a fifth (vacant) property. The acquisition of a fifth property exceeds the contract goals established for this program component. Werra further advised that the acquisition program is completely voluntary and that a total of 17 properties have been acquired since the buyout program started in 1994.

Werra stated that the second component of the CDBG program is the implementation of a Homestead Opportunity program that assists low- and moderate- income renters in becoming homeowners. Werra advised that program participants work with local banks to obtain conventional financing, and the County provides assistance with the down payment and closing costs by providing a 0%, deferred payment loan. Werra reported that the County must make three additional Homestead loans in order to meet the requirements of the 1998 CDBG grant contract.

Werra provided a summary of the State of Wisconsin CDBG Program. The State receives approximately $30 million per year, which is divided between the Department of Commerce ($20 million) and the Division of Housing ($10 million). The Division of Housing sets aside $2 million of its allocation each year to provide an emergency assistance program, such as the one being proposed by Kenosha County.

Werra summarized the three eligible uses of CDBG funding statewide: 1. Economic Development, CDBG monies can be used for ED purposes such as business retention and expansion, and addressing workforce issues. The Kenosha Area Business Alliance is the agency responsible for these efforts and obtaining ED CDBG monies; 2. Public Facilities: CDBG, monies can be used to help municipalities with infrastructure improvements. CDBG monies are requested by individual communities who determine their own needs; and 3. Housing: CDBG monies may also be used for housing. The Kenosha County Housing Authority is the agency responsible for meeting the housing needs in the County.

Werra provided a presentation of identified housing and community development needs 1. the need for affordable loans to LMI persons to rehabilitate their homes. Since 1981 KCHA has operated RLF program, made over 400 loans, with $2.5 million in CDBG monies; 2. the need for additional senior rental housing outside of the City of Kenosha. The KCHA has conducted a market feasibility study for senior housing in Kenosha County Wisconsin and is encouraging private developers to build new units throughout the County. The Housing Authority is currently working with a developer to create 37 units of senior housing in Paddock Lake; 3. the need to acquire houses and relocate residents from the Fox River Floodplain. To date, Kenosha County and the Housing Authority have purchased 15 homes with CDBG monies and returned the sites to open space. In addition two floodplain properties were acquired by tax deed and subsequently demolished through the CDBG program; 4. in addition, the KCHA has completed a FEMA Flood Mitigation Plan for the Fox River Floodplain, which is currently being reviewed in its final draft form. Werra advised that an opportunity would be provided to received citizen input into the preparation of the Flood Mitigation Plan

Werra provided a presentation of activities proposed for CDBG application, including the potential for residential displacement. Werra stated that the Proposed CDBG-EAP application for Kenosha County has two components.

The first component of the program is the acquisition, relocation and demolition of five owner occupied properties (approximately $455,000). Only properties damaged by the June, 1999 flooding in Wheatland, Salem, and Silver Lake will be eligible. Household income must be below 100 percent of County Median Income as established by HUD (handout provided). Must be year-round occupied (owner or renter) and no seasonal properties will be eligible. Program participation will be completely voluntary. Kenosha County and the Housing Authority will not exercise their power of eminent domain. Relocation assistance will be provided for participants (moving, legal, differential costs). The average cost per household is estimated to be approximately $90,000 (acquisition $50,000, relocation $30,000, demolition ($10,000).

The second component of the program is program administration (approximately $45,000). The Kenosha County Housing Authority, with the contracted services of the Southeastern Wisconsin regional Planning Commission, has been designated as the administrative agency for this program by Kenosha County and would also be responsible for the CDBG-EAP award. Werra advised that the application would be submitted to the State on July 13th and that a response is expected within 30 days.

Werra advised that the County will also apply for two grants from the Federal Emergency Management Agency (FEMA) to supplement any CDBG assistance that is received. Werra advised that applications would be submitted to the FEMA Hazard Mitigation Grant Program ($800,000) and to the Flood Mitigation Grant Program ($125,000).

Werra invited the public to present its identified housing and community development needs, to provide input into the proposed CDBG application, to discuss the proposed FEMA applications, and to provide input into the County's Flood Mitigation Assistance Plan.

Judy Beaver stated that she did not believe that the county should recommend that installation of signs as part of the Flood Mitigation Plan because it would prevent her from selling her home. She further stated that it is not the government's responsibility to warn buyers of these hazards, because the disclosure law does.

Werra responded that the disclosure law only requires that a buyer be told the property is located in a floodplain. He further stated that many sellers are not being completely honest and some have even claimed that their property doesn't ever flood, when in fact it floods every year.

Judy Beaver replied that it's the buyer's responsibility to research an area before they buy and further stated that "buyer should beware".

Elizabeth Weyer stated that she had tried to sell her property, but an insurance agent talked the buyer out of the deal. She also stated that mortgage companies should not make loans for homes that are located in the floodway. She also said that realtors should not take people to see properties in the floodway.

Earl Hollister stated that as more development occurs in the County and elsewhere, the flooding will continue to get worse.

Elizabeth Weyer stated that the flooding has gotten worse in Silver Lake, because people that live on 6th Street are flooding now when they never had before.

Robert Janicki inquired about the status of the list.

Werra responded that all references to a list should be disregarded. The County maintains an inventory of properties that are located in the floodplain, however this inventory is not ranked. The properties can not be ranked because the County utilizes many different programs to buy properties and each program has different criteria.

Robert Janicki stated that he received a letter that indicated his property was ranked No. 10.

Werra replied that the ranking he received was only applicable for the program in place at the time, and that the letter explained this in detail. Werra clarified that each program has its own application process and that application received for each program are ranked. When the program expires, so does the ranking of unfunded properties.

Robert Janicki stated that there is nothing different about the proposed program and that he should retain his status. He further stated that the letter from Werra did not explain this and left the hearing in order to retrieve the letter. (Janicki later returned with the letter and Werra showed him the paragraph that addresses the application and ranking process.)

Werra responded that in fact the proposed program requires property damage, whereas the previous program did not, the proposed program has different income limits, and is tied directly to the June 1999 flooding.

A citizen inquired whether or not signs would be installed. Werra responded that the installation of informational signs is a recommendation in the County's Flood Mitigation Plan and is a part of a County effort to increase education about the floodplain. Werra further stated that there is no requirement to install signs and that it would be up to the municipalities to install them if they wish. Werra stated that the most common complaint received by the County about the floodplain is that a buyer was lied to, or deceived about the area's flooding. Werra further stated that the suggestion to install signs originated by citizens living in the floodplain at a public hearing such as this one.

A citizen stated that you can't protect everyone from everything and questioned whether the County would be putting up signs to warn about loud neighbors and leaking roofs.

Judy Beaver stated that she believed that putting up signs to warn people not to buy floodplain properties was discriminatory.

Werra replied that the intent is not to prevent people from buying the homes period, but to prevent them from buying the homes unwittingly because a realtor or seller deceived them. By placing signs in the area, an unsuspecting buyer is directed to County staff who can provide factual account of flooding in the area, as well as additional information about County zoning and development restrictions.

Shirley Boening, Salem Town Clerk stated that she feels that installing signs is a good precautionary measure, however, since the issue has become controversial she will be raising the issue for consideration at the next Town Board meeting.

Jim Trones stated that the person that sold him his house told him that the house rarely flooded and that when it did it was minor, not even enough to cover the driveway. In fact the house is located in some of the deepest water and the strongest currents. The flooding was so bad in June that the property was only accessible by boat for over a week.

Werra stated that this is a prime example of why signs are being recommended.

The meeting was adjourned at 4:15 p.m. by Werra.

Citizens Present:

Gregory and Bobby Freiheit	32034-77th Street	(414) 537-3148
Robert Janicki	6921-319th Street	(414) 537-4672
Dale E. Larson	32132-77th Street	(414) 537-2363
Lawrence Loeffler	32142-77th Street	(414) 537-2582
Brian and Abbe Gustavus	32015-77th Street	(414) 537-2949
Russell and Allison Nelson	31823-77th Street	(414) 537-3640
Jane and Frank Wilson	6929-319th Avenue	(414) 537-4027
Kelly Ludwig	31214-77th Street	(414) 537-2336
Elizabeth Weyer	617 South Riverside	(414) 889-8434
Steve Jurzyk	31638-76th Street	(414) 537-4996
Shirley Boening	Salem Clerk	(414) 843-2540
George Vujovic	Salem DPW	(414) 862-6012
James Trones	31519-77th Street	(414) 878-2770
Judy Beaver	30521-79th Place	(414) 537-4269
Don Smitz	Town of Wheatland	(414) 537-4340

Minutes prepared by Garry M. Werra

#2487v1

(This page intentionally left blank)

Appendix 3

Fox River Flood Mitigation Program: Acquisition Register

ID No.	Address	Tax Parcel Nos.	Date Acquired	Cost		
				Acquisition/ Relocation	Demolition	Total
Kenosha County						
FLO05	32139-77th Street	95-4-119-122-0185	07/21/95	83,847.27	8,200.00	92,047.27
FLO01	32129-77th Street	95-4-119-122-0190	07/21/95	75,409.25	7,400.00	82,809.25
FLO38	437 S. Riverside Dr.	75-4-120-181-3160	07/21/95	72,966.80	9,542.00	82,508.80
FLO09	601 S. Riverside Dr.	75-4-120-183-1020	07/31/95	76,672.97	7,515.00	84,187.97
FLO32	8106 Shorewood Dr.	65-4-120-073-0135	07/31/95	79,932.91	6,839.00	86,771.91
FLO16	31524-76th Street	95-4-119-121-0420	09/15/95	72,541.58	6,520.00	79,061.58
FLO02	31217-77th Street	95-4-119-121-0955/0245	02/05/96	79,380.11	7,777.00	87,157.11
FLO07	32041-77th Street	95-4-119-122-0220	02/16/96	75,226.80	6,666.00	81,892.80
FLO27	32104-77th Street	95-4-119-122-0140/0145	11/08/96	119,910.22	10,050.00	129,960.22
FLO08	32028-77th Street	95-4-119-122-0120	04/11/97	81,512.18	10,200.00	91,712.18
98.01	31628-76th Street	95-4-119-121-0450/0455/0460	12/01/98	94,486.45	5,215.18	99,701.63
98.02	32029-77th Street	95-4-119-122-0230	12/29/98	69,543.60	3,143.05	72,686.65
98.03	32018-77th Street	95-4-119-122-0115	12/30/98	80,536.25	4,143.65	84,679.90
98.04	31710-77th Street	95-4-119-121-0481	01/29/99	95,028.90	8,983.00	104,011.90
98.05	32143-77th Street	95-4-119-122-0180	03/12/99	37,392.52	5,895.00	43,287.52
98.V5	31917-77th Street	95-4-119-121-0600/0605	01/28/00	17,263.10	5,800.00	23,063.10
TD.1	419 S. Riverside Dr.	75-4-120-181-3151	10/25/96	610.00	4,873.00	5,483.00
TD.2	31915-69th Place	95-4-119-014-1070	10/25/96	360.00	4,873.00	5,233.00
99.01	32034-77th Street	95-4-119-122-0125/0130/0135	12/22/99	92,856.63	6,200.00	99,056.63
99.03	31823-77th Street	95-4-119-121-0625/0630	12/15/99	80,831.00	5,800.00	86,631.00
99.04	8153 Shorewood Dr.	65-4-120-073-0310	07/03/00	81,409.11	6,800.00	88,209.11
99.05	31422-76th Street	95-4-119-121-0400	12/15/99	80,663.00	6,525.00	87,188.00
99.06	32132-77th Street	95-4-119-122-0165	12/29/99	59,759.31	6,875.00	66,634.31
99.07	6929-319th Avenue	95-4-119-014-0955	06/26/00	70,489.91	4,650.00	75,139.91
99.10	31638-76th Street	95-4-119-121-0465/0470/0475	07/03/00	122,661.84	4,900.00	127,561.84
99.12	441 S. Riverside Dr.	75-4-120-181-3165	06/22/00	95,290.83	5,138.00	100,428.83
99.14	31811-71st Street	95-4-119-014-1125	06/26/00	67,927.52	4,035.00	71,962.52
99.15	31519-77th Street	95-4-119-121-0765	06/27/00	78,952.35	1,636.00	80,588.35
99.17	31805-71st Street	95-4-119-014-1130	06/23/00	151,881.25	3,888.00	155,769.25
99.18	6712 Wheatland Rd.	95-4-119-013-0410/0415/0420	12/21/00	84,074.81	9,944.00	94,018.81
Town of Wheatland						
99.02	32015-77th Street	95-4-119-122-0245	12/21/99	95,921.20	6,000.00	101,921.20
99.08	31214-77th Street	95-4-119-121-0240/0960	09/08/00	51,506.59	6,100.00	57,606.59
99.09	6921-319th Avenue	95-4-119-014-0950/1075/1080	06/22/00	76,617.46	6,800.00	83,417.46
99.19	31705-71st Street	95-4-119-014-1150	01/17/01	71,074.66	4,995.00	76,069.66
99.20	6905-319th Avenue	95-4-119-014-0935/0940	12/13/00	98,042.99	6,444.00	104,486.99
Total				2,672,581.37	220,364.88	2,892,946.25

Source: SEWRPC.

28-Sep-01

#44055v1

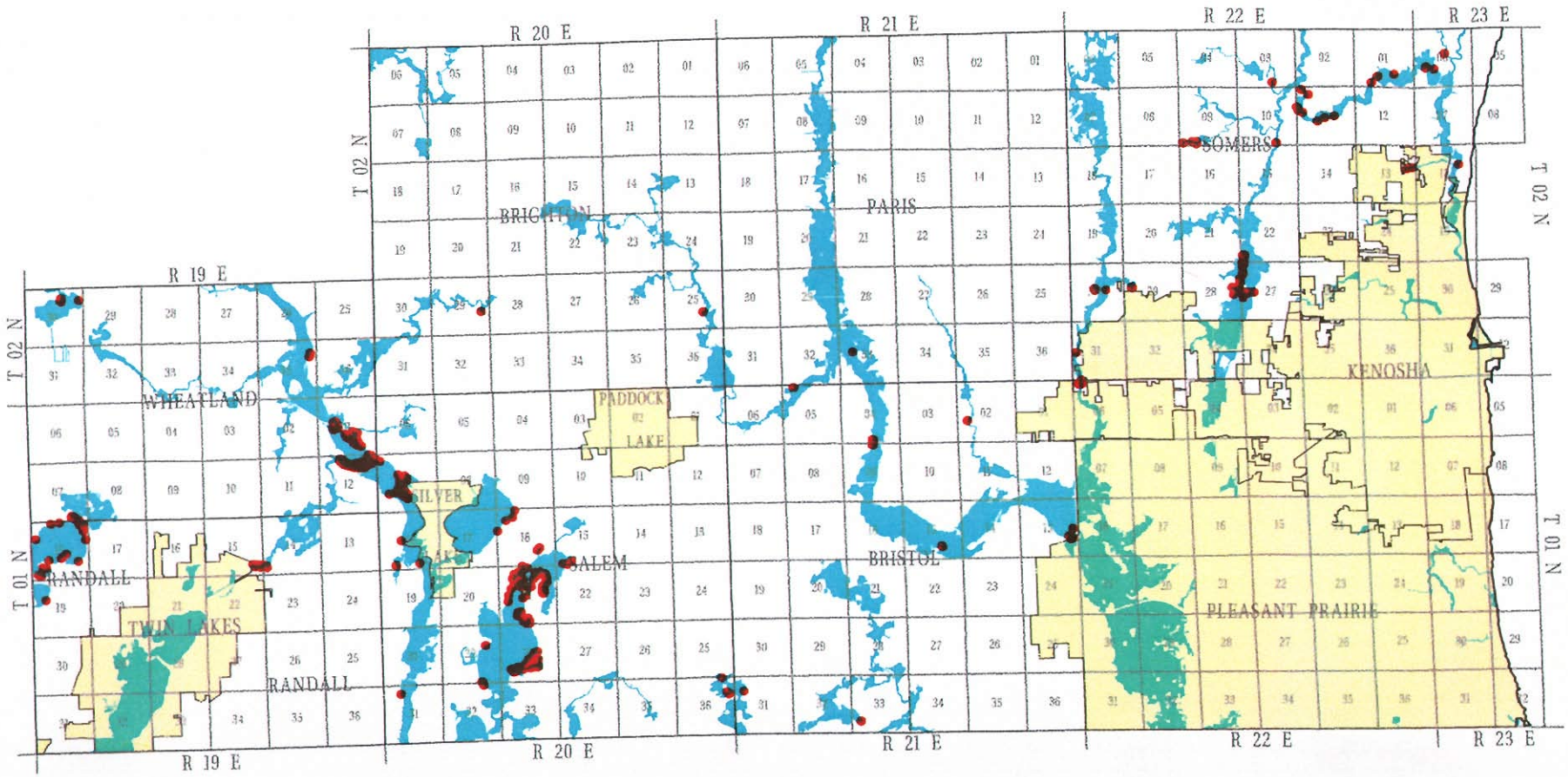
(This page intentionally left blank)

Appendix 4

Maps Identifying Floodplain Structures

(This page intentionally left blank)

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN KENOSHA COUNTY



100-Year Floodplain

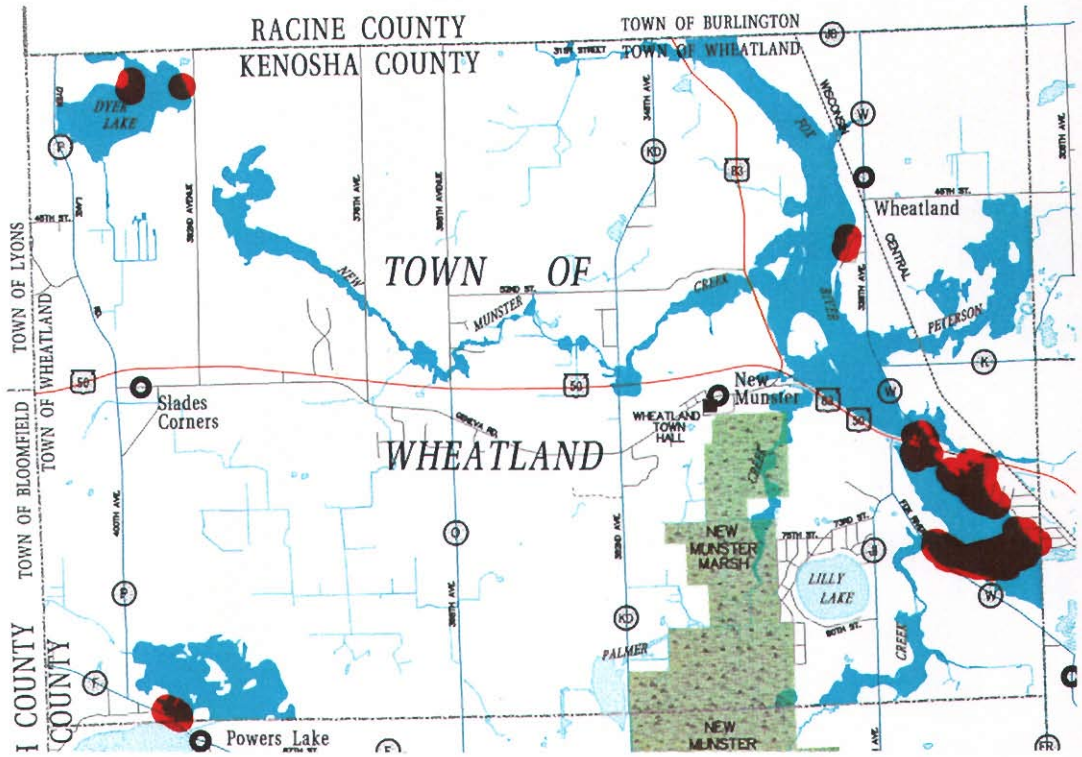
Incorporated Areas

Structure in the 100-Year Floodplain

N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION · PLANNING · DEVELOPMENT

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF WHEATLAND



1 INCH = 6000 FEET

100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

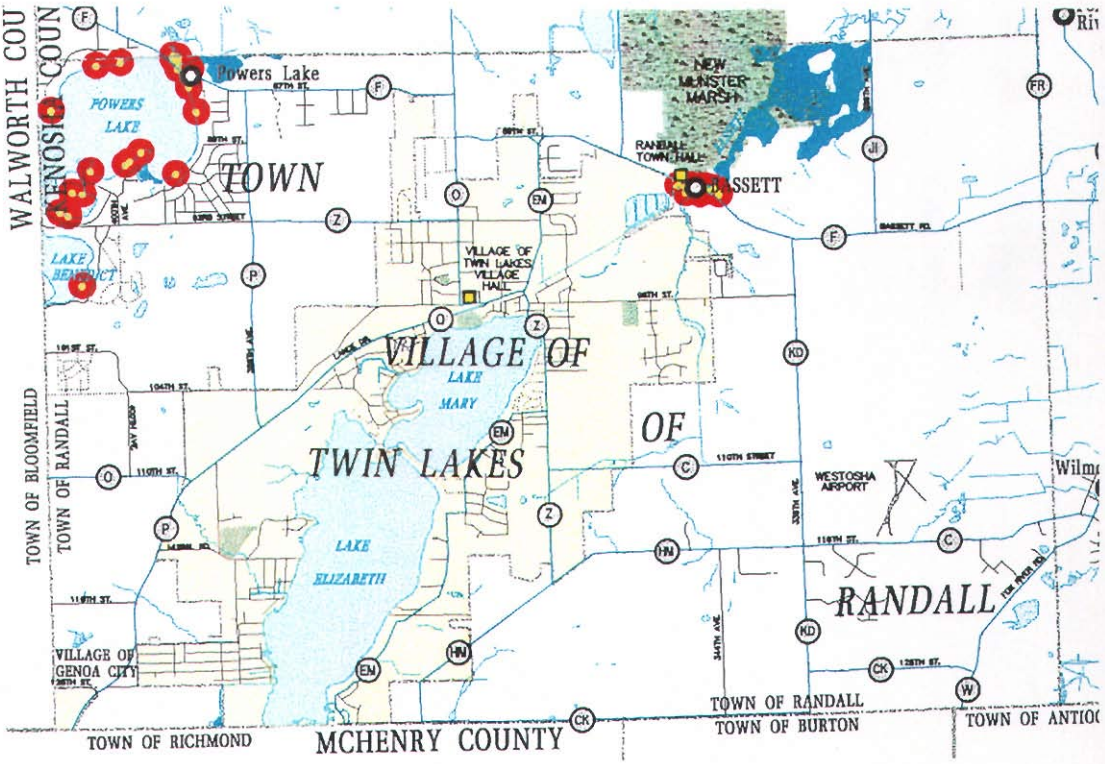
N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION · PLANNING · DEVELOPMENT

MAY 2001

file:/flood/ZF17/t.whtfld

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF RANDALL



1 INCH = 6000 FEET

100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

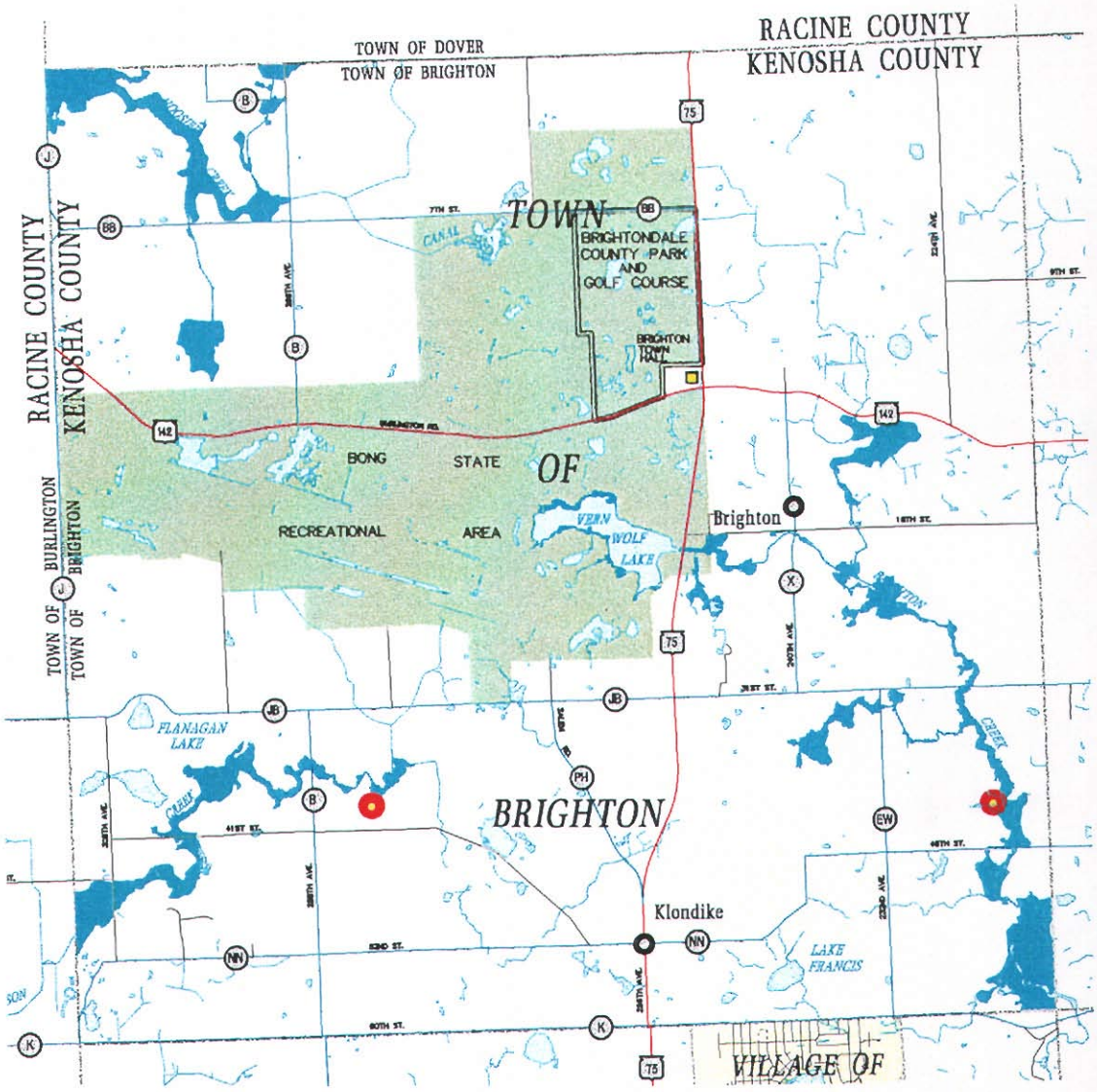
N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION • PLANNING • DEVELOPMENT

MAY 2001

file:/flood/ZF17/t.ranfld

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF BRIGHTON



1 INCH = 6000 FEET

100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

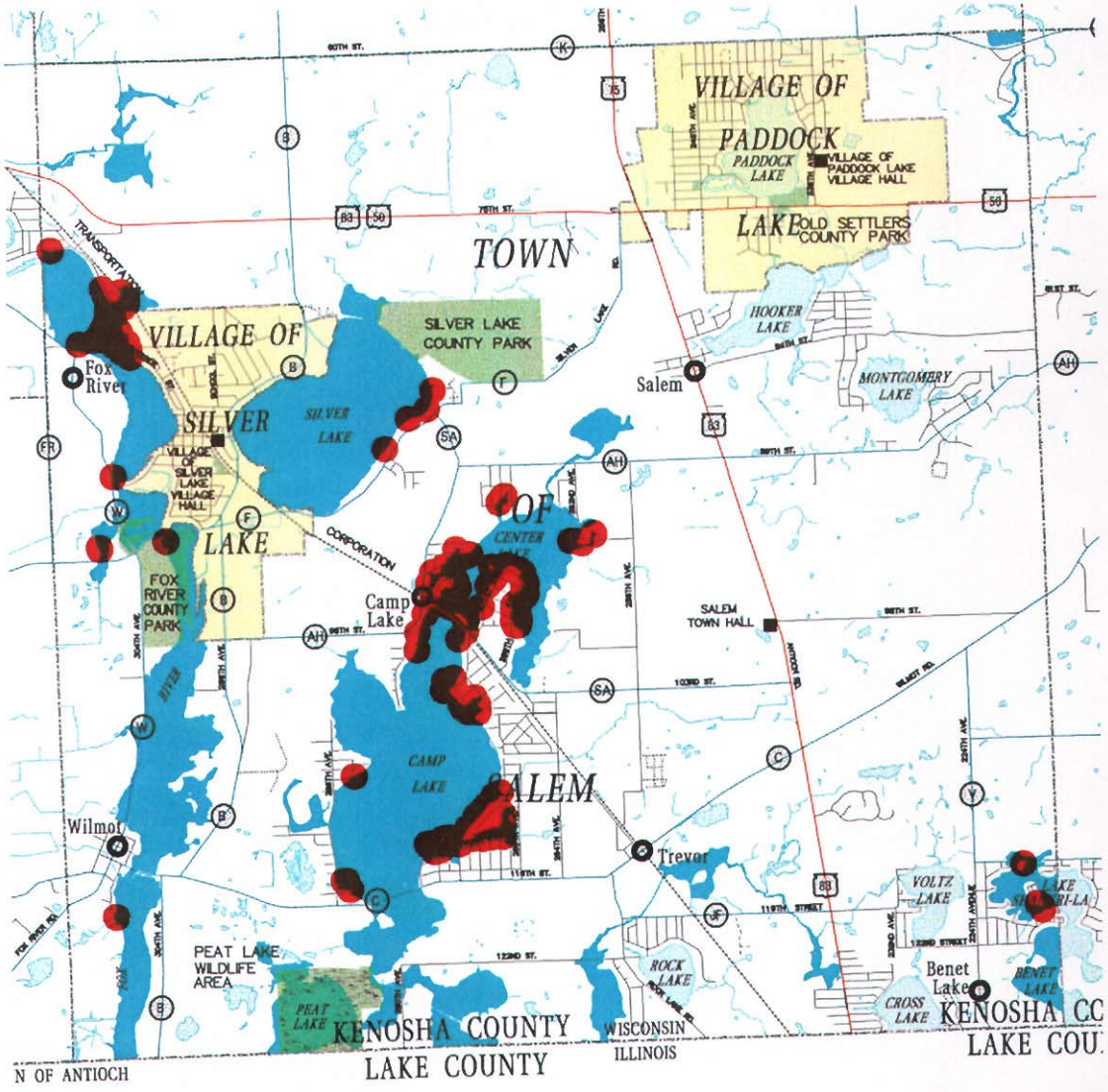
N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION · PLANNING · DEVELOPMENT

MAY 2001

file:/flood/ZF17/t.brtfld

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF SALEM



1 INCH = 6000 FEET

100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

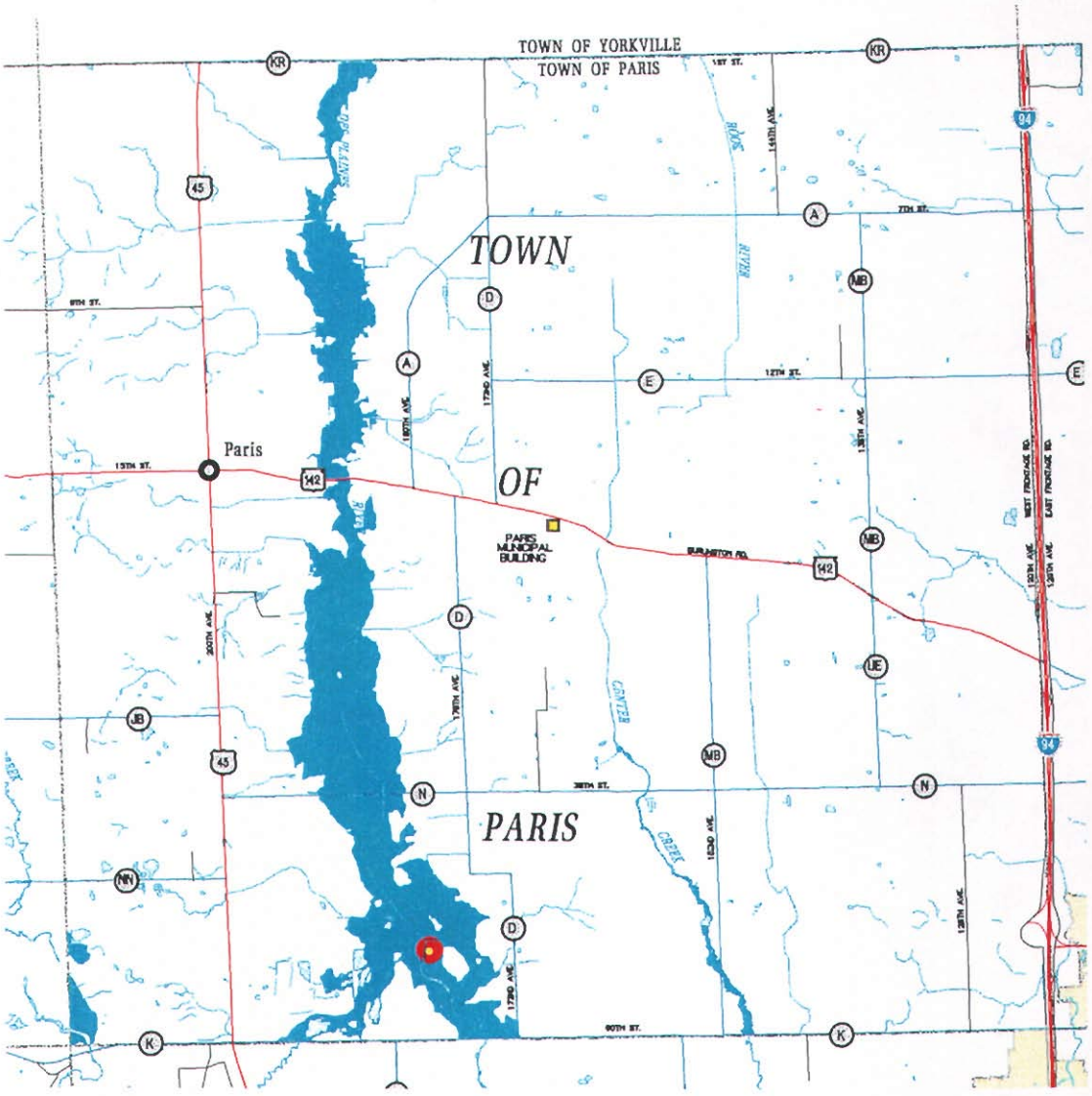
N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION · PLANNING · DEVELOPMENT

MAY 2001

file:/flood/ZF17/t.salfld-

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF PARIS



1 INCH = 6000 FEET

100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

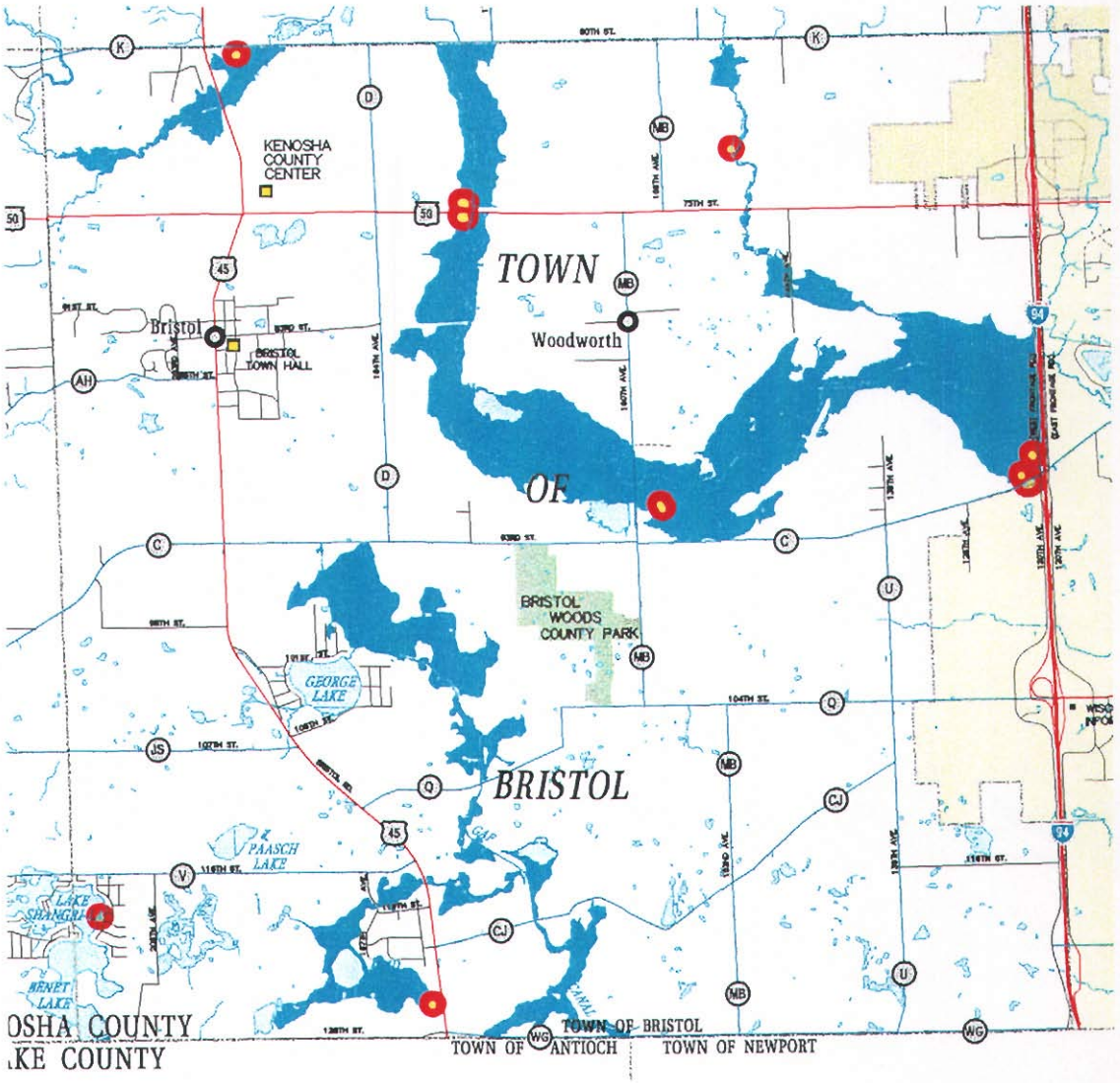
N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION · PLANNING · DEVELOPMENT

MAY 2001

file:/flood/ZF17/t.parfld

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF BRISTOL



1 INCH = 6000 FEET

100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

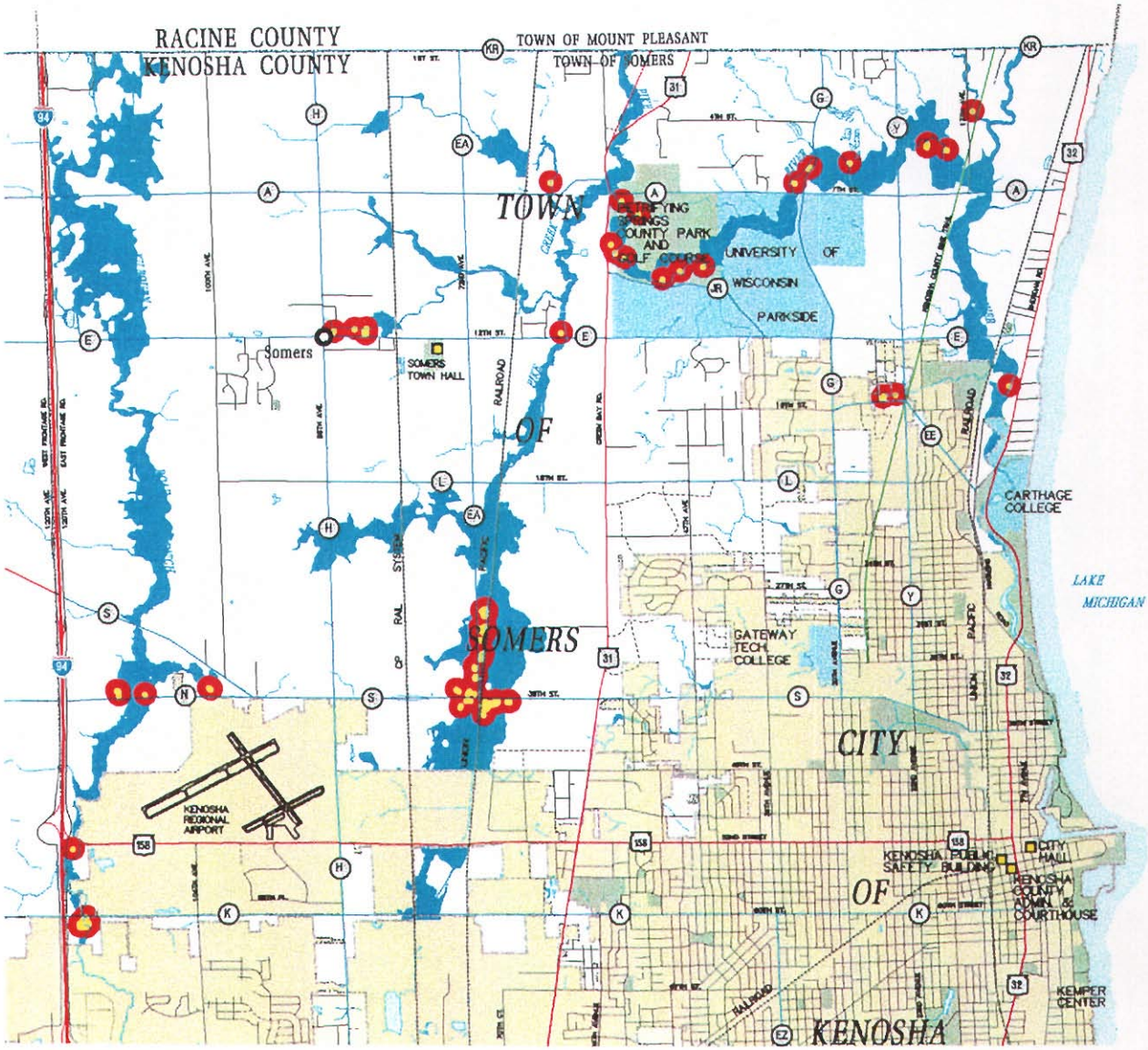
N

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
CONSERVATION · PLANNING · DEVELOPMENT

MAY 2001

file:/flood/ZF17/t.bstfld

STRUCTURES IN THE 100-YEAR FLOODPLAIN IN THE TOWN OF SOMERS



100-Year Floodplain

Incorporated Areas

Structure in the 100-Year Floodplain

N

1 INCH = 6000 FEET

KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
MAY 2001

CONSERVATION · PLANNING · DEVELOPMENT

file:/flood/ZF17/t.somfld

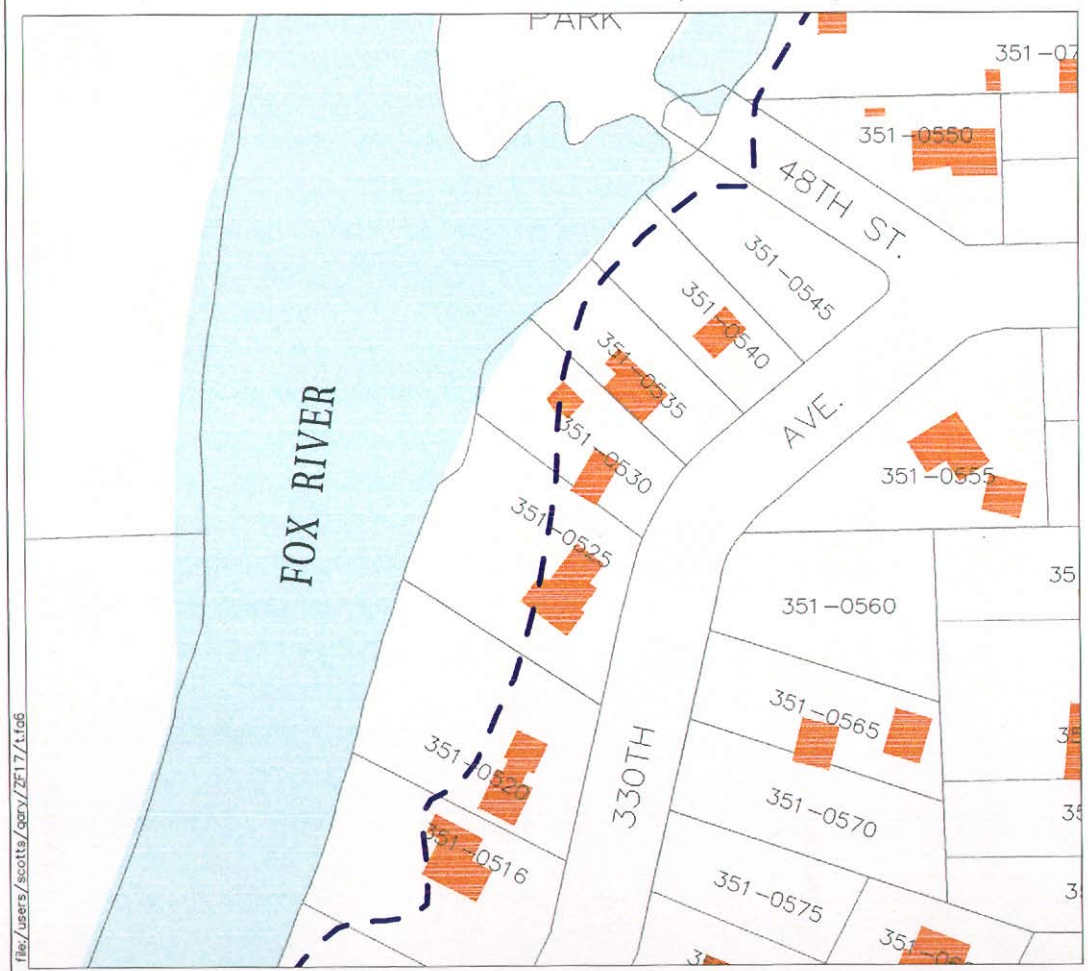
Appendix 5

Fox River Floodplain Parcel Maps

(This page intentionally left blank)

FOX RIVER FLOODPLAIN, KENOSHA COUNTY, WISCONSIN

T 2 N, R 19 E, SECTION 35



COUNTY OWNED PARCEL

EXISTING STRUCTURE

--- 100-YEAR FLOODPLAIN BOUNDARY

PREPARED BY
KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
IN COOPERATION WITH THE
KENOSHA COUNTY HOUSING AUTHORITY
AND THE
SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION

file:/users/scotts/gary/ZF17/t.fg6

FOX RIVER FLOODPLAIN, KENOSHA COUNTY, WISCONSIN

T 01 N, R 19 E, SECTION 01

COUNTY OWNED PARCEL

EXISTING STRUCTURE

100-YEAR FLOODPLAIN BOUNDARY

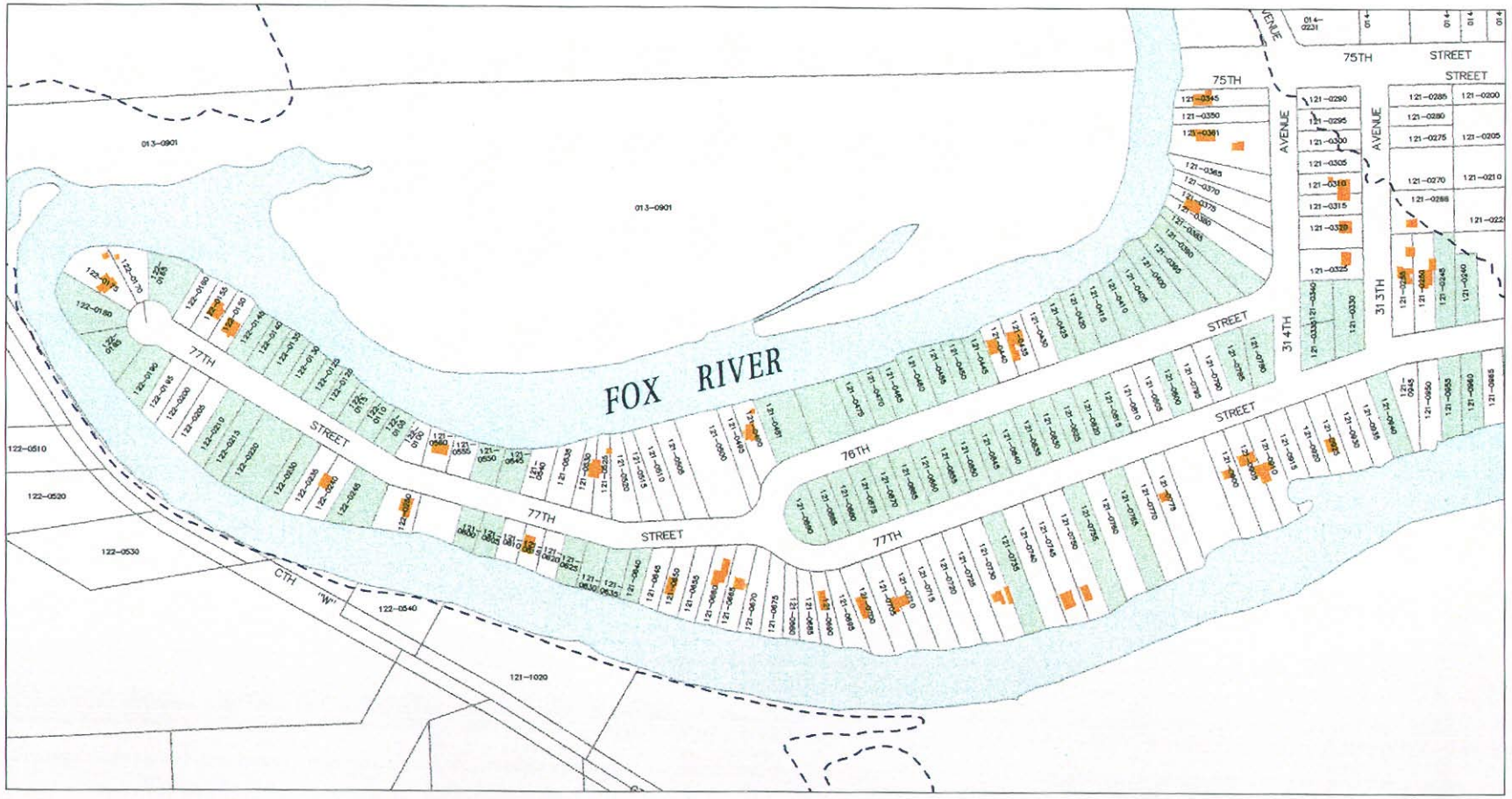
N

PREPARED BY
KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
IN COOPERATION WITH THE
KENOSHA COUNTY HOUSING AUTHORITY
AND THE
SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION

file:/users/scotts/flood/ZF17/f.fa2

FOX RIVER FLOODPLAIN, KENOSHA COUNTY, WISCONSIN

T 01 N, R 19 E, SECTION 12



COUNTY OWNED PARCEL

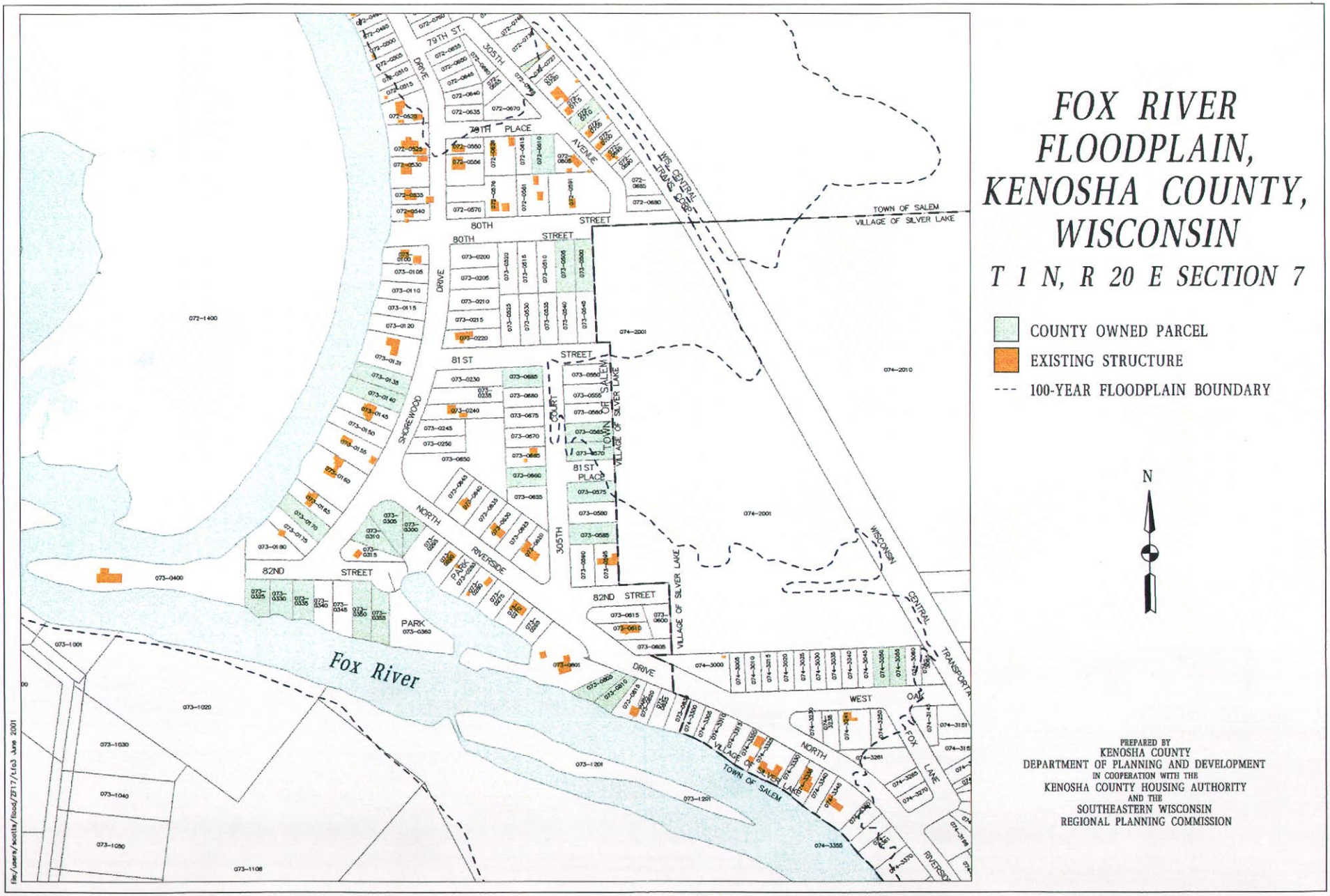
EXISTING STRUCTURE

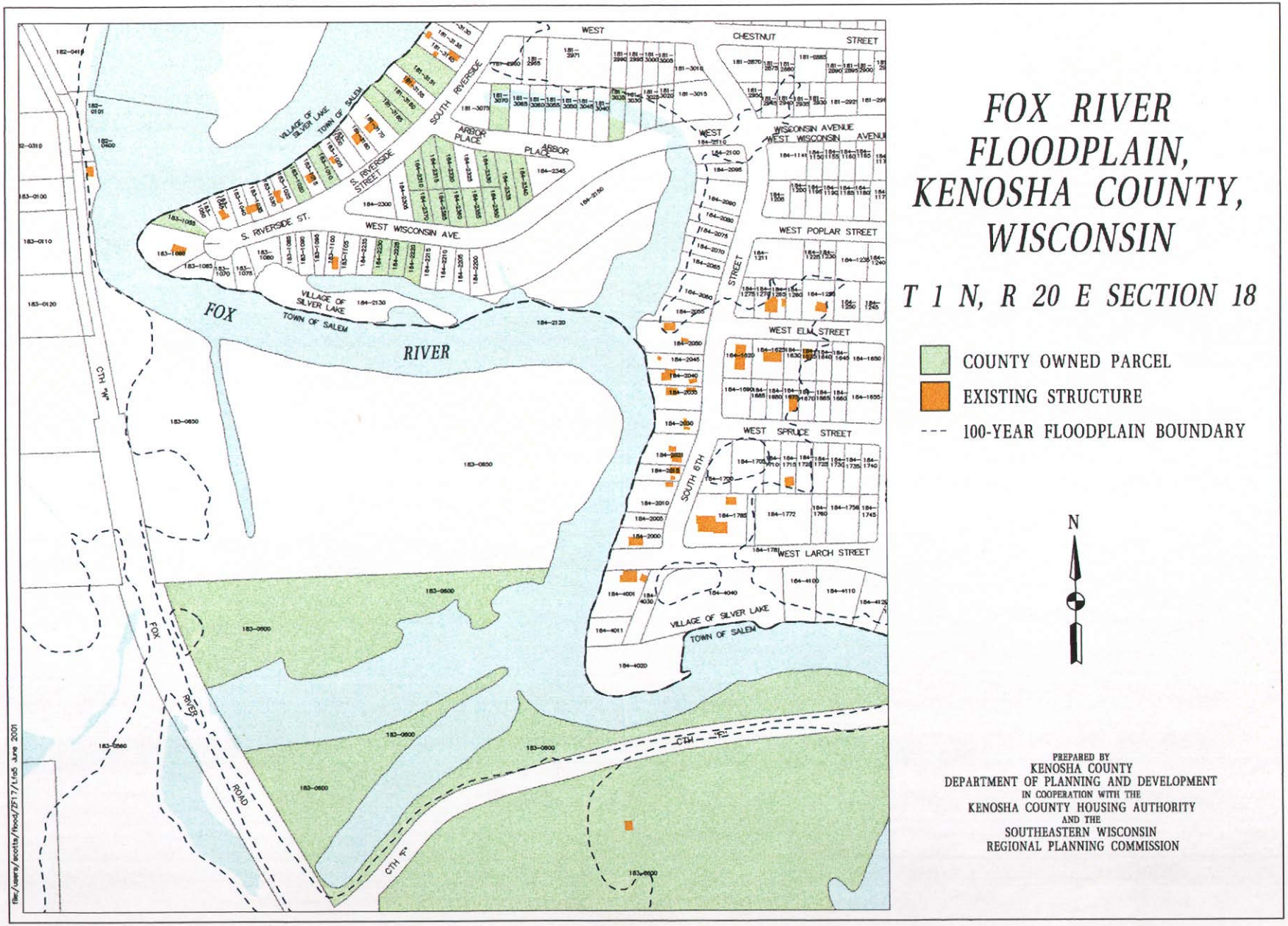
--- 100-YEAR FLOODPLAIN BOUNDARY

N

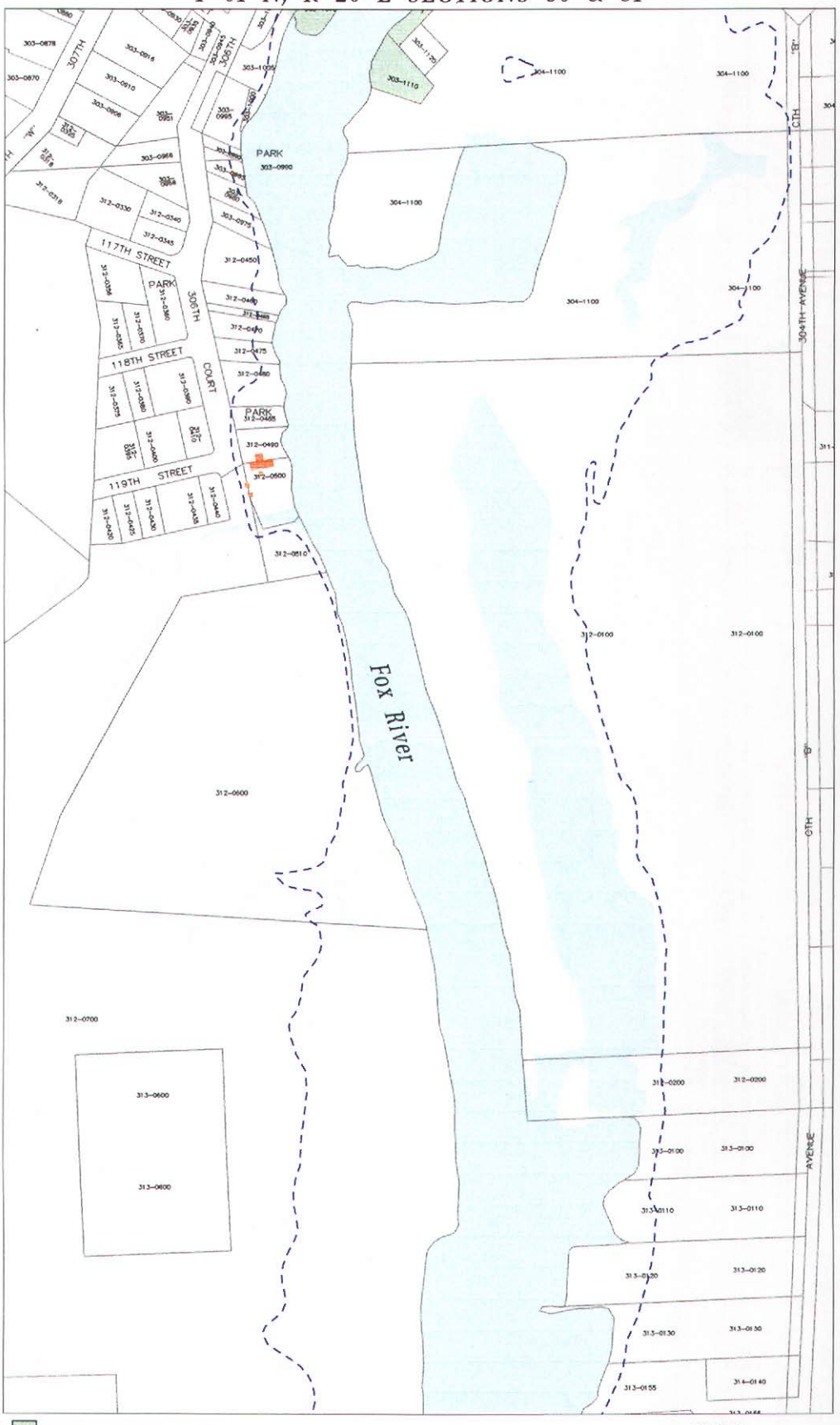
PREPARED BY
KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
IN COOPERATION WITH
KENOSHA COUNTY HOUSING AUTHORITY
AND THE
SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION

file:/users/scotts/flood/2f17/1fol June 2001


FOX RIVER FLOODPLAIN, KENOSHA COUNTY, WISCONSIN
T 1 N, R 20 E SECTION 7
COUNTY OWNED PARCEL
EXISTING STRUCTURE
100-YEAR FLOODPLAIN BOUNDARY
N
Fox River
79TH ST.
79TH PLACE
80TH STREET
81ST STREET
81ST PLACE
82ND STREET
305TH AVENUE
SHOREWOOD DRIVE
NORTH RIVERSIDE PARK
PARK
WEST OAK DRIVE
FOX LANE
VILLAGE OF SILVER LAKE
TOWN OF SALEM
VILLAGE OF SILVER LAKE
TOWN OF SALEM
WISCONSIN CENTRAL TRANSPORTATION CORP.
PREPARED BY
KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
IN COOPERATION WITH THE
KENOSHA COUNTY HOUSING AUTHORITY
AND THE
SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION


FOX RIVER FLOODPLAIN, KENOSHA COUNTY, WISCONSIN
T 1 N, R 20 E SECTION 18
COUNTY OWNED PARCEL
EXISTING STRUCTURE
100-YEAR FLOODPLAIN BOUNDARY
N
PREPARED BY
KENOSHA COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
IN COOPERATION WITH THE
KENOSHA COUNTY HOUSING AUTHORITY
AND THE
SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION
FOX RIVER
SOUTH RIVERSIDE
S. RIVERSIDE ST.
WEST WISCONSIN AVE.
WISCONSIN AVENUE
WEST POPLAR STREET
WEST ELM STREET
WEST SPRUCE STREET
WEST LARCH STREET
CHESTNUT STREET
SOUTH 6TH STREET
ARBOR PLACE
VILLAGE OF SILVER LAKE
TOWN OF SALEM
CTH "W"
CTH "E"
FOX RIVER ROAD
file:/users/scotts/flood/ZF17/Ltr5 June 2001

FOX RIVER FLOODPLAIN, KENOSHA COUNTY, WISCONSIN
T 01 N, R 20 E SECTIONS 30 & 31



Appendix 6

Kenosha County Floodplain Inventory: Low Priority Floodplains

Parcel No.	Property Address	Type of Structure	Estimated Fair Market Value
Town 1 North, Range 19 East, Section 7-- Wheatland			
95-4-119-074-0430	39614 Bloomfield Road	Residential	$ 60,764
95-4-119-074-0440	39600 Bloomfield Road	Commercial	$ 232,202
95-4-119-074-0450	39534 Bloomfield Road	Residential	$ 62,999
95-4-119-074-0460	39520 Bloomfield Road	Residential	$ 107,694
95-4-119-074-0471	39500 Bloomfield Road	Residential	$ 230,180
Town 1 North, Range 19 East, Section 14 -- Randall			
60-4-119-143-0102	34204 Bassett Road	Residential	$ 189,590
60-4-119-143-0275	34406 Bassett Road	Residential	$ 83,235
60-4-119-143-0300	34318 Bassett Road	Residential	$ 130,659
60-4-119-143-0350	34306 Bassett Road	Residential	$ 110,012
Town 1 North, Range 19 East, Section 15 -- Randall			
60-4-119-154-0480	34410 Bassett Road	Commercial	$ 144,532
60-4-119-154-0510	34431 Bassett Road		$ 137,004
60-4-119-154-0520	34437 Bassett Road	Residential	$ 94,956
60-4-119-154-0550	34439 Bassett Road	Manufacturing	$ 112,485
60-4-119-154-0570	34505 Bassett Road	Residential	$ 113,776
Town 1 North, Range 19 East, Section 18 -- Randall			
60-4-119-181-0138	Bloomfield Road	Residential	$ 80,976
60-4-119-181-0140	39320 Bloomfield Road	Residential	$ 73,234
60-4-119-181-0310	39905 85th Street	Residential	$ 294,978
60-4-119-181-0461	39440 Bloomfield Road	Residential	$ 162,598
60-4-119-181-0470	39434 Bloomfield Road	Residential	$ 315,518
60-4-119-181-0480	39428 Bloomfield Road	Residential	$ 176,148
60-4-119-181-0490	39422 Bloomfield Road	Residential	$ 186,257
60-4-119-181-0500	39416 Bloomfield Road	Residential	$ 152,274
60-4-119-181-0520	39412 Bloomfield Road	Residential	$ 124,422
60-4-119-181-0540	39403 Bloomfield Road	Residential	$ 152,705
60-4-119-181-0850	8800 392nd Avenue	Residential	$ 316,916
60-4-119-182-0170	40219 85th Street	Residential	$ 316,055
60-4-119-182-0470	8837 406th Avenue	Residential	$ 360,039
60-4-119-183-0185	9021 403rd Avenue	Residential	$ 612,969
60-4-119-183-0310	40501 91st Street	Residential	$ 248,844
60-4-119-183-0340	40311 91st Street	Residential	$ 379,503
60-4-119-183-0490	40516 92nd Street	Residential	$ 328,530
60-4-119-183-0510	40612 92nd Street	Residential	$ 317,884
60-4-119-184-0190	9056 Lake park	Residential	$ 272,502
60-4-119-184-1690	9004 400th Court	Residential	$ 806,753
60-4-119-184-1705	9016 400th Court	Residential	$ 349,392
60-4-119-184-1715	9028 400th Court	Residential	$ 500,054
Town 1 North, Range 19 East, Section 19 -- Randall			
65-4-119-192-1365	9624 402nd Avenue	Residential	$ 413,163
Town 1 North, Range 20 East, Section 15 -- Salem			
65-4-120-153-0210	9246 259th Avenue	Residential	$ 85,389
65-4-120-153-0610	26033 93rd Street	Residential	$ 101,762
65-4-120-153-0650	26211 93rd Street	Residential	$ 72,021

Appendix 6 (continued)

Kenosha County Floodplain Inventory: Low Priority Floodplains

Parcel No.	Property Address	Type of Structure	Estimated Fair Market Value
65-4-120-153-0670	26221 93rd Street	Residential	$ 73,264
65-4-120-153-0680	26229 93rd Street	Residential	$ 185,699
Town 1 North, Range 20 East, Section 16 -- Salem			
65-4-120-162-0140	27328 Silver Lake Road	Residential	$ 164,560
65-4-120-162-0211	27704 Silver Lake Road	Residential	$ 286,943
65-4-120-162-0340	27914 Silver Lake Road	Residential	$ 287,668
65-4-120-164-0355	9035 269th Avenue	Residential	$ 127,979
65-4-120-164-0500	26908 91st Street	Residential	$ 73,575
Town 1 North, Range 20 East, Section 21 -- Salem			
66-4-120-211-0185	26817 98th Street	Residential	$ 79,896
66-4-120-211-0190	26813 98th Street	Residential	$ 77,513
66-4-120-211-0200	26804 98th Street	Residential	$ 60,000
66-4-120-211-0210	26824 98th Street	Residential	$ 86,321
66-4-120-211-0220	9739 269th Avenue	Residential	$ 118,860
66-4-120-211-0230	9727 269th Avenue	Residential	$ 68,705
66-4-120-211-0235	9729 269th Avenue	Residential	$ 58,135
66-4-120-211-0245	9719 269th Avenue	Residential	$ 73,472
66-4-120-211-0250	26821 97th Street	Residential	$ 143,523
66-4-120-211-0256	26806 97th Street	Residential	$ 179,067
66-4-120-211-0266	26814 97th Street	Residential	$ 94,508
66-4-120-211-0281	26805 96th Place	Residential	$ 121,244
66-4-120-211-0285	26800 96th Place	Residential	$ 63,109
66-4-120-211-0300	26819 96th Street	Residential	$ 75,855
66-4-120-211-0316	26814 96th Street	Residential	$ 108,912
66-4-120-211-0320	9500 269th Avenue	Residential	$ 132,435
66-4-120-211-0345	27044 95th Place	Residential	$ 136,580
66-4-120-211-0350	27038 95th Place	Residential	$ 128,912
66-4-120-211-0360	27024 95th Place	Residential	$ 122,798
66-4-120-211-0365	27020 95th Place	Residential	$ 91,399
66-4-120-211-0390	26908 95th Place	Residential	$ 134,611
66-4-120-211-0400	26900 95th Place	Residential	$ 189,534
66-4-120-211-0990	9744 271st Avenue	Residential	$ 132,435
66-4-120-211-1040	9640 271st Avenue	Residential	$ 140,311
66-4-120-211-1045	9634 271st Avenue	Residential	$ 105,181
66-4-120-211-1060	9610 271st Avneue	Residential	$ 145,078
66-4-120-211-1070	9516 271st Avenue	Residential	$ 213,575
66-4-120-211-1075	9508 271st Avenue	Residential	$ 231,192
66-4-120-211-1080	9500 271st Avenue	Residential	$ 272,124
66-4-120-212-0181	27400 94th Street	Residential	$ 151,917
66-4-120-212-0420	27611 95th Street	Residential	$ 73,472
66-4-120-212-0425	27601 95th Street	Residential	$ 90,674
66-4-120-212-0450	27519 95th Street	Residential	$ 82,798
66-4-120-212-0500	27317 95th Street	Residential	$ 109,119
66-4-120-212-0505	27611 95th Street	Residential	$ 98,342
66-4-120-212-0510	27301 95th Street	Residential	$ 241,865
66-4-120-212-0515	27215 95th Street	Residential	$ 89,223
66-4-120-212-0525	28011 94th Street	Residential	$ 93,782
66-4-120-212-0646	9620 274th Avenue	Residential	$ 136,269
66-4-120-212-0670	9508 274th Avenue	Residential	$ 86,425
66-4-120-212-0695	9511 273rd Avneue	Residential	$ 112,435
66-4-120-212-0705	9523 273rd Avenue	Residential	$ 105,285
66-4-120-212-0710	9527 274th Avenue	Residential	$ 105,596

Appendix 6 (continued)

Kenosha County Floodplain Inventory: Low Priority Floodplains

Parcel No.	Property Address	Type of Structure	Estimated Fair Market Value
66-4-120-212-0715	9533 273rd Avenue	Residential	$ 66,218
66-4-120-212-0720	9537 273rd Avenue	Residential	$ 89,430
66-4-120-212-0730	9609 273rd Avenue	Residential	$ 156,373
66-4-120-212-0760	27315 96th Street	Residential	$ 100,725
66-4-120-212-0795	27332 97th Street	Residential	$ 90,466
66-4-120-212-0805	27316 97th Street	Residential	$ 122,694
66-4-120-212-0820	27339 97th Street	Residential	$ 113,368
66-4-120-212-0825	27331 97th Street	Residential	$ 86,321
66-4-120-212-0835	27319 97th Street	Residential	$ 87,668
66-4-120-212-0900	27366 Camp Lake Road	Residential	$ 60,207
66-4-120-212-0911	27356 Camp Lake Road	Residential	$ 101,865
66-4-120-212-0935	27330 Camp Lake Road	Residential	$ 110,984
66-4-120-212-0940	27318 Camp Lake Road	Residential	$ 115,648
66-4-120-212-0945	27312 Camp Lake Road	Residential	$ 61,036
66-4-120-212-0955	27304 Camp Lake Road	Residential	$ 124,456
66-4-120-212-0980	27250 Camp Lake Road	Residential	$ 220,725
66-4-120-212-0985	27246 Camp Lake Road	Residential	$ 104,456
66-4-120-212-0990	27240 Camp Lake Road	Residential	$ 97,927
66-4-120-212-0995	27206 Camp Lake Road	Residential	$ 156,788
66-4-120-212-1350	9607 Camp Lake Road	Residential	$ 167,047
66-4-120-212-1360	9535 Camp Lake Road	Residential	$ 71,813
66-4-120-212-1650	9731 276th Avneue	Residential	$ 140,518
66-4-120-212-1671	9709 276th Avneue	Commercial	$ 52,021
66-4-120-213-0101	27703 98th Street	Residential	$ 124,974
66-4-120-213-0130	278th Avenue	Residential	$ 216,062
66-4-120-214-0160	Camp Lake Road	Agricultural	$ 26,218
66-4-120-214-1145	27209 101st Street	Residential	$ 166,632
66-4-120-214-1150	27215 101st Street	Residential	$ 122,176
66-4-120-214-1155	27225 101st Street	Residential	$ 135,130
66-4-120-214-1160	27231 101st Street	Residential	$ 133,057
66-4-120-214-1170	27228 101st Street	Residential	$ 124,145
66-4-120-214-1175	27222 101st Street	Residential	$ 124,145
66-4-120-214-1180	27214 101st Street	Residential	$ 137,617
66-4-120-214-1185	27206 101st Street	Residential	$ 131,917
66-4-120-214-1190	10048 272nd Avenue	Residential	$ 124,870
66-4-120-214-1195	10040 272nd Avenue	Residential	$ 144,974
66-4-120-214-1311	9900 272nd Avneue	Residential	$ 368,705
66-4-120-214-1330	9824 272nd Avenue	Residential	$ 92,539
66-4-120-214-1745	10046 270th Avneue	Residential	$ 96,580
66-4-120-214-1755	10028 270th Avenue	Residential	$ 131,606
66-4-120-214-1760	10024 270th Avenue	Residential	$ 59,378
66-4-120-214-1905	26966 103rd Place	Residential	$ 78,549
66-4-120-214-1910	26974 103rd Place	Residential	$ 83,005
Town 1 North, Range 20 East, Section 28 -- Salem			
66-4-120-281-1406	10926 269th Avenue	Residential	$ 143,212
66-4-120-283-0470	27611 113th Street	Residential	$ 63,523
66-4-120-283-0475	27605 113th Street	Residential	$ 65,078
66-4-120-283-0570	27328 113th Street	Residential	$ 75,959
66-4-120-283-0580	27414 113th Street	Residential	$ 98,031
66-4-120-283-0595	27502 113th Street	Residential	$ 99,896
66-4-120-283-0600	27510 113th Street	Residential	$ 95,233
66-4-120-283-0605	27518 113th Street	Residential	$ 112,746
66-4-120-283-0610	27254 113th Street	Residential	$ 90,466
66-4-120-283-0615	27602 113th Street	Residential	$ 143,627

Appendix 6 (continued)

Kenosha County Floodplain Inventory: Low Priority Floodplains

Parcel No.	Property Address	Type of Structure	Estimated Fair Market Value
66-4-120-283-0625	27606 113th Street	Residential	$ 74,611
66-4-120-283-0630	27614 113th Street	Residential	$ 86,943
66-4-120-283-0635	27624 113th Street	Commercial	$ 120,000
66-4-120-283-0695	11315 276th Avenue	Residential	$ 80,829
66-4-120-283-0700	27531 113th Street	Residential	$ 73,472
66-4-120-283-1200	27223 112th Street	Residential	$ 82,902
66-4-120-283-1205	27217 112th Street	Residential	$ 94,301
66-4-120-283-1210	27211 112th Street	Residential	$ 120,829
66-4-120-283-1320	11176 270th Avenue	Residential	$ 186,736
66-4-120-284-0725	27024 113th Street	Residential	$ 91,192
66-4-120-284-0740	27002 113th Street		$ 25,078
66-4-120-284-0800	27124 113th Street	Residential	$ 69,430
66-4-120-284-0905	27113 112th Street	Residential	$ 96,788
66-4-120-284-1105	26925 112th Street	Residential	$ 78,549
66-4-120-284-1125	11159 269th Avenue	Residential	$ 89,741
66-4-120-284-1130	11155 269th Avenue	Residential	$ 132,746
66-4-120-284-1135	11145 269th Avenue	Residential	$ 118,446
66-4-120-284-1300	11010 269th Avenue	Residential	$ 140,207
66-4-120-284-1310	11014 269th Avenue	Residential	$ 106,943
66-4-120-284-1330	11106 270th Avenue	Residential	$ 127,254
66-4-120-284-1340	11116 270th Avenue	Residential	$ 135,130
66-4-120-284-1360	11134 270th Avenue	Residential	$ 141,762
66-4-120-284-1365	11138 270th Avenue	Residential	$ 73,472
66-4-120-284-1370	11142 270th Avenue	Residential	$ 155,233
Town 1 North, Range 20 East, Section 29 -- Salem			
66-4-120-294-1730	28504 116th Street		$ 76,373
Town 1 North, Range 20 East, Section 32 -- Salem			
67-4-120-321-1051	28426 117th Street	Residential	$ 83,316
Town 1 North, Range 20 East, Section 36 -- Salem			
67-4-120-361-0200	11853 218th Avenue	Residential	$ 202,694
67-4-120-361-0320	21929 116th Street	Residential	$ 153,161
67-4-120-361-1815	21730 121st Street	Residential	$ 218,135
Town 1 North, Range 21 East, Section 4 -- Bristol			
35-4-121-044-0200	15000 75th Street	Residential	$ 96,397
Town 1 North, Range 21 East, Section 5 -- Bristol			
35-4-121-052-0200	19721 60th Street	Residential	$ 148,841
Town 1 North, Range 21 East, Section 9 -- Bristol			
35-4-121-091-0210	17511 75th Street	Residential	$ 167,317
Town 1 North, Range 21 East, Section 13 -- Bristol			
35-4-121-134-0100	120th Avenue	Commercial	$ 215,860
35-4-121-134-0120	12125 Wilmot Road	Residential	$ 99,151
35-4-121-134-0124	12207 Wilmot Road	Residential	$ 104,774

Appendix 6 (continued)

Kenosha County Floodplain Inventory: Low Priority Floodplains

Parcel No.	Property Address	Type of Structure	Estimated Fair Market Value
Town 1 North, Range 21 East, Section 15 -- Bristol			
35-4-121-154-0301	9115 160th Avenue	Residential	$ 269,910
Town 1 North, Range 21 East, Section 31 -- Bristol			
35-4-121-312-0467	11844 214th Avenue	Residential	$ 130,939
Town 1 North, Range 22 East, Section 6 -- Somers			
80-4-122-062-0130	11703 60th Street	Commercial	$ 480,249
Town 2 North, Range 22 East, Section 1 -- Somers			
80-4-222-013-0320	650 Wood Drive	Residential	$ 155,371
80-4-222-013-0330	580 Wood Drive	Residential	$ 115,167
80-4-222-013-0520	2920 7th Street	Residential	$ 140,193
Town 2 North, Range 22 East, Section 3 -- Somers			
80-4-222-034-0430	5930 6th Place	Residential	$ 155,024
Town 2 North, Range 22 East, Section 9 -- Somers			
80-4-222-093-0515	8700 12th Street	Residential	$ 145,523
80-4-222-093-0545	8430 12th Street	Residential	$ 166,147
80-4-222-093-0560	8326 12th Street	Residential	$ 203,686
80-4-222-093-0565	8314 12th Street	Residential	$ 105,435
Town 2 North, Range 22 East, Section 10 -- Somers			
80-4-222-104-0316	6206 12th Street	Residential	$ 142,395
Town 2 North, Range 22 East, Section 13 -- Somers			
80-4-222-131-0150	2408 14th Place	Residential	$ 186,422
80-4-222-131-0165	2300 24th Place	Residential	$ 144,133
Town 2 North, Range 22 East, Section 22 -- Somers			
80-4-222-223-0200	2931 72nd Avenue	Residential	$ 187,002
Town 2 North, Range 22 East, Section 27 -- Somers			
80-4-222-272-0400	3107 72nd Avenue	Residential	$ 124,436
80-4-222-272-0406	3121 72nd Avenue	Residential	$ 149,926
80-4-222-272-0425	3217 72nd Avenue	Residential	$ 131,620
80-4-222-272-0435	3409 72nd Avenue	Residential	$ 115,051
80-4-222-273-0290	6821 38th Street	Residential	$ 137,760
80-4-222-273-0300	6921 38th Street	Residential	$ 76,817
80-4-222-273-0330	7007 38th Street	Residential	$ 134,284
80-4-222-273-0340	7021 38th Street	Residential	$ 116,905
80-4-222-273-0350	7031 38th Street	Residential	$ 118,759
80-4-222-273-0360	7103 38th Street	Residential	$ 118,064
80-4-222-273-0370	7107 38th Street	Residential	$ 84,579
80-4-222-273-0380	7115 38th Street	Commercial	$ 189,087
80-4-222-273-0390	7119 38th Street	Commercial	$ 35,570

Appendix 6 (continued)

Kenosha County Floodplain Inventory: Low Priority Floodplains

Parcel No.	Property Address	Type of Structure	Estimated Fair Market Value
Town 2 North, Range 22 East, Section 28 -- Somers			
80-4-222-281-0110	3500 72nd Avenue	Residential	$ 96,513
80-4-222-281-0120	3600 72nd Avenue	Residential	$ 127,564
80-4-222-281-0140	3720 72nd Avenue	Commercial	$ 107,288
80-4-222-281-0150	7260 38th Street	Residential	$ 87,360
80-4-222-281-0160	7436 38th Street	Residential	$ 110,417
80-4-222-284-0111	7259 38th Street	Residential	$ 103,117
80-4-222-284-0121	7321 38th Street	Residential	$ 120,728
Town 2 North, Range 22 East, Section 29 -- Somers			
80-4-222-292-0830	10200 38th Street	Residential	$ 92,574
Town 2 North, Range 22 East, Section 30 -- Somers			
80-4-222-301-0300	11222 38th Street	Residential	$ 151,316
80-4-222-302-0110	11310 38th Street	Residential	$ 119,222
Town 2 North, Range 22 East, Section 31 -- Somers			
80-4-222-313-0200	5501 120th Avenue	Residential	$ 137,529
Town 2 North, Range 23 East, Section 6 -- Somers			
81-4-223-061-0320	361 13th Avenue	Residential	$ 149,694
Town 2 North, Range 23 East, Section 18 -- Somers			
81-4-223-181-0750	1394 Sheridan Road		$ 109,837
Total			$ 31,324,180

Footnote #1: Grade elevation for the structures is estimated based upon topographic mapping at a scale of 1 inch = 200 feet. For properties near the margins of the 100-year recurrence interval floodplain, individual building surveys will need to be performed to determine grade elevation relative to the flood elevation.

Footnote #2: The estimated fair market value is based on the local assessor's estimate of value in the year 200 and includes the value of both the land and improvements.

Footnote #3: There are no repetitive loss structures included in this inventory.

Source: Kenosha County and SEWRPC.

#50702v2 28-Sep-01

Appendix 7

Excerpts: Fox River Watershed Studies

(This page intentionally left blank)

PLANNING REPORT

NUMBER 12

volume two

A COMPREHENSIVE PLAN FOR THE FOX RIVER WATERSHED

ALTERNATIVE PLANS AND RECOMMENDED PLAN

Southeastern Wisconsin Regional Planning Commission
Fox River Watershed Study
Old Courthouse
Waukesha, Wisconsin
53186

The preparation of this report was financed in part through an urban planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1954, as amended.

February 1970

Inside Region	$10.00
Outside Region	$15.00

Chapter IV

ALTERNATIVE FLOOD CONTROL PLAN ELEMENTS

INTRODUCTION

As urban development within the Fox River watershed continues, the problems and monetary losses associated with flooding can, in the absence of a sound flood abatement program, be expected to increase. Because of the relatively large amount of lake, wetland, and floodplain storage area still present in the watershed, the Fox River system, as it exists today, does not generate the very high-peak flood flows that have occurred on the river systems of other watersheds in Wisconsin. Watersheds of similar size within the state have recorded peak flood flows five times as large as the flood that occurred in 1960 on the Fox River. Although flood peaks on the Fox River may never approach this size, the continued loss of wetland and floodplain storage, which can be expected to accompany continued development of floodlands within the watershed, and the increased runoff potential resulting from areawide urban development may be expected to combine to increase both the size of, and the damage produced by, floods. Because urbanization increases storm water runoff, because floodplain storage is so vital in reducing flood peaks, and because sound land use development in relation to the riverine areas of the watershed is so essential to prevention of flood damage, the basic flood control element in any comprehensive plan for the watershed must consist of proposals for sound land use development, not only in the riverine areas but also in the watershed as a whole.

This chapter describes the structural flood control plan elements that were considered in the Fox River watershed study as possible adjuncts to the basic land use development proposals advanced to facilitate the attainment of regional and watershed development objectives. These structural elements are considered subordinate to the basin-wide land use plan element, and their incremental benefits and costs can be separated from those of the basin-wide land use plan element. All of the structural flood control facility plan elements could be incorporated into any of the land use plan alternatives considered, although some are unnecessary with certain land use plan alternatives.

Three types of structural measures—levee construction and channel improvement; reservoir construction; and lake level control facility construction—were considered as possible methods of controlling floods. These three basic types of structural measures were used to develop eight alternative structural flood control plan elements. Analysis indicated that four of these alternatives would provide both urban and agricultural flood damage reduction along relatively long channel reaches. Two of the alternatives would provide urban flood damage reduction along short channel reaches. The remaining two alternatives were concerned solely with reducing agricultural flood damage and improving agricultural drainage in specific rural locations.

A physical description of each structural plan element is presented in this chapter, along with a discussion of anticipated performance, an evaluation of the attendant costs and benefits, and an evaluation of the effect of the proposal on watershed development objectives and standards. Certain alternative accessory plan elements are also discussed, including the provision of adequate bridge waterway openings, the removal of certain existing residences from the floodlands, and floodproofing of residences and other structures located in the floodlands.

In calculating the benefits associated with the alternative structural flood control measures, it was assumed that existing land use development trends within the watershed would continue. The benefits attendant to each alternative were then calculated as the reduction of flood damages associated with the resulting 1990 uncontrolled land use pattern within the watershed. Implementation of the recommended watershed land use plan could be expected to reduce these calculated benefits somewhat. Any such reduction would be slight, however, since the major benefits are derived from the protection of existing development in the floodplains.

The quantitative hydrologic and hydraulic analyses necessary to evaluate the effectiveness of each alternative involved the preparation of a forecast

of the amount of water to be carried by the existing and proposed water control facilities. This forecast was based upon the assumption that the regional land use plan element recommended for adoption would be implemented as a part of this watershed program. Departures from the recommended land use plan could be expected to increase the hydraulic loadings on the water control facilities only to the extent that such departures encroach on existing floodways or eliminate existing floodplain storage. The alternative water control facility plan elements are thus subordinate to the land use plan element. Each of the water control facility elements affects only a portion of the entire watershed and alone offers only a partial solution to flood problems of the watershed.

ALTERNATIVE STRUCTURAL FLOOD CONTROL FACILITY PLAN ELEMENTS

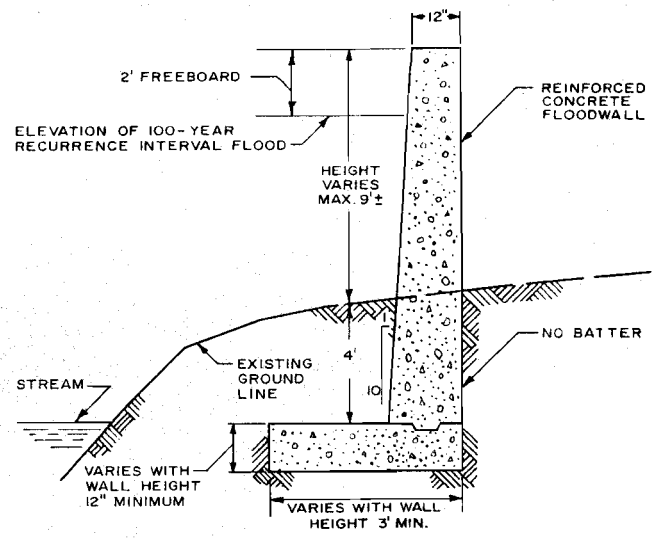
Levee Construction and Channel Improvements Within the City of Waukesha

One of the alternative structural water control facility plan elements considered was the construction of a system of intermittent dikes and floodwalls in the City of Waukesha. This alternative was developed as a method of protecting those portions of the city that experienced heavy damages in the 1960 flood and which may, in the absence of the provision of flood control works, be expected to experience even heavier damages in the future. The proposal consists of a series of sections of earth dike and concrete floodwall and of minor amounts of channel clearing and shaping.

Earth dikes are an economical means of providing flood protection to a developed area where sufficient space is available between the river and the land uses to be protected to permit such construction. The dikes would be constructed of compacted earth fill, with a minimum top width of eight feet and three-on-one side slopes. The tops and slopes would be vegetated. In confined areas the earth dikes would have to be replaced by concrete floodwalls or by specially reinforced variations of the earth dike. Floodwall dimensions and design would vary with side conditions and location (see Figure 1).

The dike and floodwall improvements, as proposed, would originate between the Moreland Boulevard Bridge and the Barstow Street Dam. Above the Barstow Street Dam, the dike and floodwall development would be continuous. Downstream from the dam, the diking would be intermittent. At road crossings the diking would be tied into either the road embankments or bridge abutments. The height of the dikes or floodwalls above the natural ground would vary with the topography but would average about four feet. The elevation of the top of the dikes or floodwalls would also vary, depending on location, but would be constructed to an elevation at least two feet above the high water surface elevation produced by a 100-year recurrence interval flood. The dikes would be built as far back from the river as practical in order to keep both the height of the dike and the loss of floodplain storage area to a minimum.

Figure 1
TYPICAL FLOODWALL CROSS-SECTION



Source: U. S. Soil Conservation Service and SEWRPC.

It is also proposed under this alternative that some channel clearing and shaping be done below the Barstow Street Dam to improve the hydraulic capacity of this channel reach. This would involve clearing and debrushing and some shaping of the banks, but not deepening of the channel, a typical cross section of which is shown in Figure 2. Automatic drainage gates would be installed on 17 storm sewer outlets to prevent storm sewer backup. A storm sewer would be constructed from the low point in St. Paul Avenue, located between Wisconsin Avenue and Fuller Street, to the river in order to alleviate flooding in this area.

The essential features of this alternative plan element are shown on Map 8. Estimated quantities of materials and estimated unit costs for the major work items are: 5,600 lineal feet of earth and stone diking, requiring approximately 25,000 cubic yards of embankment at $9 per lineal foot;

in many instances, would not need to be as great as even the very modest values indicated in the preceding discussion, which values can be considered to be probable maximums. On those structures for which raising of the spillway crest has been suggested, the proposed structure would have an overflow length greater than the overflow length of the existing structure in order to ensure that serious damages are not induced on lake properties as a result of raising the spillway crest.

Approximately 19,400 acre-feet of storage could be created by using all of these 10 lake management proposals. This is equivalent to 0.4 inch of runoff from the entire tributary watershed above Wilmot. As noted, the period required to lower the lake levels would vary from 4 to 21 days. This factor would restrict the management practices to spring runoff events and would require that the lowering procedure be started in the middle of February.

Benefits: Installation and operation of the lake management plan element would reduce average annual flood damages by $3,900. This benefit was calculated by assuming that snowmelt floods will account for 50 percent of the average annual damages.

Costs: The total cost of the proposed flood control element is estimated at $65,500, including construction and engineering and administrative services. Annual maintenance costs are estimated at $350. These costs do not include the cost of management services, it being assumed that these would be minor and would be absorbed by whatever unit or agency of government is assigned the operational responsibilities. Amortized at 3 1/4 and 6 percent interest, over a 50-year period, average annual costs would be $2,670 and $4,155, respectively.

Benefit-Cost Ratio: The benefit-cost ratio of this proposal calculated at 3 1/4 percent would be 1.3 to 1.0.

Average Annual Benefit	
Flood-damage alleviation	$3,900
Average Annual Cost	
Installation	$2,670
Maintenance	350
Total	$3,020

$$\text{Benefit-Cost Ratio} = \frac{3,900}{3,020} = 1.30$$

$$\text{At 6 percent interest} = \frac{3,900}{4,505} = 0.86$$

The reduction in damage that could be attributed to this plan element would be essentially confined to the main stem of the Fox River. Only minor reductions in stage would be realized along most of the river in Wisconsin; however, the storage of large volumes of water, up to a total of 19,400 acre-feet, as already noted, would assist in abating flood problems below the state line.

ALTERNATIVE ACCESSORY FLOOD CONTROL PLAN ELEMENTS

Adequate Waterway Openings of Bridges

The water control facility standards set forth in Chapter II of this volume recommended that bridge waterway openings be considered as an integral part of any comprehensive watershed plan in order to achieve an integrated and effective drainage system within the watershed. Application of the hydrologic and hydraulic information set forth in Appendices D and E, together with an analysis of data on the hydraulic performance of bridge openings, provides a basis for recommending bridge removal and replacement within the watershed. Seventy-five existing bridges will have substandard waterway openings under 1990 land use conditions; and when replaced by the local or state highway agencies concerned as a part of the highway improvement program, these bridges should have adequate waterway openings provided in order to achieve an effective drainage system within the watershed. These bridges are listed in Table 13. Additional related information presenting pertinent hydraulic data is presented in Appendix E. Benefit-cost analyses were not considered as a valid factor in evaluating bridge replacement because the structures requiring replacement have, with few exceptions, served their useful life and will, in any case, require replacement for transportation system construction, operation, and maintenance purposes.

Floodland Evacuation

The structural flood control plan elements discussed in the preceding sections of this report would singly or in combination serve to abate flooding and reduce flood damages in two of the three areas of the watershed which experienced

major damages in the 1960 flood: the Waukesha and Burlington areas. No economically sound means exist for the abatement of potential flood damages by the construction of flood control works in the third major damage area of the watershed, the Silver Lake area, since the cost of any practical flood control works to protect existing development in this area would exceed the flood abatement benefits. The removal of certain residences in the floodlands of the Fox River located in Sections 1 and 12, Town 1 North, Range 19 East, Town of Wheatland, Kenosha County, and in Sections 7 and 18, Town 1 North, Range 20 East, Village of Silver Lake and Town of Salem, would, however, accomplish flood damage abatement, reduce the public health and safety hazards attendant to flooding in this area, and provide additional land for park and related open-space use. Evacuation of the floodlands in the Silver Lake area of the watershed must, therefore, be considered as a possible adjunct to any comprehensive watershed plan for the Fox River watershed.

Criteria relating to the removal of residences located within floodlands are largely economic. Flood damages mount rapidly per unit depth of flooding as first floors of dwellings are inundated. It is also generally difficult to floodproof residences when floodwaters rise above the first floor level.

Benefits and Costs: As shown in Figure 13, there are 160 residences located within the 10-year recurrence interval flood hazard lines in that reach of the Fox River watershed extending from Section 1 in the Town of Wheatland through Section 18 in the Town of Salem, Kenosha County. These 160 residences have a present (1968) estimated combined property value of $1,235,115. Amortized at 3 1/4 and 6 percent interest, over a 50-year period, average annual costs of acquiring these residences would be $50,330 and $78,360, respectively. The average annual monetary benefit which could be attributed to this plan element is estimated at $44,500 all of which is attributable to flood damage alleviation.

Benefit-Cost Ratio: Assuming that the salvage value of the residences at the time of public acquisition and removal would be sufficient to cover demolition costs and subsequent landscaping of the vacated sites, the benefit-cost ratio, calculated at 3 1/4 percent interest, would be 0.88 to 1.0.

Average Annual Benefit
Flood-damage alleviation $44,500

Average Annual Cost
Property acquisition $50,330

Benefit-Cost Ratio $= \frac{44,500}{50,330} = 0.88$

At 6 percent interest $= \frac{44,500}{78,360} = 0.57$

It should be noted that the above benefit-cost ratio is very conservative in that no benefits have been assigned for the ultimate use of the land to be evacuated as an integral part of the recommended Fox River parkway.

As noted earlier in this section, no economically sound means exist for the abatement of potential flood damages in the Silver Lake area through the construction of flood control works. Not only would the cost of any practical flood control works, such as earth levees and concrete floodwalls to protect existing development in this area, greatly exceed the flood abatement benefits but the construction, for example, of earth levees would in many instances require the removal of the very residences the levees were designed to protect in order to provide room to construct the levees, which would necessarily be up to 80 feet in width at the base. The construction of concrete floodwalls nearly six miles in length and up to eight feet in height would not only destroy the aesthetic value of the river sought by the shoreline residents to be protected but by the general public as well and would be prohibitively expensive, greatly exceeding the cost of acquiring the residences themselves. Thus, it should be noted that, while the above benefit-cost ratios for floodplain evacuation are less than 1.0, they are necessarily greater than any potential corresponding ratio for the construction of flood control works in this area.

Floodproofing of Residences

It is possible and generally practicable for homeowners, as individuals, to make certain structural adjustments or to impose certain use restrictions on private properties in order to reduce flood damage. These structural measures and use restrictions applied to buildings and contents are known as "floodproofing." The flood damage survey revealed that many private indi-

Table 13 (continued)

Bridge Location	Structure Number[b]	Tributary
CTH X, Waukesha County	122	Mukwonago River
CTH NN, Waukesha County	124	Mukwonago River
CTH E, Waukesha County	127	Mukwonago River
CTH E, Waukesha County	128	Mukwonago River
Beulah Road, Waukesha County	130	Mukwonago River
CTH J, Walworth County	130A	Mukwonago River
CTH I, Waukesha County	131	Mukwonago River
CTH K, Waukesha County	21	Upper Fox (Sussex Creek)
CTH JF, Waukesha County	22	Upper Fox (Sussex Creek)
Lincoln Road, Waukesha County	46	Upper Fox (Poplar Creek)
STH 59, Waukesha County	50	Upper Fox (Poplar Creek)
CTH SS, Waukesha County	51	Upper Fox (Poplar Creek)
CTH Y, Waukesha County	56	Upper Fox (Poplar Creek)
CTH TT (Merrill Hills Road), Waukesha County	93	Pebble Creek
CTH D (Sunset Drive), Waukesha County	96	Pebble Creek
CTH I (Lawnsdale Road), Waukesha County	110	Pebble Brook
CTH U (Guthrie Road), Waukesha County	111	Pebble Brook
Glendale Road, Waukesha County	114	Pebble Brook
Joanne Drive, Waukesha County	42	Upper Fox (Deer Creek)
CTH KX (Calhoun Road), Waukesha County	43	Upper Fox (Deer Creek)
Brookfield Road, Waukesha County	44	Upper Fox (Deer Creek)
Custer Lane, Waukesha County	4	Upper Fox (Main Stem)
CTH W, Waukesha County	5	Upper Fox (Main Stem)
Mill Road, Waukesha County	9	Upper Fox (Main Stem)
CTH Y, Waukesha County	11	Upper Fox (Main Stem)
CTH VV, Waukesha County	12	Upper Fox (Main Stem)
River Road, Waukesha County	28	Upper Fox (Main Stem)
CTH M, Waukesha County	31	Upper Fox (Main Stem)
Barker Road, Waukesha County	32	Upper Fox (Main Stem)
Town Line Road, Waukesha County	59	Upper Fox (Main Stem)
CTH SS, Waukesha County	60	Upper Fox (Main Stem)

[a] *This table indicates those bridges which have substandard hydraulic capacities causing overtopping of the bridge deck or the bridge approach road sections (see Appendix E).*

[b] *See Map 33 in Volume 1 of this report.*

[c] *In 1969 this bridge was replaced with a new structure designed in accordance with the hydraulic recommendations set forth in Appendix E.*

Source: U.S. Soil Conservation Service.

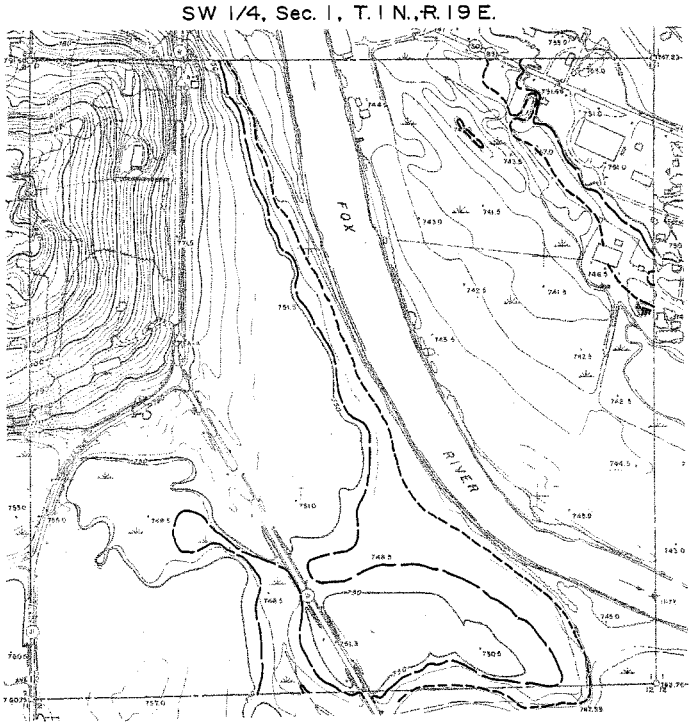
viduals have practiced and may be expected to continue to practice various kinds of floodproofing measures, and these floodproofing measures have undoubtedly contributed substantially to a reduction of historic flood damages. The calculation of future flood damages in this report (see Chapter VII, Volume 1) is based, in part, upon the implied assumption that private floodproofing measures will continue to be applied to reduce future damages in a proportion equivalent to the reduction of historic damages. A review of the technical literature and of the reports of the flood damage survey of the Fox River watershed supports the following presentation of floodproofing elements which can be applied by private individuals.

It should be noted that selection of the specific floodproofing elements to be applied to a partic-

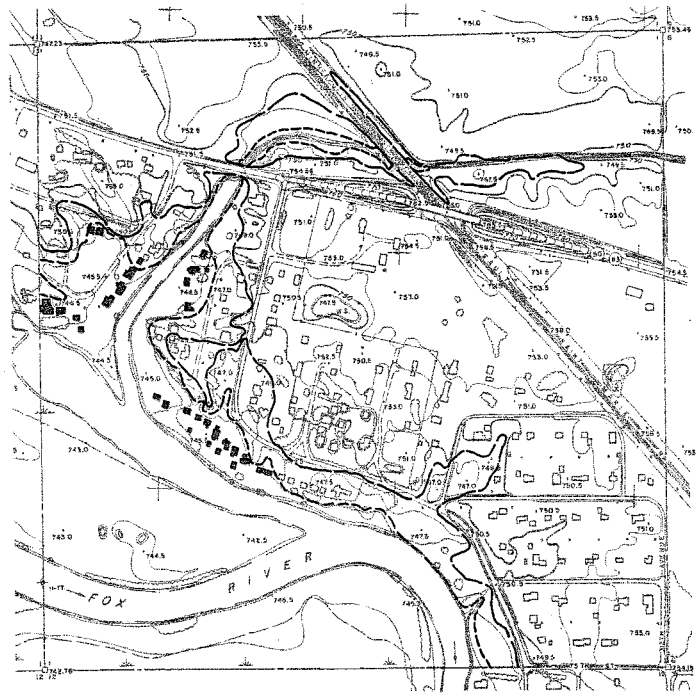
Figure 13

PROPOSED FLOODLAND EVACUATION IN THE SILVER LAKE AREA, KENOSHA COUNTY

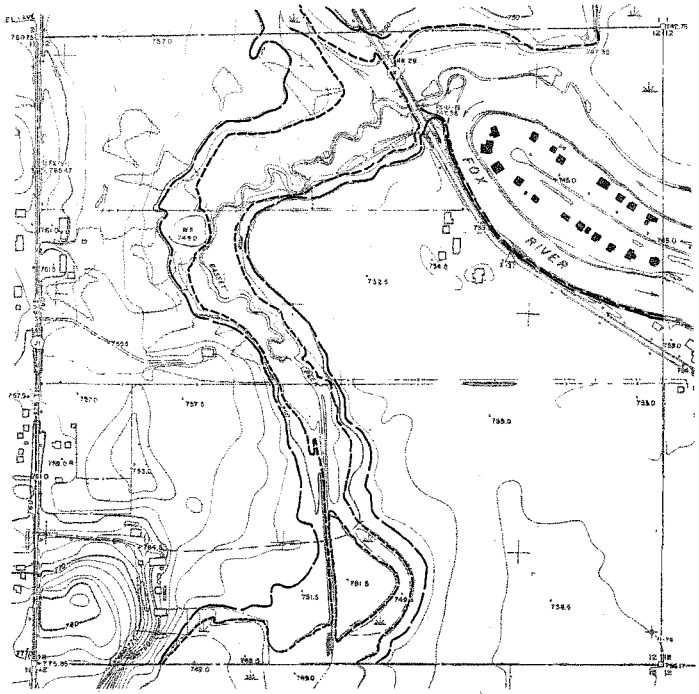
SW 1/4, Sec. 1, T. 1 N., R. 19 E.



SE 1/4, Sec. 1, T. 1 N., R. 19 E.



NW 1/4, Sec. 12, T. 1 N., R. 19 E.



NE 1/4, Sec. 12, T. 1 N., R. 19 E.

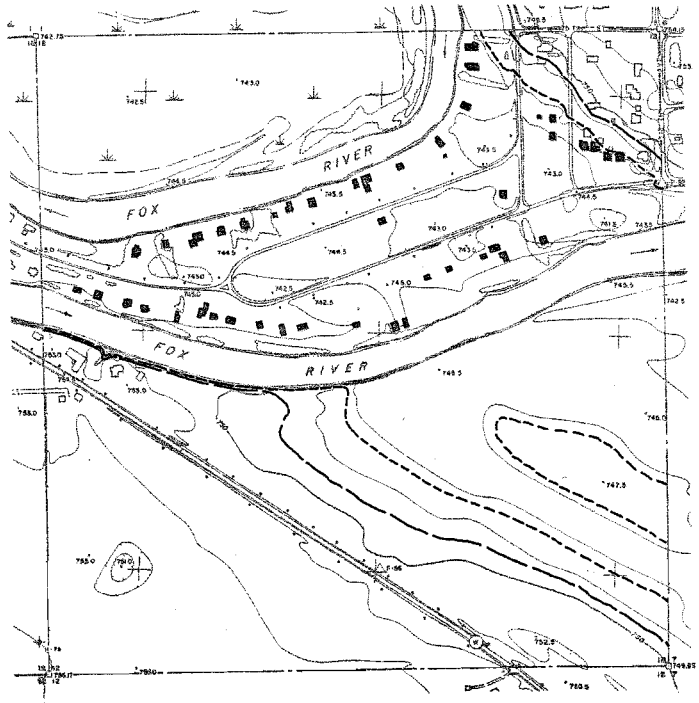
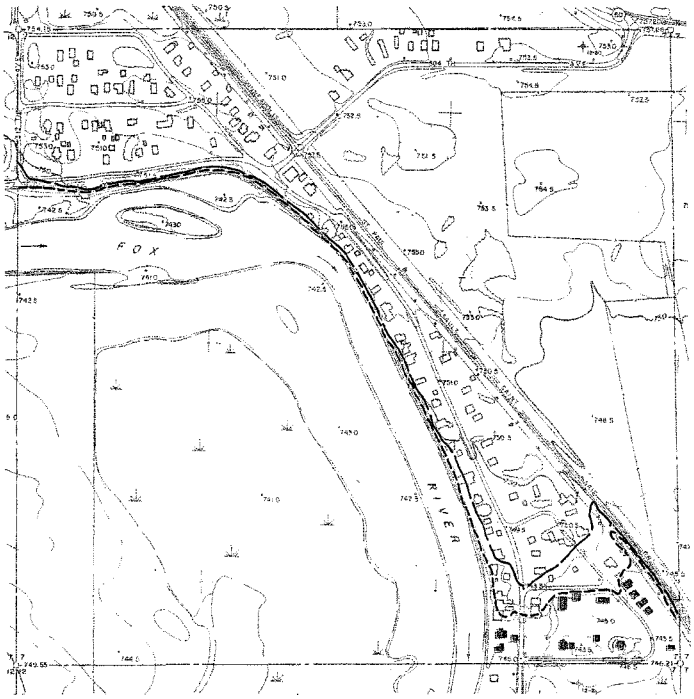


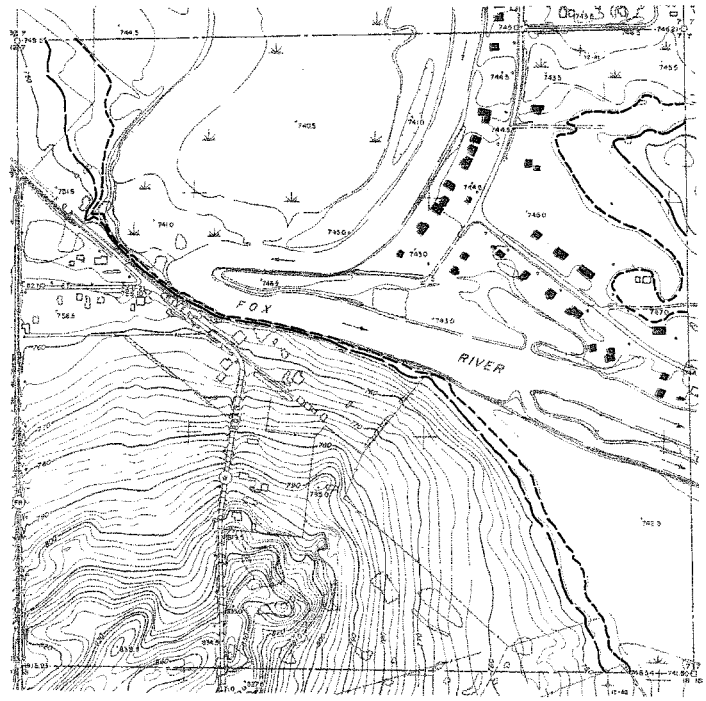
Figure 13 (continued)

PROPOSED FLOODLAND EVACUATION IN THE SILVER LAKE AREA, KENOSHA COUNTY

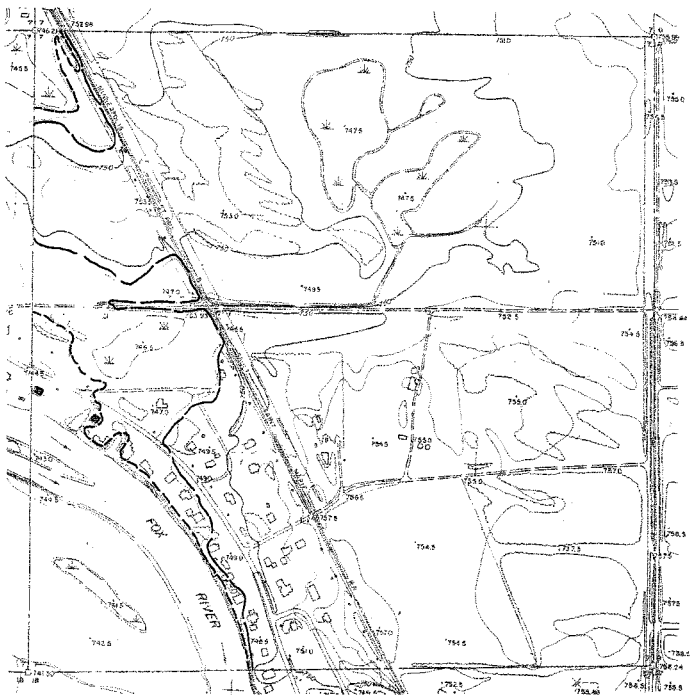
NW 1/4, Sec. 7, T. 1 N., R. 20 E.



SW 1/4, Sec. 7, T. 1 N., R. 20 E.



SE 1/4, Sec. 7, T. 1 N., R. 20 E.



NE 1/4, Sec. 18, T. 1 N., R. 20 E.

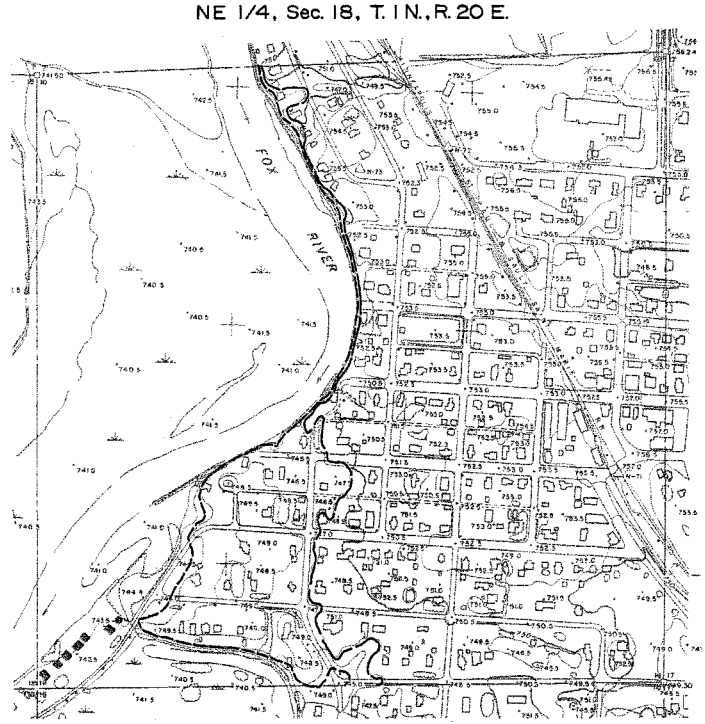
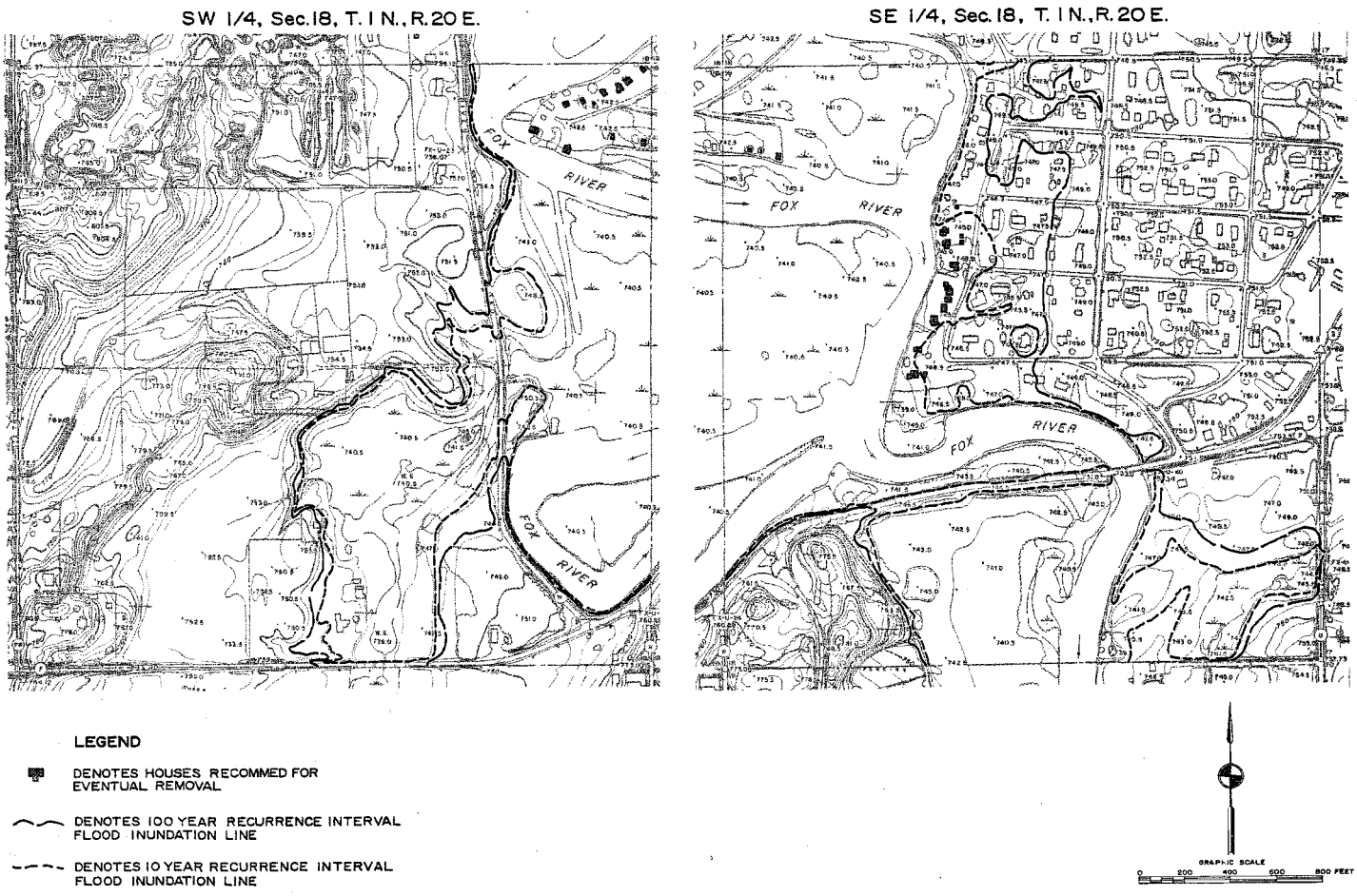


Figure 13 (continued)

PROPOSED FLOODLAND EVACUATION IN THE SILVER LAKE AREA, KENOSHA COUNTY



No feasible means exist for the abatement of potential flood damages through the construction of flood control works in the Silver Lake area, one of the three major flood damage areas of the watershed. It is proposed in this alternative plan element, therefore, to eventually remove 160 residences located in the floodway and having first-floor flooding by a 100-year recurrence interval flood. These 160 residences would be purchased for removal gradually over time as they came onto the real estate market.

Source: *SEWRPC.*

ular structure depends upon the features of the individual house, such as the kind of structural material, age of structure, substructure conditions, nature of the exposure to floodwaters, height of water table, sewerage facilities, and uses demanded of the structure. Extensive floodproofing should be applied only under the guidance of a registered professional engineer who has carefully inspected the building and its contents.

Categorized according to function, floodproofing elements are of four types: 1) general floodproofing independent of the type of flooding, 2) seepage control, 3) relief from sewer backup, and 4) protection from overland flow.

General Measures: A number of floodproofing measures apply to flood-damage prevention regardless of the manner of flooding. These include the following: 1) keeping valuable items away from areas which could be flooded; 2) using waterproof cement in laying tile or linoleum; 3) having adequate electrical fuse protection in all homes; 4) unplugging, disconnecting, or removing from flood-vulnerable areas all electrical appliances; and 5) anchoring all fuel tanks securely so that the

force of buoyancy of floodwater will not cause floating and spillage.

Some flood damages can be avoided by removing electric motors from furnaces and appliances and by removing perishable items from basements. Severe flood damages can be caused by fuel oil storage tanks floating loose from anchorage, rupturing, and spilling oil over the contents and interior of homes. Other instances of high flood damages can be caused by unsuitable uses of basements or by impractical designs of floodland homes. Use of floodland basements as bedrooms, kitchens, or living rooms can result in high flood damages.

Seepage Control: During periods of flooding and accompanying high water tables, basements situated in floodlands on permeable soils are particularly susceptible to seepage through walls. Experience has shown that basements can be severely flooded by seepage within a few hours. Where structures are sound and hydrostatic pressure from ground water is low, basements may be waterproofed against seepage by sealing walls with either asphalt or quick-setting hydraulic compounds. In many instances, however, because it is not practical to exclude all seepage water, it becomes necessary to operate a sump pump. As a safeguard against power failure, some homeowners have installed an auxiliary gasoline-fueled pump. As a general principle, all homes constructed in floodlands where the water table is high should have basement walls sealed for maximum waterproofing and should be equipped with a sump pit and with a sump pump that is actuated automatically as waters rise.

Relief From Sewer Backup: Because of flat topography, high water tables, and surface overflow into manholes, floodland homes often experience flood damage problems from the backing up of floodwaters and sewage through a basement floor drain connected to the sanitary sewerage system. It would, therefore, be advisable for floodland homeowners to guard against sewer backup.

A number of relatively inexpensive standard devices can be installed in sewer lines to prevent reverse flow of water. These include standard backwater valves, horizontal swing check valves, and a closed end pipe threaded into a floor drain. It is important to note that, in order for these devices to accomplish flood damage relief, the floor drain must be of adequate strength to resist the hydrostatic pressure without rupturing and thus introducing floodwaters.

Under certain conditions of rapidly rising floodwaters, more flood damage prevention may be accomplished by letting a basement flood than by trying to exclude the inflow of floodwater through sewer lines or in other ways. Severe damage can be caused by the differential pressure between floodwaters and empty basements. Basement floors can be uplifted by hydrostatic pressure and ruptured, and basement walls can be collapsed by the differential pressure. Basement floors, walls, and floor drains should not be floodproofed without consideration of the probable forces which the structure must withstand.

Protection From Overland Flow: Generally, it is not practicable to floodproof residences when floodwaters rise above first floor levels. Exceptions are offered by particularly sturdy structures, such as well-constructed brick buildings; but most frame structures are difficult to floodproof at first floor levels. Below first floor levels, overland flow can sometimes be excluded from homes by the installation of seal-tight, wire-reinforced glass on all basement windows. An alternative measure is to seal all exterior openings to basements and depend entirely on artificial light and air conditioning for light and air in the basement area.

Floodland Regulations

The hydraulic function of the floodplain portion of a river valley is to provide storage area for floodwaters. Major reductions in the storage potential of the floodplain caused by land filling or the construction of substantial structures will result in increased peak flood discharges downstream. If such filling and urban development is allowed to continue to preempt the natural floodplains of the stream system of the watershed, flood hazards and concomitant dangers to property, health, and life may be expected to increase sharply. This will, in turn, lead to increasing demands for the construction of structural flood control measures, such as retention reservoirs, channel improvements, dikes, floodwalls, and cutoff channels. As urban development proceeds on an areawide basis over the watershed, such an approach can only become self-defeating since the number of persons and value of property in the path of floodwaters will increase at a more rapid rate than that at which protection through public

works construction can be afforded. Moreover, the actions of upstream communities to prevent damage to land uses located in the natural floodplains may commit the downstream communities to the construction of extensive and expensive flood control works. The intelligent exercise of floodland use regulations is, therefore, required in conjunction with the development of any structural flood control measures.

Prohibition and regulation of flood-vulnerable uses in the floodlands under local police powers are two of the most efficient, economical, and logical methods of preventing flood damage. Generally, the use of the floodplain should be restricted to open uses; and any filling of the floodplains should be avoided. The structural flood control measures considered in this volume are designed to protect development which has already been allowed to occur in the floodlands of the Fox River system. The costs and benefits associated with these works are, therefore, predicated on a sound associated public policy of preventing further flood-prone development in the floodlands of the Fox River watershed.

SUMMARY

Based upon the analyses presented in this chapter, the following flood control elements are recommended for inclusion in the comprehensive Fox River watershed plan:

1. The construction of dikes and floodwalls in the City of Waukesha to protect the existing flood-vulnerable land uses and abate the high flood damages in this channel reach.

2. The construction of dikes and floodwalls in the City of Burlington to protect the existing flood-vulnerable land uses and abate the high flood damages in this channel reach.

3. The construction of channel improvements in the headwater areas of Sugar and Honey Creeks to protect flood-vulnerable agricultural areas and improve agricultural production by providing better drainage.

4. The construction of a multi-purpose reservoir on Sugar Creek to provide flood protection, low-flow augmentation, and recreational benefits.

5. The construction of dikes and channel improvements along the lower reaches of Hoosier Creek to protect flood-vulnerable agricultural areas.

6. The protection of floodland areas along the perennial stream channels from further flood-prone urban development in order to avoid intensification of the flood damage problem within the watershed, to provide for maintenance of the necessary floodwater storage, and to assist in the protection of the primary environmental corridors of the watershed and their maintenance in primarily natural, open uses.

7. The removal of 160 existing residences lying within the 10-year recurrence interval flood hazard lines of the main stem of the Fox River in the Towns of Wheatland and Salem, Kenosha County, in order to abate the serious flood problems existing within this area.

The foregoing structural flood control and floodland evacuation elements not only support both the watershed land use and water facility control development objectives but also provide the least costly and most effective method for reducing major flood damage potentials within the watershed. These flood control elements and the related multiple-purpose reservoir and agricultural water management elements would together provide an average annual flood damage reduction benefit of $144,550 and an average annual recreational benefit of $2,102,950. Together these elements would have an annual average cost of $1,036,790 and would have a combined benefit-cost ratio of 2.27 to 1.0 at a 3 1/4 percent interest rate and of 1.76 to 1.0 at a 6 percent interest rate. The nonstructural element, floodland protection, is absolutely essential if the need for future structural flood control works beyond those recommended herein is to be avoided, with the attendant necessary expenditures of large amounts of public monies.

The construction of the dikes and floodwalls in Burlington would eliminate the need for the management proposals associated with operation of the Waterford impoundment for flood control purposes and with the control of the levels of the 10 lakes within the watershed, as well as the need for the Vernon Marsh reservoir. Therefore, these

other alternative structural flood control measures are not recommended for inclusion in the final comprehensive plan for the Wisconsin portion of the Fox River watershed. If, however, additional flood control benefits for the Illinois portion of the Fox River watershed are to be sought by the Federal Government, it is recommended that only the management of the Waterford impoundment, the Vernon Marsh reservoir, and the lake level control alternatives be explored insofar as the Wisconsin portion of the Fox River watershed is concerned.

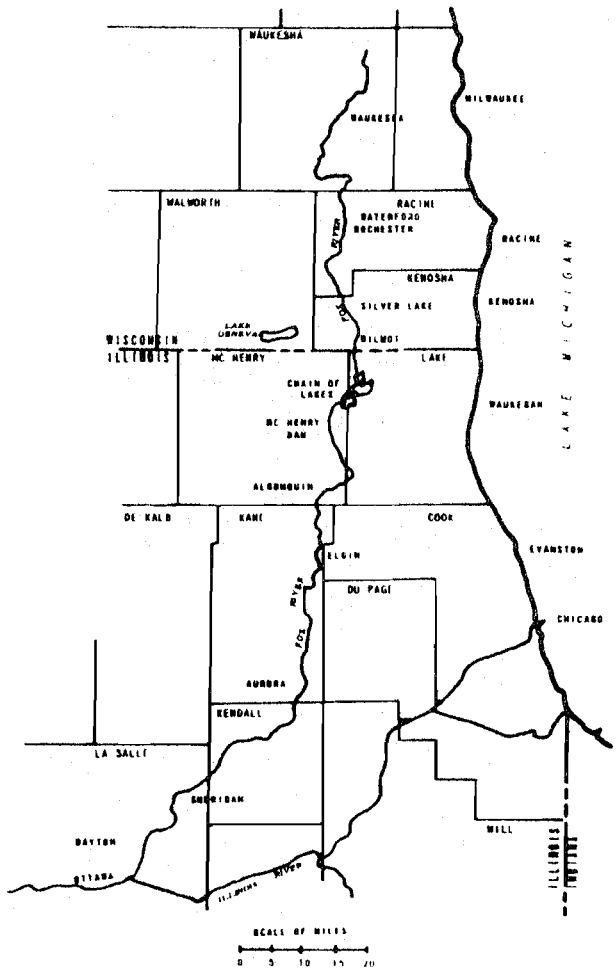
US Army Corps
of Engineers
Chicago District

Stage 2 Documentation Report

Fox River, Illinois - Wisconsin

Flood Control

September 1981



Draft

not identified any natural reservoir sites in Wisconsin. While management of 11 existing impoundments in Wisconsin for flood control would offer some potential flood control benefits, no appreciable benefits were expected. To verify this, a hypothetical reservoir was investigated for the Chain-of-Lakes. The objective was to determine how much additional storage above the Chain-of-Lakes would be required to effectively reduce flood damages.

88. Since no large natural reservoir sites are available, the additional storage could be provided either by retaining floodwaters in Wisconsin, in excavated retention areas, or lowering the normal water surface within the Chain-of-Lakes. Two reservoir capacities, 5,400 acre-feet and 21,600 acre-feet, were assessed. A 5,400 acre-foot reservoir would require approximately 300 acres of land assuming a 40-foot average reservoir depth, a 40-foot average height of excavated material and a 3 horizontal to 1 vertical slope for both the reservoir and disposal pile. A 21,800 acre-foot reservoir would require approximately 1,150 acres following the same assumptions. Capacity for 5,400 acre-feet of storage could also be obtained by lowering the Chain-of-Lakes approximately 0.8 feet while 21,600 acre-feet of storage would require that the Chain-of-Lakes be lowered 3.4 feet.

89. Assessment. Neither reservoir aproach offered any appreciable flood stage damage reduction. The maximum reduction was 0.3 foot for a 10-year event based on the larger reservoir. This small reduction in flood stage is due to the large volumes of water entering the Chain-of-Lakes during a flood and the significant amount of storage offered.

90. At this time the only apparent economic benefits considered was associated with the reduction in flood stages. The reservoirs approach presented is not economically justifiable.

91. These alternatives would require extensive additional land. Depending on where, how and when the reservoir would be construction a significant social and economic disruption in the local communities could be expected.

92. Environmental impacts cannot be determined because no site has been selected for the storage reservoirs. It may be anticipated, however, that significant and adverse impacts on aquatic habitat may be encountered, because of reservoir construction.

93. Evaluation. The plans would only minimally reduce flood stages and associated flood damages along the Fox River. This plan cannot address the impact on wetlands and the preservation of open space since no sites were selected. Plan 9 is not cost effective based on the benefit-cost ratios developed.

PRELIMINARY PLANS - WISCONSIN

94. The Southeastern Wisconsin Regional Planning Commmission (SEWRPC) conducted a thorough flood damage analysis of the Fox River basin considering both structural and non-structural flood damage reduction measures.

SEWRPC assessed non-structural measure such as flood proofing and evacuation, and structural measures including levees and flood walls, as well as channel modifications and reservoir storage. That study determined that the only feasible means of flood damage reduction is by levees and flood walls. The report, completed in 1970, recommended levees and channel improvements at Waukesha and Burlington. Channel improvements on Hoosier and Honey Creeks were designed for recreation and low flow augmentation. A 1978 update recommended channel improvements, floodproofing and a floodwall at Pewaukee. The Corps of Engineers is restricted to providing flood protection on major streams or tributaries downstream from the point where the flood discharge is greater then 800 cubic feet per second for the 10-percent flood (one change in ten of being equalled or exceeded in any given year) under conditions expected to prevail during the period of analysis. Since the discharge for the Pewaukee River associated with 10-percent flood is less than 400 cfs according to SEWRPC's analysis, no Corps of Engineers involvement is possible.

COMPARISON OF PLANS

95. The nine plans developed in Stage 2 were designed to determine certain information and to allow for comparison and trade-off among plans. A summary of the impact analysis of preliminary alternatives is indicated in table 2.

96. A comparison of plan 3 with any other plan indicates that only plan 3 can provide standard project flood (SPF) protection. Although plan 3 appears justifiable at approximately 33 sites there are over 270 damage areas in the basin. This indicates that SPF protection cannot be obtained at all damage areas.

97. A comparison of all plans with plan 2 indicates that plan 2 can potentially improve water quality more than the other alternatives. Minimal impacts are anticipated from plans 1, 3 and 4. Plans 5 and 6 incorporate elements of the earlier plans and as such will potentially improve or minimally impact water quality. Environmental impacts were not determined for plans 8 and 9. Plan 7 would severely disrupt aquatic habitat during dredging and terrestrial habitat in disposal areas.

98. In comparing the economic portion of the plans, plans 1 thru 6 appear economically feasible for various levels of protections. Plans 7, 8 and 9 offer no appreciable benefits.

99. Plan 3 may restrict access to and visions of the river as higher levels of protection are encountered. By comparison with plan 1, disruption will continue during flooding events, but no restriction to access would take place.

100. Plan 2 could expose existing river bottom or add additional recreational benefits using canoe-by-passes compared with plan 8 which potentially could offer additional recreational and water supply benefits.

Table 2 Summary of impact analysis of preliminary alternatives

Plan	Description	Impacts		
		Economic	Environmental	Social
1.	Nonstructural	• reduce but not eliminate flood damage • brick facing appears justified where depth of flooding for the 100-year event is less than 3 feet (table 1).	• minimal impact	• continued disruption during floods
2.	Dam modficatin between Algonquin and Yorkville			
a.	Removal	• reduce but not eliminate flood damage	• potential water quality improvement • potential creation of wetlands • reduce aquatic habitat	• expose existing river bottom
b.	Notching	• same as "a," except to a lesser degree	• same as "a," except to a lesser degree	• same as "a," to a lesser degree
c.	Gates, bypass channel	• same as "a," except to a lesser degree	• potential water quality improvements	• inclusion of recreation canoe by-passes possible under this option
3.	Levees	• only alternative which can provide protection for a SPF 1/ • eliminates most of residual damages	• minimal impact anticipated • impacts must be determined on a site-by site basis. • recommended land borrow of material to eliminate disruption of aquatic habitat.	• restrict access to and vision of the river • minimal disruption to protected areas during floods
4.	Modification of McHenry Dam	• reduce but not eliminate flood damage	• minimal impact anticipated	• minimal impacts anticipated
5.	Modfication of dams between McHenry and Yorkville	• same as Plans 2 and 4	• same as Plans 2 and 4	• same as Plans 2 and 4
6.	Combination of dam modification, nonstructural and levees	• same as Plans 1, 3 and 5	• same as Plans 1, 3 and 5	• same as Plans 1, 3 and 5
7.	Channelization	• no appreciable damages	• disruption to aquatic habitat during dredging • disruption to terrestrial habitat used as disposal area	• require land for disposal area
8.	Reservoirs	• negilible reduction in flood stage; no other benefits availabe at this time.	• environmental impacts not determined since the potential reservoirs were not economically justified.	• potential reservoirs may offer local recreational and water benefits
9.	Other storage			
a.	Storage upstream of the Chain-of-Lakes,	• no appreciable reduction in flood stage • no other apparent benefits	• impacts, cannot be determined because no site has been selected for the storage reservoir	• require extensive land (1-2 sq. mi.)
b.	Significant additional storage in the Chain-of Lakes	• minimal effects	• significant adverse impacts on the aquatic habitat	• practically, it would eliminate power boating in the Chain-of-Lakes •disrupt the social and economic structure of communities on the Chain-of-Lakes

1/The Standard Project Flood (SPF) is that flood that may be expected from the most severe combinations of meteorological and hydrological conditions that are reasonably characteristic of the geographic area in which the basin is located, excluding extremely rare combinations.

TRADE-OFF ANALYSIS

101. The assessment and evaluation of the nine plans analyzed in Stage 2 has indicated certain features that appear more advantageous than others. It is apparent that merely channelizing around the Chain-of-Lakes or in the reaches recommended downstream of the Chain-of-Lakes as indicated in plan 7 will not be adequate. It also appears that plan 8 and 9 do not significantly reduce flood stages to offset additional costs of the plans. It does appear that the sites protected by levees under plan 3 could be protected up to the SPF level at selected sites. Plans 1 thru 6 appear economically justified.

102. If high levees are allowed additional storage areas may be removed or the floodway may be encroached upon causing flood stages to rise. These higher Stages may cause additional areas to be flooded. For this reason, a careful reexamination is required if a levee plan is recommended.

RATIONALE FOR PLANS ELIMINATED

103. Plan 7 should not be considered for further study because of lack of economic feasibility, because it does not adequately reduce flood damages and because of the severe adverse environmental impacts to aquatic and terrestrial habitat that may be expected.

104. Plan 8 provides a negligible reduction in flood stage. No other benefits were evaluated at this time, but it appears that additional reservoirs in this area of Illinois at this time are not economically feasible.

105. Plan 9 offers no appreciable reduction in flood stages. These storage alternatives upstream of the Chain-of-Lakes are so costly that environmental impacts were not addressed and no specific storage reservoir site was selected.

RATIONALE FOR SELECTING PLANS WARRANTING FURTHER STUDY

106. Based on the Stage 2 analysis, plans studied in further detail in Stage 3 should contain certain features. These features should consider economic viability, social acceptance and environmental impacts.

107. Only plan 6 offers a combination of measures for a full basin wide analysis. Plan 5 potentially could offer some degree of basin wide protection. None of the six plans analyzed in Stage 2 should be studied in detail in Stage 3 without some modification. The plans to be recommended in Stage 3 will be combinations of the features of various plans analyzed in Stage 2. These adjustments will result in plans that are either environmentally, economically, or socially more acceptable than the six plans analyzed in Stage 2.

(This page intentionally left blank)

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

NCRPD-P

FINAL FEASIBILITY STUDY
FOR
FOX RIVER AND TRIBUTARIES
ILLINOIS AND WISCONSIN

AUGUST 1984

ALTERNATIVE PLANS

The development of alternative plans is accomplished by combining the different structural and nonstructural measures into resource management systems that allow formulation of alternatives to address the planning objectives. The "most probable future condition" employed to form the basis for establishing the planning objectives is kept in mind during this process to aid in developing plans to complement it as well as to serve as one basis for evaluating the alternative plans.

AVAILABLE MEASURES

A broad range of structural and nonstructural measures are identified and examined as the basis for formulating alternative plans. Each type measure - whether structural or nonstructural - has its appropriate place in the present and future management of our Nation's flood plains, and the principal task is to find the most appropriate measure for each specific flood hazard and community situation.

Structural Solutions

Structural solutions involve such measures as levees, floodwalls, channel improvement, and flood control reservoirs. Levees, ringwalls, and floodwalls provide protection by serving as a physical barrier between the river and adjacent flood-prone land. Channel improvement helps to alleviate flood problems by increasing the flow efficiency of the channel. Flood control reservoirs reduce flood flows by temporarily storing water.

Nonstructural Solutions

Nonstructural solutions include such measures as flood plain zoning, flood-proofing, flood plain evacuation, and flood warning systems. Zoning or other regulatory controls provide a planned program and regulate development and land use, thereby preventing future development that could suffer large flood damages. Floodproofing involves providing barriers or raising structures to reduce the effects of flooding. Flood plain evacuation may be temporary or permanent. Temporary evacuation serves to protect the people of an area and their personal property. Permanent evacuation involves removing buildings and prohibiting new construction on flood-prone lands. Flood warning systems consist of water level sensing devices which are connected to an alarm that is activated by rising water levels. These systems provide some measure of added protection on the smaller, faster rising streams but have little, if any, value on large, slow rising streams where the normal slow rising nature of the stream provides adequate warning time.

DEVELOPMENT OF ALTERNATIVE PLANS

FORMULATION CRITERIA

Alternative plans which contribute to the Federal objective are systematically formulated. In addition to a plan which reasonably maximizes contributions to NED, other plans may be formulated which reduce net NED benefits in order to further address other Federal, State, local and international concerns not fully addressed by the NED plan.

In developing a plan to reduce flood damage, standards and procedures which have been set forth in various flood control acts and policies and related regulations established by the Corps of Engineers through experience in the flood protection field have been followed. All plans considered, therefore, were evaluated in accordance with the following criteria.

Technical Criteria

The degree of protection afforded by any method of flood damage reduction proposed will be the highest practicable, consistent with economic criteria, safety, and local desirability and acceptance.

Economic Criteria

Except for certain environmental or socially related instances, the average annual tangible benefits of a proposal will exceed the annual charges on the investment. One level of protection analyzed will provide the maximum net benefits.

Environmental and Other Criteria

The public health, safety, well-being, and quality of life of the residents of the locality concerned are the prime considerations in the development of a project. Any protective works would be designed to disturb existing natural and cultural features as little as possible. Mitigation for loss of environmental features would be provided to the extent practicable. Opportunities for development of recreational facilities would be provided if desired by local residents.

DESCRIPTION OF PLANS

Several measures were considered for alleviating the flooding situation affecting the five areas of concern within the Wisconsin portion of the Fox River Basin as shown on plate 1. This section of the report presents a general description of the structural and nonstructural alternatives considered and subsequent detailed descriptions at each locality.

General Description - Structural Plans

Structural alternatives were developed for the urban areas of Pewaukee, Waukesha, and Burlington and the agricultural lands of the Wind Lake drainage area. Measures utilized consisted of levees, floodwalls, and channel modifications. Ponding areas, pumping plants, and other facilities were included as necessary. Levees are an economical means of providing flood protection to a developed area where sufficient space is available between the river and the properties to be protected to permit construction. The levees would be constructed of impervious fill obtained from borrow areas located at an average of 2 miles from the project site. The minimum crown width would be 8 feet with 1V on 3H side slopes. The crown and levee slopes would be seeded.

In areas of confinement where the existing development prohibits construction of levees due to space restrictions, concrete floodwalls would be utilized. Floodwall and/or levee design and dimensions would vary with site conditions and locations, however, all structures would include a minimum of 3 feet of freeboard above the design flood level. Sandbag closures, closure structures and road raises, depending on the height of protection required, would be constructed at city streets and railroad tracks which intersect the line of protection.

Channel improvements help to alleviate flooding by increasing the flow efficiency of the channel. This is done through a variety of means, such as straightening the channel's alignment, widening or deepening the channel bed, or paving the channel. The improvements increase the flow efficiency of the channel, which results in a degree of flood protection by allowing the conveyance of flood flows at reduced depths.

General Description - Nonstructural Plans

Nonstructural alternatives on the Fox River involved floodproofing and evacuation - relocation. For the nonstructural analysis of each location, the buildings were grouped into categories of residential, commerical, and industrial structures.

Residential floodproofing and/or evacuation included the most functional and cost-effective combinations of:

* Raising structures on existing foundations to a height above the flood.

* Relocating residents and their belongings to homes of equivalent value outside of the flood plain that are decent, safe, and sanitary.

* Relocating the structures to sites outside of the flood plain.

* Floodproofing structures using temporary closures.

* Relocating utilities (household, mechanical, and electric equipment) from the basements to enclosed utility rooms adjacent to houses at the first floor level.

The following assumptions were made in regard to this nonstructural analysis of residential structures:

* Most houses that lie in the flood plain are not structurally capable of withstanding hydrostatic pressures or holding out seepage to be effectively floodproofed using temporary closures.

* If the depth of water in the street(s) adjacent to the house were 3 feet or greater, the street(s) would be impassable to emergency vehicles. Therefore, residents and their belongings would be relocated.

* If the depth of water were less than 3 feet in the adjacent street(s) but higher than 1 foot below the first floor, the house would be raised.

* The utilities are located in the basement of houses that have a full basement.

* The utilities are located on the first floor in houses that have a crawl space or slab foundation.

* Houses that are to be raised will be raised to a level in which the first floor is 1 foot above the flood surface elevation.

* If the house has a full basement and the water surface is at ground elevation or above, but not higher than 1 foot below the first floor level, the utilities would be relocated.

Nonstructural actions utilized for commercial structures included:

* Relocating businesses to structures of equivalent value located outside of the flood plain.

* Floodproofing with temporary closures.

* Constructing I-walls or ring levees to floodproof large buildings or clusters of smaller buildings when economically feasible.

Assumptions applied to the nonstructural analysis of commercial structures were:

* If the depth of water in the adjacent street(s) is 3 feet or greater, the business would be relocated to a building that lies outside of the flood plain.

* When the water is less than 3 feet deep in the adjacent street(s) but higher than 2 feet above the first floor of the building, the business would be relocated outside of the flood plain.

* The cost of relocating a business equals the sum of the average moving expenses plus the value of the building in which the business is located.

* Few buildings are capable of being floodproofed with temporary closures to a depth of 2 feet above the first floor.

* Temporary closures consist of aluminum flood shields and a sewer gate valve.

Nonstructural solutions for industrial structures are similar to those for commercial structures with one major difference. Economically speaking, it is not feasible to relocate an industry to an alternative site outside of the flood plain.

No Additional Federal Action (Without Project Condition)

This alternative assumes that no additional resource management measures would be adopted to reduce flood damages or provide for other water resource related economic, social, or environmental needs in the areas of study.

The proposal, while offering no solution to the area's existing anticipated problems or needs, is a valid alternative and provides a basis for comparison of other proposals. Regulatory controls, flood warning, flood-fighting, temporary evacuation, flood insurance, and flood disaster relief programs are considered as a part of the most probable future condition with no additional Federal program.

Village of Pewaukee, Wisconsin

A structural line of protection consisting of levees, floodwalls and channel modifications was considered along Pewaukee Lake and the Pewaukee River, as shown on plate 2. The plan would include 1,500 linear feet of low-level levees and floodwalls to prevent lake overflow and wave wash from overtopping Wisconsin Avenue. The channel capacity of the Pewaukee River downstream from the Pewaukee Lake outlet to Clark Street would be modified and improved to convey flood flows more efficiently. Levees on each side of the improved channel would be constructed to handle the design flood discharge.

The average heights of levees, floodwalls and the widths of the modified channels are summarized in table 1 below. Projects were developed for the 25- and 100-year design levels which represented the best range for potential feasibility.

TABLE 11

Economic Summary
Nonstructural Alternatives
Burlington, Wisconsin

Description	Federal First Cost($)	Non-Federal First Cost($)	Total First Cost($)	Average Annual Charges($)	Average Annual Benefits($)	Benefit-To-Cost Ratio
50-Year	956,000	--	956,000	77,700	21,400	0.28
100-Year	1,142,000	--	1,142,000	92,800	25,700	0.28

Review of tables 10 and 11 indicates that a project to protect Burlington from Fox River flooding is not economically feasible.

Village of Silver Lake

Analysis of flood protection alternatives at Silver Lake encompasses more areas than the village itself.

Two residential areas are located at the west end of Silver Lake. Three additional residential areas are located upstream. One area is located in Salem Township, approximately 3 miles upstream, and two others in Wheatland Township, approximately 6 miles upstream. For the purpose of analysis, the three residential areas were divided into five reaches as shown on plate 8.

Inspection of the shoreline of the five reaches indicated that structural measures using levees and floodwalls would not be cost effective. The length of protection in relation to the number of houses protected is excessive and gave a basis for the exclusion of structural measures. Previous documentation by the Southeast Wisconsin Regional Planning Commission states that levee and floodwall construction along these areas would require the removal of many residences to provide room for the construction. Because of this and the physical height of the protection, structural measures proved to be socially unacceptable to most residents and were not considered further in this study.

Nonstructural solutions involving floodproofing and limited acquisition were the only measures applicable to the Silver Lake area. Total flood plain evacuation was not acceptable to most residents. Studies therefore concentrated on floodproofing plans with acquisition of structures when depths exceed 3 feet. Plans were developed for the 10- and 25-year design levels which represented the best range for economic justification and were the only levels where stages did not require a complete evacuation program.

In reach 1, 21 residences would have to be evacuated and 2 homes raised an average of 3 feet at the 25-year level. For all practical purposes, protection at this level approached total evacuation. At the 10-year design, 11 homes would be acquired and the remaining 12 structures raised an average of 2 feet.

A 25-year project in reach 2 requires the raising of 53 homes an average of 2 feet. Thirty-one homes would be raised an average of 1.5 foot at the 10-year level of protection.

In reach 3, 8 homes would be raised an average of 2.75 feet and 28 acquired at the 25-year design level. Eighteen residences would be raised an average of 2 feet and 18 evacuated at the 10-year level.

Reach 4 involves raising 11 homes an average of 2 feet and 7 homes an average of 1.4 feet to provide 10- and 25-year protection, respectively.

Protection of reach 5 to the 25-year level requires the acquisition of three residences and the floodproofing of three homes using temporary flood shields over openings. Acquisition of the same three residences and floodproofing only one home would be required for 10-year protection.

Table 12 presents the costs, benefits and benefit-to-cost ratios for a nonstructural program at each of the five reaches in the Silver Lake area.

TABLE 12

Economic Summary
Nonstructural Alternatives
Silver Lake, Wisconsin

Description	Federal First Cost($)	Non-Federal First Cost($)	Total First Cost($)	Average Annual Charges($)	Average Annual Benefits($)	Benefit-To-Cost Ratio
Reach 1						
10-Year	1,143,000	--	1,143,000	92,900	58,100	0.62
25-Year	1,396,000	--	1,396,000	113,500	69,200	0.61
Reach 2						
10-Year	1,107,000	--	1,107,000	90,000	14,700	0.16
25-Year	1,889,000	--	1,889,000	153,500	40,900	0.27
Reach 3						
10-Year	1,582,000	--	1,582,000	128,600	56,700	0.44
25-Year	1,708,000	--	1,708,000	138,800	70,600	0.51
Reach 4						
10-Year	241,000	--	241,000	19,600	4,700	0.25
25-Year	374,000	--	374,000	30,400	10,500	0.34
Reach 5						
10-Year	187,000	--	187,000	15,100	3,800	0.39
25-Year	233,000	--	233,000	18,900	7,700	0.41

Because none of the above plans were economically feasible, no further study was made at Silver Lake.

SECTION 3 - RECOMMENDATIONS

Since the Corps of Engineers involvement in flood damage reduction measures cannot be economically justified for the communities studied, it is recommended that the Federal Government undertake no improvements at those communities. In regard to the specific problem areas investigated, it is recommended that the governments of the affected entities should:

* Enact regulatory controls for the use and development of the flood plain to prevent new developments that are likely to be damaged by periodic flooding.

* Within developed areas, enact flood plain regulations and local programs to encourage floodproofing of structures, elevation of first-floor levels of new structures, removal of older buildings as they become available, and, where practicable, the gradual conversion of land to uses which minimize damages.

* Establish a flood warning system using the flood warning information available through the National Weather Service, and continue active participation in the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA).

* Seek planning assistance and technical information from the Corps of Engineers to aid in the understanding of flood hazards and the development and implementation of flood plain management programs.

William C. Burns
Colonel, Corps of Engineers
District Engineer