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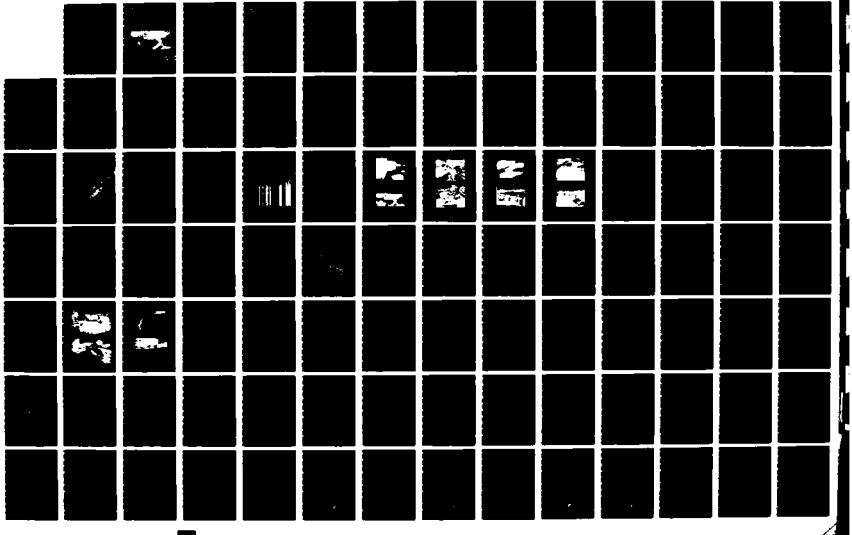

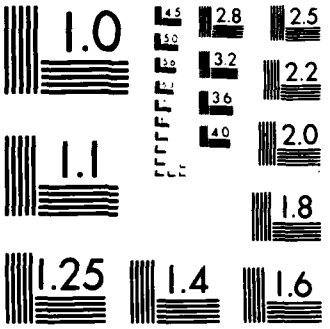

US Army Corps
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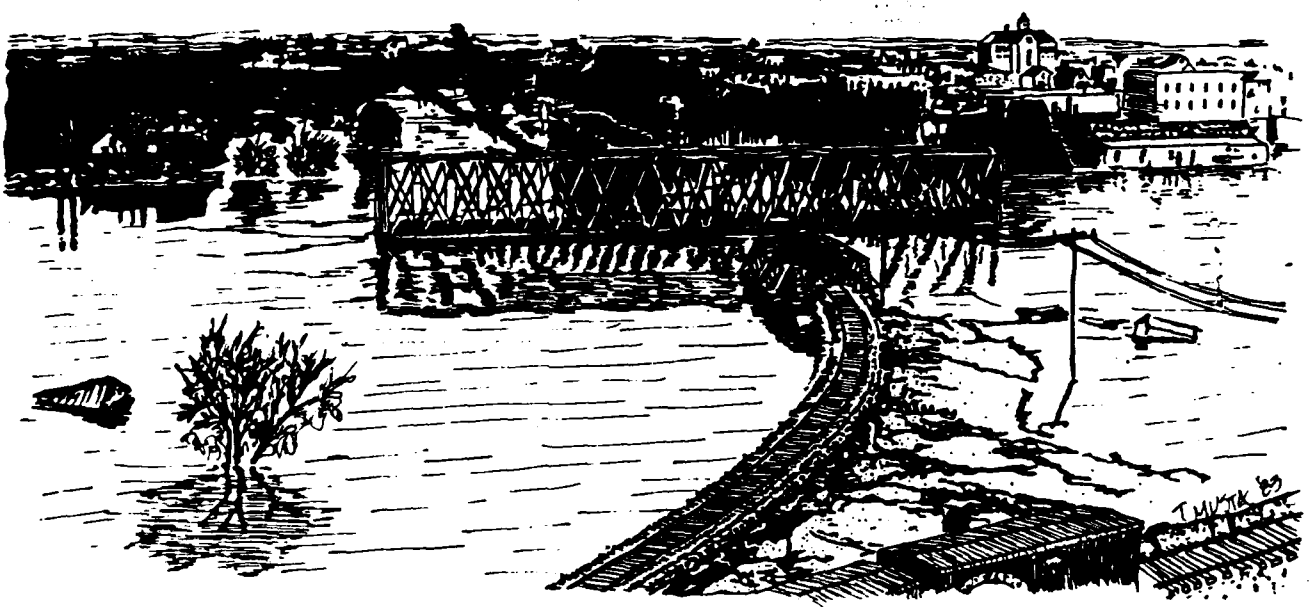
St. Paul District

GENERAL REEVALUATION AND SUPPLEMENT TO ENVIRONMENTAL IMPACT STATEMENT FOR FLOOD CONTROL AND RELATED PURPOSES



RED AND RED LAKE RIVERS AT EAST GRAND FORKS, MINNESOTA

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NOVEMBER 1984

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REPLY TO
ATTENTION OF:

GENERAL REEVALUATION
FOR FLOOD CONTROL AND RELATED PURPOSES
RED AND RED LAKE RIVERS AT
EAST GRAND FORKS, MINNESOTA

NOVEMBER 1984

GENERAL REEVALUATION
FOR FLOOD CONTROL AND RELATED PURPOSES
RED AND RED LAKE RIVERS AT
EAST GRAND FORKS, MINNESOTA

MAIN REPORT AND
ENVIRONMENTAL IMPACT STATEMENT

NOVEMBER 1984

GENERAL REEVALUATION
FOR FLOOD CONTROL AND RELATED PURPOSES
RED AND RED LAKE RIVERS AT
EAST GRAND FORKS, MINNESOTA

SYLLABUS

The East Grand Forks General Reevaluation is a study of flood problems at East Grand Forks, Minnesota.

This report brings together engineering, economic, and environmental information and analyzes a wide range of structural and nonstructural measures for their merit in reducing flood damages at East Grand Forks. Levees were identified as the only structural measure capable of significantly reducing flood damages at East Grand Forks. The report recommends detailed design studies of a plan which includes levees in combination with nonstructural measures to include floodproofing, acquisition/relocation, floodplain zoning, flood warning and forecasting, flood insurance, and an emergency plan of action.

EAST GRAND FORKS, MINNESOTA

GENERAL REEVALUATION

MAIN REPORT AND ENVIRONMENTAL IMPACT STATEMENT

TABLE OF CONTENTS

Item	Page
SYLLABUS	
INTRODUCTION	1
Purpose	1
Scope	1
Authority	2
The Report	4
Planning Process	4
Study Participants and Coordination	5
Prior Studies and Reports	6
Existing Water Projects	8
PLAN FORMULATION	10
General	10
Population Trends	10
Economy/Employment	10
Housing	11
Education	12
Government	12
Community Services	13
Problem Identification	15
General	15
Changes Since Authorization	20
Occurrence of Outstanding Floods	20
Economic Conditions	27
Views of Local Interests	28
Plan Formulation Procedures	28
Engineering Requirements	31

TABLE OF CONTENTS (Cont.)

Item	Page
Environmental and Social Impacts and Effects	31
Existing Without Plan Condition Resource Base	33
General	33
Emergency Levees	33
Floodplain Zoning	37
Flood Insurance	38
Acquisition	38
Emergency Flood Fighting	39
Emergency Flood Warning and Forecasting	41
Unstable Riverbanks	43
Economic Factors	48
Social Setting	49
Environmental Resources	51
Cultural Resources	52
Recreation Resources	54
Future Without Condition Resource Base	54
General	54
Engineering	54
Economic	56
Social	58
Natural Resources	60
Cultural Resources	60
Recreation	61
Problems and Opportunities	63
Problems	63
Opportunities	64
Formulation of Measures and Plans	65
Objectives	65
National Objective	65
Planning Objectives	65

TABLE OF CONTENTS (Cont.)

Item	Page
Plan Formulation Rationale	66
Management Measures Considered	67
No Action Measure	67
Measures to Modify Floods	67
Measures to Modify Damage Susceptibility	68
Formulation of Measures	69
Initial Review	69
Analysis of Measures	71
Formulation of Plans	87
First Level Formulation of Plans	87
Second Level Formulation of Plans	101
Future Investigations (GDM Documents)	114
DESCRIPTION OF SELECTED PLAN	115
Plan Components	115
North of the Red Lake River	115
South of the Red Lake River	118
Design and Construction Considerations	118
Structural Measures	118
Nonstructural Measures	119
Operation and Maintenance Considerations	120
Plan Accomplishments	120
Summary of Effects	121
Economic	121
Social	121
Cultural	122
Recreation	123
Environmental	123
PLAN IMPLEMENTATION	123
Institutional Requirements	124
Levees and Floodwalls	124

TABLE OF CONTENTS (Cont.)

Item	Page
Permanent Evacuation	125
Floodplain Zoning	126
Flood Insurance	126
Flood Emergency Plan of Action	126
Flood Warning and Forecasting	127
Division of Plan Responsibilities	127
Real Estate	129
Views of Non-Federal Sponsor	130
SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS	130
RECOMMENDATIONS	132
ENVIRONMENTAL IMPACT STATEMENT	
ATTACHMENT 1 - COMMENTS AND RESPONSES	

TABLES

Item	Page
Population Totals for 1960, 1970, and 1980, Polk County, East Grand Forks, and the SMSA	10
Housing Units in East Grand Forks, 1960, 1970, and 1980	11
Flood Chances for East Grand Forks	19
Highest Floods in Order of Magnitude, Red River of the Nortn at East Grand Forks, Minnesota	22
Flood Damages Under Present and Historic Conditions	27
Damages by Event Frequency ($ Millions)	27
History of Flood Insurance Policy Use, East Grand Forks	38
Emergency Flood Fight Costs, 1965 - 1979	40
Actual Flood Damages, East Grand Forks	48
Damages by Event Frequency ($ Millions)	48
Average Annual Flood Damages ($ Millions)	57
Advantages and Disadvantages of Flood Damage Reduction Measures	70
Initial Cost Estimate of Levee Measure ($ Millions)	86
Summary Comparison of Impacts by Plan	98

TABLE OF CONTENTS (Cont.)

TABLES

Item	Page
Benefit-Cost Ratios for 100-year and Standard Project Floods at the Authorized Interest Rate	101
Total Flood Damage Reduction Plan for East Grand Forks, Minnesota	102
Federal and Non-Federal Costs ($ 1,000's)	106
Benefit-Cost Ratios for Plans 6, 7, and 8	107
Summary Comparison of Plan Impacts	109

FIGURES

Authorized Project	9
Location Map	16
1-Percent Chance and Standard Project Flood Outlines	18
Floods Above Bankfull Stage at East Grand Forks, Minnesota	21
Change in City Limits, 1950 and 1984	32
East Grand Forks, Minnesota, Emergency Levee System	34
Locations of Known or Potential Instability, East Grand Forks	36
Existing Glacial Lake and Riverbed Conditions, Red and Red Lake Rivers, East Grand Forks, Minnesota	44
Risk of Damages in Percent Chance for Selected Flood Events Occurring During the Study Period, 1990 - 2090	57
Deteriorating and Commercial Areas, East Grand Forks, Minnesota	59
East Grand Forks Phase I GDM, Grand Marais Coulee, Measure 1A	78
East Grand Forks Phase I GDM, Grand Marais Coulee, Measure 1B	80
East Grand Forks Phase I GDM, Grand Marais Coulee, Measure 2A	82
East Grand Forks Phase I GDM, Grand Marais Coulee, Measure 2B	83
Alignment Configurations, East Grand Forks, Minnesota	85
Plan 7, Standard Project Flood, East Grand Forks, Minnesota	104
Recommended Plan, East Grand Forks, Minnesota	116

TABLE OF CONTENTS (Cont.)

PHOTOGRAPHS

Item	Page
1897 Flood (Demers Avenue - East Grand Forks Looking East)	23
1897 Flood (Swing Bridge - East Grand Forks Looking East)	23
1950 Flood (The Point - East Grand Forks Looking Northeast)	24
1950 Flood (Central City - East Grand Forks Looking Southeast)	24
1965 Flood (Dike Street - East Grand Forks Looking Northeast)	25
1965 Flood (First Avenue NW - East Grand Forks Looking South)	25
1979 Flood (The Point - East Grand Forks Looking East)	26
1979 Flood (First Street NW - East Grand Forks Looking South)	26
1980 Large Displacement East of Crookston, Minnesota	46
1953 Large Displacement, Grand Forks, North Dakota	47
Without Plan Future for the Downtown Area of East Grand Forks	112
With Plan Future for the Downtown Area of East Grand Forks	113

GENERAL REEVALUATION
FOR FLOOD CONTROL AND RELATED PURPOSES
RED AND RED LAKE RIVERS AT
EAST GRAND FORKS, MINNESOTA

INTRODUCTION

PURPOSE

The purpose of this planning study and report is to reformulate flood damage reduction measures and plans at East Grand Forks, Minnesota. In 1953, a federally authorized project was planned and designed to protect the city from flooding. Since the 1953 project design, many changes have occurred which require a reevaluation of the authorized project and reformulation of other measures and plans.

SCOPE

This planning study reevaluates the authorized project and other measures and plans to be responsive to changed conditions and needs since authorization (1953). This study updates the planning, engineering, economic, and environmental data base, in accordance with current Federal water resource planning policies, procedures, and regulations, to aid decision-makers in the identification and selection of the best flood damage reduction plan for East Grand Forks. The study area is limited to the municipality of East Grand Forks and any other areas upstream and downstream along the Red River of the North, the Red Lake River, and tributaries which may be affected by proposed measures and plans.

AUTHORITY

This project, as described in House Document 185-81-1, was authorized by the Flood Control Acts approved 30 June 1948 and 17 May 1950. The Flood Control Act approved 31 December 1970 extended authorization of this project to 17 April 1975 to allow local interests additional time to furnish local cooperation assurances. The pertinent paragraphs are reproduced below:

1. The portion of the 1948 act authorizing this project is:

   "The comprehensive plan for flood control and other purposes in the Red River of the North drainage basin, North Dakota, South Dakota, and Minnesota as set forth in the report of the Chief of Engineers dated May 24, 1948, is approved and there is hereby authorized the sum of $2,000,000 for the partial accomplishment of that plan."

2. Supplemental authorization in the 1950 act is:

   "In addition to previous authorizations, there is hereby authorized the completion of the plan approved in the Flood Control Act of June 30, 1948, in accordance with the report of the Chief of Engineers contained in House Document Numbered 185, Eighty-first Congress, for the Red River of the North Basin, at an estimated cost of $8,000,000."

3. The 1970 act states:

   "Notwithstanding the first proviso in section 201 of the Acts entitled 'An Act authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other

purposes' approved June 30, 1948 (62 Stat. 1171) and May 17, 1950 (64 Stat. 63), the authorization in section 203 of the Act of June 30, 1948, and section 204 of the Act of May 17, 1950, of the project for local protection at East Grand Forks, Minnesota, shall expire on April 17, 1975, unless local interests shall before such date furnish assurances satisfactory to the Secretary of the Army that the required local cooperation in such project will be furnished."

A local cooperation agreement was furnished by East Grand Forks and accepted in 1975. Local interests would be required to:

1. Provide without cost to the United States all lands, easements, rights-of-way, and spoil disposal areas necessary for the construction and subsequent maintenance of the proposed channel and levee improvements, when and as required.

2. Hold and save the United States free from damages due to the construction and subsequent maintenance of those works, except for damages due to the fault or negligence of the Government or its contractors.

3. Maintain and operate all of the channel and levee improvement works after completion in accordance with regulations prescribed by the Secretary of the Army.

4. Make at their own expense all necessary changes to utilities, highways, and bridges including approaches.

5. In acquiring lands, easements, rights-of-way and spoil disposal areas necessary for the construction and subsequent maintenance of the flood protection works, comply with the applicable provisions of the "Uniform Relocation Assistance and Real

Property Acquisition Policies Act of 1970", Public Law 91-646, approved 2 January 1971.

THE REPORT

This report is divided into two parts: (1) Main Report and (2) Supporting Documentation. The main report identifies the study objectives, the planning constraints, and the planning process; summarizes the results of supporting studies as they are used to identify, evaluate, screen, and select various measures and plans; summarizes the views of interested publics; and recommends a plan composed of several flood reduction measures for design study. The supporting documentation contains the detailed support studies used to reach the study findings and recommendations.

PLANNING PROCESS

This general reevaluation study was a three-level planning effort. Each succeeding level reflected an increase in planning detail, focusing on problem identification, plan formulation, impact assessment, evaluation, and screening of alternative measures and plans until decision-makers could identify and select a best plan. The first level of effort, a plan of study, emphasized the flood problem and possible measures and plans to solve the problem. The second level of effort (working papers) emphasized identification, evaluation, and screening of a full range of flood damage reduction measures and identification of preliminary plans. The third level of effort (this report) provides a recommendation for construction and implementation of the best flood damage reduction plan for East Grand Forks. The report recommends Federal participation in the plan.

The next step in the planning process is the detailed design of the plan's structural and nonstructural measures. The output of future

design studies is a general design memorandum which includes the detailed engineering, economic, and environmental aspects of the selected plan and project features.

STUDY PARTICIPANTS AND COORDINATION

The Corps of Engineers has primary responsibilities for conducting the planning study, reformulating project alternatives and formulating other plans, consolidating information from other agencies and local interests, and preparing the report. Federal agencies with responsibilities to provide advice and information in key areas include the Fish and Wildlife Service, Geological Survey, Department of Transportation, Heritage Conservation and Recreation Service, Environmental Protection Agency, and Soil Conservation Service. Liaison was maintained with concerned State and local agencies in Minnesota such as the Minnesota Department of Natural Resources, Department of Transportation, and Pollution Control Agency; Polk County; and the city of East Grand Forks. Because of the wide range of measures analyzed, coordination was necessary with the city of Grand Forks, various nearby rural townships, and other groups interested in water resource problems of the Red River Valley.

The most intensive coordination was with city officials and residents of East Grand Forks because this flood control project is authorized solely for local protection, would benefit primarily East Grand Forks, and is composed of work elements within its municipal boundaries. The mayor and city council of East Grand Forks appointed a flood control committee to work with the Corps in formulating and selecting alternatives. This committee is composed of members of the city council, the civil defense director, residents of the floodplain, and a liaison contact with Grand Forks. Meetings with this committee began shortly after initiation of the study in November 1979 and continued, as necessary, throughout the study.

PRIOR STUDIES AND REPORTS

Several studies of the flood problems in the Red River of the North basin have been conducted. Significant studies that have an impact on the city of East Grand Forks include:

- o Definite Project Report on Red River of the North at Grand Forks, North Dakota-East Grand Forks, Minnesota, May 1953. Following the 1948 project authorization, the most detailed investigation of East Grand Forks' flood problems and possible solutions was performed for the Definite Project Report. This report contained detailed designs for the authorized projects at Grand Forks and East Grand Forks. Construction of the authorized project at Grand Forks was undertaken in the 1950's. The design for East Grand Forks was completed, but the project was never constructed.

- o Red Lake River Subbasin, Minnesota, Feasibility Study for Flood Control and Related Purposes, March 1977. This study concluded that a reservoir near Huot, Minnesota, could provide significant protection for Crookston, Minnesota, and was socially acceptable. It would not, however, provide significant protection for East Grand Forks. No plans were found to be economically feasible and no Federal projects were recommended.

- o Grand Forks-East Grand Forks Urban Water Resources Study, July 1981. This study reviewed the feasibility of the 1953 authorized levee plan, examined the feasibility of increasing the degree of protection of the authorized plan, evaluated the feasibility of flood protection for new areas of development upstream and downstream of the authorized project, and prepared an emergency plan of action for the city until such time as a more permanent flood damage reduction plan could be carried out in East Grand

Forks. The study found the authorized project with modifications to be feasible and in 1977 recommended further analysis of the flood problem during postauthorization studies.

- o General Reevaluation and Environmental Impact Statement for Flood Control and Related Purposes, Sheyenne River, North Dakota, April 1983. The Corps has completed postauthorization studies on the Sheyenne River, North Dakota. The report findings indicate that construction of recommended flood control improvements on the Sheyenne River would not significantly reduce flood stages at East Grand Forks.

- o The Corps has completed studies on the Wild Rice River, Minnesota. The study findings indicate tnat recommended flood control improvements on the Wild Rice River would not significantly reduce the flood problem at East Grand Forks. For both the Sheyenne River and the Wild Rice River, results to date indicate, both in timing and effect, that possible flood control improvements are too far upstream to have a significant impact on flood stages at East Grand Forks.

- o The Department of Housing and Urban Development, Federal Insurance Administration, conducted the following studies for the city to help local and regional planners promote sound land use and floodplain management:

  - Flood Insurance Study, City of East Grand Forks, Minnesota, Polk County, September 1977, HUD.

  - FIRM Flood Insurance Rate Map, Community - Panel Number 2752360005C Revised 20 July 1979.

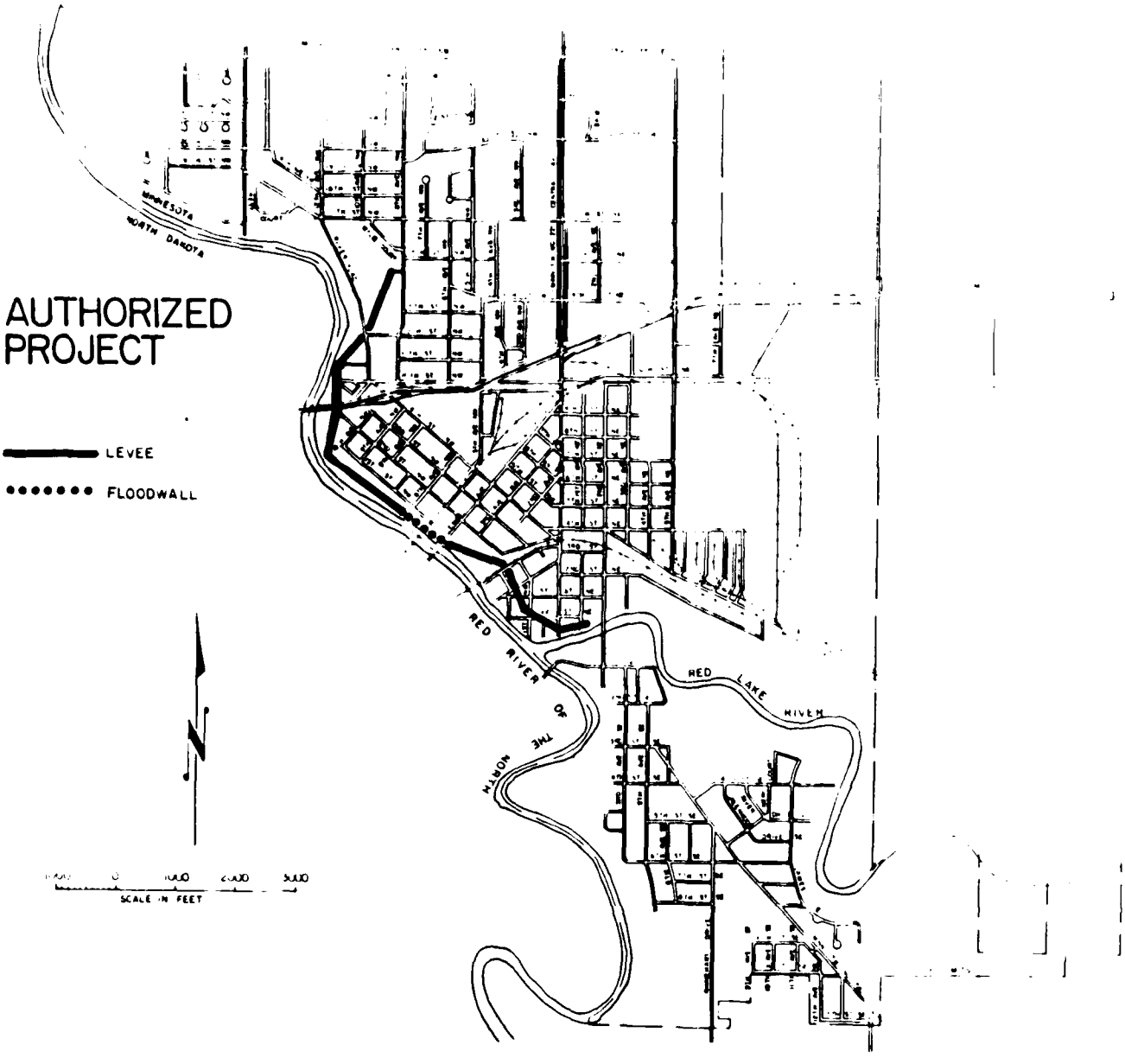
EXISTING WATER PROJECTS

On the basis of the 1953 Definite Project Report prepared by the St. Paul District, Congress authorized a levee plan for East Grand Forks. Until recently, the authorized plan was not studied further because the city would not indicate that it would meet local cooperation requirements. Following several serious floods in the mid-1960's, the city signed an official agreement indicating willingness to participate in the project.

During the floods in the mid-1960's, emergency levees were constructed which generally followed the alignment of the levees authorized in the 1953 Definite Project Report (see the following figure). Beginning with the flood of 1965 and with repeated emergency activities in 1966, 1969, 1975, 1978, and 1979, these levees were raised, widened, and extended to provide emergency flood protection for an increasing number of residents of East Grand Forks. The major portion of emergency levees remains in place from year to year. As floodwaters subside, some portions need to be removed primarily to relieve the excess weight of levee fill on unstable riverbanks.

It should be emphasized that the emergency levees do not meet the Corps of Engineers standards for permanent flood protection at East Grand Forks. They have, however, provided emergency protection against major floods, but at considerable expense to the resources of local, State, and Federal agencies.

EAST GRAND FORKS , MINNESOTA



PLAN FORMULATION

GENERAL

POPULATION TRENDS

The following table illustrates population totals for Polk County, East Grand Forks, and the Standard Metropolitan Statistical Area (SMSA) for 1960, 1970, and 1980. During this 20-year period, the population of Polk County decreased 3.7 percent.

Population Totals for 1960, 1970, and 1980
Polk County, East Grand Forks, and the SMSA

Place	1960	1970	1980	% Change 1960-70	% Change 1970-80	% Change 1960-80
Polk County	36,182	34,435	34,844	-4.8	1.2	-3.7
East Grand Forks	6,998	7,607	8,537	8.7	12.2	22.0
SMSA	85,000	96,000	101,000	12.9	5.2	18.8

SOURCE: U.S. Census Bureau

ECONOMY/EMPLOYMENT

East Grand Forks, Minnesota, and Grand Forks, North Dakota, form a strong regional trade center. The cities are an example of a metropolitan area working together while servicing the respective States of each city. Industry is a significant force in East Grand Forks. Agriculture plays an important role in the area economy. The diversity of the area produces a relatively stable local economy.

Agriculture

The flat, former glacial lakebed that forms the Red River Valley makes it one of the Nation's most productive small grain, potato, and sugar

beet areas. Over 40 percent of all economic activity in the East Grand Forks area is directly related to agriculture.

Commercial/Industrial

Manufacturing enterprises in East Grand Forks include processing plants for locally-grown grain, potatoes, and sugar beets. One of the major employers is the American Crystal Sugar Company, with 200 employees. Five firms perform various potato processing and related warehousing functions. Old Dutch Foods employs 40 area residents.

Retail

In Polk County, food stores, auto dealers, and service stations dominate the retail trade, accounting for 52 percent of total county retail sales in 1972.

Other

Located approximately 10 miles from East Grand Forks, the Grand Forks Air Force Base contributes to the economy of the Grand Forks-East Grand Forks metropolitan area.

HOUSING

Total housing units for East Grand Forks in 1960, 1970, and 1980 are shown in the following table.

Housing Units in East Grand Forks, 1960, 1970, and 1980

Place	1960	1970	1980	% Change 1960-70	% Change 1970-80	% Change 1960-80
East Grand Forks	2,038	2,282	3,467	11.9	51.9	70.1

SOURCE: U.S. Census Bureau

In East Grand Forks, 37.5 percent of the housing units were constructed before 1940. Development of the city has generally followed a concentric zone pattern, expanding from the central core areas toward the outer fringe areas.

EDUCATION

East Grand Forks Independent School District 595 includes seven schools: three elementary, a junior high, a senior high, one vocational center, and a vocational technical institute providing cooperative high school and post-high school training.

Sacred Heart parochial (Roman Catholic) schools provide elementary and high school education.

College-level educational opportunities are available at the University of North Dakota in Grand Forks and at the University of Minnesota Technical College and a community college in Crookston, Minnesota.

Educational attainment levels in the Polk County and East Grand Forks areas are 9.2 and 12.1 years, respectively. As a comparison, the median school years completed in Minnesota are 12.2.

GOVERNMENT

The East Grand Forks political structure operates under a mayor-council form of government. Council members are elected every 4 years, while the mayor is elected for a 2-year term.

Major city governmental departments include the Administration, Municipal Court, School System, Police and Fire, and Recreation. Primary sources of revenue for East Grand Forks city operations include

property taxes, various fees and miscellaneous taxes, Federal/State allotments, and utility assessments and revenues.

COMMUNITY SERVICES

Communication

East Grand Forks has one weekly newspaper, The Exponent.

Radio station KRRK broadcasts 24 hours daily with a broadcasting range of 120 miles. The University of North Dakota sponsors KFJM, a radio station featuring noncommercial broadcasting from sunrise to sunset. Three other radio stations serve the area.

Five television channels are available for residents' viewing. Telephone service is available through Northwestern Bell Telephone Company.

Transportation

Located at the junction of U.S. Highways 2 and 220, East Grand Forks is across the Red River of the North from Grand Forks, North Dakota.

Access to Interstate Highway I-29 near Grand Forks provides area residents a convenient route north to Canada and south to Mexico. U.S. Highway 2 is the east/west route in the northern part of the United States, spanning the Nation from Portland, Maine, to Spokane, Washington. Commercial airline service is available at Grand Forks International Airport, 7 miles from East Grand Forks.

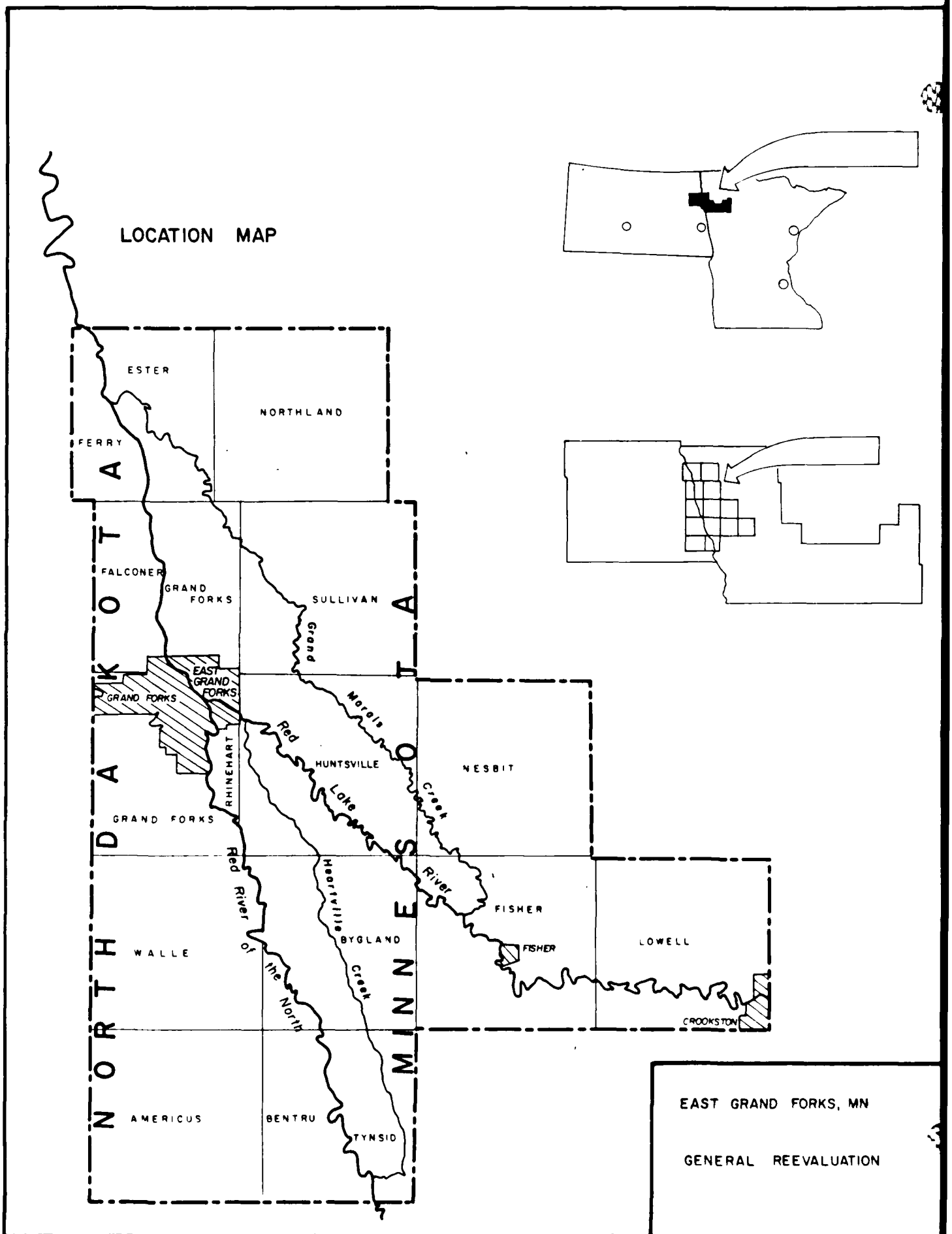
PROBLEM IDENTIFICATION

GENERAL

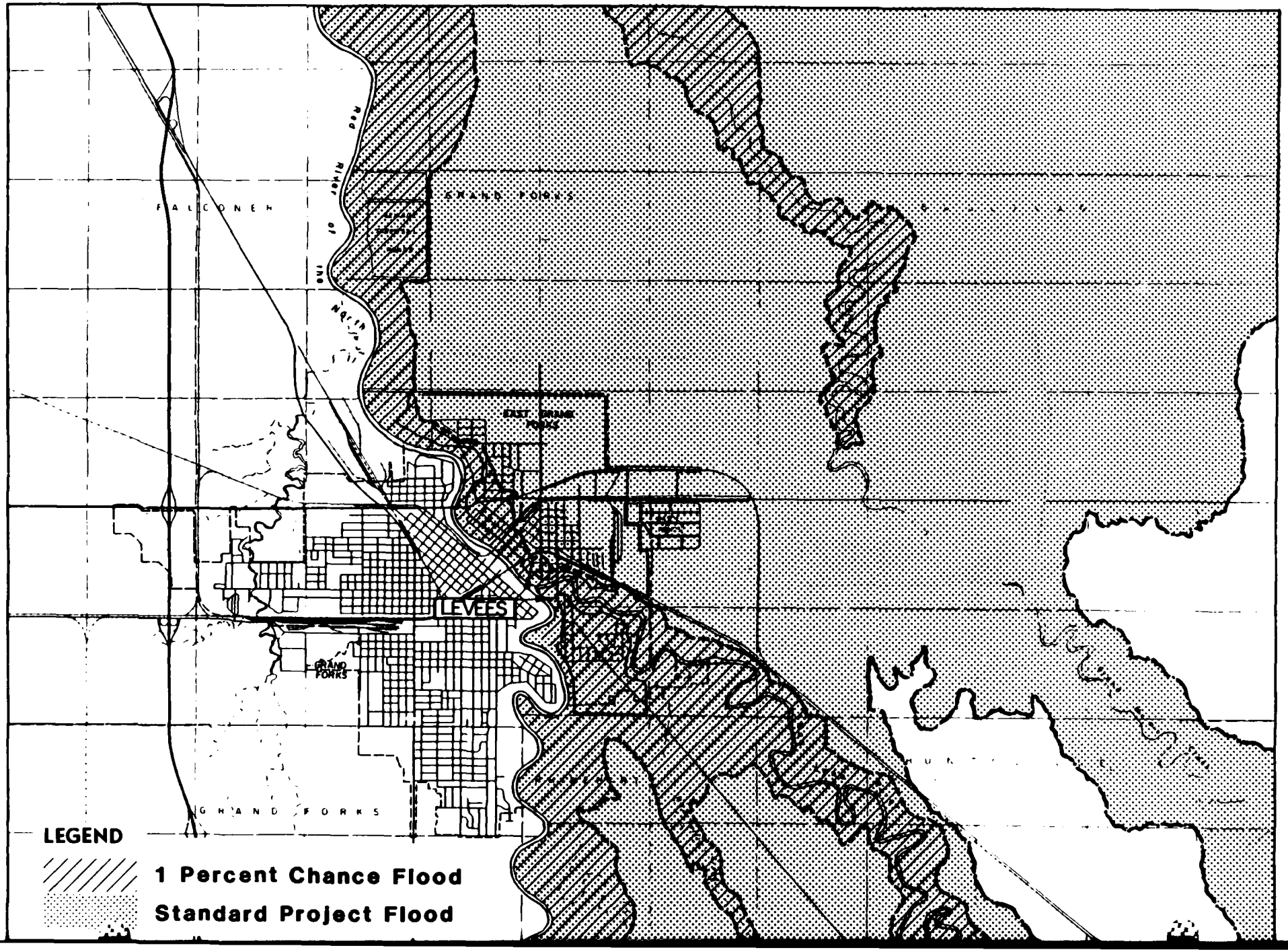
East Grand Forks lies on the east bank of the Red River of the North approximately 298 miles above the mouth of the river at Lake Winnipeg, Manitoba, Canada (see the following figure). The drainage area of the Red River at East Grand Forks is about 20,600 square miles. The Red Lake River bisects the community and intersects the Red River upstream of the commercial area. The Red Lake River drains approximately 5,700 square miles. The Red Lake River provides about 45 percent of the normal flow of the Red River at East Grand Forks and, like the Red River, is characterized by marked seasonal variations in flow. Spring snowmelt flows greatly exceed late summer and autumn low flows.

Grand Marais Coulee is another important tributary of the Red River. The coulee drains approximately 275 square miles in Minnesota and flows east and north of East Grand Forks to its confluence with the Red River of the North. At high flows on the Red River, water backs up the coulee toward East Grand Forks. At high flows on the Red Lake River, water breaks out of the Red Lake River near Fisher, Minnesota, and flows northwest to the Red River. High flows in the coulee have blocked normal traffic in the area.

Heartville Creek is another important creek that drains a small watershed paralleling the east side of the Red River of the North upstream of East Grand Forks. At high flood levels such as in 1979, flows on the Red River break out of the Red River into the creek and flow north to its confluence with the Red Lake River at East Grand Forks. Flows also back into the creek from high flows on the Red Lake River. Hign flows in this tributary have blocked normal transportation routes in the area.


LOCATION MAP
ESTER
NORTHLAND
FERRY
FALCONER
GRAND FORKS
SULLIVAN
Grand
EAST GRAND FORKS
GRAND FORKS
Marais
Red
HUNTSVILLE
NESBIT
RHINEHART
Lake
Creek
GRAND FORKS
Red River
River
FISHER
Hoorville
BYGLAND
FISHER
LOWELL
WALLE
Red River of the North
Creek
CROOKSTON
AMERICUS
BENTRU
TYNSID
NORTH DAKOTA
MINNESOTA
EAST GRAND FORKS, MN
GENERAL REEVALUATION

Naturally, the most severe flooding comes when high discharges on the Red and Red Lake Rivers coincide. Under flood conditions, East Grand Forks is subject to high water along four general areas: the east bank of the Red River, the north and south banks of the Red Lake River, backwater from Grand Marais Coulee on the north and east city boundaries, and backwaters along Heartville Creek. The following figure identifies the 1-percent chance and standard project flood outlines for East Grand Forks. Forty-four percent of the city's land area is inundated by the 1-percent chance flood with much indirect damage as a result of storm water and sanitary sewer backup. At the standard project flood level, virtually the entire city is flooded.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LEGEND
1 Percent Chance Flood
Standard Project Flood

The following table displays the city's flood risk for a given flood event in percent chance of occurrence in a given time interval.

Flood Chances for East Grand Forks

Flood	Stage (Feet)	Elevation (Feet)	Discharge (cfs)	Percentage of Risk for Given Time Interval in Years					
				5	10	20	50	70	100
5-year	39.0	817.3	30,800	67	89	99	100	100	100
10-year	43.6	821.9	45,000	40	65	88	99	100	100
25-year	47.2	825.5	66,200	18	34	56	87	94	98
50-year	49.3	827.6	84,900	10	18	33	64	76	87
100-year	**51.7**	**830.0**	**106,000**	**5**	**10**	**18**	**39**	**51**	**63**

Flooding of structures and flood damage at East Grand Forks begin at about a stage of 41 feet. To understand the chart and flood risk, follow the boldface example. A 100-year flood is a flood which would raise the water level of the Red River at Riverside Park (just below the dam) 51.7 feet above the existing river channel when dry. This is equal to an elevation of 830.0 feet above sea level. The river has a 1-percent chance of reaching this level in any given year. The flow at this level is 106,000 cubic feet per second which is the volume of water that will flow past every second. There is a 63-percent chance that a 100-year (1-percent chance) flood would occur in East Grand Forks in the next 100 years.

Principal physical factors contributing to flooding include the very flat river slope, northward drainage, channel obstructions, and past and future changes in the basin hydraulics such as agricultural drainage and diking. The low river slope of one-half foot per mile retards drainage from the area. The flow of surface runoff from southern areas into still frozen river reaches at times results in ice jams and increased river stages. Roads, bridges, and urban and agricultural levees obstruct and constrict flood flows. Local

interests feel strongly that improved agricultural drainage on lands tributary to the Red River has increased the amount of runoff and frequency of serious flooding along the Red River and Red Lake River. Farmer-constructed levees north of East Grand Forks have significantly reduced floodplain storage with resultant higher flood stages and velocities along these reaches.

CHANGES SINCE AUTHORIZATION

The authorized project was reevaluated to determine if the project as designed circa 1953 was still the best plan for the city based on changed conditions. Since authorization, changes have occurred in the following areas:

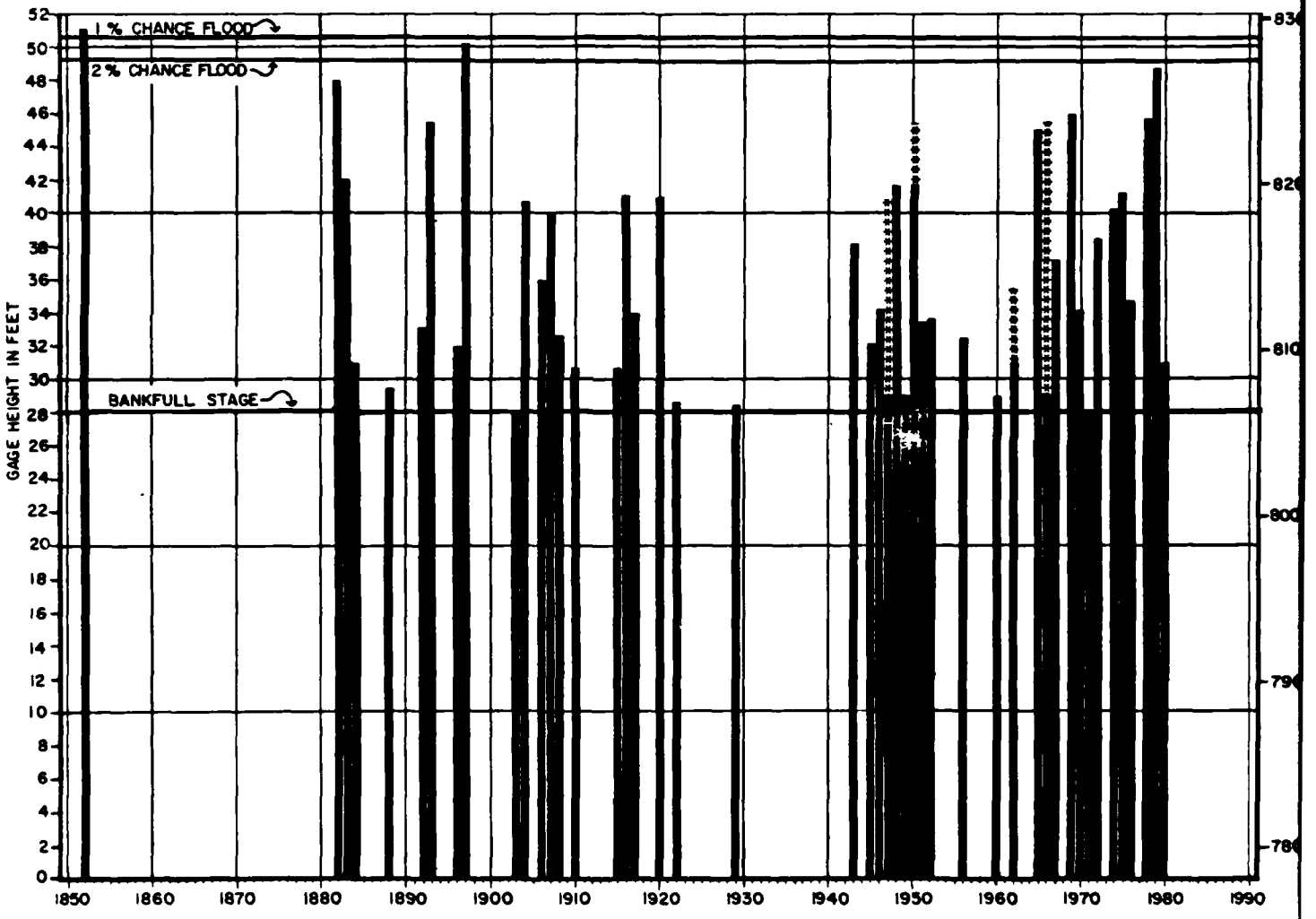
- o Occurrence of outstanding floods.
- o Economic conditions.
- o Views of local interests.
- o Plan formulation procedures.
- o Engineering requirements and cost factors.
- o Environmental and social impacts and effects.

Occurrence of Outstanding Floods

The floodplains of the four watersheds at East Grand Forks experience frequent flooding. The following figure identifies floods of record above bank-full stage at the U.S. Geological Survey gage on the Red River at East Grand Forks. Variations in shading on the graph indicate more than one flood during a given year. The horizontal lines identify the various floods in percent chance of occurrence for any given year based on historical records.

FLOODS ABOVE BANKFULL STAGE

EAST GRAND FORKS, MN. *



* (1) VARIATION IN SHADING ON THE BAR GRAPH INDICATES MORE THAN ONE FLOOD DURING THE YEAR.

(2) U.S.G.S. GAGE ON LEFT BANK 500 FEET DOWNSTREAM FROM DAM AT RIVERSIDE PARK IN GRAND FORKS AT MILE 295.7. GAGE ZERO, ELEVATION 778.35 N.G.V.D.

The following table displays the ten highest floods of record at East Grand Forks. Seven of the ten highest floods of record have occurred at East Grand Forks since 1950. In order of magnitude, the 1897 flood is the highest flood documented from historic records, although the 1979 flood of record came within one-half foot of the 1897 flood. The 1979 flood was approximately 3 feet below the 1-percent chance flood.

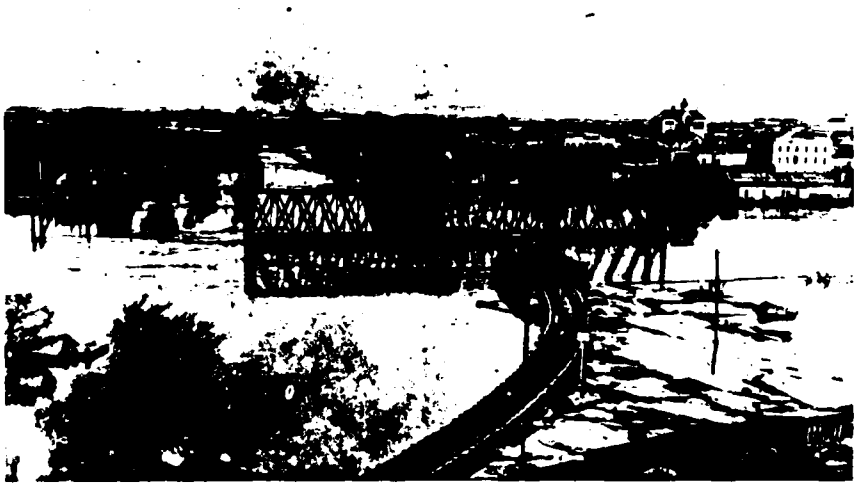
Highest Floods in Order of Magnitude
Red River of the North at East Grand Forks, Minnesota[1]

Date of Crest	Stage (Feet)	Elevation (Feet)	Estimated Peak Discharge (cfs)
10 Apr 1897	49.3	827.65	85,000
26 Apr 1979	48.6	827.00	82,000
18 Apr 1882	45.4	823.7	75,000
4 Apr 1966	45.55	823.90	55,000
11 Apr 1978	45.73	824.08	54,200
12 May 1950	45.5	823.8	54,000
16 Apr 1969	45.69	824.04	53,500
24 Apr 1893	43.8	822.2	53,300
17 Apr 1965	44.92	823.27	52,000
14 Jul 1975	43.27	821.62	42,800

(1) At river mile 295.7.

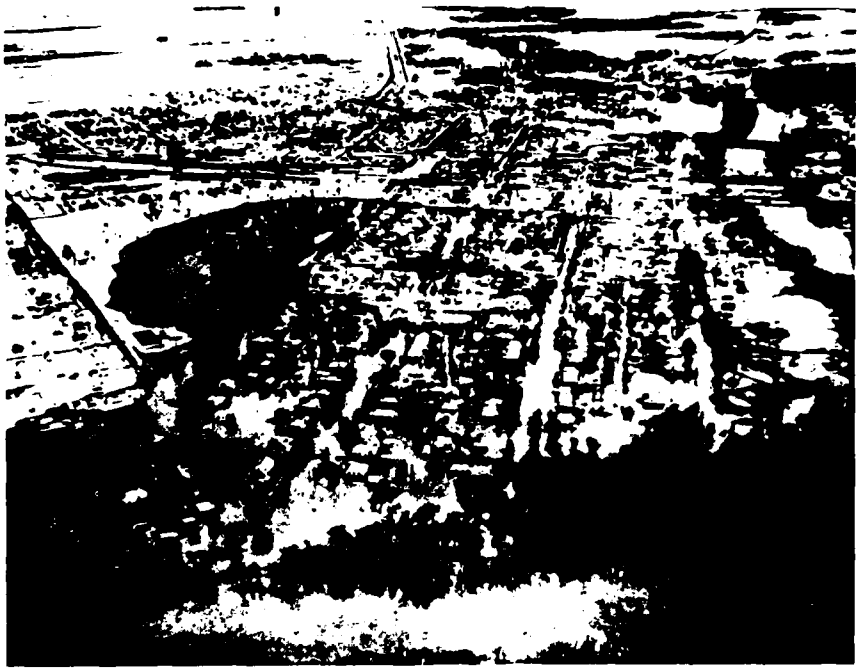
Other major floods occurred, in decreasing order of severity, in 1979, 1978, 1969, 1965, 1950, and twice in 1975. Seven of the ten highest floods of record have occurred since 1950. Scenes of some of the major floods are shown on the following photographs.

1897 Flood (Demers Ave. - East Grand Forks looking east)



1897 Flood (Swing Bridge - East Grand Forks looking east)

1950 Flood - (The Point - East Grand Forks looking northwest)



1950 Flood - (Central City - East Grand Forks looking southeast)

1965 Flood - (Dike Street - East Grand Forks looking northeast)

1965 Flood - (1st Ave. N.W. - East Grand Forks looking south)

1979 Flood - (The Point - East Grand Forks looking east)

1979 Flood - (1st Street Northwest - East Grand Forks looking southn)

Economic Conditions

The largest recorded flood in the city's history occurred in 1897. Under present conditions, this flood would have caused $32 million in damages. The latest flood occurred in 1979 and caused $3,687,000 in damages. The following table summarizes present and historic condition flood damages with and without a flood fight.

Flood Damages Under Present and Historic Conditions

Year	Damages Under Present Conditions Without a Flood Fight ($ Million's)	Actual Damages Under Historic Conditions Including the Flood Fight ($ Million's)
1979	23.6	8.9
1978	7.7	0.1
1975 (July)	2.4	0.4
1975 (April)	2.3	0.5
1969	7.7	0.1
1966	7.3	0.6
1965	6.0	0.8
1950	7.3	0.7
1897	32.0	-

The community has continued to grow and develop, increasing in population from 5,049 in 1950 to 8,537 in 1980. East Grand Forks is currently susceptible to significant flood damages. Flood damages for the study area have been identified for two major categories: residential damages and commercial damages. Commercial damages include industrial and public damages. The following table displays damages by category and event frequency.

Damages by Event Frequency ($ Millions)

Damage Category	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year	Standard Project Flood
Commercial	0	0	3.5	9.8	20.3	57.5	148.5
Residential	0.8	2.8	12.0	21.6	26.9	32.9	50.0
Total	0.8	2.8	15.5	31.4	47.2	90.4	198.5

Views of Local Interests

Until recently, the authorized plan at East Grand Forks was not implemented because the city would not guarantee that it would meet local requirements. In the 1950's this may have been an understandable position, considering that most residents at that time had experienced a major drought in the 1930's to the mid-1940's and only one major flood in the 1950's. However, following several serious floods in the late 1960's, the community's perception of flooding changed and the city signed an official agreement indicating willingness to participate in the project. The city has also entered the regular phase of the National Flood Insurance program adopted 23 September 1977. The State of Minnesota, Division of Waters, has also taken an active interest in the study and strongly supports project planning which incorporates structural and nonstructural measures.

Plan Formulation Procedures

Federal legislation, Federal Executive Orders, Corps policy and regulations, and local regulations critical to the reformulation of the authorized project have changed significantly since 1950. Over 66 changes in Federal legislation, 33 Federal Executive Orders, and numerous changes in Corps policy and regulations as well as local regulations and policy have occurred which directly or indirectly impact on the formulation and evaluation of the authorized project and other plans at East Grand Forks, Minnesota. The most significant change in Federal legislation is the requirements for formulation identified in the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" pursuant to the Water Resources Planning Act of 1965 (Public Law 89-80, as amended 10 March 1983). Significant Federal Executive Orders, as amended, include: Executive Order 11514 which outlines the responsibilities of Federal agencies in consonance with Title I of the

National Environmental Policy Act of 1969; Executive Order 11593 which outlines the responsibilities of Federal agencies in consonance with the National Environmental Policy Act of 1969, the National Historic Preservation Act of 1966, the Historic Sites Act of 1935, and the Antiquities Act of 1906; Executive Order 11988 which outlines the responsibilities of Federal agencies in the role of floodplain management; and Executive Order 11991 which includes procedures for early EIS (environmental impact statement) preparation and requirements for impact statements.

In addition, the following Corps policy is significant to the formulation process:

- To formulate projects which, to the extent possible, avoid or minimize adverse impacts associated with use of the base floodplain and avoid inducing development in the base floodplain unless there is no practicable alternative for the development.

- To provide an optimum degree of protection consistent with safety of life and property. Where the consequences of large floods would be catastrophic (i.e., where there is a potential for project failure in such an event, with attendant risk to the lives of many, which cannot otherwise be guarded against reasonably) the standard project flood is the desirable goal for minimum level of protection for urban areas. This goal is particularly applicable to flood damage prevention projects involving high levees, high floodwalls, and rapid flow velocity channels in urban areas.

- The Corps practice of consideration of nonstructural measures in the planning and formulation of all flood damage reduction plans.

Significant State and city regulations and policies critical to the formulation of plans include the following:

- Regulations: Minnesota State and East Grand Forks regulation relating to State-wide Standards and Criteria for Management of Flood Plain Areas of Minnesota (Minnesota Regulation NR 91(e)) states:

> "(2) The minimum height and structural design of any dikes, levees, floodwalls or similar structural works in place, or proposed to be placed in the floodplain shall be based on the flood profile of the regional flood (100-year) confined between the structure subject to the following:
>
> (aa) For urban areas the minimum authorized height and design of proposed structural works shall be at least three feet above the elevation of the regional flood, as confined by the structures, or shall be at the elevation of the standard project flood, whichever provides the greater protection from flooding."

Minnesota Regulation NR 91 further states that ". . . no variance shall provide for a lesser degree of flood protection than stated in these standards." The city of East Grand Forks has adopted similar language in its floodplain zoning ordinance.

- State Policy: In a letter dated 16 June 1980, responding to the draft plan of study at East Grand Forks, the State of Minnesota stated . . ."The Division of Waters does support detailed examination of the other alternatives that are listed but would like to see additional emphasis placed on the nonstructural alternative and on combinations of nonstructural and structural alternatives."

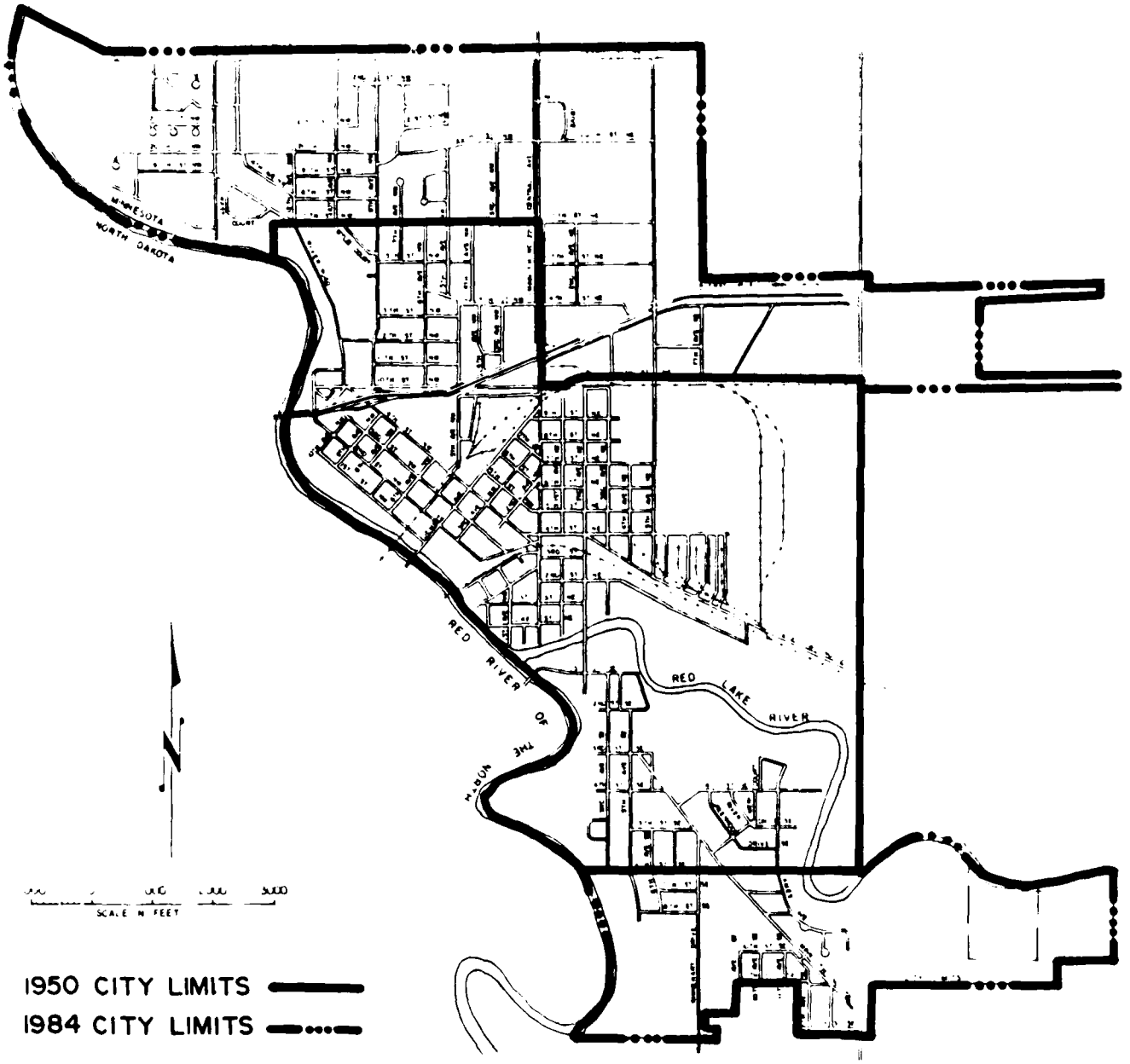
Engineering Requirements

The project, as authorized, needs to be modified in two general areas of engineering: that is, in levee design and plan components. For levee design, the alignment of the authorized levee is no longer engineeringly acceptable. The current alignment has been set back from the unstable Red and Red Lake River banks. In addition, the design level of protection has been raised to a level between the 1-percent (100-year) and standard project flood levels consistent with current State regulations and Corps policy in urban areas. For plan components, authorizing legislation has affected a plan formulation change. Public Law 93-251 expresses Congressional and Corps policy that consideration be given to nonstructural measures in the planning and formulation of flood damage reduction plans. Consistent with this legislation and Corps policy, the study evaluates the feasibility of nonstructural measures in combination with structural measures.

Environmental and Social Impacts and Effects

Since the original authorization, social conditions in East Grand Forks have changed considerably. Population has increased by 70 percent since 1950. Increased residential development, both north and south of the established city area, led to the extension of the city limits (see the following figure). During this same period of growth, the city undertook a great deal of redevelopment activity. This involved clearing and construction of a mall downtown and removal of homes and businesses in the floodplain.

EAST GRAND FORKS , MINNESOTA



CHANGE IN CITY LIMITS
FROM 1950 TO 1984
EAST GRAND FORKS, MN

General

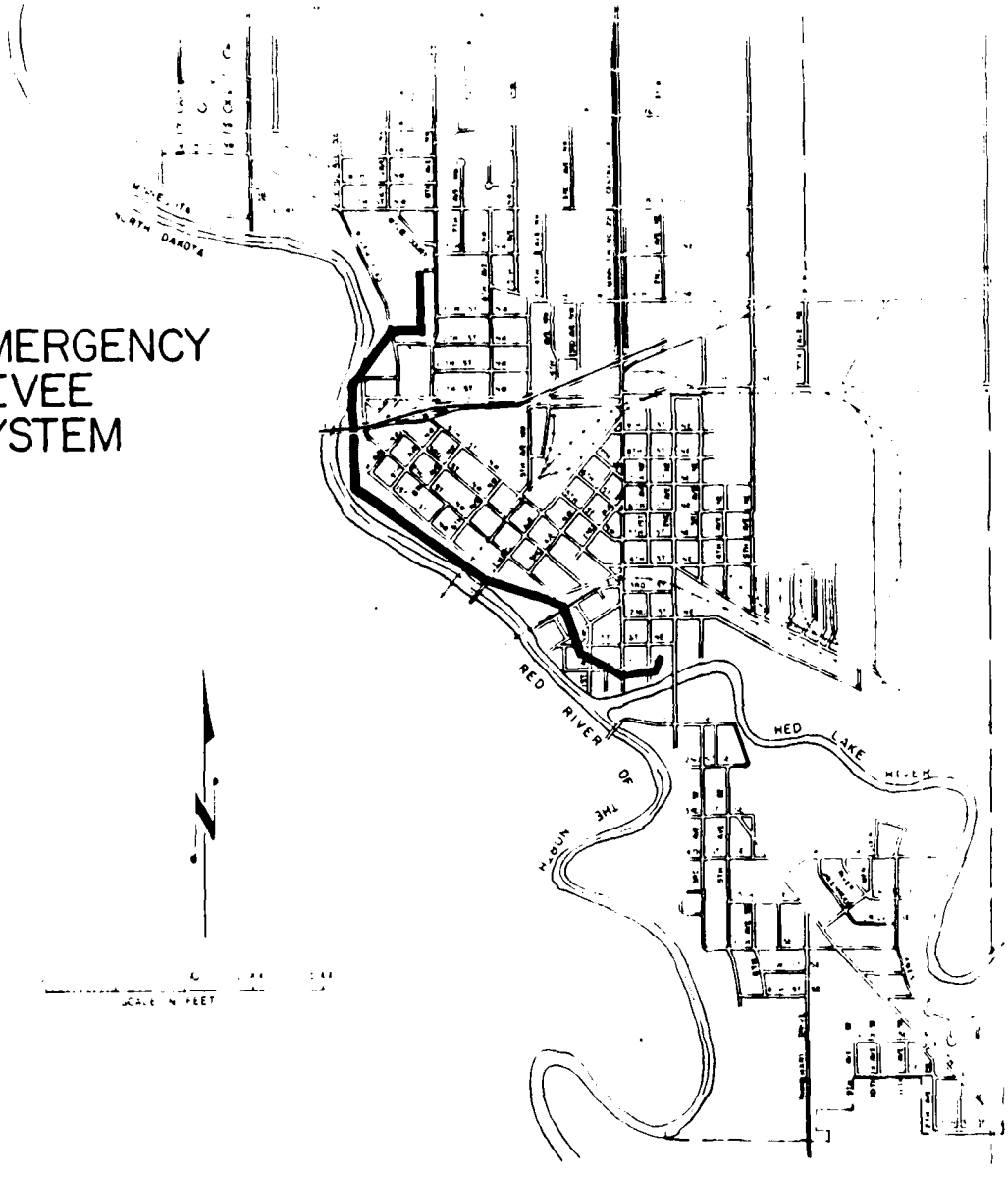
East Grand Forks' current flood plan consists of a combination of structural and nonstructural, emergency and nonemergency, flood reduction measures. Structural measures include the construction and partial removal of emergency levees during flood events. Nonstructural measures include emergency and nonemergency floodproofing of structures, emergency flood forecasting and warning, emergency and nonemergency evacuation and relocation, floodplain zoning, and flood insurance.

Emergency Levees

During past floods, starting in 1965, emergency levees were constructed and raised, widened, and lengthened for successively larger flood events (see the following figure). Emergency levees north of the Red Lake River were constructed with available earthen materials, with little consideration given to good construction standards. They were modified to protect against a one-time event. Portions of the levee need to be placed and removed during each flood event to prevent or reduce further aggravation of known unstable riverbank areas. Emergency levees south of the Red Lake River have been constructed of sandbags and removed.

EAST GRAND FORKS , MINNESOTA

EMERGENCY
LEVEE
SYSTEM



Several problems with the existing emergency levee system have been identified:

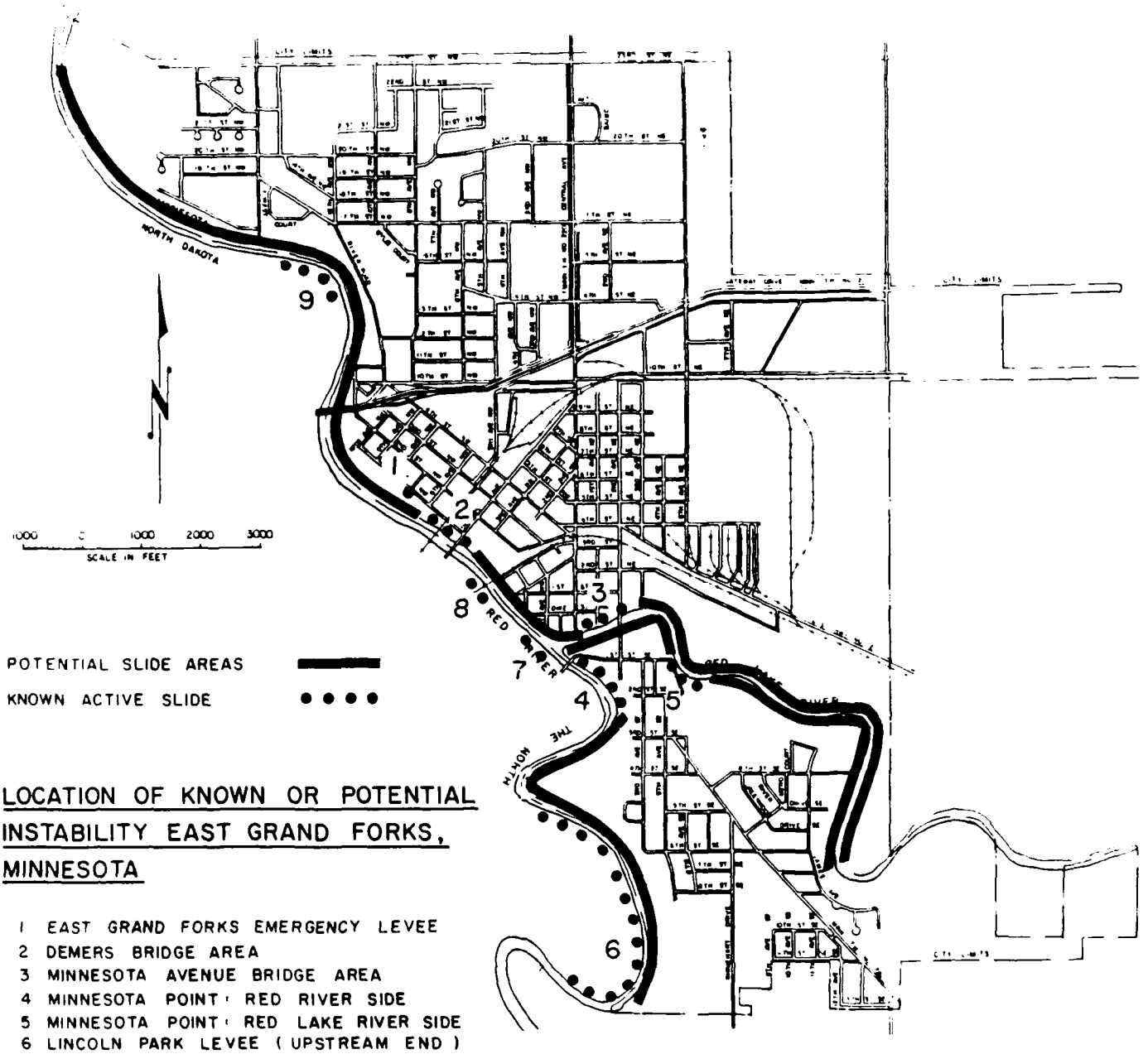
1. Engineering. -

- Lack of interior drainage facilities. Lack of a well designed permanent drainage system to handle interior drainage requires emergency pumping of seepage and normal runoff trapped behind levees during a flood.

- Poor soil foundation stability along the existing emergency levee alignment. The weak lacustrine soil deposits have resulted in severe and damaging slides and subsidence of portions of the emergency levee system. A damaging slide undergoing continued movement is just north of Sixth Avenue NW. The slide has caused subsidence of the levee and damages to adjacent residential yards. Another slide area is located in the commercial parking lot just upstream and downstream of Demers Avenue. The following figure identifies known or suspected foundation problem areas in East Grand Forks.

- Inadequate design and construction of emergency levees. The term "emergency levees" reflects the haste in which the levees were built to provide flood protection. Accordingly, the emergency levees do not meet Corps design criteria and construction procedures. All but a very small portion of the emergency levee is located on marginally stable soils. Although the emergency levees follow the recommended alignment of the 1953 report, geotechnical personnel agree that no permanent levee project should be constructed on this alignment. They also believe that any additional raise could result in failure of portions of the existing emergency levee.

EAST GRAND FORKS , MINNESOTA



LOCATION OF KNOWN OR POTENTIAL INSTABILITY EAST GRAND FORKS, MINNESOTA

1 EAST GRAND FORKS EMERGENCY LEVEE
2 DEMERS BRIDGE AREA
3 MINNESOTA AVENUE BRIDGE AREA
4 MINNESOTA POINT - RED RIVER SIDE
5 MINNESOTA POINT - RED LAKE RIVER SIDE
6 LINCOLN PARK LEVEE (UPSTREAM END)
7 GRAND FORKS - BETWEEN BRUCE AND FRANKLIN AVE
8 GREAT NORTHERN RAILROAD BRIDGE
9 RIVERSIDE PARK EMERGENCY LEVEE

2. Social. -

- o False sense of security. The daily visibility and continued success of emergency flood protection offered by the emergency levees builds local confidence in the system and may create a false impression that adequate protection is present or will be forthcoming in another emergency. Therefore, no local plan of action has been developed to upgrade the emergency levees during nonflood periods or to cope with the foundation problem should the emergency levee fail.

- o The constant threat of flooding is almost an annual event. The city depends heavily on the good will of local and outside resources to assist during flood emergencies.

- o Further encroachment of emergency levees on private property during flood emergencies.

- o Easements for flood works will be obtained during emergency periods.

- o Risk of major economic flood losses even with emergency levees.

Floodplain Zoning

The city of East Grand Forks has adopted Minnesota Statutes, Chapter 104, Flood Plain Management Act, as part of their floodplain zoning ordinance. The State and city zoning administrator enforce the regulation to assure that new structures located in the floodway fringe are properly floodproofed.

Flood Insurance

Witn the completion of flood insurance studies in 1977 and the adoption of a floodplain zoning ordinance by the city of East Grand Forks to include a flood insurance rate map, flood insurance zone and base flood elevation lines were established for the city. These maps are used to establish the flood insurance rates for various property owners in the city. The history of flood insurance policy use is shown in the following table, which is a summary of flood insurance policies in force at East Grand Forks in past years.

History of Flood Insurance Policy Use, East Grand Forks

Date	Number of policies	Total coverage	Residential	Other	Total premium
Dec 83	219				
Dec 82	247				
30 Nov 81	172	$5,101,800	$4,334,000	$768,000	$16,775
30 Jun 80	277	7,013,900	6,221,400	768,000	18,774
Dec 79	368				
Dec 78	287				

Acquisition

In 1979 and 1980, following the spring of 1979 flood, the city of East Grand Forks applied for and received a $645,000 HUD Discretionary grant to acquire a number of flood-damaged properties and assist occupants in relocation. The evacuation/relocation effort accomplished acquisition of 9 single-family homes, 1 four-plex, 1 six-plex, and 12 acres of land. Six of the single-family homes were in the floodway. Their removal opened up the floodway to be used as open-space, reduced flood insurance payments, and facilitated the protection of a number of other floodprone structures in East Grand Forks. The city is currently seeking a Small Cities Community Development Grant to acquire eight homes and relocate the residents, acquire one commercial establishment,

and hire a professional consultant to develop a long-range relocation plan for structures located in the floodplain as part of their comprehensive guide plan.

Emergency Flood Fighting

The city of East Grand Forks has developed a very efficient and well-trained flood fighting group. Following the 1979 flood, the seriousness of the flood threat as well as the inadequacy of the existing emergency levee system was very apparent to residents of East Grand Forks. The city and the Corps recognized that ongoing flood studies and their recommendations would not be completed quickly and the feasibility of identifying and implementing any plan was uncertain for the foreseeable future. Therefore, for at least several years, the city would need to continue to rely on the emergency flood fighting measure. They recognized the need for a flood emergency plan of action until a permanent levee system or other measures could be implemented. In July 1981 such a plan was completed. It captures on paper the city's extensive flood fighting experience to meet the following objectives.

- o Help the city use its flood fighting resources in the most effective manner.

- o Learn from past flood fights - take advantage of the trial and error process of previous years, anticipate recurring problems, and avoid repeating unsuccessful efforts.

- o Hypothesize possible flood emergency situations that require actions as yet untried. Plan for contingencies so that the response is quick and effective.

- o Provide a flexible, evolving manual that can be updated as experience or community changes dictate.

- o Address important emergency areas such as: flood fight organization, flood emergency center, cooperating organizations, preflood preparations, conduct of the flood fight, postflood activities, education of the public.

Emergency flood fight activities have been very costly in terms of local, State and Federal expenditures of dollars, manpower, and time resources. The following table summarizes the Federal and city costs of flood emergency activities at East Grand Forks since 1965.

Emergency Flood Fight Costs, 1965-1979

Agency	Flood year	Present worth (1981 dollars)(1)
Federal support to the city under Public Law 99-288	1965	$ 512,416
	1966	1,634,264
	1969	294,052
	1975	217,628
	1978	549,668
	1979	1,257,978
Total		4,466,006
American Red Cross Grand Forks Chapter	1979	383,959(2)
Salvation Army	1979	20,833(3)

(1) Values in 1981 dollars based on ENR price indexing.
(2) Covers Grand Forks and Traill Counties, North Dakota, and Polk County, Minnesota.
(3) Costs for Grand Forks/East Grand Forks.

These costs are for direct emergency preflood and postflood activities at East Grand Forks such as construction and cleanup of emergency areas and works. They do not include resources in terms of expense of individual property owners/lost income, outputs of goods and services,

or contributed manpower necessary to carry out an emergency flood fight. Despite the city's commendable and effective flood fighting effort during the 1978 and 1979 spring floods, residents recognize that future flood fights of greater magnitude will require a similar or more intensive emergency flood fight effort. Federal assistance dollars for flood cleanup are becoming more scarce. These costs are currently becoming more of a local responsibility. For example, cities are now being required to assume a greater burden of the flood fight cost under Public Law 288 which requires a 25-percent local cost sharing to carry out postflood cleanup activities.

Emergency and nonemergency floodproofing of properties, other than public properties, is a property owner's responsibility. During a flood emergency, a property owner generally initiates and completes several floodproofing measures including construction of levees around structures, sealing windows and doorways, turning off utilities, relocating damageable property above flood levels, etc. New construction in the flood fringe is required to be floodproofed to city ordinances.

Emergency Flood Warning and Forecasting

The National Oceanic and Atmospheric Administration (NOAA), National Weather Service, provides flood forecasting service for major river basins. This system involves predictions of anticipated stages at a particular gage or gages in the basin similar to the one at East Grand Forks. These forecasts are based on observed precipitation and stages at upstream points and anticipated weather conditions. The flood forecast is transmitted to city officials, newspapers, and radio and television stations in the basin. These media disseminate the information to residents of the floodplain in the form of a flood warning. This timely forewarning permits protective measures to be undertaken by industrial plants, public utilities, municipal officials,

and individuals with property in the lowlands. Services available are of the following types:

1. Flash Flood: The responsible Weather Service Forecast Office supplies weather forecasts twice daily for the State. In addition to the routine forecasts, special forecasts of severe storms and general flash flood watches for small streams are issued as required. WSR-57 Weather Radar installations have capability for immediate detection and evaluation of rainfall intensity, location, and storm movement. Information is promptly relayed by teletype circuits and telephone to news media and community officials and law enforcement agencies. The Weather Service Office issues flash flood warnings as required for small streams in its area of responsibility.

2. Major Floods: River stage forecasts are based on radar coverage, reports from river and rainfall reporting stations, and telemetry in or near the basin. The River Forecast Centers are staffed with professional hydrologists responsible for the preparation of river forecasts based on water equivalent of snow cover, rainfall-runoff relations, streamflow routing, and a working knowledge of anticipated weather conditions. The lead time between distribution of the forecasts and the flood crest may be short; however, lead time normally ranges from 12 hours for rainfall to several weeks for snowmelt. Specific crest forecasts are issued as required. River District Offices are responsible for interpretation and distribution of flood forecasts and operation of the hydrologic reporting substation network in their area of responsibility.

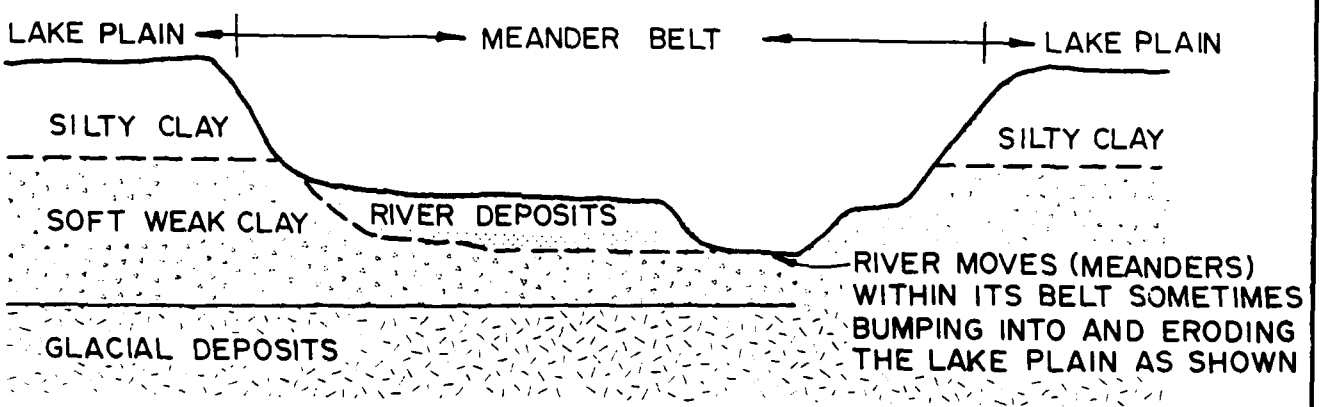
3. Hydroclimatic Data: Most of the data from the network are published. These records provide the basis for forecasts as well as for the planning and design of protective works and

their operation during floods. River and flood forecasting is fundamental in the design and essential in the operation of a levee or reservoir system.

Unstable Riverbanks

As the last glacial ice mass receded northward, it formed a barrier to the natural northerly drainage of the area. This barrier caused a large lake, Lake Agassiz, to be formed in the present area of the Red River Valley of North Dakota and Minnesota. The coarse sediments were deposited as deltas and were worked into beach lines near shore by waves off the lake. These beach lines are currently the nearest source of sand and gravel to East Grand Forks. Fine silts and clays were carried out into the lake where they settled and formed deposits up to 150 feet thick in parts of the basin. As the ice barrier melted, about 10,000 years ago, northerly drainage was reestablished on the flat featureless lake bed.

The water flowing over the lake bed slowly eroded ditch-like channels, establishing the Red River of the North, the Red Lake River, and others. Erosion continued as these rivers cut deeper into the lake sediments and started to meander. At some point, the rivers had cut channels deep enough and wide enough that the riverbanks (lake sediments) slid into the channel where they were eroded and carried downstream. Meandering of the river created a floodway within which the main channel was contained and river sediments were deposited. This is the condition of the rivers today (see the following figure). The rivers continue to widen the meander belt when the main channel butts into the lake plain, eroding the toe of the slope until a slide develops. In this sense, landslides in the area are a natural, recurring phenomenon. Natural landslides are fairly common and can be found intermittently in rural, undisturbed areas.



EXISTING GLACIAL LAKE AND
RIVERBED CONDITIONS
RED AND RED LAKE RIVERS
EAST GRAND FORKS, MINNESOTA

Most slide activity in urban areas is precipitated by human activity. The temptation to create new land at lake plain elevation along the river by filling was irresistible. What was unknown was that fill could and has reactivated ancient dormant slides or started new slides landward of the meander belt.

In the last century, the Red River Valley has witnessed many foundation failures. Although the most famous of those are the grain elevator failures at Fargo and Winnipeg, serious problems have occurred during construction of many structures, including buildings, bridges, and levees. Evidence of distress is usually noticed during or immediately following construction. Sliding in most cases is evidenced by cracking in pavements and structural damage to buildings. Movement may continue intermittently for many years. In some cases, large displacements occur very rapidly. In the Red Lake River area east of Crookston, slow movements occurred intermittently starting in the late 1940's with the placement of fill on the riverbank. In August 1980, movement increased dramatically (see the photographs on page 46). The driveway to the convent (background) dropped approximately 15 feet in 15 days and the area of movement grew several hundred feet in length and up to 100 feet in width. Large displacement sliding is not necessarily preceded by any warning of distress as was the case in the construction of the authorized levee in 1953 in Grand Forks (see the photographs on page 47).

1980 - Large displacement east of Crookston, Minnesota

1953 - Large displacement, Grand Forks, North Dakota

Economic Factors

The following table identifies actual flood damages at East Grand Forks.

Actual Flood Damages, East Grand Forks

Year	Damages Under Present Conditions Without a Flood Fight ($ Million's)	Actual Damages Under Historic Conditions Including the Flood Fight ($ Million's)
1979	23.6	8.9
1978	7.7	0.1
1975 (July)	2.4	0.4
1975 (April)	2.3	0.5
1969	7.7	0.1
1966	7.3	0.6
1965	6.0	0.8
1950	7.3	0.7
1897	32.0	-

Damageable property in the city is delineated by two geographic areas north and south of the Red Lake River. Approximately one-third of the city is in the 1-percent chance floodplain (base floodplain) as defined by FEMA. This accounts for about 40 percent of the structures in the city. Of the total 565 acres of floodplain in the city, 314 acres are north of the Red Lake River and 251 acres are south of the Red Lake River.

The city's risk of flood damages is high. The following table identifies the residential and commercial damage risk that would occur with a specified event.

Damages by Event Frequency ($ Millions)

Damage Category	5-year	10-year	25-year	50-year	100-year	500-year	SPF
Commercial	0	0	3.5	9.8	20.3	57.5	148.5
Residential	0.8	2.8	12.0	21.6	26.9	32.9	50.0
Total	0.8	2.8	15.5	31.4	47.2	90.4	198.5

Social Setting

The City's Context. - East Grand Forks is a partner in the Grand Forks-East Grand Forks metropolitan area. The Metropolitan Statistical Area (MSA) has a population of 100,944; 43,765 live in Grand Forks and 8,537 live in East Grand Forks. The largest urban area between Fargo-Moorhead and Winnipeg, the cities maintain close economic and cultural ties with their agricultural setting.

A dominating fact for East Grand Forks is its small size in relation to Grand Forks. Both cities benefit by some complementary elements in the relationship, but for East Grand Forks, the competition is often experienced as overwhelming. Grand Forks, in addition to more people, has more commercial and industrial activity, lower taxes, a military facility, passenger air and rail service, and more extensive media to emphasize the benefits of Grand Forks. The competition is as much between the two States as between the two cities, particularly when a city is trying to understand its problems.

Both cities have long been involved in agricultural industries and have had considerable residential development. Since North Dakota's recent legalization of gambling, some business may have shifted out of Minnesota. Another difference between the States, Sunday business closing laws, is not fully capitalized upon in East Grand Forks (as it is in Moorhead), for there are few stores in East Grand Forks that deal in the types of goods which are prohibited for Sunday sales in North Dakota. East Grand Forks has an advantage for water-based industrial development in its superior water supply.

Areas of the City. - The residences of the city are in three general areas. The northwest area, mostly recent construction, consists of large single-family homes near the river, more modest homes away from the river, and considerable multi-family housing. A golf course and

cemetery serve as a buffer for farmland north of the city limits. A few homes extend north of the city limits along Highway 220N.

The central part of the city contains older single-family homes, duplexes, and some denser development, such as the senior citizens' high-rise tower. Most structures are modest in size, but well-maintained, with mature vegetation. Although some of the lowest valued properties in this area are near the river, there is no sense of residential blight, perhaps because of previous urban renewal which removed homes from the floodplain. This section is actually separated into several subareas by the parks, the central business district, the roads and railway rights-of-way.

Between the Red Lake River and the Red River of the North is the area, now primarily residential, known as "The Point". In general, the larger homes are close to the rivers, with somewhat smaller and older homes in the center.

Industry in East Grand Forks is concentrated east of the central business district, along the transportation routes provided by the railway, Highway 2, Bus. 2, and Highway 220N. An industrial park is being developed to the east of the city. Most industry is agricultural and related particularly to potato and sugar beet processing.

The central business district is the weak part of the city, both visually and in terms of its viability. A number of properties on Demers Avenue are presently vacant; the street itself has been closed for a mall/parking area, as part of an earlier urban renewal effort. Some people feel that closure has contributed to the decline in business activity. Most structures in this area appear to be sound and present a less-than-desirable appearance only because of the obvious vacancies among them. Additional commercial buildings stretch out across from the elevator and railroad area along Demers Avenue, farther

east. New commercial development has focused on Highway 220N, with about 43 businesses directly on either side of this strip.

Environmental Resources

East Grand Forks is located along the fringe of the northern floodplain forest and prairie ecosystems. As a result of urban and agricultural development, few, if any, prairie areas remain and the forested areas are limited to sites immediately adjacent to the Red River and its tributaries. The most common tree species in the river floodplain are American elm, box elder, basswood, and green ash. Other species include bur oak, hackberry, and cottonwood.

The urban environment of the floodplain forest in East Grand Forks provides little vegetative diversity with much of the bottomland forest being maintained as open space or parkland. There are approximately 114 acres of bottomland forest in the East Grand Forks project area. For the most part, these areas are characteristic of an urban area, being highly disturbed with little understory. Areal extent in many cases is limited to one or two trees in width. Wildlife present in these areas is typical of an urban environment; squirrels, rabbits, and a variety of songbirds are most common. Numerous waterfowl pass through the area during spring and fall migrations, and wood ducks may utilize some of the less disturbed portions of the area.

There are approximately 114 acres of grass/open areas in the project area. These areas offer little habitat value for wildlife as the grassed acres are usually maintained by mowing.

Two endangered species, the bald eagle and the peregrine falcon, may occur in the project study area. However, these species would be present only in a migratory or transient status.

Surface water quality of the Red River and the Red Lake River in this vicinity is generally fair, and is affected by erosion, agricultural practices, and point and nonpoint waste sources from upstream area communities. Both rivers have extensive periods of high turbidity, mainly due to the nature of the streambed (very fine silty clay) and to the slow settlement of the colloidal clay after turbulence created by fluctuating stream levels and currents.

Because the Red and Red Lake Rivers support fishable populations of warmwater game fish, these rivers are classified by the Minnesota Department of Natural Resources as Class II streams. However, the physical nature of the Red River and the degradation of the water quality tend to reduce its productivity.

The soils in the project area are characteristic of soil classes that are classified as prime farmland. However, because of urban development, no portions of the project area are considered to be prime farmland.

Cultural Resources

In accordance with section 106 of the National Historic Preservation Act of 1966, as amended, the National Register of Historic Places has been consulted. As of July 3, 1984, there are no properties within the city of East Grand Forks listed on or eligible for inclusion on the National Register.

The city of East Grand Forks has not been systematically surveyed for prehistoric or historic archeological sites or historic standing structures. In 1980, the Minnesota State Historic Preservation Office conducted a brief "windshield" standing structure survey of East Grand Forks. This survey identified 14 potentially significant eligible structures within the community. Only 1 of the 14 potentially

significant structures has been assessed for inclusion on the National Register of Historic Places. This site, Whitey's Wonderbar, did not meet the National Register eligibility criteria. The other structures will either not be impacted by the proposed project or are no longer considered potentially significant.

During 1981 the St. Paul District, Corps of Engineers conducted a literature search and records review and preliminary field survey of the proposed project area in East Grand Forks. This survey followed the authorized levee alignment. The literature search and records review identified four additional sites in the immediate vicinity of East Grand Forks. These sites are: the John Griggs homestead cabin; the Nash cabin; the Witmarsh house, stable, and field; and 21 PL 2 which is an archeological site. All of these sites have either been destroyed or are not currently locatable. In addition, one historic archeological site was located during the preliminary field survey. This site, the Plantation, was recently destroyed by the expansion of the East Grand Forks golf course.

In 1984 the St. Paul District conducted a historic standing structure survey of all structures within East Grand Forks that may be impacted by the proposed project. This survey identified two structures that may potentially qualify for inclusion on the National Register. A more detailed assessment of these structures will be undertaken during the design phase of study.

Archeological surveys have also been conducted in two areas that will be unloaded and that had potential for the existence of prehistoric or historic archeological sites. This survey identified one prehistoric and two historic archeological sites with minimal potential for eligibility to the National Register. Nevertheless, these sites will be tested further to determine their significance in the design phase of study.

Recreation Resources

East Grand Forks has 11 city parks with a combined area of approximately 146 acres. In addition, the city has a civic recreation center, three play fields at elementary schools, and a 0.25-mile running track and four tennis courts at the senior high school. The city has leased land to the Valley Golf Association which has developed a nine-hole golf course open to the public. The city has approximately 1 acre of park area for every 66 people which compares favorably with the national standard.

FUTURE WITHOUT CONDITION RESOURCE BASE

General

The without future condition is not expected to vary significantly from the existing condition.

Engineering

Geotechnical. - Current studies indicate that levee failures are likely to occur with any increased loading along the existing emergency levee alignment. Pinpointing the actual event occurrence is difficult as it will depend on future natural physical processes and human activities. Two failure scenarios involving structures are possible: (1) failure with flood damages and foundation damages and (2) failure with foundation damages without flood damages. The nature and extent of these damages are also difficult to predict but may be catastrophic, including possible loss of life.

The most probable future condition without project scenario for East Grand Forks is that there will be little change from existing flood

damage reduction practices. It is expected that the community will continue, on an as-needed basis, to construct emergency levees (earthen or sandbag) along existing alignments. It is also expected that the city will continue to raise, lengthen, and widen existing emergency levee alignments, loading and unloading areas with known foundation movement as higher floods occur. At some time during the study period (next 100 years), some sections of levee will fail either along known failure surfaces or new ones developed from future activities. Following a failure, the city would probably reconstruct new emergency levees, well away from areas of failure, to restore the integrity of the existing emergency levee system. The disposition of homes, utilities, and other damageable property between the river and the new levee would depend upon the nature and extent of damages.

Hydrology. - Discharge-frequency relationships at East Grand Forks are based on an equivalent length of record of 154 years on the Red River of the North and 124 years of record on the Red Lake River. No significant hydrologic changes in established discharge-frequency relationships are expected to occur with the future condition without project.

Interior Flood Control. - According to the current development plan supplied by East Grand Forks, all undeveloped areas other than those specifically set aside as parks, playgrounds, etc., will be developed in the next 50 years. The storm water facilities for the area are already in place for the development. Current plans are to put in regulated manholes for most of the city. There are no plans to provide additional interior flood control works such as pumping stations and ponding areas.

Economic

Future population growth in the area is expected to remain relatively stable. Without the project, a further deterioration of the city's 1-percent chance floodplain is expected. This area is subject to floodplain ordinances and faces the risk of damages due to a potential failure of the emergency levees. Any population shifts and growth will occur in the northeastern and southern portions of the city outside of the 100-year floodplain. Some commercial strip development is already occurring in that area along Highway 220. Industry will probably shift to the east and residential development will occur outside the floodplain. Some growth can be expected without the project but it will occur outside the floodplain. Future flood damage categories will be affected as follows: residential damages will increase by the affluence factor which is a projected rate of increase in damageable contents over time; commercial damages are projected to remain constant because the number of commercial properties in the floodplain is not expected to change.

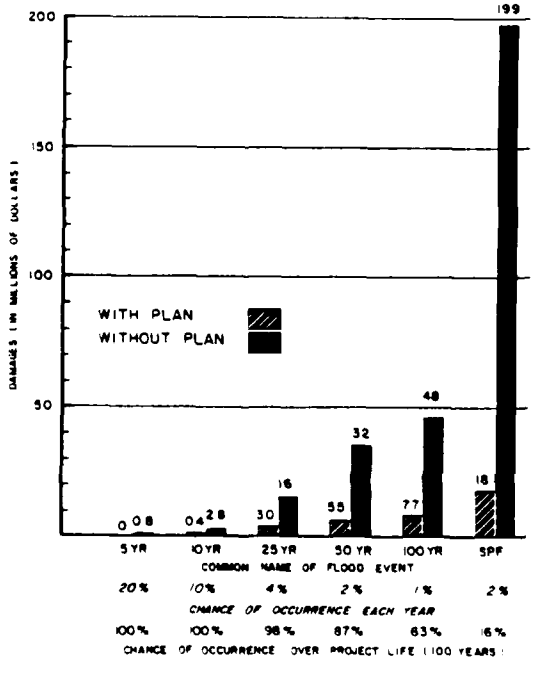
A total of 2,477 structures are susceptible to flood damages at the 1-percent chance and standard project flood levels. This includes 2,315 residential structures and 162 commercial structures. Estimated commercial and residential damages without flood protection at the 1-percent chance and standard project flood levels are $47.2 and $198.5 million, respectively.

Estimated average annual flood damages without a project at East Grand Forks are shown in the following table.

Average Annual Flood Damages ($ Millions)		
Damage category	3-1/4 percent interest	8-1/8 percent interest
Commercial	1.0	1.0
Residential	2.2	2.0
Total	3.2	3.0

The city faces considerable economic risk in terms of future flood damages. The following graph displays the risk in percent chance of occurring with and without a plan over the next 100 years. The ordinate shows flood damages in millions of dollars compared to the probability of a flood event occurring next year which is noted on the abscissa.

RISK OF DAMAGES IN PERCENT CHANCE
FOR SELECTED FLOOD EVENTS OCCURRING
DURING THE STUDY PERIOD 1990-2090

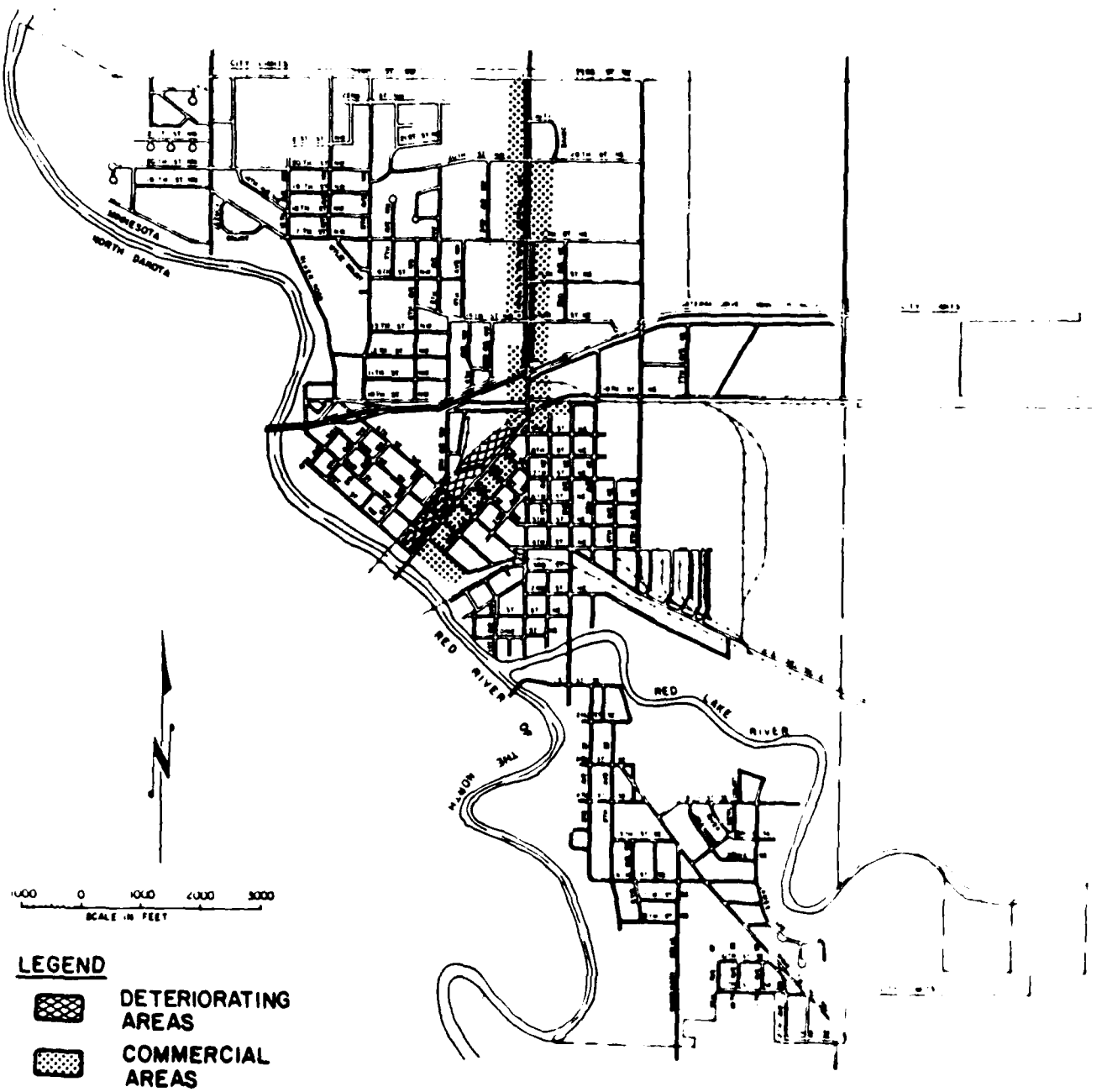


Social

The city currently faces some difficult choices in four related areas: industrial development, commercial redevelopment, population maintenance, and flood risk management. Planning and public investment for each of these needs are occurring or are possible for the near future. A critical task for the city is to coordinate the efforts, at least to the extent of avoiding public expenditures which work at cross purposes. At best, such coordination could provide a city which makes real the vision of its citizens, reflecting their priorities and values.

Without a project providing permanent flood protection, the city would experience continued decay of both commercial and residential areas (see the following figure). This would be partially due to the floodplain status of much of the community, which prevents substantial developments or improvements at reasonable costs. This decay would be accelerated if there was a failure of the present emergency levee. Restructuring of the community would be forced outside the floodplain. The commercial development that would occur would probably locate along Highway 220N, fragmenting the business area and making it even less competitive against Grand Forks. About two-thirds of the owners are expected to relocate in East Grand Forks. New residential areas will gradually develop in the northwest, northeast, and near the southern city limits as the floodplains closest to the river are eventually vacated. The presence of an industrial park will encourage industries to locate increasingly in the northeast quarter near U.S. Highway 2.

EAST GRAND FORKS , MINNESOTA



Institutional ties will become increasingly complex with a proliferation of organizations, coordination points, and regulations from higher levels of government. The city government will become more professional and will increase in size and services. Coordination requirements as part of the Metropolitan Planning Organization will lessen the sense of competition with Grand Forks, North Dakota; however, the tax rate difference between the States will continue to make residence in North Dakota relatively attractive.

Natural Resources

Assuming that residential encroachment into the floodplain will not be permitted, the 114 acres of riparian woods in the project area would be affected at an estimated loss rate of 0.2 percent per year over the period of analysis (100 years). This loss rate is assumed to be due to such factors as minor trail development on public lands, clearing on private lands, and disease, and will result in about 23 acres of trees being lost over 100 years.

Grasslands and open areas in the study area (114 acres) would not change significantly over the period of analysis. Some slight losses or additions may occur due to recreational developments, such as ball parks, or the clearing of small areas of woods.

Cultural Resources

The community of East Grand Forks contains many potentially significant historic structures that are currently suffering from flood damages. Without the project, these structures would continue to be damaged by flooding. Continued flooding would also cause the structures to deteriorate to the extent that maintenance of the structures would be reduced or eliminated. Eventually, over the 100-year study period, it

is expected that the oldest structures would be removed or abandoned, furthering the loss of historic values.

Recreation

Residents of East Grand Forks responded to the survey questions on a recent questionnaire as follows:

1. If the city decides to expand its park system, what facilities or areas do you think should be developed?

Facility/Areas	Percent Favoring
Hiking trails	39.2
Picnic areas	41.2
Nature trails	32.0
Skating areas	16.5
Flower gardens	22.7
Play areas	30.9
Ball fields	18.6
Tennis courts	14.4
Fishing areas	40.2
Campgrounds	43.3
Nothing needed	10.3

2. How could the city's present park system be improved?

Improvements	Percent Favoring
Larger facilities	18.6
Greater variety of activities	34.0
Better maintenance	17.5
Better location	7.2
Nothing needed	29.9

Of the questions asked, the largest percentages favored greater opportunities in the development of campgrounds, picnic areas, fishing areas, and trails.

An East Grand Forks recreation facilities study, prepared by the Recreation Administration, University of North Dakota, in 1977, identified the recreation needs for the city. The study recommended the development of water-based facilities to improve the appearance and to provide greater use of floodplain areas. In an effort to increase the ratio of parkland to population, the study also suggested that the city (1) increase budgetary allotments for maintenance and development, (2) acquire land in the extreme north and south areas in the northeastern segment of the city, (3) provide 6 percent of landowners' total gross acreage in new subdivisions for parks with a minimum of 2 acres, (4) develop a tot lot and park between 8th and 9th Streets at 10th Avenue North to beautify the entrance to the city, and (5) develop marked bike routes through the city, as well as bike and hiking trails paralleling the Red River of the North and Red Lake River.

PROBLEMS AND OPPORTUNITIES

Problems

The following specific flood and related water resource problems have been identified:

- o Lack of dependable cost-effective flood protection.
- o High cost of emergency protection.
- o Risk of major flood damages/health and safety problems.
- o Residents lack a good understanding of the nature and extent of their flood problem.
- o Emergency levees are currently failing along existing alignments. Continued development along this alignment has a high risk of failure.
- o Lack of interior flood control facilities.
- o Unstable riverbanks have an extensive history of failure in the area and prevent construction of permanent levees close to the rivers.
- o Emergency flood fighting activities are heavily dependent upon outside resources beyond the city's capability.
- o Flood warning and forecasting services have not met local needs during recent major flood events.
- o Individual floodplain property owners are not adequately insured. Some are not even aware that they are in the floodplain.
- o The community lacks a good working community development plan for future growth and development. Recent developments sometimes work at cross purposes to the floodplain problem.
- o Strict enforcement of floodplain zoning regulations has been difficult.
- o The flooding and floodplain problems are forcing the city to restructure past developments out of the floodplain. Existing developments are deteriorating in quality and value.
- o The existing floodplain is experiencing a declining natural resource base.

Opportunities

The following flood and related water resource opportunities have been identified.

- o Permanent flood protection.
- o Planned emergency activities and procedures beyond permanent flood protection capabilities.
- o Major reduction in the risk of flood damages/health and safety problems.
- o Major reduction in the cost of emergency flood protection.
- o Reduced dependence on outside resources for flood emergencies.
- o Reduced floodplain development pressures.
- o Restructuring and restoring the old downtown area.
- o Increased community awareness of flood problems/protection benefits.
- o Reduced floodplain land.
- o Increased natural resource and recreation resource bases.

FORMULATION OF MEASURES AND PLANS

OBJECTIVES

National Objective

The Water Resources Council Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies, effective March 10, 1983, established rules in accordance with the Water Resource Planning Act of 1965. These guidelines provide that all federally-assisted water resource projects be planned to achieve the following national objective:

- o Contribute to national economic development consistent with protecting the Nation's environment pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

Water and related land resource plans will be formulated to reduce flood damages in the Red River of the North basin, with empnasis at East Grand Forks to contribute to the national economic development tnrough increases in the net value of the national output of goods and services.

Planning Objectives

The primary planning objective identified in coordination with the city of East Grand Forks is to:

- o Reduce flood damages along the Red River of the North and Red Lake River at East Grand Forks to reduce local, State, and Federal flood control costs during the 1990-2090 period of analysis.

In conjunction with the primary objective, other planning objectives are to:

- o Contribute to recreation resources along the Red River of the North, Red Lake River, and Grand Marais Coulee at East Grand Forks to help meet current and future recreation demands for the 1990-2090 period of analysis.

- o Contribute to fish and wildlife conservation along the Red River of the North and Red Lake River at East Grand Forks to protect or enhance this resource for the 1990-2090 period of analysis.

- o Contribute to the conservation of water quality of the Red River of the North and Red Lake River at East Grand Forks by protecting or enhancing water quality for the 1990-2090 period of analysis.

- o Contribute to the social, cultural, aesthetic, and historical resources in East Grand Forks to preserve and enhance these values for the 1990-2090 period of analysis.

- o Contribute to the security and economic welfare of East Grand Forks to preserve and enhance the overall social well-being for the 1990-2090 period of analysis.

PLAN FORMULATION RATIONALE

This planning study will be conducted to develop a plan that will reduce flood damages at East Grand Forks and provide the best use, or combination of uses, of water and related land resources to meet foreseeable long-term needs. Planning will be conducted to meet the national and planning objectives of this study. The following rationale will guide the identification and evaluation of plans:

- o The plan must be technically feasible.
- o The plan must be implementable.
- o The plan must be complete and not require future improvements.
- o The plan must have a local sponsor.
- o The authority for this study limits the area of consideration to the city of East Grand Forks.

An interdisciplinary planning team was used to help the city of East Grand Forks identify area flood problems and develop and assess measures and plans for reducing the flood problems. This report brings together the current findings of the interdisciplinary team in coordination with the city.

MANAGEMENT MEASURES CONSIDERED

For a flood-prone area such as East Grand Forks, the following classes of management measures to reduce flood damages can be considered, separately and in combination.

No Action Measure

This option includes the investigation of several management measures that are available and currently used, such as flood insurance, floodplain regulation, and the flood warning system provided by the National Weather Service to allow emergency evacuation and flood protection measures.

Measures to Modify Floods

Measures to modify floods are designed to reduce the frequency and duration of damaging overflows. Typical flood damage measures include:

- o Dams and Lakes - These measures provide flood protection by delaying excessive runoff, thereby reducing flood heights downstream.

- o Levees and Floodwalls - These structures protect populated or highly developed agricultural areas by acting as barriers and confining floodwaters to a floodway where they cause little or no damage.

- o Channel Works - Flood stages and duration of flooding can be reduced by improving flow conditions within the channel and increasing the stream's carrying capacity.

- o Watershed Treatment - This measure is generally applied to small areas and involves the treatment of lands to increase their capability to absorb excessive rainfall. Treatment includes crop rotation, construction of terraces, contour strip cropping, and selective planting and reforestation.

Measures to Modify Damage Susceptibility

Measures to modify flood damage susceptibility do not attempt to alter the flooding regime of the area. These measures can be labeled as corrective measures designed to lessen the severity of floods by altering the floodplain use or the structures within tne floodplain. Corrective measures include:

- o Flood Forecasting and Warning Systems - Reliable, accurate, and timely forecasts of floods can be coupled with evacuation to save lives and reduce property losses.

- o Temporary or Permanent Evacuation - This alternative involves identification and relocation or removal of structures that are subject to frequent flooding.

- o Flood Proofing - Flood proofing consists of structural changes and adjustments to properties designed to reduce or eliminate flood damages.

- o Area Renewal and Conversion to Open Space - This measure would be part of an area renewal plan designed to remove deteriorating structures subject to frequent flood damages by converting the land to a use more commensurate with the flood risks.

FORMULATION OF MEASURES

Initial Review

The full range of structural and nonstructural measures for reducing flood damages at East Grand Forks was considered by study team members and interested publics at East Grand Forks, Minnesota. The city of East Grand Forks formed a flood committee to coordinate with the study team during the flood damage reduction study. One of the initial functions of coordination was to review all possible flood damage reduction measures and the city's concept of each measure's advantages and disadvantages. The following table summarizes the initial advantages and disadvantages that the flood committee and interested publics developed. The purpose of these meetings was to help identify flood problems and concerns, gain an understanding of local attitudes toward each measure, and develop a consensus at the community level of the advantages and disadvantages of each measure.

Advantages and Disadvantages of Flood Damage Reduction Measures

Measure	Advantages	Disadvantages
Dams and reservoirs	o Holds water during flood periods and releases it during periods of low flow. o Red Lake Watershed District has a current program for developing several sites in the basin which may lower flood peaks at East Grand Forks. o The concept of holding water back and releasing it slowly by using section line roads/culverts is good.	o Possible sites outside area of city control/ responsibility. o Red Lake Watershed District sites may not significantly reduce flooding at East Grand Forks. Reduced flooding is dependent on time of runoff and site location within the watershed. Huot Dam is no longer economically feasible and would not be a complete solution for East Grand Forks. o There are no other large storage sites in the basin which could reduce flood damages at East Grand Forks and be economically or environmentally acceptable. o The section line road concept would need to be applied on a large number of acres (5,700 square miles on the Red Lake River subbasin and 20,000 square miles in the Red River of the North basin above East Grand Forks). Operation, maintenance, and the institutional structure necessary to implement this measure are outside the controls of the city and would be difficult to manage. o Requires operation and maintenance.
Levees - floodwalls - closures	o Probably the only acceptable solution to the city. o Causes least inconvenience. o Uses least amount of space. o Can see where problems are. o Protects developed areas. o Removes development from floodplain designation. o Encourages improvements, new development, future growth. o Reduces wear and tear on utilities.	o Can be overtopped. o Requires operation and maintenance. o Power outages and pump failures. o City costs. o Untimely/lengthy delays in repair if a Corps project. o Relocation of people/homes. o Increasing the height of floodwalls may be difficult if threatened by overtopping. o Overtopping could be catastrophic, labor intensive, cause postflood problems, be prevented depending upon time constraints.
Channel works	o Lower flood stages.	o Potential aggravation of slippage (foundation) problems. o Slope problems. o Large environmental impacts. o Passes problems downstream (could be an advantage). o Requires operation and maintenance.
Diversion	o Lowers peak stage. o Lowers flood level at both Grand Forks and East Grand Forks. o Lowers East Grand Forks damages.	o Grand Marais diversion socially unacceptable. o Physical geographic features make it difficult to use this measure. o Passes flood problem to someone else (may be an advantage). o Requires operation and maintenance.
Watershed treatment	o Applicable in a basin-wide context. o Used primarily for erosion control rather than flood control.	o City has no real control. o Requires operation and maintenance.
Forecasting and warning	o Preparedness. o Advance warning.	o Poor forecasting. o Poor communication and coordination between media. o Difficult to obtain timely information, especially on Red Lake River. o Conflicting information.
Floodproofing	o Reduces damages. o Makes property eligible for flood insurance; that is, *insure for maximum, floodproof for minimum.*	o False security in measures which can cause structural damage to streets, sewers, and structures. o *Restricts growth.* o Property owner gets no monetary credit incentive to implement. If flooded, he gets a tax writeoff. No incentive to take any action outside of a designated emergency.
Levees constructed during a flood emergency.	o Reduces flood damages. o Security until overtopped.	o Potential for failure. o Not a secure or complete solution. o Requires removal of some levee areas. o Cleanup. o Utilizes Government resources (manpower, time, money). o Insurance and injury problems. Workman compensation problems.
Area renewal and conversion to open space.	o Beautification. o Strengthens tax base. o Substandard housing removal. o Higher and better use of area.	o Loss of landmarks. Disruption of neighborhood groups.
Temporary or permanent evacuation.	o Reduces flood damages. o Federally funded with minimal cost to city. o Evacuated property owners felt adequately compensated. o Reduces area requiring flood protection by city.	o Lowers real estate values. o Very expensive if city had to fund and implement. o Abandonment of city's investment in utilities.
Flood insurance	o Inexpensive - Federal subsidies and current actuarial rates are very inexpensive. Program allows policyholders to buy minimum insurance with option to increase if flood is imminent. o Burden of protection and expense on individual property owner. Those that incur damage pay the expense.	o May be a short-term measure if federal subsidies are removed and actuarial rates are related to [illegible] expense. o Could produce an urban slum if flood insurance premiums are prohibitive for individual owners.
Building code	o Reduces future damage within the floodplain. o Protects the public.	o Will not solve problems of existing [illegible] construction. Precludes rehabilitation. o Higher costs reduce growth [illegible] Inconsistencies in state/federal criteria [illegible] application.
Floodplain zoning	o Reduces damage for future developments. o Protects the public from development in floodplain.	Does not reduce damages in existing facilities. Reduces [illegible] utilities in the area. Possible [illegible] Possible [illegible] by homeowners.
Emergency operation	o Federal and state governments cover most of the costs. o Builds local experience for handling emergencies. o Provides new replacement facilities or improvements. o Saves lives. o Reduces damages. Improves appearance of city. o Provides urban renewal through FEMA. o Transfers individual, some [illegible] damages to Federal and state services.	Federal, state, [illegible] future. Future damage [illegible] Future federal, [illegible] projects. Expensive [illegible] other federal and state agencies. [illegible]

Analysis of Measures

The following paragraphs discuss the various flood reduction measures and plans in terms of their ability to reduce the flood problem at East Grand Forks, Minnesota. This includes the rationale for screening and grouping specific measures and plans, reasons for dropping or keeping them for further study, orders of compatibility and conflict of various measures, and grouping of measures into plans.

This step in the planning process involved taking an initial look at the various measures in terms of their ability to reduce the flood problem at East Grand Forks. Some structural measures have been evaluated in prior planning studies and reports while others required further analysis.

The feasibility of the following structural measures, which include dams and reservoirs, channel modifications, and diversions, has been analyzed in prior studies.

Dams and Reservoirs. - The feasibility of dams and reservoirs [illegible] flood damages in the Red River of the North basin has been [illegible] several past Corps reports, with other studies currently underway. The Corps of Engineers has constructed flood control [illegible] basin at Homme Dam on the Park River and Baldhill Dam on the [illegible] River in North Dakota, at the White Rock Diversion Dam [illegible] Traverse and Bois de Sioux on the Minnesota-South Dakota [illegible] Orwell Dam on the Otter Tail River and Red Lake Reservoir on the Red Lake River in Minnesota. [illegible] Minnesota.

Minnesota, on the Red Lake River. A flood control feasibility study was completed in March 1977 which addressed several dam options; that is, Huot Dam and lake, Huot dry dam, a series of small reservoirs, and a series of large reservoirs in the Red Lake River basin. The report concluded that no economically feasible dam alternative was possible; that is, the cost of implementing any one of the dam measures exceeded the monetary benefits. The report recommended no further study of reservoirs in the Red Lake River basin.

Based on an initial evaluation of existing and proposed dams in the Red River of the North basin, whether they were being constructed or considered by the Corps of Engineers or other agencies, further consideration of dams and reservoirs as part of this study was not recommended. That is, there appears to be no economically feasible dam site or plan which would significantly reduce flood damages at East Grand Forks. To significantly reduce flood damages, other measures including levees would need to be constructed at East Grand Forks.

Channel Modifications. - The feasibility of this measure was put into perspective by Simons and King about 1950.[1] They estimated that, by clearing a strip of primary overbank 150 feet wide on each side of the channel, with a channel completely clear of trees and snags, a stage reduction of [illegible] feet was possible if done for the entire length of the Red River of the North.

The report on this flood study[1] considered a channel clearing and snagging measure in conjunction with the authorized project. The measure consisted of removing timber and underbrush from a 16-mile reach extending from the metropolitan area 150 feet on each side of

[1] Corps of Engineers, St. Paul District, "Flood Control: [illegible] on the Red River of the North at Grand Forks, East Grand Forks, Minnesota," May 1953.

the channel and enlarging the channel [illegible] the Red Lake [illegible] and upstream a distance of [illegible] miles. Two alternatives were identified [illegible] provision of a larger floodway for passage [illegible] and [illegible] of flood stages. The study concluded that [illegible] the main [illegible] affect peak stages [illegible] flooding as a result [illegible] flow [illegible] through the city and a wide floodplain [illegible] Hydraulic studies showed that [illegible] would not exceed a maximum of [illegible] extensive clearing was advantageous [illegible] right-of-way and [illegible] would not be acceptable [illegible] unsuitable for levee embankment, [illegible] instable, making excavation [illegible] recommended no further [illegible]

The Corps '81 study[2] [illegible] Red River channel [illegible] plan included extensive [illegible] with two channel [illegible] channel bottom width [illegible] and extensive modification [illegible] there would be [illegible] channel would require [illegible] Channel modification [illegible]

Channel modification, [illegible] East Grand Forks, [illegible] feasible based on previous [illegible] application in combination with [illegible]

2 U.S. Army, Corps of Engineers, [illegible] Grand Forks Urban Water [illegible] July 1981.

__Diversions.__ - As part of the Grand Forks-East Grand Forks Urban Water Resources Study, a diversion channel constructed around the west side of Grand Forks, North Dakota, was considered. It would involve [illegible] in excess of the Red River bank-full capacity. [illegible] structure would be placed across the Red [illegible] grassed channel would have an average [illegible] and a bottom width of over [illegible] feet for the standard [illegible] would cross major [illegible]ways at five points, [illegible] and numerous county, township, and [illegible] drainage ditches and small [illegible] would require [illegible] with the diversion channel. A diversion [illegible] the North was determined to be grossly [illegible].

[illegible] water east and [illegible] of the city of East [illegible] analyzed [illegible]. However, this [illegible] to determine if there was any feasible [illegible]

[illegible] River at Fisher, [illegible] miles to its [illegible] of East Grand Forks [illegible]. The coulee, with a total [illegible], has a meandering drainage course [illegible]. Typical channel width [illegible] are about 220 and 6 feet, [illegible] feet. The coulee is [illegible] with numerous drainage ditches [illegible]

[illegible] almost entirely agricultural with [illegible]. Agricultural practices extend up to [illegible] a major portion of the coulee while other

agricultural areas are separated from the coulee by narrow, intermittent strips of riverine woodland, wetland, and/or pasture. Numerous small slack water pools are located along the coulee downstream of the U.S. Highway 2 crossing. Natural flows vary from little or no flow during late summer and winter to an estimated 3,540 cfs during a 1-percent chance flow at the Minnesota State Highway 220 bridge crossing north of East Grand Forks. Hydraulic studies indicate an existing bank-full channel or zero damage flow capacity of about 2,950 cfs. The current channel is severely restricted by numerous small bridges and culvert crossings and scattered areas of trees, shrubs, and cattail marshes.

The coulee supports a variety of small mammals, amphibians, and waterfowl. Beaver are present along the lower reaches. Several species of ducks, songbirds and shorebirds use the slack water pools for feeding, nesting, and resting areas.

During high flood flows on the Red Lake River, overflows have entered the coulee. Locals have suggested using the coulee, improved or unimproved, to pass a designated portion of Red Lake River flood flows through the coulee which, in turn, would reduce flood stages and damages in East Grand Forks.

Prior studies evaluated the feasibility of passing flows through the coulee by improvements to the coulee. The analysis indicated that an improved channel with a 150-foot bottom width and with all bridges sized to the channel cross section and areas of heavy shrubs and trees removed would have a bank-full capacity of 7,500 cfs.

Peak flows greater than 7,500 cfs would exceed bank-full capacity and result in inundation and damage to several adjacent farmsteads. The

provision of additional overflows from the Red Lake River without widening and bridge modification would raise flood levels along the coulee.

Improvements to divert 10,500 cfs (approximately one-third of the Red Lake River flow) from the Red Lake River at its 1-percent chance flow into the coulee at its 1-percent chance flow would require 10 miles of improved channel with a 200-foot bottom width together with numerous cutoffs. Also required would be the replacement of 12 road bridges or culvert crossings and 1 railroad bridge. Total first costs for this plan were estimated at $36,314,000 or an annual cost of $2,503,000. Corresponding average annual benefits from the 1.3-foot decrease in the 1-percent flood stage at East Grand Forks US 65 gage would be approximately $421,000. A comparison of benefits with costs yields an unfavorable benefit-cost ratio of 0.2.

As the current study progressed, it was suggested that an unimproved coulee along with a diversion structure on the Red Lake River may be a practical measure for reducing flood damages at East Grand Forks. The concept was to allow overflows to seek the natural floodplain of the coulee without modifying the bridges or channel along the coulee or, if necessary, make only minimum modifications.

The analysis considered the following diversion measures:

1. Sizing a diversion structure creating no more than a one-half foot increase in the 1-percent flood level at Fisher, Minnesota, when the 1-percent flood is occurring on the Red Lake River and coulee.

    a. What is the impact on flood levels as a result of no modification to the coulee?

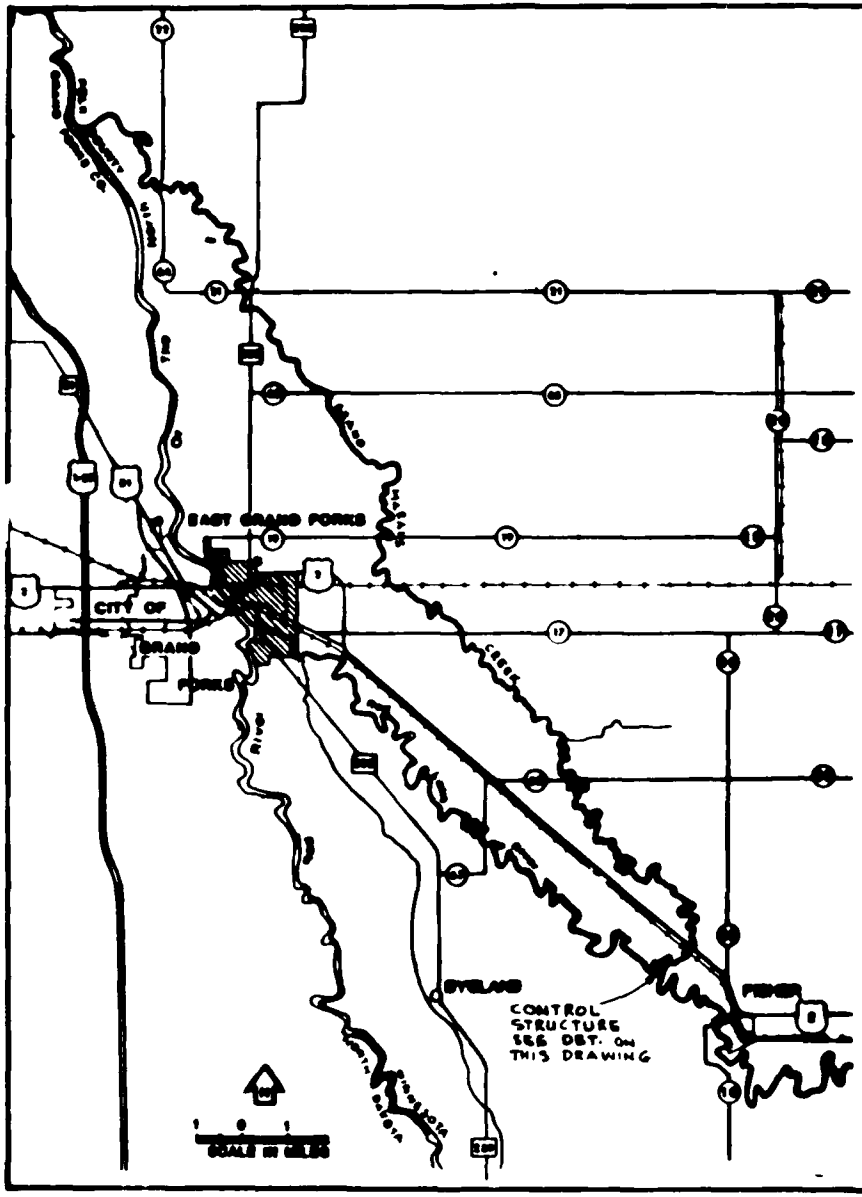
b. What is the impact of adding in a minimum amount of channel improvement and providing bridges at road crossings on the channel?

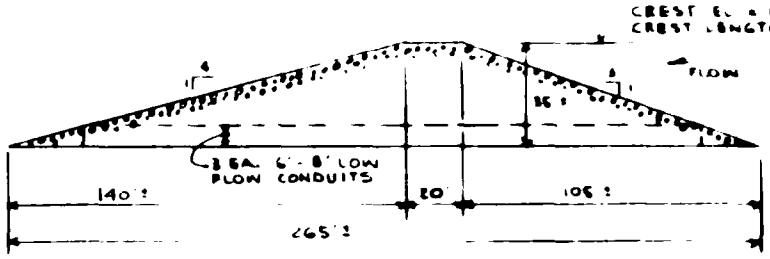
2. Sizing (raising) the diversion structure to divert 6,500 cfs during the 1-percent chance flood on the Red Lake River and coulee.

   a. What is the impact on flood levels with no modification to bridges along the coulee?

   b. What is the impact on flood levels with modification to the Burlington Northern Railroad bridge and U.S. Highway 2 crossing?

o Measure 1A: By limiting an increase in the 1-percent chance flood to one-half foot at Fisher, the elevation of the crest of the diversion structure cannot exceed 838 feet. (See the following figure.) Without improvements along the coulee, 1,000 cfs could be diverted at the time when flows along the Red Lake River and coulee were at the 1-percent chance flows. This would reduce flood stages at East Grand Forks by 0.1 foot. It became obvious that, without modification to the coulee or the raising of the diversion structure, significant flows cannot be passed.





CONTROL STRUCTURE DETAIL

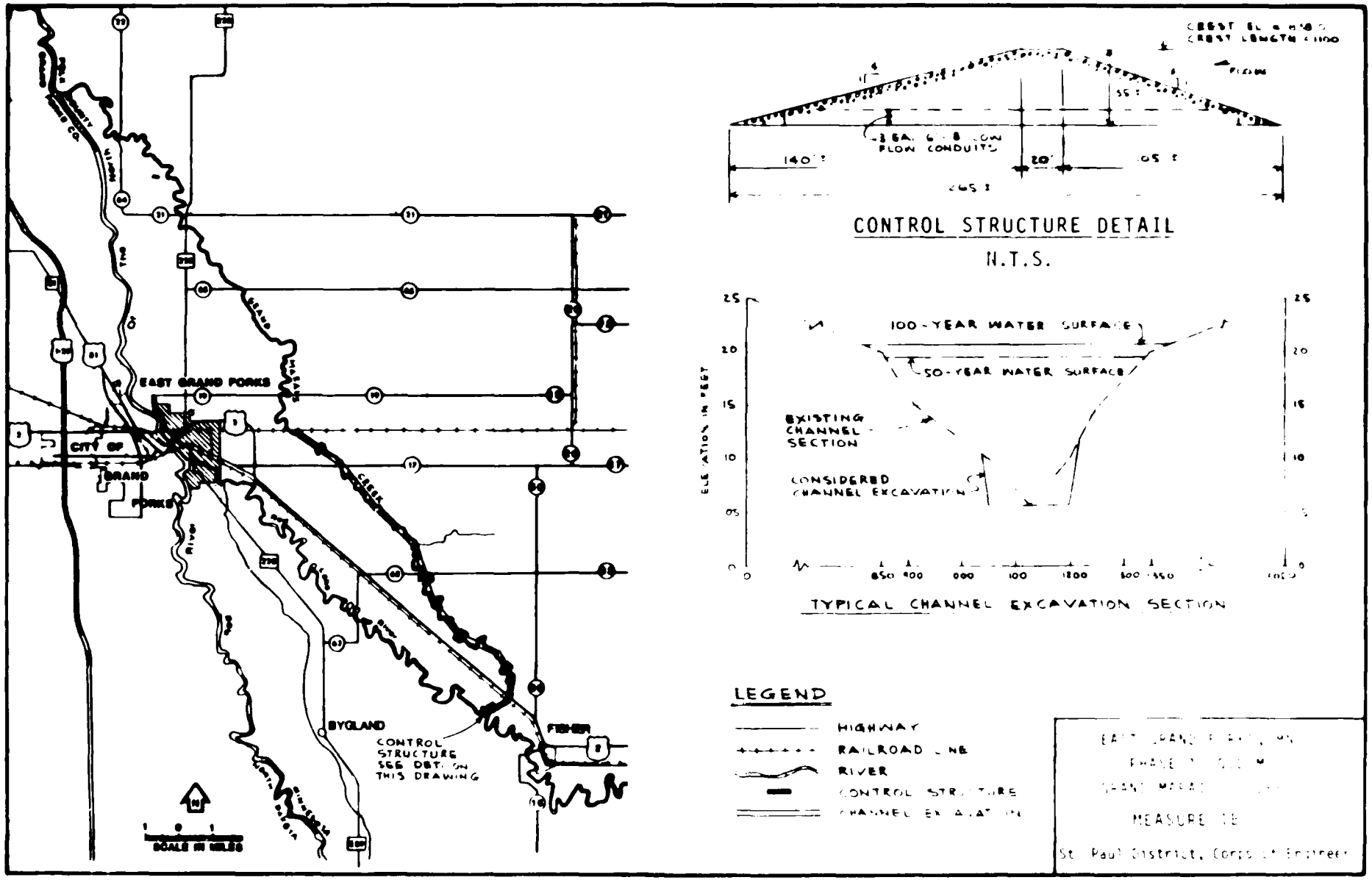
N.T.S.

LEGEND

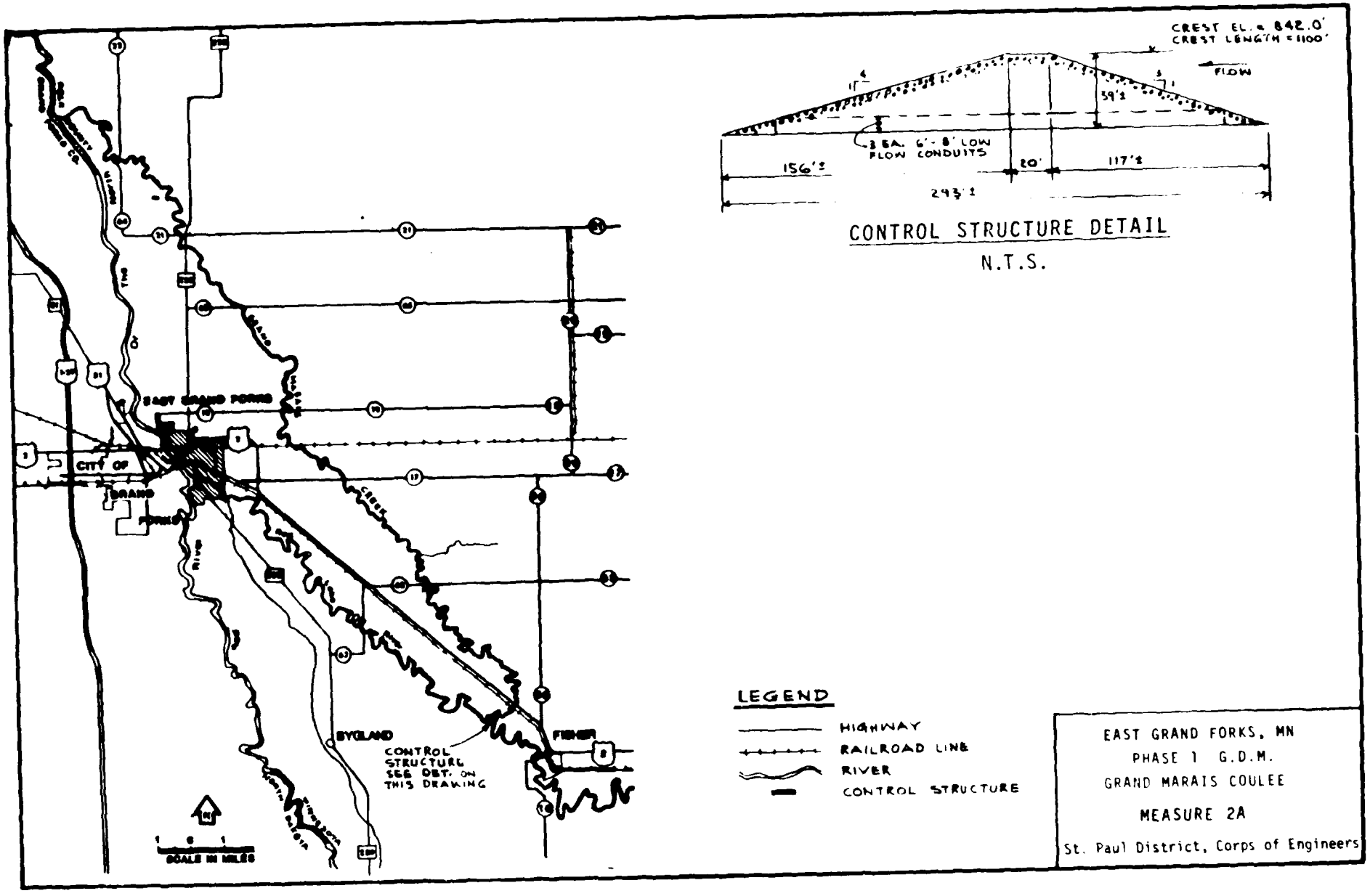
- HIGHWAY
- RAILROAD LINE
- RIVER
- CONTROL STRUCTURE

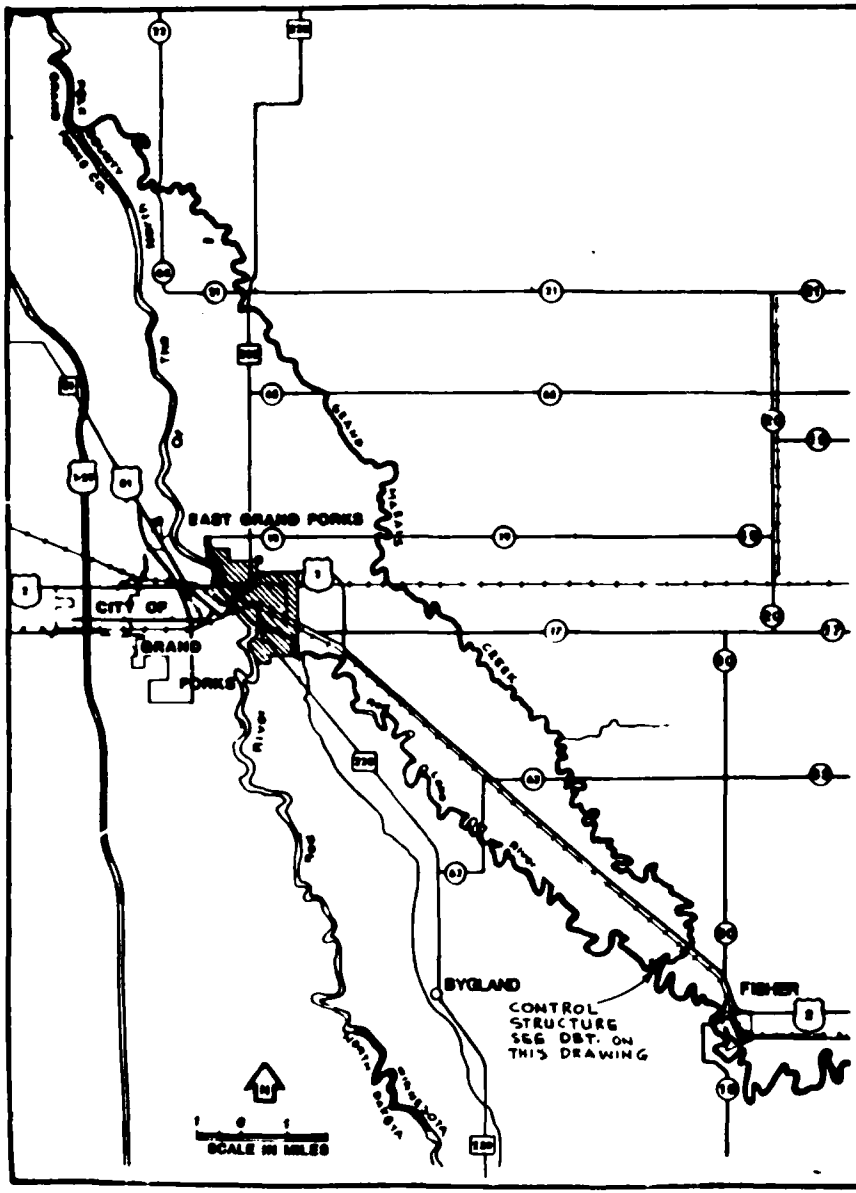
EAST GRAND FORKS, MN
PHASE I G.D.M.
GRAND MARAIS COULEE
MEASURE 1A
St. Paul District, Corps of Engineers

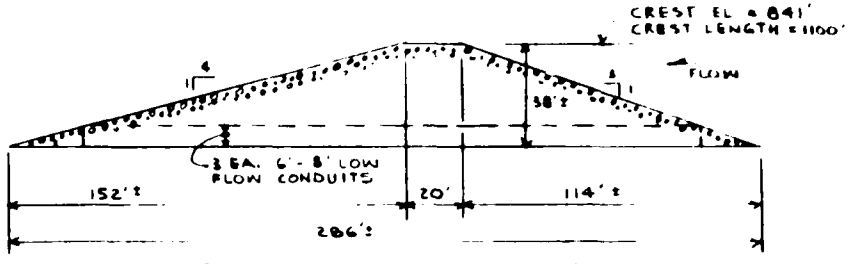
Measure 1a: This evaluation looked at the feasibility of passing flows with minimal modification to bridges and minimum channel improvements along the routes. See the following figure. To divert 7,000 cfs from the Red Lake River at its 1-percent channel flow into the Valley at its 1-percent channel flow would require a minimum of 10 miles of channel improvements and the modification of 13 bridges and road crossings. The existing channel would be excavated approximately 5 feet below the current channel bottom maintaining a 150-foot bottom width with 1 on 3 slopes. Total first costs for this plan are estimated at $10,430,000 or an annual cost of $735,361. Corresponding average annual benefits from the one-half foot decrease in the 1-percent flood stage at the East Grand Forks gage would be approximately $488,100. A comparison of benefits with cost yields an unfavorable benefit-cost ratio of 0.6.


EAST GRAND FORKS
CITY OF
GRAND
FORKS
BYGLAND
FISHER
CONTROL
STRUCTURE
SEE DETAIL ON
THIS DRAWING
SCALE IN MILES
CREST EL. & WIDTH
CREST LENGTH 1100
FLOW
55'
3 EA. 6'-8" CON
FLOW CONDUITS
140'
20'
65'
265'
CONTROL STRUCTURE DETAIL
N.T.S.
25
20
15
10
05
0
ELEVATION IN FEET
100-YEAR WATER SURFACE
50-YEAR WATER SURFACE
EXISTING
CHANNEL
SECTION
CONSIDERED
CHANNEL EXCAVATION
850
900
000
100
1200
1300
1550
TYPICAL CHANNEL EXCAVATION SECTION
LEGEND
HIGHWAY
RAILROAD LINE
RIVER
CONTROL STRUCTURE
CHANNEL EXCAVATION
MEASURE 1B
St. Paul District, Corps of Engineers

Measures 2A and 2B: This evaluation looks at the feasibility of raising the elevation of the diversion structure above the 838 crest elevation to achieve a diversion of 6,500 cfs when the 1-percent chance flood was occurring on the Red Lake River and coulee. A diversion crest elevation of 842 would be required if no improvements were made along the coulee. With improvements to the railroad bridges and U.S. Highway 2 crossing, crest elevation of 841 would be necessary. (See the following figures.) These increases in the crest elevation would raise the 1-percent floodplain at Fisher by 4 to 5 feet and require a 4,000-foot by 8-foot high levee to protect homes in Fisher. Costs for plan 2A are estimated at $6,015,000 or an annual cost of $458,944. Corresponding average annual benefits for the one-half foot decrease in stage at East Grand Forks would be approximately $488,100. A comparison of benefits with costs yields a marginally favorable benefit-cost ratio of 1.1. Plan 2B had costs estimated at $7,231,000 or an annual cost of $551,725 with an unfavorable benefit-cost ratio of 0.9.

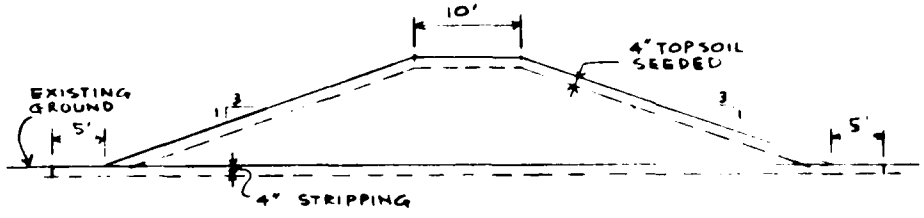

CREST EL. = 842.0'
CREST LENGTH = 1100'
FLOW
59'±
3 EA. 6'-8' LOW FLOW CONDUITS
156'±
20'
117'±
293'±
CONTROL STRUCTURE DETAIL
N.T.S.
EAST GRAND FORKS
CITY OF GRAND FORKS
BYGLAND
FISHER
CONTROL STRUCTURE SEE DET. ON THIS DRAWING
SCALE IN MILES
LEGEND
HIGHWAY
RAILROAD LINE
RIVER
CONTROL STRUCTURE
EAST GRAND FORKS, MN
PHASE 1 G.D.M.
GRAND MARAIS COULEE
MEASURE 2A
St. Paul District, Corps of Engineers





CONTROL STRUCTURE DETAIL

N.T.S.



TYPICAL LEVEE DETAIL

N.T.S.

LEGEND

- HIGHWAY
- RAILROAD LINE
- RIVER
- CONTROL STRUCTURE
- LEVEE

EAST GRAND FORKS, MN
PHASE 1 G.D.M.
GRAND MARAIS COULEE
MEASURE 2B
St. Paul District, Corps of Engineers

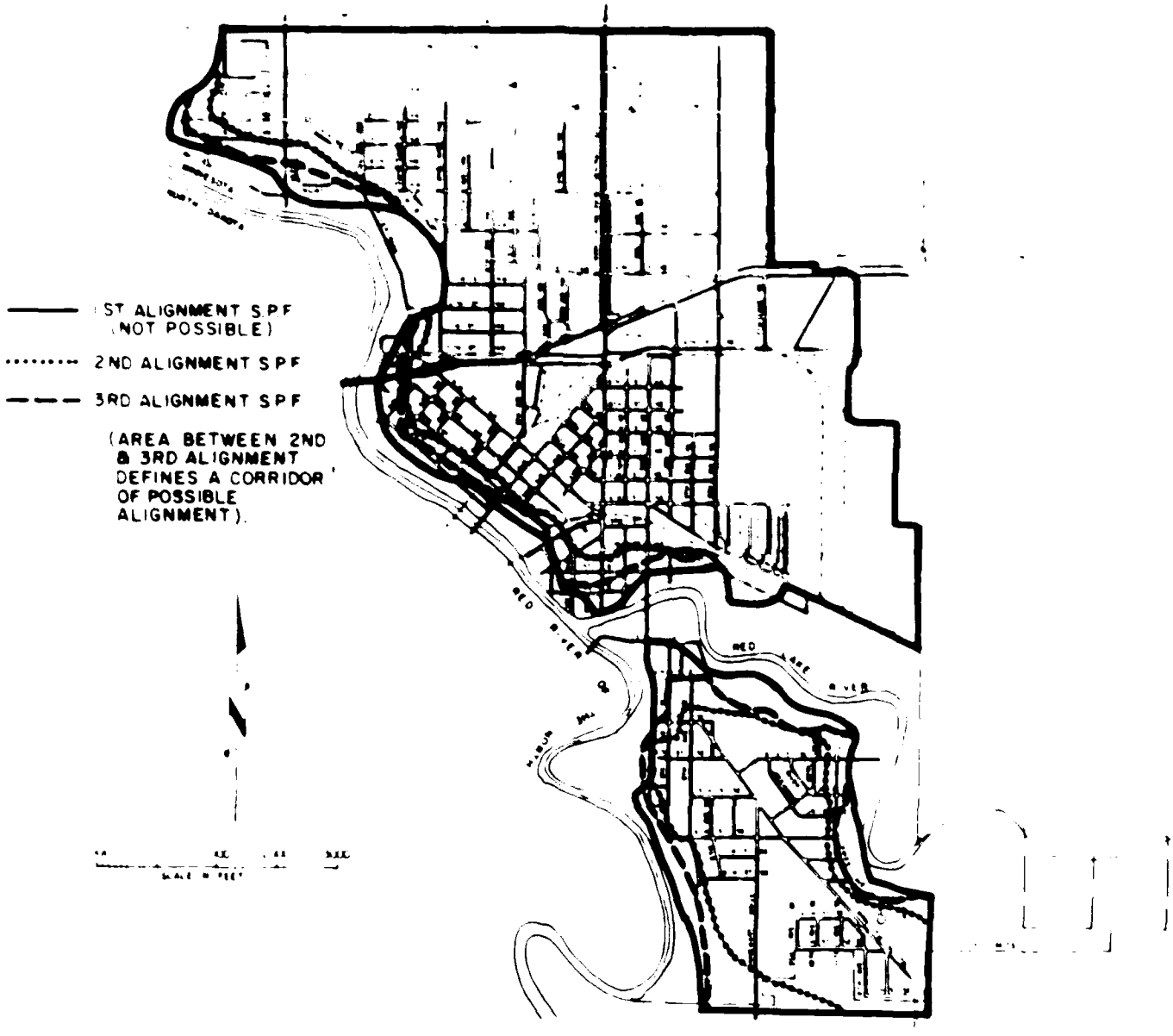
In summary, the Grand Marais Coulee diversion, as a single flood control measure, cannot completely solve East Grand Forks' flood problem. Other measures including levees at East Grand Forks will be required.

Without significant modification, the coulee's existing physiography provides essentially no capacity to pass excess Red Lake River flows. A diversion structure alone (measure 1A) cannot pass sufficient flows through the coulee without being raised to an elevation where flood levels would significantly impact the upstream areas to include the communities of Fisher and Crookston, Minnesota. A diversion structure in combination with bridge modifications (measures 2A and 2B) along the coulee again cannot pass sufficient flows to significantly reduce flood damages at East Grand Forks without impacting upstream areas. However, at the expense of economic feasibility and substantially high economic, environmental, and social costs, a diversion structure in combination with channel modification and bridge and road crossing modification (measure 1B) along the coulee could provide a significant reduction in peak flood stages in East Grand Forks without impacting upstream areas. This plan is not in the Federal interest. No Grand Marais coulee alternative can completely solve East Grand Forks' flooding problem. At best, plan 2A may have feasibility but only in combination with other measures such as levees.

Levees. - The authorized project (a levee measure) was reanalyzed based on changed conditions.

Alignment 1, the authorized project alignment, was analyzed first for its economic feasibility at three levels of protection: 2-percent, 1-percent, and standard project flood frequencies. The alignment configurations are shown on the following figure.

EAST GRAND FORKS , MINNESOTA



[illegible] was extended north and south of the authorized project [illegible] high points of land for higher levels of protection and to [illegible] areas within the levee protection, which had developed [illegible].

[illegible] resulted in a favorable benefit-cost ratio as shown in the following table.

Initial Cost Estimate of Levee Measure ($ Millions)(1)

Item	2-Percent Chance Flood	1-Percent Chance Flood	Standard Project Flood
First Costs (2)	10-12	12-14	15-17
Construction	(8-9)	(9-10)	(11-12)
Lands, Easement, and Right-of-way	(2-3)	(3-4)	(4-5)
Average Annual Cost(3)	0.37	0.44	0.54
Benefit-Cost Ratio(3)	4.5	4.9	5.4

(1) Preliminary cost subject to revision. Costs based on October 1981 price levels.
(2) Operation and maintenance cost may range from $40,000-$60,000 annually.
(3) Based on the average of first costs and authorized interest rate of 3-1/4 percent.

The initial engineering costs and economic evaluation indicated that levees protecting the entire city were feasible at the authorized interest rate. Preliminary first cost varied from $12 to $17 million, of which $3 to $5 million may be local costs. The initial benefit-cost ratio varied from 4.5 to 5.4 depending on the level of protection. The data indicated that feasibility was more attractive at the higher level of protection (standard project flood).

AD-A184 638 GENERAL REEVALUATION AND SUPPLEMENT TO ENVIRONMENTAL IMPACT STATEMENT FOR (U) CORPS OF ENGINEERS ST PAUL MN ST PAUL DISTRICT NOV 84 2/3

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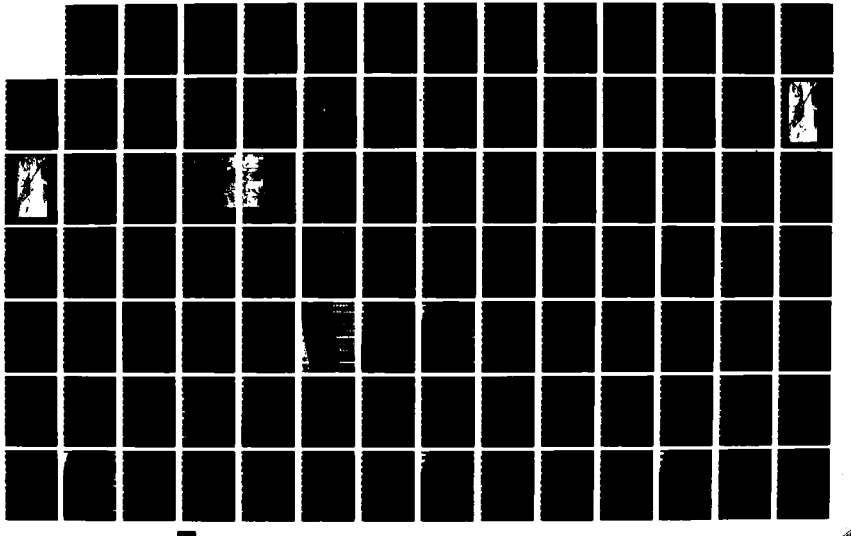
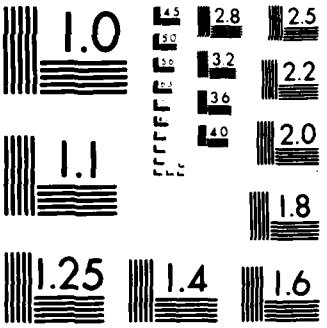




Conclusions. - The first level analysis of structural measures was based on the results of past feasibility studies and a preliminary analysis of measures not fully studied. After the first level analysis, the following conclusions were reached.

- o Upstream dams and reservoirs are not economically feasible and will not significantly reduce flood damages at East Grand Forks. This measure does not warrant further study.

- o Channel modification will not significantly reduce flood damages at East Grand Forks. This measure does not warrant further study.

- o Diversion of the Red River of the North and/or the Red Lake River is not economically feasible. This measure does not warrant further study.

- o Levees are the only economically feasible structural measure which will significantly reduce flood damages at East Grand Forks.

FORMULATION OF PLANS

First Level Formulation of Plans

Following the initial evaluation of structural measures, it was apparent that levees would be the only feasible structural measure for the city of East Grand Forks. This reconfirmed the findings of the 1953 study and the general feeling of city officials. Nonstructural measures were added to meet the legislative and policy changes since project authorization. Nonstructural measures include flood proofing, floodplain evacuation and relocation, flood forecasting and warning, floodplain zoning, flood insurance, and an updated emergency plan of action.

Description of Plans. - Five plans focusing on flood protection for the entire community were identified and evaluated to show the general impacts of the with and without plans on existing and future conditions, the interrelationships of measures and plans, and significant advantages and disadvantages of measures and plans.

The five first level plans are described as follows:

Plan	Description
With Flood Protection	
Plan 1	Permanent levees plus other nonstructural*
Plan 2	Permanent levees plus floodproofing plus other nonstructural*
Plan 3	Permanent levees plus acquisition plus other nonstructural*
Plan 4	Permanent levees plus floodproofing plus acquisition plus other nonstructural*
Without Flood Protection	
Plan 5	Continuation of existing emergency management activities

* Other nonstructural - floodplain zoning, flood forecasting, flood insurance, and flood emergency plan of action.

The nonstructural components common to all plans include floodplain zoning, flood forecasting and warning, flood insurance, and a flood emergency plan of action. Plan 5 consists of existing conditions floodplain zoning, flood forecasting and warning, a flood emergency plan of action, and flood insurance programs with necessary modifications into the future. For plans 1 through 4, floodplain zoning restrictions would be removed from areas protected by levees and from flood proofed and acquired structures. The existing flood emergency plan of action would be modified to handle flood emergencies which would exceed the design protection. Flood insurance policies on protected structures would no longer be required. Flood forecasting

and warning information would be tied more closely to the operation of flood works and emergency activities.

With the exception of plan 5, all plans include permanent levees as part of the total plan.

Plan 1 focused on various levee alignments, supporting nonstructural measures, and two levels of protection.

o Alignments

- Alignment 1 - Authorized project: levee alignment raised and lengthened to meet changed conditions.

- Alignment 2 - Authorized project: levee alignment set back, raised, and lengthened based on updated engineering information and changed conditions. The levee could be constructed along this alignment; however, some additional engineering investigations and analysis are required to verify the alignment.

- Alignment 3 - Authorized project: levee alignment set back, raised, and lengthened based on updated technical information and changed conditions. This alignment may be feasible, but will require more extensive engineering investigations and analysis than alignment 2.

o Design level of protection

- 1-percent chance flood
- Standard project flood

o Nonstructural measures

- Flood proofing, evacuation, flood insurance, floodplain zoning, flood warning and flood forecasting, updating current emergency plan of action.

Following further geotechnical investigation based on additional field investigations and an analysis of boring and testing data, it was determined that a major portion of alignment 1 (the alignment of the authorized project) was no longer feasible due to unacceptable foundation conditions. This determination made the engineering estimates and economic evaluation for alignment 1 invalid. The analysis concluded that the levee alignment needed to be moved farther landward of the unstable riverbank to ensure an acceptable levee design factor of safety. This engineering constraint meant that many homes along the riverbank could no longer be protected by levees.

Two new alignments for the authorized project were drawn farther away from the river as follows:

1. A levee alignment (alignment 2) which represents an alignment that can probably be constructed based on some additional engineering investigations and analysis.

2. A levee alignment (alignment 3) which represents an alignment that may be feasible, but will require more extensive engineering investigations and analysis than alignment 2.

Project features for alignments 1, 2, and 3 by level of flood protection are as follows:

o Alignment 1

- No flood protection is feasible at the 1-percent and standard project flood levels.

o Alignment 2

- 1-percent chance flood design level of protection - The levee/floodwall measure consists of 18,170 feet of earth levee, 2,360 feet of floodwall, four stop log transportation closures, 20,500 feet of interceptor storm sewers, 28 acres of stormwater ponding area, five gravity stormwater outlets, five interior flood control pumping stations with a combined pumping capacity of 486,000 gpm, alterations to utilities including some sanitary sewers, water and gas lines, and power lines. The design level of protection would be to the 1-percent chance flood.

- Standard project flood design level of protection - The project consists of 37,920 feet of earth levee, 2,400 feet of floodwall, 8 stop log transportation closures, 20,500 feet of interceptor storm sewer, 28 acres of stormwater ponding area, five gravity stormwater outlets, five interior flood control pumping stations with a combined capacity of 986,000 gpm, alteration to utilities including some sanitary sewer, water and gas lines, and power lines. The design level of protection would be the standard project flood level of protection.

o Alignment 3

- 1-percent chance flood protection - The levee/floodwall measure consists of 28,900 feet of earth levee, 7,080 feet of floodwall, three stop log transportation closures, 20,500 feet of interceptor sewer, two stormwater ponding areas totaling 31.9

acres, five gravity stormwater outlets, five interior flood control pumping stations with a combined capacity of 370,000 gpm, and alterations to utilities including some sanitary sewers, water and gas lines, and power lines. The design level of protection would be the 1-percent chance flood.

- Standard project flood protection - The levee/floodwall project feature consists of 35,120 feet of earth levee, 7,080 feet of floodwall, 8 stop log transportation closures, 20,500 feet of interceptor sewer, two stormwater ponding areas totaling 31.9 acres, five gravity stormwater outlets and five interior flood control pumping stations with a combined capacity of 370,000 gpm, and alterations to utilities including some sanitary sewer, water and gas lines, and power lines. The design level of protection would be the 1-percent chance flood.

Alignments 2 and 3 and the area in between defined a corridor of possible alignments. Somewhere between alignments 2 and 3 exists a "best alignment" based on engineering, economic, and environmental constraints. The major engineering constraints of foundations needed to be balanced against the economic resources and social constraints of the area. Obviously, additional engineering foundation studies were required to firm up the best foundation alignment. Additional borings, testing, and analysis of soils in the area as well as project features and bank unloading need to be evaluated further to help define a recommended alignment. Social concern for the disposition of structures and people who would not be protected by modified levee alignments had to be considered carefully and weighed against engineering and economic constraints. Whether structures stay in the present area, are relocated, or are floodproofed would impact on many social factors in the community. These social factors and concerns needed to be addressed to help identify the overall best plan. Economic considerations are also necessary to define the best plan.

Study findings indicated that the final plan would most probably consist of a combination of structural and nonstructural measures. Major components of a best plan will probably consist of levees and floodwalls, floodproofing, acquisition/relocation, flood emergency management plan, floodplain zoning, flood warning and forecasting, and flood insurance.

All plans would have levees constructed within the corridor of alignments 2 and 3. Emergency levees outside the permanent levee alignment would be removed, and materials from the levees would be used, where possible, to construct the permanent levees. Structures outside the levee would be provided transportation and utilities access during nonflood periods. Levee project features are defined for alignments 2 and 3 at the 1-percent chance flood and standard project flood level.

- o Alignment 1

  - No flood protection is feasible due to foundation problems.

- o Alignment 2

  - This alignment consists of the following features at the 1-percent chance and standard project flood levels of protection.

Features	Level of project protection: 1-percent Chance Flood	Level of project protection: Standard Project Flood
Earthen levee (feet)	18,170	37,920
Floodwall (feet)	2,360	2,400
Road closures (No. of)	4	8
Interior drainage works		
Interceptor sewer (feet)	20,500	20,500
Ponding area (acres)	28	28
Gravity outlets (No. of)	5	5
Pumping stations (No. of)	5	5
Utilities	Relocation of sewer and water	Relocation of sewer and water

o Alignment 3

- This alignment consists of the following features at the 1-percent chance and the standard project flood levels of protection.

Features	Level of project protection: 1-percent Chance Flood	Level of project protection: Standard Project Flood
Earthen levee (feet)	28,900	35,120
Floodwall (feet)	7,080	7,080
Road closures (No. of)	3	8
Interior drainage works		
Interceptor sewer (feet)	20,500	20,500
Ponding area (acres)	31.9	31.9
Gravity outlets (No. of)	5	5
Pumping stations (No. of)	5	5
Utilities	Relocation of sewer and water	Relocation of sewer and water

Plan 2 adds floodproofing to select commercial structures in the area. Residential structures were not considered eligible for floodproofing because of the long duration of inundation of structures, which may last for several weeks. Any plan including floodproofing will need to be analyzed carefully for its engineering and economic impacts.

Plan 3 adds acquisition to levees and other nonstructural measures. Approximately 135 structures could be cost effectively acquired as part of the overall plan. However, not all structures outside the levee protection are economically feasible to acquire. The disposition of the remaining structures depends on many factors to include: cost of flood damages, levee alignment, availability of roads and utilities services, willingness of owners and city residents to identify and agree upon a solution to the problem, and availability of outside financial and social assistance to acquire and relocate structures in the area.

Plan 4 is a combination of levees, floodproofing, acquisition, and other nonstructural measures. This plan could be labeled the "best plan" because it utilizes all available flood reduction measures to reduce flood damages at East Grand Forks. This combination needs further definition before decision-makers can identify a "best plan."

Plan 5 assumes no change from existing emergency flood fighting practices. This plan is not in the local or Federal interest. Until the 1979 flood, most people in East Grand Forks felt that the emergency management approach to the city's flood problem was appropriate, and outside assistance was generally available to prevent flood damages. Following the 1979 flood, city officials and many residents recognized the seriousness of their flood problem and the limitations of outside

resources. They were no longer confident that emergency flood fighting would provide flood protection for higher flood levels.

In 1979, extensive city, State, and Federal resources were necessary to provide emergency flood protection. The risk of depending on emergency flood management was very apparent. Flood forecasting and warning did not provide enough advance information to flood insurance holders or emergency construction workers. The construction of emergency levees was just keeping ahead of floodwaters, and materials and supplies for their construction were becoming scarce. The efforts of thousands of volunteer workers were necessary to implement levee protection. Although the successful flood fight had a tremendous positive effect on community cohesion, a levee failure could have had many negative impacts.

When the flood levels began to subside, the city undertook a massive cleanup effort which took months to complete. This effort would have placed a large financial burden on the city without outside financial assistance from Federal and State resources. This source of financial assistance was almost 100-percent Federal.

Current Federal assistance programs for cleanup require a 25-percent local commitment. Current flood insurance actuarial rates are subsidized by Federal dollars. The trend is for fewer Federal dollars in future years, which will put more of the burden of costs for building in the floodplain on the actual owner.

It appears that existing flood fighting practices may not be able to meet the higher future flood threats at East Grand Forks. Sooner or later, a flood level will overtop emergency efforts. The time of this occurrence is hard to predict. If it happens within the near future, the city cannot afford the costs related to major flood losses and will need to seek outside assistance. If it occurs in the distant future,

time may help relocate and reduce the flood losses through normal deterioration of floodplain areas. However, the city will continue to face the threat of major flood damages and a deteriorating effect on future development.

If the city undertakes a plan now, it has State and Federal support for a plan, it will hedge against future flood losses, and it will have a greater opportunity to plan around flood problems. However, the city must obligate scarce resources for that commitment. If the city does not undertake a flood control plan now, it risks major flood losses and hedges against a major commitment of scarce resources which can be redirected toward other purposes such as redevelopment of the business district.

Comparison of Plans. - The following table summarizes the significant impacts of the five plans.

Summary comparison of impacts by plans

Item impacted	Plan 5 - no action	Plan 1		Plan 2		Plan 3		Plan 4	
Levee alignment		Alignment 3	Alignment 2	Alignment 3	Alignment 2	Alignment 3	Alignment 2	Alignment 3	Alignment 2
Plan description	Maintain status quo - flood protection through floodplain zoning, flood forecasting/warning and emergency preparedness.	Flood protection through levee construction and other nonstructural measures.		Flood protection through levee construction, flood proofing and other nonstructural measures.		Flood protection through levee construction, evacuation/relocation, and other nonstructural measures.		Flood protection through levee construction, flood proofing, evacuation, and other nonstructural measures.	
Engineering:									
Geotechnical	Failure of emergency levee imminent due to poor foundation integrity.	Levee alignment requires further study.	Levee alignment not likely to move further landward.	Same as plan 1. Flood proofing of many residential structures not possible due to long inundation period.		Same as plan 1.		Same as plan 1.	
Interior flood control	No interior flood control facilities for emergency levees. Areas subject to interior flooding.	Interior flood control works provided for area protected by levee.		Same as plan 1.		Same as plan 1.		Same as plans 1, 2, and 3.	
Design	Design is on an as-needed emergency basis. No guarantee emergency levees will work for next event.	Levee designed to meet engineering, economic, environmental, and social constraints. Guaranteed to work for level designed.		Same as plan 1 plus flood proofed structures.		Same as plan 1.		Same as plans 1, 2, and 3.	
Economic	o Expensive emergency costs. Approximately $5 million Federal, State, and local funds expended since 1965.	Plan benefits exceed costs: benefit-cost ratio of 2.8 at 3 1/4 percent and 1.1 at 7 7/8 percent.		Same as plan 1.		Same as plan 1.		Same as plan 1.	
	o Loss of revenues during pre- and post-flood activities.	Range of first cost		Range of first cost		Range of first cost		Range of first cost	
		Federal		Federal		Federal		Federal	
		$10.7 to $15.6 million.		$12.2 to $15.8 million.		$16.5 to $21.4 million.		$18.0 to $21.6 million.	
		Non-Federal		Non-Federal		Non-Federal		Non-Federal	
	o Estimated average annual damages of $3.1 million at 3 1/4 percent interest and $2.9 million at 7 7/8 percent interest.	$ 9.8 to $10.0 million.		$10.0 to $10.2 million.		$11.2 to $11.5 million.		$11.5 to $11.6 million.	
		Levees will provide 78-93 percent reduction of flood damages.	Levee will provide 72-90 percent reduction of flood damages.						
Social	o 2475 structures without permanent protection: 162 commercial, industrial, and public structures; 2,313 residential structures.	Structures protected		Same as plan 1 and:		Same as plan 1 and:		Same as plan 1 and:	
		2,193	1,983	Commercial structures flood proofed		Homes outside levee acquired		Homes outside levee acquired	
		Under levee		2	13	135	135	135	135
		78	82			Unprotected		Flood proofed	
		Outside protection				66	275	2	13
		201	410					Unprotected	
								64	262
	o Regional factors remain constant: o National/regional relations change o Flood regime remains constant or worsens o Continual decay of commercial and residential floodplain areas o Reduced property values and tax base of floodplain areas	o Same as no action plan for area/structures without flood protection. o Opportunity to maintain or improve economic and population bases. o Noise level high during construction. o Aesthetics will change significantly along downtown/residential floodwall areas. o Opportunity to maintain and improve community conesion. o All above impacts depend on timing of acquisition of unprotected structures.		o Same as plan 1.		o Same as plan 1.		o Same as plan 1.	
Environmental									
Terrestrial habitat	Base condition - 48 acres of woods lost over 100 years.	57 acres of woods lost over 100 years; 6 acres of agricultural land lost. Short-term adverse impacts on grassed/open areas. Approximately 29 acres affected.	Same as base condition - 48 acres of woods lost.	Same as plan 1.		Same effects as plan 1, with some increase in acres of grassland/open due to relocation/evacuation.		Same as plan 3.	
Wetlands	Base condition.	1.5-acre man-made wetland.		Same as plan 1.		Same as plan 1.		Same as plan 1.	
Water quality	Base condition.	Short-term decrease in surface water quality due to runoff from construction site.		Same as plan 1.		Same as plan 1.		Same as plan 1.	
Air quality	Base condition.	Temporary increase in air pollution during construction.		Same as plan 1.		Same as plan 1.		Same as plan 1.	
Threatened and endangered species	Base condition.	No effect.		No effect.		No effect.		No effect.	
Cultural	Base condition.	Currently no known sites listed on or eligible for inclusion on National Register.		Same as plan 1.		Same as plan 1.		Same as plan 1.	
Recreation	No change from base condition.	There is an opportunity to upgrade and/or add areas and facilities to the city's park system.		Same as plan 1.		Same as plan 1.		Same as plan 1.	

Conclusions of Initial Plans. -

- o Emergency flood fighting will not be able to meet higher future flood threats without a better emergency plan and extensive outside help.

- o A flood damage reduction plan is needed to allow the city to plan around its flood problem, grow, and develop.

- o A flood damage reduction plan composed of structural and nonstructural measures is technically feasible, implementable, complete, and will not require future improvements.

- o The plan components will consist of structural and nonstructural measures. Structural measures include levees. Nonstructural measures may include floodplain evacuation, floodproofing, floodplain zoning, flood insurance, flood warning and forecasting, and updating the existing emergency plan of action.

Planning Constraints of Initial Plans. - Major planning constraints required further study and analysis of the following items.

- o Establishment of a recommended levee alignment to meet engineering factors of safety as well as economic and social needs.

- o Identification of East Grand Forks' most probable future without flood works.

- o Identification of the disposition of structures remaining outside of the levee protection.

- o Identification of Federal and non-Federal cost and sources of funds.

Studies for developing first level plans identified an alignment corridor in which the overall best alignment lies. Additional studies were programmed to identify the best alignment in terms of engineering, economic, and environmental constraints. Further studies were needed to analyze the foundation problem to identify the best alignment closest to the river that meets an acceptable factor of safety considering the engineering, economic, social, and environmental risks involved.

The city of East Grand Forks has a decaying central business district. New commercial development has recently focused on Highway 220N. The city faces several most probable future choices which are sensitive to the flood risk in four areas: industrial development, commercial redevelopment, residential development, and population maintenance. A critical task for the city was to define the most probable future without project condition. Once this condition was defined and concurred in by the city, flood control measures and plans could be determined and evaluated against this condition to aid decision-makers in identifying the merits of flood control works.

The number and disposition of structures not protected by a levee project, floodproofing, or acquisition would depend on the final levee alignment and related engineering, economic, social, and environmental impacts. Obviously, the closer the levees were to the river, the larger the number of structures to be protected by the levees and the fewer the number of structures requiring floodproofing or acquisition. Additional studies were needed to weigh the risks in levee location against the realistic social impacts.

The financial cost of flood protection is beyond the city's capability. Identification of a Federal and non-Federal source of funds and cost sharing arrangement to help the city implement the plan were required. The range of the Federal and non-Federal share of the project cost is shown in the following tabulation.

	Project First Cost ($ Millions)
Federal cost	10.7 - 21.6
Non-Federal cost	9.8 - 11.6
Total project cost	20.5 - 33.2

Second Level Formulation of Final Plans

Initial plans were coordinated with interested publics at an October 1983 workshop/public meeting in East Grand Forks. Following the meeting, studies were continued to identify a recommended levee alignment, the city's most probable future, and the disposition of structures outside levee protection. The final level of formulation and evaluation focused on three new plans for the city based on a recommended levee alignment, the complete evacuation of structures outside the levee protection and a newly defined city future. Two distinct areas were identified and evaluated separately; that is, the areas north and south of the Red Lake River. Each area is able to stand alone as an independent flood protection area. Each area was first analyzed for its engineering and economic feasibility for the construction of levees independently and in combination with complete evacuation of structures outside the levee protection. The following table summarizes the results of that evaluation.

Benefit-Cost Ratios for 100-Year and Standard Project Floods at the Authorized Interest Rate (3-⅛ Percent)

Area	100-Year Flood	Standard Project Flood
North	2.9	3.0
South	0.8	0.9

The analysis at the 1-percent and standard project flood levels of protection showed that the area north of the Red Lake River produced a feasible levee component whereas the area south did not. No further study of levees south of the Red Lake River was recommended. Following this evaluation, two plans were evaluated at the 1-percent and standard project flood levels of protection for the city. The plans focused in on the following measures for each subarea.

Total Flood Damage Reduction Plans for East Grand Forks, Minnesota

Area	Viable Measures
North	Levees and floodwalls Evacuation Floodplain warning and forecasting Floodplain zoning Updated flood emergency plan of action
South	Evacuation/relocation Flood proofing Flood insurance Floodplain warning and forecasting Floodplain zoning Updated flood emergency plan of action

Description of Plans. - A description of each plan follows.

Plan 6 consists of levees and other nonstructural measures for the subarea north of the Red Lake River and nonstructural measures for the subarea south of the Red Lake River.

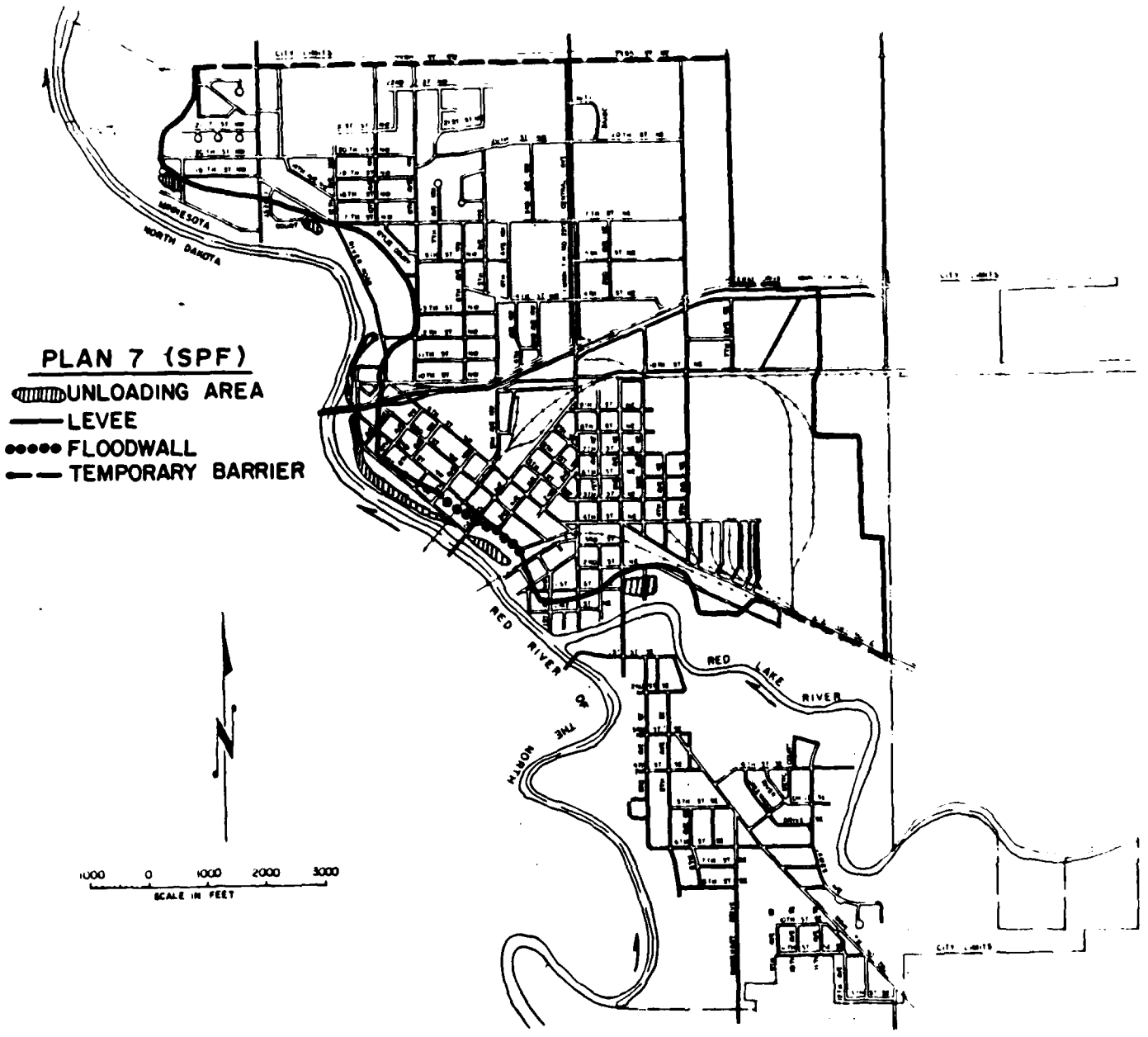
For the area north of the Red Lake River, levees would be constructed to a design level and freeboard of the 1-percent chance flood. Emergency levees outside the levee alignment would be removed to reduce the risk of foundation failure. Material from the emergency levees would be used, where possible, to construct the project levees. All structures outside the levee protection would be acquired. Four

riverbank areas (see the following figure) would be unloaded to reduce the risk of levee failure. All unloaded areas and acquired properties would be restored to the appearance and condition of the natural floodplain, as much as possible, and zoned for appropriate floodplain use. In addition, floodplain zoning regulations would be revised, removing protected areas from current floodplain zoning regulations and the requirement of flood insurance. Flood forecasting and warning would be tied closely with the operation of the project plan and the current flood emergency plan. The emergency plan of action would be revised to consider flood emergencies that require the operation of the project as specified by operation manuals and to consider emergency action for floods that would exceed design levels of protection.

For areas south of the Red Lake River, 14 residential and 3 commercial structures would be acquired. Commercial structures would be floodproofed when the cost of acquisition or floodproofing is less than or equal to the flood damages incurred. Individual owners would be advised of the benefits of acquiring flood insurance to defray flood losses to residential and commercial structures. Areas acquired would be restored to an appropriate floodplain use and remain zoned floodplain. Flood forecasting and warning systems and coordination with NOAA and other forecasting agencies would be closely tied to emergency action activities. The current flood emergency plan of action would be revised to identify emergency actions the city and individual property owners would carry out during a series of flood scenarios starting at the zero damage level to action required for a standard project flood.

Plan 7 is the same as plan 1A with one exception. The costs and benefits of structural and nonstructural measures are evaluated at the standard project flood level of protection.

EAST GRAND FORKS , MINNESOTA



Plan 8 selects the best components of plans 1A and 2A, identifying the optimum plan (NED plan) for areas north and south that reasonably maximizes the economic benefits of structural and nonstructural measures. This plan seeks to optimize the economic benefits based on the design level of protection of levees as well as the evacuation and flood proofing of structures outside levee protection, where reasonable and practical. For the area north, levees would be constructed to the 0.3-percent chance flood level of protection. All other conditions would remain the same as those identified in plan 1. For the area south, all conditions would be the same as those recommended in plan 1; that is, by evacuating or floodproofing structures to the 1-percent chance protection where they have a benefit-cost ratio of 1/1 or greater. The evacuation and floodproofing measures were removed from further consideration when the city of East Grand Forks indicated that it could not implement the acquisition of the 14 residential and 3 commercial properties on the Point because of social and political problems.

Plan 5 - This is the same without plan used in the initial evaluation. It assumes continuation of existing flood fighting practices based on emergency management or on an emergency by emergency basis. The city would follow the existing emergency plan to include construction of emergency levees; loading and unloading of emergency levees; and dependence on Federal, State, and local materials, money, manpower, and time resources to meet future flood threats and reduce flood damages.

Comparison of Plans. - The Federal and non-Federal first costs for plans 6, 7, and 8 are shown in the following table. The recommended plan (No. 8) would have a Federal first cost of $22,440,000 and a non-Federal first cost of $8,100,000.

Federal and Non-Federal First Costs ($1,000's)

Item	Plan 6	Plan 7	Plan 8 (NED)
Federal	19,923	23,035	22,440
Structural	[illegible]	12,415	11,820
Levee construction	(475)	(921)	(842)
Bank unloading	(472)	(472)	(472)
Removal of emergency [illegible]	(348)	(348)	(348)
Floodwall construction	(3,377)	(3,751)	(3,445)
Closure	(266)	(838)	(749)
Roads	-	(320)	(199)
Interior drainage	(3,038)	(3,038)	(3,038)
Pumping plant	(2,277)	(2,277)	(2,277)
Beautification	(450)	(450)	(450)
Nonstructural	[illegible],000	8,000	8,000
Evacuation	(6,480)	(6,480)	(6,480)
Relocation assistance	(1,520)	(1,520)	(1,520)
Recreation	215	215	215
Engineering & Design	1,467	1,467	1,467
Supervision & Administration	938	938	938
Non-Federal	8,080	8,100	8,100
Structural	5,865	5,885	5,885
Utilities	(1,385)	(1,385)	(1,385)
Evacuation	(3,000)	(3,000)	(3,000)
Relocation assistance	(1,480)	(1,500)	(1,500)
Nonstructural	2,000	2,000	2,000
Evacuation	(1,620)	(1,620)	(1,620)
Relocation assistance	(380)	(380)	(380)
Recreation	215	215	215
Total Plan Cost	28,003	31,135	30,540

The following table displays the average annual costs, benefits, and benefit-cost ratio of plans 6, 7, and 8 at the authorized and current interest rates of 3-1/4 and 8-1/8 percent, respectively.

Benefit-Cost Ratios for Plans 6, 7, and 8

	3-1/4 percent ($1,000's)			8-1/8 percent ($1,000's)			8-3/8 percent ($1,000's)
	Plan 6	Plan 7	Plan 8 (NED)	Plan 6	Plan 7	Plan 8 (NED)	Plan 8 (NED)
Average Annual Benefits							
Levee	$1,799	$2,211	$2,193	$1,632	$2,005	$1,990	$1,982
Acquisition	587	587	587	587	587	587	587
Other	154	154	154	155	155	154	154
Total Average Annual Benefits	2,540	2,952	2,934	2,374	2,747	2,731	2,723
First Costs	28,003	31,135	30,540	28,003	31,135	30,540	30,540
Interest During Construction	264	314	300	670	797	773	780
Total Investment Costs	27,404	28,049	27,440	27,810	28,532	27,913	27,920
Average Annual Costs							
Annual Costs	840	948	928	2,054	2,319	2,269	2,274
O&M Costs	30	30	30	30	30	30	30
Total Annual Costs	870	978	958	2,084	2,349	2,299	2,304
Benefit-Cost Ratio	2.9	3.0	3.1	1.14	1.17	1.2	1.18
Net Benefits	1,670	1,974	1,976	290	398	432	419

The following table summarizes plan features and compares the economic, environmental, cultural, and social impacts of plans 6, 7, and 8 with plan 5 (without plan). The selected plan for Federal action is plan 8, which has the most favorable benefit-cost ratio and the greatest net economic benefits consistent with protecting the Nation's environment. This selection is based on comparison of plan impacts as summarized in the table and documented in the environmental impact statement and supporting documentation.

Summary Comparison of Plan Impacts

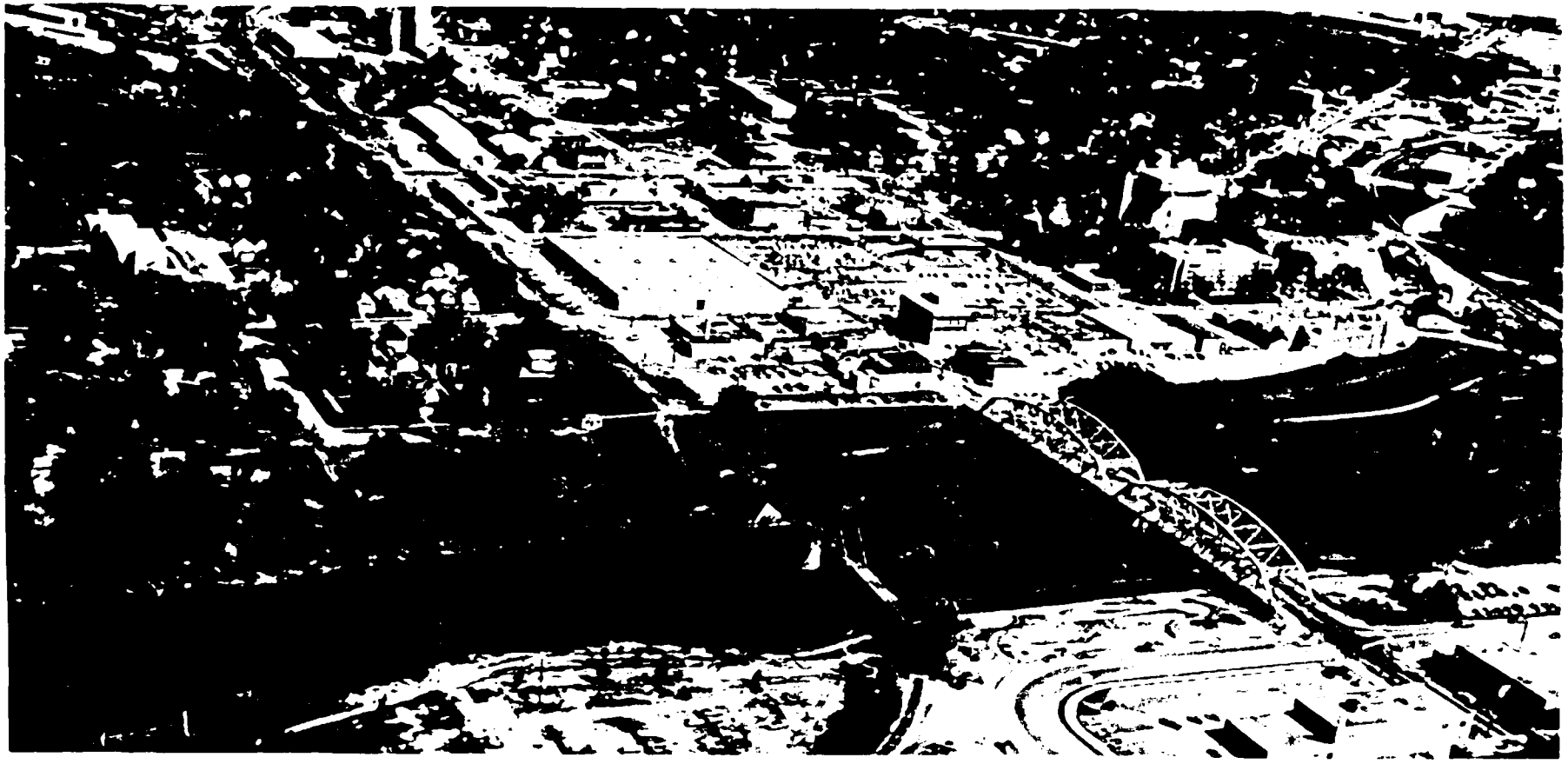
Item	Without Plan	With Plans					
		Alternative Components North of Red Lake River			Alternative Components South of Red Lake River		
	Plan 5	Plan 6	Plan 7	Plan 8 (NED)	Plan 6	Plan 7	Plan 8 (NED)
Structural Components							
Level of Protection	Protection uncertain, levees constructed for one-time event.	1.0 percent	SPF	0.3 percent	1.0 percent	SPF	Base condition
Length of Earth Levee (ft)	9,504	13,240	17,290	17,290	14,100	16,240	Base condition
Length of Floodwall (ft)	0	2,970	3,760	3,760	2,800	1,800	Base condition
Closures (No. of)	0	5	8	8	4	6	Base condition
Road Modification (ft)	N.A.	200	9,950	6,850	-	600	Base condition
Bank Unloading (acres)	N.A.	15	15	15	10	10	Base condition
Removal of Emergency Levees	Loading and unloading of 650 feet of emergency levee north of Red Lake River for each flood event.	9,500	9,500	9,500	0	0	Base condition
Interior Drainage	No permanent system. Emergency equipment only.						
Gravity outlet (ft)		2,800	2,800	2,800	400	400	Base condition
Interceptor sewer (ft)	-	8,300	8,300	8,300	7,700	7,700	Base condition
Ponding area (acres)	-	16.1	16.1	16.1	3.9	3.9	Base condition
Gravity outlets (No.)	-	4	4	4	1	1	Base condition
Pumping stations (No.)	-	3	3	3	1	1	Base condition
Real Estate	Emergency acquisition.						
Structures acquired							
Residential		75	75	75	Dropped from further consideration due to economic infeasibility.		Base condition
Commercial		3	3	3			
Utility Modifications	Modifications would be made under emergency conditions.						
Water lines (ft)		6,350	6,350	6,350	6,150	6,150	Base condition
Sanitary sewer (ft)		9,900	9,900	9,900	1,000	1,000	Base condition
Nonstructural Component							
Evacuation							
Structures with permanent protection (No.) (1)	0	1,777	1,777	1,777	0	0	0
Structures acquired (No.)	Emergency acquisition will be required, depending on nature and extent of future floods.	129	129	129	17	17	0
Residential		(117)	(117)	(117)	(14)	(14)	0
Commercial		(12)	(12)	(12)	(3)	(3)	0
Occupancy units	All susceptible city units will continue to be disrupted, depending on nature and extent of floods.	293	293	293	17	17	0
Residential households		(254)	(254)	(254)	(14)	(14)	0
Commercial businesses		(39)	(39)	(39)	(3)	(3)	0
Total occupants		600	600	600	34	34	0
Flood Forecasting and Warning	Continuation of existing practices.	----------Tied closely with NOAA and project operation--------					Tied closely with NOAA and emergency plan of action.
Floodplain Zoning	Continuation of existing practices.	Of 314 floodplain acres, 290 would be removed and 24 would remain.			Of 251 floodplain acres, 75 would be removed and 176 would remain.		Enforcement of zoning regulations on 251 acres of floodplain.
Flood Emergency Plan of Action	Continuation of existing plan.	Update plan to consider emergencies that would overtop designed level of protection.					
Flood Insurance	40 percent of the structures in the city are in the floodplain; all would need flood insurance.						
Structures needing flood insurance		0	0	0	0	0	574
Economic	High risk of major flood damages; approximately $5 million has been spent in emergency efforts since 1965. Costs are difficult to forecast and are based on nature and extent of future flooding.						
First Costs ($ millions)							
Federal first cost		16.4	19.5	18.9	Dropped due to economic infeasibility.		
Non-Federal first cost		10.3	10.3	10.3	Dropped due to economic infeasibility.		
Total first cost		26.6	29.8	29.2	Dropped due to economic infeasibility.		
Benefit-Cost Ratio		2.9	3.0	3.1	0.7	0.9	0.7
Fish and Wildlife Resources							
Riparian Habitat							
Wooded	Of 114 acres of total habitat, 60 acres north and 54 acres south, approximately 12 acres will be lost north and 11 acres south.	49 acre increase when compared to without condition.			Plans dropped due to economic infeasibility.		Base condition south
Grassed	114 acres of total grassland 42 acres north and 72 acres south. Wooded acres would be converted to grassland; 12 acres north and 11 acres south.	6 acre increase when compared to without condition.			Plans dropped due to economic infeasibility.		Base condition
Wetlands	1.5-acre man-made wetland.	----------Same as plan 5----------					
Water Quality	Base condition.	Short term decrease in surface water quality due to runoff from construction site.			Plans dropped due to economic infeasibility.		Base condition
Air Quality	Base condition.	Short term increase in air pollution during construction.			Plans dropped due to economic infeasibility.		Base condition
Threatened or Endangered Species	Base condition.	----------No effect.----------			Plans dropped due to economic infeasibility.		No effect

(1) The total number of structures in East Grand Forks subject to direct flood danger is 2,477. With above plan 1,777 structures north of Red Lake River would have permanent protection.

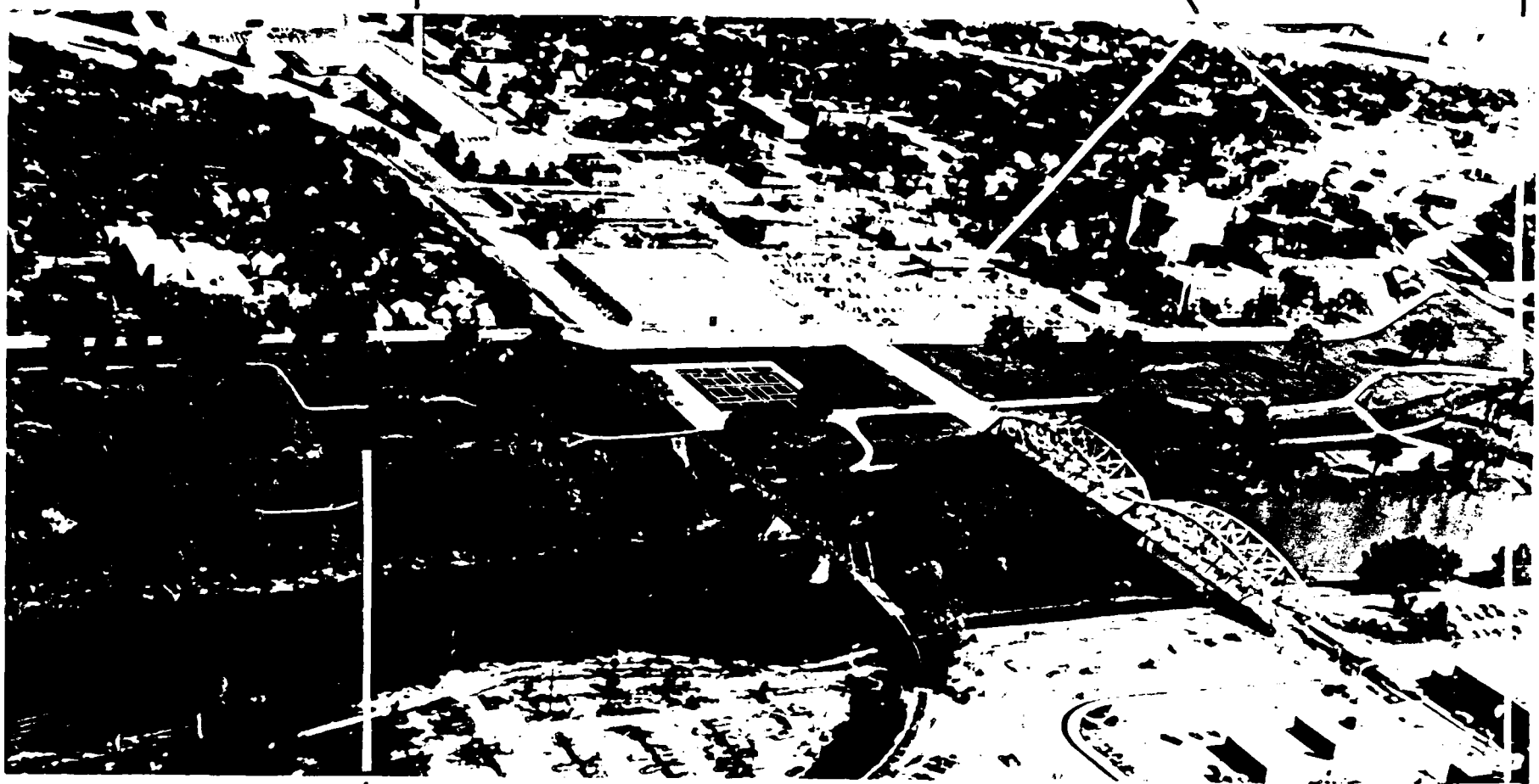
Summary Comparison of Plan Impacts (Continued)

Item	Without Plan	With Plans					
		Alternative Components North of Red Lake River			Alternative Components South of Red Lake River		
	Plan 5	Plan 6	Plan 7	Plan 8 (NED)	Plan 6	Plan 7	Plan 8 (NED)
Cultural Resources	Currently, no known sites are listed on or eligible for inclusion on National Register.	--------Same as without plan.-------			Plans dropped due to economic infeasibility.		Same as without plan.
Social							
Existing Physical Development							
Structures	Deterioration and devaluation due to floodplain regulations and floods.	192 residential and 15 commercial structures removed of which about 70 percent may be relocated to protected areas. 1,777 remaining structures would be protected.			Plans dropped due to economic infeasibility.		Base condition
Utilities	No significant change.	Some abandoned infrastructure, but most will be protected.			Plans dropped due to economic infeasibility.		Base condition
Transportation	No significant change.	Traffic disruption during construction only.			Plans dropped due to economic infeasibility.		Base condition
Property value	Devaluation of all floodplain property, particularly in lowest elevations.	Enhanced in protected areas, declined in acquired areas; net increase.			Plans dropped due to economic infeasibility.		Base condition
Tax Base							
Property Value	Devaluation of all floodplain property, particularly in lowest elevations.	----------Net increase----------			Plans dropped due to economic infeasibility.		Base condition
Population	Growth of 14 percent over next 20 years.	Temporary slowing of growth. Approximately 76 households (183 individuals) may not choose to relocate within city. Opportunity for increased growth and development over study life.			Plans dropped due to economic infeasibility.		Base condition
Retail Sales	Moderate increase.	No significant impact.			Plans dropped due to economic infeasibility.		Base condition
Social System							
Neighborhoods	No significant change; some general blight.	15 residential floodplain blocks or clusters permanently removed. Opportunity to restructure residential area protected and maintain or improve neighborhood integrity.			Plans dropped due to economic infeasibility.		Base condition
Business District	Deterioration of downtown; continued restructuring along Highway 220 north (out of floodplain).	Four commercial floodplain blocks removed; opportunity to restructure existing downtown area.			Plans dropped due to economic infeasibility.		Base condition
Social Cohesion							
Need	Continued anxiety and concern for the threat of flooding, flood control, and lack of permanent dependable flood protection.	High consensus on seriousness of floodplain problem, but not on best solution.			Plans dropped due to economic infeasibility.		Base condition
Community Viability	Continued concern for deterioration of residential and business community.	Concern about residential and commercial consequences.			Plans dropped due to economic infeasibility.		Base condition
Equity	Concern for devaluation of floodplain properties and their upkeep under strict floodplain zoning regulations.	Concern about allocation of costs, acquisitions, and property values.			Plans dropped due to economic infeasibility.		Base condition
Recreation							
Valley Golf Association Golf Course	Nine-hole golf course expanding to eighteen-hole golf course.	Some disruption to area during construction. No loss of property.			Plans dropped due to economic infeasibility.		Base condition
River Heights Park	22-acre wooded park with existing trails and playground equipment. City plans to provide additional facilities.	Possible minor loss of park land. No impact for existing or planned future development.			Plans dropped due to economic infeasibility.		Base condition
Dike Park	A 1.5-acre park is a tot lot for surrounding residents. Continued use of park.	Surrounding residents would be relocated. Equipment would be relocated. Loss of clientele.			Plans dropped due to economic infeasibility.		Base condition
Rivers Edge Park	A 20-acre park - primarily open space. City plans to develop a 25-unit campground next to river.	No impact to existing or planned facilities. Park area would be expanded.			Plans dropped due to economic infeasibility.		Base condition
Driggs Park	A two-acre park with play equipment, warming house, and hockey rink. Continued use of park.	Levee would displace some equipment and hockey rink.			Plans dropped due to economic infeasibility.		Base condition
Open Space System	Continued traditional use of open space areas beyond existing park boundaries.	The addition of approximately 55 acres to system with potential for recreation development and/or wildlife habitat. Increased maintenance responsibilities for city.			Plans dropped due to economic infeasibility.		Base condition

The following photographs depict two future scenarios for downtown East Grand Forks -- with and without a permanent levee. Without a permanent levee to protect the city, the downtown area (see picture on page 112) and depressed growth and development future is expected to look much as it is today due to future, even higher flood threats. Emergency levees will remain as shown but higher levels will be constructed only by raising and unloading earthen levees in this reach during each flood emergency. Without unloading of this reach, the city faces the risk of the ultimate failure of the entire system. If frequent flooding continues, the city faces the risk of expensive flood emergency costs and further deterioration of the downtown area. With permanent flood protection (see picture on page 113), a floodwall would be constructed and homes and businesses evacuated as shown. The floodwall would be constructed to blend into a scenic city entrance. The area between the river and floodwall would be beautified and designated for an appropriate floodplain use such as: a picnic/recreation boat launch facility shown south of the DeMers Avenue bridge; an alternate road bypass south of the Burlington Northern tracks when unit trains block major traffic routes; a trail system tying into existing and planned trail systems; and conversion of remaining areas for wildlife purposes and reduced maintenance costs. In addition, permanent protection affords the city the opportunity for increased residential, commercial, and industrial growth without the needs for flood insurance and concern for the threat of future floods. The area north of DeMers Avenue connecting the older downtown area with development along Highway 220 could be redeveloped with a mix of businesses such as the conceptual shopping center shown in the picture. Redevelopment of existing structures in the older downtown residential and commercial area can be undertaken to retain and enhance the rich historical and cultural values of East Grand Forks' past with new future growth and development.



WITHOUT PLAN FUTURE FOR THE DOWNTOWN AREA OF EAST GRAND FORKS



WITH PLAN FUTURE FOR THE DOWNTOWN AREA OF EAST GRAND FORKS

Conclusions. - Upon completion of the final analysis of the plan, the following conclusions were reached.

- o The NED plan (plan 8) is the selected plan for reducing flood damage at East Grand Forks, Minnesota.

- o The NED plan is recommended for design studies.

Future Investigations (General Design Memorandum Documents)

The next level of studies will focus on the following general work items:

- o Detailed design of structural, nonstructural, and recreation features.
- o Plan implementation strategy.
- o Detailed cost estimates.
- o Legal documents/commitments.

Design details will be prepared for each feature of the plan to the level necessary for preparation of final plans and specifications. An implementation strategy activities flow chart will be developed to carry out each design detail. A detailed cost estimate and necessary legal documents will be prepared to specify the Federal and non-Federal responsibilities for carrying out the overall plan.

DESCRIPTION OF THE SELECTED PLAN

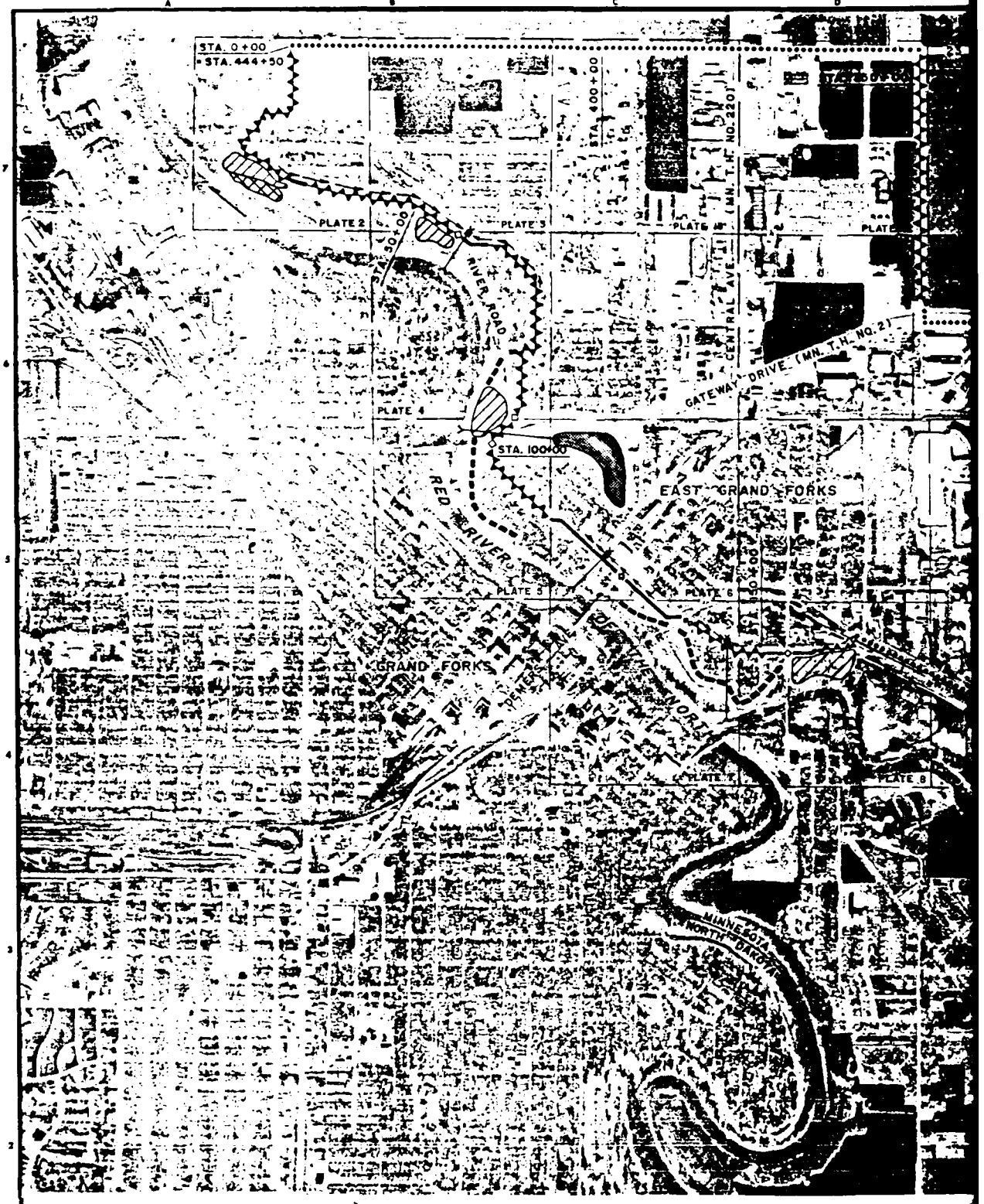
PLAN COMPONENTS

The flood damage reduction plan would provide flood protection for approximately 1,777 structures in East Grand Forks, Minnesota, that receive direct flood damages. The selected plan is composed of tne following structural and nonstructural measures by area.

Area	Measure
North of Red Lake River	Structural
	Levees
	Nonstructural
	Evacuation
	Floodplain zoning
	Flood warning and forecasting
	Emergency plan of action
South of Red Lake River	Structural
	None
	Nonstructural
	Floodplain zoning and enforcement
	Flood warning and forecasting
	Flood insurance
	Emergency plan of action

NORTH OF THE RED LAKE RIVER

Levees would be constructed to a design water surface elevation of the 0.3-percent chance flood event and a top of levee elevation of an 0.11-percent chance flood event along the alignment shown in the following figure. Approximately 1.8 miles of emergency levee would be removed from outside the permanent levee alignment to reduce the risk of foundation failure. Material from the emergency levees and unloading



GENERAL PLAN & INDEX

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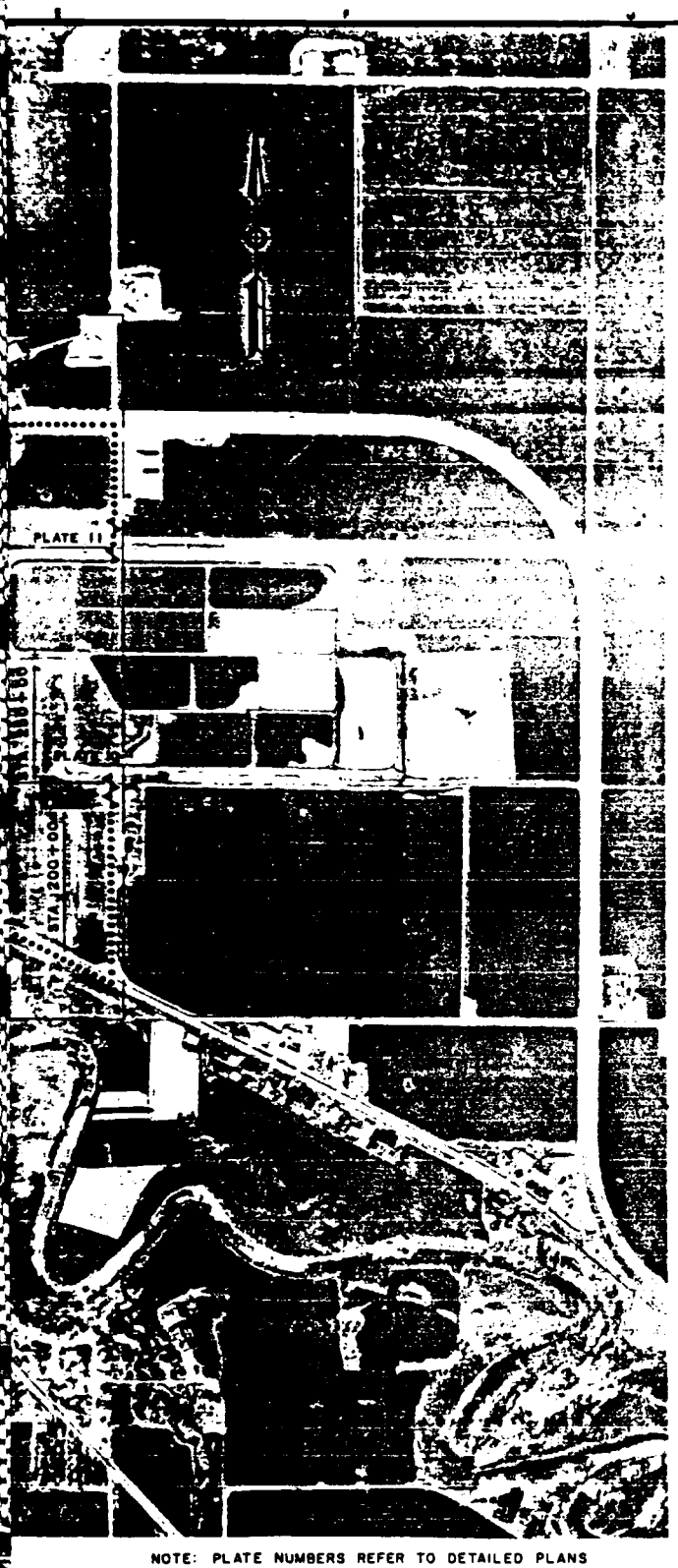
SCALE IN FEET

1 of 2



NOTE: PLATE NUMBERS REFER TO DETAILED PLANS IN SUPPORTING DOCUMENTATION.

LEGEND

- LEVEE
- FLOODWALL
- CLOSURE STRUCTURE
- ROAD RAISE & EMERGENCY FREEBOARD
- EMERGENCY LEVEE REMOVAL
- BANK UNLOADING AREA
- FILL AREA
- PONDING AREA
- PUMPING STATION
- GRAVITY OUTLET
- INTERCEPTING STORM SEWER

2 of 2

GENERAL REEVALUATION STUDY
FOR FLOOD CONTROL
AT
EAST GRAND FORKS, MINNESOTA

RECOMMENDED PLAN

GENERAL PLAN, INDEX, LEGEND

U. S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT MARCH 1984

area would be used to construct the permanent levees. A total of 75 structures under the permanent levee alignment and 129 structures outside the levee protection would be evacuated. All properties would be purchased and the owners would be assisted in finding replacement property under the Uniform Relocation Assistance Act. Four riverbank areas would be unloaded to reduce the risk of levee failure.

All unloaded areas and evacuated properties would be restored to the appearance and condition of the natural floodplain, as much as possible, and zoned for an appropriate floodplain use. Supplemental plantings would be provided to help beautify acquired lands, razed emergency levee areas, and unloaded areas. Plantings would be in groupings of trees and shrubs to allow visual diversity and interspersion, maximizing aesthetics and habitat values.

Floodplain zoning regulations would be revised, removing protected areas from the requirements of floodplain zoning regulations and flood insurance. Flood forecasting and warning services would be closely tied with the operation of the project plan. The current emergency plan of action would be incorporated into the operation of the project plan and revised to consider flood emergencies that would exceed design levels of protection.

Recreation development would take advantage of the expanded open space corridor along the Red and Red Lake Rivers. Recreation development would be concentrated in several areas with the remaining areas allowed to revert to natural areas to help minimize maintenance costs. Each area would be connected by a trail system. Specific areas include: a tailwater fishing and picnic area at the Red Lake River Dam; a picnic and play area in the unloaded area south of River Heights Park; a passive recreation/natural area between the U.S. Highway 2 bridge and the swing railroad bridge downtown; an open space area between the two railroad bridges downtown; a campground and fishing area south of the

Burlington Northern tracks; and connection of these areas with a trail system being proposed on "The Point."

SOUTH OF THE RED LAKE RIVER

Floodplain zoning regulations would be strictly enforced. Flood forecasting and warning services would be closely tied with the operation of the project plan. Residents would be advised annually of their floodplain status and the individual and city responsibilities during a flood emergency. Residents within the floodplain would also be advised of the advantages and disadvantages of acquiring flood insurance to defray flood losses. The current flood emergency plan of action would be updated and made a part of the project operation manual. It would consider a series of flood emergency scenarios at flood levels between the zero damage level and the standard project flood level. Selected scenarios would consider a step by step emergency action plan for reducing flood damages and loss of life when and if such a flood were to occur. This plan would be used by local, State, and Federal flood emergency agencies during a flood emergency.

DESIGN AND CONSTRUCTION CONSIDERATIONS

STRUCTURAL MEASURES

Design and construction of earthen levees, floodwalls, road raises, road closures, and interior flood control facilities would be the primary responsibility of the St. Paul District, Corps of Engineers. Protection would be constructed to a design water surface elevation of a 0.3-percent chance flood and a top of levee elevation of an 0.11-percent chance flood. Components of the levee-floodwall protection include: 17,290 feet of earthen levee, 3,760 feet of concrete floodwall, 8 road and/or railroad closures, 6,850 feet of road raise, 15 acres of unloaded bank, and 18,980 feet of flood emergency barrier which would be placed on top of existing roadways to provide freeboard for a design flood event only. Components of the interior drainage

system include: 2,800 feet of gravity outlet pipe, 8,300 feet of interceptor sewer, 16.1 acres of ponding area, 4 gravity outlets, and 3 pumping stations. The city of East Grand Forks and the Corps would closely coordinate all structural features as well as modifications to existing utilities to include: 6,350 feet of water lines and 9,900 feet of sanitary sewer lines.

Acquisition of all lands, easements, and rights-of-way, including acquisition of the 75 residential structures and 3 commercial structures along the levee alignment, would be the primary responsibility of the city of East Grand Forks. Many of these structures would be relocated within the city. The city and Corps would identify the disposition of these structures.

NONSTRUCTURAL MEASURES

Under the selected plan, an additional 12 commercial and 117 residential structures would be purchased and evacuated from the area between the permanent levee and the river. Evacuated sites would be graded, seeded, and beautified with appropriate vegetation for public safety and aesthetics and to minimize operation and maintenance costs. The city would have the primary responsibility for acquiring these properties. Acquisition would be coordinated with the Corps of Engineers. Many of these homes could be relocated within the city. The Corps, along with other agencies, would provide technical assistance to the city in planning, developing, and carrying out a city evacuation plan to include relocating structures; planning, layout, and design of evacuated and relocation areas; development sites; public involvement; coordination; and implementation details. In addition, the city would make available sufficient residential and commercial land in East Grand Forks, with and without existing dwellings, to accommodate all evacuated persons who wish to relocate there. It would be the responsibility of the city to insure that sufficient improved lots for new or relocated dwellings were ready by the time of project implementation.

OPERATION AND MAINTENANCE CONSIDERATIONS

The project would be operated for flood damage reduction. The operation and maintenance of the plan would be the responsibility of the city of East Grand Forks, in accordance with regulations prescribed by the Secretary of the Army.

PLAN ACCOMPLISHMENTS

The selected plan is a part of a comprehensive approach to reducing flood damages in the Red River of the North basin and represents a significant reduction in flood damages for the metropolitan area of East Grand Forks, Minnesota.

Tangible accomplishments of the selected plan are: reduced flood levels for the East Grand Forks area south of the Red Lake River (The Point area); significantly reduced flood damages and threat of flooding for East Grand Forks north of the Red Lake River; increased opportunity for growth and development for East Grand Forks; and reduced flood levels and damages (no induced flood damages) for Grand Forks, North Dakota and areas north and south.

Though tangible accomplishments are the principal items considered in this study and decision-making process, intangible accomplishments are just as important. Intangible accomplishments include: a significant reduction of a major basin-wide flood problem; a significant reduction of the threat of flooding in East Grand Forks; a renewed opportunity for redirected growth and development for East Grand Forks and the region; matched local, State, and Federal goals and purposes of floodplain management policies and regulations; and matched goals and values of grass roots organizations such as The International Coalition (TIC) for Land/Water Stewardship in the Red River drainage basin. By recognizing and seeking solutions to its flood problem, East Grand Forks models the type of cooperation on which this region must ultimately rely.

SUMMARY OF EFFECTS

ECONOMIC

Average annual flood damages would be reduced by 80 percent. Development within protected areas is expected to increase and coalesce. The major portion of relocated businesses and residences are expected to remain in East Grand Forks. Protected floodplain areas would be fully developed. The value of property protected would increase, the cost of administering flood insurance policies would decrease, and there would be an increase in benefits from increased recreation.

SOCIAL

No adverse effects were found in the areas of employment, community, and regional growth. Significant effects were identified for the following areas: man-made and natural resources, aesthetic values, community cohesion, public facilities and services, taxes, property values, residences, and businesses. Floodplain neighborhoods would be temporarily disrupted, permanently changed, or terminated, as homes and businesses are acquired, removed, and/or relocated. Most of these effects would be of short duration until new neighborhood ties were established. The downtown floodplain businesses would be significantly disrupted by removal of structures. The effect of a major change or restructuring of the downtown area may provide a positive motivation toward creation of a new downtown area, perhaps tying the newer commercial strip development along Highway 220 with the older downtown area.

The flood threat for 107 commercial and 1,624 residential properties would be ended. Property values, tax base, and community appearance would be enhanced and development would be facilitated by removal of floodplain restrictions. During construction, roads, utilities, and traffic would be disrupted over a short period of time and/or modified

permanently to meet the overall plan. Population growth would be slightly depressed for a few years as properties are relocated. Social cohesion may be temporarily disrupted by three areas of controversy: need, community viability, and equity. Lack of consensus on how serious the flood problem is and the need for, costs of, and social effects of the project could be politically important. Community viability of the plan needs to be emphasized by the city and Corps by conducting open and ongoing educational efforts to quell rumors and explain project consequences. Equity over issues needs to be continued and addressed in several areas of current controversy: nonviability of flood protection south of the Red Lake River, property values, and taxes.

CULTURAL

As of July 3, 1984, there are no sites listed on or determined to be eligible for inclusion on the National Register that would be impacted by this proposed plan.

There are two structures that may qualify for inclusion on the National Register that will be impacted by floodplain evacuation. Additional data regarding their eligibility will be collected during the next phase of study.

There are also one prehistoric and two historic archeological sites that will be impacted by bank unloading within the proposed project area. Although these sites are considered to have a minimal chance of eligibility to the National Register, additional testing for assessment of their significance will be undertaken during the design phase of study.

RECREATION

The proposed plan would have the following beneficial and adverse effects on recreation. The plan offers the opportunity for reducing demand and increasing supply by expanding and/or improving the recreation resource base through the addition of 55 acres of developable land. Levees would adversely impact existing recreation areas to varying degrees at the golf course, River Heights Park, Dike Park, and Griggs Park. The increased lands would increase maintenance responsibilities. The general overall effect of the plan would be positive.

ENVIRONMENTAL

No adverse impacts would occur to air and water resources. Noise would not be a problem. The plan would require the removal of 6 acres of riparian woods to accommodate the construction of levees, the addition of 43 wooded areas, and beautification of approximately 30 acres of project lands. Effects of levee construction on grasslands and open areas would be short term as disturbed areas would be reseeded. Evacuation of the floodplain would add approximately 12 acres of grassland/open habitat. A 1.5-acre man-made wetland would be filled during construction. This action is required to ensure stability of levees and would be in compliance with Executive Order 11990.

PLAN IMPLEMENTATION

Implementation of the recommended plan depends upon the following principal organizations by measure. Each organization has the authority to implement the measure. The current institutional structure is capable of fully implementing the plan. No new institutions are required.

Measures	Responsible Organizations
Levees	Corps of Engineers City of East Grand Forks
Evacuation	City of East Grand Forks Corps of Engineers State and Federal Development Agencies
Floodplain zoning and enforcement	City of East Grand Forks State of Minnesota
Flood warning and forecasting	City of East Grand Forks National Oceanic and Atmospheric Administration
Emergency plan update	City of East Grand Forks Corps of Engineers State and Federal Emergency Management Agencies
Flood insurance	Individual property owners City of East Grand Forks State and Federal Emergency Management Agencies

INSTITUTIONAL REQUIREMENTS

LEVEES AND FLOODWALLS

The Corps of Engineers and the city of East Grand Forks have legal authority to construct levees and floodwalls. City financing of the local share can be provided by a bond issue to be paid off by an ad valorem tax. The city's level of bonding is possibly sufficiently low for funding to be realistic. East Grand Forks has been extensively involved in the construction of emergency levees and presently is maintaining those levees. With that experience, the city believes it can honor its operation and maintenance responsibilities by using either its own staff or consultants.

Interrelations required by this alternative measure include permit approval for construction and operation and maintenance activities by the Red Lake Watershed District and the Minnesota Department of Natural Resources. In financing the local share, the city would work directly with a bonding consultant; no State approval or review is required.

The levee and floodwall measure can be implemented within the existing institutional framework. This measure has widespread local and regional support.

PERMANENT EVACUATION

Minnesota statutes, Chapter 462.415 and Chapter 472, provide for relocation projects conducted by either the city or the Housing and Redevelopment Authority of East Grand Forks. Financing the project can be part of a local bond issue. However, the community would require financial assistance from the State Planning Agency and/or Federal housing and urban development agencies. The city has experience with relocations, but this measure is larger in scope than previous efforts.

In implementing this measure, the city would work with the Corps and the Office of Local Government of the Minnesota Department of Energy, Planning, and Development. The Office of Local Government is assuming responsibility for administering the HUD Community Development Block Grant Program for small cities in Minnesota during fiscal year 1984.

Institutional deficiencies include insufficient local funds and inadequate staff. Both deficiencies can be filled by funding provided by State or Federal agencies, although there are significant program and funding cuts at both levels.

FLOODPLAIN ZONING

Floodplain zoning is already implemented in East Grand Forks. Present zoning restriction and enforcement involves interaction between the city and the Department of Natural Resources. The Department monitors compliance with State and Federal regulations and, in turn, reports to the Federal Emergency Management Agency.

The only institutional deficiency existing is the lack of rigidly enforced floodplain zoning. Signs could be placed to identify the floodplain and help potential buyers consider the consequences.

FLOOD INSURANCE

This measure is already established and is in use in the area. Individual property owners have the responsibility of obtaining flood insurance from a State certified insurance agency. The city, State, and Federal emergency management agencies can help existing and prospective owners identify whether they would be required to maintain insurance coverage by nature of their floodplain status. An annual notification could be provided to property owners to make them more aware of their floodplain status and serve as a reminder that their property requires flood insurance to defray property losses. Notification could be achieved by a special message on property tax notices or a monthly utility service charge notice.

FLOOD EMERGENCY PLAN OF ACTION

This measure is already established. However, to make the overall plan for flood damage reduction complete, the existing flood emergency plan of action would be updated and made a part of the overall project operation plan to identify a stage action chart of activities. This could be done by the Corps in coordination with the city of East Grand Forks and State and Federal emergency management agencies.

The National Oceanic and Atmospheric Administration (NOAA), National Weather Service, provides flood outlooks and forecasting services for the river basin. NOAA provides flood forecasting information at the gage in East Grand Forks, Minnesota. Better communication links need to be established between NOAA and city officials during flood emergencies to make available factual and timely outlook and forecast information for plan operation. These communication links can be achieved by ongoing programs and participation in Federal and State Emergency Preparedness Programs provided prior to the flood season each year.

DIVISION OF PLAN RESPONSIBILITIES

Federal and non-Federal participation has been established by Congressional authorities for specific structural and nonstructural measures. Responsibility for measures recommended for further study is defined in general as follows:

- o Local Flood Protection (Levees): Non-Federal interests are required to provide all lands, easements, and rights-of-way, borrow and disposal areas, and all alterations and relocations of utilities, streets, highways, bridges, buildings, storm drains, and other structures and improvements necessary for the construction of the levee; hold and save the United States free from damages due to the construction works; and assume operation and maintenance in accordance with regulations prescribed by the Secretary of the Army (33 CFR 208.10). A local cooperation agreement between the Corps of Engineers and the city of East Grand Forks dated April 9, 1975, identifies legal responsibilities of this measure.

- o Nonstructural Measures: Measures include evacuation, floodplain regulation, flood warning, and updating the emergency plan of action.

1. When a nonstructural measure is recommended, non-Federal participation is 20 percent of the measure's cost (section 73, Public Law 93-251). Operation and maintenance costs are the responsibility of non-Federal interests. Costs eligible for cost sharing include the cost of acquiring improvements, land, or interests in land, the cost of removal of existing structures, and relocation assistance costs incurred under the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970. Eligible costs also include the costs of reestablishing existing public facilities; in the case of relocation, that is, for example, building new public facilities to replace those in the floodplain.

2. Lands or interests therein acquired in the floodplain as part of a recommended nonstructural measure to avoid or reduce damages will require a 20-percent non-Federal contribution.

3. Future use of property: A tract of land acquired as a nonstructural measure may be used for any purpose which is not incompatible with the project purpose. Any contract or agreement shall note that authority to determine whether a use is compatible shall lie with the Secretary of the Army acting through the Chief of Engineers.

4. Regulation of the floodplain: Adoption and enforcement of regulations for floodplain management are entirely a non-Federal responsibility. Non-Federal interests may be required to adopt and enforce such regulations if they are necessary to protect the Federal investment or to achieve expected project benefits.

5. Flood warning: The cost of equipment exclusively devoted to flood warning systems and/or emergency evacuation will require a 20-percent non-Federal contribution.

6. Recreation: Lands outside those acquired in conjunction with a flood damage reduction plan will be limited to those necessary

for access, parking, potable water, sanitation, and related developments for health, safety, and public access. For cost sharing purposes, the costs of such lands will be treated as separable recreation costs. Facilities for recreation require a 50-percent non-Federal contribution.

7. Real estate acquisition: Fee title will be acquired over all lands and improvements required for nonstructural purposes. Upon completion, a perpetual restrictive easement will be conveyed to the government by the city.

8. Revenue sharing funds made available to the States and local communities under the State and Local Fiscal Assistance Act of 1972 (Public Law 92-512) are considered to be local monies upon receipt. Such funds can be used by non-Federal interests to meet non-Federal requirements. Similarly, contributions derived in whole or in part from HUD's Community Development Block Grant program may be accepted to meet non-Federal requirements.

- Non-Federal interests are required to comply with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, approved January 2, 1971, in acquiring lands, easements, and rights-of-way for construction and maintenance of the project and inform affected persons of the benefits, policies, and procedures in connection with said act.

- Non-Federal interests are required to comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, in connection with the construction and maintenance of the project.

REAL ESTATE

The proposed plan requires acquisition of approximately 84 acres in perpetual easement and fee by the local sponsor. The areas include

about 51 acres of residential land, 3.5 acres of golf course land, 14.5 acres of low wooded lands and 15 acres of commercial industrial land. The estimated total cost of acquiring the necessary real estate is $14,500,000 and includes cost for lands, improvements, damages, contingencies, Public Law 91-646 relocation payments, and administration.

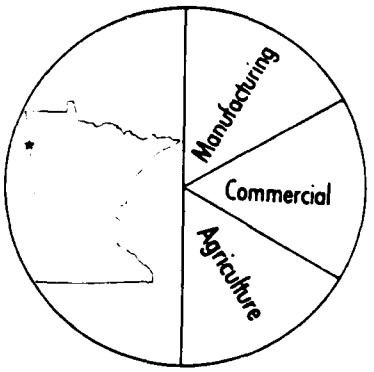
The recommended plan has a total cost of $30,540,000. Federal costs are $22,440,000 and non-Federal costs are $8,100,000. The city of East Grand Forks is currently planning to use community development monies to implement part of the plan by evacuating homes from the nonstructural component of the plan. A draft Section 215 agreement has been forwarded to the Secretary of the Army's office to credit the community for this effort.

VIEWS OF NON-FEDERAL SPONSOR

The formulation of the selected plan has been coordinated with interested publics at two public meetings in East Grand Forks, Minnesota, on October 11, 1984, and November 19, 1984. Based on this coordination, the following November 23, 1984, letter was received from the city of East Grand Forks. The city expressed support for the selected plan and a willingness to financially participate in the plan.

SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

Formulation of the selected plan has been coordinated with interested citizens of East Grand Forks and other publics through several forums to include: distribution of draft reports for public review and comment; publishing a six-page insert in the local newspaper summarizing the results of the study for general information; holding a public meeting on October 11, 1984, and a follow-up meeting on November 19, 1984. Attachment 1 contains letters of comment and Corps responses. Transcripts of the public meetings are retained in the St. Paul District, Corps of Engineers Office, St. Paul, Minnesota.



CITY OF EAST GRAND FORKS

"Center of the Rich Red River Valley"

EAST GRAND FORKS, MINNESOTA 56721

D. E. MACK, Clerk-Treasurer
P. O. Box 373, Phone (218) 773-2483

Novmeber 23, 1984

Colonel Edward Rapp
District Engineers
U.S. Army Corps of Engineers
1135 U.S. P.O. and Custom House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

The City of East Grand Forks continues to support the flood control plan being developed jointly between the City and the St. Paul District Corps of Engineers.

On Novmeber 20, 1984, the City Council did pass action requesting the U.S. Army Corps of Engineers to proceed with the design stage of the proposed flood plan and this letter serves as our request.

The City is presently gathering information needed to plan properly for the continuation of said project. The next phase is to have the City Council engage some designated planning group to develope, prepare and recommend a City transition plan for the future, with possible assistance from a private consultant or the Northwest Regional Development Commission. Also, in conjunction the City will be investigating and planning for our share of the financial requirement.

If there are any questions or concerns, please contact me.

Sincerely yours,

Louis A. Murray,
Mayor

RECOMMENDATIONS

I recommend that the existing project for flood control at East Grand Forks, Minnesota, authorized by the Flood Control Acts approved on 30 June 1948, 17 May 1950, 31 December 1970, and 17 April 1975, be modified to provide for implementation of nonstructural measures in conjunction with structural measures for flood control, in accordance with the plan selected herein, with further modification thereto as in the discretion of the Chief of Engineers may be advisable, at a first cost to the United States presently estimated at $22,440,000, provided that, except as otherwise included in these recommendations, the exact amount of non-Federal contribution shall be determined by the Chief of Engineers prior to project implementation, in accordance with the following requirements to which non-Federal interests must agree prior to implementation:[1]

a. Provide without cost to the Government all lands, easements, rights-of-way, and spoil disposal areas necessary for the construction and subsequent maintenance of the proposed channel and levee improvements, when and as required.

b. Hold and save the Government free from damages due to the construction and subsequent maintenance of those works, except for damages due to the fault or negligence of the Government or its contractors.

c. Maintain and operate all of the channel and levee improvement works after completion in accordance with regulations prescribed by the Secretary of the Army.

d. Make at their (city's) own expense all necessary changes to utilities, highways, and bridges, including approaches.

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1 Items a. through d. are a part of the existing Section 221 agreement executed March 27, 1975.

e. Provide 20 percent of the cost of nonstructural measures in accordance with Section 73 of Public Law 93-251.

f. Provide all lands, easements, and rights-of-way required for implementation of the nonstructural measures of the project if so directed in writing by the St. Paul District Engineer, with the only cost to the United States being reimbursement of the Federal 80-percent share, subject to the availability of funds and prior written approval by the said District Engineer of all proposed expenditures, contracts, and appraisals in connection with the provision of said lands, easements, and rights-of-way.

g. Enter into a separate recreation cost-sharing agreement with the United States in connection with the recreational features of the project.

h. Contribute 50 percent of the first cost of recreational facilities including the value of lands, easements, and rights-of-way furnished for recreational access, safety, sanitation, and health purposes located outside the basic flood control project boundaries and provide for maintenance, repair, and replacement of the recreational facilities.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for implementation funding.

Edward G. Rapp

EDWARD G. RAPP
Colonel, Corps of Engineers
District Engineer

SUPPLEMENT

TO THE

FINAL ENVIRONMENTAL IMPACT STATEMENT

EAST GRAND FORKS FLOOD CONTROL PROJECT

POLK COUNTY, MINNESOTA

SUPPLEMENT

TO THE

FINAL ENVIRONMENTAL IMPACT STATEMENT

EAST GRAND FORKS FLOOD CONTROL PROJECT

POLK COUNTY, MINNESOTA

TABLE OF CONTENTS

Item		Page
1.00	SUMMARY	EIS-1
	Major Conclusions and Findings	EIS-1
	Areas of Controversy	EIS-2
	Unresolved Issues	EIS-3
	Relationship to Environmental Statutes	EIS-4
2.00	NEED FOR AND OBJECTIVES OF ACTION	EIS-7
	Study Authority	EIS-7
	Public Concerns	EIS-7
	Planning Objectives	EIS-7
3.00	ALTERNATIVE MEASURES	EIS-8
	Plans Eliminated from Further Study	EIS-8
	Without Project Condition	EIS-9
	Plans Considered in Detail	EIS-14
	Comparative Impacts of Alternatives	EIS-16
4.00	AFFECTED ENVIRONMENT	EIS-21
	Environmental Conditions	EIS-21
	Significant Resources	EIS-22
	Natural Resources	EIS-22
	Cultural Resources	EIS-23
	Recreation Resources	EIS-24
	Social Resources	EIS-24

5.00 ENVIRONMENTAL EFFECTS EIS-28
Natural Resources EIS-28
Cultural Resources EIS-30
Recreation Resources EIS-31
Social Resources EIS-33
6.00 PUBLIC INVOLVEMENT EIS-38
Public Involvement Program EIS-38
Required Coordination EIS-39
Final Supplement to Final EIS Distribution EIS-39
Public Views and Responses EIS-42
List of Preparers EIS-43
Index EIS-44
Table 1 - Relationship of Plans to Environmental Requirements EIS-5
Table 2 - Comparative Impacts of Alternatives EIS-17
Exhibit 1 - Beautification Features on Project Lands
Exhibit 2 - Fish and Wildlife Service - Coordination Act Report

for floodprone areas of East Grand Forks south of the Red Lake River. This plan has a benefit-cost ratio of 3:1.

1.03 Tne selected plan would also result in positive benefits to the environmental quality of the area. All structures on the riverward side of the levee would be removed and the area would be maintained as open space. Landscape beautification measures are proposed for project lands to reduce maintenance costs of open space areas and to improve wildlife habitat and aesthetic values.

1.04 Impacts on the social resources in East Grand Forks would be significant. Impacts expected to occur include displacement of neighborhoods, changes in tne business district, changes in transportation routes and utilities, and changes in the tax base. All of these factors may temporarily disrupt the normal level of social cohesion.

1.05 The selected plan would require placement of fill material in a 1.5 acre man-made wetland. This activity would be covered under 33 CFR 330.4, Nationwide Permits for Discharges into Certain Waters. Construction activities would not involve the placement of fill material within the ordinary high watermark of the rivers. Therefore, a 404(b)(1) evaluation will not be prepared.

Areas of Controversy

1.06 Several areas of controversy developed during this study. Of primary concern to city officials was the alignment of the flood barriers. The local preference was to have the levee/floodwall follow the authorized project (existing emergency levee) alignment. However, because of foundation problems, preliminary alignments followed a setback from the river at a distance of 400 to 1,000 feet. In many instances, this was a considerable departure from the existing emergency levee. As a result of additional geotechnical studies, and the proposed bank unloading in some areas, the

SUPPLEMENT

TO THE

FINAL ENVIRONMENTAL IMPACT STATEMENT

EAST GRAND FORKS FLOOD CONTROL PROJECT

POLK COUNTY, MINNESOTA

1.00 SUMMARY

Major Conclusions and Findings

1.01 In 1953, a federally authorized project was planned and designed to protect the city of East Grand Forks, Minnesota, from flooding. For various reasons, the project was not constructed. Since then many changes have occurred, requiring reevaluation of the authorized project and preparation of a supplement to the Final EIS that was filed in 1971. During screening of final plans, the following actions were evaluated: No Action, construction of levees/floodwalls with a 100-year (1-percent chance) design level of protection, construction of levees/floodwalls with a standard project flood design level of protection, and construction of levees/floodwalls with a 0.3-percent chance design level of protection. A description of the plans is presented in Section 3.00 of this EIS. The 0.3-percent chance level of protection is the design level at which the net benefits are optimized and, therefore, it contributes the most to the National Economic Development (NED) objective. This is the selected plan. Economic feasibility, geotechnical factors, probable impacts, and acceptability were factors contributing to the selection of this alternative plan.

1.02 The selected plan consists of construction of a levee/floodwall with a 0.3-percent chance level of protection and acquisition/removal of all structures on the riverward side of the levee for floodprone areas north of the Red Lake River. Floodplain zoning, flood forecasting/warning, flood insurance, and emergency preparedness would continue to be applied and updated

alignment has been moved closer to the river and, in some cases, even follows the city's preferred alignment.

1.07 City officials also expressed concern over the large number of structures that would be left on the riverward side of the levee and the costs of maintaining services to those structures. The proposed plan would involve the acquisition and removal of all structures on the riverward side of the levee, thereby resolving this issue.

1.08 Concerns were also expressed over the cost of maintenance of the open space areas that would result from the proposed plans. Beautification plans were developed to reduce the maintenance costs on project lands. In addition, concepts for recreation developments, many of which would minimize maintenance costs, were developed for existing city land adjacent to proposed project lands.

1.09 The Fish and Wildlife Service expressed concern over the impacts of levee construction on the riparian community. Levee alignments and proposed beautification and management measures for project lands have been coordinated with the Fish and Wildlife Service. It appears that all of the agency's concerns have been met.

Unresolved Issues

1.10 Several unresolved issues remain. The first issue concerns how to handle the large number of households and businesses that would be displaced with the project. It is recommended that the Corps establish a field office and relocation center, in accordance with Public Law 91-646, prior to construction. This would be done in coordination with the city.

1.11 City officials have also expressed concern over how to finance the local share of the project cost. It is recommended that the St. Paul District,

Corps of Engineers work with the city to explore past financing systems used by other communities and develop an innovative financing mechanism.

1.12 The third issue concerns the damages that will continue to occur to residences in the floodprone areas of "The Point." It is suggested that the city of East Grand Forks annually educate property owners and encourage flood insurance acquisition for this area.

Relationship to Environmental Statutes

1.13 The relationships of the detailed alternative plans to the requirements of Federal environmental laws, executive orders and policies, and State and local laws and policies have been evaluated and are presented in table 1.

Table 1. Relationship of Plans to Environmental Requirements (selected plan is plan 8)

	Plan 6	Plan 7	Plan 8
Federal Statutes			
Archeological and Historic Preservation Act, as amended, 16 USC 469, et seq.	Full(1)	Full	Full
National Historic Preservation Act, as amended, 16 USC 470a, et seq.	Full	Full	Full
Clean Air Act, as amended, 42 USC 7401, et seq.	Full	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 USC 1251, et seq.	Full	Full	Full
Coastal Zone Management Act, as amended, 17 USC 1451, et seq.	NA(2)	NA	NA
Endangered Species Act, as amended, 16 USC 1531, et seq.	Full	Full	Full
Estuary Protection Act, 17 USC 1221, et seq.	NA	NA	NA
Federal Water Project Recreation Act, as amended, 17 USC 460-1(12), et seq.	Full	Full	Full
Fish and Wildlife Coordination Act, as amended, USC 661, et seq.	Full	Full	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.	Full	Full	Full
Marine Protection, Research and Sanctuaries Act, 22 USC 1401, et seq.	NA	NA	NA
National Environmental Policy Act, as amended, 42 USC 4321, et seq.	Full	Full	Full
Rivers and Harbors Act, 33 USC 401, et seq.	Full	Full	Full
Watershed Protection and Flood Prevention Act, 16 USC et seq.	NA	NA	NA

Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.	Full	Full	Full
Executive Orders and Memoranda			
Floodplain Management (E.O. 11988)	Full	Full	Full
Protection of Wetlands (E.O. 11990)	Full	Full	Full
Analysis of Impacts on Prime and Unique Farmlands (EQ Memorandum, 30 August 1976)	Full	Full	Full
State and Local Policies			
Minnesota Environmental Policy Act	Full	Full	Full
Land Use Plans	Full	Full	Full

(1) Full compliance - All requirements of statute, E.O., or other policy and related regulations have been met.

(2) Not applicable - Statute, E.O. or other policy is not applicable.

2.00 NEED FOR AND OBJECTIVES OF ACTION

Study Authority

2.01 The Flood Control Acts of 1948 and 1950 authorized the development of flood control plans in the Red River of the North drainage basin. In 1953, a flood control project was planned and levees designed to protect East Grand Forks, Minnesota. For various reasons, the project was not constructed. The Flood Control Act of 1970 extended project authorization and a final EIS was filed in 1971. Since then, many changes have occurred which required reevaluation and reformulation of the authorized project. Major changes in levee alignments and levels of protection have been identified, resulting in a need to prepare this supplement to the final EIS.

Public Concerns

2.02 Through public meetings, coordination meetings, and correspondence, local interests and various government agencies identified the following concerns: flooding in East Grand Forks, management of open areas along the river that would result from project implementation, preservation of riverine areas (especially floodplain forests), preservation of archeological or nistoric resources, the number of businesses and residences removed by or excluded from the project, and affordability.

Planning Objectives

2.03 The planning principles and guidelines for conducting feasibility studies require that all federally assisted water resource projects be planned to further the National Economic Development (NED) objective while protecting the environment.

2.04 The specific study objectives are:

a. Reduce flood damages at East Grand Forks, Minnesota.

b. Develop a flood protection plan that would minimize adverse impacts on the natural resources in the area.

c. Develop and provide a concept for development of open space area for recreation and wildlife.

d. Identify and preserve significant archeological, historic, and architectural resources.

e. Contribute to the security and economic welfare of East Grand Forks to preserve and enhance the overall social well-being.

3.00 ALTERNATIVE MEASURES

Plans Eliminated From Further Study

3.01 The following structural measures were eliminated from further analysis during stage 2 studies because of economic and engineering considerations: reservoirs upstream of East Grand Forks, channel work on the Red Lake River and the Red River, diversion of the Red Lake River through Grand Marais Coulee, and construction of a permanent levee along the existing emergency levee alignment.

3.02 Two levee alignments, each providing different levels of protection, were carried over to the stage 3 evaluation. However, more detailed geotechnical studies revealed that only one alignment was feasible.

3.03 Four plans focusing on flood protection for East Grand Forks were developed in the early stages of plan formulation. These plans consisted of a combination of levee alignments and various non-structural measures. They are described in the plan formulation section of the main report and are

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of these plans from further

for two areas in East Grand
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ood damages would
ally result in the

3.07 The city would continue to operate, maintain, and expand its park system, including those parks in the floodway. Capital improvements for River Heights Park include an exercise track, a shelter, and playground equipment. A campground is planned for Rivers Edge Park.

3.08 Because the majority of this project's significant impacts would affect the city's social resources, those resources are discussed at considerable length. The affected social resources are divided into four categories: social systems, physical development, tax bases, and social cohesion.

3.09 Social conditions for the future without the project are discussed only for a 20-year period. They are based upon OBERS 1980 projections; Small Area Ratio Forecast (a population projection program being developed by the Corps' Institute for Water Resources); tax records analysis; and other quantitative data. Community input was given during three "City Futures" meetings conducted in the fall of 1983. During these meetings, about 60 citizens developed prioritized goals, obstacles, and strategies. The results of the meetings were analyzed, for this part of the report, in terms of what was mentioned; how it was supported, discussed, and ranked; how it would have to be implemented; the specificity of the strategy; the resources that would be required; and the scale of its effect.

The Social System

3.10 The city's role within its region will gradually change. It will continue to be an important agricultural service center for rural Polk County, and its agribusinesses will process products from much of the Red River Valley. With increased commercial activity, it will make modest progress at regaining its status as an independent community, and it will reverse the trend toward becoming a bedroom suburb to Grand Forks. At the same time, there will be increased ties between the two cities, in the form of shared bus transportation, the Metropolitan Planning Organization, and similar efforts undertaken on a metropolitan basis.

Population is projected to increase as follows:

	Population		
Year	East Grand Forks	Grand Forks-East Grand Forks SMSA	Polk County
1980 (census)	8,537	101,[illegible]	34,844
1985	8,843	104,[illegible]	34,872
1990	9,324	109,245	35,093
1995	9,496	112,349	35,302
2000	9,759	115,453	35,234

Note: 1985-2000 projections for the SMSA are from 1980 OBERS moderate change in shares projections; for Polk County they are from the Minnesota State Demographer's office. Projections for East Grand Forks are based on the SMSA projections, using the Corps' Institute for Water Resources Small Area Forecast program.

3.12 Thus, in 20 years, the population is expected to grow by 14 percent which will be a larger share of the county total and the same share of the SMSA total. This growth will be one of the driving forces behind all of the other changes.

3.13 Residential demand will be generated by population growth, in general, and by the same flood-related effects important in the downtown area. That is, homes damaged by floods will deteriorate and will legally be unable to have major repairs, accelerating the decline of property values in the floodplain areas. Floodplain regulations will prevent major improvement, which will be a more important limit in the older parts of town where structures are often smaller, aging, and of lower value. These factors will put pressure on the city to continue to acquire deteriorating housing, allowing owners to relocate elsewhere. About two-thirds of such families are

expected to relocate in East Grand Forks. New residential areas will gradually develop in the northwest, northeast, and near the southern city limits, as the floodplains closest to the rivers are eventually vacated.

3.14 Institutional arrangements will become increasingly complex, with a proliferation of organizations, ties and coordinating points between them, and regulations from higher levels of government. The city government will become more professional (such as perhaps hiring a City Planner) and somewhat larger, in response to the population growth and in order to best use both its own natural resources - its citizens and its region - and resources of the county, State, and Federal governments. These complexities will create some interdependencies and occasionally put restrictions on the city - such as floodplain zoning - that it would perhaps not otherwise have initiated. Coordination within the region will slightly lessen the sense of competition with Grand Forks, through institutions such as the Metropolitan Planning Organization. The tax rate differences between the States will continue to make residence in North Dakota relatively attractive.

Physical Development

3.15 Land use patterns will change in several ways. The presence of the industrial park will encourage industries to locate increasingly in the northeast quarter and near U.S. Highway 2 in the east. Some of this activity will be due to existing industries which choose to relocate in more appropriate locations. However, there will continue to be industrial firms in areas better used for commercial or other development, resulting in continued traffic difficulties, and in suboptimal patterns of commercial development.

3.16 The city's commercial establishments will continue to spread along Highway 220N in a strip development. The number and diversity of businesses will gradually rise above the recent declining levels, which will provide a more balanced availability of goods and services than at present. The number of sales tax-reporting establishments is expected to increase to about 100, up

from the recent high of 93 in 1979, and the recent low of 80 in 1982. These establishments will account for a growing proportion of retail business in Polk County. However, the downtown area will become increasingly run-down and underutilized. This will be due partially to competition from the merchants on Highway 220N and in Grand Forks, floodplain regulations which will continue to restrict new construction and substantial improvements, and decreased property values in the area. Conditions will also be worsened by whatever flood damages actually occur during this time period.

Tax Base

3.17 Property values in the floodplain will continue to deteriorate as floods occur and as normal investment is retarded by floodplain regulations. Land outside the legally defined floodplain will become more highly valued as it becomes less available.

3.18 Population and income are the bases of the State income tax process. In this border city, high State taxes will continue to cause some population loss, although the population will experience net growth.

3.19 Sales taxable by the State will continue to grow as the population of the city increases and as the city's merchants capture a larger portion of the county's business.

Social Cohesion

3.20 Although complete community cohesion is never possible in a modern urban society due to variations in ages, occupations, incomes, neighborhoods, interests and values, we can usefully think of cohesion as theoretically attainable when discussing one particular issue, such as flood control. East Grand Forks currently is debating the necessity of a flood control project, and different social and economic interests make this debate a type of low-level conflict. If no flood control project is built, and no serious flood

ever occurs again, there will be less of this type of conflict. The likelier case is that there will be continued flood threats and floods, which will keep anxiety high about the need for protection, and conflict about foregone opportunities and other possible measures.

Plans Considered in Detail

3.21 A combination of several measures was considered in the development of flood protection for East Grand Forks. Levees, in conjunction with floodwalls and closures, were found to be the only feasible structural measures. Geotechnical, environmental, social, and economic factors were considered in determining the levee alignment to be evaluated (see the main report). Differences in the degree of protection vary primarily with the height, width, and length of levee and do not require a change in alignment.

3.22 Nonstructural measures were considered for structures not protected by levee construction. These are acquisition/removal, floodproofing, and other nonstructural measures, which include floodplain zoning, flood warning and forecasting, flood insurance, and emergency preparedness. Acquisition/removal was considered to be the most desirable action for structures not protected by levees, and it was considered first. If acquisition/removal was not economically feasible for a structure, floodproofing was considered. The other nonstructural measures were considered for areas where acquisition/removal or floodproofing was found to be not economically justified.

3.23 Further information concerning the plan formulation process is presented in the main report.

3.24 Using the above considerations, the plans described below were considered in detail.

Plan 6

3.25 This plan consists of levees/floodwalls and nonstructural measures for the area north of the Red Lake River and nonstructural measures for the suburban area south of the Red Lake River. Levees in the north area would follow the alignment shown in the figure on page 116 of the main report, and would be designed to provide 1-percent chance level of protection. Because of the soil characteristics in the region, it would be necessary to unload the riverbank in four areas along the alignment to ensure levee stability. This would involve removing large amounts of earth from the riverward side of the levee. Those areas would be restored to the condition of the natural floodplain as much as possible.

3.26 Nonstructural measures in the area north of the Red Lake River would involve acquisition and removal of all structures on the riverward side of the levee. Residential plantings would be retained, where possible, and the area would be allowed to revert to a more natural condition.

3.27 Supplemental plantings would be included to beautify project lands on the riverward side of the levee and, where necessary, to revegetate unloaded areas. Plantings would be in groupings of trees and shrubs, as opposed to a blocked stand, to allow for visual diversity and interspersion, and to maximize aesthetics and habitat values. Species used for revegetation would be varieties identified as suitable for the project area. These beautification features would be cost shared at the same rate as other project features. More detailed information on the beautification plan is presented in Exhibit 1.

3.28 Measures implemented for the area south of the Red Lake River would include acquisition/removal of 14 residential structures and floodproofing of 3 commercial structures. Floodplain zoning, flood warning and forecasting, and emergency preparedness would be applied to the remaining areas in the south.

3.29 A more detailed description of this plan in presented in the main report.

Plan 7

3.30 This plan is the same as plan 6 except that the design level of protection would be for the standard project flood (SPF) events. Flood barrier alignments would be the same as those described for plan 6. Additional sandbag closures and road raises would effectively provide ring levee protection for the city. Detailed information concerning design features for the flood barriers at SPF level of protection is presented in the main report and in the Supporting Documentation.

Plan 8 (Selected Plan)

3.31 This plan is similar to plan 6, except the design level of protection would be that level at which the economic benefits of structural and nonstructural measures are optimized (0.3-percent chance flood event). This plan is the NED plan. Flood barrier alignments would be the same as those described for plan 6. No structures south of the Red Lake River would be floodproofed or acquired. Floodplain zoning, flood warning and forecasting, and emergency preparedness would continue to be applied to this area. Detailed information concerning this plan is presented in the main report (pages 115-121) and in the Design and Cost Supporting Documentation (pages E-1 - E-3; plates 1 and 2).

Comparative Impacts of Alternatives

3.32 An evaluation of the impacts of the plans considered is presented in table 2.

Table 2. Comparative Impacts of Alternatives (Selected Plan is Plan 8)

Item	Baseline	Plan 5 (No Action)	Plan 6	Plan 7	Plan 8
Economic Characteristics[1]	--	--	Total cost: $28,003,000 Net benefit[2]: $1,670,000 B/C ratio: 2.9/1	Total cost: $31,135,000 Net benefits[2]: $1,974,000 B/C ratio: 3.0/1	Total cost: $30,540,000 Net benefits[2]: $1,976,000 B/C ratio: 3.1/1
Natural Resources					
Riparian Community	114 acres of woods 114 acres of grassed/ open	91 acres of woods 137 acres of grassed/ open	140 acres of woods 143 acres of grassed/open	Same as plan 6	Same as plan 6
Threatened and Endangered Species	Bald eagle and peregrine falcon may occur in the area, but only in a migrating or transient status.	No effect	No effect	No effect	No effect
Water Quality	--	--	Short-term decrease in surface water quality due to runoff from construction site	Same as plan 6	Same as plan 6
Air Quality	--	--	Temporary increase in air pollution during construction	Same as plan 6	Same as plan 6
Noise	--	--	Temporary increase in noise pollution during construction	Same as plan 6	Same as plan 6
Cultural Resources	No known sites listed on NRHP	No known sites listed on NRHP	No known sites listed on NRHP that will be impacted	Same as plan 6	Same as plan 6

Table 2. Comparative Impacts of Alternatives (Selected Plan is Plan 8)

Item	Baseline	Plan 5 (No Action)	Plan 6	Plan 7	Plan 8
Recreation Resources					
Valley Golf Association Golf Course	9-hole course currently expanding to 18 holes	An 18-hole course; no impacts	Some disruption to area is possible to incorporate course and levee/unloading requirements. No loss of "playability"	Same as plan 6	Same as plan 6
River Heights Park	22-acre wooded park. Existing trails and playground equipment	City plans to provide additional facilities within park	The increased levee height would result in a minor loss in park lands. No impacts to existing or planned future developments	Same as plan 6 with slightly more land loss.	Same as plan 6. Land lost between plans 6 and 7
Dike Park	A 1.5-acre park that is a tot lot for surrounding residents	Continued use of the park	The surrounding residents would be relocated. Relocation of equipment to other area where it would be used (loss of clientele)	Same as plan 6	Same as plan 6
Rivers Edge Park	20-acre park primarily open space	City plans to develop a 25-unit campground next to the Red	No impact to existing or planned facilities or uses of park. Park area would be expanded	Same as plan 6	Same as plan 6
Griggs Park	2-acre park with play equipment, warming house, and hockey rink	Continued use of park	Levee would displace some equipment and hockey rink	Same as plan 6	Same as plan 6
Open Space System	Areas of open space beyond existing park boundaries	Continued use of area	The addition of approximately 55 acres to system. Potential for wildlife habitat. Additional maintenance responsibilities for city	Same as plan 6	Same as plan 6

Table 2. Comparative Impacts of Alternatives (Selected Plan is Plan 8)

Item	Baseline	Plan 5 (No Action)	Plan 6	Plan 7	Plan 8
Social Resources	Population 8,537 (1980); agricultural service center for its county and region. Increasing dependence on Grand Forks, ND, for some goods and services, but not yet a bedroom community. One third of city is in 100-year floodplain, including declining downtown.	Greater regional role. No significant change in residential neighborhoods. Deterioration of downtown; continued strip development on Highway 220N	Temporary disruptions to social patterns as 15 residential blocks or clusters and 4 commercial blocks are permanently removed.		
Existing Physical Development	Most structures and facilities well-maintained but some commercial vacancies	Deterioration and devaluation of floodplain areas due to legal regulations, flood threat, and flood events	Protection provided to development north of Red Lake River. 192 residents and 15 commercial/public structures removed (70 percent may be relocated to the protected area)		

Table 2. Comparative Impacts of Alternatives (Selected Plan is Plan 8)

Item	Baseline	Plan 5 (No Action)	Plan 6	Plan 7	Plan 8
Tax Base	Consistent population growth. Commercial activity significantly decreased from previous highs. Some property values depressed due to past flood events and possibly due to floodplain status	Fourteen percent population growth; moderate increase in retail sales base; decline in value of property in floodplain	Temporary slowing of population growth, as about 76 households (183 persons) do not relocate within the city. No significant impact on sales tax. Net increase in property taxable valuation.		
Social cohesion	Difficult choices about community viability faced by city, including commercial survival, industrial development, and flood control	Continued concern over need for flood control	High consensus on seriousness of flooding, but not on best solution. High concern about residential and commercial consequences. Concerns about allocations of cost, acquisitions, property values, and lack of protection on "The Point."		

(1) Figure represents first cost.
(2) Average annual net benefits - interest rate used is 3 1/4 percent.

archeological survey of two areas within the proposed project area that will be unloaded was also conducted in 1984. This survey identified two historic and one prehistoric archeological sites. These sites are considered to have minimal potential for eligibility to the National Register.

4.05 East Grand Forks has 11 city parks with a combined area of approximately 146 acres. With a population of 9,000, the city's relationship of parkland to population averages 1 acre of park area for every 66 people, which compares favorably with the national standard of 1 acre per 100 people.

4.06 Residences of the city are in three general areas: the northwest area, which is mostly recent construction, the central part of the city, containing older single family homes, and the area south of the Red Lake River, known as "The Point," with larger, newer homes close to the river and smaller, somewhat older homes in the center. The central part of the city contains most of the business district. Industry is concentrated to the east along the transportation routes provided by the railway, U.S. Highway 2, and Highway 220N.

4.07 Future population growth in the area is expected to remain relatively stable. However, numerous properties are susceptible to flood damage. Population shift and growth will probably occur in the northeastern and southern portions of the city outside of the 100-year floodplain.

4.08 A more detailed description of the existing conditions is presented in the main report.

Significant Resources

Natural Resources

4.09 The riparian community in the study area, although somewhat degraded in quality, is an important resource to the area. It functions as a buffer

4.00 AFFECTED ENVIRONMENT

Environmental Conditions

4.01 East Grand Forks is located in northwestern Minnesota on the Red River of the North at its junction with the Red Lake River. The city serves as a trading, service, and food processing center for the farm areas on the Minnesota side of the Red River Valley.

4.02 The city is located on the fringe of the northern floodplain forest and prairie ecosystems. Urban and agricultural development have all but eliminated the prairie ecosystems, and forested tracts are limited to sites adjacent to the Red River and its tributaries. Forested areas in East Grand Forks are characteristic of an urban area, being highly disturbed with little understory, and the areal extent in many cases is limited to one or two trees in width.

4.03 The city of East Grand Forks has not been systematically surveyed for cultural resources, although a few potentially significant sites are known. During a "windshield" brief survey of the city in 1980, the Minnesota State Historic Preservation Office identified 14 structures which may be potentially significant. The Corps of Engineers identified 5 more sites during a literature search and brief field survey in 1981. These additional 5 sites have either been destroyed or were not locatable in the field. Only 1 of the 14 potentially significant sites has been assessed for inclusion in the National Register of Historic Places. This site, Whitey's Wonderbar, did not meet the National Register eligibility criteria. The other structures will either not be impacted or are no longer considered potentially significant.

4.04 During 1984 the St. Paul District conducted a historic standing structure survey of all structures within East Grand Forks that may be impacted by the proposed project. This survey identified two structures that may potentially qualify for inclusion on the National Register. An

between the city and the river, providing recreational opportunities and wildlife habitat. Throughout the region, the floodplain forest has been diminished through encroachment by agricultural practices and urban development. Therefore, it is important that the riparian areas be preserved and maintained where possible.

4.10 There are 114 acres of riparian woods in the East Grand Forks study area, of which 60 acres are nortn and 54 acres are south of the Red Lake River. The most common tree species present are American elm, box elder, basswood, and green ash. Other species present include bur oak, hackberry, and cottonwood. For the most part, the areas are characteristic of an urban environment, being highly disturbed with little understory. Areal extent, in many cases, is limited to one or two trees in width. Wildlife present in these areas is typical of an urban environment; squirrels, rabbits, and a variety of songbirds are the most common. White-tailed deer may occasionally be seen using the corridor.

4.11 Approximately 114 acres of grassed/open areas exist in the study area. These areas offer little habitat value for wildlife as the grassed acres are usually maintained by mowing.

4.12 Two endangered species, the bald eagle and the peregrine falcon, may occur in the study area. However, these species would be present only in a migratory or transient status.

Cultural Resources

4.13 In accordance with section 106 of the National Historic Preservation Act of 1966, as amended, the National Register of Historic Places has been consulted. As of 3 July 1984, no sites within the city of East Grand Forks are listed on or eligible for inclusion on the National Register.

4.14 Historic standing structure surveys of all structures that may be impacted by the proposed project have identified two structures that may be potentially significant.

4.15 An archeological survey of two areas that will be unloaded for bank stability has identified one prehistoric and two historic archeological sites. Due to their present conditions, however, they are considered to have minimal eligibility to the National Register.

Recreation Resources

4.16 East Grand Forks has 11 city parks with a combined area of approximately 146 acres. In addition, the city has a civic recreation center, three play fields located at elementary schools, and a 0.25-mile running track and four tennis courts at the senior high school. The city has leased land to the Valley Golf Association which developed a nine-hole golf course open to the public. The course was recently expanded with an additional nine holes constructed riverward of the original course. Six parks encompassing 83 acres are located in the area of the emergency levees and could be affected by various flood control measures. These parks are River Heignts, Pike, Griggs, Rivers Edge, O'Leary and Folsom Parks. In addition, approximately 60 acres are designated as flood areas available for recreation. A complete description of the park and open space system is contained in the recreation portion of the main report.

4.17 There are no parks within the project area acquired and/or developed with Land and Water Conservation Fund Act (LAWCON) funds.

Social Resources

4.18 Social Systems. - East Grand Forks is the "small partner" in the Grand Forks-East Grand Forks metropolitan area. The SMSA has a population of 100,944; 43,765 live in the city of Grand Forks, and 8,537 live in East Grand

Forks. The largest urban area between Fargo-Moorhead and Winnipeg, the cities still maintain close economic and cultural ties with their agricultural settings.

4.19 A dominating fact for East Grand Forks is its small size in relation to Grand Forks. Both cities benefit by some complementary elements in the relationship, but for East Grand Forks, the competition is often experienced as overwhelming. Grand Forks, in addition to more people, has more commercial and industrial activity, lower taxes, a military facility, passenger air and rail service, and more extensive media to emphasize the benefits of Grand Forks. The competition is seen to be as much between the two States as between the two cities, and it is important in explaining why East Grand Forks is concerned about population loss due to the project.

4.20 Both cities have long been involved in agricultural industries and have had considerable residential development. For many years, however, there was one functional specialization: East Grand Forks was more of an "open" town, and much of its business involved liquor and related establishments. Since North Dakota's recent legalization of gambling, some of this sector's business may have shifted out of Minnesota. Another difference between the States, Sunday business closing laws, is not fully taken advantage of in East Grand Forks (as it is in Moorhead), for there are few stores in East Grand Forks which deal in the types of goods which are prohibited for Sunday sales in North Dakota. In conclusion, the current commercial base of the economy is not strong, and this is another reason for the city's concern about project impacts.

4.21 East Grand Forks has an advantage for industrial development in its superior water supply; some of Grand Forks' water is presently purchased from East Grand Forks and comes from the Red Lake River.

4.22 Pnysical Development and Tax Bases. - About one-third of the city is in tne legally defined floodplain. The residences of the city are in three general areas. The northwest area, mostly of fairly recent construction, consists of large single-family homes near the river, more modest homes away from the river, and considerable multi-family housing. A golf course and cemetery serve as a buffer for farmland north of the city limits. A few homes extend north of the city limits along Highway 220N.

4.23 The central part of the city contains older single-family homes and some denser development, such as the senior citizens' high-rise tower. Most structures are modest in size but well-maintained with mature vegetation. Previous urban renewal efforts have removed many homes from the floodplain. This section is actually separated into several subareas by the parks, the central business district, the roads, and railway rights-of-way.

4.24 Between the Red Lake River and the Red River of the North is the area, now primarily residential, known as "The Point". In general, the larger homes are close to the rivers, with somewhat smaller and older homes in the center.

4.25 Industry in East Grand Forks is concentrated east of the central business district, along the transportation routes provided by the railway, Highway 2, Business 2, and Highway 220N. An industrial park is being developed in the eastern part of the city. Most industry is agricultural, related particularly to potato and sugar beet processing.

4.26 The central business district is, visually and in terms of its viability, the weak part of the city. A number of properties on Demers Avenue are presently vacant; the street itself has been closed for a mall/parking area as part of an earlier urban renewal effort. Some people feel that closure has contributed to the decline in business activity. Most structures in this area appear to be sound and present a less-than-desirable appearance

only because of the obvious vacancies among them. Additional commercial buildings stretch out across from the elevator and railroad area along Demers Avenue farther east. New commercial development has focused on Highway 220N, with about 43 businesses directly on either side of this strip.

4.27 Social Cohesion. - The city currently faces some difficult choices in four related areas: industrial development, commercial redevelopment, population maintenance, and flood risk management. Planning and public investment for each of these needs are occurring or are possible in the near future. A critical task for the city is to coordinate tne efforts, at least to the extent of avoiding public expenditures which work at cross purposes. At best, such coordination could provide a city which makes real the vision of its citizens, reflecting their priorities and values.

4.28 A summary of some of the specific issues which may disrupt social cohesion includes the following:

o Should there continue to be a central business district, or should there be strip commercial development?

o If there should be a central business district, where should it be? If a flood control project requires removal of the first commercial block, where should those structures be moved?

o Is flood control an important enough social priority, given the fiscal and social costs involved?

o Should tax incentive districts be located in the present floodplain in anticipation of a flood control project?

o Should development (and potential future annexation) outside the boundaries of a flood control project be allowed? Encouraged?

o Given a flood control project which displaces many structures, how can the city retain the most possible residents and businesses?

5.00 ENVIRONMENTAL EFFECTS

5.01 Public Law 91-611, Section 122, requires that specific adverse effects be considered. The following adverse effects would not be expected to occur: adverse employment effects; injurious displacement of farms; and disruption of desirable community and regional growth.

5.02 The following adverse or significant potential effects are addressed below: Destruction or disruption of man-made and natural resources; air, noise, and water pollution; aesthetic values; community cohesion; availability of public facilities and services; tax and property value losses; and injurious displacement of people and businesses.

Natural Resources

5.03 The impacts on the natural resources in the study area do not differ among the plans considered. The primary sources of impacts arise from levee construction and the removal of all structures on the riverward side of the flood barrier. The degree of protection considered does not alter the levee alignment. Although higher degrees of protection would result in levees with a wider base and some additional road raises and sandbag closures, these design features do not result in significant differences in the comparative impacts of the alternatives.

5.04 Impacts on natural resources would be limited to those areas north of the Red Lake River. Measures considered for "The Point" area south of the Red

Lake River would not change the natural resources when compared to the without project conditions (43 acres woods, 72 acres grassed/open).

5.05 Levee construction, and the associated unloading in some areas, would result in the removal of approximately 6 acres of bottomland woods. These areas would be converted to grassed/open habitat. Removal of all structures on the riverward side of the levee and retention of the residential plantings would result in the addition of 43 wooded acres to open space. This would result in 97 acres of woods (54 + 43) between the levee and the river. Supplemental planting for landscape beautification on project lands would effectively offset any natural losses that could be expected to occur to the existing woodlands over the period of analysis (100 years). As a result, there would be an increase of 49 acres of woodlands in the study area when compared to the without condition (without project = 91, with project = 140).

5.06 Levee construction would result in the disturbance of 4.3 acres of grassed/open area. This would be a short-term loss as the construction area would be reseeded after construction. Levee construction and the removal of structures on the riverward side of the levee would result in the addition of 18 grassed/open acres. This is an increase of 6 acres over without project conditions (137 acres without project, 143 acres with project).

5.07 The area between the river and the levee would be maintained as open space with the objectives of improving wildlife habitat and recreational opportunities in the study area. The proposed measures would result in an open space area consisting of approximately 130 acres. It would extend for approximately 1.5 miles from River Heights Park (at river mile 296.4 on the Red River) to a point near the bridge crossing the Red Lake River at river mile 0.3. Proposed measures for beautification and possible recreational development are discussed in exhibit 1 and the recreation resources supporting documentation.

5.08 No State or federally listed threatened or endangered species would be affected by any of the proposed measures.

5.09 None of the measures considered would have an impact on prime or unique farmlands.

5.10 Construction activities would result in short-term adverse impacts on noise and air quality due to the operation of construction equipment. In addition, a short-term decrease in water quality may occur because of runoff from construction.

Cultural Resources

5.11 No sites currently listed on or determined to be eligible for inclusion on the National Register would be impacted by this proposed plan.

5.12 Historic standing structure surveys have identified two potentially significant structures that may be impacted by the proposed project. A more detailed assessment of their eligibility to the National Register will be undertaken in the next phase of planning. In addition, an archeological survey of two bank unloading areas within the proposed project area has also identified one prehistoric and two historic archeological sites. These sites are considered to have minimal potential for eligibility to the National Register. However, additional testing will be undertaken as planning progresses in order to make a detailed assessment of their significance.

5.13 All sites and structures determined eligible for inclusion on the National Register of Historic Places will be mitigated in accordance with the Advisory Council on Historic Preservation Regulations, 36 CFR Part 800.

Recreation Resources

5.14 Five recreation areas would be directly affected by the proposed plans. The proposed levee alignment is along the boundary of the golf course. The only area where the levee would affect the course is near the clubhouse. The levee height would be 3 to 5 feet in this area. The major concern is access between the parking lot and the course with the levee in the middle. This design problem can be satisfactorily resolved in later design phases. The remainder of the proposed levee would serve as a physical boundary between the residential areas and the golf course.

5.15 The unloaded area within the golf course expansion area would result in some disruption in play during construction activities. In general, the holes affected by the unloading would be "removed", the unloading of the levee would be accomplished, and the holes would be "replaced" on the unloaded areas. The long-term effects would be the reduced elevation of that portion of the golf course.

5.16 Dike Park is a tot lot area, adjacent to the existing emergency levee, that is used by nearby residents. Removal of the emergency levee may require moving the play equipment. Since the residents in this area would be relocated, the playground equipment would no longer be needed there. It is assumed the city would relocate the equipment into areas where additional equipment is needed. For example, should the city decide to develop a new residential area for those residents relocated, new park areas would be provided. The equipment currently located in Dike Park could be relocated in the new park areas.

5.17 Griggs Park is a neighborhood park with play equipment, a hockey rink, and a warming house. Proposed alignments show that the levee in this portion of Griggs Park would cross an area currently occupied by a hockey rink. As more detailed plans are developed in subsequent study efforts, the exact alignment will be determined. It may be possible to reorganize the uses of

the park and relocate the rink within the park. Also, the need for hockey rinks in terms of location and numbers may change by the time the project is built, and no loss would occur.

5.18 River Heights Park is 22 acres and primarily wooded. The existing levee would be raised in this area and result in a minor loss in park lands. However, this would not affect existing or planned future developments.

5.19 Rivers Edge Park is a large open space area in the floodway. The proposed measures would result in an increase in the size of this park but would not affect existing or planned facilities or uses of the park. The city would have additional lands to maintain, which could affect the city's operation and maintenance budget. However, the overall effects of the proposed measures would be positive.

5.20 A system of trails is proposed for inclusion with the flood control project. Recreational developments are also possible on properties required for the project. The recreation portion of the main report describes possible developments. All developments outside the levee would be designed and constructed so as not to be damaged by flooding.

5.21 Some loss of existing vegetation would occur as a result of the project. A landscape beautification plan has been developed which describes what can be done to ennance the project areas. In general, wildlife values and minimal maintenance would be key criteria in plant selection. Except where recreational developments would occur, areas would be planted so as to minimize maintenance, such as mowing.

5.22 The Red Lake River from Thief River Falls to the dam just upstream from the confluence with the Red River is included in the final list in the Nationwide Rivers Inventory. The proposed flood control project would be extended along the north bank for approximately 1 mile witnin the included segment. Based on current designs, the existing riparian vegetation would not

...ected and the river corridor within this urban area would be unaltered. ...ore, no adverse effects on the Red Lake River would result from ...entation of the proposed project.

...ial Resources

5.23 Social Systems. - Neighborhoods would be temporarily disrupted, permanently changed, or terminated, as homes are acquired and removed for the project. About 192 houses and 36 commercial properties would be affected. These structures are not in isolation, for the most part, but can be thought of as presently occupying about 19 blocks or other natural clusters.

Properties	Blocks or Clusters	Structures	Occupancy Units	Residents (Persons)
Residential	15	192	254 households	610
Commercial or	4	15	36 businesses	
Public			3 public	
Total	19	207	293	610

5.24 As these structures are acquired, both their occupants and the neighbors not acquired would be affected by the activity and the resulting change. That is, the area where a neighbor lived before, or where a business was, would now be open space or a landscaped levee or a floodwall. Also, when some of these structures are relocated, whether as a group or by individual owners, the new neighbors would experience change. Perhaps about 30 percent of the occupants would choose not to relocate within the same part of town or even within the city. These changes are not necessarily negative; we are a highly mobile society and many people experience more uprooting than this, several times during their lives. When asked what concerns they would have about moving, people were more likely to mention economic issues (72 to 83 percent) than maintaining neighborhood ties (16 percent). Finding a good neighborhood was an important issue, though, to nearly half of the people. A change of residence is always stressful at the personal level, even when the change is

welcomed. Having a whole block "move away" from a neighborhood would also have a significant impact on social ties and on personal stability of those who are "left behind". As a result, most of these effects would be of short duration, until new neighborhood ties are established.

5.25 The downtown district would be radically disrupted by the removal of structures occupied by about 38 businesses. However, with proper civic leadership, this action could provide an opportunity to restructure the downtown area into a more viable pattern than under either present conditions or likely future without conditions, or, without proper leadership, the "downtown" could literally cease to exist. With active city guidance and perhaps some economic incentives, a new downtown area could be created, perhaps tying the Highway 220N commercial strip into the remaining Demers Avenue commercial area. In that more optimistic scenario, East Grand Forks could develop an integrated shopping and service area which would reestablish the city's retailing independence and be reasonably competitive with Grand Forks commercial areas. A very active interest was expressed, during the 1983 City Futures meetings, in this possibility. The major changes caused by the project, plus the flood-free land created for development, may provide the motivation for this planned restructuring.

5.26 Physical Development. - The recommended plan would provide 230-year protection to 107 commercial establishments and 1,624 residences. By acquisition, flood threat would be ended for another 39 businesses and 254 households as those properties would be acquired for the project, and thus removed from the floodplain. About 70 percent of those proprietors or residents would relocate within East Grand Forks, on what would then be flood-free land. The buildings which are relocated, rather than demolished, would tend to be those of better structural quality and higher value, thus upgrading the physical stock of the city.

5.27 As population grows during the next 20 years (by 14 percent), there will be increased demand for residential and commercial buildings. New buildings

in the protected area would be less frequently subjected to both floods and soil faults, which are problems experienced by 9 to 27 percent of residents under present conditions. Therefore, property values, tax base, and community appearance would be enhanced. This development would also be facilitated by removal of floodplain restrictions.

5.28 Utilities and roads would be abandoned or replaced in the many blocks outside of the protected area. Some of these facilities would be near the end of their design lives but others would have 25 to 35 years remaining. The city would need about 6 to 8 months before the summer construction season to coordinate the necessary work.

5.29 The flow of traffic in the downtown area may be changed to coincide with preferences expressed in the City Futures meetings. Roads and utilities within the protected area would be less costly to maintain.

5.30 During construction, roads would be extensively interrupted for short times as structures are removed and levees/floodwalls are built. The city may reduce some of the disruption by coordinating its acquisition and removal activities. Road deterioration caused by project construction would be corrected by the Federal contractors.

5.31 The possible decline of property values during the interim period (from the present to the time of acquisition) is a great concern to all floodplain property owners. Many people believe their values are already being lowered by the Federal flood control study, as prospective buyers become aware of the threat of flooding, and of the possibility of eventual acquisition. (About 15 percent of survey respondents reported lowered values specifically resulting from floods in the past.)

5.32 Tax Bases. - Property values would experience a modest net increase on an annualized basis (at an 8-1/8 percent interest rate for the project's economic calculations). That is, despite the loss of taxable properties due

to the project, benefits inside the project would cause an even larger increase in the taxable property values for the city.

5.33 Population growtn (which affects income taxes) would be slightly depressed for a few years, when properties are being acquired, and residents have an economically advantageous opportunity to leave the city/State. It is expected that this would not be a significant or long-term effect, involving about 76 households (approximately 183 individuals).

5.34 Taxable sales would not be significantly affected by the project, as most of the businesses involved are not classified as retail sales tax collectors. Probably only four establishments collecting sales tax would not relocate in East Grand Forks.

5.35 Social Cohesion. - Three areas of controversy may temporarily disrupt the normal level of social cohesion in East Grand Forks: need, community viability, and equity.

5.36 Need: At the City Futures meetings, flood protection (specifically 1-percent chance flood protection) was repeatedly listed as a high priority; 78 to 81 percent of survey respondents believed flooding is a very serious problem for the city, and 57 percent thought that a new structural flood protection system was a good solution. On the other hand, from 6 to 12 percent of respondents in the 1982 opinion survey believed flooding was not a serious problem for the city. And 33 percent thought that one of the good solutions to flooding problems was "present city levees, combined with emergency flood fighting, and flood forecasting (as in 1979)", while indicating other solutions were also seen as good. (Greatest support for a permanent levee came from people who believed they were in the floodplain, whether or not they were.) Thus, there is not a total consensus about how serious the city's problem is or about the best solution to the problem. Given the cost and social effects of the project, this lack of consensus could become politically important.

5.37 Structural protection, such as a ring levee, for "The Point" was eliminated because it would have disrupted so many homes to provide relatively little protection, and the soil conditions resulted in an economically unfeasible alignment. A few structures were found to be individually feasible to acquire or floodproof, as nonstructural measures, but this was seen as inequitable by local interests. Lack of protection on "The Point" may cause some conflict during and after severe floods, but probably less than under other solutions which were considered.

5.38 Community Viability: There is concern in the city that the project would fatally disrupt the community. This concern has been expressed in various ways: "If we acquire those properties, they'll all move to North Dakota"; "We won't have any downtown left"; and "This protects less than it removes." According to responses in the public opinion survey and business survey (see social supporting documentation), about 70 percent of the people whose properties were acquired would choose to relocate their homes and businesses in East Grand Forks. The actual percentage might be higher, of course, since jobs, families, schools, and other social ties can bind people to the community itself, not just to their particular lot of land. The city may also encourage relocation within its boundaries by sensitive treatment during acquisition, and by careful planning for reuse and preparing new sites for some acquired homes and businesses. Both the city and the Corps can make major contributions to the city's viability by conducting an open and ongoing education effort to quell rumors and explain actual project consequences.

5.39 Equity: Some equity issues have been successfully addressed during planning, but several sources of controversy remain. "The Point" area of the city would not receive flood protection for reasons of economic feasibility and social acceptability. Some residents would experience more negative impact (having to move, or being near a levee) than others. Some people would feel their property was unfairly valued, either for city acquisition, or by the realty market if they sold during the interim period. And many residents

would be dissatisfied with the impact on their taxes; respondents to the public opinion survey thought costs should be spread over a wider tax base (county and State) than they probably would be.

5.40 Effects of Other Plans 6 and 7: Construction of a longer and higher levee would have somewhat greater effects than a smaller levee, as it would require more material, more time, etc., and be more obtrusive after completion. However, these differences are mostly of short duration and would not be significant.

6.00 PUBLIC INVOLVEMENT

Public Involvement Program

6.01 A notice of intent to prepare a draft supplement to the final EIS for the East Grand Forks flood control project appeared in the Federal Register on 29 September 1983. This notice invited the participation in the scoping process by anyone who was interested.

6.02 As part of the study and scoping process, views of the public were actively solicited throughout the study. Individuals, groups, and government bodies were brought into the study process through a wide-based public information program with regular communication on project matters. A flood control committee appointed by the mayor met periodically to hear and discuss presentations concerning the various alternatives under consideration, including engineering aspects, costs, and community views on their effectiveness and acceptability. A public meeting and workshop was held in October 1983 to review and comment on the results of the stage 2 studies. Throughout the study, the St. Paul District has maintained coordination with Federal, State, and local government agencies, interested groups and citizens. A detailed discussion of the public involvement program is presented in the Public Involvement Supporting Documentation.

...ired Coordination

6.03 Following coordination of the draft supplement to the final EIS with appropriate agencies, groups, and individuals, a public meeting was held. Comments received at the meeting or by letter concerning the draft report and supplement to the final EIS were used in preparation of the final planning report and supplement. Coordination with appropriate agencies and groups continued throughout the study process.

Final Supplement to Final EIS Distribution

6.04 The following agencies, organizations, and individuals will be sent a copy of this supplement to the final EIS. Those identified with an asterisk (*) provided comments on the draft report. Their comment letters along with the Corps responses, where applicable, are presented in Attachment 1.

Distribution List

United States Senators

Honorable David Durenberger
Honorable Rudy Boschwitz

United States House of Representatives

Honorable Arlan Stangeland

Governor of Minnesota

Honorable Rudy G. Perpich

Federal Agencies

Advisory Council on Historic Preservation

Department of Agriculture

Agricultural Stabilization and Conservation Service
United States Forest Service
Eastern Region Forest Service
Soil Conservation Service

Department of Commerce

Department of Energy

Environmental Protection Agency

Region V Administrator*

Federal Emergency Management Agency

Department of Health and Human Services

Department of Housing and Urban Development

Department of the Interior

United States Fish and Wildlife Service
United States Geological Survey
Bureau of Indian Affairs
National Park Service

Department of Transportation

U.S. Coast Guard
Federal Highway Administration
Federal Railroad Administration

Minnesota State Agencies

Department of Agriculture
Department of Natural Resources
Office of Economic Development
Minnesota State Historic Preservation Office
State Archeologist
Minnesota Historical Society
Environmental Quality Board
Minnesota Pollution Control Agency
Minnesota Department of Transportation*
Minnesota Department of Energy and Commerce Development
Minnesota Department of Health, Environmental Health Division
Water Resources Board, Executive Secretary
Minnesota State Clearinghouse

Regional, County, Local Agencies

Red Lake River Watershed District
Northwest Regional Development Commission
Board of County Commissioners, Polk County
Polk County Emergency Service
Polk County Auditor
County Commissioner, Polk County
Polk County Planning and Zoning
Chairman, Huntsville Township
East Grand Forks Chamber of Commerce

City of East Grand Forks, Mayor
East Grand Forks City Council
City Engineer, East Grand Forks
City Attorney, East Grand Forks
Clerk/Treasurer, East Grand Forks
Planning Commission, East Grand Forks
Supt. - Streets and Sanitation, East Grand Forks
Water and Light Commission, East Grand Forks
City of Grand Forks, North Dakota, Mayor*

Individuals

A list of individuals and interest groups receiving the Draft Supplement to the Final EIS is contained in the supporting documentation.

Public Views and Responses

6.05 Public views on resources in the area and project concerns have been actively solicited throughout the study. Of primary concern has been the alignment of the proposed barrier and the effect on the residences and businesses that would be excluded from protection. Every effort has been made to develop an alignment that provides flood protection to the largest number of homes possible. In addition, many nonstructural measures were evaluated for structures on the riverward side of the levee.

6.06 The cost of managing open space areas that would result from the proposed project has also been of some concern. Revegetation and recreational development concepts that would reduce maintenance costs on both project and nonproject lands have been developed.

List of Preparers

The following people were primarily responsible for preparing this Environmental Impact Statement:

Name	Discipline/ Expertise	Experience	Role in Preparing EIS
Mr. Randall D. Devendorf	Biology/Wildlife	6 years, EIS studies, Corps of Engineers, St. Paul District	EIS coordinator, Effects on Natural Resources
Ms. Suzanne Gaines	Sociologist	6 years, EIS studies, Social Analysis and Public Involvement, Corps of Engineers, St. Paul District	Social Analysis, Public Involvement
Ms. Terry Pfutzenreuter	Archeologist	5 years, Minnesota Historical Society, 4 years, Cultural Resources, Corps of Engineers, St. Paul District	Cultural Resources Evaluation
Mr. Franklin Star	Outdoor Recreation Planner	1 year, Minnesota Department of Natural Resources, 8 years, EIS studies, Recreation Analysis and Aesthetic assessments, Corps of Engineers, St. Paul District	Recreation Analysis and Aesthetic Assessment

Index, References and Supporting Documentation

Subjects	Study Documentation: Supplement to EIS	Study Documentation: Main Report	Study Documentation: Supporting Documentation
Affected Environment	EIS-24	31-64	---
Alternatives	EIS-9, EIS-14	70-124	Sup. Doc. E
Comparative Impacts of Alternatives	EIS-16	98, 109	---
Environmental Conditions	EIS-21	31-54	---
Environmental Effects			
Cultural Resources	EIS-30	98, 110, 122	---
Natural Resources	EIS-28	98, 109, 123	---
Recreation Resources	EIS-31	98, 110, 123	Sup. Doc. L
Social Resources	EIS-33	98, 110, 121	---
Plans Eliminated from Further Study	EIS-8	87, 98 - 99	---
Public Involvement	EIS-38	130	Sup. Doc. N
Public Views and Responses	EIS-42	130	Sup. Doc. N
Significant Resources			
Cultural Resources	EIS-23	52	---
Natural Resources	EIS-22	51	---
Recreation Resources	EIS-24	54	Sup. Doc. L
Social Resources	EIS-24	49	Sup. Doc. J

Exhibit 1

Beautification Features on

Project Lands

AD-A184 638 GENERAL REEVALUATION AND SUPPLEMENT TO ENVIRONMENTAL IMPACT STATEMENT FOR (U) CORPS OF ENGINEERS ST PAUL MN ST PAUL DISTRICT NOV 84 1/3

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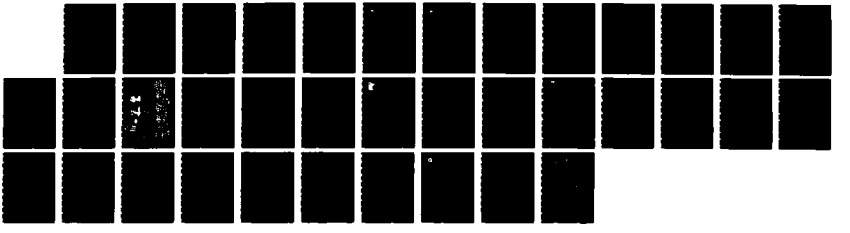

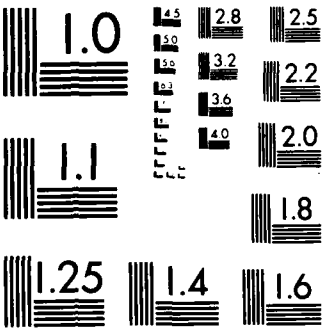

Beautification Features on Project Lands

The principal natural resources which would be impacted by project construction would be those associated with construction of levees and unloading of areas. These activities would result in some short-term habitat losses. However, the acquisition and removal of all structures on the riverward side of the levee would increase the amount of open space along the river corridor. Some concerns have been raised about costs to the city for maintenance of this area. The following plans have been developed to beautify the project lands between the river and the flood barriers, provide wildlife habitat, stabilize the soils, and improve recreational resources in the area. The objective of this plan would be to return this open space to an area more characteristic of the natural floodplain in a manner that would require a minimal amount of maintenance. The information presented provides a basic concept of the actions to be done and should not be considered complete. A detailed site plan would be developed during the design stage of this study.

The proposed project would result in an open space area approximately 1.5 miles in length and consisting of about 130 acres. This area would extend from River Heights Park (at river mile 296.4 on the Red River) to a point near the bridge crossing the Red Lake River at river mile 0.3. This area provides a mix of current and potential recreation areas with several areas that would be maintained or developed as natural areas.

The basic plan would provide for beautification of the project area by supplemental plantings for wildlife and aesthetic reasons, with some limited recreational development, such as hiking or bike trails, included in the overall design of the area. Those areas where unloading or levee construction would be adjacent to parks or recreation facilities would be designed and revegetated with recreational and aesthetic needs being the primary criteria. Detailed descriptions of the types of vegetation to be used and possible designs are presented in the recreational resources supporting documentation.

In areas where residential structures are being removed, the trees and shrubs would be retained where possible, thereby preserving some of the vegetative diversity that is currently present. These areas would be allowed to revert to a natural floodplain condition.

Areas not adjacent to parks would be designed and revegetated primarily for wildlife. Species utilized would be, for the most part, characteristic of the riparian woods of the region. Recommended tree species are white oak, green ash, red maple, silver maple, and cottonwood. Suitable shrub species include honeysuckle, willows, autumn olive, and highbush cranberry.

Planting design would be in the form of groupings of trees and shrubs as opposed to blocked stands. This approach allows for visual diversity and increased interspersion, thereby maximizing aesthetic and habitat values.

To increase survival of newly planted stock, the majority of the trees would be planted on the higher elevations of the site. This plan would minimize damage to newly established vegetation by the more frequent flood events. It is assumed that some invasion into the lower elevations of the floodplain would occur after the plantings became established.

The costs associated with beautification measures would be shared between the Corps and the local sponsor. Since the proposed features would occur on project lands, beautification costs would be cost shared at the same rate as project costs. The development of an accurate cost estimate at this stage of planning is difficult due to the lack of detail. However, the following assumptions were used in developing a rough cost estimate: (1) revegetated acres would be planted at a rate of 40 trees per acre and 100 to 150 shrubs per acre; (2) revegetation costs would average $200 per tree and $50 per shrub.

Given the above assumptions, it is estimated that beautification costs would be about $15,000 per acre. It is estimated that approximately 30 acres would

require revegetation with a total cost of approximately $450,000. Final costs would depend on final alignments, acreages to be planted, availability of the desired plant species, and their cost.

Exhibit 2

Coordination Act Report

U.S. Fish and Wildlife Service

United States Department of the Interior

IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE
St. Paul Field Office, Ecological Services
570 Nalpak Building
333 Sibley Street
St. Paul, Minnesota 55101

November 28, 1984

Colonel Edward G. Rapp
District Engineer, St. Paul District
U.S. Army Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101-1479

Dear Colonel Rapp:

This provides U.S. Fish and Wildlife Service comments on your Draft General Reevaluation and Supplement to the Environmental Impact Statement for Flood Control and Related Purposes for the Red and Red Lake Rivers at East Grand Forks, Minnesota.

Our review of the draft document provided has revealed that virtually all of the actions and/or measures recommended by the Service in our March 7, 1984 Draft Coordination Act Report to minimize the project's impacts on fish and wildlife resources are being proposed by the District. As such, we support the recommended plan as presently proposed and look forward to working with District personnel and other interested parties during subsequent planning stages to ensure that the most appropriate and environmentally sound alternative plan is ultimately selected and implemented for this project.

Inasmuch as the District Office has informed us that the selected plan is the same plan that was identified in the Draft document, our March 7, 1984 Draft Coordination Act Report will constitute the Service's Final Fish and Wildlife Coordination Act Report for this project.

Sincerely,

for James L. Smith

Robert F. Welford
Field Office Supervisor

cc: MN DNR, St. Paul
MN PCA, Roseville
US EPA, Chicago

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

St. Paul Field Office, Ecological Services
570 Nalpak Building
333 Sibley Street
St. Paul, Minnesota 55101

March 7, 1984

Colonel Edward G. Rapp
District Engineer, St. Paul District
U.S. Army Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

This constitutes our draft (phase 1) Coordination Act report on the proposed East Grand Forks Flood Control Project within the City of East Grand Forks in Polk County, Minnesota. Our comments are based on the drawings and other information provided by the St. Paul District and our April 19, 1983 field review of the project area. They reiterate many of the comments provided in our planning aid letter of June 9, 1983, and also address the work items identified in our scope of work for FY 1984.

Fish and Wildlife Resource Concerns Within the Study Area

Our primary concerns with this project are associated with the riverine and riparian floodplain fish and wildlife habitat that exists within the East Grand Forks study area.

The Red River of the North and the Red Lake River have been classified as warmwater gamefish (Class II) streams by the Minnesota Department of Natural Resources. The Red River has exceptional value because it contains a good sport fishery which includes channel catfish, walleye, northern pike, sauger, crappie, bullhead, yellow perch, goldeye, freshwater drum and rock bass. The Red Lake River also supports good populations of sport fish such as northern pike, walleye, channel catfish, rock bass and bullhead. The Red Lake River is also the source of municipal water supply for the City of East Grand Forks. As such, no actions should be undertaken within the study area that would inappropriately degrade these important aquatic resources.

There are approximately 114 acres of riparian woodland vegetation within the study area; 60 acres north of the Red Lake River and 54

acres south of the Red Lake River. These remaining forested areas within the City of East Grand Forks are primarily confined to the lower portions of the floodplain immediately adjacent to the Red and Red Lake Rivers. The predominant trees in these floodplain areas are American elm, green ash, box elder, cottonwood, basswood, bur oak and hackberry. The ribbons of wooded vegetation along these rivers are important because of their location and scarcity and the habitat they provide for many species of wildlife. In addition, they function as important migration and travel corridors for birds and mammals, as well as provide an important ecotone or "edge" with adjacent areas (agricultural lands, aquatic habitats, etc.) and attract wildlife species representative of these bordering habitat types.

Some of the wooded areas directly adjacent to the Red River within East Grand Forks have been maintained by the City as parkland or as open space which has helped to protect them from intensive development. However, in many areas within the City, agricultural and urban development activities have resulted in the removal of the riparian woodland vegetation almost to the river's edge. This has had a detrimental effect on the wildlife resources and decreased both the population densities and species diversity of wildlife within the City of East Grand Forks. The continued destruction or further degradation of these riparian woodland areas in the future would result in the eventual elimination of the biological communities that are dependent upon these habitats for their basic life requirements. These wooded areas along the Red River of the North and Red Lake River are significant and should be protected and, where possible, enhanced or reestablished within the study area.

There are approximately 114 acres of riparian grassland within the study area. However, most of these grassed areas have been routinely mowed by the City and, as such, presently provide only limited habitat value for wildlife.

A variety of birds and small mammals are the predominant types of wildlife within the study area. Wildlife such as the white-tailed deer, fox and raccoon are also present in the more heavily wooded corridors where development is not as extensive.

Presently, there are no federally listed threatened or endangered species that occur in Polk County. Therefore, this project should have "no effect" on listed species or their critical habitat. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 2973, as amended. However, if new information indicates endangered species may be affected, consultation with this office should be reinitiated.

Flood Reduction Measures Evaluated

Various structural and nonstructural measures were evaluated by the Corps to reduce the flooding problems within the City of East Grand Forks. Levees, in conjunction with floodwalls and closures, were determined to be the only feasible structural measures for East Grand Forks. The most feasible nonstructural measures were acquisition/removal, floodproofing, floodplain zoning, flood warning and forecasting, flood insurance and emergency preparedness. The nonstructural measures were primarily considered for those areas of the City within the lower portion of the floodplain that would not be protected by levee construction. Acquisition and removal was considered to be the most desirable action for those structures located outside (riverward) of the new levee.

Levee feasibility was evaluated separately for two areas in East Grand Forks; the area north of the Red Lake River, which includes the central city area and northern suburbs, and the suburban area south of the Red Lake River. However, studies undertaken by the Corps during stage 3 revealed that levees for the area south of the Red Lake River were not economically justified.

Two alternative levee alignments, each providing different levels of protection, were carried over and evaluated in more detail by the Corps during stage 3. These are alternative levee/floodwall alignments #2 and #3 that we addressed in our June 9, 1983 planning aid letter. However, geotechnical, environmental, social and economic factors considered in stage 3 ultimately resulted in a determination of the most appropriate levee alignment for the central and northern parts of the City. This levee alignment, which is essentially a combination of alternative alignments #2 and #3, is now being proposed in each of the three action alternative plans.

Three alternative levels of flood protection were also evaluated in stage 3; the standard project flood (SPF), 100-year flood, and the design level of protection at which the economic benefits of the various structural and nonstructural measures would be optimized. However, the new levees would still be constructed in essentially the same location for each of these design levels of protection in those areas of the City where levees would be in close proximity to the Red or Red Lake Rivers. Differences in the degree of protection would vary primarily with the height, width, and length of the new levee and not require a change in alignment.

Description of the Various Alternative Plans

In addition to the no action alternative, three other alternative plans were evaluated in detail by the St. Paul District to provide increased flood protection for East Grand Forks. Each of these plans would involve implementing a combination of various structural and/or nonstructural flood reduction measures.

The no action alternative plan, if ultimately selected, would allow many of the structures presently receiving flood damages within the City to continue to be damaged in the future and no action would be taken to provide any permanent flood protection for East Grand Forks. Flood protection would be provided through floodplain zoning, flood insurance, flood forecasting/warning and emergency preparedness activities.

Alternative Plan #1 would consist of levee/floodwalls and nonstructural measures for the area north of the Red Lake River and nonstructural measures for the suburban area south of the Red Lake River. The new levee/floodwall in the north area would be constructed on an alignment which is set back at least 400 feet (varies between 400 to 800 feet) from the Red and Red Lake Rivers and would be designed to protect this area of the City from the 100-year flood event. However, because of the soil characteristics in this area, unloading of the riverbank (removal of large amounts of earth from the riverward side of the levee) would be necessary in four areas along the alignment to ensure the stability of the new levee. These areas would be restored to as near the condition of the natural floodplain as possible following construction.

Nonstructural measures proposed in the north area would include the acquisition and removal of all structures on the riverward side of the new levee. The trees and shrubs in these residential areas would be retained to the extent possible and the area allowed to revert to a more natural floodplain condition.

Nonstructural measures to be implemented for the area south of the Red Lake River would include acquisition and removal of 14 residential structures, floodproofing three commercial structures, floodplain zoning, floodwarning and forecasting and emergency preparedness.

Supplemental plantings would be made by the Corps to beautify project lands on the riverward side of the new levee and, where it is necessary, to revegetate the unloaded areas.

Alternative Plan #2 is the same as Plan #1 except that the design level of protection would be for the Standard Project Flood (SPF) events. Additional sandbag closures and road raises would be required for this alternative which would effectively provide ring levee protection for the central and northern areas of the City north of the Red Lake River.

Alternative Plan #3 is also the same as Plan #1 except that the design level of protection provided by the new levee/flood barrier would be for the 230-year flood event (the level at which the economic benefits obtained are optimized) and no structures south of the Red Lake River would be flood-proofed or acquired. This plan is the NED plan and is the Corp's preferred and tentatively selected flood reduction plan for the City of East Grand Forks.

Anticipated Effects of Alternative Plans on Fish and Wildlife Resources

Based on our field review of the project area, we anticipate only minimal impacts should occur to fish and wildlife resources due to implementation of any of the above described alternative plans. The primary wildlife habitat impacts would occur in the area north of the Red Lake River due to levee/floodwall construction and unloading of the riverbank adjacent to the Red and Red Lake Rivers. No fish and wildlife or other environmental impacts would occur due to implementation of any of the nonstructural measures.

Approximately six acres of riparian woodland vegetation would be adversely affected in the north area by all of the action alternative plans (Alternative Plan #1, #2 or #3). However, since the new levee/floodwall would be constructed on an alignment which is set back at least 400 feet from the Red and Red Lake Rivers and only the extreme outer (landward) edge of the riparian woodland vegetation along these river systems would be impacted, we do not have any problems with this levee alignment. No riparian woodland habitat would be affected within the area south of the Red Lake River by any of the alternative plans.

Approximately 10 acres of open grassland vegetation would be affected by Alternative Plans #1 or #2; four acres in the north area and six acres in the area south of the Red Lake River. Four acres of open grassland would be affected in the north area by Alternative Plan #3. Since these disturbed grassland areas would be reseeded to grasses following construction, the impacts to these areas should only be of a temporary nature. No riparian grassland vegetation would be affected within the area south of the Red Lake River by Alternative Plan #3.

No natural wetland areas would be affected by any of the alternative plans. However, a borrow pit (artificial wetland) area, approximately 1.5 acres in size, would be unavoidably filled in the north part of the project area by Alternative Plan #1, #2 or #3. It would be necessary to fill in this borrow pit wetland in order to adequately stabilize the riverbank in this area and to ensure the stability of the new levee.

We anticipate that the project should have no significant adverse affect on any aquatic habitat and/or aquatic resources within the Red Lake River or the Red River of the North. However, any increased velocity of flood flows within the existing river channels created by the new levee may increase the streambank erosion along the banks of these rivers through this area of the City.

If all of the structures on the riverward side of the new levee are removed out of the floodplain, the existing trees and shrubs in these residential areas are retained to the extent possible and these areas are allowed to revert to a more natural floodplain condition (as proposed by each of the three action alternative plans), approximately 43 acres of riparian woodland habitat would be reestablished within the floodplain by this project. Implementation of the proposed beautification features (planting trees and shrubs on project lands on the riverward side of the new levee) would result in a net gain of approximately 49 acres of riparian woodland vegetation over what is anticipated would exist in 100 years along these rivers within the study area without the project.

Alternative Plans #1, #2 and #3 would also establish a 400 to 800-foot wide vegetative buffer area as well as an important wildlife and recreational corridor along about a 1.5 mile reach of the Red and Red Lake Rivers within the City of East Grand Forks. In addition to its wildlife and recreational value, maintaining a vegetative buffer strip at least 400 feet wide along these rivers would help to restrict future inappropriate development within these lower and more vulnerable portions of the floodplain, control streambank erosion and reduce the amount of sediment, nutrients and other pollutants entering these waterways.

No impacts to fish and wildlife resources would occur due to implementation of the No Action (no project) Alternative Plan. However, we estimate that the riparian woodland vegetation along the Red and Red Lake Rivers would likely decline at a loss rate of about 0.2 percent/year within the study area due to such things as disease, storm damage and the clearing of private lands. This would result in

a loss of about 23 acres of riparian woodland wildlife habitat within the study area over the next 100 years. Once cleared, these wooded areas would most likely be converted to open/grassed habitat with a much reduced wildlife value.

Fish and Wildlife Recommendations

We recommend that the following measures be undertaken to minimize the impacts to fish and wildlife resources due to this project:

1. The new levee/floodwall be constructed at least 400 feet away (landward) from the Red River of the North and Red Lake River as presently is being proposed by each of the three action alternative plans.

2. Construction activities be undertaken in a manner which will, to the extent possible, maintain the existing riparian woodland vegetation along the Red River of the North and Red Lake River.

3. To the extent possible, the existing residential plantings (trees and shrubs) be retained on the riverward side of the new levee/floodwall when removing the acquired structures from the floodplain.

4. All disturbed areas riverward of the new levee/floodwall be seeded down and stabilized as soon as possible following construction to reduce the water quality impacts to the Red and Red Lake Rivers as a result of construction activities.

5. The slopes of the new levee be seeded with legumes and/or grasses following construction and the mowing of the levee slopes (particularly on the riverward side) be avoided, or minimized to the extent possible, to increase their wildlife habitat value.

6. The supplemental planting of trees and shrubs be undertaken by the Corps as proposed to beautify project lands between the new levee/floodwall and the Red River of the North and Red Lake River. We suggest that these plantings be in groupings of trees and shrubs as shown on the attached sketch map (see Figure 1). This planting design would provide some visual diversity and interspersion and also should maximize the aesthetic and wildlife habitat value of these areas. Trees and shrubs planted in these areas

should be relatively flood tolerant native species such as green ash, red maple, silver maple, cottonwood, willow ssp., red-osier dogwood, honeysuckle, autumn olive and highbush cranberry. In addition, we recommend that these project lands on the riverward side of the new levee/floodwall be maintained as open space or parkland for wildlife and recreational use.

7. A contiguous vegetative buffer area of trees and shrubs at least 50 feet in width be maintained and/or reestablished along the edges of the Red and Red Lake Rivers within the study area.

8. Future residential, commercial or other inappropriate development be curtailed within the lower portions of the floodplain between the new levee/floodwall and the Red and Red Lake Rivers and the strict enforcement of floodplain management programs be provided for within the East Grand Forks study area.

If the above measures are undertaken, in our opinion, this project would be environmentally sound and comply with the Executive Orders on wetlands and floodplains. We also believe that if Recommendation Nos. 3, 4 and 5 above are undertaken, they should adequately compensate for the riparian floodplain wildlife habitat that would be unavoidably impacted by this project. The supplemental tree and shrub plantings being proposed by the Corps to beautify project lands riverward of the new levee/floodwall would also help to increase the wildlife habitat value and improve the environmental quality of these areas.

We look forward to working with District personnel and other interested parties during subsequent planning stages to ensure that the most appropriate and environmentally sound alternative plan is selected and ultimately implemented for this project. Although we still believe that a preventive (as opposed to a protective) approach would be more appropriate, we concur that levee/floodwall protection cannot be avoided in some of these highly developed urban areas along the Red River of the North such as East Grand Forks.

This report has been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et

seq.) and the National Environmental Policy Act of 1969. The proposed project was also examined for its conformance with Executive Orders 11988 and 11990.

Sincerely,

Robert F. Welford
Field Office Supervisor

Attachment

cc: MN DNR, St. Paul
MN PCA, Roseville
US EPA, Chicago

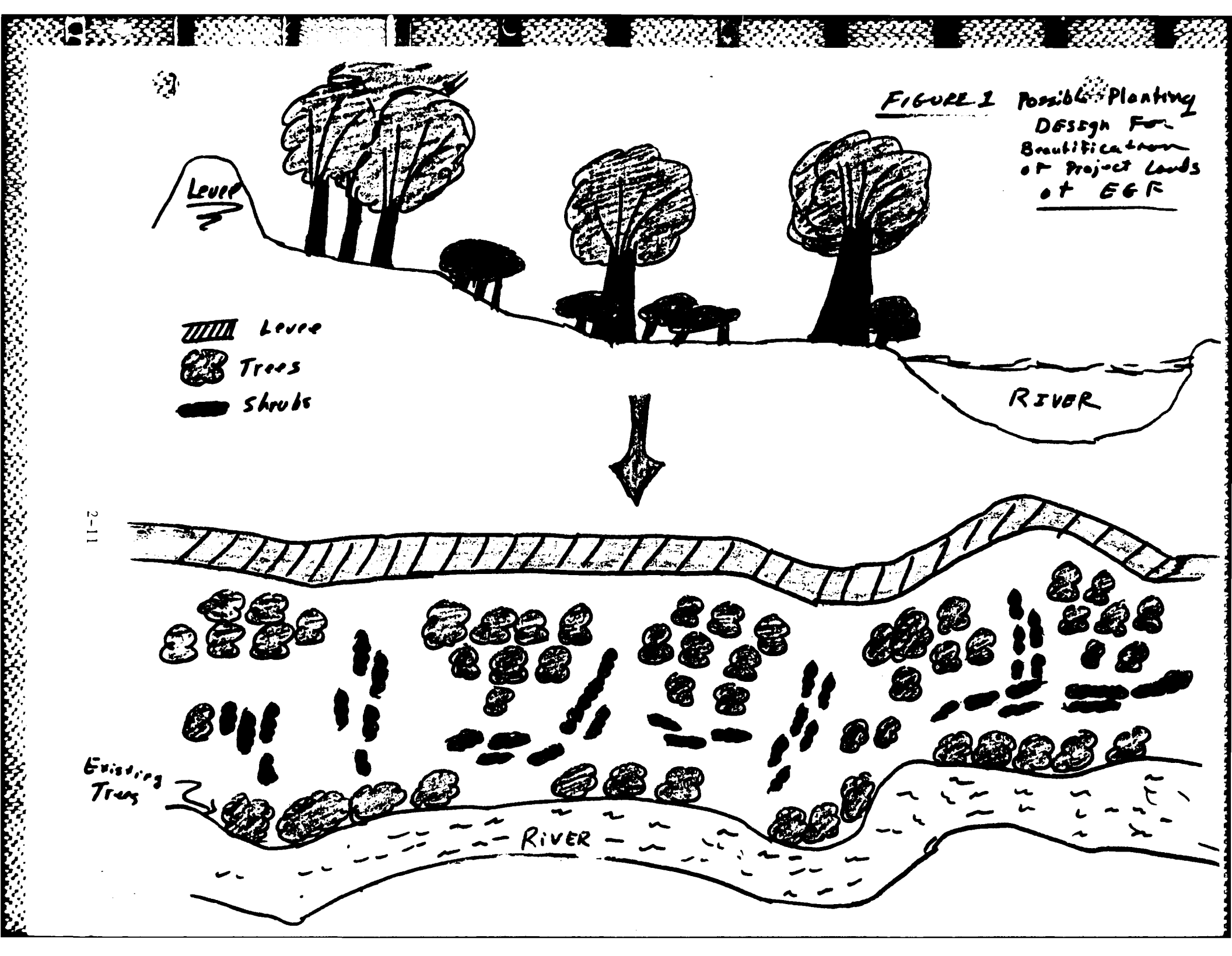

FIGURE 1 Possible Planting Design For Beautification of Project Lands at EGR

ATTACHMENT 1

LETTERS OF COMMENT

AND

CORPS RESPONSES

MARCH 1985

ATTACHMENT 1

LETTERS OF COMMENT AND CORPS RESPONSES

TABLE OF CONTENTS

Item	Page
LETTERS REQUIRING RESPONSES	
Red Lake Watershed District, Thief River Falls, Minnesota, February 5, 1985	1-1
Corps Response to Red Lake Watershed District	1-3
Minnesota Department of Natural Resources, January 7, 1985	1-4
Corps Response to Minnesota Department of Natural Resources	1-5
Mr. Vernon Quern, Oslo, Minnesota, November 3, 1984	1-8
Corps Response to Mr. Vernon Quern	1-9
City of Grand Forks, North Dakota, October 29, 1984	1-10
Corps Response to City of Grand Forks, North Dakota	1-11
LETTERS REQUIRING NO RESPONSE	
Letter from U.S. Environmental Protection Agency, Chicago, Illinois, November 26, 1984	1-15
Minnesota Department of Transportation, St. Paul, Minnesota, November 16, 1984	1-16
Town of Bigwoods, Minnesota, October 25, 1984	1-17

LETTERS REQUIRING RESPONSES

RED LAKE WATERSHED DISTRICT

"Dedicated to Water Management"

District Office
309 LaBree Ave. North
Thief River Falls, MN 56701
Phone: (218) 681-5800

Engineer's Office
P.O. Box 668
Crookston, MN 56716
Phone: (218) 281-1182

February 5, 1985

Mr. Martin McCleery
Corps of Engineers
1135 USPO & Customhouse
St. Paul, MN 55101

Dear Mr. McCleery:

We have reviewed the draft report by the Corps of Engineers for the proposed flood control project in the City of East Grand Forks. The Red Lake Watershed District is vitally interested in the flood control needs of the City and its people and we take this opportunity to comment on the plan and how it relates to programs and policies of the District.

The need for a levee system has been proven during many historic flood events. We have little direct knowledge regarding the existing levees. However, we understand that they do not provide adequate protection against anticipated flood levels and may in some areas be placed on unstable foundation soils.

The Watershed Districts in the Red River Valley are actively constructing flood control projects. The current emphasis is on the construction of many small (relative to the problem) impoundments throughout the drainage basin. Recent studies indicate that this approach is practical and will result in long range flood damage reduction. However, this program should be viewed in a realistic context. The current level of funding is relatively low, therefore the City should not expect significant relief in the near future. The current program has relatively modest goals which would reduce flood stages by one to two feet at East Grand Forks.

The Watershed District believes that a comprehensive flood damage reduction program in the Red River Valley must be a combination of measures including floodwater impoundment, floodplain zoning, flood forecasting and levee protection for critical areas. We believe that substantial progress is being made in all these areas. Improvement of the East Grand Forks levee system and the proposed floodway evacuation are important parts of the necessary basin wide program.

1. A Watershed District Permit will be required for construction of the dikes. Please continue to keep us informed as the project progresses in order that any permitting problems can be minimized.

In summary, we are supportive of the project as proposed. Please contact us if we can be of assistance.

Sincerely,

Truman Sandland

Truman Sandland
President

TS:bs

CORPS RESPONSES TO RED LAKE WATERSHED DISTRICT, THIEF RIVER FALLS, MINNESOTA

1. We will continue to keep the watershed district informed of the project status and will coordinate the necessary requirements for construction permits.

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX , 500 LAFAYETTE ROAD • ST. PAUL, MINNESOTA • 55146

DNR INFORMATION
(612) 296-6157

January 7, 1985

Colonel Edward G. Rapp
St. Paul District Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Colonel Rapp:

Thank you for the opportunity to review and provide comments on the "General Reevaluation and Supplement to Environmental Impact Statement for Flood Control and Related Purposes - Red and Red Lake Rivers at East Grand Forks, Minnesota." This report is one of the most comprehensive analyses of flood damage reduction opportunities ever conducted by the St. Paul District Corps of Engineers and does a thorough job of investigating various combinations of both structural and non-structural methods of flood damage reduction.

The following comments relate to specific portions of the report document.

Page 63. It is our impression that East Grand Forks was satisfied with existing flood warning and forecasting services. This may be a situation where there are unreasonable expectations about what can be accomplished with these techniques. We will work with the city and the Corps to see what improvements can be made.

1. Page 101. Why is it necessary to separate the North and South Project Areas? It appears as though there was an economically feasible project when both areas were still combined that would have provided protection to a significantly greater number of structures under the existing authorization. Now that they are separated the area south of the Red Lake River essentially receives no greater protection than under current conditions.

2. Page 115. It is difficult to tell whether or not the top of the proposed levee meet state standards i.e,, 3 feet above the 100 year flood event or the standard project flood event, whichever is greater. It would be helpful if actual levee elevations were included so that this determination could be made. This

3. standard will have to be met in order to certify the removal of the areas behind the levee from the floodplain. It is also assumed that there will be an approved operating plan for the closures.

Page 123. The selected plan as proposed will only affect about 6 acres of riparian vegetation. This impact can be mitigated by replanting or reseeding the construction areas with native grasses shrubs and trees. We also suggest establishing wood duck nest boxes and a number of smaller cavity nesting

CORPS RESPONSES TO MINNESOTA DEPARTMENT OF NATURAL RESOURCES

1. During the second level formulation of final plans, two distinct areas were identified and evaluated separately: the areas north and south of the Red Lake River. Each area is able to stand alone as an independent flood protection area. When the two areas are analyzed as separate units, the area south of the Red Lake River did not have sufficient economic benefits to cover the cost of the structural flood protection. However, other measures of protection are available. Nonstructural measures identified for the south area include development of a comprehensive flood emergency plan that would consider plan layout of emergency works for construction during an emergency when it occurs and updating the current flood emergency plan to meet changed conditions.

2. The current design elevations at the U.S. Geological Survey gage site are as follows:

1-percent administratively agreed to water surface	829.0
Design water surface	831.5
Top of levee	834.5

Ongoing design studies will define the final water surface and top of levee profile. Detailed hydrology and hydraulic design information is contained in the supporting documentation for this study and is available for your use upon request.

structures sufficient to replace the cavities from the removed trees. It is also suggested that a 50 - 100 foot wide strip of undisturbed cover be established along both the Red and Red Lake Rivers to serve as a corridor for the movement of wildlife and to serve as a buffer between the river and the park-like areas to be established in the floodplain. We would be happy to work with your staff in designing these features.

In conclusion, this report closely resembles the type of evaluation of structural and non-structural alternatives that should be conducted for all flood control studies in the future. It demonstrates that both structural and non-structural techniques can be used in combination to develop an effective flood damage reduction program.

If you have any questions, please contact Mr. Joseph Gibson, Federal Projects Coordinator at 296-2773.

Sincerely,

DIVISION OF WATERS

Larry Seymour
Director

cc: Larry Shannon
Steve Thorne

LS/JG:mh
m-36

3. Closure structures will be provided for all highways and railroads where road and/or track raises are not possible. Approximately eight closures will be necessary. Preliminary analysis and experiences with previous flood emergencies indicate that a minimum of 3 to 5 days warning is available to initiate actions to make the necessary closures.

Ada, Minn.
Nov.3,1984

Dept.of the Army
St.Paul District Corps of Engineers.

Dear Sirs:-

1. I am writing you to ask if there isn't some other way to control the flooding of East Grand Forks,Minn.

You are suggesting spending thirty million dollars on dikes in East Grand Forks and yet you are apposed to these farm dikes north of East Grand Forks.I agree with you on not liking the farm dikes and would much rather have control of the flooding by holding back the water during the flood period.East Grand Forks could certainly use much better control of their water.I can remember many times when they could not water lawns or wash cars because of this shortage and I feel that dams,to control both the flooding and the water shortage,would be a much better way to go then those dikes,in helping East Grand Forks and the agricultural area which we are all so much a part of .

Sincerily,

Vernon Fuerst

Ada, Minn. 56744

CORPS RESPONSES TO MR. VERNON QUERN OF OSLO, MINNESOTA

1. There are many ways, both structural and nonstructural, to reduce flood damages. Over the course of this study, the city of East Grand Forks and the Corps of Engineers have evaluated all possible ways and have concluded that levees in combination with nonstructural measures is tne only cost effective way of significantly reducing flood damages for the city.

OFFICE OF MAYOR
[illegible] WESSMAN MAYOR
[illegible]-3103

City of Grand Forks

402-2ND AVENUE NORTH-BOX 1519 GRAND FORKS NORTH DAKOTA 58206-1519

October 29, 1984

Edward G. Rapp
Colonel, Corp. of Engineers
1135 U. S. Post Office & Customs House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

Thank you for the opportunity to comment on the General Re-evaluation and Supplement to the Environmental Impact Statement for Flood Control and Related Purposes dated September, 1984. I have asked both the City Planner and the City Engineer to review the plan and their comments are included with mine in this letter.

First, as Mayor of the City of Grand Forks, North Dakota, I appreciated the Corp of Engineers continued interest in helping our Metropolitan Area find a workable solution to the continuous flooding our two communities have been experiencing. The City of Grand Forks will support whatever decision the citizens of East Grand Forks make and will do our best to work with federal and local officials during both the planning and implementation stages.

Historically, the Central Business Districts of both cities developed over the years together, and while being competitors,also complimented each other. On a metropolitan scale it is difficult to distinguish them as two separate economic units. Both geography and economics bind one to the other. Will this vital
1. economic unit, separated only by the Red River, be hurt by a greater physical separation in addition to being less able to compete with the two large shopping areas located on the south end of Grand Forks? What will be
2. the economic impact on the Grand Forks Central Business District if the heart of the East Grand Forks Central Business District is located elsewhere?

On page 120 the Plan indicates a "reduction in flood levels and damages for Grand Forks, North Dakota, and areas North and South." What will the net effect on the
3. overall flood threat in feet be if the project is implemented?

CORPS RESPONSES TO THE CITY OF GRAND FORKS, NORTH DAKOTA

1. It appears that flooding along with other factors is seriously affecting the vitality of the residential as well as the commercial downtown area. Removal of the flood threat will reduce the need for flood insurance and costly zoning regulations and will afford the city the opportunity to more fully develop this vital economic unit without this constraint.

2. Flooding, along with other factors, appears to be involved in forcing the redevelopment of the current downtown area to other areas. Decentralization of the East Grand Forks business district may impact on the Grand Forks business district.

3. The project recommended would relocate earthen levees and floodwalls farther away from the riverbank and open up the cross-sectional area of the floodway for the passage of an equivalent volume of water at a lower level. The recommended project would reduce flood levels approximately one-half foot.

On page 132, the non-federal interests (i.e., East Grand Forks) must agree to: "Make at their (city's) own expense all necessary changes to utilities, highways and bridges including approaches."

4. Will there be any cost to the City of Grand Forks for modifications to the Sorlie Bridge, Point Bridge or the Minnesota Avenue Bridge which Grand Forks will be expected to participate in? In 1983, Grand Forks purchased the old N.P. Bridge from Burlington Northern to provide a pedestrian bikeway link between the two communities.

5. Will there be any improvements or modifications made to this structure as a result of the proposed project? Grand Forks and East Grand Forks jointly completed a Water Transfer Station this summer.

6. How will that station be affected by the proposal?

This concludes our comments. Please advise if further information is needed.

Sincerely,

H. C. "Bud" Wessman
Mayor

HCW/po

cc: Frank Orthmeyer, City Engineer/Director of Public Works
Mayor Louis Murray, E.G.F.

4. There will be no cost to the city of Grand Forks, North Dakota, for bridge modifications.

5. There are no plans for improvements or modifications to the Burlington Northern pedestrian bikeway structure. Recreation development is being considered to take advantage of the expanded open space corridor along the Red and Red Lake Rivers with a connected trail system. The pedestrian bikeway could become a link in the trail system and would need to be coordinated in on-going design studies.

6. There is no effect on the Water Transfer Station.

LETTERS REQUIRING NO RESPONSE

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF

NOV 26 1984

DS-COE-F36149-MN

Colonel Edward G. Rapp
District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

The U.S. Environmental Protection Agency has completed its review of the draft supplemental Environmental Impact Statement (EIS) for flood control on the Red and Red Lake Rivers at East Grand Forks, Polk County, Minnesota. The EIS evaluates the environmental impact of a wide range of structural and non-structural measures for reducing flood damages at East Grand Forks, Minnesota. The EIS recommends further design studies of a plan that includes levees in combination with such non-structural measures as floodproofing, evacuation, floodplain zoning, flood warning and forecasting, flood insurance, and an emergency plan of action.

The structural component of the plan involves the construction of 17,290 feet of earthen levee and 3,760 feet of concrete floodwall. Additionally, 16.1 acres of ponding area would be provided for stormwater retention. The non-structural component includes the removal of 129 structures from the floodplain, the revision of floodplain zoning regualtions, and flood forecasting and flood warning plans. The plan would return about 12 acres of floodplain to the Red River.

Based on the information in the EIS, we are rating the proposed project LO-1, which means we lack objections (LO) to the project's environmental impact, and there is sufficient information (1) in the EIS to evaluate its impact.

Thank you for the opportunity to review the EIS. If you have any questions about our review responsibilities, please call Mr. James Hooper of my staff (FTS 353-1326 : COM. 312/353-1326).

Sincerely yours

William D. Franz

William D. Franz, Chief
Environmental Review Branch

Minnesota
Department of Transportation
Transportation Building
St. Paul, Minnesota 55155

(612) 296-7528
Phone

November 16, 1984

Louis Kowalski
Chief, Planning Division
Corps of Engineers
1135 U.S. Post Office
St. Paul, MN 55101

Dear Mr. Kowalski:

We have reviewed the draft EIS for "flood control and related purposes for the Red Lake and Red Rivers at East Grand Forks, Minnesota". It appears that this project involves negligible natural resources impacts in relation to its magnitude. In addition, we noted minimal reference to the impact this proposal would have upon transportation corridors such as T.H.2 in East Grand Forks. Since the project would raise 6,850 feet of road, it would seem transportation facilities would be improved.

Thank you for the opportunity to review this document.

Sincerely,

Leonard G. Eilts

Leonard Eilts, Director
Office of Environmental Services

TOWN OF BIGWOODS
Marshall County, State of Minnesota

Oct. 25, 1934

Edward G. Rapp
Colonel, Corps of Eng.
District Engineer

Colonel Rapp:

In regard to the draft report dated Sept. 27, 1934 for reducing flood damages at East Grand Forks, Mn. This report recommends further studies before final approval.

We the board of Bigwoods Township, representing the people of this township, feel that directing attention only to this one location is by no means an answer to the problem of flooding along the Red Lake and Red River of the North.

We would like to direct your attention to a letter dated March 1, 1971 scheduling a meeting at Red Lake Falls, Mn by Colonel Charles I. McGuines. This study considered water Management in a much broader scope and not directing attention to one small area.

In order to reduce flooding for the area upstream of East Grand Forks and also downstream to the north of the city, there must be more attention given to regulating the amount of water flowing into the Red River at East Grand Forks, from this major tributary, the Red Lake River. This would reduce flood damages to public roads, bridges, farm buildings and also farmland in both states and also Canadian property.

We do recognize the problem at East Grand Forks, but feel we must have better management of water and not go after a piece meal solution to one location only.

Sincerely,

Curtis H. Carlson

Curtis H. Carlson
Chm. Bigwoods Twp.

END

10-87

DTIC