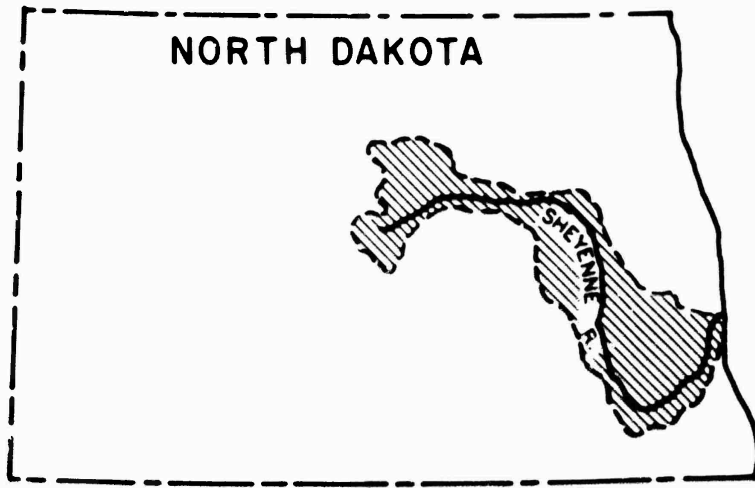


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GENERAL REEVALUATION AND ENVIRONMENTAL IMPACT STATEMENT FOR

FLOOD CONTROL AND RELATED PURPOSES

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SHEYENNE RIVER NORTH DAKOTA



US Army Corps
of Engineers
St. Paul District

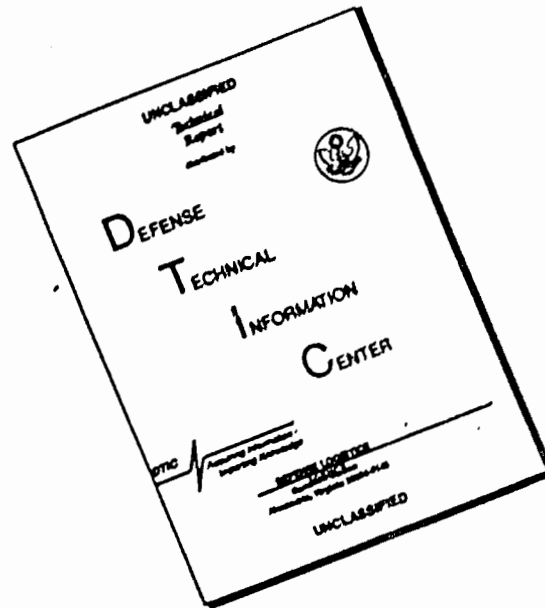
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report addresses the water resource and related problems and needs of the lower Sheyenne River basin with particular emphasis on reducing flood damages. The main report summarizes the water resource and related problems and needs of the basin, the alternatives evaluated, the process used to develop and select a plan, conclusion and recommendations, and the environmental impact statement.		

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DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060

REPLY TO
ATTENTION OF:

BERH-PLN

23 January 1984

SUBJECT: Sheyenne River, North Dakota

Chief of Engineers
Department of the Army
Washington, DC 20314

Summary of Board Action

The Board concurs in the recommendation of the reporting officers for flood control improvements on Sheyenne River, North Dakota. The improvements consist of:

- a. Levees and a flood diversion channel at West Fargo and Riverside.
- b. A flood diversion channel from Horace to West Fargo.
- c. Raising the existing Baldhill Dam 5 feet to provide additional flood control storage.

The project cost is estimated at \$39,600,000, of which \$13,900,000 would be non-Federal, based on traditional cost-sharing policies. The benefit-cost ratio is 6.7. The Board recommends the plan of improvement subject to cost-sharing and financing arrangements satisfactory to the President and the Congress.

Summary of Report Under Review

1. Authority. Section 201, Title II, of the Flood Control Act of 1970 (Public Law 91-611) authorized the Secretary of the Army, acting through the Chief of Engineers, to construct and implement the Kindred Lake project and other improvements in the Sheyenne River Basin. Section 201 is quoted in the District Engineer's Report. After completion of the feasibility report that recommended implementation of the multiple-purpose Kindred Lake project, several significant events affected later planning studies. These events included passage of the National Environmental Policy Act of 1969; adoption by the Water Resources Council in 1973 of the Principles and Standards for Water and Related Land Resources Planning; special studies by the District Engineer in 1974 which examined effects of the Kindred Lake project on groundwater levels, shoreline erosion, and water

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quality; and changes in implementation schedules and plans for the Garrison Diversion Unit. These events prompted a complete reevaluation of problems, needs, and alternative solutions for the study area and resulted in preparation of this report.

2. Description of the study area. The Sheyenne River Basin in southeastern North Dakota drains 7,140 square miles, and flows into the Red River of the North near Fargo, North Dakota. The principal study area for this report includes Lake Ashtabula and the Sheyenne River from Baldhill Dam downstream to the confluence with the Red River of the North, with emphasis on flood-prone areas along the Sheyenne. Water quality of the river is relatively poor and is directly related to land use. Dominant land use is for cropland and pasture/rangeland.

3. Economic development. Agriculture is the economic base of the basin and is expected to remain relatively stable. Changes in crops will be dictated by the agricultural economy, with the most profitable crops being grown in the largest quantities. Some land will be lost to urbanization and some wetland and woodland will be converted to cropland. The population centers of the lower Sheyenne River Basin are the communities of Valley City, Lisbon, West Fargo, and Riverside. Residential development is expected to spread outside the urban areas, but must be in accordance with floodplain regulations. Total population of the lower basin in 1980 was 21,325 and is expected to increase to 37,770 by year 2030.

4. Existing and authorized improvements.

a. Baldhill Dam, which impounds Lake Ashtabula, was authorized by the Flood Control Act of 1944 for flood control, water supply, low-flow augmentation, and pollution abatement. The U.S. Army Corps of Engineers began construction of that project in 1947 and the dam was substantially completed in 1950. It is located about 15 miles upstream of Valley City at river mile 271 on the Sheyenne River. Studies conducted under the Corps of Engineers Dam Safety Program found that Baldhill Dam has inadequate spillway capacity and that the earthen embankment may be unstable.

b. Local interests have constructed low levees along many reaches of the Sheyenne River in an attempt to reduce flooding problems.

c. The authorized Kindred Dam project consists of a multiple-purpose reservoir for flood control, water quality control, recreation, and fish and wildlife on the Sheyenne River near Kindred, North Dakota, in combination with a revised

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operating plan at Baldhill Dam and appropriate floodplain management measures at Lisbon, Valley City, and West Fargo.

5. Problems and needs. Flooding and resulting damages along the Sheyenne River from Valley City to its confluence with the Red River of the North are still major problems in the study area. Major recent floods occurred in 1969, 1975, and 1979. Significant floods also occurred in 1882, 1897, 1950, 1965, 1966, and 1978. Although Baldhill Dam provides some flood protection, damages still result. Estimated damages that would be incurred by a 1-percent chance flood are \$109,000,000. Average annual damages are estimated at over \$28,000,000 for the basin. Most of these flood damages would occur in the West Fargo and Riverside urban area.

6. Improvements desired. Residents and local governments of flood-prone areas along with Water Resource Districts (particularly the Southeast Cass Water Resource District) and the North Dakota State Water Commission have actively supported development of a plan to address the severe flood problems. Although the Kindred Lake project received strong local support from 1968 through 1976, recent support for the reevaluation of all alternatives has been widespread and substantial. Local interests desire additional flood control improvements for the basin.

7. Alternatives considered. A comprehensive evaluation of alternatives to address the flooding problems was conducted. Structural and nonstructural alternatives included major reservoir storage, levees, channels, floodplain evacuation, wetland storage, and other options. Modified versions of the authorized Kindred Lake project were also evaluated, but were not included among the final alternative plans because the potential significant adverse social and environmental impacts resulted in a general lack of regional or local support for the project.

8. Plan of improvement. The District Engineer's selected plan of improvement consists of the following major components along with designated responsibility for their implementation:

a. U.S. Army Corps of Engineers implementation.

(1) Levees and a flood diversion channel at West Fargo and Riverside.

(2) A flood diversion channel from Horace to West Fargo.

(3) A 5-foot raise of Baldhill Dam to provide additional flood control storage. In addition to lands required for the proposed flood control storage, acquisition of up to 450 acres is proposed for wildlife mitigation.

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b. Non-Federal implementation.

(1) Adoption (or continuation) and enforcement of floodplain regulations in flood-prone areas of the basin.

(2) Enforcement of drainage laws to ensure that future drainage of wetlands would not increase downstream flood damages.

(3) Control of private levee construction to prevent increases in upsteam and downstream flood damages.

(4) A multiple-purpose dam for flood control and recreation on Dead Colt Creek, a tributary of the Sheyenne River (construction by local interests is about 80-percent complete).

c. Non-Federal or other Federal agency implementation.

(1) Ring levees at individual flood-prone farmsteads and residences.

(2) Increase in the capacity of wetlands (drained and existing) to store floodwaters.

The District Engineer found that while elements c(1) and c(2) above were desirable, their implementation was uncertain, and remaining features of the plan were not dependent on these elements for economic justification or functioning. Therefore, elements c(1) and c(2) were not included in the plan recommended for U.S. Army Corps of Engineers implementation.

9. Economic evaluation. Based on October 1981 price levels, those components recommended by the reporting officers for implementation in the Corps of Engineers plan are estimated to cost \$34,400,000, of which \$12,200,000 would be non-Federal, based on traditional cost-sharing policies. Average annual costs, using an interest rate of 7-5/8 percent and a 100-year period for economic analysis, are estimated at \$3,003,000, including \$80,000 for annual operation and maintenance. Average annual benefits are estimated at \$22,432,000, and the benefit-cost ratio is 7.5.

10. Project impacts. The District Engineer finds that the recommended Corps of Engineers plan would provide a comprehensive approach for addressing the flooding problems of the lower Sheyenne River Basin. It would reduce average annual flood damages by about three-fourths and would provide a very high degree of flood protection in the urban areas of West Fargo and Riverside. Environmental quality would be enhanced at West Fargo and Riverside and on the channel from Horace to West Fargo due to grassed areas and selected shelterbelts. Raising Baldhill Dam

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would have some adverse environmental effects, but these would be mitigated. The quality of life would be improved for over 15,000 persons by reducing the threat of flooding. When compared with other possible alternative plans, the District Engineer finds that his recommended plan provides the most acceptable trade-offs of economic, environmental, social well-being, and implementability considerations while achieving flood damage reduction.

11. Recommendations of the reporting officers. The District Engineer recommends authorization of improvements for flood control in the Sheyenne River Basin, generally in accordance with the plan described in his report and subject to certain items of local cooperation. He also recommends deauthorization of the Kindred Dam project. The Division Engineer concurs.

Review by the Board of Engineers for Rivers and Harbors

12. General. The Board's review encompassed the overall technical, economic, social, and policy aspects, and interrelated phases of the findings, conclusions, and recommendation of the reporting officers, including compatibility of the recommended plan with the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. The Board also considered the views of interested parties, including Federal, State, and local agencies.

13. Responses to the Division Engineer's public notice. The Division Engineer issued a public notice on 25 April 1983 stating the findings and recommendations of the reporting officers and inviting interested parties to present additional information to the Board. Six letters have been received in response to the notice. A State agency expressed support for the project and reaffirmed its intent to act as local sponsor. One association requested and was granted an extension of time, and later expressed opposition to raising Baldhill Dam because private land would be taken. Another association opposed both the Kindred Dam project and the raising of Baldhill Dam for the same reason. Also, one association opposed deauthorization of the Kindred Dam project. A church parish objected to the adverse impact on its church camp resulting from raising Baldhill Dam.

14. Findings and conclusions. The Board of Engineers for Rivers and Harbors concurs in the findings and recommendation of the reporting officers. The recommended improvements are economically justified, engineeringly feasible, and environmentally acceptable, and the requirements of local cooperation are generally appropriate. The recommended plan is the National Economic Development plan.

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15. The levees and diversion at West Fargo and Riverside and the flood diversion channel from Horace to West Fargo, with the grassed areas and selected shelterbelts, would improve the environmental quality in the area. The raise of Baldhill Dam would have some limited adverse effects because of temporary flooding of woodlands and other habitats; however, the wildlife mitigation features of the project will compensate for the adverse effects.

16. Wildlife mitigation.

a. The reporting officers estimate that 1,214 acres of wildlife habitat at Lake Ashtabula, including 170 acres of woodlands, would be subjected to infrequent but long-duration inundation from increased storage of floodwaters at Baldhill Dam. The Board notes that, while many of the tree species in the project area are known to be tolerant to natural river flooding of long duration, there is uncertainty as to the tolerance of these species to nonflowing, standing water inundation common to a reservoir situation. In addition, there would be significant destruction of understory vegetation. Any major loss of trees and understory shrubs and forbs would have significant adverse impact on dependent wildlife species such as white-tailed deer, downy woodpeckers, great horned owls, and fox squirrels. In addition, many species of songbirds use these woodlands. Woodland habitat is critical for food and cover for many wildlife species during the typically severe winters.

b. Up to 450 acres of separable lands have been recommended for acquisition to mitigate habitat for these losses. The reporting officers indicate that separable lands could be located within the Sheyenne River Basin, but not necessarily contiguous to project boundaries. They assume, as a worst case, that no mitigation could be accomplished on lands needed for the basic project. The reporting officers state that because the amount of land ultimately needed for the design flood control pool is uncertain, the exact amount of separable lands that might be needed for wildlife mitigation can only be determined after a detailed identification of the project take-line.

c. During detailed preconstruction planning, any additional lands needed for squaring-off or to be acquired as uneconomic remnants or for severance will be identified. If none of these lands prove suitable to mitigate remaining wildlife losses, then separable lands would need to be acquired to accomplish the mitigation. The Board recognizes, however, that due to inherent uncertainties in the amount of land needed for the final design flood control pool, the reporting officers need the flexibility and authorization to be able to acquire additional lands for wildlife mitigation.

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SUBJECT: Sheyenne River, North Dakota

d. The Board notes that fencing and management (tree and shrub plantings, food plots, etc.) of existing project lands at Lake Ashtabula could accomplish much of the anticipated mitigation. If sufficient lands of suitable habitat are acquired with the basic project take-line, few additional, if any, separable lands would be needed. In addition, there is sufficient acreage of woodland habitat contiguous to project boundaries at Lake Ashtabula to mitigate woodland losses, if separable mitigation land is needed. Consequently, the Board believes that woodlands contiguous to the project should be authorized for acquisition and management to mitigate wildlife losses, if determined to be needed during preconstruction planning, but should be limited to 300 total acres rather than 450 acres. This procedure conforms to current policy that project lands should be used to the fullest extent practicable for mitigation of fish and wildlife losses and that contiguous lands should then be used for any separable land acquisition. The estimated first cost of acquisition of these separable mitigation lands, if needed, would be about \$175,000. The estimated first cost of the total mitigation plan, including measures on project lands, would be about \$415,000. The average annual cost, including operation and maintenance, would be about \$40,000.

17. Total project first cost, based on October 1983 price levels, is estimated at \$39,600,000, of which \$25,700,000 would be Federal and \$13,900,000 non-Federal, based on traditional cost-sharing policies. Average annual charges, based on an 8-1/8 percent interest rate and a 100-year period for economic analysis, are estimated at \$3,933,000. Average annual benefits are \$26,317,000, and the benefit-cost ratio is 6.7.

18. The Administration's position on cost sharing and financing of flood control is that 35 percent of assigned construction costs are to be financed during the period of construction by non-Federal interests, or if the project is covered by Section 3 of the Flood Control Act of 1936, as amended, then non-Federal interests are to provide the value of lands, easements, rights-of-way, and relocations required for project construction, if these requirements are greater than 35 percent. Operation, maintenance, and replacement costs would also be a non-Federal responsibility. A portion of the non-Federal share may be paid, with interest, over a period not to exceed 50 years from initiation of construction, when payment during construction would be an undue burden on the non-Federal sponsor.

19. Recommendations. The Board recommends implementation of a flood protection plan on the Sheyenne River, North Dakota, generally in accordance with the reporting officers' plan, except that separable mitigation land should be limited to 300 acres and should be contiguous to the project, with such modifications as

23 January 1984

SUBJECT: Sheyenne River, North Dakota

in the discretion of the Chief of Engineers may be advisable, and in accordance with cost-sharing and financing arrangements satisfactory to the President and the Congress. This recommendation is made with the provision that work may be accomplished in separable increments as determined feasible by the Chief of Engineers, and that, prior to implementation, non-Federal interests will agree to comply with the following requirements:

a. Provide without cost to the United States all lands, easements, rights-of-way, relocations of utilities, highway bridges, roads, and sewers necessary for construction, operation, and maintenance of the levees and diversion at West Fargo and Riverside and flood diversion channel from Horace to West Fargo;

b. Hold and save the United States free from damages that may result from construction and maintenance of the levees and diversion at West Fargo and Riverside and the flood diversion channel from Horace to West Fargo, not including damages due to the fault or negligence of the United States or its contractors;

c. Maintain and operate the flood diversion channel and levee portions of the project after completion, in accordance with regulations prescribed by the Secretary of the Army;

d. Regulate private and non-Federal public levee construction along the Sheyenne River to ensure that construction of levees would not significantly affect flood levels or potentially increase flood damages either upstream or downstream;

e. At least annually inform affected interests of the limit of protection afforded by the project;

f. Regulate drainage activities in the watershed to ensure that flood frequencies and discharges are not increased or that the effectiveness of the project is not adversely affected; and

g. Publicize floodplain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the project.

The Board also recommends that the multiple-purpose project for flood control, water quality, recreation, and fish and wildlife


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23 January 1984

SUBJECT: Sheyenne River, North Dakota

at Kindred Lake, North Dakota, authorized for implementation by the Flood Control Act of 1970 (Public Law 91-611), be deauthorized.

FOR THE BOARD:


RICHARD M. WELLS
Major General, USA
Chairman

Proposed Report*



DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D. C. 20314

REPLY TO
ATTENTION OF:

DAEN-CWP-A

SUBJECT: Sheyenne River, North Dakota

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on Sheyenne River, North Dakota. It is accompanied by the reports of the Board of Engineers for Rivers and Harbors and the District and Division Engineers. Section 201, Title II, of the 1970 Flood Control Act (Public Law 91-611) authorized construction of the Kindred Lake project and other improvements in the Sheyenne River Basin. This report is a reevaluation of the authorized Kindred project.

2. The District and Division Engineers recommend deauthorization of the Kindred Lake project and authorization of a plan consisting of levees and a diversion channel at West Fargo and Riverside, a flood diversion channel from Horace to West Fargo, and raising the existing Baldhill Dam. The reporting officers also recommend acquisition of up to 450 acres of land for wildlife mitigation. Using October 1983 price levels, the project's first cost is estimated at \$39,600,000, of which \$25,700,000 would be Federal under traditional cost-sharing policies. Average annual charges, based on an 8-1/8 percent interest rate and a 100-year period for economic analysis, are \$3,933,000. Average annual benefits are \$26,317,000, and the benefit-cost ratio is 6.7.

3. The Board of Engineers for Rivers and Harbors recommends implementation of flood protection improvements on the Sheyenne River, North Dakota, generally in accordance with the plan of the reporting officers, except that any separable land acquisition for wildlife mitigation should be limited to 300 acres and should be contiguous to the project. It recommends the plan in accordance with cost-sharing and financing arrangements satisfactory to the President and Congress. The Board further recommends that the Kindred Lake project, authorized in the Flood Control Act of 1970 (Public Law 91-611), be deauthorized.

*This report contains the proposed recommendations of the Chief of Engineers. The recommendations are subject to change to reflect substantive comments.

DAEN-CWP-A

SUBJECT: Sheyenne River, North Dakota

4. I concur in the findings, conclusions, and recommendations of the Board.

J. K. BRATTON
Lieutenant General, USA
Chief of Engineers

NCDED-T (August 1983) 1st Ind
SUBJECT: Sheyenne River, North Dakota - General Reevaluation Report and
Environmental Impact Statement

DA, North Central Division, Corps of Engineers, 536 South Clark Street,
Chicago, Illinois 60605

TO: Cdr, USACE (DAEN-CWP-C) WASH, D.C. 20314

20 APR 1983

I concur in the analysis and recommendations of the District Commander.

Scott B. Smith
SCOTT B. SMITH
Brigadier General, USA
Division Engineer

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SHEYENNE RIVER, NORTH DAKOTA

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PREFACE

The General Reevaluation and Environmental Impact Statement for flood control and related purposes in the Sheyenne River basin, North Dakota, presents the findings, conclusions, and recommendations of studies conducted from February 1976 through August 1982.

The report addresses the water resource and related problems and needs of the lower Sheyenne River basin with particular emphasis on reducing flood damages - the most significant local water resource need. The goal of the reevaluation is to identify a plan for water resource development that meets the needs of the basin, is consistent with the national objective of economic development and the national considerations for environmental quality, and is implementable.

The study completely reevaluates and reformulates work done during the feasibility study (1963 through 1968). The 1968 feasibility report recommended construction of the multiple-purpose Kindred Lake project. The Kindred Lake project would reduce flood damages, improve water quality, provide for recreation, and enhance fish and wildlife. The report also recommended that Baldhill Dam be operated to provide more flood control storage before spring runoff.

In the Flood Control Act of 1970 (Public Law 91-611) Congress authorized the Kindred Lake project for construction. Before funds were appropriated for the reevaluation, special studies examined the effects the project would have on groundwater levels in the Sheyenne National Grassland, the potential shoreline erosion around Kindred Lake, and the effects the project would have on water quality. In 1976, following completion of these studies, the Corps received appropriations to begin the reevaluation.

Several events occurred between completion of the feasibility study (1968) and the start of the reevaluation studies (1976) that significantly changed planning guidelines. These changes required a complete reevaluation of the study area. The events included:

1. Passage of the National Environmental Policy Act of 1969,
2. Completion of the special studies (1974),
3. Adoption by the Water Resources Council of new principles and standards for planning water and related land resources (1973), and
4. Uncertainty in the status of the Garrison Diversion Unit (1975 and 1976).

The principal elements of the water resource plan selected on the basis of the reevaluation and presented in this report are:

- Adoption (or continuation) and enforcement of floodplain regulations in flood-prone areas of the basin (non-Federal implementation).
- Regulation of drainage to ensure that future drainage of wetlands would not increase downstream flood damages (non-Federal implementation).
- Control of private levee construction to prevent increases in upstream and/or downstream flood damages (non-Federal implementation).
- Levees and a flood diversion channel at West Fargo/Riverside (Corps of Engineers implementation with a non-Federal sponsor).
- A flood diversion channel from Horace to West Fargo (Corps of Engineers implementation with a non-Federal sponsor).
- A 5-foot raise of Baldhill Dam to provide additional flood control storage (Corps of Engineers implementation with a non-Federal sponsor).

- Ring levees or other individualized flood proofing at flood-prone farmsteads and residences (non-Federal or other Federal agency implementation or continued evaluation for potential Corps of Engineers implementation).

- A multiple-purpose dam for flood control and recreation on Dead Colt Creek, a tributary of the Sheyenne River (non-Federal implementation).

- Increase in the storage capacity of wetlands (drained and existing) to retain floodwaters (non-Federal or other Federal agency implementation).

The General Reevaluation and Environmental Impact Statement consists of four volumes: the main report and environmental impact statement (published jointly in one volume) and three volumes of technical appendixes.

The main report summarizes the water resource and related problems and needs of the basin, the alternatives evaluated, the process used to develop and select a plan, the conclusions of the study, and the recommendations for Federal participation through the Corps of Engineers.

The environmental impact statement, bound with the main report, describes the environmental effects of implementation of the selected plan and discusses the relative merits of the other alternatives.

The technical appendixes present the detailed information used in investigating the problems and needs, assessing the impacts of the alternatives, and evaluating the alternatives and technical details of the selected plan.

These "General Reevaluation" studies were accomplished under the title of "Phase I General Design Memorandum" during the period 1976 through February 1982. Any references in these general reevaluation documents to "Phase I General Design Memorandum" is synonymous with a reference to a "general reevaluation".

Comments or inquiries on the General Reevaluation and Environmental
Impact Statement should be sent to:

District Engineer
St. Paul District, Corps of Engineers
ATTN: NCSPD-PF
1135 U. S. Post Office & Custom House
St. Paul, Minnesota 55101

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INTRODUCTION

PURPOSE OF DOCUMENTATION

The purpose of this report and environmental impact statement is to provide to agencies and the public the information compiled during the General Reevaluation studies for flood control and other purposes on the Sheyenne River, North Dakota. The information in this report has been the basis for the formulation of water management plans to address basin-wide water and related problems and needs. The reevaluation study is required by Corps of Engineers regulations to ensure that plans developed are consistent with basin needs and conditions and meet current evaluation criteria for Federal water projects. These studies comply with the U.S. Water Resources Council's Principles and Standards and with the appropriate Corps of Engineers regulations.

STUDY AUTHORITY/AUTHORIZED PROJECT

The Flood Control Act of 31 December 1970 (Public Law 91-611), Title II, Section 201, authorized the Secretary of the Army acting through the Chief of Engineers to construct and implement the Kindred Lake project and other improvements in the Sheyenne River basin. The act states:

"The following works of improvement for the benefit of navigation and the control of destructive floodwaters and other purposes are hereby adopted and authorized to be prosecuted by the Secretary of the Army, acting through the Chief of Engineers, in accordance with the plans and subject to the conditions recommended to be the Chief of Engineers in the respective reports hereinafter designated...The project for flood protection and other purposes on the Sheyenne River, North Dakota, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 91-330, at an estimated cost of \$20,000,000."

The authorized plan of improvement consists of a multiple-purpose reservoir for flood control, water quality control, recreation, and fish and wildlife on the Sheyenne River near Kindred, North Dakota, in

combination with a revised operating plan at Baldhill Dam and appropriate floodplain management measures at Lisbon, Valley City, and West Fargo, North Dakota. The authorized Kindred Dam was to be located at river mile 76 on the Sheyenne River, about 5 miles southwest of Kindred, as shown on plate 1.

This project is described in the report of the Chief of Engineers, dated 15 September 1969, House Document No. 91-330, 91st Congress, 2d Session. A summary of the authorized project is contained in Appendix M, Plan Formulation.

NEW INFORMATION SINCE THE SURVEY REPORT

The interim survey report, October 1968, recommended construction of the Kindred Lake project and other features. Since then, several events have occurred, additional information has been gathered, and further studies have been accomplished to assist in the evaluation of alternatives. Following are some of the principal items.

Hydrology

1. Floods - Major floods in 1969, 1975, 1978, and 1979 affected all or parts of the basin.
2. Drought - In the late summer, fall, and winter of 1976 and early 1977, very dry conditions were experienced in the basin.
3. Studies - Studies included delineation of drainage areas, development of HEC-1 and HEC-5C computer models to analyze runoff patterns and floods, reanalysis of frequency-discharge curves, and reanalysis of probable maximum discharges at the Baldhill and Kindred Dam sites. Additional information on the hydrology of the Sheyenne River basin can be found in Appendix B, Hydrology.

Hydraulics

Studies included the development of the HEC-2 computer model to analyze water surface profiles for floods, development of stage-discharge relationships on the lower Sheyenne River, and analysis of the effects of backwater from the Maple River and Red River of the North on the water surface profile from West Fargo downstream. Additional information on the hydraulic characteristics of the Sheyenne River can be found in Appendix C, Hydraulic Analysis and Interior Drainage Design.

Environmental

Studies included acquisition of false color infrared imagery along the Sheyenne River, development of base-line environmental data, inventory of cultural resources of the basin, analysis of groundwater levels and vegetation types in the Sheyenne delta area, and mapping of habitat types in the Baldhill Dam and Kindred Dam areas. Additional information on Environmental Resources is contained in Appendix D, and on Cultural Resources in Appendix E.

Social

A social profile of the area's base-line condition and a social impact assessment of the alternatives were developed. An institutional analysis was developed to describe the interrelationship of agencies and organizations involved in water resource development in the Sheyenne River basin. Additional information on social and institutional characteristics is contained in Appendix F.

Public Involvement

A citizens committee representing interests in the lower Sheyenne River basin was formed to provide public input to the study. A discussion of the public involvement and coordination process is contained in Appendix A, Coordination and Public Participation.

Economic

Studies included a detailed inventory of floodplain properties including residences, businesses, industries, public facilities, and agricultural lands and an analysis of land use patterns and projected future trends in the flood-prone areas. Additional information on the flood damage characteristics of the basin is contained in Appendix G, Economic Analysis - Flood Damages and Benefits.

Water Quality

Studies included collection of water quality and sediment data at several locations on the Sheyenne River. Information on the water quality characteristics of the basin is contained in Appendix H.

SCOPE OF THE STUDY

The general reevaluation study for the authorized Kindred Lake project is a complete reevaluation of problems and needs and reformulation of alternatives to address those problems and needs. Because of the reevaluation nature of the study and the sensitivity of the issues involved, the name of the study was changed from the Kindred Lake project to the Sheyenne River Flood Control project. The authorized project purposes were flood damage reduction, water quality control, recreation, and fish and wildlife. The reformulation studies are addressing all of these purposes plus water supply; however, the principal emphasis is on flood damage reduction. The principal study area is the Sheyenne River basin from the Baldhill Dam downstream to the confluence of the Sheyenne River and Red River of the North, with emphasis on the flood-prone areas along the Sheyenne River.

STUDY PARTICIPANTS AND COORDINATION

The St. Paul District, Corps of Engineers, managed, conducted, and coordinated the reevaluation studies. Input was provided by other Federal agencies, North Dakota State agencies, consultants under contract, the Lower Sheyenne River Citizens Committee, water management districts, communities, and other interested parties and organizations. Appendix A

presents a detailed discussion on the study's coordination and public participation. The Lower Sheyenne River Citizens Committee meetings offered the principal forum for the expression of public opinions concerning the study and for the transmittal of information to the public. Other Federal and State agencies also presented information at the Citizens Committee meetings. Planning, coordination, management, and decision making were conducted in an open public forum.

STUDIES OF OTHERS

Studies and reports by other agencies and interests which relate to the problems, needs, and alternative water management plans evaluated during this reevaluation study are listed below.

- The Garrison Diversion Unit by the U.S. Bureau of Reclamation⁽¹⁾ is covered in several reports. The report to the International Joint Commission in 1976 by the International Garrison Diversion Study Board and the 1979 Final Supplemental Environmental Statement are the most pertinent.

- Sheyenne National Grassland Land Management Plan, Environmental Impact Statement, Richland and Ransom Counties, North Dakota, U.S. Forest Service, Billings, Montana, February 1980.

- Overall Water Resources Management Plan, Southeast Cass County Water Management District, West Fargo, North Dakota, 1974.

- Lower Sheyenne River Basin, Water-Land-People, North Dakota State University, Fargo, North Dakota, 1974.

- Souris-Red-Rainy River Basins Comprehensive Study, Souris-Red-Rainy River Basins Commission, 1972.

(1) Note that the Bureau of Reclamation was named the Water and Power Resources Service for a period in the late 1970's. References to the Bureau of Reclamation and to the Water and Power Resources Service are references to the same agency.

- North Dakota Interim State Water Resources Development Plan, SWC Project No. 322, North Dakota State Water Commission, Bismarck, North Dakota, 1968.

- Conservation Needs Inventory, North Dakota, U.S. Soil Conservation Service, Bismarck, North Dakota, July 1970.

PROBLEM IDENTIFICATION

INTRODUCTION

The problem identification process was conducted by addressing public and agency concerns and through technical analysis of the water and related land resources of the basin. Past studies and reports of other agencies as well as public meetings, interagency meetings, correspondence, and congressional testimony were used in assessing the problems and needs perceived by the agencies and public. Interests outside the study area who might be affected were also involved. Technical analyses were conducted by the Corps of Engineers and other agencies to determine the extent and severity of the water and related land resource problems and needs. The relationship of these problems and needs to the resource base was described in quantitative terms as much as possible.

NATIONAL OBJECTIVES

The national objectives which guided this study are expressed in the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources (1973):

"The overall purpose of water and land resource planning is to promote the quality of life, by reflecting society's preferences for attainment of the objectives defined below:

A. To enhance national economic development by increasing the value of the Nation's output of goods and services and improving national economic efficiency.

B. To enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems."

PUBLIC CONCERNS

The concerns of the public were assessed through public meetings, citizens committee meetings, correspondence, testimony before congressional committees, and media accounts of community and citizen concerns. Several of the key concerns expressed before and during evaluation of alternatives include:

- Citizens of Fargo, North Dakota-Moorhead, Minnesota, were very concerned about water supply shortages in late 1976 and early 1977 when flow in the Red River of the North dropped to zero.

- Residents along the Sheyenne River from Kindred to the mouth suffered considerable economic loss, mental anguish, and physical inconvenience during the floods of 1975, 1978, and 1979, 3 of the last 7 years.

- Residents along the entire Sheyenne River were adversely affected by the 1979 flood and had a strong wish to see some type of flood damage reduction measures implemented.

- Public concern in North Dakota over the continued acquisition of wetlands was expressed through a stoppage of the Federal wetland easement program. Continued removal of property from the tax rolls was one of the items of concern.

- Public concern was expressed over the continued loss of woodlands and wetlands and the degradation of aesthetic qualities and wildlife habitat in the basin. Preservation of these values is a general public concern.

- Dissatisfaction with the potential impacts of the multiple-purpose Kindred Dam was expressed, centering on the issues of the number of families to be relocated, the large number of acres to be taken from

private ownership, potential changes in ranching operations in the adjacent lands as a result of the raised groundwater table, and impacts on the woodlands and wildlife habitat in the reservoir area.

- Residents in flood-prone areas consider the increased flooding of the past several years to be a direct result of drainage of wetlands and farmland. Much concern has been expressed for having the uncontrolled drainage stopped to prevent any further increase in flooding.

- Many opponents of the authorized Kindred Lake project expressed their concern that the Corps of Engineers objectively analyze the alternatives to the authorized project. All affected parties in the lower Sheyenne River basin expressed the view that an objective reanalysis should be done.

PROFILE OF RESOURCE BASE (EXISTING CONDITIONS)

This profile of the basin's resources represents existing conditions. The completion dates of the data base collection and/or descriptions may vary; however, these descriptions are based on the information available at the time of publication.

Water Resources

Surface Water. - The surface water resources in the basin have been observed and used by man since early settlement. Estimates and records of water flow first began around the late 1800's when newspaper accounts of flood levels were made. The U.S. Geological Survey started systematic and continuous observation of flow at West Fargo in 1929, Valley City in 1938, Coopers-town in 1945, Kindred in 1949, and Lisbon in 1956. Miscellaneous other observations were made before that time.

Early accounts of floods indicate that major floods occurred in 1882, 1883, and 1897 (see table 1). Newspaper accounts of the 1882 flood were found at Valley City and Fargo. Although no historical records of floods before 1882 have been found for the Sheyenne River, undoubtedly floods did occur but may not have been observed or recorded. Since the 1882 flood, at least 14 floods have occurred in the Sheyenne River basin. Table 1 summarizes the major floods in the basin.

Table 1 - Summary of historical floods, Sheyenne River basin, North Dakota

Year	Valley City		Lisbon		Kindred		West Fargo(1)	
	Maximum stage	Relative ranking(2)	Maximum stage	Relative ranking(2)	Maximum stage	Relative ranking(2)	Maximum stage	Relative ranking(2)
1882	20.0	1	(3)	-	(3)	-	(3)	-
1883	18.0	3	(3)	-	(3)	-	(3)	-
1897	15.0	6	(3)	-	(3)	-	(3)	-
1919	14.9	7	(3)	-	(3)	-	16.8	-
1947	10.2	-	(3)	-	22.1(4)	1	20.5	8
1948	17.5	5	(3)	-	(4)	1	18.5	10(8)
1950	14.6(5)	9	(3)	-	20.5	5	20.6	7
1952	6.0(5)	-	(3)	-	17.8	7	20.5	8
1965	14.9(5)	7	16.0	5	17.5	8	20.8	6
1966	14.3(5)	10	16.2	4	20.2	6	21.0	4
1969	17.6(5)	4	16.5	3	21.5	3	21.7	3
1975	10.3(5)	-	19.0	1	21.7	2	22.2	1
1978	8.9(5)	-	11.7	6	16.4	9	21.0	4
1979	18.9(5)(7)	2	17.6	2	21.0	4	22.1	2
Flood stage(6)	13		11		16		16.5	

(1) Flood stage information at the U.S. Geological Survey gage on the north (downstream) side of West Fargo. This location is significantly affected by backwater from the Maple River and the Red River of the North and is not necessarily indicative of flood profiles through West Fargo.

(2) Relative rankings are based on the flood stages presented; only the top 10 are given a ranking.

(3) Data not available.

(4) In either 1947 or 1948, a stage of 22.1 was recorded. In the other year, a major stage was recorded although the exact magnitude is not available.

(5) Flood stages from 1950 to the present have been affected by the operation of Baldhill Dam. They are reduced from natural condition flood peaks. See Appendix R for further details.

(6) National Weather Service flood stage.

(7) Based on staff gage measurements by city at discontinued USGS gaging station.

(8) Floods occurred in 1962, 1953, and 1943 and had peak stages of 19.0, 18.8, and 19.4, respectively.

Each flood had different characteristics with respect to its occurrence and its relative magnitude at each city along the Sheyenne River. However, the floods have several common characteristics which are important to the analysis of flooding in the basin:

a. All the floods listed in table 1 occurred in the spring except for the July 1975 flood. Snowmelt combined with rainfall during runoff was the principal cause of these floods. The July 1975 flood resulted from an intense rainstorm which remained centered over the lower basin for 3 days, dropping over 15 inches of rain in many areas.

b. The long, narrow shape of the Sheyenne River basin results in the runoff from the upper basin arriving much later than the runoff from the lower basin. For most floods, there are two distinct and separate peaks in the lower basin from Lisbon to West Fargo. The relative magnitudes of the two peaks vary depending on the flood and the location. For example, at Kindred in 1969, the flow was greater during the first peak, which combined with ice to produce a higher stage than during the second peak even though the volume of the second peak was about twice that of the first peak. In 1966, the stage of the first peak at Kindred was greater than the second peak, largely because of ice; however, both the flow and the volume of the second peak were considerably greater than those of the first peak. Table 2 summarizes information on the first and second peaks for the April-May 1979 flood, where the stages at Kindred for the two peaks were comparable, but the flow and volume of the second peak were greater than for the first. In general, the first peak at Kindred comes from the runoff from the drainage area between Kindred and Baldhill Dam, approximately 1,100 square miles; and the second peak comes from the drainage area upstream of Baldhill Dam, approximately 3,812 square miles.

Table 2 - Summary of first and second peaks of 1979 flood

Item	Valley City		Lisbon		Kindred		Horace		West Fargo	
	First peak	Second peak	First peak	Second peak	First peak	Second peak	First peak	Second peak	First peak	Second peak
Date	18 Apr	25 Apr	20 Apr	2 May	19 Apr	7 May	21 Apr	8 May	21 Apr	2 May
Stage	16.95	18.86	12.65	17.58	20.72	20.75	15.7	15.85	22.12	21.22
Peak discharge (in cfs)	1765 (4)	4,900(2)	2620	4880	4,000	4,160	(3)	(3)	3,480	3,340
Duration of flow above flood stage (in days)	-	18 (2)	4	18	8	17	10	20	11	20
Total duration of flow above flood stage (in days)		18 (2)	22	25	25	30	31			

- (1) At the West Fargo U.S. Geological Survey gaging station, several peaks were experienced, both peak stages and peak flows: first peak stage and flow on 21 April; second peak stage on 30 April; third peak flow on 2 May; and fourth peak flow on 8 May.
- (2) Based on estimates using stage measurements made during floods by NWS & Corps. Station discontinued in 1975 by USGS.
- (3) The flows at Horace on the first and second peaks were estimated to be approximately equal but, because of the lack of specific measurements, are only estimated to be in the range of from 3,300 to 3,500 cubic feet per second.
- (4) Estimate based on rating curve and model studies.

c. From Kindred to Horace, major breakout flows cause flooding. These breakouts tend to stabilize the flows remaining in the Sheyenne River from Horace through West Fargo. Thus, for peak flows over 4,000 cfs (cubic feet per second) registered at Kindred, flows of only about 3,000 cfs are registered at West Fargo. Many private levees paralleling the river have been constructed in the reach from Kindred to Horace, North Dakota, in the past decade. These levees tend to prevent breakout flows and, subsequently, maintain higher flows in the river through West Fargo.

d. Flood stages from the mouth of the Sheyenne River upstream through West Fargo are affected by backwater from the Red River of the North and the Maple River. Thus, flood stages in this reach are usually greatest during the combined peaks of the Red River of the North, the Maple River, and the Sheyenne River. The first peak of the Sheyenne River at Kindred usually coincides with the Maple and Red River peaks. Flood profiles through West Fargo vary from the first and second peaks as a result of this influence. Similar flood stages can occur at the south side of West Fargo during the second peak even though lower levels may be recorded at the U.S. Geological Survey station on the north side of West Fargo. The later arrival of the flows of the second peak does not contribute to peak flood stages along the Red River of the North and would normally affect only the duration of flooding at lower stages.

Additional data and discussion of the flooding and flood characteristics of the basin can be found in Appendix B, Hydrology. The backwater effects of the Maple River and Red River of the North on river stages along the Sheyenne River are discussed in additional detail in Appendix C, Hydraulic Analysis and Interior Drainage Design.

The low-flow periods on the Sheyenne River typically occur from June through March, with the lowest flows generally coming from September through February. The drought of the 1930's was the severest extended drought in the region. During the 4-year period from 1937 through 1940, a total of 48,000 acre-feet of runoff was produced upstream of Valley City, an average daily flow for the 4 years of just 15 cfs. During this period,

the flow was at or near zero in 25 months, with 9 of these months being consecutive. The low-flow periods at West Fargo, although not as severe as at Valley City, were also very low. The average daily flow for the lowest runoff year was 37 cfs in 1934. Average daily flows for 1938 and 1940 were 39 cfs, and in 1977 the average was only 45 cfs. If the flow in 1977 had not been supplemented by stored water from Lake Ashtabula, the low-flows would have approached the record low, since an average flow of only 13 cfs was recorded at Cooperstown, North Dakota. Table 3 summarizes some of the pertinent low-flow data for the Sheyenne River and the Red River of the North at Fargo.

Table 3 - Summary of low-flow data for Sheyenne River and Red River of the North at Fargo (1)
 Red River of the North at Fargo

Item	Cooperstown	Valley City	Lisbon	Kindred	West Fargo	North at Fargo
Period of record	1945-1979	1938-1979(2)	1956-1979	1949-1979	1929-1979	1901-1979
Years of record	35	37	23	30	50	79
Lowest total annual runoff during period of record						
Year	1977	1977 (3)	1977	1959	1934	1934
Volume (acre-feet)	9,300	9,300 (3)	21,500	35,000	26,500	12,900
Average flow (cfs) for year	13	13 (3)	30	49	37	18
Number of months of zero flow in period of record	2	12	-	-	-	14
Number of months with flows less than 5 cfs	53	43	-	-	1	34
Average flow over entire period of record (cfs)	105	120	160	200	170	560

(1) Data in this display are presented only through 1979, although data are available to date at all locations except Valley City.

(2) Since 1975, the records which are gathered below Baldhill Dam can be considered as generally representative of the Valley City flows.

(3) Represents flow as measured below Baldhill Dam.

Sheyenne River flows are supplemented at various points along the river by groundwater entering from flowing springs and aquifer leakage. Perhaps the most notable area for flowing springs is in the Sheyenne Delta area near Kindred. This supplemental flow is perhaps the principal reason that the flow in the Sheyenne River at West Fargo never reached zero during the 1930's drought.

The most recent period of low flow was from late summer 1976 through spring 1978 when the flow in the Red River of the North was zero and water had to be released from Lake Ashtabula to meet water needs at Fargo.

Groundwater. - Most of the groundwater in the basin is found in glacial drift aquifers. About 24 percent of the basin is underlain by known or possible major aquifers. Groundwater, although fairly widespread, is not always available in quantities sufficient for use. The level of the aquifer being used by West Fargo as a source of water supply has been continually dropping as withdrawals exceed the recharge rates. Although levels appear to have stabilized in the last few years, continued withdrawals and declining water levels may require a shift to a surface water source in the future. The Sheyenne Delta aquifer is perhaps the most extensive and well known of the aquifers. It covers about 750 square miles and has thicknesses of over 100 feet. The water level throughout much of the aquifer is at or near the ground surface. Thus, a tremendous amount of water is stored in the aquifer. However, water is yielded from the aquifer at low rates because of the low transmissibility of the deposits.

Water Quality. - The water quality of the Sheyenne River is relatively poor and is directly related to land use. The river has high levels of ammonia and bacteria. High ammonia can result in fish kills, and bacteria can cause health problems. Lake Ashtabula is eutrophic, with high nutrient levels and frequent algal blooms. This condition reduces the fishery, recreational, and aesthetic qualities of the reservoir.

Environmental Resources

The Sheyenne River basin has three distinct physiographic areas: the Red River Valley, the Sheyenne delta sandhills, and the drift prairie. Most of the drift prairie lies upstream of Lisbon. The Red River Valley is downstream of Kindred, and the sandhills lie in between.

Of the more than 3 million acres in the basin, over 70 percent is devoted to cropland and only 1 percent, or about 38,000 acres, is woodland. The woodland is a very important resource from the standpoint of wildlife and vegetative composition. The woodland is essential to maintain healthy wildlife populations. The woodlands in the lower basin also provide habitat for a number of rare species of birds found nowhere else in North Dakota. The land use for the basin is illustrated in table 4.

Table 4 - Land use in the Sheyenne River basin

<u>Land use</u>	<u>Acres</u>	<u>Percent</u>
Cropland	2,400,000	71
Pasture or rangeland	650,000	19
Wetland	150,000	5
Urban	92,000	3
Large water	40,000	1
Woodland	38,000	1

Source: Land Use Assessment Needs, Non-Point Source Task Force, North Dakota Soil Conservation Service, Bismarck, North Dakota.

The vegetation of the basin is very diverse and contains many plants that are uncommon in North Dakota. The lower basin downstream of Kathryn, North Dakota, because of its expanses of woodland, geographic location, and microclimatic characteristics, is able to support species of plants that otherwise occur only in western North Dakota or farther east in Minnesota but virtually nowhere else in North Dakota. Eastern deciduous woodland species and western prairie species meet in the lower basin.

Similarly, many more species of fish are present here than in other areas of North Dakota, as shown in table 5. Fifty-three species of fish are found in the Sheyenne River; 49 downstream of Lake Ashtabula. The large diversity of fish in the river is due to the variety of habitats and substrates available.

Table 5 - Comparison of number of fish species found in different rivers in North Dakota

River	Number of fish species
Sheyenne	53
Downstream of Lake Ashtabula	49
Pembina	27
Forest	26
Wild Rice	12
Souris	45
Lake Sakakawea	48

Spring-fed streams in the lower basin, including the Mirror Pools, provide habitat for some uncommon fish species. These springs also provide refuge for species that require clear water.

Because of the diverse and relatively abundant vegetation, the basin contains many species of wildlife. From a recreation standpoint, the waterfowl, fish, upland game birds, and upland game wildlife are the most important. The rare species include white pelican, osprey, and redheaded woodpecker.

The most valuable wildlife habitat is provided by the existing wetlands, woodlands, and grasslands because of their relative scarcity or regional and national importance. The relatively large block of woodland in the Anselm, North Dakota, area is very important wildlife habitat. The wooded corridor along the river provides a route for wildlife movement between larger stands of woodland. The white-tailed deer is a major game species in the basin and throughout North Dakota. The sighting of deer, as well as other wildlife, is also highly valued by recreationists.

White-tailed deer are common from Devils Lake to Horace. The wooded valley bottoms are essential to their winter survival. The highest quality deer habitat is in the area between Kindred and Fort Ransom, North Dakota. Table 6 is a summary of data on white-tailed deer harvests.

Table 6 - Summary of white-tailed deer harvest information (1952-1971)

Area	Number of Hunters per		White-tailed deer harvest	
	hunters	1,000 miles	Total number	Number/1,000 miles
State	39,903	576	21,008	323
Sheyenne River headwaters	2,374	457	1,446	285
Devils Lake	513	544	309	336
McVille	1,110	815	703	521
Lake Ashtabula	887	452	582	303
Kathryn	384	429	242	274
Lisbon	1,243	651	703	391

Source: Summarized from North Dakota State Game and Fish Department, Pittman-Robertson Reports, Bismarck, North Dakota.

The prairie chicken is a very rare species in North Dakota. Its preferred habitat, at least for booming grounds, is grassland. This bird is essentially restricted to the sandhills-grassland area where it is associated with sharp-tailed grouse. About 95 percent of the State's prairie chickens are in the Sheyenne National Grasslands.

On the basis of human use and the populations of plants and animals within its boundaries, the basin is one of the major wildlife, scientific, and recreational areas in North Dakota. The basin contains such unique areas as the wooded draws in Barnes County, wetlands for waterfowl, the Little Yellowstone area near Kathryn, the woodlands of the lower basin, the Mirror Pools area near Anselm, the sandhills, and grasslands. Together, these form a major North Dakota habitat and one of the few forests in the grassland and agricultural biome. Appendix D, Environmental Resources, contains additional detail and discussion on the existing environmental resource setting.

Human Resources

The human resources of the basin can be described by data on such items as population, education, and employment. These data cannot fully portray the people of the basin, but they offer a background from which to start.

Population. - The population centers of the lower Sheyenne River basin are the communities of Valley City and Lisbon and the West Fargo area.

The areas outside these cities are rural, with scattered farmsteads and intermittent small communities, except in the West Fargo area where there are many small developments whose residents work in West Fargo or Fargo.

Table 7 lists 1980 and projected 2030 populations for the counties and cities, parts or all of which constitute the lower Sheyenne River basin. Additional detail on the population trends for the area are presented in Appendix F, Socioeconomic and Institutional Analysis.

Table 7 - Population of cities and counties, lower Sheyenne River basin

City	1980 ⁽¹⁾	2030 ⁽²⁾	County	1980 ⁽¹⁾	2030 ⁽²⁾
West Fargo	10,080	23,500	Cass	88,243	137,500
Riverside	465	600	Barnes	13,949	11,800
Horace	497	1,100	Ransom	6,714	5,800
Harwood	326	570	Richland	19,197	19,800
Lisbon	2,286	2,600			
Valley City	7,771	9,400			

(1) Based on preliminary 1980 U.S. Census data.

(2) Summarized from projections developed in Appendix F.

Major population increases are expected in the Fargo-Moorhead metropolitan area of Cass County which includes the West Fargo, Riverside, Horace, and Harwood, North Dakota, areas. The populations of the rural areas outside the influence of the metropolitan area are expected to decrease gradually.

Education. - The area is well served by educational facilities, with several universities and colleges located in the Fargo-Moorhead metropolitan area. The formal educational level in the area varies, with the rural areas having lower attainment levels and the cities and metropolitan area having higher attainment levels. About 29 percent of the population in Cass, Barnes, Ransom, and Richland Counties have college degrees or some college education; the State average is about 20 percent.

Employment. - Although agriculture is the predominant industry in the basin, overall employment in the four-county area is dominated by nonagricultural jobs such as wholesale-retail trade, services, and government. The Fargo-Moorhead metropolitan area accounts for the bulk of the nonagricultural employment. Agriculture has offered less and less employment as mechanization and farm sizes have increased.

Economic Resources

The economy of the area is dependent on agriculture. When crop prices are high and yields are good, a healthy regional economy results. Per capita income figures used as a measure of income available for consumption at any one time show that the Fargo-Moorhead area is below the national and State averages for per capita income. This difference can be expected in an area heavily dependent on agriculture.

The potential for flood damages in the basin is summarized in table 8. The estimated number of residences located in the floodplain is over 3,500 and is based on physical counts at 1977 development levels. Population figures show that about 15,700 live in flood-prone areas and this estimate is based either on 1977 estimated populations for the communities or, in the rural areas, on three persons per residence. The floodplain area used for estimating acreages and residences is that area flooded by the 1-percent chance flood, which represents about 95,000 acres. The equivalent average annual flood damages for the Sheyenne River basin are estimated at \$28,939,200, of which about 68 percent are located in the cities of West Fargo and Riverside.

Table 8 - Summary of characteristics of flood-prone areas

Category	Location	Acres subject to flooding	Damage per acre	Number of residences in floodplain (1)	Estimated population in floodplain (1)	Estimated average annual flood damages (2)
Urban	Valley City	-	-	625	1,900	\$1,943,600
	Lisbon	-	-	161	480	376,700
	Harwood (3)	-	-	128	400	809,000
	Horace	-	-	123	340	492,600
	West Fargo	-	-	1,636	10,000 (4)	19,811,800
	Argusville	-	-	42	180	257,900
	Nonurban reach 5-A	-	-	172	520	1,054,500
	Nonurban reach 5-B	-	-	208	620	1,032,200
	Nonurban reach 5-D	-	-	316	950	1,371,400
	Nonurban reach 5-E	-	-	113	340	450,000
	Subtotal	-	-	3,524	15,730	27,599,700
Agricultural	Reaches 2-4 (Valley City to Kindred)	30,000	\$9 to \$21	NA	NA	88,400
	Reach 5 (Kindred to mouth)	65,000	\$52	-	-	1,055,000
	Subtotal	95,000	-	-	-	1,143,400
Transportation						196,100
Total Sheyenne River			3,524 (5)	15,730	28,939,200	

(1) Based on 1977 conditions.

(2) Over the 100-year period 1990 to 2090.

(3) Includes Brooktree and Rivertree

(4) 1980 population figure.

(5) Number of residences may be greater because those located in rural reaches from Valley City to Kindred are not included.

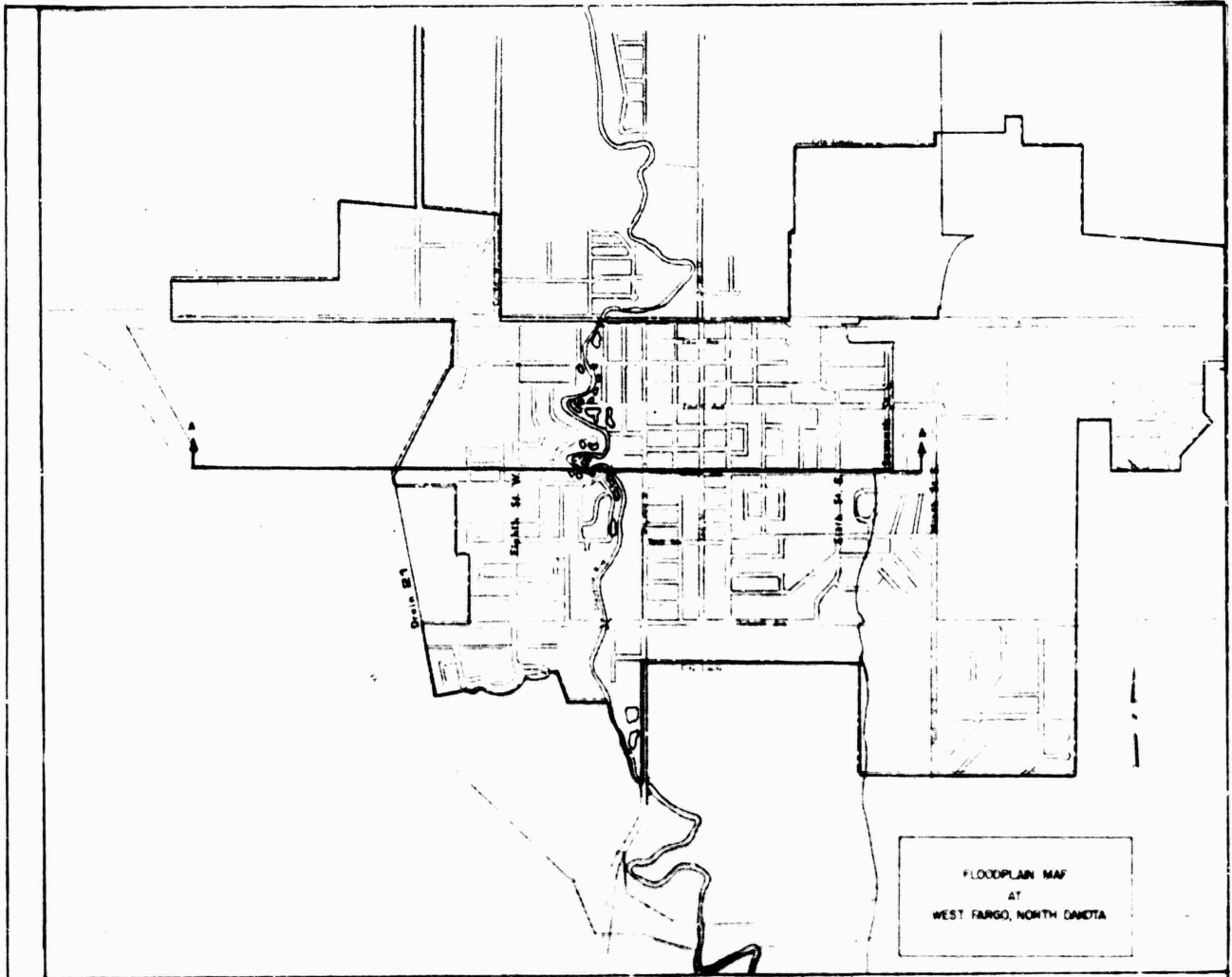
The flood-prone area of West Fargo is shown on figure 1. An aerial view of the western part of West Fargo during the 1979 flood is shown on figure 2. Figures 3 and 4 present the flood-prone area map and an areal view of the 1979 flood, respectively, for Valley City. The flood-prone area map for Lisbon is presented in figure 5, and a typical view of ice flows during spring breakup floods on the lower Sheyenne River is shown on figure 6. In West Fargo, unlike Valley City and Lisbon, the riverbanks are among the highest areas in the city so that when the floods break out of the river channel the potential for damages is very high.

Flood forecast services in the Sheyenne River basin at Baldhill Dam, Valley City, Lisbon, Kindred, and West Fargo are provided by the National Weather Service with input and assistance from other agencies. These forecasts are issued from several days to several weeks in advance of the flood, depending on the nature of the flood. This advance warning has at times allowed some floodplain residents and communities to take emergency preventive measures and reduce their level of flood damage.

The city of West Fargo has been growing very rapidly, about doubling in population between 1970 and 1980 (about 5,265 in 1970 to 10,080 in 1980). Continued growth in West Fargo, Riverside, and scattered developments in surrounding rural areas is expected. Future developments should comply with floodplain regulations and should not result in increased flood damages for floods of magnitudes less than the 1-percent chance flood.

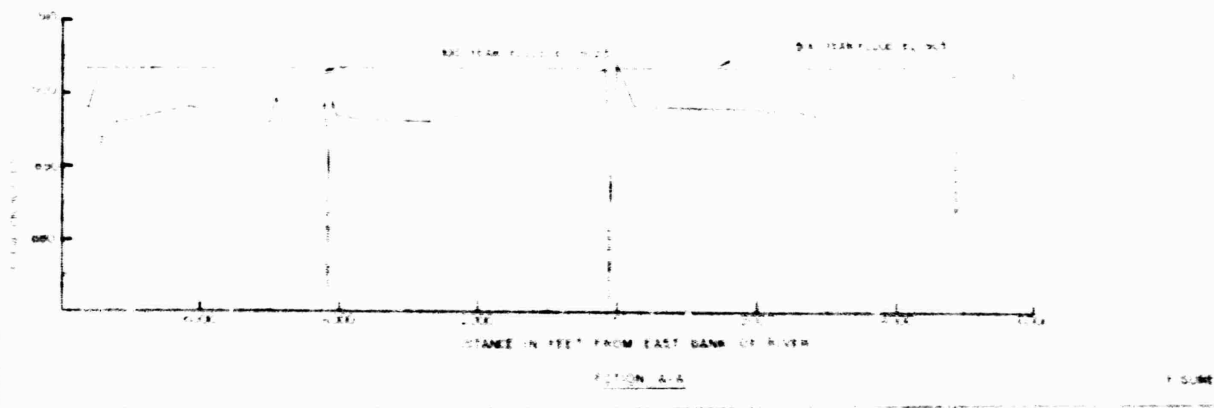
Recreation Resources

The Sheyenne River valley is a unique, scenic resource in eastern North Dakota. It is one of the few river valleys remaining largely in a natural state. The extensive wooded character (5 percent of the State's woodland acres) and high valley walls create an area of scenic and recreational value in contrast to the surrounding flat farmland. Major recreational opportunities within the valley include hunting, snowmobiling, bicycling, trapping, fishing, canoeing, camping, and hiking. Until recently, 200 river miles from Horace to Valley City were considered worthy of some form of protection for its scenic and recreational values. This segment of the river was included in a list of rivers being considered as candidates for the National Wild and Scenic Rivers System. However, it was not



AREA PRONE TO FLOODING BY 100 YEAR FLOOD

NOTE: ALL LAND INSIDE CORPORATE LIMITS IS PRONE TO FLOODING BY 500 YEAR FLOOD

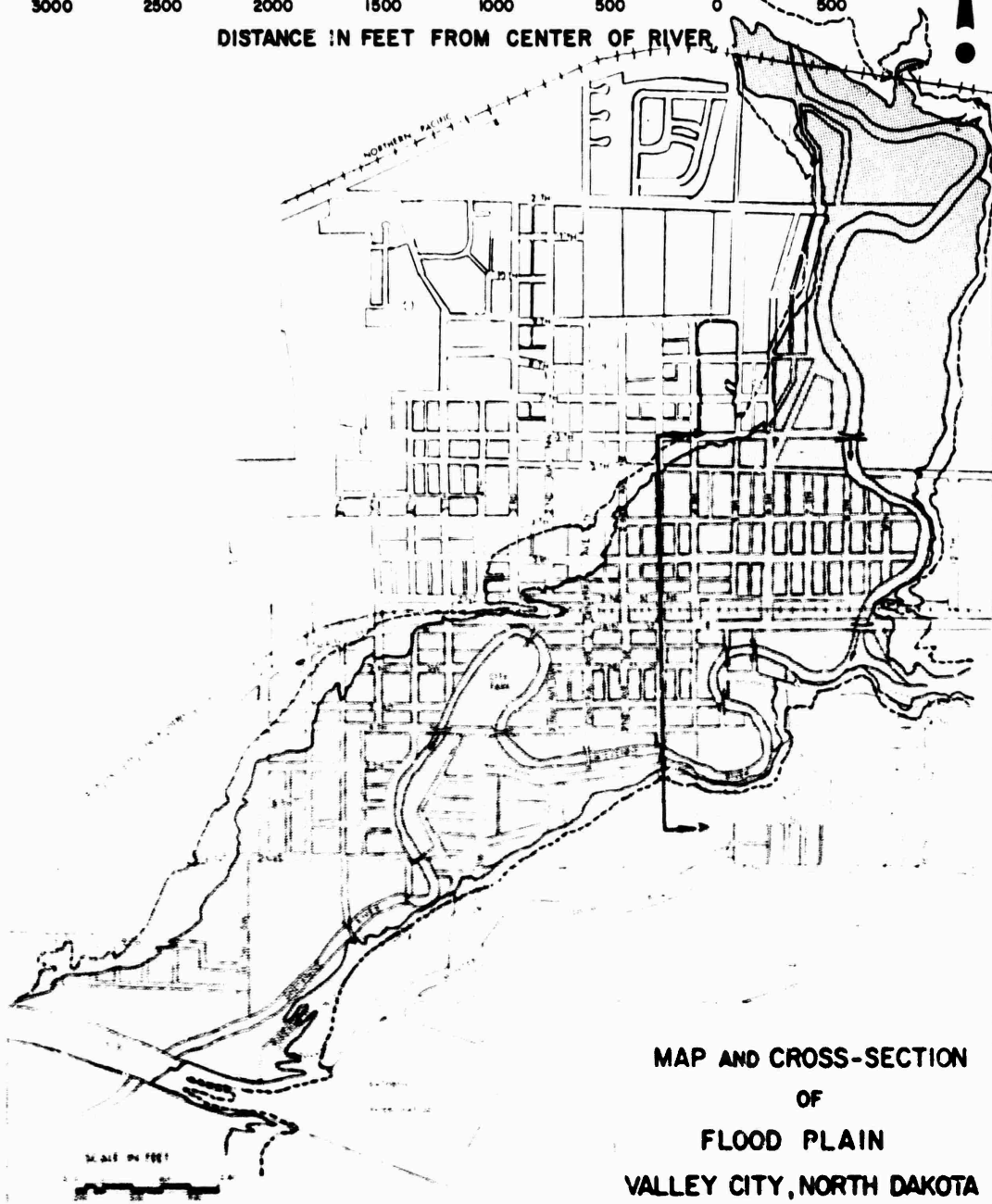
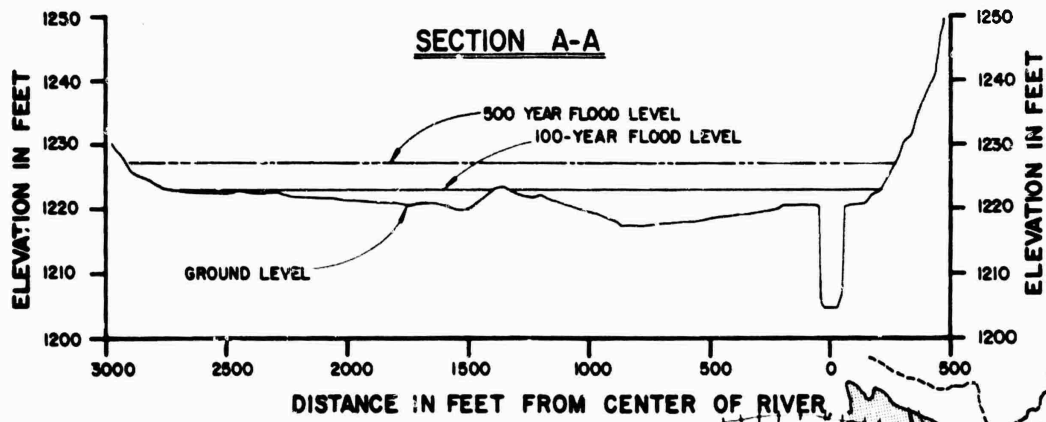


FIGURE



WEST FARGO - RIVERSIDE

APRIL 1979 FLOOD



AREA PRONE TO FLOODING
BY 100 YEAR FLOOD

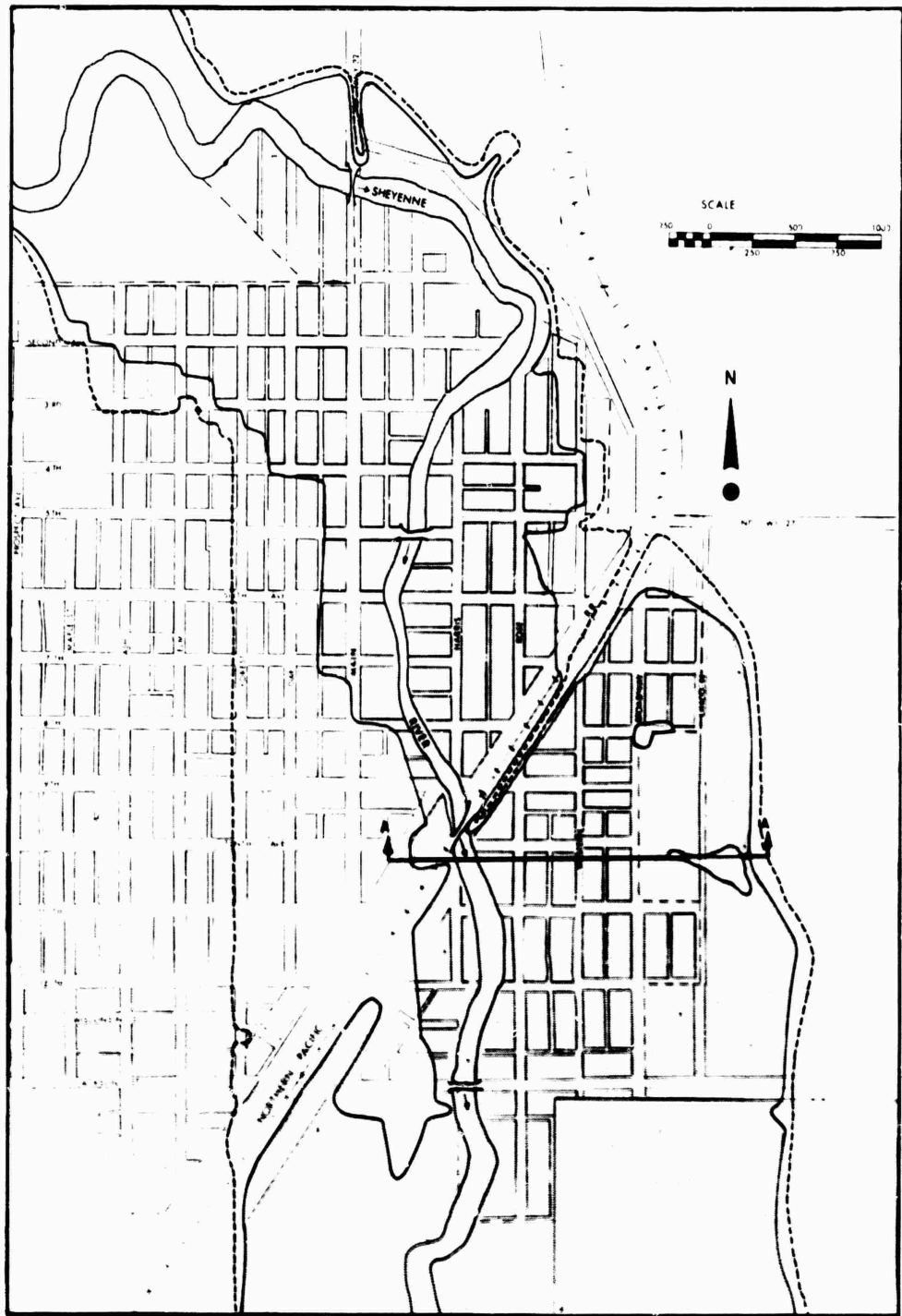
OUTLINE FOR 500 YEAR FLOOD

FIGURE 3



VALLEY CITY, N.D.
APRIL 1979 FLOOD

← ELEV



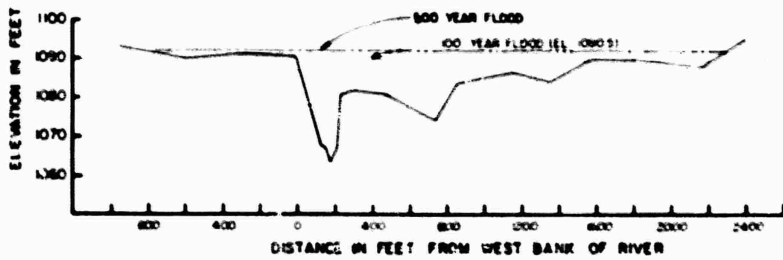
AREA PRONE TO FLOODING
BY 100 YEAR FLOOD



OUTLINE FOR 500 YEAR
FLOOD



FLOODPLAIN MAP
AT
LIBON, NORTH DAKOTA



SECTION A-A

FIGURE 5



Ice flow accumulations at bridge over Sheyenne River near
Bismarck, North Dakota (20 April 1979)

recommended for inclusion and has recently been removed from consideration. A 110-mile section of the Sheyenne River between Kathryn and Kindred is identified by the North Dakota State Outdoor Recreation Agency as a scenic canoeing river. A section of the valley between Anselm and Kindred is considered to be one of the best deer hunting areas in eastern North Dakota by Federal and State fish and game resource experts. Major constraints on the use of existing resources include such factors as poor public access, general lack of facilities, limited rural financial resources, inadequate maintenance of existing facilities, poor water quality, and lack of coordinated regional planning between government agencies.

The valley corridor provides an environment in which diversified recreation opportunities could be established. Existing and potential recreation resources provide an excellent opportunity for development of a recreation/environmental corridor composed of nodes of activity linked by various trail systems (incorporating the North Country Trail). Nodes of activity might include resources provided within urban areas (riverside parks, campgrounds); Federal, State, and county areas (Sheyenne National Grasslands, Fort Ransom State Park, Little Yellowstone, etc.); potential recreation facilities constructed as part of flood control improvements; and smaller activity centers such as fishing access points and hunting camps. Also, cultural sites as yet undefined could further enhance the interpretive and historic character of the valley and provide additional nodes of activity. The unique vegetative types; large number of bird species; and the scenic woodland areas with deer, squirrel, and other game species attract special user groups.

With growing urban populations, public pressure for outdoor recreation opportunities will also increase. Given equal quality of competing areas, recreationists will use those resources closest to them. The valley area will receive light to medium public use pressure from area population centers once new opportunities are provided.

Cultural Resources

A number of cultural resource investigations have been conducted in the Sheyenne River basin for the Corps of Engineers since 1946. Included are two field surveys by the River Basin Surveys of the Smithsonian Institution, a literature search and records review to compile records of all known

sites, a cultural resource survey conducted specifically for the Sheyenne River flood control study, an aerial infrared photographic survey to identify areas of high cultural resource potential, and a cultural resource survey of Lake Ashtabula done under the authority of Executive Order 11593. These investigations identified 319 prehistoric and historic sites and 185 prehistoric and historic site leads.

As required by Section 106 of the National Historic Preservation Act of 1966 (Public Law 89-665), as amended, the Corps has consulted the National Register of Historic Places. As of 16 November 1981, one archaeological site, five standing structures, and one historic district in the Sheyenne River valley are listed on the register. None of these sites will be affected by the proposed project. However, further survey and testing of sites may identify additional properties eligible for the register. The Advisory Council on Historic Preservation will be asked to comment in accordance with 36 CFR, Part 800, for all properties listed on or determined eligible for the register that may be affected by the proposed project.

Additional information on cultural resources is in Appendix E.

Institutional Resources

A variety of governmental units ranging from the Federal and State to county, township, and city governments exist in the lower Sheyenne River basin. Zoning regulations are adopted by the communities or by the townships for areas outside of cities, except in the case of Ransom County where zoning is regulated at the county level. The water resource districts (previously called water management districts) are the local political entities with the most authority for water and related land use decisions. Water resource district boundaries correspond to county boundaries, as in Barnes, Richland, and Ransom Counties; however, the Southeast Cass Water Management District includes only the southeastern part of Cass County. Other water resource districts cover the remainder of Cass County.

The regional governments in the lower basin include the Lake Agassiz Regional Council, South Central Regional Council, and the Fargo-Moorhead Metropolitan Council of Governments. These councils serve primarily as clearinghouses for planning activities. They have not enacted any zoning

rules or regulations. However, they have been active in assisting townships and other political subdivisions in preparing ordinances and other planning activities.

ANTICIPATED FUTURE RESOURCE BASE (FUTURE "WITHOUT" CONDITION)

Realistic prediction of future conditions requires careful analysis of the existing setting, the trends now developing, and the limitations of the resource base. When determining the effects of any proposed major Federal action, the predicted setting with the proposed project in place must be compared with the setting as it would be without the project. This "with and without project" assessment requires a reasonable estimate of future conditions. The following is a description of the estimated most probable future "without" project condition addressing primarily those areas which are sensitive or related to actions being considered in this report.

Water Resources

Floods will continue to occur in the basin, and the magnitude and frequency may increase if future drainage of wetlands and low-lying areas continues uncontrolled. State law requires permits for drainage of wetlands that have a watershed greater than 80 acres. These permits may not be granted if the drainage will adversely affect downstream interests. Enforcement of the law would prevent any future increases in frequency and/or magnitude of floods as a result of increases in the effective drainage area of the basin. Enforcement of the law, however, would not entirely preclude the drainage of wetland areas and the subsequent loss of natural wetland values. The drainage could take place with the use of gated control structures to regulate when the water is released. Wetland areas will probably continue to be drained with gated control structures used to regulate the effects of this drainage on downstream flood flows.

Low-flow periods can be expected to occur along the Sheyenne River, with water stored in Lake Ashtabula supplementing streamflows during times of extremely low flows. Since the prolonged drought of the 1930's, only 6 years have had very low runoff. These years were scattered, not consecutive. Although a drought more severe than any experienced since 1940 may occur, the return frequency of this type of drought would be very low. The use of groundwater for irrigation and rural water supply systems will probably

increase, and heavier demands will be placed on groundwater reserves. Communities such as West Fargo where the aquifer levels are dropping may be forced to change to surface water sources.

Demands placed on surface water and groundwater resources will increase. Also, increased emphasis will be placed on water conservation measures and improvement of the water quality of the Sheyenne River. The improvement in water quality will depend on the extent of measures taken to improve the quality of runoff from the cropland.

Baldhill Dam will be evaluated under the Dam Safety Assurance Program to determine the modifications necessary to bring the structure into compliance with current criteria. The structure would receive the necessary modifications, subject to congressional appropriations, to bring it into conformance with safety requirements.

Diversion of water into the Sheyenne River through Garrison Diversion Unit facilities depends on the outcome of ongoing consultation between the United States and Canada. The State of North Dakota has proposed a phased development plan for the unit which is designed to address Canadian concerns. Under the proposed plan, the first phase would include completion of Lonetree Dam and Reservoir, the New Rockford Canal, and a 5,000-acre test area at Oakes, North Dakota. The first phase provides for a 20-cubic-foot-per-second flow release for municipal purposes to the Sheyenne River through a canal filter in Lonetree Dam; however, no irrigation is planned in the Sheyenne River basin. Phase II would involve irrigation in the Sheyenne River basin and would depend on demonstrating to Canada that the Boundary Waters Treaty would not be violated. In addition, the Secretary of the Interior is also reviewing a proposal by South Dakota Governor William J. Janklow to deliver water for beneficial use in South Dakota via Garrison facilities. The principal features of the Garrison Diversion Unit which will potentially affect the Sheyenne River are shown on plate 1.

The most likely effect of the Unit's Phase I on the Sheyenne River would be increased and stabilized streamflows in the upper reaches during no- and low-flow periods and changes in water quality. No effects on flood flows are anticipated.

Privately constructed levees which parallel the river will probably continue to be raised and strengthened. Continual confinement of the flood flows will tend to worsen flood conditions downstream of the leveed sections. This adverse effect would be greater when major reaches of the river are confined. Control of the construction of these levees, especially their maximum elevation, and a limit on potential downstream effects may be administered by the State of North Dakota or the water resource districts. Effective control over these private levees will be difficult to administer and will require a strong enforcement effort by the administering body. However, because of the floods in the last several years, more interest is being expressed in preventing persons from taking actions which might worsen the flood problems of others. The construction of private levees falls into this category. Of particular concern is the reach from Kindred to West Fargo.

Environmental Resources

In general, the future environmental setting will be one of reduced quality and quantities. Wetland, woodland, and grassland habitat will continue to be converted to agricultural, residential, and other uses.

Some ongoing draining of wetlands and clearing of woodlands will, over time or by nature of their quality, amount to a significant loss. The wetlands being drained are generally in the upland areas and, once drained, essentially lose their value as fish and wildlife habitat. Although the concern for drainage affecting flood flows downstream will result in stricter controls and regulations on such drainage, it is quite likely that the drainage will continue (although with the use of controlled outlet structures) and that the fish and wildlife values of the wetlands will continue to be lost. Preservation of natural wetland values would require positive action to prevent the drainage. The U.S. Fish and Wildlife Service wetland easement program has been essentially stopped in North Dakota. After some of the political sensitivity of the issues involved in stopping the program lessens, the program will probably be continued. The easement program requires a willing seller to allow the easement to be purchased and, although many wetlands will be preserved through this easement program, there will probably be a net loss of wetland values in the future.

The woodlands being cleared are mostly shelterbelts or valley bottom woodlands. The rate of clearing will probably decrease because much of the land suitable for agriculture has already been put to that use. Losses from residential expansion will probably increase. Vegetation plantings are conducted by State and Federal agencies. In terms of acreage, the amount of clearing is approximately equal to the amount of planting. However, the plantings are usually in the uplands, whereas the clearing occurs in the more ecologically valuable bottomlands.

The principal grassland values in the basin are located in the Sheyenne National Grasslands and in the steeper sloped areas of the basin. The U.S. Forest Service's Environmental Impact Statement indicated that increased emphasis will be placed on management of the Sheyenne National Grasslands for wildlife purposes. Future use of other grassland areas will probably be similar to current use. No significant future changes in grassland values are anticipated.

Human Resources

The education level of residents will increase. The population of the area will increase, although the distribution of people throughout the area will shift. The population of the rural areas should generally be decreasing except in the fringe of the Fargo-Moorhead metropolitan area where scattered rural residential developments will continue to expand.

Economic Resources

The economic base of the basin will remain relatively stable. The agricultural base of the economy will be retained. Changes in crops will be dictated by the agricultural economy, with the most profitable crops being grown in the largest quantities, trending generally toward specialty crops. More processing of raw agricultural commodities will take place in the area. There will be expanded services to the area. Relatively minor changes in total land use will take place, with the acreage in cropland remaining stable. Some land will be lost to urbanization, and some wetland and woodland will be converted to cropland.

Residential development will continue to spread outside of the urban areas. Although most of the rural areas around Fargo-Moorhead are in the floodplain, development will continue in these areas in accordance with floodplain regulations. Most floodplain areas of the basin are governed by regulations that restrict the method of land development to prevent any potential future increases in flood damages. As a result of these regulations, floods up to the magnitude of the regulatory flood will not damage more properties than are currently located in the flood-prone areas. The very large and infrequent floods may pose threats to new developments in floodplain areas.

Recreational Resources

As population and economic growth in the area continues and more leisure time becomes available to individuals, the need for additional recreational development will increase. High gasoline prices will encourage people to consider recreational facilities closer to their homes. Thus, the nearness of the recreation resource to the population centers will become more important.

Cultural Resources

No significant changes from the existing setting are anticipated.

Institutional Resources

Continued emphasis will be placed on State and local management of water resources. More basinwide or watershed control will be needed. Either the existing water resource district organization will be modified or increased coordination will occur between the water resource districts within a watershed area to address more comprehensively the overall water management problems of the entire watershed. The communities of Kindred, Horace, West Fargo, Riverside, Fargo, and Harwood and rural residential developments from Horace to Harwood will all continue to grow. The city limits of these communities will expand as necessary to provide services to the

developing areas. The development will take place primarily in floodplain areas, and the local enforcement of the floodplain regulations will be instrumental in curbing the growth of future flood damages.

PROBLEMS, NEEDS, AND OPPORTUNITIES

Resource management agencies and the public have identified the problems, needs, and enhancement opportunities associated with water and related land resources. Many of these issues are addressed in this study; however, many are beyond the scope of this study. The level of detail to which the identified problems, needs, and enhancement opportunities are addressed is based on the pertinence and relative priority of the problem, need, or opportunity and its relationship to the objectives and implementing characteristics of this study.

Those Expressed

Members of the public, via a Citizen Input Workshop held on 27 June 1977, expressed their views on the problems and needs of the basin. The following were identified as being of relatively high priority. This list does not necessarily include all major problems nor does inclusion on this list necessarily imply that these issues take precedence over others.

Flooding -

- Residential and commercial floodplain development.
- Uncontrolled drainage.
- Water release problems from Baldhill Dam.
- Drainage problems in the Harwood area.
- Need for hydrologic study of drainage areas.
- Flooding in Red River Valley and basin.
- Control of farmland drainage.
- Overflow of Cass County Drains Nos. 45, 21, and 13.

Water Supply and Water Quality -

- Drainage contributing to degradation of water quality in the lower Sheyenne River basin.
- Need to stabilize flow.
- Need for improved sewage treatment systems.
- Upstream polluters have no concern for downstream neighbors.
- Need to determine causes of poor water quality.
- Need to stop the dumping of dead animals into the Sheyenne River.
- Fort Ransom dumping sewage into river.
- Increased residential building in rural areas is adding to water quality problems.
- Need to preserve natural purification areas in the Sheyenne River basin.
- Need to coordinate Garrison Diversion and Sheyenne River planning.
- High water table causes problems (in Sheyenne Delta deposits between Lisbon and Kindred).
- Need to retain surface water supplies.
- Declining underground water supplies (in West Fargo area).
- Bad effects on fish from dissolved solids in Lake Ashtabula.

Recreation, Wildlife, Historical --

- Preservation of sandhill environment.
- Preservation of wildlife habitat.
- Preservation of prairie chicken habitat.
- Preservation of duck habitat.
- Preservation of woodland of Sheyenne River basin.
- Need to reduce conflicts between recreation and other uses.
- Private landowners are liable for accidents on private land and are not compensated for recreational use.
- Need to determine value of small springs coming into the Sheyenne River.
- Need to determine economic value of recreation to area.
- Need to maintain unique areas.
- Need to improve trapping.

In testimony to congressional appropriation committees, several interests, including representatives of the city of West Fargo, Southeast Cass Water Management District, and North Dakota State Water Commission, have testified to the severity of flooding along the lower Sheyenne River and have requested study and implementation of alternatives to resolve these problems. Several interests testifying in opposition to the authorized Kindred Dam project have also recognized the severity of the flood problem; however, they did not feel the authorized project was the best way to solve the problem.

Several other significant needs and opportunities have been expressed:

- Preserve the scenic value of the Sheyenne River from Valley City to Horace.
- Ensure adequate future water supplies at Fargo, Moorhead, and West Fargo.
- Improve recreational opportunities in the region.
- Improve water quality in the Sheyenne River.

Those Addressed

The problems, needs, and opportunities being addressed to varying degrees in this study include:

- Flooding and associated flood problems along the Sheyenne River from Valley City to the confluence with the Red River of the North.
- Potential water supply needs at communities along the Sheyenne River and at Fargo-Moorhead.
- Need to preserve, conserve, or restore fish and wildlife habitat in the lower Sheyenne River basin.
- Need to provide outdoor recreational opportunities in the lower Sheyenne River basin.
- Need to improve water quality of the Sheyenne River.

Priorities

The priority for addressing these problems, needs, and opportunities relates to the authorities of the Corps of Engineers and to the views expressed by representatives of the study area. The principal objective of this study is to resolve the flooding problems of the lower Sheyenne River from Kindred to the mouth of the Sheyenne River. The other purposes are being considered in conjunction with alternatives being evaluated to reduce flood damages. Where possible, multiple-purpose projects are being considered. However, if this study does not help solve the basin's flood problem, it would probably be many years before any positive steps would be taken again to address this problem. Thus, it is imperative that the flooding issue has the highest priority.

PLANNING CONSTRAINTS

Although not absolute constraints, the following are practical constraints which should be considered to the maximum extent practicable in the development of implementable plans.

Sheyenne National Grasslands

Adverse effects on the Sheyenne National Grasslands should be avoided. The grasslands came into existence after the drought of the 1930's turned the sandhills area into a virtual wasteland. The reclamation actions plus the return of normal precipitation patterns turned the area back into a very productive unit. The grasslands are now managed primarily for livestock grazing. The unit has regional and national significance as a grassland area. Several alternatives may affect the grasslands.

Executive Order 11988 - Floodplain Management

The objective of the executive order is to avoid adverse impacts associated with occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The order requires Federal agencies involved

in floodplain activities to avoid the 1-percent chance (base) floodplain, unless it is the only practicable alternative, or to adjust to the base floodplain where it cannot be avoided. All actions considered in this study to reduce flood damages would in some manner affect floodplain activities and, therefore, involve Executive Order 11988. The relationship between this order and the considered alternatives needs to be taken into account in the decision-making process.

Executive Order 11990 - Protection of Wetlands

This order directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. It states that Federal agencies shall avoid undertaking or assisting new construction located in wetlands unless there is no practical alternative. Many of the considered actions may directly or indirectly affect wetlands. These effects need to be considered in decision making.

Lands Owned and Managed by Federal and State Agencies

Properties under Federal and State ownership and management have had public funds dedicated for their purposes, and adverse impacts on these properties should be avoided as much as possible. Lands in the Sheyenne River basin falling into this category include the Sheyenne National Grasslands, the wetland easement areas of the U.S. Department of the Interior, Federal Wildlife refuges, State game management areas, and Fort Ransom State Park. Any potential adverse effects on these properties should be taken into account. Several alternatives considered could have potential effects on these lands.

Publicly Expressed Concerns over Adverse Impacts from the Relocation of Individuals and the Transfer of Lands from Private to Public Ownership

Much public sentiment has been expressed that actions recommended to resolve the problems being addressed should minimize the number of relocations and the acres of land dedicated to public ownership.

PLANNING OBJECTIVES

The planning objectives of this study are to develop a plan that will provide the best use, or combination of uses, of water and related land resources to meet foreseeable short- and long-term needs of the study area.

The planning objectives listed below are valid for the period of analysis from 1985 through 2035:

- Improve the health, safety, and well-being of residents of flood-prone areas of the lower Sheyenne River basin from Valley City to the confluence with the Red River of the North by reducing flood damages in both urban and rural areas.
- Preserve or enhance the scenic values of the Sheyenne River valley from Valley City to Horace.
- Preserve or enhance the fish and wildlife habitat in the Sheyenne River basin, including threatened, endangered, peripheral, or unique associations of plant and animal species.
- Improve the water quality of Lake Ashtabula and the Sheyenne River downstream of Baldhill Dam.
- Contribute to the well-being of communities and individuals who rely on the Sheyenne River as a water supply by ensuring sustained flow in the river during droughts.
- Contribute to outdoor recreation opportunities in the lower Sheyenne River basin.
- Preserve existing cultural resources in the basin.
- Improve the quality of fish and wildlife habitat and agricultural land by reducing erosion and sedimentation in the lower basin.

CHANGES SINCE THE SURVEY REPORT

Several major changes in the plans of others, the resource base, and public attitudes have taken place since the survey (feasibility) report was completed in 1968. Several of the changes relate directly to issues being addressed in this study.

- The Bureau of Reclamation's Garrison Diversion Unit has undergone several changes in levels of support/opposition, changes in irrigation practices and anticipated effects on water quality of the Sheyenne River and the Red River of the North, and changes in the schedule for implementation. Environmental concerns and Canada have expressed significant opposition because of potential adverse effects. Currently, the effects of the irrigation return flows on the water quality of the Sheyenne River and the Red River of the North are estimated to be significantly less than anticipated at the time of the survey report. The current implementation schedule for Phase I of the unit does not call for irrigation return flows to enter the Sheyenne River. Components being scheduled for Phase I construction center around canals and other components to provide irrigation water within the James River basin. Components of the project are shown on plate 1, with the Phase I components shown as the "first priority" features.

- The resource base, although remaining relatively constant since the late 1960's, has changed in the area of drainage of wetlands and acres of wetlands placed under the wetland easement program. Although the U.S. Fish and Wildlife Service has acquired easements on a large portion of the wetlands in the basin, many wetland areas still are not under easement. Many of these have been drained or are under consideration for drainage. Drainage of wetlands can increase the volume and peak of floods if a normally noncontributing area is made contributing and if that additional flow contribution is added at a time when it will increase the peak. Some changes in the drainage pattern could actually reduce peaks for certain floods. This increase of wetland drainage has resulted in a loss of wetland habitat and has had an unknown effect on floods in the basin.

● Public attitudes on flooding, potential solutions to flood problems, and other related study problems have changed since the late 1960's. Increased public attention has been focused on actions which result in large impacts on nonbeneficiaries. Distributive equity has become a major issue in creating opposition to proposed actions. The credibility of public agencies has also declined since the Kindred Lake project was authorized. However, interest in potential water shortages was stimulated in 1976 and 1977 after a short drought period, and interest in flooding has grown after the 1975, 1978, and 1979 floods. Although limited agreement has been reached on how to resolve the issues, there is widespread support for some resolution. Increased public support has been expressed for preservation of existing environmental values; however, this support has not always been translated into effective programs. Controversies surrounding the Garrison Diversion Unit and wetland easements have stopped the acquisition of further wetland easements.

RESOLUTION OF ISSUES DISCUSSED IN THE PLAN OF STUDY

A summary of the key issues raised during the plan of study for this reevaluation study and a discussion of the status of their resolution is given below.

Issue: Alternatives to reduce flooding other than Kindred Dam should be investigated.

Status: Many alternatives have been investigated and the results of these investigations are presented in this report.

Issue: A better identification of the existing and anticipated future conditions in the Kindred area "without" the Kindred Lake project is needed.

Status: Additional land use, recreational, and other data have been collected to describe existing and future conditions.

Issue: Impacts associated with the Kindred Dam alternative should be evaluated in greater detail, especially the effects of raising groundwater levels, wildlife losses, pool fluctuations, and water quality problems within the reservoir.

Status: Many aspects of the Kindred Lake project have been investigated in greater detail and used in the evaluation of the Kindred Dam alternatives.

Issue: The need for water-based recreation facilities should be more fully documented since the State Comprehensive Outdoor Recreation Plan (SCORP) shows little need for additional boating acres.

Status: The new SCORP information was used in the assessment of recreation needs.

Issue: Since the timetable for full development of the Garrison Diversion Unit has been changed and its impacts on water quality in the Sheyenne River changed and delayed, the water quality storage components of the authorized Kindred Lake project should be dropped.

Status: Storage of water for the improvement of downstream water quality is not considered a project purpose at this time. The Environmental Protection Agency did not indicate a need for such storage to be included as a project purpose.

FORMULATION OF ALTERNATIVE PLANS

INTRODUCTION

Alternative management measures to address the problems, needs, and opportunities of flood damage reduction, water supply, recreation, fish and wildlife, and water quality were considered individually. The greatest emphasis, however, was placed on flood damage reduction measures, with opportunities for meeting or conflicting with other purposes being recognized. Single-purpose plans for flood damage reduction were similarly developed, recognizing the opportunities for addressing other needs and addressing the conflicts with other purposes. Both structural and nonstructural measures were considered.

MANAGEMENT MEASURES

Flood Control

Measures to address the flooding problems of the basin were identified through past studies; comments of other agencies; public discussion and comments in workshops, meetings, and letters; and interdisciplinary team evaluation. The list of alternative flood damage reduction measures included 102 alternatives ranging from nonstructural measures - such as evacuation of flood-prone structures, flood proofing, control of drainage, control of private levee construction, and others - to structural measures - such as levees, diversions, channelization, snagging and clearing, and reservoir storage. Storage measures included main stem reservoirs on the Maple and Sheyenne Rivers, reservoirs on tributaries to the Sheyenne and Maple Rivers, and increasing wetland storage areas along the Sheyenne River by restoring drained wetlands and increasing the storage capacity of existing wetlands. The list of alternatives considered is presented in table 9. Each of the alternative measures was evaluated to determine its potential effectiveness in reducing flood damages at the various locations in the basin. Then the potential costs, benefits, and environmental and social effects were determined as appropriate. Detailed information on these alternatives can be found in Appendix L, Flood Damage Reduction Alternatives.

Table 9 - Measures considered for flood damage reduction,
Sheyenne River basin, North Dakota

Basin-wide drainage plan	Sheyenne River Diversions	Dams and reservoirs-Sheyenne River main stem
Regional/basin-wide approach to water planning	M-19 to RRN via Harwood Slough	Kindred (M-76)
Develop out of floodplain	M-30 to M-24 around W. Fargo via Drain No. 21	Highway 18 (M-86)
Better land-use planning	M-33 to RRN via Pose Coulee	Larson's Bridge (M-110)
Floodplain zoning	M-35 to RRN via Sheyenne Diversion	Strong Memorial Park (M-138)
Floodplain regulations	M-42 to Wild Rice River near Horace	Lisbon (M-171)
Prohibit replacement of obsolete homes in floodplain	M-42 to M-24 via Drain No. 21	Fort Ransom (M-196)
Control private levee construction	M-54 to Wild Rice River near Norman	Baldhill Dam (M-271)
Enforce drainage laws	M-65 to Wild Rice River near Kindred	Cooperstown (M-320)
Better legislation to control drainage	M-138 to Wild Rice River near Milnor	Warwick (M-418)
Establish greenbelts	M-150 to James River via Tasyer Reservoir	Dams and reservoirs-Sheyenne River tributaries
Financial incentives to retain water on farmland	M-155 to James River via Bear Creek	(T-83)
Small retention dams	M-190 to James River via Bear Creek	(T-94)
Provide flood insurance	M-195 to James River via Bear Creek	Dead Colt Creek (T-150)
Eliminate flood insurance on future construction	Maple River diversions	Timbar Coulee (T-158)
Relocate frequently flooded structures	M-6 to RRN via Drain No. 13	(T-213)
Evacuate floodplain developments	M-104 to Sheyenne River via natural valley	(T-240)
Flood proofing	Channelize Sheyenne River-Kindred to mouth	(T-268)
Fall release of water from Baldhill Dam	Channelize Maple River-Durbin to mouth	Baldhill Creek (T-283)
Better management of Baldhill Dam	Enlarge Cass Co. Drains Nos. 13, 21, and 45	(T-304)
Urban levees	Install retention control structure on drains	(T-308)
Valley City	Modify bridges and highways	(T-321)
Lisbon	Snag and clear Sheyenne River	Picksrel Lake Creek (T-334)
Kindred	Snag and clear Maple River	Lake Norway (T-350)
Horace	Snag and clear Sheyenne River tributaries	Kloten (T-366)
West Fargo	Restore drained wetlands	McVile Coulee (T-367)
Harwood	Increase storage capacity of wetlands	Spring Coulee (T-393)
Rural levees		Robinson Coulee (T-416)
Kindred to Horace		(T-438)
Horace to West Fargo		(T-439)
West Fargo to Harwood		(T-448)
Harwood to RRN		Peterson Coulee (T-453)
Kindred to RRN		(T-460)
		Big Coulee (T-463)
		North Fork (T-470)
		Dams and reservoirs - Maple River main stem
		Watson (M-76)
		Highland (M-87)
		Enderlin (M-106)
		Dams and reservoirs - Maple River tributaries
		South Branch (T-102)
		(T-104a)
		(T-104b)
		Lucca (T-110)

Water Supply

Existing use and anticipated increases in use of Sheyenne River water were evaluated in light of the history of supply and flow in the basin. Analysis of the effects that a recurrence of a 1930's type drought would have on existing and projected uses identified no significant potential shortages at the communities along the Sheyenne River or at Fargo-Moorhead, which relies in part on the Sheyenne River for a source of supply. The probable increase of base flows in the Sheyenne River as a result of implementation of the proposed first phase of the Garrison Diversion Unit would improve the reliability of existing supplies to accommodate increased demands. Although some localized shortages may occur under severe drought conditions, water supply shortage is not seen as a major water resource problem for the basin. Additional information on water supply in the basin is presented in Appendix M, Plan Formulation.

Fish and Wildlife Resources

The woodlands, grasslands, and wetlands of the Sheyenne River basin provide important wildlife habitat to a great number of species. Although the Sheyenne National Grasslands provides a large and concentrated acreage of grassland habitat, the Sheyenne River valley has limited woodland area except in the river valley and coulee areas. A fairly large acreage of wetlands is still present in the basin. However, the pressures to clear woodlands and to drain wetlands will tend to reduce fish and wildlife values in the future. Alternative measures to preserve and/or enhance fish and wildlife resources are listed in table 10. These measures were considered for potential incorporation or addition to flood control measures and plans. More detailed information on these measures can be found in Appendix D, Environmental Resources.

Table 10 - Alternative measures considered to preserve or enhance the fish and wildlife resources of the Sheyenne River basin

- Determine the value of small springs coming into the Sheyenne River
 - Determine the value of natural vegetation in the Sheyenne River basin
 - Inventory unique areas in the basin
 - Reactivate the soil bank program
 - Implement a program for the preservation and management of existing wetlands
 - Implement a program for the construction of small retention dams
 - Encourage the planting of more shelterbelts
 - Develop greenbelt areas along rivers
 - Implement a program for the preservation and management of existing woodlands
 - Encourage the designation of the Sheyenne River as a Wild and Scenic River
 - Implement the State Nature Preserves program in the Sheyenne River valley
 - Encourage participation in the water bank program
 - Implement a program to improve the water quality of the Sheyenne River and Lake Ashtabula
 - Develop wildlife management plans for the basin
 - Develop plans to preserve unique areas in the basin
 - Develop a forestry management plan for the basin
 - Develop a land-use plan for the basin
 - Encourage use of more land treatment measures
 - Improve low-flow characteristics of streams
 - Restore drained wetlands and increase the size of existing wetlands
 - Provide in-stream structures for fishery enhancement
-

Recreation

Water-based outdoor recreation opportunities in the lower basin are quite limited, and future demands for these activities are expected to exceed the supply. Alternatives considered to meet these needs included major water-oriented developments, water-related activities, and interpretive features. Those alternatives with potential for development in conjunction with a flood control plan were emphasized. Additional information is presented in Appendix I, Recreation Resources Analysis.

Other Purposes

Hydropower development in the basin was given very limited consideration because of the low sustained flows and low head potential on the Sheyenne River.

Preservation and/or enhancement of cultural resources were also considered only in a limited manner, primarily in their relationship to flood damage reduction alternatives.

Improvement of Sheyenne River and Lake Ashtabula water quality was considered as it related to flood damage reduction alternatives. Alternatives that related solely to general improvement of water quality were not considered.

PLAN FORMULATION RATIONALE

The rationale used in plan formulation follows U.S. Water Resources Council Principles and Standards and Corps of Engineers regulations. This rationale uses an iterative process of problem identification, alternative development, impact assessment, and evaluation.

The screening process has been done essentially in three stages with local, State, and Federal agency and public input being used to assist in the process. In stage 1, the flood damage reduction measures were evaluated individually according to economic, environmental, and implementability criteria and were considered for their potential for inclusion into plans. A discussion of the process and the ratings given the measures are presented in Appendix M, Plan Formulation. After completion of the stage 1 screening process, additional data were collected on the remaining alternatives.

Using the supplemental data, the alternative measures were combined into plans using different philosophies or approaches to meeting the flood damage reduction objective. The descriptions of the plans, discussion and display of their relative merits, and conclusions reached by an interdisciplinary team were presented for agency and public review. Agency and public comments as well as additional data were used in the development of the final array of flood damage reduction plans.

The plans were formulated to meet the objective of improving the health, safety, and well-being of floodplain residents by reducing flood damages to flood-prone residential, commercial, and industrial developments and agricultural land along the Sheyenne River. Because of the high percentage of total average annual flood damages attributable to the developments, the plans emphasized reductions of these types of damage. Agricultural protection was included in the plans wherever possible. Plans were sized to provide reasonable degrees of flood protection and features were selected which would not provide a false sense of security for residents being protected by the plan. Although several of the plans would reduce flood damages along the Red River of the North, such reductions were not considered essential to the plans. However, the plans were carefully formulated so that none of them would worsen flood damages along the Red River.

The flood control plans presented could include other purposes at limited levels of development, in keeping with the planning objectives for these purposes. However, plans were not developed with the intent that all planning objectives would be fully met.

PLANS OF OTHERS

The Ransom County Water Resource District - in conjunction with the North Dakota State Water Commission, and other State, regional and local interests - is planning a dam and lake on Dead Colt Creek near Lisbon. The principal purpose of the lake is to provide water-based recreational opportunities. However, because this site is one of the tributary damsites considered for flood control storage which has significant potential for adding net positive benefits to a flood damage reduction plan, flood control storage has been added as a project feature so that the project will be multipurpose. Planning, design, and operation of

the project are being coordinated and should continue to be coordinated with other water management plans and projects.

The U.S. Forest Service has prepared a Land Management Plan for the Sheyenne National Grasslands. This plan covers land owned and managed by the Forest Service. Few of these lands would be affected by any of the proposed actions, although the Kindred Dam and Lake alternative could affect some of the grasslands.

The Garrison Diversion Unit has the greatest potential for effects on the Sheyenne River in the area of low-flow augmentation. The Unit could improve the low-flow characteristics of the stream for the fishery and water supply purposes. Future work that relates to the Sheyenne River drainage area should be coordinated with water management projects and plans in the Sheyenne River basin.

DEVELOPMENT OF PRELIMINARY ALTERNATIVE PLANS

Many of the measures listed in table 9 were dropped from further consideration in the first screening process. From those measures carried into the stage 2 level of evaluations, seven alternative plans were developed and evaluated for their relative merits. These plans were formulated recognizing the need to meet the objectives of improving the health, safety, and well-being of floodplain residents by reducing flood damages and providing opportunities to meet other related needs where possible. In development of the plans, three actions were considered essential to ensure their successful implementation: (1) continuation (or adoption if needed) and enforcement of floodplain regulations, (2) control of private levee construction, and (3) control of future drainage. Also, the continued availability of flood insurance for developments in floodplain areas was also considered important. The plans developed used two key components as the basis for the building of the plans: (1) local protection at West Fargo or (2) the large flood control reservoir near Kindred. Starting with one of these two components, plans were formulated to reduce basin flood damages emphasizing either potential environmental quality objectives, national economic development objectives, or a combination of the two and recognizing that the plans must be meaningful and implementable, yet different enough to provide some true options.

Seven preliminary plans were formulated. The plans and their components are listed in table 11. Four of the plans contained the levees and flood diversion channel at West Fargo as a key component; these plans are labeled D-1 through D-4. The other three plans used the Kindred Dam as the key component -- plans K-1, K-2, and K-3.

Assessment and Evaluation of Preliminary Plans

The preliminary plans and their components were addressed for their effects and impacts and evaluated for their relative contributions to the planning objectives. Table 12 presents a summary of the relative merits of the preliminary plans. Additional details on the evaluations of the plans can be found in Appendix M, Plan Formulation. The information on these plans was used to draw conclusions and then the data and conclusions were furnished to other agencies and the public for their review and comment. Plan D-2 was listed as the candidate national economic development (NED) plan and also as the candidate environmental quality (EQ) plan (or perhaps more appropriately labeled as the environmentally least damaging plan). Plans D-1 and K-3 also had positive economic net benefits and if various components of the plans were shifted, a change in which plan is classified as the NED plan could result. Similar changes in the EQ account could result between plans D-1 and D-2.

Public and Agency Response to Preliminary Plans

Letters of comment were received in response to the preliminary plans from nine Federal agencies, six State agencies, five cities, eight water management districts and counties, eight organizations, and five individuals. Table 13 summarizes these comments. The table shows if the comments include a specific recommendation to keep or drop any of the three plans recommended for further study in the stage 2 report and summarizes any specific remarks.

Table 11 - Flood damage reduction plans for the Shevenne River, North Dakota (1)

Plan D-1	Plan D-2	Plan D-3	Plan D-4	Plan K-1	Plan K-2	Plan V-3
Levees and diversion around West Fargo (M-10 to M-24)	Levees and diversion around West Fargo (M-10 to M-24)	Levees and diversion around West Fargo (M-10 to M-24)	Levees and diversion around West Fargo (M-10 to M-24)	Kindred Dam (near site capacity - about 360,000 acre-feet of storage)	Kindred Dam (reduced size - about 180,000 acre-feet of storage)	Kindred Dam (reduced size - about 180,000 acre-feet of storage)
Diversion to the Wild Rice River (M-54) with about a 2,000-cfs design	Diversion from Horace to West Fargo (M-42 to M-50)	Raise of Baldhill Dam (5 to 15 ft.)	Channelization of Shevenne River from Kindred to West Fargo	Revised management of Baldhill Dam	Raise of Baldhill Dam (5 to 15 feet)	Diversion to Wild Rice River (M-65) with a design of about 2,000 cfs
A revised management and/or a raise of Baldhill Dam (up to a 5 foot raise)	Revised management of Baldhill Dam	Restoration of drained wetlands, increase of storage capacity of existing wetlands, and/or put control structures on legal drains from Baldhill Dam to Kindred	Restoration of drained wetlands, increase of storage capacity of existing wetlands, and/or put control structures on legal drains from Baldhill Dam to Kindred	Revised management of Baldhill Dam	Raise of Baldhill Dam (5 to 15 feet)	Diversion to Wild Rice River (M-65) with a design of about 2,000 cfs
Tributary dams T-150 Dead Colt Creek (2)	Relocation of frequently flooded residences at Valley City	Tributary dams T-150 Dead Colt Creek (2)	Tributary dams T-150 Dead Colt Creek (2)	Revised management of Baldhill Dam	Raise of Baldhill Dam (5 to 15 feet)	Diversion to Wild Rice River (M-65) with a design of about 2,000 cfs
T-158 Timber Coulee	Ring levees at farmsteads and residences from Kindred to Horace, and from West Fargo to the mouth	Tributary dams T-150 Dead Colt Creek (2)	Tributary dams T-150 Dead Colt Creek (2)	Revised management of Baldhill Dam	Raise of Baldhill Dam (5 to 15 feet)	Diversion to Wild Rice River (M-65) with a design of about 2,000 cfs
Restoration of drained wetlands, increase storage capacity of existing wetlands, and/or put control structures on legal drains from Baldhill Dam to Kindred	Ring levees at farmsteads and residences from West Fargo to the mouth	Tributary dams T-150 Dead Colt Creek (2)	Tributary dams T-150 Dead Colt Creek (2)	Revised management of Baldhill Dam	Raise of Baldhill Dam (5 to 15 feet)	Diversion to Wild Rice River (M-65) with a design of about 2,000 cfs

(1) All plans used as a basic assumption that:
 a) Adequate floodplain zoning and regulations exist and are enforced.
 b) Flood insurance is available in floodplain areas.
 c) Private levee construction will be controlled.
 d) Existing drainage laws will continue and will be enforced.

Also, these plans can be modified consistent with the national objectives of National Economic Development and Environmental Quality.
 (2) Using Dead Colt Creek as a multiple purpose project with about 5,000 acre-feet of flood control storage available.

Table 12 - Summary of relative merits of flood damage reduction plans

Comparison items	Plan						
	D-1	D-2	D-3	D-4	K-1	K-2	K-3
Reduction of flood damages	Moderate	Moderate	Moderate to high	Moderate to high	High	Moderate to high	Moderate to high
Positive contribution to national economic development	Yes	Yes	Marginal	Marginal	Marginal	No	Yes
Positive contribution to environmental quality	Maybe	Maybe	No	No	No	No	No
Positive contributions to social well-being	Moderate	Moderate	Moderate	High	High	High	High
Potential adverse social impacts	Moderate	Moderate	Moderate to high	Moderate	High	High	High
Potential adverse environmental impacts	Low	Low	Low to moderate	Moderate	High	High	High
Potential to add purposes to plan							
Water supply	Yes	-	Yes	Yes	Yes	Yes	Yes
Recreation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fish and wildlife	Yes	-	Yes	Yes	-	-	-
Cultural resources	Limited	Limited	Limited	Limited	Limited	Limited	Limited
Water quality	-	-	-	-	-	-	-
Potential to preclude other objectives	Limited	Limited	Limited	Limited; some scenic river	Scenic river; others	Scenic river; others	Scenic river; others

Table 13 - Summary of comments received on stage 2 report, preliminary plans

COMMENTING PARTY	PLAN			REMARKS/OTHER COMMENTS
	D1	D2	K3	
<u>FEDERAL AGENCIES</u>				
Department of Agriculture Forest Service	N	K	D	Need more information about K-3 to assess impacts on Shoyenne National Grasslands.
Department of Agriculture Soil Conservation Service (Bismarck)	N	N	N	SCS participation in the implementation of tributary dams requires analysis by Principles and Standards. Mugs have local sponsorship.
Department of Commerce National Weather Service	N	N	N	No significant issues, resources, or impacts have been omitted.
Department of Health and Human Services	N	N	N	Any proposed flood control project should be an overall benefit.
Department of Interior Fish and Wildlife Service (Bismarck)	D	K	D	Plan D-2 with wetland restoration added is favored.
Department of Interior National Park Service	N	N	N	No National parks affected; no comment.
Department of Interior Water and Power Resources Service	N	N	N	Water quality discussions need more documentation.
Environmental Protection Agency	N	N	D	Favor water quality improvement of Lake Ashtabula. No water quality storage needed at Kindred Dam or Baldhill Dam.
Federal Energy Regulatory Commission	N	N	N	Raise of Baldhill Dam and/or Kindred Dam would provide small hydroelectric potential. Development of this hydroelectric potential does not appear economically feasible.

K - KEEP FOR FURTHER STUDY
D - DROP FROM FURTHER STUDY
N - NO RECOMMENDATION STATED

Table 13 - Summary of comments received on stage 2 report, preliminary plans (cont)

COMMENTING PARTY	PLAN			REMARKS/OTHER COMMENTS
	DI	D2	K3	
<u>STATE AGENCIES</u>				
North Dakota Forest Service	N	K	N	Plan D-2 has the least impact on woodlands.
North Dakota Game and Fish Department	K	K	D	Favor some type of diversion plan. Add restoration of drained wetlands to areas above Baldhill Dam.
North Dakota State Highway Department	N	K	N	Impacts of transportation facilities from local through State systems need further study.
North Dakota State Water Commission	K	K	K	Further studies should be conducted on plans D-1, D-2, and K-3. Consideration should also be given to a combination of plans D-1 and D-2, in which small upland water retention dams would be included. Specific views on components of the plans will be provided after more detail is available.
State Historical Society of North Dakota	N	N	N	Evaluations are provided based on standpoint that the area of total land disturbance by each plan is an indication of cultural resources affected.
Minnesota Pollution Control Agency	N	N	N	No comment at this time.
<u>CITIES</u>				
City of Casselton	N	N	N	No comment at this time on flood control plans. More concerned about potential future drought conditions.
City of Grand Forks	D	D	K	Prefer original authorized Kindred Dam project; however, would favor plan K-3 with addition of a small conservation pool.

K - KEEP FOR FURTHER STUDY
D - DROP FROM FURTHER STUDY
N - NO RECOMMENDATION STATED

Table 13 (cont)

COMMENTING PARTY

REMARKS/OTHER COMMENTS

	PLAN			REMARKS/OTHER COMMENTS
	D1	D2	K3	
<u>CITIES (continued)</u>				
City of Valley City	N	N	N	Do not support relocation of flood-prone structures within Valley City. Favor revised management and/or raise up to 5 feet of Baldhill Dam.
City of West Fargo	K	K	K	Plans D-1 and D-2 appear to address mainly West Fargo's problems and do not solve the problems downstream. Costs of plans D-1 and D-2 appear to be too low.
<u>WATER MANAGEMENT DISTRICTS</u>				
Barnes County Water Management District (Russell McKay)	K	K	N	Favor the installation of small holding dams, diversion of the Wild Rice into the Red River, and diversion ditches and dikes around West Fargo.
Barnes County (Lester Abraham)	N	N	N	Do not favor any raise of Baldhill Dam. Favor small dams and revised management of Baldhill Dam. All drainage should be controlled drainage.
Red River Joint Water Management Board	K	K	D	Favor addition of small upland water retention dams as part of plans D-1 and D-2. Do not recommend plan K-3 for any further studies.
Richland County Water Management District (Jorgen Haugen)	N	K	D	D-2 is favored with some changes.
Rush River Water Management District (Ken McIntyre)	N	K	D	Plan D-2 is favored with some modifications including diversions to the Red River of the North at miles 35 and 19. Favor up to 5-foot raise of Baldhill Dam and support construction of small retention dams.
Ransom County Water Management District	K	K	D	Plan D-1 or D-2, with modifications, would be supported. Raises of Baldhill Dam should be dropped. Relocation of frequently flooded residences in Valley City should be dropped. Timber Coulee Dam should be dropped. Keep Dead Colt Creek Dam.

K - KEEP FOR FURTHER STUDY
D - DROP FROM FURTHER STUDY
N - NO RECOMMENDATION STATED

Table 13 (cont)

COMMENTING PARTY	PLAN			REMARKS/OTHER COMMENTS
	D1	D2	K3	
<u>WATER MANAGEMENT DISTRICTS (cont.)</u>				
Southeast Cass Water Management District	K	K	K	Favor protection for larger floods. If a diversion plan is to be viable, consideration should be given to substantial reclamation of wetlands, control drainage and diking, and active program of ring levees. Many concerns on diversion plans must be answered before plan is acceptable.
<u>ORGANIZATIONS</u>				
Lower Sheyenne River Citizens Committee	K	K	D	No new drains without controls and reassess existing drainage for controls. Monitor and regulate any private levee construction which might affect river levels at Horace and downstream points.
North Dakota Farm Bureau	N	N	D	Favor a series of small dry dams throughout the basin.
North Dakota Township Officers Association	K	K	D	Favor a series of dikes, channelizing and small retention dams.
Pleasant Township (Mr. Jerome Nipstad)	D	K	D	Against any diversion to Wild Rice River.
Richland County Farm Bureau	N	N	D	Strongly oppose Kindred Dam.
Sheyenne Valley Association	K	K	D	D-2 is favored with no relocations at Valley City.
Sheyenne Valley Grazing Association	K	K	D	D-2 is favored with some modifications.

K - KEEP FOR FURTHER STUDY
D - DROP FROM FURTHER STUDY
N - NO RECOMMENDATION STATED

Table 13 (cont)

COMMENTING PARTY

REMARKS/OTHER COMMENTS

	PLAN			REMARKS/OTHER COMMENTS
	D1	D2	K3	
<u>OTHER</u>				
"The Forum" Fargo-Moorhead Newspaper	D	D	K	Strong support for upstream storage, including use of the Kindred site.
Mr. Greg Doffin	K	K	D	Favor ring levees for areas downstream of West Fargo as well as between West Fargo and Horace.
Michael L. Gregg (University of North Dakota)	N	N	N	Concerns and interests relate to identification and protection of important cultural resources lying in areas where landscape modifications will be made to implement a plan.
Mr. Larry Richard and Mr. George Richard	D	N	D	Against any diversion to Wild Rice River.
Mr. R. Joseph Sether	D	D	K	Favor the upstream storage of flood waters. Not in favor of diversions.

K - KEEP FOR FURTHER STUDY
 D - DATA FROM FURTHER STUDY
 N - NO RECOMMENDATION STATED

Comments received on individual plans, components of the plans, and/or project purposes as presented in the stage 2 report are summarized in the following paragraphs.

Plan D-1 -

1. Interests along the routes of the diversions to the Wild Rice River (Pleasant Township, Mr. Larry Richard, and Mr. George Richard) oppose any diversion to the Wild Rice River.

2. Interests along the Red River of the North (city of Grand Forks and the editor of the Fargo-Moorhead Forum) believe the diversions to the Wild Rice River and Red River of the North and the other diversions do not contribute to the solution of the flooding problems of the Red River and should be dropped in favor of storage alternatives.

3. The U.S. Fish and Wildlife Service expressed concern over the adverse impacts of the storage elements of plan D-1.

Plan D-1 was generally supported for further consideration, although the viability and/or implementability of several of the plan's components were questionable. The plan's concept was generally supported but modifications were suggested for further studies.

Plan D-2 - Although only three of the letters received favored dropping the diversions and other components of plan D-2 (the city of Grand Forks, the Forum, and Mr. R. Joseph Sether), many expressed concern about the viability of the plan. Most of the letters supported keeping plan D-2 or a modification for further evaluation.

Plan K-3 - Most of the comments received on this plan recommended dropping it from further consideration. These views were expressed by the U.S. Forest Service, U.S. Fish and Wildlife Service, Environmental Protection Agency, North Dakota Game and Fish Department, the Red River Joint Water Management Board, the Lower Sheyenne River Citizens Committee,

and many others. The major concerns with this plan were the large acreages of land required and the effects on the relocated residents and the local tax base, woodland and wildlife in the project area, and groundwater levels.

Recommendations that plan K-3 should be carried for further study came from the North Dakota State Water Commission, the city of Grand Forks, the city of West Fargo, the Southeast Cass Water Management District, the Forum, and Mr. R. Joseph Sether.

Other Plans - The North Dakota State Water Commission and the Red River Joint Water Management Board both requested consideration of a plan that would combine the features of plans D-1 and D-2 with small upland water retention dams. Comments from other agencies and interests also suggested the modification of plans D-1 and D-2.

Components of the Plans -

1. Baldhill Dam - Valley City indicated its preference for revised management of Baldhill Dam and a raise of not more than 5 feet as the method for reducing potential flood damages in the city. Barnes County, however, opposed any raises requiring acquisition of lands. Other interests also commented on the raise of Baldhill Dam.
2. Tributary Dam. Timber Coulee - The city of Lisbon, Ransom County, and the Ransom County Water Management District all recommended dropping the Timber Coulee site from further consideration or changing its location.
3. Tributary Dam: Dead Colt Creek - The city of Lisbon, Ransom County, and the Ransom County Water Management District indicated that the Dead Colt Creek dam should be built as a multiple-purpose project including storage for flood control.
4. Relocation of Frequently Flooded Structures at Valley City - Valley City does not support the relocation of flood-prone structures. No favorable responses were received concerning the relocations at Valley City.

5. Wetlands - The U.S. Fish and Wildlife Service indicated it would cooperate in a wetland restoration/wetland size increase program if wildlife resources were adequately considered. The Bureau of Reclamation indicated the possibility of acquiring and restoring drained wetlands in the Sheyenne River basin as part of a wildlife mitigation plan for the Garrison Diversion Unit. These restored wetlands could also provide flood control storage. The North Dakota Game and Fish Department would like to extend the area for restoration of wetlands beyond the reach from Kindred to Baldhill Dam. The department believes the drainage area above Baldhill Dam should also be considered.

6. Control of Drainage - The Lower Sheyenne River Citizens Committee passed a resolution asking the North Dakota State Water Commission to ensure that all future drainage projects be controlled so as to not increase downstream flood problems and that existing drainage projects be reassessed to determine if additional controls are needed. The North Dakota State Water Commission stated that Section 61-02-02 of the North Dakota Century Code requires that drainage of a watershed of 80 acres or more must have a permit from the State Engineer and the appropriate water management district and that all drainage in the Red River of the North basin is of statewide significance requiring final approval by the State Engineer. Enforcement is often difficult; however, reorganization of the water management districts could strengthen this enforcement. Water management districts and others also discussed the need for control of drainage in the basin.

7. Control of Private Levee Construction - The North Dakota State Water Commission commented that Section 61-16-15 of the North Dakota Century Code requires permits for dikes that contain more than 12.5 acre-feet of water (all dikes along the Sheyenne River would be included). This regulation is not easy to enforce. However, the water management districts and water commission are attempting stricter enforcement. The ability of the water management districts and water commission to effectively control these private levees is essential to development of any levee and diversion plan for the lower Sheyenne River to ensure that a meaningful degree of flood protection can be provided.

Water Resource Management and Related Purposes -

1. Flood Damage Reduction - When commented on at all, flooding and flood damages along the lower Sheyenne River were generally recognized as a major problem. The Soil Conservation Service commented that the statements of the flooding problem should be clarified.

2. Water Supply - Existing and future water supply needs as discussed in the stage 2 report were addressed only by the Bureau of Reclamation and Valley City. The Bureau indicated that more than 60,000 acres of potentially irrigable land is located in the area of the Kindred reservoir site and that the potential water needs of this land should be recognized in the analysis of water needs. Valley City indicated its concern with adequate water storage for Valley City's future needs if the management of Baldhill Dam were to be revised without proper consideration for potential water shortages during severe droughts.

3. Water Quality - The Bureau of Reclamation indicated its concern over the adequacy of the water quality information in the report. The U.S. Environmental Protection Agency (EPA) indicated no foreseeable need for storage at either the Kindred Dam site or Baldhill Dam for water quality improvement. The EPA indicates that opportunities to improve the water quality in Lake Ashtabula should be considered.

4. Recreation - The city of Grand Forks commented that a small permanent pool should be considered in plan K-3 to improve recreation potential. No one else commented on the recreation needs or potentials of the study area.

5. Hydroelectric Power - The Federal Energy Regulatory Commission provided information on the potential for hydropower at the Kindred Dam site and Baldhill Dam. The Commission's analysis showed small potential for the development of hydropower; it does not appear to be economically feasible to develop the power potential at these sites.

6. Fish and Wildlife - The U.S. Forest Service indicated there are opportunities for improving wildlife habitat on the Sheyenne National Grasslands, but no specific proposals are being considered for implementation. The Fish and Wildlife Service, Environmental Protection Agency, and North Dakota Game and Fish Department indicated that the potential for the restoration of drained wetlands should be investigated further with the possibility of improving wildlife habitat.

7. Cultural Resources - The State Historical Society of North Dakota and Michael L. Gregg, University of North Dakota, commented that additional information should be gathered in potential project areas to ensure that cultural resources are considered when any project is developed.

Conclusions on Stage 2 Report and Preliminary Plans

On the basis of analysis of the Stage 2 Report findings and the comments and responses received from interested parties, several conclusions were reached on the plans to be carried the final evaluations.

1. Joint-Coordinated Actions by Federal, State, and Local Agencies - For any plan to resolve flood problems in the basin, there must be a joint and fully coordinated effort by Federal, State, and local agencies to address the issues and the solutions. The magnitude and extent of the problem require the commitment of resources which exceed the capability of the State and local interests. Although Federal agencies can provide the resources to analyze problems and implement some elements, they do not have the authority to implement many of the elements needed to make any effective long-range plan function. Commitments are required at all three levels to resolve the issues. Failure by any one of the levels will result in either complete failure of the plan or, at best, implementation of an incomplete plan.

2. Individual Flood Damage Reduction Measures are Needed to Form a Viable Plan - The flood damage reduction measures carried into the stage 2 process should be considered in subsequent planning as discussed in table 14.

The sizes and operating characteristics of the individual alternatives must be considered in terms of the overall plan. For example, the diversion to the Wild Rice River (M-54) must be operated as a part of plan D-1 or potentially as a part of plan K-3. The size of the diversion and the operating plans for the diversion would be different in the two plans. The following points are of particular concern:

a. Baldhill Dam - Revised management or a raise of up to 5 feet could be considered as a possible addition to almost any comprehensive flood control plan. However, most of the benefits would be in Valley City. This measure appears to be one of the few viable ways to reduce flood damage at Valley City.

b. Kindred Dam - This flood damage reduction alternative is one of the most effective. Its widespread benefits would include downstream areas along the Red River of the North. However, it would have major environmental and social impacts. These adverse impacts would have to be minimized for this alternative to be considered implementable.

c. Tributary Dams: Dead Colt Creek - This dam has potential to reduce the first peak on the Sheyenne River and could be used in conjunction with diversion plans D-1 and D-2: as an integral part of plan D-1 or as supplemental protection in plan D-2.

d. Levees and Diversion at West Fargo/Riverside - This alternative would efficiently protect West Fargo/Riverside while having few or no adverse effects on surrounding areas. It forms the nucleus for several different diversion plans.

e. Ring Levees at Individual Farmsteads and Residences - These levees could supplement all plans in those areas where a widespread form of flood protection cannot be provided by other means.

f. Better Land-Use Planning - There is no good substitute for effective land use planning. Putting the land to its most beneficial uses will provide maximum benefit in the long term. This practice should be used to the extent possible, incorporating many approaches to proper management of flood-prone areas.

Table 14 - Summary of conclusions on flood damage reduction measures considered in Stage 2

Measures carried into Stage 2	Conclusion for incorporation into Stage 3 plans	Remarks
<u>Measures that could be considered part of the existing and future base conditions</u>		
Basinwide drainage plan	Keep	For State planning to ensure no future worsening of floods.
Regional basinwide approach to water planning	Keep	Needed to ensure a complete comprehensive plan is implemented.
Better land-use planning	Keep	At local level to promote wise land use and minimize flood losses.
Floodplain zoning	Keep	For all new construction and remodeling at local level.
Floodplain regulations	Keep	For all new construction and remodeling at local level.
Control private levee construction	Keep	At local and State level to ensure flood stages are not worsened in other areas.
Enforce drainage laws	Keep	At State and local level.
Provide flood insurance	Keep	At Federal level to assist existing development; should be in combination with floodplain regulations.
<u>Measures that could be considered minor components of an overall plan</u>		
Develop out of floodplain	Keep	At local level to minimize potential flood losses (practical in only a few areas).
More stringent legislation to control drainage	Keep	Could be adopted at State or local level; current laws appear sufficient if enforced.
Financial incentives to retain water on farmland	Drop	Would require new Federal or State programs; similar effects can be obtained through drainage control.
Small retention dams	Keep	Similar to effects obtained by control of drainage, the restoration of wetlands; local implementation.
Relocate frequently flooded structures	Keep	For possible Federal participation at Valley City; for State or local participation in other areas (as part of a nonstructural plan).

Table 14 - Summary of conclusions on flood damage reduction measures considered in Stage 2 (cont)

Measures carried into Stage 2	Conclusion for incor- poration into Stage 3 plans	Remarks
<u>Measures that could be con- sidered minor components of an overall plan (cont)</u>		
Flood proofing	Keep	On an individual case basis; this measure includes ring levees at farmsteads and residences in rural areas.
Revised management of Baldhill Dam	Keep	Greater spring drawdowns for flood control; care must be taken not to jeopardize low-flow storage.
Urban levees at Harwood Rural levees from Horace to West Fargo	Drop Drop	Costs exceed apparent benefits. Although marginally feasible when considered alone, the diversion paralleling the Sheyenne River appears better suited.
Rural levees from West Fargo to Harwood	Drop	Costs exceed apparent benefits; could be some worsening of down- stream flood levels; individual ring levees more favorable.
Rural levees at selected reaches from Kindred to the Red River	Drop	Ring levees at farmsteads and residences are preferred.
Maple River diversion M-6 to Red River via drain No. 13	Drop	Costs exceed apparent benefits; principal benefits come from lower Sheyenne River north of West Fargo.
Enlarge Cass County drains Nos. 13, 21, and 45	Drop	Enlargement of drain No. 21 in conjunction with diversion plans D-1 and D-2 only.
Install retention control structures on drains	Keep	At local level a coordinated con- trol plan for drains could provide some reduction in flooding.
Modify bridges and highways	Keep	At local level these could reduce localized flood problems.
Snag and clear the Sheyenne River	Keep	Should be accomplished after major flood events to keep channel clear; local implementation.
Restore drained wetlands	Keep	Could benefit downstream interests especially as part of plans D-1 and D-2.

Table 14 - Summary of conclusions on flood damage reduction measures considered in Stage 2 (cont)

Measures carried into Stage 2	Conclusion for incor- poration into Stage 3 plans	Remarks
<u>Measures that could be con- sidered minor components of an overall plan (cont)</u>		
Increase storage capacity of wetlands	Keep	Could benefit downstream interests especially as part of plans D-1 and D-2.
Tributary dams:		
Iron Springs (T-94)	Drop	Costs exceed apparent benefits.
Dead Colt Creek (T-150)	Keep	Could be effective as a part of plans D-1 and D-2.
Timber Coulee (T-158)	Drop	Although it could be effec- tive as a part of plans D-1 and D-2, has substantial opposition and no local support.
T-240	Drop	Costs exceed apparent benefits.
Maple River main stem dam (M-106) near Enderlin	Drop	Costs exceed apparent bene- fits; levee protection is more practical at Enderlin.
<u>Measures that could be con- sidered major components of an overall plan</u>		
Levee and diversion M-30 to M-24 around West Fargo	Keep	A major component of plans D-1 and D-2.
Sheyenne River diversion M-42 to Wild Rice River	Drop	Drop in favor of M-54 or M-65; however, could replace M-54 as part of plan D-1.
Sheyenne River diversion M-42 to M-24 via drain No. 21	Keep	A supplemental component of plan D-2.
Sheyenne River diversion M-54 to Wild Rice River	Keep	A supplemental component of plan D-1 and possibly plan K-3.
Sheyenne River diversion M-65 to Wild Rice River	Keep	A supplemental component of plan K-3.
Channelize Sheyenne River, Kindred to mouth	Drop	Is not as desirable as other plans.
Kindred Dam (M-76)	Keep	A major component of plan K-3.
Raise Baldhill Dam (M-271)	Keep	Keep up to a 5-foot raise as part of plans D-1, D-2, K-3, or other plans.

3. Basic Elements of Any Plan - Several elements are considered essential to prevent increases in flood damages and ensure the viability of any comprehensive flood damage reduction plan. These components include existence and enforcement of floodplain zoning and regulations, control of private levee construction, and continuation and enforcement of existing drainage laws.

The floodplain regulations and zoning should be used to ensure that future construction in flood-prone areas is consistent with true flood risk and will not require corrective action. A control system should be established for private levee construction to minimize the adverse effects of levees on flood levels on other properties. The regulation of drainage must be enforced to ensure that future drainage does not worsen flood conditions. The floodplain regulations, drainage regulation, and control of private levees require involvement and implementation by State and local interests. All of these actions are necessary to deal with Sheyenne River flood problems.

4. Any Comprehensive Plan Should Include Either the Kindred Dam or Local Protection in the West Fargo Area - In addition to measures taken to ensure that flood damage potential is not increased, a comprehensive plan must significantly reduce flood damage potential of existing flood-prone developments. A comprehensive plan which addresses this need should include either the Kindred Dam or local protection at West Fargo/Riverside. The West Fargo/Riverside area, the major urban center, contains over 50 percent of the potential flood damages and is subject to flooding from two peaks on the Sheyenne River and the backwater effects of the Maple, Rush, and Red Rivers. Use of upstream reservoir storage would require a dam at the closest point to the damage to be able to control both peaks and, during the first peak, reduce the flow to zero. This location would be near the Kindred Dam site. If major upstream reservoir storage is not used, some form of levee protection must be used. The most cost-effective and least disruptive levee plan identified consists of the combination of levees and diversion channel around West Fargo/Riverside. Other plan components could be added to reduce flood damages over larger areas of the basin.

5. Variations of Plans D-1, D-2, and K-3 Merit Further Consideration -

The three plans do not appear to be widely supported without some modifications. The diversion-oriented plans received much more widespread support than did the Kindred Dam plan. Plan K-3 received very limited support; however, it should be considered further because it is economically viable and represents a "nonlevee" alternative.

6. Opportunities to Meet Other Water Management Purposes and Needs Could be Considered in Conjunction with the Plans Evaluated Further -

The meeting of the other needs does not appear to be an overriding factor in plan selection. Plan selection should be based primarily on the capability of the plan to reduce flood damages. Project additions or modifications to meet other objectives (such as water supply, water quality, and recreation) should be considered on a case-by-case basis and the positive and negative effects should be displayed for consideration in plan selection. Potential water supply shortages do not appear significant; at least, additional major reservoir storage does not appear necessary. Water-based recreation needs have relatively low priority and could best be met by smaller impoundments.

7. Non-Federal Interests would be more Effective in Implementing Their Portions of an Overall Water Management Plan if They had Jurisdiction Over the Entire Watershed - Water resource districts, which are generally organized on the county basis, have little incentive to consider interests outside their jurisdiction. Although they may consider potential adverse effects downstream, potential projects that benefit other areas are quite often given very limited consideration. A watershed approach to planning, decisions, and implementation could result in better water management for the entire area.

DEVELOPMENT OF FINAL PLANS

The measures listed in table 14 as having merit for further study were considered for inclusion in the final array of plans. Implementable plans which reduced flood damages were compared with each other and the "no action" plan. Table 15 summarizes the components included in the final array. These plans include an environmental quality plan, national economic development plan, "nonstructural" plan,⁽¹⁾ and selected plan. A discussion of the rationale used in the development of each final plan and in the dropping of those components not in the final array is presented in the following paragraphs.

(1) As required and discussed in ER 1165-2-122, Use of Nonstructural Measures in Planning for Flood Damage Reduction, and ER 1105-2-353, Evaluation of Nonstructural Measures.

Table 15 - Summary of the components in the final array of plans (1)
Plan

Plan component	No (2) action	Nonstructural	EQ (3)	NED (4)	Selected
Floodplain regulations	N	N	N	N	N
Flood warning and forecasting	F	F	F	F	F
Flood emergency measures	N	N	N	N	N
Flood insurance	F	F	F	F	F
Debris removal	N	N	-	N	N
Control of wetland drainage	N	N	N	N	N
More stringent control of drainage	-	N	N	-	-
Control of private levee construction	N	N	N	N	N
Flood proofing	-	N	N	-	N
Encourage public control/ownership of riverine lands	-	N	N	-	N
Encourage more land treatment	-	N	N	-	N
Ring levees at farasteads and residences	-	(5)	N	(5)	(5)
Controlled cattle grazing at Lake Ashtabula	-	-	F	-	F
Subimpoundments at Lake Ashtabula	-	-	F	-	F
Aerators at Lake Ashtabula	-	-	F	-	F
Revised management of Baldhill Dam	-	F	-	-	-
5-foot raise of Baldhill Dam	-	-	-	F	F
Levees and diversion at West Fargo/Riverside	-	(6)	F	(6)	(6)
Flood diversion channel - Horace to West Fargo	-	-	F	F	F
Multiple-purpose dam on Dead Colt Creek	-	-	-	-	N
Restoration of drained wetlands	-	N	N	-	N
Increasing floodwater storage capacity of existing wetlands	-	N	N	-	N
Postflood relocation at Valley City and Lisbon	-	F	-	-	-

(1) "N" indicates non-Federal interests have primary implementation responsibility; "F" indicates Federal interests have primary implementation responsibility.

(2) Represents the future condition without major Federal action.

(3) Environmental Quality Plan.

(4) National Economic Development Plan.

(5) Principal responsibility for evaluation and implementation would probably be through non-Federal interests; however, Federal participation through the Soil Conservation Service or Corps of Engineers may be possible.

(6) Includes shelterbelts at selected locations and grassed waterways in and along the diversion channel.

No Action Plan

Under the "no action" plan, the future "without project" condition presented earlier would occur. Those actions pertinent to the comparison of the no action plan with the other plans include floodplain regulations, flood warning and forecasting, flood emergency measures, flood insurance, control of wetland drainage, control of private levees, and debris removal. Floodplain regulations would continue and future development in the floodplain would recognize the flood hazard and be built so that the 1-percent chance flood would cause little or no damage. Flood warning and forecasting would continue and probably be improved as new technology, data collection techniques, and prediction capability are developed. Flood emergency measures taken just preceding or during a flood would be the primary means of preventing damage to existing development. These measures could include constructing emergency levees, moving damageable property above flood levels, evacuating residents of flooded or floodable properties, and other short-term actions. Flood insurance would continue to be available to assist in minimizing the impact of a flood loss on an individual property owner. Debris removal from the river channels and bridge openings would be necessary before and after floods, especially in reaches where the lack of sufficient flow capacity would cause extensive flood damages. The control of wetland drainage would continue and drainage would be allowed only when it would occur in a manner that would not worsen downstream flooding. Private levees would also be controlled. Effective enforcement would probably not occur, however, without an overall plan to reduce flood damages. The no action plan would attempt to reduce flood damages to existing development by short-term action just before and/or during a specific flood. Future development would be essentially flood proofed or resistant from most floods. Continuing difficulties would be encountered, however, in the control of drainage and private levee construction. Because drainage and private levees can worsen future floods if not accomplished properly, control of these two activities would be crucial to management of future flood problems.

Nonstructural Plan

A plan reducing flood damage using primarily "nonstructural" measures as discussed in ER 1105-2-353 and ER 1165-2-122 and building on the

results of the preliminary planning was developed. Valley City and Lisbon are the two locations in the basin where evacuation of structures from portions of the floodplain may be an implementable measure, but only under certain conditions. Those areas prone to the most frequent flooding are generally adjacent to the river and represent a significant yet relatively small portion of the city. At Valley City, the evacuation option has marginal economic feasibility; at Lisbon, it clearly lacks economic feasibility. Neither community supports moving from the floodplain, in part because the flood fight efforts for recent floods have been successful and major flood damages have been averted. In the future, however, if flood fight efforts fail and these areas receive substantial damages and if funds were available immediately after the flood to acquire the flooded properties, relocation of residents from much of the Valley City and Lisbon floodplains could be implemented. At West Fargo/Riverside, where the entire community is on flood-prone land, the evacuation alternative is not viable even under the above described conditions for Valley City and Lisbon. The only alternative that can address the objective of reducing flood damages for the existing development in a manner which could be interpreted as "nonstructural" is the levees and flood diversion channel plan around West Fargo. Other features of the "nonstructural" plan listed in table 15 were included to reduce the flood damages in areas outside the three main cities. The control of private levee construction and drainage to prevent the worsening of flooding would be a key element in this plan. Use of existing and drained wetlands in the upland areas to store more floodwaters would help moderate flood peaks. Most of the components of the plan would be for non-Federal implementation.

Environmental Quality (EQ) Plan

National environmental policy mandates that important cultural and natural aspects be preserved and that a diverse environment be maintained. Designation of an EQ plan implies that the plan enhances and protects the aesthetic, cultural, and natural diversity of the environment and provides positive contributions to the EQ account. The EQ plan was developed to reduce flood damages and maintain or enhance the environmental resources of the basin, working primarily with the measures carried into the final evaluation stage. The EQ plan components are listed in table 15, with the levees and flood diversion channel at West Fargo/Riverside, the flood

diversion channel from Horace to West Fargo, and ring levees at farmsteads and residences providing the nucleus of the plan. The net environmental effects of these three alternatives are about neutral with some minor losses and some minor gains. The other components of the plan are needed either to make the plan effective or provide positive environmental contributions. Measures which add environmental credits to the plan include controlled cattle grazing, subimpoundments, and aerators at Lake Ashtabula; restoration of drained wetlands; increased storage capacity of existing wetlands; encouragement of more land treatment; encouragement of public control/ownership of riverine lands; and control of wetland drainage. Some features which could enhance the environment include planting of extensive shelterbelts along the diversion channel alignments and management of the shelterbelts and grassy areas of the channels and levees for environmental purposes. Use of the wetlands areas of the basin for floodwater storage could also enhance the environment if the operating plans for the management of these areas are developed primarily around waterfowl and wildlife values. Most of the components would be the responsibility of non-Federal interests to implement as part of the overall plan.

National Economic Development (NED) Plan

The national economic development (NED) plan primarily includes plan components that would increase net economic benefits. The key components for flood damage reduction include the levees and flood diversion channel around West Fargo/Riverside, the flood diversion channel from Horace to West Fargo, the 5-foot raise of Baldhill Dam, and ring levees at farmsteads and residences. All NED plan components are listed in table 15. All four key components provide net economic benefits. The remaining components - especially control of private levee construction, control of wetland drainage, and floodplain regulations - are essential to making the overall plan work.

Selected Plan

The components of the selected plan were chosen recognizing the economic, environmental, and implementability aspects of the potential plans and plan components. The levee and flood diversion channel at West Fargo/

Riverside plus the flood diversion channel from Horace to West Fargo resulted in as good or better economic considerations for providing flood protection for the developments from Horace through West Fargo as the Kindred Dam plan K-3 or other combinations of plan components with the levee and diversion. The environmental aspects of these two components were very good when compared to other options and there appeared to be general support with little opposition. While these two components provided good protection for the area from Horace through West Fargo, other areas upstream of Horace and downstream of West Fargo did not receive any protection. Ring levees at individual farmsteads and residences offered the most cost-effective manner to protect these developments. A raise of Baldhill Dam (not exceeding 5 feet) could produce substantial benefits at Valley City and Lisbon and could substantially improve conditions during the second peak downstream of Kindred. When considered in conjunction with the upgrading for safety reasons, the cost allocated for flood control was exceeded by the benefits. The multiple-purpose Dead Colt Creek tributary dam and increased floodwater storage capacities of existing and drained upland area wetlands in the reach from Valley City to Kindred were added to reduce flooding from the first peak on the Sheyenne River downstream of Kindred, particularly in the reach from Kindred to Horace and from West Fargo to the mouth of the Sheyenne River. Floodplain regulations, flood warning and forecasting, control of wetland drainage, and control of private levee construction are essential for an effective plan. Flood emergency measures, flood insurance, debris removal, and flood proofing can provide additional protection when used at appropriate locations and times. The encouragement of public ownership or control of riverine lands; encouragement of more land treatment in upland areas; and controlled cattle grazing, subimpoundments, and aerators at Lake Ashtabula would all provide increases in the EQ account. The control of cattle grazing, subimpoundments, and aerators at Lake Ashtabula could also be accomplished to some extent under a revised management plan for Baldhill Dam, which would be implementable under existing operation and maintenance authorities for the project. Planting of shelterbelts and grasses in selected portions of the diversion channels would help keep the channels operational and less prone to fill with drifted snow as well as providing wildlife benefits.

PLANS AND COMPONENTS DROPPED IN THE FINAL STAGE

Plans D-1, D-2, and K-3 as presented in Stage 2 were essentially dropped in the final stages; modifications to or variations of plans D-1 and D-2 were considered in the final array. Perhaps of greatest significance was the dropping of Kindred Dam and plan K-3. The flood diversion channel from the Sheyenne River to the Wild Rice River was also dropped.

Kindred Dam/Plan K-3

The Kindred Dam as a component of plan K-3 was dropped from consideration in the final array of plans primarily for environmental and implementability considerations. Although it substantially reduced flood damage in the basin (79 percent) and was economically justified (B/C ratio of 3.5), the Kindred Dam would have required the purchase of about 25,000 acres in the Sheyenne River valley between Kindred and Anselm and the relocation of up to 70 families. This plan would have had a particularly acute regional impact, because acquisition would occur adjacent to the Sheyenne National Grasslands, which has over 70,000 acres in Federal ownership already in this area. The periodic flooding of about 3,700 acres of bottomland forests would significantly affect the environmental quality of the region. The significant adverse social and environmental impacts resulted in a general lack of regional or local support for the Kindred Dam. The estimated first cost of plan K-3 is \$62 million.

Diversion to the Wild Rice River

Diversions to the Wild Rice River were considered in plans D-1 and K-3. Because the Kindred Dam was dropped from consideration, any potential combination of a diversion to the Wild Rice River with the Kindred Dam was also dropped. When considered in combination with other components such as wetlands and upstream tributary dams, a diversion could serve as a viable component only if the wetlands and tributary dams implementation were ensured. There is no firm support or commitment to implement the wetlands concept without knowing the exact tracts of lands to be involved and then only if the landowners would be willing to cooperate. Also, the only tributary dam which had any support is the Dead Colt Creek structure. Because of the high degree of uncertainty associated with the plan's implementability and because

Table 16 - Display of pertinent data on final array of plans

Item	Plan		No. acres	MED		Selected
	Structural	EQ		Structural	EQ	
Economic Costs						
Federal first costs ⁽¹⁾ (\$ million)	14.8	13.1	--	22.2 (9)	22.2 (9)	22.2 (9)
Non-Federal first costs ⁽²⁾ (\$ million)	36.5	37.9	--	21.4 (9)	39.6 (9)	39.6 (9)
Total first costs (\$ million)	51.3	51.0	--	42.8 (9)	61.8 (9)	61.8 (9)
Annual costs (\$1,000)	4,120	4,235	--	3,700	5,140	5,140
Benefits (average annual)						
Flood control (\$1,000)	19,551 (10)	19,551 (10)	--	19,551 (10)	19,551 (10)	19,551 (10)
West Fargo	405	--	--	1,400	1,400	1,400
Valley City and Lisbon	--	--	--	--	--	--
Agricultural	42 (10)	71 (10)	--	83 (14)	83 (10)	83 (10)
Other	4,152 (10)	4,600 (10)	--	4,640 (14)	4,640 (10)	4,640 (10)
Total flood control	24,150 (10)	24,222 (10)	--	25,674 (14)	25,674 (10)	25,674 (10)
Recreation (\$1,000)	some	some	--	some	some	some
Fish and wildlife enhancement (\$1,000)	some	some	--	some	some	some
Total benefits (\$1,000)	24,150	24,222	--	25,674	25,674	25,674
Benefit-cost ratio	5.6	5.7	--	6.9	5.0	5.0
Net benefit (\$1,000)	19,030	19,987	--	21,974	20,534	20,534
Environmental						
Wetlands affected (acres)	5	5	--	250	250	250
Shrublands planted ⁽³⁾ (acres)	15	15	--	285	285	285
Wetlands affected (acres)	20	40	--	500	500	500
Wetlands placed under management (acres)	18	40-300+	--	500+	500-800+	500-800+
Grasslands affected (acres)	50	90	--	250	250	250
Grasslands placed under management (acres)	110	255	--	350	350	350
Cropland affected (acres)	60	100	--	142	142	142
Average annual equivalent loss ⁽⁴⁾ (habitat units)	--	--	--	0-450	0-450	0-450
Mitigation lands required (acres)	0	0	--	24 acres	24 acres	24 acres
Cultural resources affected ⁽⁸⁾	No known effects	No known effects	--	No known effects	No known effects	No known effects
Other						
Acquisitions (number of homes, etc.)	126 (13)	3 (13)	--	110 (12)	110 (12)	110 (12)
Lands required (acres)	29,300 (13)	29,500 (13)	--	3,300	4,100 (13)	4,100 (13)
Flood damage reduction effectiveness ⁽⁵⁾	83	84	--	89	89	89
Number of persons benefited ⁽⁷⁾	11,269	11,900	--	11,750	15,750	15,750
Acres of cropland benefited ⁽⁷⁾	103,000	103,000	--	58,500	115,000	115,000
Residual flood damage (\$1,000)	4,789	4,717	28,939	3,265	3,265	3,265

(1) Implementation by the St. Paul District, Corps of Engineers, based on traditional cost sharing. The actual cost sharing between Federal and non-Federal interests is subject to significant change. Costs are included for the levees and diversion at West Fargo, the diversion from Horace to West Fargo, the raise of Baldhill Dam, and/or the acquisition of floodplain dwellings as appropriate for each plan.

(2) Includes potential costs of other Federal agencies, as well as non-Federal entities (also based on traditional cost sharing).

(3) Also includes wetlands placed under management.

(4) As measured before mitigation measures are incorporated.

(5) Effectiveness is represented as a percent of total Sherman River flood damages reduced.

(6) Estimated number of persons receiving benefits from flood damage reduction measures.

(7) Estimated cropland acreage receiving benefits as a result of reduced frequency of flooding.

(8) Includes only those impacts for sites known to date; intensive survey and testing may identify additional sites.

(9) The costs shown do not include any costs of structural upgrading at Baldhill Dam. Only those costs at Baldhill Dam apportioned to flood control are included.

(10) Does not include benefits for the wetlands alternative.

(11) Does not include benefits for the Dead Coot Creek tributary dam alternative.

(12) Includes about 100 cabins and dwellings on the Lake Ashkabiula shoreline.

(13) Does not include any acreage estimate for the wetland alternatives. Potentially, up to 28,900 acres could be acquired for implementation of the wetland alternatives. Although the probability of the full 28,900 acres being acquired is rather unlikely in the foreseeable future, it is possible that some of the wetlands could be implemented in the same time frame as the other alternatives with the appropriate support from local interests and other Federal agencies.

(14) Does not include benefits downstream of flood control that would be creditable to the raise of Baldhill Dam.

its relative economics were not as good as the plans which used the Horace-West Fargo diversion channel, the diversion to the Wild Rice River was not considered further.

COMPARISON OF FINAL PLANS

Pertinent information on the final plans is displayed in table 16. The information presented includes costs, benefits, and impacts for all components of the plans, both Federal and non-Federal, wherever possible. In some cases, however, some of the effects are not quantifiable. For example, in the data presented for the selected plan, the costs and impacts of the wetlands alternative are included; however, benefits are extremely difficult to quantify and none are presented in the table even though significant benefits would accrue to the plan as a result of the wetlands alternative.

All plans are economically justifiable and would provide high degrees of flood damage reduction. All of the plans improve the public health of the area by reducing flooding. The potential for transmitting diseases and contamination of wells during flood periods would be reduced. The selected plan would benefit the greatest number of persons and largest area. Although the acquisition impacts seem large for the selected plan, the nature of the actual impact must be considered. Most of the dwelling acquisitions (about 90 percent) are cabins around Lake Ashtabula that are used primarily as recreational summer lakeshore dwellings, and their purchase would not preclude their owners from building on another site around the lake. The new sites might be set back slightly farther from the lakeshore, but the owners would still have their view and access to the lake. For the wetland part of the plan, the lands involved would generally have marginal value as cropland, and the landowners would probably be willing to consider this type of use.

The cost-sharing data in table 16 is based on traditional cost-sharing policy for water resource development projects. However, because new cost-sharing policies have not yet been established, the distribution of costs between Federal and non-Federal interests should be considered as only a guide. Final estimates and recommendations for cost-sharing and financing arrangements could vary significantly from the information presented in this report.

DESCRIPTION OF THE SELECTED PLAN

The selected plan consists of several types of components: those recommended for implementation by the Corps of Engineers; essential components that must be implemented by the non-Federal sponsors; and important components that will be implemented by other Federal or non-Federal agencies but that are not essential to the functioning of the other plan components. Plan components are shown on plate 2. The plan components for Corps implementation and the essential components for non-Federal implementation constitute the recommended plan for evaluation and justification purposes. The functioning of the recommended plan does not depend on the other components of the selected plan.

PLAN COMPONENTS FOR CORPS OF ENGINEERS IMPLEMENTATION

Three plan components would be implemented by the Corps of Engineers with the cooperation and participation of non-Federal interests: a raise of Baldhill Dam, levees and a flood diversion channel at West Fargo/Riverside, and a flood diversion channel from Horace to West Fargo.

Raise of Baldhill Dam

The raise of Baldhill Dam would be primarily for adding flood control storage to the project, recognizing that structural modifications to the existing project are required to comply with the provisions of the Dam Safety Assurance Act. The modifications include a 5-foot raise of the design flood pool, raise of the height of the dam by about 5 feet, change in location of the gated spillway structure, and change in the operation of the dam during floods. These changes would provide an additional 31,400 acre-feet for storage of floodwater above the existing 39,600 acre-feet of dual-use storage now available for flood control during major floods. A total storage of 71,000 acre-feet would be available for flood control during major floods. Plate 5 presents illustrations of the modifications and summarizes pertinent information for the structure. Appendix I, Flood Damage Reduction Alternatives, provides additional discussion on considered modifications to the Baldhill Dam. Appendix B, Hydrology, and Appendix K, Geotechnical, also provide additional data on the proposed raise of Baldhill Dam. The project would be operated to maintain the pool level at elevation 1266 during summer

and fall to ensure that water is available for downstream water supply needs. The pool would be drawn down as necessary during fall and winter to provide storage for floodwater during spring runoff. Drawdowns to the 1257 level would be considered when severe spring floods are predicted. The stored floodwaters would be released as quickly as possible without incurring additional damages downstream to minimize environmental damages in the flood pool area of Lake Ashtabula and to have the flood storage available for another flood as soon as possible.

Under the Dam Safety Assurance Program, major upgrading of the Baldhill Dam is required. The upgrading would result in major changes to the existing embankment and main public use area because construction of additional spillway capacity on the east abutment is needed. The 5-foot raise of Baldhill Dam and changes in the operation for flood control would require the purchase of about 2,700 acres (including mitigation acreage) of lands around and upstream of the lake including the acquisition of many cabins, several farmsteads and two church camps. Additional modifications to the embankment and gated spillway would also be required. Many of the cabins that would be affected could be relocated by the property owners to other sites around the lake if land is available.

The additional flooding of project lands by the raise would require actions to mitigate for fish and wildlife losses. The mitigation measures are described in Appendix D, Environmental Resources; Appendix L, Flood Damage Reduction Alternatives, and Appendix N, Fish and Wildlife Coordination Act Report. Up to 450 acres of mitigation lands would be needed to offset project losses. Although sufficient lands for mitigation should be among those acquired for the project, some (up to the full 450 acres) may have to be acquired outside of the project lands. In addition, mitigation would include the replacement of any fish rearing facilities that would be adversely affected by the project. Several aspects of the plan that would enhance the natural resources around Lake Ashtabula include control of the cattle grazing on Federal property around the lake, development of subimpoundments at the upper end of the lake, and use of aerators in the lake.

Levees and Diversion Channel at West Fargo/Riverside

The levees and diversion channel at West Fargo/Riverside consist of two segments of levees, a flood diversion channel and associated control structures, interior drainage facilities, and other features which provide a very high degree of flood protection (standard project flood) for the cities of West Fargo and Riverside. The general features of the project are presented on plate 3. Additional information on the project is also presented in Appendix C, Hydraulic Analysis and Interior Drainage Design, and Appendix L, Flood Damage Reduction Alternatives.

The operation of the project calls for closure of the control structures at the upstream and downstream river crossing whenever river flows or stages at West Fargo reach damaging levels. Sheyenne River flows would then be diverted through the diversion channel. During low and normal flows, the Sheyenne River would flow through the natural river channel. The flood diversion channel would be sized to pass flows comparable to what the existing Sheyenne River through West Fargo would be capable of handling. The height of the principal levees is planned to be 3 feet above the standard project flood level through the area. Drainage ditches and ponding areas are included to handle interior runoff; the Sheyenne River channel and a portion of the Drain 21 channel that would be cutoff within the leveed area would serve as ponding areas. The levee on the west side of the diversion channel would be a closed loop completely encircling the development. On the east side of the diversion channel, however, the levee would tie back into high ground near Interstate Highway 94 on the southeast corner and the railroad embankment on the northeast corner. Because of the potential stability problems associated with the soils, the levees would be set back away from major excavation such as the diversion channel.

Shelterbelts would be placed along selected portions of the diversion channel to reduce erosion, reduce the amount of snow accumulating in the channel, and provide wildlife habitat diversity in a generally treeless area. The levees and diversion channel slopes and the set-back areas between the channels and levees would be planted with grasses that would provide the optimum mixture for project operation, wildlife values, and compatibility with nearby developments. Features for enhancement of fish and wildlife values such as increased plantings of shelterbelts for primarily wildlife values would be considered for development

at appropriate locations with concurrence and sponsorship of local interests.

Flood Diversion Channel from Horace to West Fargo

The flood diversion channel from Horace to West Fargo would consist of an excavated grass-lined channel parallel to and about 1 mile west of the Sheyenne River between Horace and West Fargo. The inlet to the channel would be located about 1 mile upstream of Horace. The downstream end of the channel would join the diversion channel around West Fargo/Riverside on the north side of Interstate Highway 94. The diversion channel would be operated to allow low and normal flows to go down the natural Sheyenne River channel. During higher flows, the water arriving at the diversion structure would be divided with flows in the diversion channel gradually increasing as the total flow increased so that when peak flows occur, such as occurred during the 1979 flood, the flows would be about split evenly. The location of the diversion channel and pertinent information on the size of the channel is presented on plate 4. The side slope of the channel would be grassed.

PLAN COMPONENTS FOR IMPLEMENTATION BY OTHERS - ESSENTIAL

Several plan components essential to the operation and effectiveness of the plan would have to be implemented by non-Federal interests. These components include floodplain regulations, control of levee construction, and control of drainage.

Floodplain Regulations

The adoption of floodplain regulations where they do not now exist and enforcement of existing and newly adopted floodplain regulations by the non-Federal agencies which regulate land use are essential to preserve the flood-carrying capacity of the floodplain and ensure that any development in a flood prone area does not subject the development to unwarranted flood risks. The floodway should be preserved for the passage of large floods. In the area down-

stream of about river mile 75 of the Sheyenne River near Kindred, regulation would include not only buildings but all road construction in about a 5-mile wide strip from near Kindred to the mouth of the Sheyenne River. Roads raised without providing for floodwater-carrying capacity could change the flood characteristics of the area and result in significantly worsened flood damages in some areas. Generally, the 1-percent chance flood is used as the base flood for regulation purposes; this flood should be used for all portions of the basin except the area downstream from river mile 75 where larger floods, such as the standard project flood, should also be considered. The effectiveness and integrity of the levees and diversion at West Fargo/Riverside depends on the preservation of the flood-carrying capacities of the upstream and surrounding areas for floods up to at least the standard project flood. Roads and railroads in the area should not be raised without providing for sufficient flood-passing capacity. Floodplain regulations would prevent increases in flood damages resulting from new construction outside protected areas.

Control of Levee Construction

Public regulation of levee construction, both private and non-Federal public levees, is necessary to ensure that flood levels do not increase upstream or downstream of the levees. Any increase in flood levels caused by levee construction could jeopardize the protection provided by other plan components and could worsen flood damages in some areas. Individual ring levees around a farmstead or residence that do not affect floodplain storage or flood-carrying capacities are not of concern. However, any continuous stretch of levee that parallels the river, preventing the breakout of floodwaters, and that appreciably affects floodplain storage or flood-carrying capacities is of concern and should be regulated in the public interest. Levee locations and heights should be approved by the water resource districts and the State of North Dakota before levee construction could commence. The existing laws of the State of North Dakota appear to have sufficient authority to provide adequate regulation; however, criteria and rules to be used in the levee regulation need to be developed.

Control of Drainage

Public regulation of drainage is necessary to prevent increases in the frequency or severity of floods. Uncontrolled drainage can change the runoff

characteristics of a watershed by reducing the time and increasing the amount of runoff. In some cases, the frequency and magnitude of floods, particularly in the moderate-sized floods, can be increased. Increases in the frequency and/or magnitude of floods resulting from uncontrolled drainage could reduce the effectiveness of the other plan components. If drainage is to occur, proper control structures should be built to ensure that the flood characteristics downstream would not be adversely affected. North Dakota laws now require permits for any drainage projects which have a watershed larger than 80 acres. This law seems to provide sufficient authority; however, the development of criteria and rules to provide effective regulation appear necessary. Control of the drainage should be considered on a basinwide watershed approach. A regulation board or panel would be helpful in providing an effective coordinated operation of future drainage projects. Drainage of any areas of the basin which are now considered "noncontributing" or contribute runoff only during very infrequent events are of particular concern.

PLAN COMPONENTS FOR IMPLEMENTATION BY OTHERS - IMPORTANT TO ACHIEVING OBJECTIVES

The remaining plan components are to be implemented by either other Federal agencies, non-Federal interests, or in some cases in part by the Corps of Engineers and are important to achieve the overall objectives of the plan. These components include flood warning and forecasting, flood emergency measures, flood insurance, multiple-purpose dam on Dead Colt Creek, ring levees at farmsteads and residences, increasing the floodwater storage capacity of existing and drained wetlands, debris removal, flood proofing, encouragement of public control/ownership of riverine lands, and encouragement of more land treatment. Implementation or non-implementation of these components would not affect the justification or sizing of the Corps components and the essential non-Federal components of the plan.

Flood Emergency Measures

For damageable floodplain developments where other plan components do not reduce flood damages, flood emergency measures would prevent damages just before the actual floods. These measures would include temporary emergency levees where they would be cost effective, particularly at Valley City and

Lisbon for those infrequent floods that would exceed the capabilities of the raised Baldhill Dam in keeping flows below damageable levels. Evacuation of people and property from areas under threat of imminent flooding is a prudent measure and one for which contingency plans should always be prepared. Federal, State, and local funds should be used as appropriate, including the use of Corps of Engineers funds for construction of temporary levees when necessary.

Flood Warning and Forecasting

The flood warning and forecasting services of the National Weather Service are necessary for the proper planning and preparation for an anticipated flood from several days up to several months in advance depending on the type of flood. This advance warning is needed for efficient operation of flood control reservoirs and the timely construction or upgrading of temporary levees. Advance warning is also needed for the operation of flood diversion channels. Although flood warning and forecasting has much greater significance under the existing and "future without" project conditions than with the proposed projects in place, continuation of flood warning and forecasting services would still be needed in the basin with the proposed plan.

Flood Insurance

Federally-subsidized flood insurance would be important for existing developments not protected by the proposed plan. However, flood insurance for new developments should be assessed at actuarial rates.

Multiple-Purpose Dam on Dead Colt Creek

A dam and reservoir on Dead Colt Creek near the confluence of Dead Colt Creek with the Sheyenne River would serve several purposes, most noticeably flood control and recreation. The dam with a permanent lake plus additional floodwater storage would provide needed water-based recreational opportunities for residents of Lisbon and the surrounding area and the flood control storage would assist in reducing peak flood discharges for the first peak in the downstream area. When considered with the other plan components, this dam would

provide its most significant flood damage reduction effects to agricultural areas from Kindred to the mouth. The reductions in first peak flood discharges downstream of West Fargo resulting from operation of the dam would offset any potential adverse effects of the Horace to West Fargo diversion. The operation of the reservoir would have to consider the effects of releases on downstream areas and would have to be coordinated with releases from Baldhill Dam to ensure that peak flood discharges during the second peak on the Sheyenne River are considered in reservoir operation. This plan component is being developed by non-Federal agencies in North Dakota.

Ring Levees at Farmsteads and Residences

Ring levees at farmsteads and residences in rural floodplain areas, particularly in the reach from Kindred to Horace and from West Fargo to the mouth of the Sheyenne River, would provide protection from floods to the residents of existing dwellings outside of the protection provided by the other plan components. The concept of ring levees as discussed here would also include other flood proofing or nonstructural flood damage reduction techniques that may be more appropriate or economical for specific structures. These levees or other techniques would be designed to provide protection from the base flood as defined for that reach of the river. Criteria for the design of these levees would be anticipated to be comparable to the design criteria established by the Soil Conservation Service for this type of situation. Care would have to be taken in the development of these ring levees that flood stages would not be increased by the raising of a driveway, road, levee, or other continuous feature that would restrict the flood-carrying capacity of the river. This measure is intended for existing development only, with new developments being controlled by floodplain regulations.

The U.S. Soil Conservation Service has an ongoing program for these type of ring levees which appears to be applicable to these portions of the basin. Non-Federal interests would be instrumental in implementing this component. Further evaluation of potential participation by the Corps of Engineers could also be undertaken through the feasibility study of farmstead ring levees in

the Red River of the North basin or through the urban study being conducted for the Fargo-Moorhead area. At specific groups of residences, such as Harwood, Rivertree and Brooktree, further evaluation for Federal participation through the Corps of Engineers could be considered as part of the small projects program, under the ring levee program, or under the urban study program.

Increasing the Floodwater Storage Capacity of Existing or Drained Wetlands

When considered as a part of the overall plan, the use of existing or drained wetlands for the storage of floodwaters could reduce flood discharges for the first peak on the Sheyenne River if accomplished in sufficient numbers in the reach from Kindred to Valley City. The placing of control structures on existing drains in this reach could also be considered. The major flood control benefits would be to agricultural interests from Kindred to Horace and north of West Fargo. While it is unlikely that a large number of drained wetlands would be restored or existing wetlands would be modified just to provide floodwater storage, it is probable that the wetland areas would be developed for their wildlife and environmental values. When the restoration of drained wetlands or the management or preservation of existing wetlands is being accomplished for wildlife values, compatible plans to use portions of the wetland for floodwater storage could be developed. The U.S. Bureau of Reclamation is considering drained wetland areas for restoration and use as mitigation for the Garrison Diversion Unit. Any of these mitigation areas being considered in the Sheyenne River basin should include the consideration of multiple-use, with operation of the wetland areas for floodwater storage as well as fish and wildlife values.

Other agencies, such as the U.S. Fish and Wildlife Service, should consider the multiple-use concept and inclusion of floodwater storage as a purpose of their wetland acquisition and/or management. Through the multiple-purpose use of wetland areas, storage of floodwaters under this concept could become a reality. Control structures could be placed on some existing drains by non-Federal interests where they can find support to do so and where the basic functioning of the drains is not affected in periods critical to the land being drained.

Debris Removal

Debris removal from bridges and other channel constrictions along the Sheyenne River before, during, and after floods will help alleviate localized

flooding problems in the vicinity of the blocked constriction. It could also affect downstream flooding by changing how, when, and where breakout flows occur. Debris removal would be accomplished by non-Federal interests, probably the Water Resource Districts.

Flood Proofing

Flood proofing would be considered in cases of existing flood prone developments where the flood proofing would be economically feasible, practical, and supported by non-Federal interests. Its use would be considered in some cases in lieu of ring levees at farmsteads and residences.

Encouragement of Public Control/Ownership of Riverine Lands

Use of public acquisition, easements, or land use controls over riverine lands could preserve many of the natural environment and floodplain values associated with the wooded strips along the rivers. For most of the Sheyenne River this type of control would be appropriate at the State or local level of government.

Encouragement of More Land Treatment

Erosion, water quality, and runoff have been identified as problems in the basin. The use of more land treatment measures throughout the basin would provide water quality and erosion control benefits. Encouraging landowners to participate more in land treatment programs offered by non-Federal and Federal interests would help improve the aesthetic and environmental setting of the basin.

Selected Plan/Recommended Plan

Considering the completeness and certainty tests for plan implementation, several components of the plans listed in the final array have a lesser degree of certainty for implementation than others. To provide a more realistic comparison of the final array of plans from the perspective of likelihood of implementation in the near future as a part of the Federal plan, the final array of plan components would be as presented in table 16a.

X Those components which are important to achieving the basin-wide objectives of flood control but which are not essential to the effectiveness or completeness of the plan, have been removed from the array of plans. The plans as presented in table 16a would represent plans which would be recommended for authorization as Federal plans. The "selected plan" thus becomes the "recommended plan."

The comparison of the recommended plan to the modified non-structural, EQ, and NED plan allows closer scrutiny to the most likely effects to be achieved by the plans. This comparison of plans is presented in table 16b. Under this scenario, the recommended plan is the same as the NED plan. Those components of the selected plan which were dropped from the recommended plan would achieve greater effectiveness in reducing flood damages throughout the basin and should be considered for implementation by non-Federal interests wherever practical, however their implementation will most likely depend in large part on the implementation of the recommended plan. Subsequent evaluations and discussion in this report will concentrate on the components of the recommended plan.

DESIGN AND CONSTRUCTION CONSIDERATIONS

On the basis of the reevaluation studies and comments received from various interests, items which should be given additional consideration during the design and construction phases are discussed in the following paragraphs.

Table 16a - Summary of the components in the final array of plans, as modified to consider completeness through the Federal Interest Plan

Plan component	Plan				Recommended
	No action (2)	Nonstructural EQ (3)	FD (4)		
Floodplain regulations	N	N	N	N	N
Flood warning and forecasting	F	F	F	F	F
Flood emergency measures	N	N	N	N	N
Flood insurance	F	F	F	F	F
Debris removal	N	N	N	N	N
Control of wetland drainage	N	N	N	N	N
More stringent control of drainage	-	N	-	-	-
Control of private levee construction	N	N	N	N	N
5-foot raise of Baldhill Dam	-	-	-	F	F
Levees and diversion at West Fargo/Riverside	-	F	F	F	F
Flood diversion channel - Horace to West Fargo	-	-	F	F	F
Postflood relocation at Valley City and Lisbon	-	F	-	-	-

(1) "N" indicates non-Federal interests have primary implementation responsibility; "F" indicates Federal interests have primary implementation responsibility.

(2) Represents the future condition without major Federal action.

(3) Environmental Quality Plan.

(4) National Economic Development Plan.

Table 1bb. Display of pertinent data on final array of plans which achieve completeness based on implementation through the Federal Interest Plan (3)

	Plan				
	No action	Nonstructural	BQ	HEB	Selected
Economic Costs					
Federal first costs (1) (\$ million)	--	14.8	13.1	22.2 (9)	22.2 (9)
Non-Federal first costs (2) (\$ million)	--	9.5	12.2	12.2	12.2
Total first costs (\$ million)	--	24.3	25.3	34.4	34.4
Annual costs (\$1,000)	--	2,069	2,235	3,004	3,004
Benefits (average annual)					
Flood control (\$1,000)	--	19,551 (10)	19,551 (10)	19,551 (10)	19,551 (10)
West Fargo	--	405	--	1,400 (12)	1,400
Valley City and Lisbon	--	2	1,356	1,398 (12)	1,398 (12)
Other	--	42	71	83 (12)	83 (12)
Agricultural	--	20,000	20,978	22,432 (12)	22,432 (12)
Total flood control	--	20,000	20,978	22,432 (12)	22,432 (12)
Total benefits (\$1,000)	--	20,000	20,978	22,432 (12)	22,432 (12)
Benefit-cost ratio	--	9.6	9.4	7.5	7.5
Net benefits (\$1,000)	--	17,931	18,743	19,429	19,429
Environmental					
Wetlands affected (acres)	--	5	5	175	175
Wetlands affected (acres)	--	20	40	600	600
Grasslands affected (acres)	--	50	90	320	320
Cropland affected (acres)	--	70	115	355	355
Average annual equivalent loss (4) (habitat units)	--	--	--	142	142
Mitigation lands required (5) (acres)	--	0	0	0-450	0-450
Cultural resources affected (6)	--	No known effects	No known effects	24 sites	24 sites
Social					
Acquisitions (number of homes, etc.)	--	126	3	110 (11)	110 (11)
Lands required (acres)	--	390	630	3,330	3,330
Flood damage reduction effectiveness (5)	--	69	72	78	78
Number of persons benefited (6)	--	10,370	10,940	13,860	13,860
Acres of cropland benefited (7)	--	--	25,000	60,000	60,000
Residual flood damages (1,000)	28,939	8,939	7,961	6,507	6,507

(1) Implementation by the St. Paul District, Corps of Engineers, based on traditional cost sharing. The actual cost sharing between Federal and non-Federal interests is subject to significant change. Costs are included for the levees and diversion at West Fargo, the diversion from Morace to West Fargo, the raise of Baldhill Dam, and/or the acquisition of floodplain dwellings as appropriate for each plan.

(2) Includes potential costs of other Federal agencies, as well as non-Federal entities (also based on traditional cost sharing).

(3) This includes those components necessary to allow the Federal components of the plan to function effectively.

(4) As measured before mitigation measures are incorporated.

(5) Estimated number of persons receiving benefits from flood damage reduction measures.

(6) Estimated cropland acreage receiving benefits as a result of reduced frequency of flooding.

(7) Includes only those impacts for sites known to date; intensive survey and testing may identify additional sites.

(8) The costs shown do not include any costs of structural upgrading at Baldhill Dam. Only those costs at Baldhill Dam apportioned to flood control are included.

(9) Does not include \$46,500 of additional annual savings in flood insurance administration costs at West Fargo and Riverside.

(10) Includes about 100 cabins and dwellings on the Lake Ahtabala shoreline.

(11) Does not include benefits downstream of Kindred attributable to raises of Baldhill Dam for flood control.

Raise of Baldhill Dam

The raise of Baldhill Dam should be evaluated in greater detail to determine the optimum point of net benefits. The information available during the reevaluation studies indicated that the 5-foot raise was the best condition of those evaluated. However, since the reevaluation studies did not involve the level of detail needed to determine if a slightly higher or lower level of raise (such as a 4- or 6-foot raise) might provide greater net benefits, more detailed studies should be conducted during the Phase II General Design Memorandum studies. The evaluations of the raise should be combined with further evaluations of the operating plan. The additional benefits attributable to Baldhill Dam in the areas downstream of Kindred should be quantified and used in this optimization process. Since environmental and social impacts are important considerations in the raise of Baldhill Dam, these factors should also be considered in the selection of the level of raise. The level of raise and operating plan selected in the Phase II General Design Memorandum should increase the net economic benefits without increasing the adverse environmental and social impacts caused by a 5-foot raise.

Marsh impoundments should be evaluated in a greater level of detail at the upper end of Lake Ashtabula. These impoundments should be developed so that no additional land is required and so that the fish and wildlife resource is improved with the goal of reducing the fish and wildlife mitigation needs or enhancing the fish and wildlife resources.

Land and property acquisition needs should be refined to minimize the social disruption to the area but provide sufficient property rights to the Corps of Engineers to allow full operation of the project for the authorized purposes. Application of standard Corps of Engineers real estate policy guidelines for reservoirs resulted in the identification of elevation 1276 as the guide-take elevation. This elevation should be reevaluated after the acquisition of detailed topographic mapping information around the lake to determine if a lower elevation could be used. Both fee title purchase and easements were used for land acquisition estimates in this reevaluation report; however, easements should be considered wherever feasible, when it would benefit both the Government and the property owner. The farmsteads, cabins, and two church camps should be given particular attention when the real estate needs of the project are assessed in greater detail.

The assessment of the fish and wildlife mitigation needs requires further evaluation of the quality of habitat of the lands acquired for the project that are located outside of the design floodpool. If sufficient lands of suitable habitat are acquired with the normal project take-line, few additional lands specifically for fish and wildlife mitigation would be needed. However, if there is not sufficient suitable habitat contained in the project lands, up to 450 additional acres outside of normal project take-lines may have to be acquired for fish and wildlife mitigation. The fencing of project lands should also be evaluated for those segments where substantial fish and wildlife benefit can be obtained and where the need for additional land acquisition specifically for fish and wildlife mitigation can be reduced. If specific additional lands are required for fish and wildlife mitigation, lands in downstream areas such as those adjacent to other publicly-owned lands near the Sheyenne National Grasslands should also be considered. The suitability of the land for mitigation, the relative social impact, and the net cost should all be considered in the selection of any additional lands for fish and wildlife mitigation.

The U.S. Fish and Wildlife Service fish rearing ponds and the hatchery building would be affected by construction of a new spillway and by enlargement of the embankment at Baldhill Dam. This effect would be primarily a result of work required under the Dam Safety Assurance Program, and the cost of replacing these structures has been apportioned to the Dam Safety work. Under the provisions of the 1950 lease between the Corps and the Fish and Wildlife Service for use of the land where the fishery structures are located, the Corps can recall the lands to use for project purposes. Thus, there may be a question of whether the Dam Safety Assurance Program should have to replace the affected fishery structures. However, under the Fish and Wildlife Coordination Act, replacement of these structures would be an appropriate project cost. If the Dam Safety Assurance Program cannot cover replacement costs, then the raise of Baldhill Dam for additional flood control should bear these costs. This could increase the cost apportioned to flood control by about \$580,000 and could require 30 more acres for fish and wildlife mitigation lands. Existing federally-owned land should be used for mitigation to the maximum extent practicable, however.

The operating plan for Baldhill Dam should be refined to provide the optimum level of benefits and, to the maximum extent practicable, reduce flood damages and flood stages at Valley City, particularly for floods of the magnitude of the base flood used for regulatory purposes. The operating plan developed during this study has shown that flood levels can be significantly reduced at Valley City, Lisbon, and other areas. However, the timing of the first and second peaks must be carefully monitored to ensure that optimum results are being achieved. This refined operating plan should also include the effects of the Dead Colt Creek Dam which will probably be constructed by the time the refined operating plan is being developed.

Improvements to Baldhill Dam under the Dam Safety Assurance Program should be closely coordinated with the raise of Baldhill Dam for flood control. Design and construction of the dam and spillway under either program should be done concurrently if at all possible to minimize any potential duplication of effort or waste of resources.

Levees and Diversion at West Fargo/Riverside

The alignment of the levees and diversion as presented in this report should be evaluated in greater detail before construction. Although the general alignment should be followed, changes should be considered in several areas. The inlet to and first leg of the diversion channel has been evaluated on both the north and south sides of I-94. The north side alignment was selected for this level of detail because of a slightly cheaper cost. However, with consideration of potential changes that the North Dakota State Highway Department may be making to the I-94 bridges over Drain 21, the diversion channel alignment on the south side of I-94 may be more cost-effective and provide an alignment more compatible with the transportation and development patterns at West Fargo. Other areas of further evaluation of alignment should include the tie-back of the north levee, and the channel alignment north of the railroad tracks.

Land acquisition for the levees and diversion is normally considered the responsibility of a local sponsor under traditional policies and is included as a local cooperation item in this report. Implementation difficulties, however, can arise when rights-of-way to be furnished by non-Federal sponsors

do not proceed on a timely schedule and hinder construction of the project. Scheduling of the project should be closely coordinated with the local sponsors to facilitate timely acquisition of required rights-of-way. Also, property acquisition plus operation and maintenance for the levees and diversion as well as for the raise of Baldhill Dam and the flood diversion channel from Horace to West Fargo would require compliance with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, and with Section 601 of Title IV of the Civil Rights Act of 1964, Public Law 88-352.

Use of shrub and tree plantings, recreational trails and facilities, other compatible developments, and use of project lands should be considered in the development of a land use plan for the project. Integration of the project into the communities of West Fargo and Riverside is essential to a well planned and functional project. The levees and diversion and associated features should be designed and developed to function for the authorized project purpose of flood damage reduction in a manner compatible with the surrounding developments.

Other Components

The design of the flood diversion channel from Horace to West Fargo calls for side slopes of 7 to 1 to allow for ease in mowing and use of other equipment on the side slope. Steeper side slopes could be considered; however, because of soil stability considerations, the berms would have to be set back an appropriate distance. The degree of side slope and setback distance for the berms can be revised as needed to improve the implementability and/or feasibility of the diversion channel.

The optimum level of net benefits from the flood diversion channel from Horace to West Fargo should be evaluated in additional detail by subsequent design studies. If greater net benefits can be achieved and if at least a comparable level of flood protection can be provided without increasing the adverse environmental and social effects, the size of the diversion channel should be modified.

The design of the Dead Colt Creek Dam should be developed by the North Dakota State Water Commission to operate in a manner compatible with the other components of the selected plan.

OPERATION AND MAINTENANCE CONSIDERATIONS

The operation and maintenance of Baldhill Dam with the raise of 5 feet for flood control would be the responsibility of the Corps of Engineers. The project would be operated for water supply, flood control, recreation, and fish and wildlife; the pool levels would be operated primarily for water supply and flood control. The upstream and downstream streamflow gages and upstream watershed rainfall and snow water-content measurement locations should be reviewed to ensure that sufficient data are available for proper operation of Baldhill Dam as an integral part of the overall plan. Project lands should be managed in accordance with the wildlife plan developed to ensure adequate mitigation measures for wildlife habitat losses.

The levees and diversion at West Fargo/Riverside and the flood diversion channel from Horace to West Fargo would be operated and maintained by the local sponsor in accordance with regulations prescribed by the Secretary of the Army. Appropriate adjustments in the stream gaging stations from Kindred through West Fargo should be made to ensure proper forecasting and project operation.

PLAN ACCOMPLISHMENTS

The selected plan represents a comprehensive approach to reducing flood damages throughout the lower Sheyenne River basin while recognizing the environmental, social well-being, economic, and implementability constraints and considerations. The accomplishments of the plan are both tangible and intangible.

The tangible accomplishments of the selected plan are measured and presented as reductions in flood flows, flood levels, and flood damages and also as the benefits to homes, businesses, people, and acres of agricultural land. Table 17 summarizes the effectiveness of the selected plan in reducing flood damages at the various locations throughout the basin as measured by the benefits resulting only from the following components:

- Raise of Baldhill Dam.
- Levees and diversion at West Fargo/Riverside.
- Flood diversion channel - Horace to West Fargo.
- Control of drainage.
- Control of private levee construction.
- Floodplain regulations.

Table 17—Effectiveness of selected plan in reducing flood damages (1984)

Damage location	Average annual conditions		Subject chance flood		Percent damages reduced		Project chance flood		Standard project flood		Magnitude of flood for which emergency measures would be needed to supplement plan (1)
	Damages without plan	Benefits with plan	Damages with plan	Benefits with plan	Percent damages reduced	Benefits with plan	Damages without plan	Benefits with plan	Damages without plan	Benefits with plan	
Urban											
Valley City	\$1,943,600	\$1,290,000	\$4,094,000	\$5,600,000	66.4	3,229,000	\$4,200,000	0	\$29,000,000	0	3.0
Lisbon	376,700	110,000	1,027,000	167,000	29.2	1,172,000	Some	0	6,864,000	0	11.5
Horace	492,600	439,000	1,650,000	1,650,000	98.1	4,984,000	Some	0	1,940,000	0	2.0
West Fargo/Riverside	19,811,800	19,551,000	59,273,000	59,273,000	98.2	65,709,000	67,709,000	\$68,838,000	98,838,000	\$68,838,000	SPP
Harwood	425,800	---	1,851,000	---	---	2,712,000	0	0	3,650,000	0	31
Other	591,100	---	2,916,000	0	---	2,590,000	0	0	5,172,000	0	31
Subtotal	21,691,600	21,390,000	72,177,000	67,386,000	90.3	81,581,000	70,509,000	68,838,000	115,484,000	68,838,000	---
Rural residential (4)											
Kindred-Horace	1,034,500	---	4,389,000	---	---	5,217,000	---	---	5,789,000	---	26
Horace-West Fargo	1,032,200	911,000	3,911,000	3,911,000	88.3	4,902,000	Some	0	4,407,000	0	2
West Fargo-Mouth	1,821,400	---	7,451,000	---	---	9,454,000	---	---	10,900,000	---	25
Other	---	---	---	---	---	---	---	---	---	---	---
Subtotal	3,908,100	911,000	15,951,000	3,911,000	23.3	19,071,000	---	---	21,096,000	---	---
Agricultural											
Kindred-West Fargo	181,600	30,000	522,000	182,000	16.5	1,514,000	0	0	2,273,000	0	68
West Fargo-Mouth	871,500	31,000	3,642,000	1,194,000	8.7	4,451,000	166,000	179,000	5,010,000	179,000	61
Other	891,500	11,600	321,000	37,000	13.1	515,000	166,000	0	272,000	0	52
Subtotal	1,764,600	72,600	4,485,000	156,000	7.2	6,481,000	166,000	179,000	8,055,000	179,000	---
Transportation											
196,100	48,000	992,000	416,000	42.8	1,247,000	242,000	9,000	1,518,000	1,518,000	9,000	0.6
Total	28,939,200	22,431,600	96,155,000	72,765,000	77.5	108,780,900	70,917,000	69,026,000	146,173,000	69,026,000	47.2

(1) October 1981 prices. 7 5/8-percent interest. Indexes are the same as those shown in table 6-25.

(2) Based only on flood damage reductions provided by the raise of Baldhill Dam, levees and diversion at West Fargo/Riverside, and flood diversion from Horace to West Fargo. Benefits and effectiveness of other components are not included in this table. Does not include all benefits attributable to the raise of Baldhill Dam. Additional benefits downstream of Kindred could be quantified and incorporated.

(3) Expressed in percent chance frequency of occurrence.

(4) Includes only those areas labeled "nonurban".

Overall average annual flood damages in the basin would be reduced about 78 percent. The damages at West Fargo/Riverside would be reduced about 99 percent, and the damages at Valley City about 66 percent. Significant reductions are achieved through most areas for the more frequent floods such as the 5-percent chance flood. For the larger, infrequent floods such as the 1-percent chance flood, significant reductions are provided mainly at Valley City and West Fargo/Riverside. Additional benefits from the raise of Baldhill Dam can be quantified in the reach from Kindred to West Fargo. Implementation of other components such as Dead Colt Creek Dam, ring levees at farmsteads and residences, and upstream wetland floodwater storage could further reduce flood damages to existing developments. The enforcement of floodplain regulations throughout the basin would reduce the growth of future flood-damageable development. Damages sustained from a flood of the magnitude of the standard project flood would be less with the plan than without the plan.

Table 18 summarizes the effects of the selected plan on flood flows and flood levels at several key locations in the basin, including the major flood damage centers. At Valley City, Lisbon, and Kindred, flood flows and levels would be reduced as a result of the raise of Baldhill Dam. The flood diversion channel from Horace to West Fargo would reduce the river levels in that reach of the river. At West Fargo and Riverside, the flows and stages would be similar to existing conditions; the flood protection at West Fargo/Riverside would be provided by the levees. Figures 7, 8, and 9 illustrate the effects of the plan at Valley City, West Fargo, and Horace, respectively.

Flood flows and levels would be reduced additionally along the Sheyenne River from implementation of the Dead Colt Creek Dam. These reductions would come on the first peak and would occur from the confluence of Dead Colt Creek and the Sheyenne River downstream to the mouth of the Sheyenne River. Additional reductions would also result from implementation of the wetland storage alternative.

About 16,000 persons, 3,000 homes, 213 businesses, and 115,000 acres of agricultural lands would benefit.

Table 18 - Summary of effects of selected plan on flood flows and flood stages⁽¹⁾

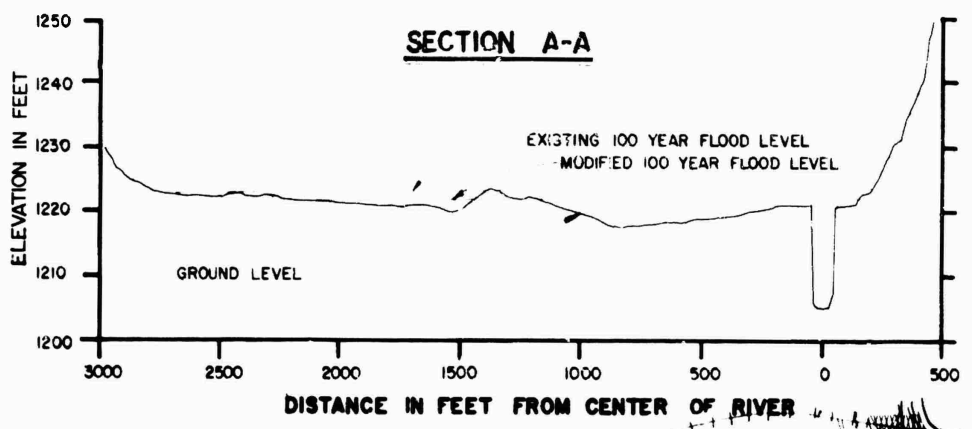
Location	1979 flood		1969 flood		1966 flood		1-percent chance flood ⁽²⁾	
	Discharge (cfs)	Stage (cfs)	Discharge (cfs)	Stage (cfs)	Discharge (cfs)	Stage (cfs)	Discharge (cfs)	Stage (cfs)
Lake Ashtabula								
Existing conditions	--	1268.55	--	1267.50	--	1267.90	--	1269.3
With plan	--	1271.6	--	1270.3	--	1268.3	--	1272.8
Valley City								
Natural conditions	10,250	23.0	5,380	18.5	3,800	16.0	10,900	23.5
Existing conditions	4,900 ⁽³⁾	18.86 ⁽³⁾	4,520	17.62	3,350	14.27	9,400	22.4
With plan	3,720	15.8	3,420	15.2	1,670	9.9	7,100 ⁽⁴⁾	20.4 ⁽⁵⁾
Lisbon								
Natural conditions	8,760	19.9	8,200	19.6	3,900	15.4	14,100	22.1
Existing conditions	4,800	17.58	4,380	16.54	4,260	16.23	10,900	20.9
With plan	3,780	15.1	4,050	15.7	2,700	12.2	9,800	20.5
Kindred								
Natural conditions	7,930	23.6	8,000	23.6	3,700	19.3	13,600	26.0
Existing conditions	4,160	21.01	4,690	21.54	3,380	20.16	11,800	25.0
With plan	4,000 ⁽⁶⁾	19.9 ⁽⁶⁾	4,690 ⁽⁶⁾	21.5 ⁽⁶⁾	2,800 ⁽⁶⁾	16.4 ⁽⁶⁾	11,800 ⁽⁶⁾	25.0 ⁽⁶⁾
Horace								
Existing conditions ⁽⁷⁾	3,450	915.85	3,000	915.5	3,000	915.1	4,500	916.9
With plan	1,800	912.25	1,800	912.25	1,660	911.7	2,150	913.2
West Fargo								
Existing conditions	3,480	22.12	3,060	21.70	3,110	21.05	4,000	24.0
With plan	3,480 ⁽⁸⁾	22.12 ⁽⁸⁾	3,060 ⁽⁸⁾	21.70 ⁽⁸⁾	3,110 ⁽³⁾	21.05 ⁽³⁾	4,000 ⁽⁸⁾	24.0 ⁽⁸⁾

(1) The effects are presented for three historic and one synthetic flood at the USGS gaging stations. Three conditions are recognized:

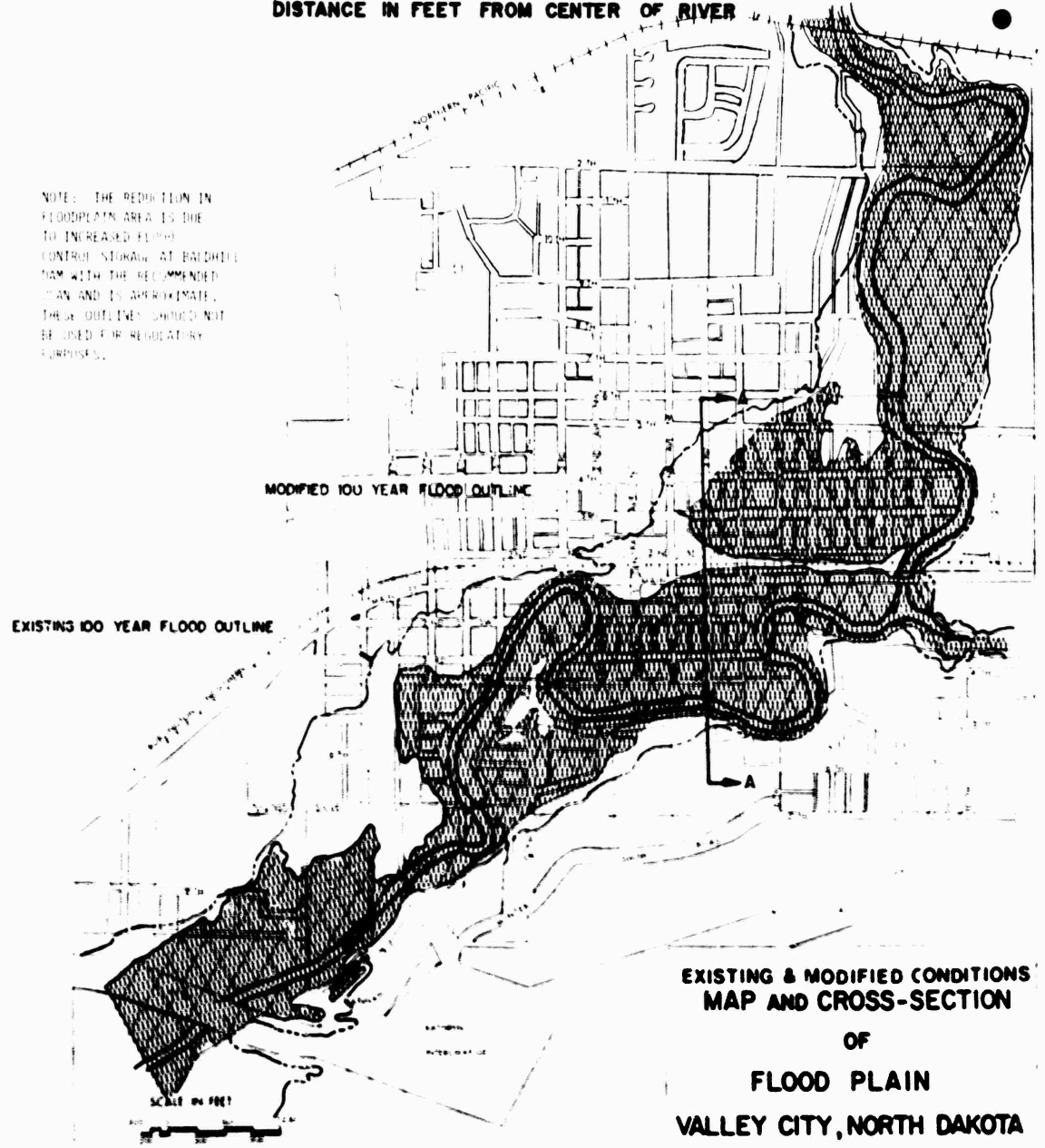
- (a) Natural conditions - estimated flood flows and stages that would occur if Baldhill Dam had not been built.
 - (b) Existing conditions - measured flood flows and stages. For the 1-percent chance flood, the estimates reflect the hydrology developed for this study; these values are subject to change.
 - (c) With plan - anticipated effects with the raise of Baldhill Dam, levees and diversion at West Fargo/Riverside, flood diversion channel from Horace to West Fargo, multiple-purpose Dead Colt Creek Dam, control of drainage, and control of private levee construction. The effects of other plan components are not included.
- (2) Approximate values as currently adopted; subject to change.
 (3) Approximate values at USGS gage. Official gage records were discontinued in 1975.
 (4) Maximum reduction of flows at Valley City through operation of Baldhill Dam primarily for Valley City would result in a 1-percent chance discharge of 5,650 cfs.
 (5) A stage of 18.7 would correspond to a discharge of 5,650 cfs.
 (6) With plan conditions should be lower because of the effects of Dead Colt Creek Dam on the first peak; however, these effects were not accounted for in the estimates.
 (7) Unofficial staff gage at bridge crossing in Horace. Discharge values are based on measurements taken near Horace or from a rating curve relationship to the Kindred gage.
 (8) The Horace to West Fargo diversion could slightly increase the peak flood stage at West Fargo under certain conditions. However, the Dead Colt Creek Dam would reduce flood flows and levels during the first peak. The net effect at the West Fargo stage would be either "no change" from existing conditions or a potential decrease in flows and stages.

Although the tangible effects are the principal items considered in the evaluation and decision-making process and are the most readily measurable for use in comparing various measures, the intangible effects of the plan are perhaps as important to the people in the region. The comprehensiveness of the plan for addressing the basinwide flood problems and the joint commitment by Federal, State, regional, and local interests would reduce the threat of floodwaters to the health and safety of floodplain residents. The disruptions in community programs caused by flooding would be reduced. The sense of crisis that exists throughout the basin during a flood would be converted more toward a sense of planned actions and response.

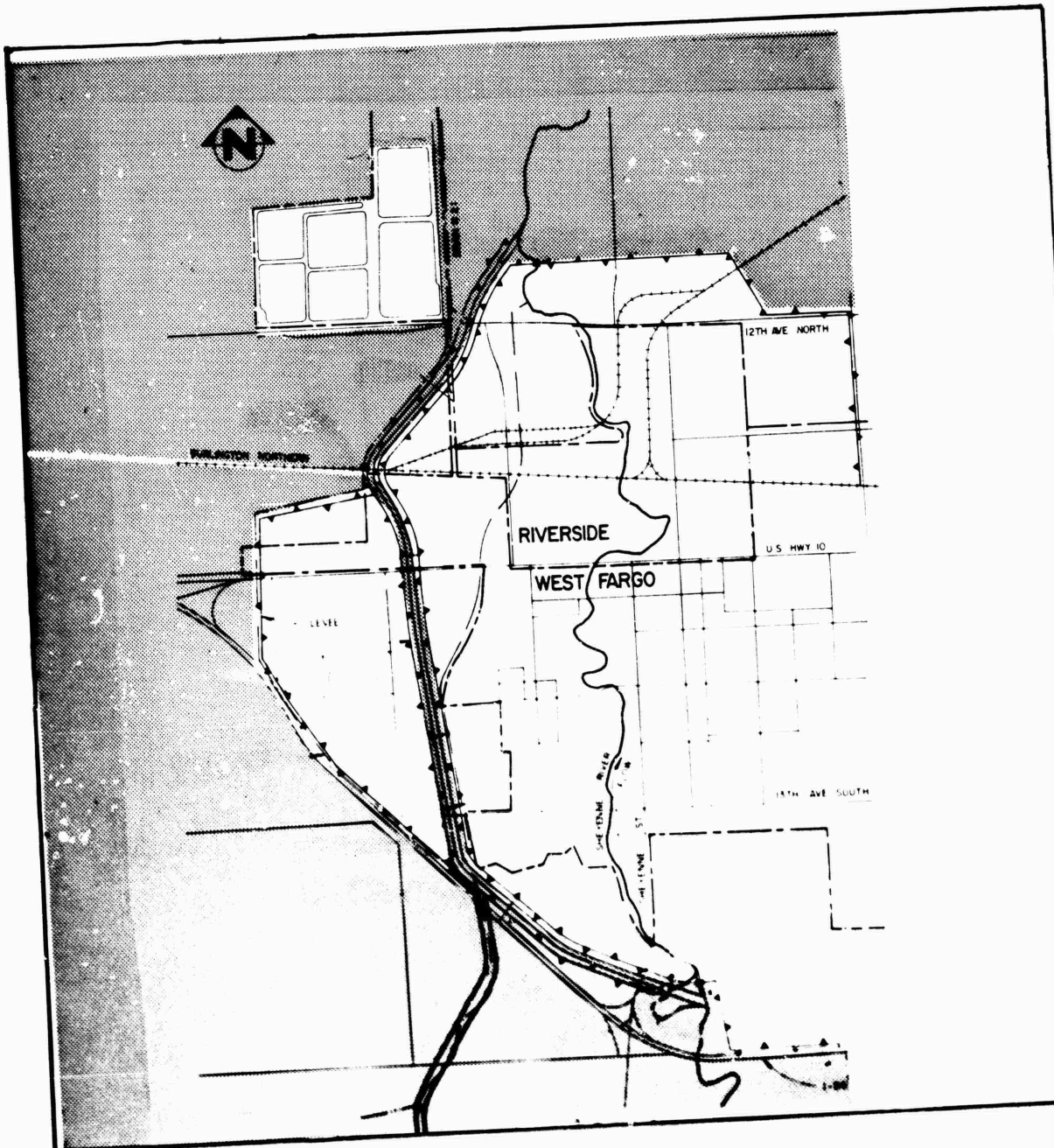
An overview of the plan accomplishments by major communities and reaches of the river is contained in table 19.



NOTE: THE REDUCTION IN FLOODPLAIN AREA IS DUE TO INCREASED FLOOD CONTROL STORAGE AT BAIRDHILL DAM WITH THE RECOMMENDED PLAN AND IS APPROXIMATE. THESE OUTLINES SHOULD NOT BE USED FOR REGULATORY PURPOSES.



**EXISTING & MODIFIED CONDITIONS
MAP AND CROSS-SECTION
OF
FLOOD PLAIN
VALLEY CITY, NORTH DAKOTA
FIGURE 7**



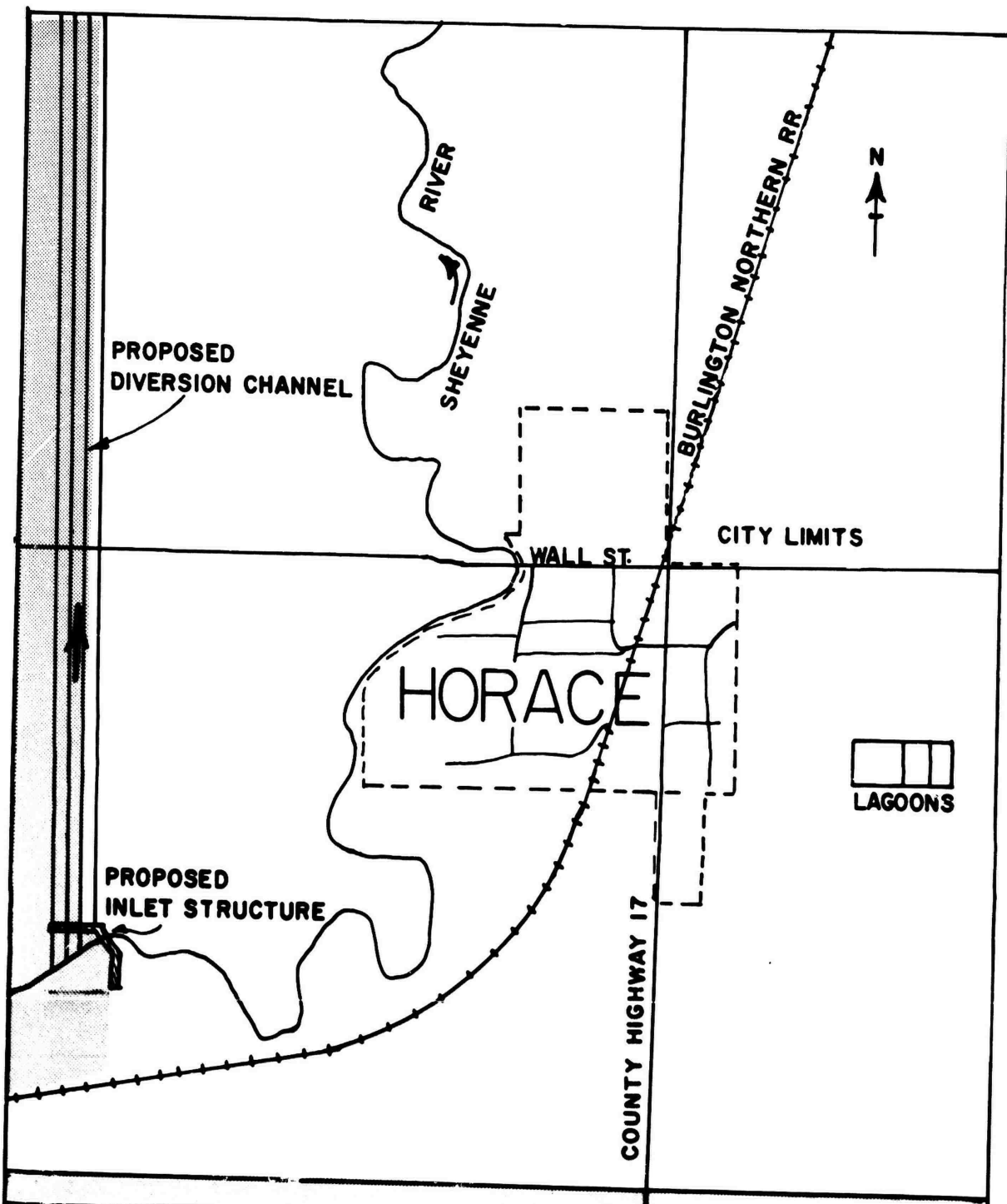
Area Classified as Floodplain Under "with" Plan Conditions

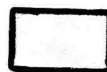


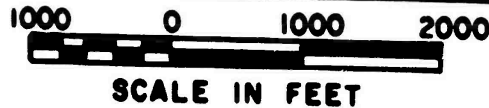
NOTE: Entire area is classified as floodplain under existing conditions for the 1-percent and greater floods. For the with plan (modified) conditions, the areas protected by the levees are removed from the floodplain classification.

EXISTING AND MODIFIED CONDITIONS FLOODPLAIN AREA AT WEST FARGO AND RIVERSIDE

FIGURE 5



 Area Subject to Flooding With Occurrence of 2% Chance Flood Under "With" Plan Conditions.



NOTE: Essentially entire area is subject to flooding due to 1-percent chance flood under existing conditions. Under "with plan" (modified) conditions, for floods larger than the 2-percent chance, some of the protected areas may be subject to flooding.

EXISTING AND MODIFIED CONDITIONS
FLOODPLAIN AREA AT
HORACE

FIGURE 9

Table 19 - Overview of plan accomplishments by community or reach of river

<u>Community</u>	<u>Plan accomplishments</u>
Valley City	Flood levels for most floods reduced to nondamaging or manageable levels. The base flood level would be reduced by at least two feet. The area of the city subjected to development restrictions because of floodplain and/or floodway classification would be reduced.
Lisbon	Flood levels would be reduced from 1/2 foot to 4 feet for any given event, depending on the magnitude and runoff characteristics of each flood.
Horace	Flood levels would be reduced by about 3 feet for most floods.
West Fargo/Riverside	The area of the cities protected by the levees (essentially the entire area of both communities) would be removed from the floodplain classification.
<u>Rural areas/reach of river</u>	
Baldhill Dam to river mile 150 (near Lisbon)	Flood levels caused by runoff from the drainage area above Baldhill Dam could be substantially reduced; greatest reductions would be near Valley City and Baldhill Dam.
River mile 150 (near Lisbon) to Horace	Flood levels of the second peak would be reduced substantially as a result of the raise of Baldhill Dam. Flood levels of the first peak would be reduced some by flood control storage in Dead Colt Creek Dam.
Horace to West Fargo	Flood levels along the Sheyenne River between Horace and West Fargo would be reduced by about 3 feet for most floods. The area west of the diversion channel alignment would have incidence of flooding reduced by flood storage behind Baldhill and Dead Colt Creek Dams.

Table 19 - Overview of plan accomplishments by community or reach of river (cont)

Rural areas/reach of river

Plan accomplishments

West Fargo to mouth of Sheyenne River	Peak flood levels basically unchanged although the Dead Colt Creek Dam may reduce the peak. Nonpeak flood levels, especially during the second peak, would be reduced by the raise of Baldhill Dam. Residential and other developments could be protected from flooding by ring levees or other nonstructural techniques.
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SUMMARY OF EFFECTS

An assessment and evaluation of the effects of the entire selected plan considering all components would be beneficial. However, uncertainty as to degree of implementation with several of the components scheduled for non-Federal or other Federal agency responsibility requires that the primary assessment and evaluation consider only the following components:

- Raise of Baldhill Dam.
- Levees and diversion at West Fargo/Riverside.
- Flood diversion channel - Horace to West Fargo.
- Control of drainage.
- Floodplain regulations.
- Control of private levee construction.

ECONOMIC EFFECTS

The economic effects of the plan include the benefits and costs. The flood damage reduction benefits of the plan are presented in table 20. An estimated \$22,431,600 in benefits would accrue on an average annual basis.

The estimated costs for those components designated for implementation by the Corps of Engineers with the assistance and cooperation of non-Federal sponsors are presented in table 20.

The costs and benefits presented represent evaluations and computations based on October 1981 price levels and an interest rate of 7 5/8 percent.

Table 20 - Summary of economic effects of selected plan

Component	First cost		Total	Average annual costs (2)	Average annual benefits (3)	Benefit cost ratio (7)
	Federal (1)	Non-Federal (1)				
Levees and diversion at West Fargo/Riverside	\$9,100,000	\$8,100,000 ⁽⁴⁾	\$17,200,000	\$1,529,900	\$19,595,000 ⁽⁷⁾	12.8
Flood diversion channel from Horace to West Fargo	3,975,000	4,125,000 ⁽⁴⁾	8,100,000	706,300	1,383,000	2.0
Raise of Baldhill Dam	9,100,000 ⁽⁴⁾⁽⁵⁾	--	9,100,000	767,700 ⁽⁵⁾	1,453,600 ⁽⁶⁾	1.9
Total	22,175,000	12,225,000	34,400,000	3,003,900	22,431,600 ⁽⁷⁾	7.5

(1) Apportionment of costs to Federal and non-Federal interests were based on traditional cost-sharing policies.

(2) Includes annual operation and maintenance costs of \$46,000 for levees and diversions at West Fargo, \$25,000 for the Horace to West Fargo diversion, and \$10,000 additional at Baldhill Dam.

(3) Benefit estimates are separated by component using the assumption that the levees and diversion at West Fargo would be first in-place, the flood diversion channel from Horace to West Fargo would be second in-place, and the raise of Baldhill Dam would be third in-place.

(4) Costs of lands, easements, and rights-of-way are included as a portion of this cost.

(5) Includes the costs allocated to flood control only. The total first cost of construction to current criteria for a 5-foot raise of Baldhill Dam is estimated at \$31,100,000, of which \$22,000,000 is apportioned to Dam Safety Assurance.

(6) Includes only readily quantifiable benefits from Baldhill Dam to about river mile 125 near Anselm. Additional benefits are creditable in the reach from river mile 125 to West Fargo; however, these were not quantified.

(7) An additional \$46,500 annual savings in flood insurance administration costs at West Fargo and Riverside is creditable as benefits but is not included here.

The levees and diversion at West Fargo/Riverside have an estimated first cost of \$17,200,000 and a separable benefit-cost ratio of 12.8. The flood diversion channel from Horace to West Fargo has an estimated first cost of \$8,100,000 and a separable benefit-cost ratio of 2.0 when the diversion is considered functioning in addition to the levees and diversion at West Fargo/Riverside. The apportioned first cost for flood control with the raise of Baldhill Dam is \$9,100,000. The entire first cost to raise Baldhill Dam 5 feet constructed to current-day criteria would be about \$31,100,000. However, as part of the Major Rehabilitation and the Dam Safety Assurance Programs, Baldhill Dam is scheduled for major structural upgrading because of insufficient spillway capacity. The estimated cost to accomplish the needed structural upgrading is \$22,000,000. The remaining \$9,100,000 is apportioned to flood control. The benefits attributable to the additional flood control storage at Baldhill Dam exceeded \$1,453,600 on an average annual basis. Flood control benefits of this magnitude can be readily quantified when considering the Baldhill Dam acting alone in the reach from Baldhill Dam to river mile 125 near Anselm.

Additional benefits can be credited to the Baldhill Dam raise in the reach from river mile 125 to West Fargo but were quantified in only a preliminary manner and were not included in the tabulation. These additional benefits could range from \$500,000 to \$800,000 if the raise of Baldhill is considered after the Dead Colt Creek dam is built and prior to implementation of the flood diversion channel from Horace to West Fargo.

The overall plan is economically justified with a benefit-cost ratio of 7.5, and, as shown in table 20, the major components of the plan are also incrementally justified. Additional detail on the cost estimates can be found in Appendix J, Cost Estimates, and additional detail on the estimate of flood control benefits can be found in Appendix C, Economic Analysis - Flood Damages and Benefits.

COST SHARING

The cost sharing between Federal and non-Federal interests for the raise of Baldhill Dam, the levees and diversions at West Fargo/Riverside, and the flood diversion channel cannot be determined at this time.

Table 20 presents a cost-sharing distribution based on traditional cost-sharing policies. These policies state that for major reservoir projects where the benefits are widespread the costs allocated to flood control are a Federal responsibility. For local protection projects such as levees and flood diversion channels, the non-Federal sponsors are responsible for all lands; easements; rights-of-way; and all alterations and relocations to utilities, streets, bridges, buildings, storm drains, and other structures and improvements. Changes to railroad bridges and approaches are a full Federal expense in both cases. The non-Federal sponsors are also required to operate and maintain the local protection projects after completion. Using the traditional cost-sharing formulas, the non-Federal share of the first cost would be about \$12,225,000 at the current estimate of project cost. The operation and maintenance costs of the levee and diversion projects are estimated at \$46,000 annually for the levees and diversion channel at West Fargo/Riverside and \$25,000 annually for the flood diversion channel from Horace to West Fargo.

A possible alternative to the traditional cost-sharing policies which have been discussed with non-Federal interests was a uniform percentage of the flood control portion of the construction cost assigned to the non-Federal sponsor. If 35 percent of the construction cost were the responsibility of the non-Federal sponsor, the non-Federal share would be \$12,040,000.

ENVIRONMENTAL CONSIDERATIONS

The plan would provide net benefits to the environmental quality account. The levees and diversion at West Fargo/Riverside and the flood diversion channel from Horace to West Fargo with the grassed areas and selected areas of shelterbelts would improve the environmental quality in the area. The raise of Baldhill Dam would have some limited adverse effects because of temporary flooding of woodlands and other habitats; however, the fish and wildlife mitigation features of the project as well as several potential enhancement features would provide net environmental benefits. Some of the more significant potential enhancement opportunities at Baldhill Dam are: (1) the creation of shallow marsh impoundments at the upper end of Lake Ashtabula with management of water levels in the marshes for fish and wildlife, (2) the controlling of grazing on project lands, and (3) the opportunity to modify slightly the regulation of lake levels and discharges to reduce the magnitude of drawdowns

for flood control during the winter months in years of anticipated light to moderate runoff. The control of drainage, floodplain regulation, and control of private levee construction should result in some slight positive environmental effects from the greater consideration given to environmental values associated with drainage and floodplain development.

SOCIAL WELL-BEING CONSIDERATIONS

The plan would provide net benefits to the social well-being account. The improvements to the quality of life for over 15,000 persons greatly overshadow the adverse effects to those persons relocated or otherwise affected. Virtual elimination of flood threat to residents of West Fargo/Riverside and major reductions in the flood threat to residents of Valley City and other parts of the basin would significantly improve the physical and mental well-being of these people. About 3,300 acres of land would be dedicated to public use, and about 100 cabins and residences, 2 businesses, 6 farmsteads and 2 church camps would have to be acquired. Most of the property acquisition is associated with the raise of Baldhill Dam. Although the numbers of persons that would be relocated and acres of land that would be acquired give the appearance of a significant social impact, most of the structures involved are lakeshore cabins. These cabins are used periodically throughout the summer and other suitable locations may be available around the lake. Much of the land around Lake Ashtabula is marginally useful as cropland because of steep slopes and low productivity. Several landowners at the upper end of Lake Ashtabula would be significantly affected by acquisition of their lands. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 would be applied for all properties acquired, thus ensuring that any adverse impacts would be minimized. Replacement housing benefits provided for under the act would be applied only to those primary residences acquired. Incorporation of the ring levees, wetlands, and Dead Colt Creek Dam components would provide additional social well-being benefits and have some additional impacts. The net effect of these components would be beneficial.

COMPLIANCE WITH FEDERAL LAWS AND EXECUTIVE ORDERS

Executive Orders and Congressional acts have been used in the planning and decision-making process and in the final development of the alternatives.

including the selected plan. An assessment was made of the compliance of the selected plan with these acts and executive orders. Table 1 in the Environmental Impact Statement displays a list of environmental protection statutes and requirements and the degree of compliance of the selected plan. The selected plan is in compliance with these statutes and requirements. Compliance with the following acts and executive orders is discussed below: Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; Executive Memorandum, Prime and Unique Farmlands; and the Endangered Species Act of 1973, as amended.

Executive Order 11990, Protection of Wetlands, 24 May 1977

The Shyenne River basin contains many important wetlands. In fact, most of the basin, especially the upper portion, is located in the "Prairie Pothole Region" and is considered significant waterfowl production habitat for the North American continent. Because of this fact, wetlands protection and enhancement is a planning objective and various alternatives have been formulated and evaluated to protect these values.

Various features of the selected plan would affect wetlands. The most noticeable adverse effects would result from the 5-foot raise of the flood pool of Lake Ashtabula. However, these impacts are not considered significant because the wetlands are located at the upper end of the existing permanent pool and are expected to remain in the same general location without a drastic change in total acreage.

Various measures have been included in the selected plan to protect and enhance the wetlands of the basin. These measures include creating subimpoundments at Lake Ashtabula, restoring wetlands and on-land storage of water, and the control of future wetland drainage.

The selected plan is considered to be the most responsive to the planning objectives and would not result in unacceptable impacts on the environment or wetlands.

Executive Order 11988, Floodplain Management, 24 May 1977

This executive order requires Federal agencies to recognize the significant values of floodplains and consider the public benefits that would be realized from restoring and preserving floodplains. The principal purpose of this study was to evaluate various methods of reducing flood damages, and, since the conclusions and recommendations of this study do affect and propose changes in floodplain uses, the significant values of the floodplain must be recognized. The actions proposed for non-Federal or other Federal agency implementation are as important in their effects as the three actions proposed for implementation by the Corps of Engineers. Table 21 presents the summary assessment of the proposed plan components considering Executive Order 11988. The components would provide both potential beneficial and adverse effects on the natural and beneficial values of the floodplain. Wherever possible, actions have been taken to preserve or improve floodplain values and minimize any potential adverse effects. The residual adverse effects would be relatively minor. The net effect of the plan would be beneficial because the plan would reduce flood damages in the basin, recognizing the flood hazards of the basin, and would provide information on ways to preserve the natural and beneficial values of the floodplain. The proposed plan of action represents the most practical alternative plan for management of the Sheyenne River floodplain and would comply with Executive Order 11988.

Executive Memorandum, Analysis of Impacts on Prime and Unique Farmlands in EIS, CEQ Memorandum, 30 August 1976

Much of the basin, including the floodplain, upland areas, and the Red River Valley downstream of Kindred, is classified as prime farmland. (See plates D-6 through D-9 in Appendix D for their location.) The diversion structures would be constructed in areas designated as prime farmland. Secondary impacts would result from increased development because of reduced flooding. The commitment of prime farmland to the construction of flood damage reduction structures is considered an acceptable tradeoff and use of the resource.

Table 21- Summary assessment of components considering Executive Order 11980

Item	Corps of Engineers Implementation		Non-Federal or other Federal Implementation							Overall plan
	Basin of Smith Hill Dam	Levees and diversion at West Fargo	Diversion channel Norace to West Fargo	Control private levee construction	Control drainage	Floodplain regulation	Ring levees at residence and farmsteads	Dam on Dead Cult Creek	Increase flood- water storage on wetlands	
1. Is project or action located in floodplain?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
2. Reason for location in floodplain	To reduce flood damage in Valley City, Liberty, and other areas downstream	To reduce flood damage in West Fargo and riverbank areas	To reduce flood damage in Norace and West Fargo	To prevent future increases in flood damage to reach river of the North	To prevent future increases in flood damage at residential and farmsteads in rural areas	To prevent future increases in flood damage in flood plain areas	To reduce flood damage at residential and farmsteads in rural areas	To reduce flood damage at downstream locations and provide water-based recreation	--	To reduce flood damage in basin
3. Does this action conform to State or local floodplain protection standards?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Does this action affect the natural and beneficial values of the floodplain?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
-Directly (1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
-Indirectly (2)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
-Beneficially	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
-Adversely	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
-Significant adverse magnitude	No	No	No	No	No	No	No	No	No	No
5. Were steps taken to minimize potential harm to or within the floodplain?	Yes, but limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes	--	Yes
6. Were other viable alternatives to this action considered?	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

(1) Effects which are caused by the construction, operation, or implementation of the action at the site of implementation.
 (2) Effects which are caused downstream or away from the actual site of implementation, such as the area protected by a levee or the area downstream of a dam.

Public Law 96-159, Endangered Species Act of 1973, as Amended

In accordance with the Endangered Species Act, as amended, coordination with the U.S. Fish and Wildlife Service was conducted to determine the presence of any species included on the Federal list of endangered or threatened species in the study area and any impacts the proposed plan could have on endangered or threatened species. The peregrine falcon and the bald eagle were the species found on the lists. The selected plan components should have no adverse effects on the continued existence or critical habitat of either species.

PLAN IMPLEMENTATION

Implementation of the selected plan requires coordinated actions by Federal, State, regional and local interests. The degree of participation by each interest varies from one plan component to the next.

INSTITUTIONAL REQUIREMENTS

No new institutional entities have to be formed to implement the selected plan. However, several modifications to the authorities and/or jurisdictional boundaries of some institutions could improve the relative ease of implementation. The important institutional requirements for each plan component will be discussed.

Levees and Diversion at West Fargo/Riverside

The Corps of Engineers would implement this component with participation of the local sponsor. The alignment of the levees and diversion channel at West Fargo and Riverside is only partially within the city limits of West Fargo and Riverside. For land acquisition and operation and maintenance of the project, either arrangements between the cities of West Fargo and Riverside and the Southeast Cass Water Resource District may have to be made, the city limits may have to be expanded to include the total alignment, or some other suitable arrangement may have to be made to ensure that the local sponsor has the legal capability to fulfill the items of local cooperation.

The local sponsors of the project have the capability of fulfilling their obligations; however, additional detail on the relationships of the local sponsors will be needed before implementation.

The non-Federal sponsor would be required to operate and maintain this plan component.

Flood Diversion Channel from Horace to West Fargo

The Corps of Engineers would implement this plan component with the participation of the non-Federal sponsors. The Southeast Cass Water Resource District has the authority and capability to fully implement the non-Federal responsibilities of this plan component. The non-Federal sponsor would be required to operate and maintain this plan component.

Raise of Baldhill Dam

Although some of the local cooperation items, such as regulation of drainage and floodplain regulations, relate to the raise of Baldhill Dam, no specific responsibilities of this plan component fall to non-Federal interests, with the possible exception of cost sharing. If cost sharing is required for flood control, the North Dakota State Water Commission has the capability to provide the non-Federal share. The Corps of Engineers would implement and operate and maintain the modified Baldhill Dam project.

Regulation of Drainage and Regulation of Levee Construction

The North Dakota State Water Commission, in conjunction with the water resource districts, has the authority and capability to regulate drainage and levee construction as described in the selected plan. The ability to provide uniform and effective regulation of drainage and levees would be improved if the boundaries of the water resource districts were watershed boundaries rather than political boundaries. Implementation of these plan components is the responsibility of the non-Federal sponsor.

Floodplain Regulations

The cities, townships, and counties have the authority to regulate the floodplain. Regulation of the floodplain is coordinated through the North Dakota State Engineer. The State of North Dakota encourages the adoption and enforcement of floodplain regulations. The passage of additional legislation would further guarantee that the regulations would be enforced throughout the basin. Implementation of this component would be the responsibility of non-Federal interests.

Dead Colt Creek Multiple-Purpose Dam

The North Dakota State Water Commission, Ransom County Water Resource District, and other non-Federal agencies and interests have the authority and capability to implement this component. Although a part of the selected plan, this component is not part of the plan recommended for Corps of Engineers participation.

Ring Levees at Farmsteads and Residences

The Corps of Engineers, Soil Conservation Service, North Dakota State Water Commission, and water resource districts have the authority and capability (subject to funding) to evaluate the merits of this option and develop a plan for implementation. Actual implementation authorities fall only with the Soil Conservation Service and non-Federal interests. However, the specific authority and the justification to implement a plan for the designated reaches of the Sheyenne River would have to be prepared for Soil Conservation Service and non-Federal interest participation. The Southeast Cass Water Resource District has the non-Federal jurisdictional capability for implementation of this plan component. Although part of the selected plan, this component is not part of the plan recommended for Corps of Engineers implementation.

Restoring Drained Wetlands and/or Increasing the Floodwater Storage Capability of Existing Wetlands

The Fish and Wildlife Service and Bureau of Reclamation potentially have the authority at the Federal level to participate in development of

this component. At the non-Federal level, the North Dakota State Water Commission and water resource districts appear to have the authority to develop such flood control measures. However, a coordinated effort by non-Federal interests and the other Federal agencies would be needed to initiate implementation. Although part of the selected plan, this component is not part of the plan recommended for Corps of Engineers implementation.

DIVISION OF PLAN RESPONSIBILITIES

The responsibilities of implementation of the recommended plan fall to the Corps of Engineers as the Federal agency and to the North Dakota State Water Commission, the water resource districts (particularly Southeast Cass Water Resource District), and the city of West Fargo and other communities as the non-Federal entities.

Local Cooperation Requirements

To ensure proper functioning of the selected plan and a wise investment and use of Federal funds with implementation of the raise of Baldhill Dam, levees and diversion channel at West Fargo/Riverside, and flood diversion channel from Horace to West Fargo, the non-Federal sponsor will be required to fulfill the following items of local cooperation:

1. Provide without cost to the United States all lands; easements; rights-of-way; relocations of utilities, highway bridges, roads, and sewers; except as otherwise warranted for special reasons, as determined by the Chief of Engineers to be necessary for the construction, operation, and maintenance of the levees and diversion at West Fargo/Riverside and flood diversion channel from Horace to West Fargo.

2. Prescribe and enforce regulations to prevent obstructions or encroachments on channels, floodplain and floodway areas, and ponding areas that would reduce their flood-carrying capacity or hinder the operation and maintenance of the projects and/or compromise the level of protection provided by the projects.

3. Regulate private and non-Federal public levee construction along the Sheyenne River to ensure that construction of levees would not significantly affect flood levels and/or potentially increase flood damages either upstream or downstream.

4. At least annually inform affected interests of the limits of the protection afforded by the project.

5. Maintain and operate the flood diversion channel and levee portions of the project after completion in accordance with regulations prescribed by the Secretary of the Army.

6. Regulate drainage activities in the watershed to ensure that flood frequencies and discharges are not increased or that the effectiveness of the projects is not adversely affected.

7. Publicize floodplain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the projects.

8. Hold and save the United States free from damages that may result from construction and maintenance of the project, not including damages which are the fault of or are caused by the negligence of the United States or its contractors.

The local sponsor's provision of these items would be credited toward the non-Federal share of the construction cost, with the non-Federal share and necessary financing arrangements to be determined as satisfactory to President and Congress. As part of the traditional cost-sharing policies, non-Federal interests would provide the lands, easements, etc., for local protection projects, as in the case described above. However, if the President and Congress adopt a change in cost-sharing policies that involves a uniform percentage of non-Federal sharing of the construction cost, the items that the non-Federal interests have provided would be credited toward their share.

Regulation of private and non-Federal public levees along the entire Sheyenne River is important to proper functioning of the plan. However, the reach of the Sheyenne River from Kindred to West Fargo is the most important, because uncontrolled levee construction in this reach could significantly increase flood stages and flood damages at West Fargo, and could jeopardize the effectiveness of the proposed levee and diversion channel project.

Although the relocations of utilities, roads, bridges, etc., are generally the local sponsor's responsibility, under some special circumstances the modifications would be considered a Federal cost and responsibility within the traditional cost-sharing policies. An example of a modification in this category would be a water line that would pass under a project levee and that would jeopardize the level of protection or the integrity of the project if this line fails. This situation plus others, as determined appropriate by the Chief of Engineers, would constitute a special reason for including the item as a Federal rather than a non-Federal cost.

Before construction of the recommended plan begins, the non-Federal sponsors will have to enter into a legal and binding agreement with the Corps of Engineers that they will provide these items of local cooperation, including the appropriate share of the costs. The non-Federal sponsors will have to comply with all appropriate Federal laws and regulations in their role of implementation and/or operation and maintenance of the plan components, including the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and Section 601 of Title VI of the Civil Rights Act of 1964.

Acquisition of lands, easements, and rights-of-way for construction and subsequent maintenance of the project would have to 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, and affected persons would have to be informed of the pertinent benefits, policies, and procedures in connection with this act.

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, would have to be complied with in connection with the maintenance and operation of the project.

Cost Sharing

The non-Federal share of project costs will be paid by the non-Federal sponsors. The non-Federal sponsors will include the North Dakota State Water Commission, Southeast Cass Water Resource District and city of West Fargo. Other cities, counties and water resource districts may also be involved. Because a specific cost-sharing policy is not being recommended in this report, the amounts and/or categories of cost for the plan and plan components to be provided by the non-Federal interests cannot be presented. However, on the basis of information available on cost sharing, the North Dakota State Water Commission has indicated its willingness to work with local government entities to provide the needed items of local cooperation including the non-Federal share of the costs as ultimately determined when the project is authorized by Congress.

Views of Non-Federal Sponsors and Other Agencies with Implementation Responsibilities

The North Dakota State Water Commission, Southeast Cass Water Resource District, and city of West Fargo are the principal non-Federal sponsors. Other non-Federal interests may also become involved with non-Federal sponsorship of portions of the plan; however, their specific roles and involvement will be defined at a stage closer to implementation and when the cost-sharing for the plan is set. The Fish and Wildlife Service, although not having a specific role with implementation responsibilities, has provided the required Coordination Act Report which gives its recommendations to minimize and mitigate for projected losses to fish and wildlife habitat.

North Dakota State Water Commission - The Commission supports the selected plan and has indicated its willingness to work with local governments to provide the required items of local sponsorship. A letter from the Commission is in the comment-response section of the Environmental Impact Statement.

Southeast Cass Water Resource District - The Southeast Cass Water Resource District supports the selected plan and has expressed its willingness to work with the North Dakota State Water Commission to provide the required items of local cooperation. Its letter of support is presented in the comment-response section of the Environmental Impact Statement.

City of West Fargo - West Fargo supports the selected plan and has expressed its willingness to work with the North Dakota State Water Commission to provide the needed items of local cooperation. Its letter of support is presented in the comment-response section of the Environmental Impact Statement.

U.S. Fish and Wildlife Service - The Bismarck Field Office of the U.S. Fish and Wildlife Service believes the selected plan has merit and should be implemented. It has recommended mitigation measures for fish and wildlife resources that would be affected by the selected plan. Its recommendations will be incorporated into the selected plan. A summary of the recommendations and the method of incorporating the recommendations into the selected plan is presented in table 22. The complete text of the Coordination Act Report is presented in Appendix N.

Table 22 - Summary of fish and wildlife mitigation recommendations of the Fish and Wildlife Service and method of incorporation into selected plan

<u>Recommendation</u>	<u>Method of incorporation</u>
1. Replace affected fish-rearing ponds	These ponds would be replaced as either a part of the Dam Safety Assurance Program or as a part of the raise of Baldhill Dam.
2. Replace hatchery building at Baldhill Dam	This building would be replaced as either a part of the Dam Safety Assurance Program or as a part of the raise of Baldhill Dam.
3. Initiate study on creating marsh impoundments at the upper end of Lake Ashtabula	Further studies are planned during the next stage of preconstruction planning or possibly under the operation of the existing project.
4. Develop an interagency plan to control feedlot runoff and cattle access to the upper reaches of the Sheyenne River	St. Paul District would coordinate and cooperate with other agencies in developing a plan to control nutrient-laden runoff. The lead agency would be an agency other than the Corps.

Table 22 - Summary of fish and wildlife mitigation recommendations of the Fish and Wildlife Service and method of incorporation into selected plan (continued)

Recommendation	Method of incorporation
<p>5. The Corps should purchase 450 acres of existing wildlife habitat or, if suitable lands are available within project boundaries, the Corps should manage these lands for wildlife purposes</p>	<p>Sufficient lands would be purchased and/or managed to ensure that the projected losses to wildlife habitat would be mitigated. Up to 450 acres outside of project lands would be considered for purchase if needed. The amount to be purchased and managed would be determined after a more detailed evaluation of specific land requirements and identification of the project take-line. Acquisition of additional lands for mitigation would be kept to a minimum by managing project lands as much as practical. If additional lands outside the project take-line are needed, lands not contiguous with project lands would also be considered, including potentially suitable lands near the Shoyenne National Grasslands.</p>
<p>6. Project lands, when appropriate, should be dedicated to fish and wildlife management purposes and administered under a general plan in accordance with Sections 3 and 4 of the Fish and Wildlife Coordination Act.</p>	<p>A general plan for management of project lands would be developed after acquisition. Appropriate and suitable lands would be identified for fish and wildlife management. Sections 3 and 4 of the Fish and Wildlife Coordination Act would be consulted in the development of the land management plan.</p>

(1) The recommendations are summarized in this table; the complete recommendation is contained in Appendix N, Fish and Wildlife Coordination Act Report.

SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

The coordination of the selected plan presented in the review draft Phase I General Design Memorandum and Environmental Impact Statement, Sheyenne River, North Dakota was accomplished through public meetings, distribution of the draft report, and agency coordination meetings. The review and comment period was January through August 1982. The minutes of a public meeting held on 28 January 1982 in Fargo, North Dakota, to present the selected plan are contained in Appendix A. Letters of comment received in response to the selected plan and the review draft report are printed in the Environmental Impact Statement or the technical appendixes. Table 23 contains a list of all agencies or interests sending in letters of comment, a synopsis of their comments, and the location in the report where a copy of the letter can be found.

The letters of comment received can be grouped into four types, on the basis of the nature of the comments:

1. Support for the proposed plan - Letters of support were received from the North Dakota State Water Commission, city of West Fargo, and Southeast Cass Water Resource District -- the principal non-Federal interests required for local sponsorship. Several interests represented on the Lower Sheyenne River Citizens Committee also provided general letters of support. However, several other Committee members provided letters of support for the plan except for the raise of Baldhill Dam. The support for the plan seemed to be based on the comprehensiveness of the plan and the general meeting of the objective of reducing flood damages in the basin with a minimum of adverse social and environmental impacts. Those members which qualified their support of the plan by not supporting the raise of Baldhill Dam included representatives from the Barnes County area, the Griggs County area, and the area potentially affected by the Kindred Dam. Although the North Dakota Department of Human Services endorses the selected plan, most agencies did not support or endorse the plan. Some indicated their approval of a plan other than the Kindred Dam but did not specifically support or endorse the selected plan.

2. No major objections - No Federal or State agency that commented on the selected plan had any major objections to the plan. The Environmental Protection Agency gave an LO-1 rating to the proposal, which signifies a lack of objection to the proposal and that the information presented is adequate for decision making. Some concerns were raised by several agencies on specific project features and impacts; however, these concerns were either responded to in the EIS or the report was modified to reflect the concerns.

3. Opposition to the raise of Baldhill Dam - A substantial amount of opposition was expressed regarding the proposed raise of Baldhill Dam. This opposition was expressed largely by landowners at the upper end of Lake Ashtabula, friends and neighbors of these landowners, property owners around the lake, and persons having an association with the Cooperstown Bible Camp.

The property owners, including the Cooperstown Bible Camp and the Wesley Acres Church Camp, are concerned with the potential adverse effects on their interests from the purchase of their property for the raise of Baldhill Dam for flood control.

Several other groups and interests -- including Barnes, Griggs, Traill, and Steele Counties; the Sheyenne Valley Association; the North Dakota Wildlife Federation, and others -- have indicated they did not believe the benefits to be gained by the raise of Baldhill Dam justified the cost of raising the structure.

4. Opposition/concern about other portions of the plan - Some people living north of West Fargo in the Harwood area expressed concern about several aspects of the selected plan, including potential adverse effects on their area by the diversions, lack of protection for the agricultural lands north of West Fargo, and lack of a firm program for implementing the ring levees and other nonstructural measures recommended for their area.

Property owners at the upstream end of the levees and flood diversion channel around West Fargo near the inlet to the diversion channel have objected to the need for the diversion channel and the use of their land for the project.

Several other interests also offered statements of nonsupport for some components of the plan, including the flood diversion channel from Horace to West Fargo and the diversion components in general.

Several comments were received supporting upstream floodwater storage, including the Kindred Dam, with the view that the reservoir storage alternatives would be more effective in reducing the widespread effects of flooding.

The comments and concerns of all interests expressed in response to the selected plan were considered in the process of making the recommendations contained in this report.

Table 23 - Summary of comments on plan presented in the draft Phase I GDM

Agency or interest	Comment	Location of letter of comment
<u>Federal</u>		
Department of Agriculture Forest Service Soil Conservation Service Department of Commerce	Supported decision to drop Kindred Dam. Supported need for land treatment.	EIS EIS
National Oceanic and Atmospheric Administration National Ocean Survey National Weather Service Department of Health and Human Services	Requested copy of final EIS. Concerned about effects on surveying monuments. Concerned about needs for flood forecasting.	EIS EIS EIS
Department of Housing and Urban Development Department of the Interior, Fish and Wildlife Service Environmental Protection Agency Federal Energy Regulatory Comm.	Commented on justification for and treatment of alternatives and effects. Concerned about possible impacts of construction workers. No objection to selected plan; provided Coordination Act Report. No major objections to the plan; LO-1 rating for EIS. No specific comments.	EIS EIS EIS, App. N EIS EIS
<u>State</u>		
MN Pollution Control Agency ND Department of Human Services ND Federal Aid Coordinator ND Forest Service ND Game and Fish Department ND Parks and Recreation Dept. ND State Highway Department ND State Water Commission	Encouraged floodwater storage in wetlands. Endorsed the proposed project. Distributed reports to ND State agencies. Selected plan is more acceptable than Kindred Dam plan. Concurs with Fish and Wildlife Service Coordination Act Report. Supported decision to drop Kindred Dam. Concerned with effects of plan on highways. Willing to work with local governments to provide items of local cooperation.	EIS EIS EIS App. A App. N EIS EIS EIS
<u>Regional and local governments</u>		
Barnes County Water Resource Dist. Valley City West Fargo	Supported selected plan except for the raise of Baldhill Dam. No opinion expressed at this time. Supported selected plan; willing to be a local sponsor.	EIS EIS EIS

Table 23 - Summary of comments on plan presented in the draft Phase I GDM (continued)

Agency or interest	Comment	Location of letter of comment
Coburn Township	Supported selected plan except for the raise of Baldhill Dam.	App. A
Griggs County	Opposed the raise of Baldhill Dam.	EIS, App. A
Griggs County Water Resource Bd.	Supported selected plan except for the raise of Baldhill Dam.	App. A
Riverside Township	Opposed the raise of Baldhill Dam.	EIS
Sheldon Road of Education	Supported diversion plan.	App. A
Southeast Cass Water Resource District	Supported selected plan; willing to be a local sponsor.	EIS, App. A
Steele County	Opposed raise of Baldhill Dam.	EIS
Sverdrup Township	Opposed raise of Baldhill Dam.	EIS
Traill County	Opposed raise of Baldhill Dam.	EIS
Washburn Township	Opposed raise of Baldhill Dam.	EIS
<u>Individuals, organizations, and other interests</u>		
Lester Abraham, Page, ND	Agreed with selected plan except for raise of Baldhill Dam.	EIS
Glen Anderson, Sheldon, ND	Supported selected plan except for raise of Baldhill Dam and diversion from Horace to West Fargo.	App. A
Shirley Anderson, Cooperstown, ND	Opposed raise of Baldhill Dam.	App. A
Association for the Preservation of the Sheyenne River Valley, Cooperstown, ND	Opposed raise of Baldhill Dam.	App. A
Kenneth Beaton et al., West Fargo, ND	Protested the diversion at West Fargo.	App. A
Robert Broadshaug, Fargo, ND	Supported upstream storage, including Kindred Dam.	App. A
Earl Brokofsky, West Fargo, ND	Supported the selected plan.	App. A
Richard Collins, Erie, ND	Supported drainage control.	App. A
Cummings Evangelical Free Church, Cummings, ND	Opposed raise of Baldhill Dam.	App. A
Dakota Water Users, Inc., Finley, ND	Opposed raise of Baldhill Dam.	EIS
Alice Erickson, Cooperstown, ND	Opposed raise of Baldhill Dam.	App. A
Mr. & Mrs. Algot Erickson, Cooperstown, ND	Opposed raise of Baldhill Dam.	App. A
Ernest Erickson, Cooperstown, ND	Opposed raise of Baldhill Dam.	App. A
Mrs. Sidney Erickson, Coopers-town, ND	Opposed raise of Baldhill Dam.	App. A
Evangelical Free Church, Pembina, ND	Opposed raise of Baldhill Dam.	App. A
Faith Evangelical Free Church, Grand Forks, ND	Opposed raise of Baldhill Dam.	App. A

Table 23 - Summary of comments on plan presented in the draft Phase I GDM (continued)

Agency or interest	Comment	Location of letter of comment
Mr. & Mrs. C.H. Falkenstein, Bismarck, ND	Opposed raise of Baldhill Dam.	App. A
First Evangelical Free Church, Bismarck, ND	Opposed raise of Baldhill Dam. Cultural resource considerations are adequate.	App. A EIS
Michael Gregg, Grand Forks, ND Griggs County Township Officers Association, Cooperstown, ND	Opposed raise of Baldhill Dam. Opposed raise of Baldhill Dam.	App. A App. A
Roland Grosz, Bismarck, ND Robert J. Jacobsen, Luverne, ND	Questioned raise of Baldhill Dam. Opposed raise of Baldhill Dam.	App. A App. A
Agnes Jensen, Cooperstown, ND Dave Kaspari, Sheldon, ND Arthur & Harriet Klemetson, Hillsboro, ND	Favored the selected diversion plan. Opposed raise of Baldhill Dam. Favored selected plan except for the raise of Baldhill Dam.	App. A App. A App. A
Earl Kruschwitz, Valley City, ND Lake Ashtabula Landowners and Users Association, Valley City, ND	Opposed raise of Baldhill Dam.	App. A
David Lunde, Cooperstown, ND Luverne Sportsman Club, Luverne, ND	Supported selected plan except for raise of Baldhill Dam.	App. A App. A
Joe Milton, Jr., McLeod, ND National Wildlife Federation, Washington, D.C.	Opposed raise of Baldhill Dam. Supported the selected plan.	App. A App. A
Tena Nelson, Cooperstown, ND North Dakota Wildlife Federation, Inc., Erie, ND	Believed each increment of the plan should be justified; other comments. Opposed raise of Baldhill Dam.	EIS App. A
Mr. & Mrs. Delvo Olson, Buxton, ND	Opposed raise of Baldhill Dam.	EIS
Red River Flood Control Association, Drayton, ND	Questioned raise of Baldhill Dam.	App. A
Red River Valley Fair, West Fargo, ND	Generally opposed to diversions.	App. A
Mr. & Mrs. Merton Shelby, Mapleton, ND	Concerned with diversion at West Fargo.	App. A
Sheyenne Valley Association, Kindred, ND	Opposed to raise of Baldhill Dam.	App. A
Sheyenne Valley Grazing Association, Sheldon, ND Sodbuster Club, Dazey, ND	Supported selected plan except for raise of Baldhill Dam. Favored the selected plan. Opposed raise of Baldhill Dam.	App. A App. A App. A

Table 23 - Summary of comments on plan presented in the draft Phase I GDM (continued)

Agency or interest	Comment	Location of letter of comment
Jacque Stockman et al., Harwood, ND	Expressed disfavor with selected plan for the Harwood area.	App. A
W.J. Tintes, West Fargo, ND	Supported the floodway around West Fargo plus extension to Harwood.	App. A
Martin Ueland, Cooperstown, ND United Methodist Church Camps, Turtle Lake, ND	Opposed raise of Baldhill Dam.	App. A
Ronald Wieland, Dazey, ND	Opposed raise of Baldhill Dam.	EIS
Mr. & Mrs. Bernhard Wold,	Opposed raise of Baldhill Dam.	EIS, App. A
Thief River Falls, MN	Opposed raise of Baldhill Dam.	App. A

CONCLUSIONS

After a comprehensive review of the water related problems and needs of the lower Sheyenne River basin; thorough evaluation of the alternative measures and plans addressing these problems and needs; and consideration of the environmental, economic, social well-being and implementability aspects of the various alternatives, I have drawn the following conclusions:

1. The flooding problems of the lower basin are the most significant water resource problems. While other problems and needs have been identified, the overwhelming expression of public sentiment has been for a solution to the flooding problems.
2. The selected plan provides a comprehensive approach to addressing the flooding problems of the lower Sheyenne River basin. The plan would reduce average annual flood damages of the basin about three-fourths and provide a very high degree of flood protection at the urban area of West Fargo and Riverside. The selected plan is economically justified, and is implementable. When compared with other possible alternative plans, the selected plan represents the most acceptable trade off of economic, environmental, social well-being, and implementability considerations while achieving the objective of reducing flood damages.
3. The levees and diversion at West Fargo and Riverside, the flood diversion channel from Horace to West Fargo, and the raise of Baldhill Dam should be implemented by the Corps of Engineers subject to the provision of the required items of local cooperation by non-Federal interests.
4. Significant opposition to the raise of Baldhill Dam (and Lake Ashtabula) has been expressed by the property owners around Lake Ashtabula whose lands and/or property may be acquired in the implementation of the project. This opposition includes a substantial number of churches and individuals associated with the Cooperstown Bible Camp. The adverse impacts of the raise of Baldhill Dam were considered in the alternatives evaluation and decision-making process, and the overall benefits to be provided by the raise of the dam outweigh the adverse effects on the property owners affected.

5. During future detailed design stage of plan implementation, additional information will be gathered to provide the best alignments and designs of the various project features. Some of the levee and channel alignments; specific features of levee, channel, and dam design; and right-of-way (land acquisition) requirements should change in a manner to make the plan more acceptable to those expressing concern or opposition.

6. Floodwater retarding structures on tributaries to the Maple and Sheyenne Rivers could additionally reduce flood levels along the Sheyenne River north of West Fargo. These floodwater storage impoundments could be implemented by non-Federal interests to supplement the selected plan and increase the overall reductions in flood damages in the basin, particularly in the agricultural damage category.

7. A coordinated effort by Federal, State, regional, and local entities should be followed in the implementation of the selected plan. This coordinated effort is essential for effective implementation and functioning of the plan. Commitments by all levels of government will be needed to implement the plan.

8. The multiple-purpose Kindred Lake project, authorized for construction in the Flood Control Act of 1970 (Public Law 91-611), is no longer considered to be the most desirable alternative for flood damage reduction in the Sheyenne River basin. Although flood damage reduction plans using floodwater storage at the Kindred dam site were developed which would substantially reduce flood damages and would be economically justified, the level of the adverse social well-being and environmental impacts rendered the plan less acceptable than the selected plan and other plans which were carried into the final array of alternative plans. The authorized Kindred Lake project should be deauthorized.

Accordingly, it is my decision that the best interests of the public would be served by implementation of the selected plan.

RECOMMENDATIONS

I recommend that the levees and diversion at West Fargo/Riverside and the flood diversion channel from Horace to West Fargo be authorized for implementation as a Federal project. I also recommend that the existing project for flood control and water supply at Baldhill Dam authorized by the Flood Control Act approved 22 December 1944 (Public Law 78-534) be modified to provide for implementation of a Federal project for additional flood control. These measures are as described in this report with such modifications as the Chief of Engineers deems advisable. The total first cost is estimated at \$34,400,000. Total annual operation, maintenance, and replacement costs are estimated at \$81,000. The exact amount of non-Federal contributions will be determined by the Chief of Engineers before project implementation in accordance with the following requirements. Non-Federal interests must agree to these requirements before implementation:

1. Provide without cost to the United States all lands; easements; rights-of-way; relocations of utilities, highway bridges, roads and sewers; except as otherwise warranted for special reasons, as determined by the Chief of Engineers to be necessary for the construction, operation, and maintenance of the levees and diversion at West Fargo/Riverside and flood diversion channel from Horace to West Fargo.
2. Prescribe and enforce regulations to prevent obstructions or encroachments on channels, floodplain and floodway areas, and ponding areas that would reduce their flood-carrying capacity or hinder the operation and maintenance of the projects and/or compromise the level of protection provided by the projects.
3. Regulate private and non-Federal public levee construction along the Sheyenne River to ensure that construction of levees would not significantly affect flood levels and/or potentially increase flood damages either upstream or downstream.
4. At least annually inform affected interests of the limits of the protection afforded by the project.

5. Maintain and operate the flood diversion channel and levee portions of the project after completion, in accordance with regulations prescribed by the Secretary of the Army.

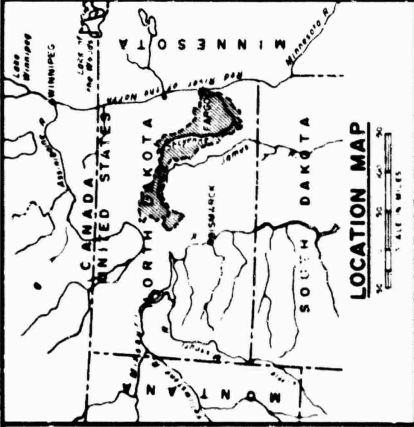
6. Regulate drainage activities in the watershed to ensure that flood frequencies and discharges are not increased or that the effectiveness of the projects is not adversely affected.

7. Publicize floodplain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the projects.

8. Hold and save the United States free from damages that may result from construction and maintenance of the project, not including damages which are the fault of or are caused by the negligence of the United States or its contractors.

I also recommend that the multiple-purpose project for flood control, water quality, recreation, and fish and wildlife at Kindred Lake, North Dakota, authorized for implementation by the Flood Control Act of 1970 (Public Law 91-611) be deauthorized.

EDWARD G. RAPP
Colonel, Corps of Engineers
District Engineer

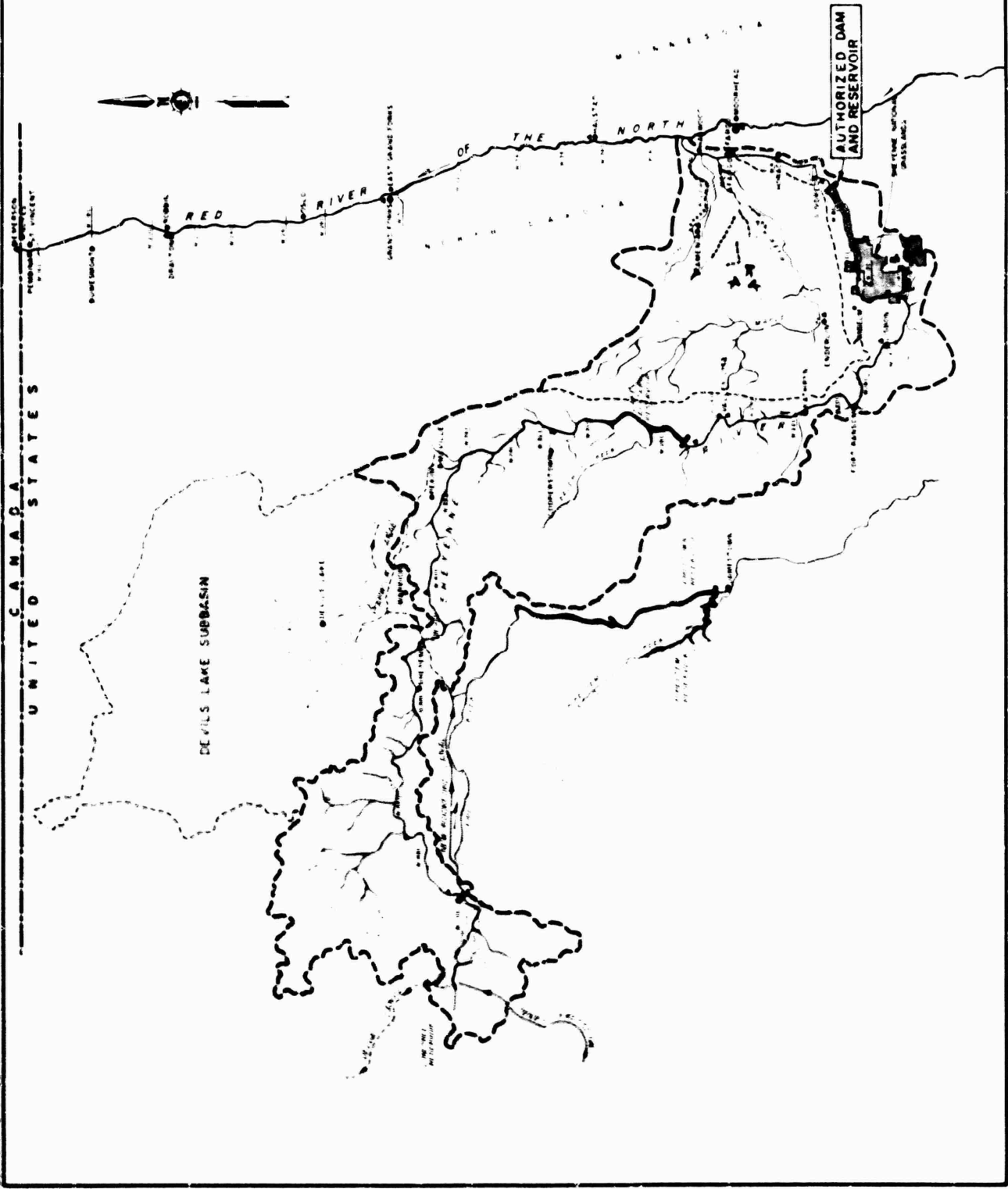


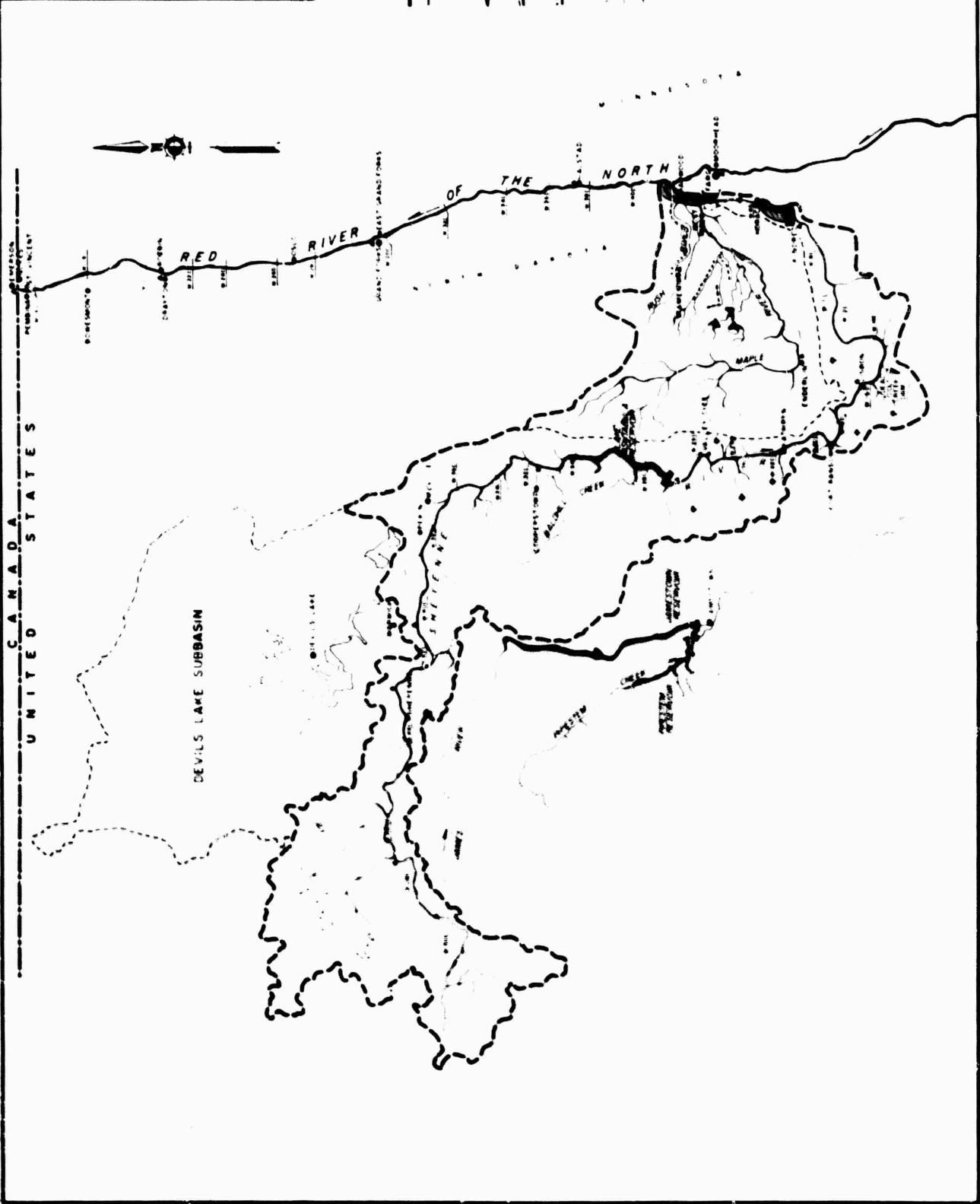
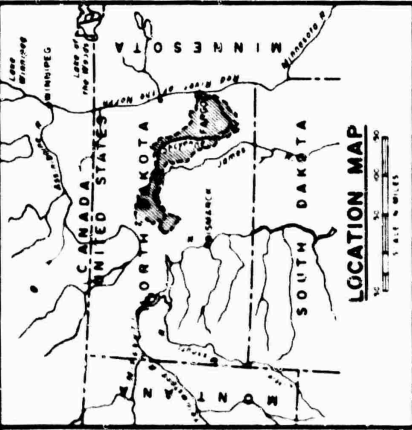
LEGEND

- RIVER BASIN OUTLINE
- - - SUBBASIN OUTLINE
- 0 100 MILES ABOVE THE MOUTH
- █ EXISTING DAM & RESERVOIR
- █ AUTHORIZED DAM & RESERVOIR
- █ EXISTING CHANNEL ENLARGEMENT
- █ EXISTING SNAGGING & CLEARING
- FIRST PRIORITY COMPONENTS OF GARRISON DIVERSION UNIT PROJECT
- DEFERRED COMPONENTS OF GARRISON DIVERSION UNIT PROJECT
- ▲ STREAM GAGING STATIONS

GENERAL EVALUATION REPORT
FLOOD CONTROL AND RELATED PURPOSES
BASIN MAP
AND
AUTHORIZED KINDRED LAKE PROJECT LOCATION MAP
RED RIVER NORTH DAKOTA
U. S. ARMY CORPS OF ENGINEERS

PLATE 1





LEGEND

- RIVER BASIN OUTLINE
- SUBBASIN OUTLINE
- M 300 MILES ABOVE THE MOUTH
- ▲ STREAM GAGING STATION
- EXISTING DAM & RESERVOIR
- EXISTING CHANNEL ENLARGEMENT
- EXISTING SNAGGING & CLEARING
- SELECTED PLAN COMPONENTS FOR CORPS OF ENGINEERS IMPLEMENTATION
- BASIN OF BALDWIN DAM
- FLOOD DIVERSION CHANNEL
- LEVEES
- SELECTED PLAN COMPONENTS FOR OTHER AGENCY IMPLEMENTATION
- RING LEVEES AT RAINLEADS AND RESIDENCES
- DAM AND RESERVOIR ON DEAD CREEK
- INCREASING FLOODWATER STORAGE CAPACITY OF EXISTING AND DRAINED WETLAND

GENERAL EVALUATION OF REPORT
FLOOD CONTROL AND RELATED PURPOSES
BASIN MAP

SELECT PLAN COMPONENTS LOCATION MAP
SHEWENEE RIVER, NORTH DAKOTA
17 MAY 1962
US ARMY, CORPS OF ENGINEERS

OUTLET TO DIVERSION CHANNEL



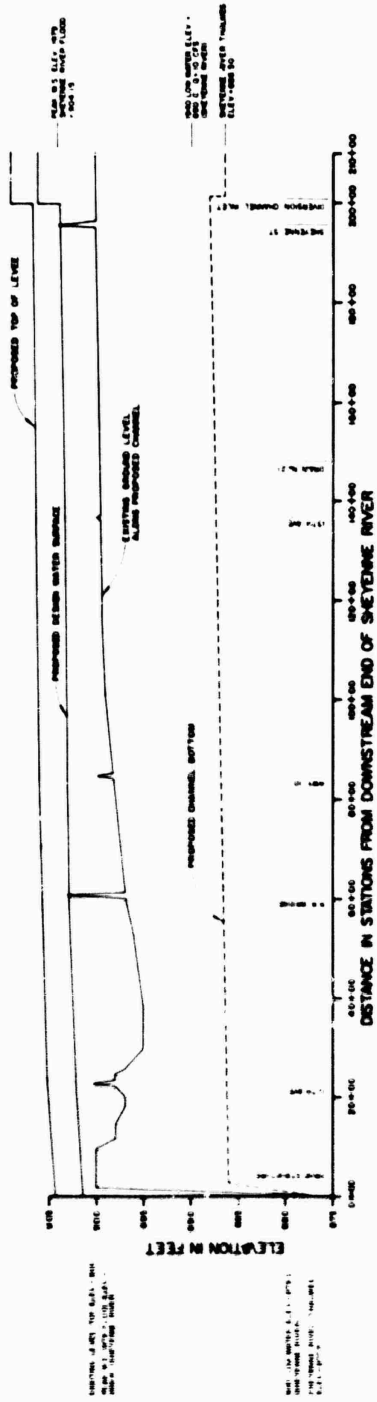
DIVERSION CHANNEL AT MAIN AVENUE



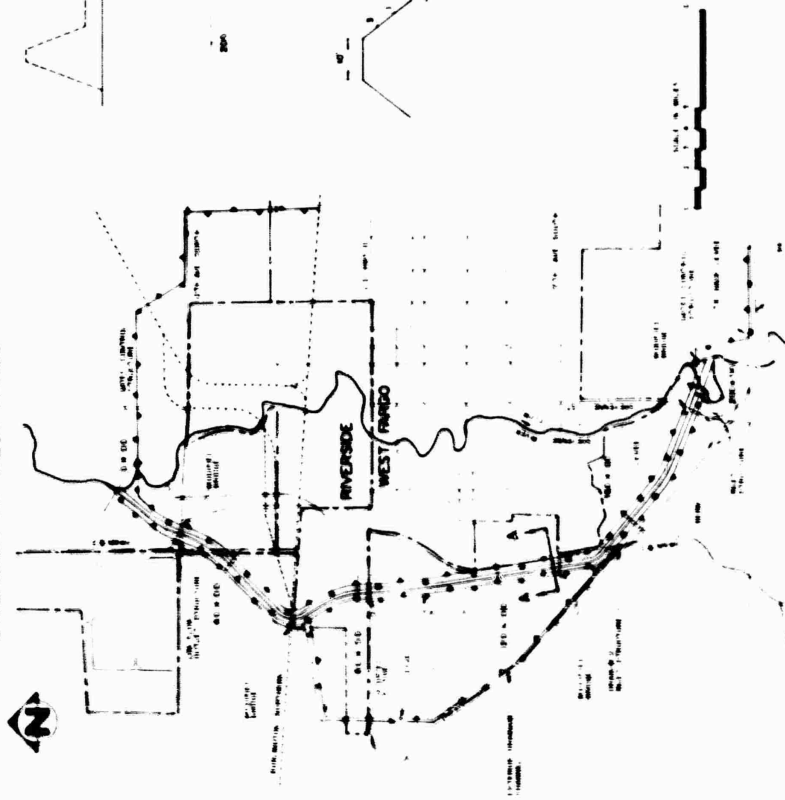
INLET OF DIVERSION CHANNEL



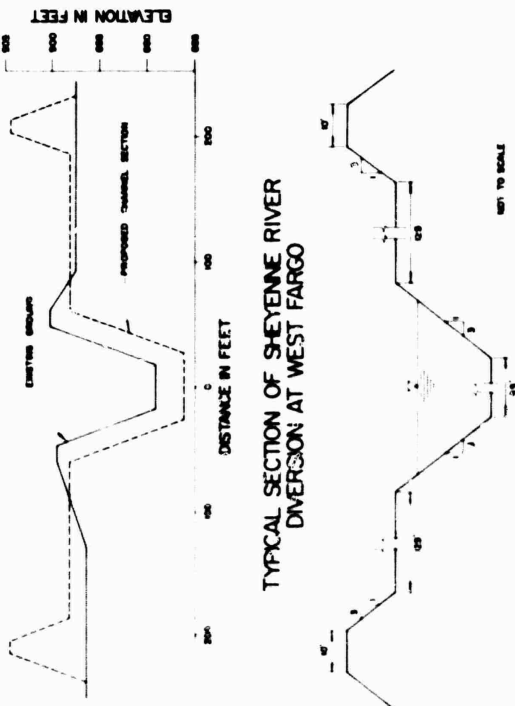
PROFILE OF SHEYENNE RIVER DIVERSION AT WEST FARGO



PLAN VIEW OF SHEYENNE RIVER DIVERSION AT WEST FARGO



SECTION A-A
100' DOWNSTREAM OF 13th AVE. S

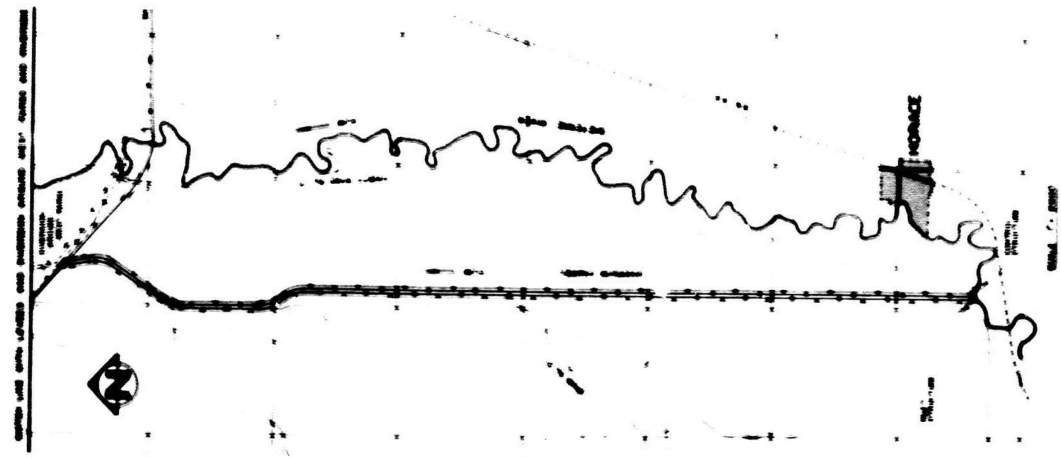


TYPICAL SECTION OF SHEYENNE RIVER DIVERSION AT WEST FARGO

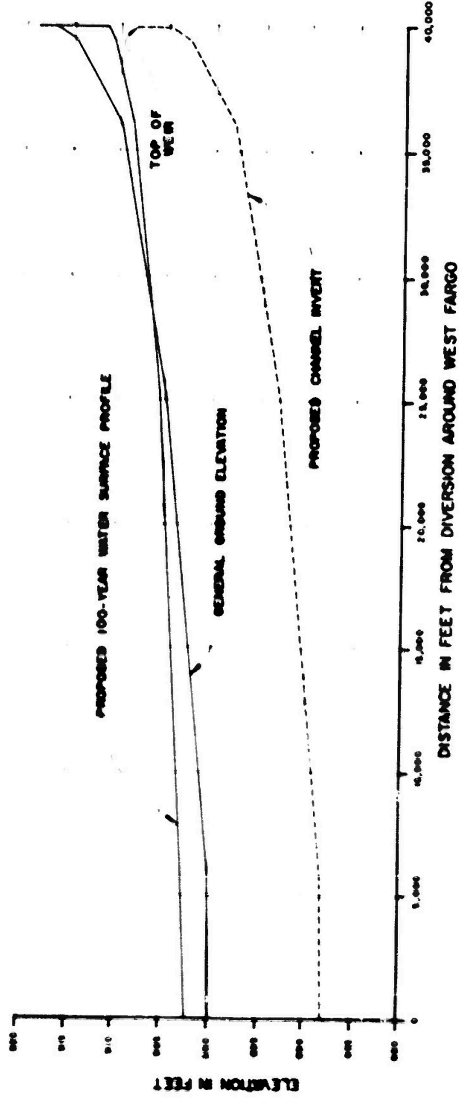
GENERAL REEVALUATION REPORT
SHEYENNE RIVER, NORTH DAKOTA
LEVEES AND FLOOD DIVERSION SYSTEM
AROUND WEST FARGO/RIVERSIDE
(M-29 TO M-24)

BY: [Name] [Title]
DATE: [Date]

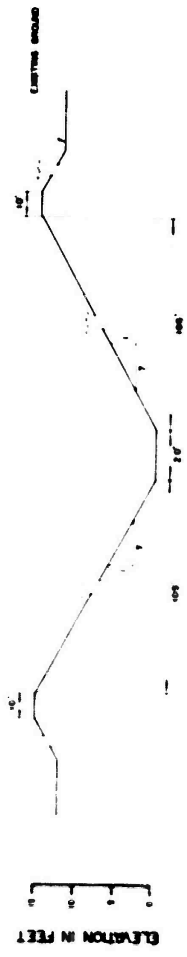
PLAN VIEW OF DIVERSION OF THE SHEYENNE RIVER
(HORACE TO WEST FARGO)



PROFILE OF SHEYENNE RIVER DIVERSION HORACE TO WEST FARGO

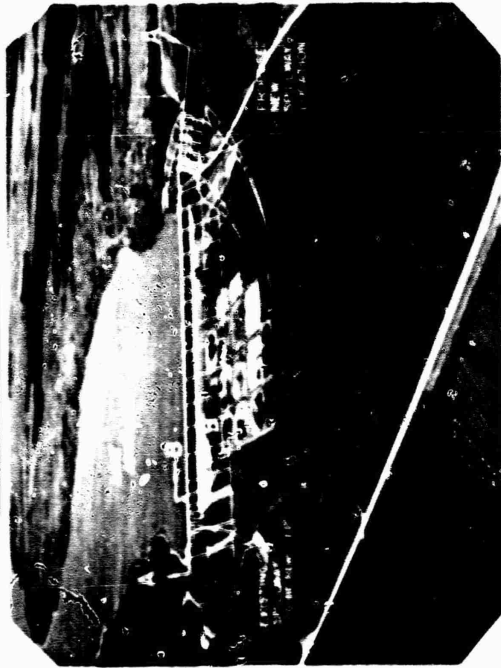


TYPICAL SECTION OF SHEYENNE RIVER
DIVERSION HORACE TO WEST FARGO

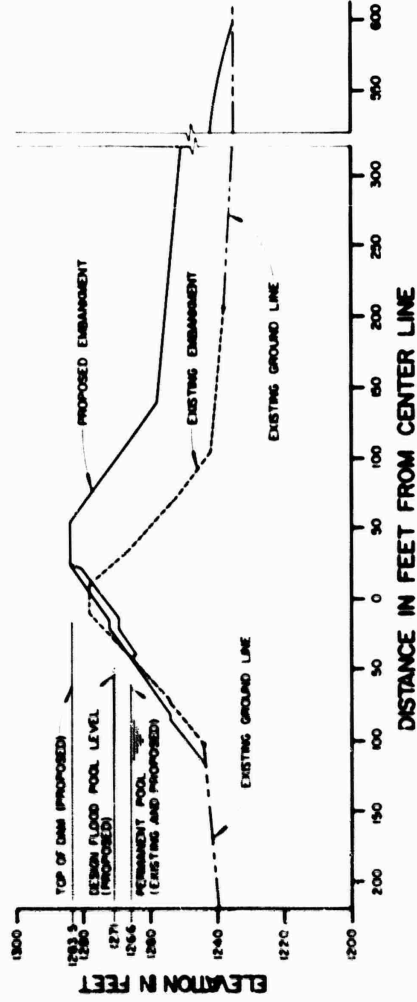


GENERAL REEVALUATION REPORT
SHEYENNE RIVER, NORTH DAKOTA
DIVERSION OF THE SHEYENNE RIVER
(M-42 TO M-24)
ST. PAUL DISTRICT
U.S. ARMY CORPS OF ENGINEERS
ALBUQUERQUE
PLATE 4

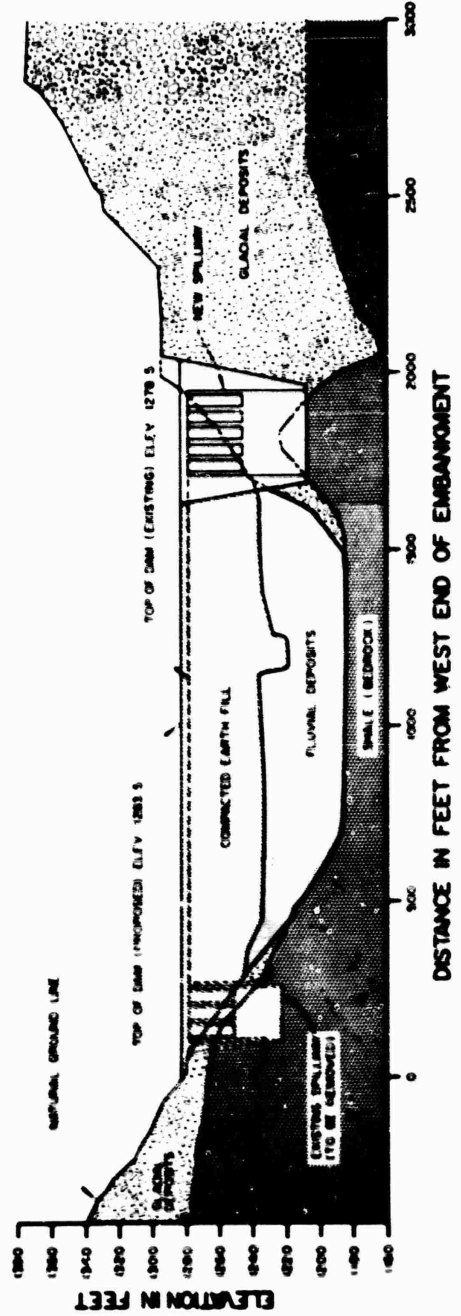
AERIAL OBLIQUE VIEW



SECTION B-B EMBANKMENT CROSS-SECTION



SECTION A-A VALLEY / DAM SECTION



PERTINENT INFORMATION

	EXISTING STRUCTURE	PROPOSED STRUCTURE
<u>ELEVATIONS</u>		
TOP OF DAM	1278.5	1283.5
SPILLWAY DESIGN POOL	1273.2	1278.0
DESIGN FLOOD POOL	1266.0	1271.0
PERMANENT POOL	1266.0	1266.0
<u>AREA (IN ACRES)</u>		
PERMANENT POOL	5430	5430
FLOOD POOL	5430	6200
FEDERALLY OWNED LAND	8463	11390
<u>STORAGE (BRADE-FEET)</u>		
WATER SUPPLY	67800	68300
FLOOD CONTROL*	39600	71000
TOTAL	69600	100000
* INCLUDES 34,800 ACRES-FEET OF DUAL USE FLOOD CONTROL STORAGE		

GENERAL REEVALUATION REPORT
 SHEYENNE RIVER, NORTH DAKOTA
**PROPOSED RAISE OF
 BALD HILL DAM**
 U.S. ARMY CORPS OF ENGINEERS
 ST. PAUL DISTRICT
 FILE NO. R23-R-7/119
 AUGUST 1962
 PLATE 5

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
GENERAL REEVALUATION REPORT
SHEYENNE RIVER, NORTH DAKOTA

OCTOBER 1982

FINAL ENVIRONMENTAL IMPACT STATEMENT

SHEYENNE RIVER, NORTH DAKOTA
FLOOD CONTROL, GENERAL REEVALUATION

Proposed Plan for the
Reduction of Flood Damages in the
Sheyenne River Basin, North Dakota

The responsible lead agency is the U.S. Army Engineer District, St. Paul.

Abstract: The St. Paul District is conducting General Reevaluation studies for flood control and related purposes on the Sheyenne River, North Dakota. Most of the flooding occurs in an area between the mouth of the Sheyenne River and Kindred, North Dakota, and results mainly from spring snowmelt and rains. Initially, 102 flood damage reduction measures were considered; from these, 5 plans were developed and studied in detail: the no action plan, a nonstructural plan, the National Economic Development plan, the Environmental Quality plan, and the selected plan. The selected plan is recommended on the basis of its responsiveness to evaluation criteria and its satisfaction of planning objectives. The implementation of this plan would provide significant flood damage reduction, recreation, and fish and wildlife benefits.

If you would like further information concerning this statement, please contact:

Mr. Robbin R. Blackman
U.S. Army Engineer District, St. Paul
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101
FTS Telephone: 725-7746
Commercial Telephone: (612) 725-7746

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1.00 SUMMARY

Major Conclusions and Findings

1.01 The selected plan must satisfy specific needs of the study area and show a positive contribution to the objectives of National Economic Development (NED) and Environmental Quality (EQ). To achieve a balanced plan which reflects society's dual concern for improving national economic efficiency while maintaining and enhancing the natural environment, one plan emphasizing the Environmental Quality objective and another plan emphasizing the National Economic Development objective were developed.

1.02 The National Economic Development plan addresses the planning objectives while maximizing the net economic benefits. The 5-foot raise of Baldhill Dam, levee and diversion around West Fargo/Riverside, and diversion from Horace to West Fargo plan constitutes part of the NED plan for the Sheyenne basin. It has a benefit/cost (B/C) ratio of 6.9 and net benefits of \$21,974,000. This plan is considered implementable, although it does have some controversy associated with landowner opposition to the raise of Baldhill Dam.

1.03 Environmental Quality measures are intended to preserve, enhance, or restore environmental values at a level greater than the "without" project condition. The levee and diversion at West Fargo/Riverside, diversion from Horace to West Fargo, and various EQ measures combine to form the EQ plan for the Sheyenne basin. It has a B/C ratio of 5.7. This plan is considered implementable to varying degrees. However, it does have some controversy associated with it, primarily the wetland restoration component.

1.04 The selected plan is a combination of measures that best address the problems and needs of the basin identified during the study. This plan includes a levee and diversion at West Fargo/Riverside, a 5-foot raise of Baldhill Dam, shelterbelts at selected locations along the diversion channel, control of grazing and cattle access at Lake Ashtabula, and various other measures. The overall plan has a B/C ratio of 5.0 and is considered implementable. The portion of the plan that would be implemented by the Corps has a B/C ratio of 7.5. (See other sections of the Reevaluation Report and EIS for more detailed descriptions of the selected plan.)

1.05 The selected plan is in compliance with Executive Order 11990, Protection of Wetlands, and does not result in unacceptable impacts to wetlands. Levee locations in the selected plan have been modified to meet the requirements of Executive Order 11988 on Floodplain Management. This document contains a Section 404(b)(1) Evaluation and will be submitted to Congress with the Reevaluation Report. (See the Reevaluation Report and other portions of the EIS for more information on compliance with Executive Orders and statutes.)

Areas of Controversy

1.06 Acquisition of any additional lands for either flood control or required compensation at Lake Ashtabula is a controversial matter. The control of grazing and fencing at Lake Ashtabula are also controversial issues. Landowners immediately downstream of the diversions believe that flood levels would be worsened by the project; however, studies have shown that flood levels would not be increased by the overall plan.

Unresolved Issues

1.07 Impacts on cultural resources is an unresolved issue because intensive surveys of the proposed project area have not been conducted. On the basis of previous surveys, there is a high probability that previously unknown cultural resources exist in the project area. Although cultural resource studies conducted to date are consistent with the level of detail required by ER 1105-2-50, further survey work will be necessary during the Phase II GDM to fully comply with the National Historic Preservation Act of 1966 and the Archaeological and Historic Preservation Act.

1.08 All cultural sites located during Phase II intensive surveys that would be affected by the selected plan will be tested to determine their eligibility for the National Register of Historic Places. The results will be coordinated with the State Historic Preservation Office and the National Park Service. In addition, comments will be requested from the Advisory Council on Historic Preservation, in accordance with 36 CFR 800, for all significant resources that will be affected by the selected plan.

Relationship to Environmental Protection Statutes and Other Environmental Requirements

1.09 Table 1 describes the relationship of the alternatives that were developed in detail to applicable environmental regulations (see section 3.00 for a discussion of all the alternatives considered).

Table 1 - Relationship of Plans to Environmental Requirements and Protection Statutes
(Plan Tentatively Recommended: Selected)

Federal Statutes	No Action	Nonstructural	NED	EQ	Selected
Archeological and Historic Preservation Act, as amended, 16 USC 469, et seq.	N/A	Full	Full	Full	Full
Clean Air Act, as amended, 42 USC 7401, et seq.	Full	Full	Full	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 USC 1251, et seq.	Full	Full	Full	Full	Full
Coastal Zone Management Act, as amended, 16 USC 1451, et seq.	N/A	N/A	N/A	N/A	N/A
Endangered Species Act, as amended, 16 USC 1531, et seq.	Full	Full	Full	Full	Full
Estuary Protection Act, 16 USC 1221, et seq.	N/A	N/A	N/A	N/A	N/A
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.	Full	Full	Full	Full	Full
Fish and Wildlife Coordination Act, as amended, 16 USC 661, et seq.	Full	Full	Full	Full	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.	Full	Full	Full	Full	Full
Marine Protection, Research and Sanctuaries Act, as amended, 22 USC 1401, et seq.	N/A	N/A	N/A	N/A	N/A
National Historic Preservation Act, as amended, 16 USC 470a, et seq.	N/A	Full	Full	Full	Full
National Environmental Policy Act, as amended, 42 USC 4321, et seq.	Full	Full	Full	Full	Full
Rivers and Harbors Act, 33 USC 401, et seq.	N/A	N/A	N/A	N/A	N/A
Watershed Protection and Flood Prevention Act, as amended, 16 USC 1001, et seq.	N/A	N/A	N/A	N/A	N/A
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.	Full	Full	Full	Full	Full
<u>Executive Orders, Memoranda, etc.</u>					
Floodplain Management (E.O. 11988)	Full	Full	Full	Full	Full
Protection of Wetlands (E.O. 11990)	Full	Full	Full	Full	Full
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A	N/A	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 Aug 76)	Full	Full	Full	Full	Full
<u>Land Use Plans</u>					
Shenandoah National Grasslands Land Use Plan	Full	Full	Full	Full	Full
West Fargo Development Plan	Full	Full	Full	Full	Full
<u>State and Local Policies</u>					
	Full	Full	Full	Full	Full
<u>Required Federal Entitlements</u>					
Clean Water Act Section 404(b)(1) Permits	Full	Full	Full	Full	Full

NOTES: The compliance categories used in this table were assigned on the basis of the following definitions:

- a. Full compliance - All requirements of the regulation have been met for current stage of planning.
- b. Partial compliance - Some requirements of the regulation have not been met for current stage of planning.
- c. Noncompliance - Violation of requirement of the statute, E.O., policy, etc.
- d. Not applicable (N/A) - Regulation is not applicable.

2.00 NEED FOR AND OBJECTIVES OF ACTION

Study Authority

2.01 The Flood Control Act of 31 December 1970 (Public Law 91-611), Title II, Section 201, authorizes the Secretary of the Army, acting through the Chief of Engineers, to construct and implement the Kindred Lake project and other improvements in the Sheyenne River basin. The project is described in the report from the Chief of Engineers dated 15 September 1969, House Document No. 91-330, 91st Congress, 2d Session.

2.02 The alternatives and impacts discussed in this document were not addressed in the 14 October 1970 Final Environmental Impact Statement prepared by the St. Paul District. In 1972, a study was begun to investigate groundwater levels, water quality, and slope stability associated with the previously authorized Kindred Reservoir. In 1976, a postauthorization study was initiated to reevaluate the problems and needs of the basin and to develop alternative solutions. This Reevaluation Report and EIS are the results of that study.

Public Concerns

2.03 Through public meetings, reports, and correspondence, local interests and various government agencies have identified the following concerns: controlling floodplain development and urban flooding; improving water quality; and preserving wildlife habitat, aesthetic values, recreation, and cultural resources. A detailed discussion of the public involvement program is presented in the Reevaluation Report, Appendix A, and in Section 6.00 of this document.

Planning Objectives

2.04 The primary planning objective is to develop an implementable plan with an acceptable level of flood protection and minimal or no environmental impacts.

2.05 The planning objectives were developed using guidance given in the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources and from identified resource management needs and public concerns. Two broad national objectives are enhancement of national economic development by increasing the value of the Nation's output of goods and services and enhancement of environmental quality by management, preservation, and restoration of natural, cultural, and recreational resources and amenities. Specific planning objectives for this project include:

- a. Reducing flood damages in the Sheyenne River basin.
- b. Preserving and enhancing the wildlife habitat and populations in the basin.
- c. Maintaining a municipal and industrial water supply.

d. Preserving and enhancing the aesthetic and recreational amenities and resources of the basin.

e. Minimizing social impacts and relocations.

f. Preserving cultural resources.

3.00 ALTERNATIVES

3.01 Seven alternative plans were formulated during Stage 2, and were grouped according to their major element: the D plans contained a diversion; the K plans involved Kindred Reservoir. As the study progressed, modifications to the plans resulted in the Stage 3 alternatives. (See the Reevaluation Report and Appendixes for more discussion of the alternatives, existing setting, and impacts.)

Plans Eliminated from Further Study

3.02 Plan D-1 - Plan D-1 would consist of a levee and diversion around West Fargo, diversion to the Wild Rice River, revised management and/or a 5-foot raise at Baldhill Dam, tributary dams at miles 150 and 158, wetland restoration, storing water in coulees, and/or putting control structures on legal drains. Revised management of Baldhill Dam could increase fish winterkill in Lake Ashtabula, significantly affecting the recreational fishery. In addition, winter drawdowns would probably adversely affect Lake Ashtabula's use for downstream water supply and would therefore be objectionable to downstream interests. A 5-foot raise of the lake would adversely affect about 170 acres of woodland wildlife habitat. It would also require relocation of over 100 farmsteads and residences, mostly cabins around the lake. Adverse environmental impacts associated with tributary dams would probably be minor. Wetland restoration could have flood control benefits and significant wildlife value. Although this plan is economically feasible, it is not considered implementable as formulated.

3.03 Plan D-2 - Plan D-2 would consist of a levee and diversion around West Fargo, diversion from Horace to West Fargo, revised management of Baldhill Dam, relocation of frequently flooded residences at Valley City, and ring levees at farmsteads and residences from Kindred to Horace and from West Fargo to the mouth. As discussed under Plan D-1, the revised management of Baldhill Dam is undesirable from a fishery standpoint. A major adverse social impact of this plan would be the relocation of about 87 residences in Valley City. This plan was economically feasible; however, because of undesirable social and biological aspects, it is not considered implementable as formulated.

3.04 Plan D-3 - Plan D-3 would consist of a levee and diversion around West Fargo, a 5- to 15-foot raise of Baldhill Dam, tributary dams T-150 and T-158, restoration of drained wetlands, storing water in coulees, and/or putting control structures on legal drains from Baldhill Dam to Kindred. Raising Baldhill Dam to increase flood protection does not have overwhelming local support. In addition, adverse social impacts are significant for raises greater

(R 3/18/83)

than 5 feet. Over 100 residences would be relocated under this plan. Adverse wildlife impacts would result from loss of habitat resulting from temporary inundation and would increase proportionally with the higher raises of the dam. The tributary dams have less adverse impact on fish and wildlife resources than raises of Baldhill Dam, but they do not have complete local acceptance. Wetland restoration could have significant benefits; however, local support for this measure is low. The overall plan had marginal economic feasibility, and is not considered implementable.

3.05 Plan D-4 - Plan D-4 would consist of a levee and diversion around West Fargo, channelization of the Sheyenne River from Kindred to West Fargo, revised management of Baldhill Dam, tributary dams T-150 and T-158, ring levees around farmsteads, and wetland restoration. Channelization would have significant adverse aesthetic impacts caused by the destruction of about 500 acres of woodlands, which is about 40 percent of the remaining woodlands in the immediate area from Kindred to West Fargo. The effects of revised management of Baldhill Dam were discussed under Plan D-1. Alignments for ring levees around farmsteads could have minor adverse effects on wildlife and habitat because of the partial clearing of shelterbelts and windbreaks. Other impacts of this plan are similar to Plan D-3. The overall plan had marginal economic feasibility and is not considered implementable.

3.06 Plan K-1 - Plan K-1 would consist of a full-sized Kindred Dam and revised management of Baldhill Dam. The effects of revised management of Baldhill Dam were discussed under Plan D-1. The most significant adverse social and environmental impacts of all the Stage 2 plans are associated with Kindred Dam. As proposed, Kindred would be a dry dam with a 9,600-acre design flood pool (maximum flood pool would affect about 14,000 acres). About 5,000 acres of woodland would be adversely affected by the temporary storage of floodwaters, which is 19 percent of the woodlands in Richland and Ransom Counties. In addition, there are 50 rare plant and 10 rare bird species found in this area. A significant adverse social impact would be the relocation of 57 residences, a 4-H camp, 2 churches, and 2 cemeteries. There are also 15 areas of historic significance in the pool area. This reach of the Sheyenne River has potential as a Federal or State scenic or recreational river. The dam would effectively preclude the reach from receiving this designation and could adversely affect potential for riverwide inclusion in the system. The economic justification for this alternative was borderline. The plan is not considered implementable.

3.07 Plan K-2 - Plan K-2 consists of a reduced-size Kindred Dam, a 5- to 15-foot raise of Baldhill Dam, and a diversion of the Maple River to the Red River. Although the reduced-size Kindred Dam would have fewer adverse impacts than the full-sized structure, the social and environmental impacts and necessary land acquisitions would still be unacceptable. Implementation of Plan K-2 would also adversely affect potential for the Wild and Scenic River designation. The social and fish and wildlife impacts of a major raise of Baldhill Dam are considerable and have generated little support. This plan was not economically feasible. The plan is not considered implementable.

3.08 Plan K-3 - Plan K-3 would consist of a reduced-size Kindred Dam, diversion to the Wild Rice River, levees from Kindred Dam to the mouth of the diversion channel, and revised management of Baldhill Dam. The adverse social and environmental consequences of these measures and the adverse effects on Wild and Scenic River potential are significant. In addition, the major land acquisitions are considered unacceptable. Although the plan is economically justified, it is not considered implementable.

Without-Project Conditions (No Action)

3.09 The following is a description of the most probable future "without-project" conditions.

a. Floods will continue to occur in the basin, and their magnitude and frequency may increase if unregulated drainage continues. Low-flow periods can also be expected to continue in the basin, although there have been only 6 years with very low runoff since the 1930's.

b. In the future, increased emphasis will be placed on improvement of the relatively poor water quality in the Sheyenne basin. However, actual improvement in river and Lake Ashtabula water quality will depend on the extent of measures taken to improve the quality of runoff from agricultural and grazing lands.

c. Baldhill Dam will be evaluated under the Dam Safety Assurance Program and, pending congressional approval, will be modified to make it conform with safety requirements.

d. Construction of private levees parallel to the river in agricultural areas will probably continue. This would tend to worsen flood conditions downstream, particularly if major reaches of the river are confined. However, since the 1978 and 1979 floods, greater interest is being expressed in controlling this type of activity.

e. The clearing of woodlands and the draining of wetlands will continue and will eventually result in significant losses. Some of the woodlands being lost are valuable bottomland hardwoods. Although about an equal amount of reforestation is being done, the plantings are usually in the uplands, which are less valuable to wildlife. The rate of woodland clearing will probably decrease because much of the land suitable for agriculture has already been put to that use. Woodland losses caused by residential expansion will probably increase. A future net loss of wildlife values is likely because of wetland drainage for both agricultural and urban uses.

f. The Sheyenne National Grasslands is managed under the multiple-use concept with emphasis on grazing and erosion control. In the future, increased emphasis will be placed on wildlife, recreation, and watershed management.

g. In general, the future environmental setting, especially in the flatter, upland areas, will degrade compared to existing conditions.

h. The population of the urban areas will probably increase, while that of the rural areas will decline. The communities in the basin will continue to grow as the demand for goods and services increases. The economic resources of the basin will remain relatively stable, especially the agricultural base. Residential expansion will continue, especially outside the rural areas. (See Appendix F, tables F-1, F-2, and discussion of growth projections on pages F-4 to F-6.)

i. Along with an increase in population and leisure time, there will be a greater need and demand for recreational development. This demand will be influenced by inflation and cost of travel.

j. The no-action conditions would not significantly affect Wild, Scenic, or Recreational River designation potential. However, debris removal from the river between Kindred and the mouth and the continued loss of woodland/wetland areas would degrade future designation potential. This degradation is inevitable without implementation of an active protection program by the State or Federal Government; however, no such program has been initiated.

k. Under the no-action conditions, existing impacts on cultural resources would continue to occur. These impacts include cultivation of archaeological sites and flooding and deterioration of historic standing structures within the floodplain. In addition, the proposed changes to Baldhill Dam under the Dam Safety Program would affect two prehistoric archaeological sites.

l. Future flood damage reduction measures will probably be similar to those currently used. Flood warning and forecasting services will continue and will become more sophisticated. Emergency flood-fighting assistance will continue as needed. After floodwaters recede, debris will continue to be removed from the river. Baldhill Dam will probably not have a significant change in operation for additional flood control, mostly because of water supply concerns. Potential average annual economic losses from the flooding are estimated at \$28,939,000 for the lower basin (October 1981 price levels).

m. Social cohesion will continue within given communities and within given interest groups which cross geographic boundaries. Drainage, drought, floods, and levee construction will continue to cause dissension between these groups or communities.

n. Fiscal capacity of sponsors will fluctuate with population growth and decline, national and regional economic conditions, and State and local political priorities. In general, it will remain somewhat constrained.

o. As discontinued rail service puts heavier traffic on roads, the transportation system will continue to be improved and expanded, although this will be increasingly difficult and expensive.

Plans Considered in Detail

3.10 The following plans were developed after comments were received on the Stage 2 report, and represent an optimum mix of water resource development measures.

3.11 National Economic Development Plan - The National Economic Development (NED) plan addresses the planning objectives while maximizing the net economic benefits. The NED plan would consist of a 5-foot raise of Baldhill Dam, including modifications for dam safety; a levee and diversion at West Fargo/Riverside; a diversion from Horace to West Fargo; ring levees at farmsteads and residences; a grassed waterway in the diversion channel; shelterbelts at selected locations along the channel; floodplain regulations; control of drainage and private levee construction; flood warning and forecasting; and a flood emergency plan. Compensation would be needed for the 5-foot raise of Baldhill Dam and would be similar to that described for the selected plan. Implementation of this plan would be a joint Federal and local effort, with total first costs of \$43,600,000. The B/C ratio is 6.9.

3.12 Environmental Quality Plan - The Environmental Quality (EQ) plan maximizes net contributions to the environment and is responsive to the project's planning objectives. The major components of the EQ plan would be a levee and diversion at West Fargo/Riverside, diversion from Horace to West Fargo, ring levees at farmsteads, wetland restoration/on-land floodwater storage, control of wetland drainage, floodplain regulations, flood insurance, control of private levee construction, flood proofing, and flood warning and forecasting. Other measures that would provide net benefits to the environment include: controlling cattle grazing and access in selected areas around Lake Ashtabula; investigating the use of aerators and low-flow releases from Lake Ashtabula to improve the fishery and water quality in the lake and river; providing grassed waterways and shelterbelts for the diversion channels; creating subimpoundments at Lake Ashtabula; encouraging public ownership/easement of riverine lands through programs such as Wild, Scenic, or Recreational River designation or development of State parks, etc., for suitable reaches of the lower Sheyenne River; and encouraging the use of more land treatment measures in the Sheyenne basin, such as stock ponds, contour farming, and shelterbelts. There would be no required mitigation or compensation associated with this plan. Implementation would be a joint Federal and local effort with total first costs of \$51,000,000. The B/C ratio is 5.7.

3.13 Nonstructural Plan - The nonstructural plan would partially meet the study objectives through the use of nonstructural measures. The plan consists of a levee and diversion at West Fargo/Riverside; postflood relocation in Valley City and Lisbon at approximately the 10-percent chance flood levels; flood proofing both old and new structures; ring levees around farmsteads and isolated developments; storing of floodwaters in upland low-lying areas; temporary on-land storage and permanent storage where possible; flood warning and forecasting; flood insurance; flood emergency measures

when needed; floodplain regulation; debris removal; more stringent controls on wetland drainage and levee construction; encouraging public ownership/easement of riverine lands through such programs as Wild, Scenic, or Recreational River designation or development of State parks, etc., for suitable reaches of the lower Sheyenne River; and possibly revising management of Baldhill Dam to the degree that is compatible with water supply and fishery needs. The only compensation required with this plan would be to offset some of the fishery impacts that would result from revised management of Baldhill Dam. Details for the compensation requirement, however, have not been determined. Implementation would be a joint Federal and local effort, with total first costs of \$53,300,000. The B/C ratio is 5.6.

3.14 Selected Plan - Of the plans studied, the selected plan would be the most responsive to the planning objectives and overall needs of the basin. It would consist of a levee and diversion at West Fargo/Riverside; a diversion from Horace to West Fargo; a 5-foot raise of Baldhill Dam; a multiple purpose reservoir at Dead Colt Creek; ring levees at farmsteads and residences from Kindred to the mouth of the river; restoration of drained wetlands and on-land storage of water; floodplain regulation; flood proofing; flood warning and forecasting; stringent control of private levee construction and wetland drainage; grassed waterways and shelterbelts along portions of the diversion; controlling grazing and cattle access, creating subimpoundments, and installing aerators at Lake Ashtabula; encouraging public ownership/easement of riverine lands through such programs as Wild, Scenic, or Recreational River designation or development of State parks, etc., for suitable reaches of the lower Sheyenne River; and encouraging the use of more land treatment measures such as conservation tillage, stock ponds, and shelterbelts.

3.15 The selected plan would require compensation to offset some of the project's impacts. The Corps of Engineers would implement the levee and two diversions, the 5-foot raise of Baldhill Dam, and the fish and wildlife compensation required for these features. All other project features, any other required compensation, and various EQ measures would be the responsibility of other agencies.

3.16 The modification of Baldhill Dam would require the replacement of fish-rearing ponds and a hatchery building located immediately downstream of the dam. These structures would either be relocated on existing project lands or on land acquired for relocation. This relocation would be a comparable replacement of facilities and a project responsibility. (See General Reevaluation Report for design and construction considerations.)

3.17 The temporary inundation of wildlife habitat caused by the fluctuating flood pool would adversely affect the vegetation and its value for wildlife. Three equally desirable compensation alternatives have been developed for the mitigation of habitat impacts.

3.18 If project lands are not managed for fish and wildlife purposes (for example, if they are not available or not suitable), up to 450 acres of existing habitat (including about 292 acres of woodland, about 155 acres of grassland, and about 3 acres of shrubland) would have to be purchased and managed for wildlife mitigation.

3.19 If project lands are managed for wildlife mitigation (including fencing), 272 acres of additional woodland would have to be purchased and managed for wildlife mitigation. However, if excess woodland or grassland is acquired for other project purposes, these lands could be managed (fencing, tree planting, etc.) for wildlife mitigation and the additional number of woodland acres needed could be reduced. This is only possible if woodland or excess grassland or cropland is available and project lands, excluding those used for other purposes, are fenced and managed for fish and wildlife resources.

3.20 It may be possible to compensate for wildlife losses by using a combination of the mitigation plans discussed above. If only a portion of the project lands is available for fencing and wildlife management, up to 450 acres of additional lands would have to be purchased to mitigate losses not compensated for on project lands. (See Appendix D for a discussion of the effects of inundation on vegetation and Appendix N for a detailed description of mitigation requirements).

3.21 Preliminary evaluations indicate that some mitigation would be required for the Dead Colt Creek tributary dam. Final design of the structure and mitigation requirements for the dam would be the responsibility of other agencies. For additional discussion of mitigation requirements and costs, see other portions of the Reevaluation Report and EIS, and Appendixes I (Recreation Resource Analysis) and N (Fish and Wildlife Coordination Act Report) of the Reevaluation Report.

3.22 Implementation of the overall project would be a joint Federal and local effort, with total first costs of \$61,800,000 (October 1981 price levels), and a B/C ratio of 5.0. This EIS discusses primarily those components of the selected plan that the Corps is responsible for implementing. The B/C ratio for the Corps portion of the overall project is 7.5.

Comparative Impacts of Alternatives

3.23 Table 2 presents the comparative impacts of the various alternatives.

Table 2 - Comparative impacts of alternatives

Impact category	Base Condition	Plan(1)				National Economic Development plan
		Without condition (no action)	Environmental Quality plan	Nonstructural plan	Recommended plan/ Selected plan (2)	
Woodland	The about 21,000 acres of woodland in the lower basin provide significant economic and environmental benefits.	Clearing for agricultural and residential uses would continue. Clearing in the valley bottom is not anticipated.	Some minor clearing (about 5 acres) would be done for construction. Shelterbelts would create some upland habitat. The Wild and scenic Rivers program would preserve some woodland.	Some minor clearing might be needed for relocations. About 5 acres would be cleared for the diversion.	About 170 acres would be affected, mostly because of the raise of Baldhill Dam. Some frequently flooded woodland would be destroyed and converted to a weed-type community. (The shelterbelts and Wild & Scenic Rivers program would create and preserve some woodlands.)	About 170 acres would be affected, mostly because of the raise of Baldhill Dam. Some minor clearing (about 5 acres) would be required for construction of diversions. The shelterbelts would create some habitat.
Prairie chicken habitat	Approximately 300 prairie chickens are in the Shesenne National Grasslands. This population is the largest in the State.	Gradual increase in numbers is expected.	No effect.	No effect.	No effect.	No effect.
Sandhills	About 70,000 acres provide many aesthetic, recreational, economic, and scientific benefits.	No change expected. Grazing will probably continue to be the major use.	No effect.	No effect.	No effect.	No effect.
Unique areas	A number of unique areas have been identified.	Unless these areas are protected by law, they may be cleared for other uses.	No effect.	No effect.	No effect.	No effect.
Mirror Pools	507 acres of upland, grassland and aquatic habitat. Fish rearing potential.	No change. Major use would be wildlife habitat preservation.	No adverse effect. Wild and Scenic Rivers designation would complement the area.	Same as EQ plan.	Same as EQ plan.	No effect.
Social cohesion	The project area is composed of diverse values, attitudes, and interests.	Existing conditions would probably continue.	Two business relocations in West Fargo. Possible concerns about inequitable effects of each alternative. Some opposition to any nonreservoir alternative.	Same as EQ plan. An additional 126 relocations at Valley City and Lisbon.	Same as EQ plan. An additional 97 cabins, 6 farms, 2 church camps, 2 multifamily dwellings, and other relocations. Possible inequities perceived due to acquisition of lands for project purposes and for environmental mitigation.	Same as Selected Plan.
Financial capability of sponsors	Dependent on tax base and rather limited.	Capacity will increase, but will probably remain limited.	Unknown.	Unknown.	Unknown.	Unknown.
Shesenne National Grasslands	The 70,000-acre area is managed for grazing, wildlife, and soil and water conservation.	Grazing will continue to be a major use. Recreation and wildlife use will increase.	Wetland restoration and Wild and Scenic Rivers designation would affect some portions. No adverse impact expected.	No significant effect. Wetland restoration could affect some areas.	No significant effect. (Wetland restoration and Wild and Scenic Rivers program could affect some areas.)	No effect.
Riverine environment	About 220 miles of wooded riverine environment in project area.	Future development would decrease its quality.	The Wild and Scenic Rivers program and water quality improvements would benefit the riverine environment. Wetlands may improve water quality of the river.	No effect. Wetland restoration may improve river's water quality.	About 3 miles of river would be affected by the raise of Lake Ashtabula. (Various EQ measures would enhance the riverine environment.)	About 3 miles of river would be affected by the raise of Lake Ashtabula.
Economics		Average annual residual flood damage \$19,939,000.	B/C of 5.7. Total first costs: \$31,300,000. Average annual residual flood damages: \$4,717,300.	B/C of 5.8. Total first costs: \$31,300,000. Average annual residual flood damages: \$4,789,030.	B/C of 5.0. Total first costs: \$31,300,000. Average annual residual flood damages: \$1,263,000.	B/C of 6.9. Total first costs: \$3,600,000. Average annual residual flood damages: \$3,243,000.
Cultural	245 known prehistoric sites, 125 prehistoric site leads, 38 known historic sites, 60 historic site leads.	Existing impacts would continue.	No known effect. Intensive survey and testing might locate previously unknown significant resources.	Same as EQ plan.	Raise of Baldhill Dam could affect 23 prehistoric sites; (Bald Creek Dam could affect 1 prehistoric site.) Intensive survey and testing may locate previously unknown significant resources.	Change to Baldhill Dam proposed under the Dam Safety Program could affect two prehistoric sites. Intensive survey and testing may locate previously unknown significant resources.
Transportation	Reasonably well-maintained and integrated transportation network.	System will continue to be improved and expanded.	3 new bridges needed. 2 frontage roads closed in West Fargo. Road flooding during operation of Horse diversion.	3 new bridges; 2 frontage roads closed in West Fargo.	Same as EQ plan.	Same as EQ plan.
Spring-fed streams	A number of spring-fed streams entering the Shesenne River between Kindred and Anselm help improve water quality and provide fishery benefits.	No effect is anticipated.	No adverse effect. Wild and Scenic Rivers Program would enhance and preserve portions of these streams.	Same as EQ plan.	Same as EQ plan.	No effect.
Water Quality	The water quality of the Shesenne River and Lake Ashtabula is relatively poor.	The water quality is not expected to improve.	Various measures in the EQ plan (such as wetland restoration, submergents, land treatment measures, etc.) could improve the water quality. There would be no adverse impacts on water quality.	Same as EQ plan.	Same as EQ plan.	No adverse effect on water quality. Some measures of the plan could help improve the water quality.

Table 2 - Comparative Impacts of alternatives continued

Impact category	Base condition	Plan ⁽¹⁾			Recommended plan/ Selected plan (2)	National Economic Development plan
		Without condition (no action)	Environmental Quality plan	Nonstructural plan		
Aesthetic qualities	Wildlife, vegetation, water, and variety of landscapes produce outstanding aesthetic qualities. Scenic road route developed in lower basin.	Aesthetic qualities will decline slightly because of clearing of woodlands, wetland drainage, and decline of wildlife.	No significant adverse effect. Net benefits would accrue as a result of the various EQ measures.	Benefits could accrue from wetland restoration and relocations.	Amount of dead vegetation would increase because of raise of Lake Ashtabula. (Benefits would accrue from various EQ measures.)	No significant adverse effects. Shelterbelts would provide some benefits. Increased amount of dead vegetation from raise of Lake Ashtabula.
Fishery in river and Lake Ashtabula	53 species of fish present. 15% of river fishing in State is on Sheyenne River. Lake Ashtabula has fair fishery as a result of stocking program.	Water quality will continue to decline. Fishery may also decline as a result.	Subimpoundments, controlled grazing, and low-flow augmentation would enhance the fishery.	No effect.	Raise of Lake Ashtabula could eliminate some spawning habitat. (Subimpoundments and controlled grazing would enhance the fishery.)	Raise of Lake Ashtabula could eliminate some spawning habitat.
Federal threatened and endangered species	Bald eagles and peregrine falcons probably migrate through the area. No nesting.	No change except that caused by impacts outside of project area.	No adverse effect.	No effect.	No adverse effect.	No effect.
State rare species	33 rare plants and 7 rare birds in area. Some are restricted to the Sheyenne basin (Kindred to Ansel).	Some clearing, draining, etc., is anticipated. These species may be affected because of their unique requirements.	No adverse effect. Some of the measures would preserve the habitat and therefore benefit the rare species.	No effect.	Same as EQ plan.	No adverse effect.
Wildlife	The lower basin is a prime wildlife area because of the abundance and type of vegetation present. Game and nongame birds and mammals are a significant resource.	Wildlife management practices will increase. Limited developments anticipated will cause declines in habitat and populations.	The various EQ measures would benefit the habitat and wildlife. Habitat would be preserved or enhanced.	Wetland restoration and on-land storage would benefit wildlife.	Some habitat would be destroyed or adversely affected by the raise of Baldhill Dam. Wildlife and habitat would be preserved or enhanced by various EQ measures.	Some wildlife habitat would be adversely affected by the raise of Baldhill Dam. Wildlife and habitat would be preserved or enhanced by various EQ measures.
Wetlands	About 150,000 acres in basin--some than half are upstream of Lake Ashtabula.	Some draining expected especially on existing agricultural lands. Little draining expected at reservoir sites. Acreage and values will probably decline.	Wetland values and habitat would be enhanced through restoration. About 40 acres of ditch-bottom wetlands would be adversely affected.	Wetland restoration and on-land storage would enhance wetland values. About 20 acres of ditch-bottom wetlands would be adversely affected.	About 50 acres would be adversely affected by more frequent inundation caused by raise of Lake Ashtabula. Wetlands would be enhanced by wetland restoration and control of wetland drainage. As a result, no net change in wetlands is expected.	The raise of Baldhill Dam would adversely affect about 50 acres of wetlands in the upper end of the pool. Control of drainage would result in benefits. As a result, no net change in wetlands is expected.
Wild and Scenic River	The reach from Horace to Valley City has Wild and Scenic River potential. State or Federal protection may be exercised.	Because limited developments are expected, future inclusion in the system would be possible but does not seem in the near future. Debris removal from Kindred to the mouth would minimally affect Wild and Scenic River values.	Would foster wild and Scenic River designation potential by improving water quality components and controlling private levee construction. Continued and increased public land control would encourage future protection of Wild and Scenic River values.	Would adversely affect a small segment of the river at West Fargo. Would benefit Wild and Scenic River values through improved water quality resulting from wetland restoration, etc. Public land control would be encouraged.	Would adversely affect small portions of the river through West Fargo and Horace. Would improve water quality and encourage programs to secure public ownership of land.	Would have minimal adverse impacts on Wild and Scenic River attributes near West Fargo and Horace. Some benefits from improved water quality and control of private levees.
Hunting	Upland game hunting predominates at Kindred area and waterfowl hunting at Lake Ashtabula. Deer hunting is significant in the Kindred area.	Hunting would probably increase because of increasing populations, higher travel costs, and lack of comparable alternative sites.	Hunting opportunities would benefit through habitat enhancement.	Hunting opportunities might be enhanced through wetland restoration.	Hunting opportunities in the Lake Ashtabula area might decrease because of habitat deterioration. Various EQ measures would enhance habitat.	Hunting opportunities in the Lake Ashtabula area might decrease because of habitat deterioration.

(1) Major measures of plans, see text for details:

Without condition (no action) - Clearing of woodlands and drainage of wetlands will continue. Emergency flood fighting will continue.

Environmental Quality plan - Levee and diversion at West Fargo/Riverside. Diversion from Horace to West Fargo. Wetland restoration. Shelterbelts and grazed artery. Subimpoundments.

Nonstructural plan - Relocation in Valley City and Lisem. Ring levees. Wetland restoration (on-land storage). Flood proofing. Levee and diversion at West Fargo/Riverside.

Selected plan - Levees and diversion at West Fargo/Riverside. Diversion from Horace to West Fargo. 5-foot raise of Baldhill Dam. Wetland restoration. Control of drainage and private levees. Shelterbelts. Encourage public ownership of riverine environment.

National Economic Development plan - 5-foot raise of Lake Ashtabula. Levee and diversion at West Fargo/Riverside. Diversion from Horace to West Fargo. Ring levees. Floodplain regulation. Control private levee construction.

(2) The portions of the recommended plan selected plan that would be implemented by the Corps include the levee diversion around West Fargo/Riverside, the diversion from Horace to West Fargo, the 5-foot raise of Lake Ashtabula, and any required compensation for the 5-foot raise. Other plan features and most of the EQ measures would be the primary responsibility of other agencies or interests, although all components are discussed in the EIS, General Reevaluation Report, appendices, and other related documents. Impacts caused by measures in the selected plan only are indicated in parentheses.

4.00 AFFECTED ENVIRONMENT

Environmental Conditions

4.01 The Sheyenne River basin, located in a predominantly agricultural area of eastern North Dakota, has a drainage area of 6,900 square miles and drains into the Red River of the North about 10 miles north of Fargo, North Dakota. The basin occupies an area of more than 3 million acres, over 70 percent of which is cropland.

4.02 The scarcity and importance of woodlands in the area is demonstrated by the fact that only 1 percent of the basin is forested. However, the vegetation of the basin is very diverse and includes many plants that are rare in North Dakota, most of which are found in the woodlands between Kindred and Lisbon.

4.03 Because of its diverse and relatively abundant vegetation, the Sheyenne basin also contains many species of wildlife. The woodlands between Kindred and Lisbon are essential to continue the high productivity of certain species such as white-tailed deer and to provide habitat for at least nine rare species of birds.

4.04 Numerous cultural resource investigations have been undertaken in the Sheyenne River basin. To date, there are 265 known prehistoric and 54 known historic sites in the basin, with an additional 125 prehistoric and 60 historic site leads. Additional surveys and testing will probably identify many more sites.

4.05 The lower Sheyenne River basin consists of parts of Cass, Richland, Ransom, and Barnes Counties. The population of this area increased 8.6 percent from 1950 to 1970, mostly because of the overwhelming 25.1-percent increase in Cass County. However, Barnes, Ransom, and Richland Counties decreased by 13.1, 20.0, and 8.9 percent, respectively. The fastest growing city in the lower basin was West Fargo, which recorded a population increase of 342 percent from 1950 to 1970.

4.06 A number of land-based recreation areas and associated facilities including city, county, and State parks exist throughout the Sheyenne basin. Boating, canoeing, and camping are already popular or rapidly growing in popularity, but opportunities for these activities are limited and inadequate in the lower Sheyenne River basin. Lake Ashtabula and the areas upstream of the lake and between Kindred and Lisbon offer fishing and hunting opportunities. Additional water acreage, access to existing resources, and acquisition, preservation, and development of existing resources are needed.

Significant Resources and Concerns

Environmental

4.07 Significant resources identified on the basis of public interest, law, standards, and/or technical criteria include woodlands, cultural resources, wetlands, fish and wildlife, endangered species, the Sheyenne National Grasslands, wildlife management areas, and scenic qualities. A summary of these

resources is presented in the following paragraphs. The General Reevaluation Report and Technical Appendixes contain more detailed information, including species lists.

4.08 Woodlands - The wooded hills and valleys of the Sheyenne basin have been identified as a significant wildlife and aesthetic resource. The 28,000 acres of woodland in the lower basin provide critical habitat for many wildlife species, including white-tailed deer and nongame birds.

4.09 Wetlands - Wetlands are scattered throughout the basin, with the majority located in the upper portion. These areas provide significant waterfowl habitat in the region and are also important to waterfowl production in other parts of North America.

4.10 Fish and Wildlife - The existing fish and wildlife and their continued production are a significant resource in the basin. Both game and nongame species have a high aesthetic value. The fishery of Lake Ashtabula and the river is considered important on a local scale.

4.11 Threatened, Endangered, and Rare Flora and Fauna - There are federally-listed threatened and endangered species, including the bald eagle and peregrine falcon, which possibly migrate through the basin but do not nest there. There are also a number of species of plants and animals, some unique to the Sheyenne basin, which are found on various lists of threatened, endangered, or rare species prepared by agencies and institutions in North Dakota. Thirty of the bird species found in the Sheyenne basin are on the National Audubon Society's "Blue List." This list alerts observers to species which have suffered recent population declines.

4.12 Sheyenne National Grasslands - The Sheyenne National Grasslands, approximately 70,000 acres in size, is administered by the U.S. Forest Service. Grazing is its primary land use; however, it does contain important wildlife habitat. For example, over 90 percent of North Dakota's rare prairie chicken population is found there. Leasing the grasslands to local residents for grazing has been identified by public input as a matter of concern. The U.S. Forest Service has an experimental shelterbelt planting on the grasslands, using Scotch pine trees obtained from Russia. This planting has significant research value.

4.13 Wildlife Management Area - There are a few wildlife management areas in the lower basin, mostly State-administered, which provide significant wildlife and recreation value. The most important of these is probably the 500-acre Mirror Pools Game Management Area, located about 15 miles downstream of Anselm. The Baldhill Dam State Game Refuge and Baldhill State Game Management Area, 600 acres and 900 acres, respectively, are adjacent to Lake Ashtabula.

4.14 Aesthetic Qualities - The woodlands, grasslands, wetlands, wildlife, and hills and valleys in the basin combine to produce significant aesthetic qualities. A scenic road has been established in the lower basin and various public lands have foot trails in the more scenic areas.

4.15 Prairie Chicken - The prairie chicken is a very rare species in North Dakota, and over 90 percent of its population is located within the Sheyenne National Grasslands. Because this bird is rare, its populations and habitat should be preserved and enhanced where possible. There is considerable public concern and scientific interest in this species.

4.16 Sandhills Environment - The sandhills area was formed through a unique combination of climatic and geologic factors. Its ecosystem encompasses about 70,000 acres and is not found elsewhere in eastern North Dakota. Local interests have identified the combination of vegetation, wildlife, and aesthetic characteristics of this area as a significant resource.

4.17 Unique Areas - A number of areas in the Sheyenne basin have been identified as unique by the State because of vegetation, wildlife, or aesthetic characteristics. These areas constitute significant natural, scientific, and educational resources.

4.18 Spring-Fed Streams - A number of spring-fed streams enter the Sheyenne River in the delta area. These streams usually have better water quality than the Sheyenne River and are therefore important for forage, fish production, and as places of refuge.

Cultural

4.19 As of 17 February 1983, no sites listed on or eligible for inclusion on the National Register of Historic Places would be affected by any of the alternatives. However, preliminary cultural resource surveys have identified numerous sites in the Sheyenne River basin. Intensive surveys and testing will be conducted as project planning progresses. Additional information on the known cultural resources of the Sheyenne River basin is available in Appendix E of this report.

Recreation

4.20 Wild, Scenic, and Recreational Rivers Program (State or Federal) - The free-flowing nature of the Sheyenne River, its outstanding natural and recreational values, and its relative lack of intrusion by man have qualified this river for Wild, Scenic, or Recreational River status. The Nationwide Rivers Inventory, published by the Heritage Conservation and Recreation Service in May 1978, listed the reaches of the Sheyenne River from Horace to Lisbon (119 miles) and from Lisbon to Valley City (88 miles) as potential candidates for inclusion in the National Wild and Scenic Rivers System (i.e., shown as a category II river). The updated Nationwide River Inventory, dated September 1980 and a final listing published in January 1982, no longer list the Sheyenne River as one being considered for inclusion in the system. North Dakota State Comprehensive Outdoor Recreation Plans have identified the Sheyenne River as a possible State Wild and Scenic or Recreational River. Potential for such designation is high.

4.21 Hunting and Fishing - Recreational hunting and fishing are an important resource in the basin. Deer, waterfowl, and upland game hunting and both river and reservoir fishing are important to the local economy and to leisure activities and are therefore a significant public concern.

4.22 Riverine Environment - The riverine environment has high scenic, recreational, wildlife, scientific, and economic value of local and regional importance and is a significant resource.

Economic

4.23 The economic aspects of the plans are both a Federal and a local concern. Local sponsors have a limited fiscal capacity and are concerned that project costs be closely watched.

Social

4.24 In accordance with Section 122 of the River and Harbor Act of 1970 (Public Law 91-611) and the WRC Principles and Standards, the following social factors were considered and were determined to be not significantly affected by any of the components of the various plans studied: population mobility and density, housing, education opportunities, public facilities, public services, local/regional activity, real income distribution, employment/labor force, business/industrial activity, agricultural activity, and national defense. The effects of the alternatives on flood-plain development were also studied in accordance with E.O. 11988 and are discussed in detail in other sections of this report.

4.25 Potential exists for significant impacts to the following social factors: transportation, local government finance, community cohesion, displacement of people, desirable community growth, health, land use, institutional relationships, noise, aesthetic values, man-made resources, natural resources, and air and water quality.

4.26 Noise - Although noise impacts are associated with the project alternatives, they have not been identified as a significant issue.

4.27 Aesthetic Values - Public interest and technical criteria developed for the study have shown aesthetic values to be a significant resource and an area of concern in the Sheyenne basin. Aesthetic features include a variety of habitat types and topographic characteristics. The areas of highest aesthetic values in the project area are between the towns of Kindred and Sheyenne. (See earlier discussion in this section.)

4.28 Social Cohesion - The project area is a region of such natural and man-made variety that social cohesion could be expected to be the exception rather than the rule. The region includes a healthily growing metropolitan area, a number of agricultural service towns, a mid-sized city that serves a tourist area, and many farms and ranches. The populations of these communities have divergent values, attitudes, and interests, particularly regarding a resource such as water, which is both a threat and a necessity. Therefore, cohesion is discussed in terms of relocations of homes and businesses, perceptions of equity, and acceptability of the project components.

4.29 Fiscal Capacity of Sponsors - The North Dakota State Water Commission has submitted a letter of intent to be the non-federal sponsor for this project. The city of West Fargo and the Southeast Cass Water Management Board support the selected plan, and they are willing to work with the Water Commission to implement the plan. Other cities and water management boards may also be responsible for certain costs and activities of implementation. Because most of the city and county organizations rely on local taxes to finance their activities, it is important that they be able to provide vital services to their citizens without imposing heavy taxes upon them. At the State level, the State Water Commission does have extensive financial resources; however, the future will probably see an increasing emphasis on the Commission's role in statewide development efforts. This shift in emphasis may divert funds somewhat from flood control projects.

4.30 Transportation - Roads serving the region include Interstates 94 and 29; U.S. 10; ND 26, 32, 46, and 18; county roads; and city streets. These form a reasonably well-maintained and integrated network, linking this region to surrounding areas and connecting the cities within the region. Burlington Northern railroad tracks, including those of its major east-west route through the State, cross the Sheyenne River valley at four places. The most significant obstacle to transportation besides weather is the number of river crossings required.

4.31 Man-made Resources - Baldhill Dam and Lake Ashtabula have been identified, through public concern and technical criteria developed for the study, as a significant recreational, water supply, and flood damage reduction resource. The boating and fishing use of Lake Ashtabula should therefore not be degraded. (See discussion in other portions of this section for more detail.)

4.32 Natural Resources - Natural resources are abundant throughout the basin but are mostly associated with the wooded valley, grasslands, wetlands, and the river. The natural resources of the basin have been identified as significant by law, study-specific technical criteria, and public interest. Issues of concern include the woodlands, wildlife, grasslands, and recreational use. (See discussion in other portions of this section for more detail.)

4.33 Air - Impacts on air quality may be associated with various alternatives, but have not been identified as a significant issue.

4.34 Water - Water is considered a significant resource as identified by law, study-specific technical criteria, and public interest. Water supply and water quality are important considerations for public health, fisheries, and wildlife. The areas of poor water quality in the project area include Lake Ashtabula and most of the Sheyenne River. (See Appendix H for more details.) Improvement of water quality is a goal of project planning. (See discussion in other portions of this section for more detail.)

5.00 ENVIRONMENTAL EFFECTS

Significant Impacts

5.01 This section discusses the environmental effects of each alternative on the significant issues given in the preceding section. For additional information, see the Comparative Impacts and Compliance tables in this document and the General Reevaluation Report. The impacts are described primarily for measures that would be implemented by the Corps of Engineers. It should be noted that not all features of the plans require implementation simultaneously. Other sections of this report describe implementation responsibilities.

Environmental

5.02 Woodlands - Approximately 5 acres of woodlands would be lost as a result of the construction of the diversion channels for the NED, EQ, non-structural, and selected plans. However, all of the plans would mitigate this loss through measures such as shelterbelt planting along the diversion channel. The EQ and selected plans could enhance and preserve woodland habitat and wildlife populations through programs such as land treatment measures and the Wild and Scenic Rivers Program. The NED and selected plans would affect another 170 acres of woodlands because of the raise of Baldhill Dam and subsequent inundation. Depending on the frequency, duration, timing, and other factors related to the inundation, this temporary inundation could affect the growth and species composition of these areas. Upland forest vegetation is not tolerant of inundation, even for relatively short periods. This inundation would destroy some woodland vegetation and create areas of more weedy vegetation. (The effects of flooding on vegetation are discussed in Appendix D.) The raise of Lake Ashtabula could affect 170 acres of woodland to varying degrees. This impact was considered when the impacts were identified. These 170 acres provide 102 wildlife habitat units of value. The project would cause an average annual equivalent loss of 73 habitat units because of inundation. The effects of regrowth were considered in this evaluation. (See Appendix N for a discussion of the impacts and mitigation requirements.) Various mitigation proposals have been developed to compensate for project-induced losses. If Lake Ashtabula project lands are fenced, the selected plan would require compensation in the amount of 272 acres of managed woodlands outside of the flood pool. If Lake Ashtabula project lands are not fenced to control grazing, 450 acres of additional woodlands, grasslands, and shrublands would be needed for compensation. (See paragraphs 5.03 and 5.04, 3.10-3.22 (Plans Considered in Detail, and Appendixes D and N for more discussion of impacts and compensation requirements.) These woodlands provide habitat for the abundant basin wildlife, including rare species of flora and fauna. fauna.

5.03 Wetlands - Wetlands and wetland values, such as flood damage reduction and fish and wildlife benefits, would be enhanced by the restoration measures in the EQ, nonstructural, and selected plans. Minor adverse impacts are anticipated from the raise of Baldhill Dam. Approximately 563 acres of wetland at the upper end of the pool would be temporarily inundated. Major change in the composition of the wetland is not expected; however, the areal extent and location may change. This assessment of wetland impacts considers that wetland vegetation is tolerant of hydric (wet) conditions and that the 5-foot raise would not be a significant change from existing conditions, except for the increased frequency and

duration of storage. Therefore, mitigation for wetland losses from the raise of Lake Ashtabula would not be required. (See Appendixes D and N for discussion on impacts.) The more stringent control of drainage measures in the NED, EQ, nonstructural, and selected plans would help retain the effectiveness of the flood control plans, reduce the quantity of runoff water in the future, and maintain the wildlife values of the area. The construction of subimpoundments at Lake Ashtabula in the EQ and selected plans would also create some wetland areas. These measures could improve the water quality of Lake Ashtabula and the Sheyenne River. They would also create fish and wildlife habitat in the flood pool of the reservoir.

5.04 Fish and Wildlife - The fishery of Lake Ashtabula would be adversely affected by the raise, mostly because of the loss of spawning habitat and temporary inundation of 3 river miles. Although these losses are not quantifiable, they are not considered significant. Various measures in the EQ and selected plans could enhance the fishery and offset these losses. These measures include wetland restoration, aerators, subimpoundments, land treatment measures, and control of grazing and cattle access. The nonstructural plan would have no effect on the fishery of the basin. The wildlife would benefit from measures in the EQ, nonstructural, and selected plans that preserve or enhance wildlife habitat, such as shelterbelts and the preservation of riverine habitat. The 5-foot raise of Baldhill Dam in the NED and selected plans would adversely affect about 1214 acres of wildlife habitat, requiring mitigation of project impacts at Lake Ashtabula. In addition to the woodland and wetland areas discussed previously, about 474 acres of grassland areas would be affected by the 5-foot raise. Depending on the type of grassland community involved, these areas can be affected (possibly killed) by very short periods of inundation. Because of the shorter recovery period for grasslands (compared to woodlands, for example), the average annual equivalent loss is 68 habitat units. Up to 155 acres of grasslands would have to be managed to compensate for such losses. The total average annual equivalent loss for all habitat types would be 142 habitat units. This loss of habitat units would require purchase and management of up to 450 acres of habitat for mitigation. (See Appendixes D and N for more information). The modification to Baldhill Dam either due to the raise or to the Dam Safety Program would require the replacement of 11 fish-rearing ponds and their operating house located immediately downstream of the dam. Some ponds could be relocated on adjacent Federal lands; others could require additional land purchases. Revised management of Baldhill Dam would result in an increased frequency of floodwater storage. This additional floodwater storage might create areas of dead vegetation and weed communities, which have limited wildlife value. Increased winter drawdowns would increase the potential for winter fish kills.

5.05 Threatened, Endangered, and Rare Flora and Fauna - None of the plans would have an adverse effect on Federal or State listed species. (See Endangered Species coordination letters in Appendix A.) Some benefits could accrue through measures in the EQ and selected plans that provide for preservation of habitat, especially in the lower basin.

5.06 Sheyenne National Grasslands - No significant adverse effect is expected. The wetland restoration and the preservation of riverine habitat programs in the nonstructural, EQ, and selected plans could affect some areas. Wildlife habitat in the grasslands could be complemented by measures that would maintain habitat values in the lower basin.

5.07 Wildlife Management Areas - No significant adverse effects are expected from any of the plans. The Baldhill Dam State Game Refuge and Baldhill State Game Management Area would be affected by temporary inundation from the 5-foot raise of Baldhill Dam in the NED and selected plans. The Wild and Scenic Rivers Program could complement the Mirror Pools Game Management Area in the nonstructural, EQ, and selected plans by providing a wildlife corridor between the more heavily wooded areas in the lower basin.

5.08 Aesthetic Qualities - The NED and selected plans would result in major adverse aesthetic effects, mainly because the 5-foot raise of Baldhill Dam would destroy some of the woodlands and produce more unsightly mudflats. The nonstructural, EQ, and selected plans would provide some aesthetic benefits through environmental measures such as wetland restoration, the Wild and Scenic Rivers Program, and land treatment measures.

5.09 Prairie Chicken - None of the plans would affect the prairie chicken or its habitat.

5.10 Sandhills Environment - None of the plans would affect the sandhills environment.

5.11 Unique Areas - None of the plans would affect any designated or potential unique areas.

5.12 Spring-Fed Streams - None of the plans would have any adverse effects on spring-fed streams. The Wild and Scenic Rivers Program in the non-structural, EQ, and selected plans could complement and preserve these streams.

Cultural

5.13 No known significant cultural resources would be affected by any of the alternatives. Preliminary cultural resource surveys have identified numerous sites in the Sheyenne basin, and additional intensive surveys and testing will be undertaken to assess the significance of these sites and to identify previously unknown resources that might be affected. The primary impacts from the levee, diversion, and ring levees in the NED, non-structural, EQ, and selected plans result from construction activities. Impacts may also result from inundation from the wetland restoration and subimpoundments in the EQ, nonstructural, and selected plans. Surveys have indicated that 23 sites could be affected by a 5-foot raise of Baldhill Dam and 1 site would be affected by Dead Colt Creek Dam in the selected plan. Two prehistoric sites may also be affected by the dam modifications under the Dam Safety Program in the NED and selected plans. (It is also expected that the dam would be modified under the no-action plan.) In the nonstructural plan, impacts could result from the flood proofing and relocation components.

Recreation

5.14 Wild, Scenic, and Recreational Rivers Designation (State or Federal) - Flood control measures can affect Wild, Scenic, or Recreational Rivers potentials in several ways. If impacts are significant enough, future designation options may even be foreclosed (e.g., an impoundment area would probably foreclose options on that reach). Also possible are secondary impacts on adjacent reaches of the river not directly affected by the project. Flood control measures could also have positive impacts upon designation (e.g.,

improvement of water quality through wetland restoration). The NED and non-structural plans would not significantly affect Wild or Scenic River designation potential of the Sheyenne River. The selected and EQ plans would tend to foster potential for river designation. The nonstructural, NED, selected, and EQ plans would adversely affect small segments of the river near West Fargo, but because this area is already significantly affected by man, the Wild and Scenic River potential of this reach would not be appreciably changed. The EQ, nonstructural, and selected plans would enhance designation potential through such measures as restoration of drained wetlands, more stringent controls of drainage and levee construction (also in NED plan), control of grazing at Lake Ashtabula, construction of subimpoundments at Lake Ashtabula, and encouragement of public ownership/easements of riverine lands for programs such as the creation of parks or forests.

5.15 Hunting and Fishing - None of the plans should have a significant adverse effect on the hunting or fishing activities in the basin. The 5-foot raise of Baldhill Dam would cause some deterioration of wildlife habitat and would therefore reduce wildlife population levels. However, mitigation lands and management practices would compensate for this loss, resulting in little net effect on hunting and fishing activities. Various environmental considerations in the EQ and selected plans, such as wetland restoration, subimpoundments and aerators at Lake Ashtabula, and low-flow augmentation, would improve the hunting and fishing opportunities in the area.

5.16 Riverine Environment - In the NED and selected plans, about 3 miles of the Sheyenne River would be affected by the raise of Baldhill Dam. Some areas of dead vegetation and mudflats would be created, along with areas of bare shoreline and weedy vegetation caused by more frequent storage of floodwaters. (See Appendix D and other sections of the report for more detail.) The non-structural, EQ, and selected plans would preserve a significant portion of the Sheyenne River between Kindred and Lisbon if the Wild and Scenic Rivers Program or other public ownership/easement programs were instituted.

Economic

5.17 The benefit/cost ratios for the selected, NED, EQ, and nonstructural plans are 5.0, 6.9, 5.7, and 5.6, respectively. The selected plan is the most expensive with a total first cost of \$61,800,000. The NED plan is the least costly at \$43,600,000. The plans with the highest and lowest residual damages are the nonstructural and selected plans, respectively.

Social

Impacts on Public Law 91-611, Section 122 Accounts

5.18 Noise - The noise impacts associated with all of the plans would be short-term and are not considered to be significant.

5.19 Social Cohesion

a. The Effects of Relocations - Under the nonstructural plan, buildings in the 10-year floodplain would be acquired after suffering serious flood damage. In Valley City and Lisbon, this would eventually affect 126 properties. The affected neighborhoods would experience both physical and social disruption when residents and businesses are moved away, perhaps over the course of several floods. However, this may be preferable to allowing damaged structures to remain in the floodplain, unrepaired and perhaps abandoned.

A 5-foot raise of Baldhill Dam (selected plan) would require the acquisition of 107 properties (97 cabins, 6 farms, 2 church camps, 2 multifamily dwellings, and other structures). Although many are seasonal residences, it is a reasonable assumption that a sense of community exists in some of these "temporary neighborhoods," and that it would be disrupted or destroyed when cabins are acquired and then relocated or removed. It is not known if land would be available for all of them to be simply moved back to the new shoreline. Relocations required in West Fargo because of acquisition of property for the diversion (NED, EQ, nonstructural, and selected plans) involve only three properties and are not expected to significantly change the character or cohesion of the community. The diversion from Horace to West Fargo is not expected to require any relocations. All acquisitions must comply with Public Law 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, which should minimize negative consequences for the individual household or business and ensure consistent treatment for all those affected.

b. Perceived Equity - Probably any solution, including the no-action alternative, will result in some perceptions of unfairness because the causes of flooding and flood damages are seen from opposing viewpoints, with blame of both upstream (drainage and levee practices, for instance) and downstream (unwise floodplain development) river users. There will inevitably be difficulty in arriving at a solution which everyone sees as equitable, with benefits and costs fairly distributed. Because all alternatives include components which attack each of the causes of increased flooding, people may feel that there is an equitable sharing of the social and economic costs of flood control. However, some components are outside Federal jurisdiction for actual implementation; if a part of the eventual solution is not carried out by its local sponsor, there will again be a sense of inequity and also of betrayed trust. This could have a serious effect on the region's future ability to reach compromises in solving its flood problems.

c. Acceptability of Project Components - At present, there are no known threats to social cohesion in terms of significant opposition to any of the alternatives. This is a change from an earlier stage of the Sheyenne study when there was strong, vocal opposition against the proposed Kindred Reservoir. The present alternatives have been developed largely in response to that opposition. However, some pro-reservoir sentiment clearly exists, and a focal point for controversy might be the Fargo-Moorhead Forum's perception that diversions (as in each of the present plans) will simply not be an adequate flood control solution. The city of Grand Forks has also expressed concern that diversions may worsen downstream flooding. Although these perceptions may not agree with those of technical experts, they could cause considerable controversy. Valley City has indicated (December 1980) that it is not interested in being the local sponsor of any relocations (the nonstructural plan); however, a plan of gradual relocations might be acceptable to the affected citizens if available promptly after they have experienced flood damages. Opposition to the proposed raise of Baldhill Dam has become more apparent since the Draft EIS was released in early 1982. This opposition centers on users around and owners upstream of the present Lake Ashtabula, whose concerns stem from the economic, social, and recreational changes they would undergo as a result of temporary higher lake levels and property acquisition by the Federal Government.

d. Fiscal Capacity of Sponsors - It is not presently possible to accurately predict the impacts of the alternatives on the various sponsors because: (a) costs are not known for all components of each plan (such as flood proofing in the nonstructural, EQ, and selected plans or ring levees in all plans); (b) the cost of some components may be shared between several local sponsors (such as the West Fargo levees and diversions, which may be paid for by an undetermined combination of State Water Commission, city of West Fargo, and SE Cass Water Management District funds); (c) some components would not be paid for by any local sponsor, but would be the financial responsibility of individuals (such as removal of certain private levees); and (d) current and future financial positions, including tax bases, bonding abilities, and competing expenditures, are not known for all potential local sponsors. Although the State Water Commission has indicated its intention to be the local sponsor, it may still pass on some costs to other local units. When costs have been more thoroughly developed and local sponsors or cosponsors identified, it will be possible to see what effect the costs will have on the fiscal bases of those sponsors, and hence on their taxable population. This information will be collected during Phase II and presented in an EIS Supplement if the impacts are found to be significant.

e. Transportation - The diversion at West Fargo/Riverside in the nonstructural, EQ, NED, and selected plans would require construction of the following five new bridges: Horace Road, north of I-94; 13th Avenue South, near I-94; Main Avenue West, near Bonanzaville; BNRR, south of sewage lagoons; 12th Avenue North, at the Sheyenne River.

Although construction of each road bridge might take 3 or 4 months, the necessary detours and bypasses are expected to cause minimal impacts on travel time or safety. Assuming Main Avenue traffic would be rerouted onto its two frontage roads around the construction site, there would be temporary congestion in those commercial and industrial areas. The railroad bridge would not interrupt service on the main line. Although the bridge might take more than a year to build, Burlington Northern would construct a bypass before disrupting the existing track. The only permanent road closures will be the Main Avenue West frontage roads, which will cause insignificant changes in access to the businesses located nearby, and Third Avenue NW, located in a new industrial area, which should not affect the remaining industrial sites. The diversion from Horace to West Fargo in the EQ, NED, and selected plans would require modification to the present I-94 bridges; significant disruption during one construction season is anticipated. Other roads should not be significantly disrupted during construction, but the diversion is designed to allow flows over the roads during floods. This would require some detours, although probably fewer than those needed under present flood conditions.

f. Environmental mitigation plans being studied include either acquisition and management of up to 450 acres, and/or management of project lands alone. Neither option will provide significantly beneficial social impacts and one has potential for causing significant negative social effects. (The other option may not be locally popular or favorably perceived, but would not cause significant quantifiable harm.)

The negative effects would result if the acquisition of up to 292 acres of hardwood lands for mitigation were to occur in Griggs County. In addition to opposition which already exists in some parts of that county, there are three perspectives from which Griggs County could suffer harm: present resource base; scale of impact; and tax base consequences.

(1) Of the counties in the region which might provide this mitigation land, Griggs has the smallest size and population, has experienced the worst decline in population, has one of the highest proportions of the population in the aged category (65 years or more), has the highest rate of substandard housing, has the lowest government revenue, and has the highest per capita property taxes. Many of these statistics simply reflect the lack of a significant urban area within the county, but they also indicate a comparatively weak social resource base that would be aggravated by removal of land resources from the county.

(2) Acquisition of 292 hardwood acres within Griggs County would remove about 5 percent of all hardwood in the county from private control (about twice as great an effect as it would cause in any of the other counties). Combined with the loss of private hardwood acreage due to inundation from the raise of Lake Ashtabula, the loss of private hardwood land is about 12 percent in Griggs (nearly three times the amount that would occur in the other counties). Government acquisition of land, particularly for wildlife purposes, is a very sensitive issue in North Dakota. Taking this amount of land in Griggs County for this purpose would be seen as inequitable by many of its citizens.

(3) Lands acquired for reservoirs by the Corps of Engineers are covered by Public Law 94-565 (31 USC 1606), and are considered "entitlement lands" for which Federal compensation (in lieu of local taxes) is paid to the local taxing authority. However, lands acquired for mitigation purposes by the Corps are not entitlement lands, and the tax base is thus permanently reduced, with no compensation to the local government unit.

5.20 Aesthetic Values - The impacts on aesthetic values are discussed earlier in this section (see paragraphs 5.08 and 5.16).

5.21 Man-Made Resources - The impacts on these resources are discussed earlier in this section (see paragraphs 5.06, 5.07, 5.13, and 5.18).

5.22 Natural Resources - The impacts on these resources are discussed earlier in this section (see paragraphs 5.02 to 5.07, and 5.09 to 5.16).

5.23 Air - The impacts on air quality associated with all of the plans would be short-term and are not considered to be significant.

5.24 Water - The 5-foot raise of Baldhill Dam would neither improve nor degrade the water quality of Lake Ashtabula. Most of the water quality problems at Lake Ashtabula occur during the summer and are related to algae and aquatic vascular plant growth. This profuse growth is the result of a seemingly inexhaustible supply of nitrogen and phosphorus in the sediment and the water column during the growing season. The proposed modification of flood control operations would result in a higher pool and longer detention time for water during the early spring. But in most cases, the pool elevation would return to the normal seasonal operating range before the growing season, without significantly changing the initial available nutrient supply. Those features that affect runoff (such as wetland restoration, better land use planning, and control of drainage) would result in some improvement in water quality through reductions in erosion and nutrient loading (see paragraphs 5.03, 5.04, 5.12,

tions in erosion and nutrient loading (see paragraphs 5.03, 5.04, 5.12, 5.15, and 5.16, and Appendix H). The water quality of the Dead Colt Creek Reservoir is expected to be similar to other existing reservoirs in the area, such as Clausen Springs. Algal blooms are possible and the water quality would be relatively poor but adequate for most recreational activities. Various measures of the selected plan (such as upstream land treatment and control of cattle access) could help improve the water quality in the basin. No adverse effects on water quality are anticipated because of implementation of the selected plan.

6.00 PUBLIC INVOLVEMENT

Public Involvement Program

6.01 A Notice of Intent to Prepare a Draft Environmental Impact Statement for a Proposed Flood Damage Reduction Project, Sheyenne River, North Dakota, appeared in the Federal Register on 15 May 1980. This notice invited participation in the scoping process by anyone who was interested.

6.02 As part of the study and scoping process, the views of the public were actively solicited throughout the course of the study. Individuals, groups, civic organizations, and government bodies were brought into the study process through a broadly-based public information program, including regular communication on project matters. In addition, a Citizens Committee was formed in June 1976. The committee met periodically to hear and discuss presentations on the water resource development plans and issues in the basin. These meetings were open to the public. In August 1980, the Stage 2 Documentation Report was distributed to the public for review and comment. Throughout the study, coordination has been maintained between the St. Paul District and Federal, State, and local government agencies and interested groups, agencies, and citizens. A detailed discussion of the public involvement program is presented in Appendix A.

Required Coordination

6.03 After coordination of the Draft EIS with appropriate agencies, groups, and individuals, various meetings were held. Comments received at the meetings or by letter concerning the Draft Design Memorandum and EIS were used in the preparation of the final planning report and EIS. Coordination with appropriate agencies and groups will continue throughout the study process.

6.04 Further coordination is required with the Fish and Wildlife Service and other agencies concerning implementation of the mitigation plan. Wildlife management opportunities on project lands will be investigated and used to the maximum extent possible. Implementing agencies for components of the selected plan that are not the responsibility of the Corps of Engineers have not been identified.

6.05 In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, the Reevaluation Report and EIS contain a summary of the biological assessment of impacts on federally-listed or proposed threatened or endangered species which may be affected by the project.

6.06 The results of all cultural resource investigations will be coordinated with the State Historic Preservation Office and the National Park Service. The comments of the Advisory Council on Historic Preservation will be requested in accordance with 36 CFR 800 for all significant cultural resources that may be affected by the proposed project.

6.07 Continued coordination with Federal, State, and local agencies will be necessary to ensure that a socially and environmentally acceptable plan is implemented.

6.08 Because the proposed plan involves placement of fill material in waters of the United States, a Section 404(b)(1) Evaluation of the effects of the fill placement has been prepared and circulated with these documents in compliance with the Clean Water Act of 1977, as amended (Public Law 95-217). The Reevaluation Report and Final EIS, containing the Section 404(b)(1) Evaluation, will be submitted to Congress pursuant to Section 404(r) of the Clean Water Act. Only those plan features to be implemented by the Corps are covered by the Section 404(b)(1) Evaluation. If other plan features involve Section 404 regulated activities, the implementing agency would be required to obtain the Section 404 permits in these cases.

EIS Distribution

6.09 The following agencies, organizations, and individuals were provided copies of the draft Reevaluation Report/EIS. They will also receive copies of the final Reevaluation Report/EIS, or a notice of availability.

State Conservationist Bismarck, ND	Dept. of Health & Human Serv. Washington, D.C.
U.S. Forest Service Missoula, MT	Dept. of Health & Human Serv. Denver, CO
Deputy Reg. Forester Missoula, MT	Advisory Council on Historic Pres. Washington, D.C.
ND Coordinator, Custer NF Bismarck, ND	Administrator HUD, Region VIII Denver, CO
Chief, River Basin Pln. Br. Washington, D.C.	Asst. Sec. for Prog. Policy Washington, D.C.
Deputy Asst. Sec. for Env. Affairs Washington, D.C.	Regional Director U.S. Fish and Wildlife Service Lakewood, CO
Director Office of Fed. Activities Washington, D.C.	U.S. Fish & Wildlife Service Bismarck, ND
Region VIII U.S. EPA Denver, CO	Bureau of Indian Affairs Aberdeen, SD
Garrison Diver. Conserv. Dist. Carrington, ND	Bureau of Land Management Dickinson, ND

Div. of Cultural Programs
Denver, CO

Chief, Interagency Arch. Serv.
Denver, CO

USGS, Conserv. Div.
Denver, CO

Asst. Dir., Central Region
U.S. Geological Survey
Denver, CO

District Chief
U.S. Geological Survey
Bismarck, ND

Director
Water Resources Management Div.
Seattle, WA

U.S. Dept. of Transportation
Denver, CO

Commander (dcw)
Second Coast Guard District
St. Louis, MO

N.D. Dept. of Agriculture
Bismarck, ND

Department of Anthropology
Grand Forks, ND

Attorney General's Office
Bismarck, ND

Clearinghouse-Fed. Aid
Bismarck, ND

Dr. Gary Johnson, Reg. EIS
Bismarck, ND

Energy Specialist
Bismarck, ND

Dr. Robert Johnson, State Forester
Bottineau, ND

District Forester
Bottineau, ND

Commissioner
N.D. Game & Fish Dept.
Bismarck, ND

Liaison Officer
Bureau of Mines
Bismarck, ND

Director
National Park Service
Denver, CO

North Dakota Hwy. Department
Bismarck, ND

State Historical Society
Bismarck, ND

State Historic Pres. Officer
Bismarck, ND

Executive Director
ND Indian Aff. Comm.
Belcourt, ND

North Dakota Land Dept.
Bismarck, ND

Chairman
Governor's Natural Res. Council
Bismarck, ND

Director
N.D. State Planning Div.
Bismarck, ND

Reclamation Director
Public Serv. Comm. of ND
Bismarck, ND

Executive Officer
ND State Outdoor Rec. Agency
Mandan, ND

Executive Secretary
North Dakota Soil Cons. Comm.
Bismarck, ND

Chief Engineer
North Dakota Water Commission
Bismarck, ND

Documents Librarian
Fort Collins, CO

North Dakota State University Library
Fargo, ND

University of North Dakota Library
Grand Forks, ND

North Dakota Geological Survey
Grand Forks, ND

Administrator
ND Dept. of Health
Bismarck, ND

Lake Agassiz Reg. Council
Fargo, ND

National Audubon Society
Jamestown, ND

National Audubon Society
Madison, WI

North Central Reg. Vice Pres.
Omaha, NE

Director
Institute for Ecol. Studies
Grand Forks, ND

Environmental Defense Fund Inc.
Washington, D.C.

H. Paul Friesema
Indianapolis, IN

North Central Region
Natl. Wildlife Federation
Mandan, ND

North Central Plan. Council
Devils Lake, ND

North Dakota Nat. Science Soc.
Bismarck, ND

President
North Dakota Wildlife Federation
Watford City, ND

Chairman, Dakota Group
Sierra Club
Minot, ND

Executive Vice President
North Dakota Water Users Assoc.
Minot, ND

Izaak Walton League of America
Arlington, VA

Thermodsgard Law Library
Grand Forks, ND

Veterans Memorial Library
Bismarck, ND

Old West Regional Commission
Rapid City, SD

The Waterways Journal
St. Louis, MO

North Central Field Rep.
Wildlife Management Inst.
Firth, NE

Water Res. & Coastal Cons. Prog.
National Wildlife Federation
Washington, D.C.

Public Views and Responses

6.10 The original Kindred Lake flood control project was authorized by Congress in 1970, and a Final Environmental Impact Statement for the project was completed in that year. In response to official comments on the interim survey reports by the Departments of the Interior, Agriculture, and others, a Kindred Lake Restudy was initiated in 1972. This study addressed potential groundwater problems, the effects of reservoir storage on water quality control, and the possible bank slope stability problems resulting from impoundment of water in the authorized Kindred Lake. The restudy did confirm that some groundwater level increases and shore erosion could be expected with reservoir development.

6.11 In 1976, a complete reevaluation of alternatives was undertaken to address issues regarding plan selection that were unresolved at the time of authorization or which arose after authorization. The study procedures and plan selection must address current Water Resources Council criteria. Coordination for the current study has involved telephone contacts, letters, and several meetings with local, State, and Federal interests and the Sheyenne River Citizens Committee.

6.12 During the public involvement program, many public views were expressed that had a major influence on the study and that were considered in the decision-making process. Two primary concerns were the reduction of flooding problems and the minimization of social impacts. There was considerable local, State, and Federal opposition to the authorized Kindred Dam, primarily because of the large quantity of land needed for the project. Concern was expressed over the loss of wildlife habitat, social and cultural impacts, and locating the project where the actual flood damages occur. All of these concerns and others were considered in the plan formulation process and in identification of the selected plan.

List of Preparers

<u>Name</u>	<u>Expertise</u>	<u>Experience</u>	<u>Role in Preparation of EIS</u>
Mr. Robert Anfang	Forest Ecology	2 years, Research Assistant, University of Minnesota; 1 1/2 years Forestry Technician and Biological Laboratory Technician, U.S. Forest Service; 8 years, Forester, St. Paul District, Corps of Engineers.	EIS Coordinator. Biological evaluation; reviewed documents prepared by contractor; prepared EIS, mitigation requirements.
Dr. William T. Barker	Systematic Botanist/Plant Ecologist	18 years of university teaching and research in systematic botany and plant ecology. Serves as a consultant in revegetation and vegetation inventory and management. Present address--North Dakota State University.	Consultant; Existing Environmental Setting and Vegetation/ Groundwater Effects contract reports.
Mr. Richard Beatty	Fisheries Biologist	2 years Field Biologist, Aquatic Life Consultants; 2 years Field Biologist, U.S. EPA; 4 years EIS studies, St. Paul District, Corps of Engineers.	Prepared 404(b)(1) Evaluation; technical assistance on water quality.
Mr. Ralph Berger	Civil Engineer	4 years Civil Engineer, St. Paul District, Corps of Engineers; 5 years design, Chicago and Northwestern Railroad.	Design of structures and alternatives.
Mr. Robbin Blackman	Supervisory Fisheries Biologist	12 years EIS Studies, Corps of Engineers.	EIS Coordinator.
Dr. Mary C. Bromel	Pathogenic Bacteriologist/ Microbial Ecologist	11 years research at North Dakota State University on microbiological water quality of Sheyenne River, Red River, rural wells, and Lake Metigoshe. Consultant to three municipalities on sewage treatment facilities, IJC Committee on Garrison Diversion Impact Study, and EPA on coal mining impact on Knife River basin.	Consultant: Existing Environmental Setting contract report.

<u>Name</u>	<u>Expertise</u>	<u>Experience</u>	<u>Role in Preparation of EIS</u>
Dr. John A. Brophy	Geologist	31 years of professional experience, teaching, and research at North Dakota State University in quaternary geology, geomorphology, and environmental geology.	Consultant: Vegetation/ Groundwater Effects contract report.
Dr. J. Frank Cassel	Ornithologist/ Mammalogist	36 years of university teaching and research, with emphasis on bird and mammal population ecology.	Consultant: Existing Environmental Setting contract report.
Mr. Leonard Carmohous	Fish and Wildlife Biologist	16 years Fish and Wildlife Biologist with U.S. Fish and Wildlife Service.	Prepared Fish and Wildlife Coordination Act Report; fish and wildlife evaluation; mitigation requirements.
Ms. Suzanne Gaines	Sociologist	3 years Sociologist, St. Paul District, Corps of Engineers; 1 year research assistant, Arizona State University Sociology Department and Survey Research Laboratory; 3 years teaching assistant, University of Minnesota Sociology Department.	Prepared social/economic impacts and alternative evaluations.
Dr. Harold Coetz	Range Ecologist/ Plant Ecologist	19 years of teaching and research at North Dakota State University in plant and range ecology. Consultant in mined land reclamation, vegetation inventory, and natural resource management.	Consultant: Existing Environmental Setting and Vegetation/ Groundwater Effects contract report.

<u>Name</u>	<u>Expertise</u>	<u>Experience</u>	<u>Role in Preparation of EIS</u>
Mr. John Kittleson	Biologist	2 years Biologist, St. Paul District, Corps of Engineers; 1 year Peace Corps Biology teaching; 2 years Naturalist, National Park Service.	Prepared Monetary Evaluation of Lake Ashtabula and Kindred; participated in wetland delineation.
Mr. Edward L. McNally	Supervisory Landscape Architect	10 years Landscape Architect, St. Paul District, Corps of Engineers; 1 year research assistant University of Wisconsin.	Prepared Recreation Appendix; designed recreation features of alternatives; recreation impacts.
Mr. David Miller	Sociologist	2 years Research Assistant, Rural Sociology Department, University of Minnesota; 5 years Sociologist, St. Paul District, Corps of Engineers.	Social analysis studies coordinator.
Mr. Michael O'Keefe	Wildlife Biologist	4 1/2 years EIS studies, St. Paul District, Corps of Engineers.	Assisted HEP field studies.
Mr. John Peterka	Aquatic Ecologist/ Ichthyologist	18 years of teaching and research at North Dakota State University in limnology, fisheries biology, and ichthyology.	Consultant: Existing Environmental Setting contract report.
Ms. Terry J. Pfitzenreuter	Archaeology	5 years Archaeologist, Minnesota Historical Society; 2 years Archaeologist, Corps of Engineers.	Reviewed and coordinated cultural resources technical report. Cultural evaluation.
Ms. Jody Rooney	Economic Planner	8 years Economist, St. Paul District, Corps of Engineers.	Economics evaluation.

<u>Name</u>	<u>Expertise</u>	<u>Experience</u>	<u>Role in preparation of EIS</u>
Mr. Clifford Schluefer	Hydraulic Engineer	5 years Hydraulic Engineer, 1 year Engineer Trainee, St. Paul District, Corps of Engrs.	Hydraulic design of alternatives.
Mr. Gregory Schroeder	Water Resources Management/Civil Engineer	4 years project management, St. Paul District, Corps of Engineers; 3 years hydraulic engineer, Rock Island District, Corps of Engineers; 3 years Engineering Supervisor, Regulation Section, Iowa Natural Resources Council, State of Iowa.	Assistant project manager; developed alternatives.
Mr. William Spychalla	Water Resources Management/Civil Engineer	12 years Water Resources Investigations, St. Paul District, Corps of Engineers; 4 years officer in charge of field survey teams, National Geodetic Survey.	Project manager. Reviewed contractors' reports; developed alternatives.
Mr. John M. Wiehe	Vertebrate Ecologist	8 years graduate and post-graduate experience at North Dakota State University as an interpreter, investigator, author, and environmental consultant. Has investigated (and directed field parties) numerous terrestrial vertebrate communities, resulting in several publications. Currently employed by Ecological Analysts, Inc., Northbrook, Illinois.	Consultant: Existing Environmental Setting contract report.
Mr. Mark Ziemer	Hydrology/Hydraulic Engineer	3 years hydraulic engineer, 1½ years civil engineer; 1 year civil engineer/student trainee, St. Paul District, Corps of Engineers	Hydraulic evaluation and design of alternatives.

Index, References and Appendixes
(The selected plan is recommended)

Subjects	Study Documentation		
	Environmental Impact Statement (Paragraph)	Main Report (References Incorporated, Page)	Report Appendix (References Incorporated)
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Areas of Controversy	EIS-1, EIS-2		A
Comparative Impacts of Alternatives	EIS-11, EIS-12, EIS-19 through EIS-24	EIS-13, 31-36 51-88 103-111	L, M, N
Cover Sheet	EIS-1		
Environmental Conditions	EIS-14 through EIS-18	16-18	B, E, F, H, I
Environmental Effects	EIS-19 through EIS-24	31-36 51-88 103-111	D, L, M, N
List of Preparers	EIS-31 through EIS-34		
Major Conclusions and Findings	EIS-1	88-102	
Need for and Objectives of Action	EIS-4, EIS-5	1-2	A
Planning Objectives	EIS-4, EIS-5	6, 41	A, D, M
Plans Considered in Detail	EIS-9 through EIS-13	70-75 79-102	L, M
Plans Eliminated from Further Study	EIS-5 through EIS-7	51-59 76-78	L, M

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(The selected plan is recommended)

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Public Involvement	EIS-26 through EIS-29	4-5	A
Public Involvement Program	EIS-26	120-126	A
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Relationship to Environmental Requirements	EIS-2, EIS-3	39-40 107-111	M, N
Required Coordination	EIS-26 through EIS-28		A
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Wetlands	EIS-12, EIS-13 EIS-15, EIS-19	16-18 106-107	D, N
Fish and Wildlife	EIS-12, EIS-13 EIS-15, EIS-19 EIS-20	16-18 106-107	D, N
Threatened, Endangered and Rare Flora and Fauna	EIS-12, EIS-13 EIS-15, EIS-20	16-18	D, N
Sheyenne National Grasslands	EIS-12, EIS-13 EIS-15, EIS-20		D
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Cultural	EIS-12, EIS-13 EIS-16, EIS-21	29, 30, 35	E

Index, References and Appendixes
(The selected plan is recommended)

Subjects	Environmental Impact Statement (Paragraph)	Main Report (References Incorporated, Page)	Report Appendixes (References Incorporated)
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Sandhills Environment	EIS-12, EIS-13 EIS-16, EIS-20	16-18	D
Unique Areas Spring-Fed Streams	EIS-12, EIS-13 EIS-16, EIS-21	16-18	D
Wild and Scenic Rivers	EIS-12, EIS-13 EIS-16, EIS-21	22-29	D, I
Hunting and Fishing	EIS-12, EIS-13 EIS-17, EIS-21 EIS-22	16-18 106-107	D, I
Riverine Environment	EIS-12, EIS-13 EIS-17, EIS-22		D
Public Law 91-611 Section 122 Accounts	EIS-12, EIS-13 EIS-17, EIS-22		F
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EXHIBIT 1

404(b)(1) Evaluation of
Proposed Plan for Flood Control
Sheyenne River, North Dakota

As required by Section 404(b)(1) of the Clean Water Act of 1977 (Public Law 95-217), the following is an evaluation of the proposed construction and fill activity for the Sheyenne River, North Dakota, flood control project.

1. Project Description

a. Location. The project is located on the Sheyenne River in eastern North Dakota near the cities of West Fargo, Valley City, and Horace.

b. General description. The proposed project has two principal components: (1) the West Fargo diversions and (2) the modifications to the Baldhill Dam (Lake Ashtabula) (Plate 2). The proposed diversion structures would have three inlets/outlets on the Sheyenne River in the area of West Fargo and Horace (see Plates 3 and 4). In addition, three cross-channel retarding structures would be built. The modifications to the Baldhill Dam would consist of raising the elevation of the present structure, removing or modifying the existing floodgate on the right (west) side of the dam, and constructing a new floodgate and channel on the left (east) side (Plate 5).

c. Authority and purpose. The Flood Control Act of 31 December 1970 (Public Law 91-611), Title II, Section 201, authorizes the Secretary of the Army, acting through the Chief of Engineers, to construct and implement the Kindred Lake project and other improvements in the Sheyenne River basin. In 1976, a postauthorization study was initiated to reevaluate the problems and needs of the basin and develop alternative solutions to flood damage and related problems.

d. General description of dredged or fill material.

(1) General characteristics of material.

Diversion: Compacted earth fill and riprap would be used for the cross-channel structures. Culverts or gated structures would be placed in the earth dikes and steel sheetpile would be used to help stabilize the earth embankment. Riprap consisting of random fill and rock would be used to control erosion.

Dam: The addition to the sides of the dam would be riprap and earth fill. The temporary cofferdams would be earth-fill structures with steel sheetpile. The present spillway would be modified or removed and the channel filled with compacted earth. The cofferdam used for the existing spillway could become part of the dam after construction or could be removed.

(2) Quantity of material proposed for discharge.

(a) Diversion: Approximately 2,000 cubic yards of earth fill and riprap would be needed at each diversion opening and for the cross-channel structure. Steel sheetpile may also be used.

(b) Dam: Approximately 110,000 cubic yards of earth fill would be required for the cofferdams. About 575,000 cubic yards of earth fill would be required to raise the dam, extend the sideslopes, and, if recommended, fill the existing spillway and channel. Steel sheetpile may also be used. Not all of this material would be placed below the water line.

(3) Source of material. It is anticipated that most of the earth fill material would be obtained from the excavation for the new spillway. If additional material is needed it would be obtained from sites that are compatible with the requirements of NEPA and the Clean Water Act. Concrete and steel sheetpile would be commercially purchased. Riprap would be obtained by using field stones from the surrounding area and/or quarry sites as required.

e. Description of the proposed discharge sites.

(1) Location (Plates 2, 3, 4, and 5)

Diversion: The areas to be riprapped and the location of the channel structure are at river miles 24, 29, and 42 of the Sheyenne River.

Dam: The construction would occur at Baldhill Dam (Lake Ashtabula), located at river mile 271 of the Sheyenne River.

(2) Size.

Diversion: The total area affected is about 3 acres in size.

Dam: The total area affected is about 10 acres in size.

(3) Type of site.

Diversion: The rock riprap and its foundation material would be placed in open water along the riverbank from above the waterline to the riverbed. The compacted earth-fill structures would be placed in open water across the river channel from the riverbed to the top of the bank. Gated structures would be used to control the flow of water.

Dam: The placement of fill to enlarge the dam would occur in open water along the lakeward side of the dam. The cofferdams would be placed in open water directly upstream of the existing and proposed spillways. The riprap earth-fill material would be placed in open water from above the waterline to the riverbed at the junction of the river channel and the proposed left bank channel. The existing spillway and outlet channel consists of concrete, rock, and earth sides and bottom.

(4) Type of habitat.

Diversion: The habitat in the area consists of open water associated with the river and has a sand, silt, and clay bottom.

Dam: The habitat in the area consists of open water associated with Lake Ashtabula and the river. The bottom is mostly silt and clay.

(5) Timing and duration of discharge. Fill activities would be associated with the construction phase of the project, which is expected to begin about 1990.

f. Description of disposal method.

Diversion and Dam: The fill material would be brought in and mechanically discharged from barges and trucks.

Diversion: At river miles 24, 29, and 42, riprap would be placed along the bank of the main channel on either side of the opening to the diversion canal. Foundation material would consist of compacted earth fill covered by large-sized riprap. At river miles 42, 29, and 24 near the diversion channels, a flow regulation structure would be constructed across the main channel (Plates 3 and 4). These would be compacted earth-fill and riprap structures with gated culverts and would be anchored at each end to rock riprap on the channel banks. Both the riprap and structures would have a foundation layer of compacted earth fill.

Dam: The height of the dam would be raised by 5 feet, and the base would be expanded approximately 600 feet. On the upstream side of the dam, the fill material would consist of rock riprap. In addition to raising the height of the structure, the existing spillway and channel on the right side may be removed and replaced with compacted earth fill and riprap. A new spillway and channel would be constructed on the left side of the dam. During the construction phase, cofferdams would be placed around the upstream side of the spillways. The cofferdam placed for the existing spillway could be either temporary or permanent and could become part of the dam structure after construction.

II. Factual Determinations (Section 230.11)

a. Physical substrate determinations.

(1) Substrate elevation and slope.

Diversion: The proposed construction area has a typical riverine configuration: relatively steep-sided banks and a flat central region. The riprap would replace the sand and clay now on the channel bank. The cross-channel structures would cause a change in bottom geometry over a small area.

Dam: The side of Baldhill Dam where the rock fill would be placed has a height of about 40 feet and a 1:3 slope. The cofferdams would butt up against the dam and the lakeshore and would run along the relatively flat lake bottom. The bathymetric configuration at the junction downstream is similar to that found near the diversion described above. The riprap would replace the sand and clay now on the channel bank. If the existing spillway is filled, it would modify a small area.

(2) Sediment type.

Diversion: The sediment in this area consists mostly of river-deposited silts and clays.

Dam: The sediment in this area consists of gravel, sand, silt, and clay in varying quantities.

(3) Dredged/fill material movement. The fill material would be relatively stable and is not expected to move after placement.

(4) Physical effects on benthos. Some benthic organisms would be buried by the fill material. However, recolonization should occur fairly rapidly on the new substrate. In addition, the coarser texture of the fill material would provide more diverse and probably higher quality habitat than what is presently found in the area.

(5) Other effects. See other portions of this evaluation for a discussion of other effects.

(6) Actions taken to minimize impacts. The use of coarse fill and material with a composition similar to the existing substrate would reduce impacts. The effects of fill placement are not expected to be significant.

b. Water circulation, fluctuation, and salinity determinations.

(1) Water.

(a) Salinity. There would be no effect on salinity.

(b) Water chemistry. There would be no effect on water chemistry.

(c) Clarity. The clarity of the water in the immediate area would be reduced temporarily. Increased turbidity would be localized and would have no long-term effects.

(d) Color. Increased turbidity would temporarily affect the water color; however, no long-term or significant effects are expected.

(e) Taste. There would be no effect on taste.

(f) Dissolved gas levels. There would be no effect on dissolved gas levels.

(g) Nutrients. Because the fill material is essentially the same as the existing substrate at the disposal site, no effects are anticipated.

(h) Eutrophication. The fill activities would not affect the eutrophication level of the river or Lake Ashtabula.

(2) Current patterns and circulation.

(a) Current patterns and flow.

Diversion: The cross-channel structures would cause a slight constriction of flow during low and moderate water stages. At high flows, the water would be channeled through the diversion structures.

Dam: The proposed project is not expected to cause variations in the current or circulation patterns of the river.

(b) Velocity.

Diversion: The velocity in the river would be reduced in the area of the diversions during moderate and high flows. There would be little effect on low flows.

Dam: Velocities would not be affected.

(c) Stratification. Fill activities would have no effect on stratification.

(d) Hydrologic regime. The fill activities would reduce downstream flood flows and stages.

(3) Normal water level fluctuations. The revised operating plan of the lake caused by fill activities would increase water level fluctuation in Lake Ashtabula and decrease fluctuations downstream. The fill activities at the diversions would decrease water level fluctuations in the main river channel by diverting flood flows.

(4) Salinity gradients. Salinity would not be affected.

(5) Actions that will be taken to minimize impacts.

Diversion and Dam: The use of compacted earth fill material and riprap with particle size greater than silt and the use of mechanical disposal techniques would minimize the impacts of turbidity.

c. Suspended particulate/turbidity determinations.

(1) Expected changes in suspended particulates and turbidity levels in vicinity of disposal site.

Diversion and Dam: Fill material would consist of sand, rock, sheetpile, earth fill, and concrete, none of which should release constituents in overlying water that would cause alterations of biological communities. Some exchange with disturbed sediments may occur during construction, but any adverse impact would be short-term and minor. Increased turbidity during construction caused by the suspension of minor amounts of small particles in the fill material and resuspension of bottom sediment material would be the only water quality problems expected to be caused by the project. This increase would be short-term and would not result in significant effects.

(2) Effects on chemical and physical properties of the water column.

(a) Light penetration.

Diversion and Dam: Some increase in turbidity and suspended solids would be expected during construction. This condition would not be severe, however, and would end with the completion of the construction phase.

(b) Dissolved oxygen. The fill activities would have no significant effect on dissolved oxygen levels.

(c) Toxic metals and organics. No effect. The fill material is essentially the same composition as the existing substrate and includes large rock.

(d) Pathogens. No effect.

(e) Aesthetics.

Diversion: Some trees and shoreline vegetation would be removed for the diversion openings and the placement of riprap. The cross-channel structures would detract from the visual appearance of the river.

Dam: During construction, the cofferdams would detract from the visual appearance of Lake Ashtabula.

(3) Effects on biota.

(a) Primary production, photosynthesis. The fill activities would have little effect on these items.

(b) Suspension/filter feeders. Placement and removal of the fill material would destroy or displace some of these aquatic organisms. However, impacts are expected to be minor. The permanent fill would have no effect.

(c) Sight feeders. Impacts would be similar to those expected for the filter feeders.

(4) Actions taken to minimize impacts. The use of clean fill with a composition similar to that of the existing substrate and the use of nonhydraulic methods of placement would reduce impacts.

d. Contaminant determinations. The fill material would consist of rock, gravel, steel, concrete, and material similar to the existing substrate. Although an analysis has not been conducted, it is not anticipated that any new contaminants would be introduced or released as a result of the fill activities.

e. Aquatic ecosystem and organism determinations.

(1) Effects on plankton. Minor impacts would result from the placement and removal of the fill material. Most of these effects would result from the displacement of organisms.

(2) Effects on benthos.

Diversion: Some marginal habitat would be destroyed by the placement of the riprap and cross-channel structures. However, these structures would provide improved, more diverse habitat for benthic organisms.

Dam: The fill material at Baldhill Dam would bury existing communities but would provide new habitat similar to that which presently exists.

(3) Effects on nekton. The fill material would cause a minor disruption of the nekton, resulting from increased turbidity.

(4) Effects on aquatic food web. The fill activities would have little effect on the aquatic food web or production.

Diversion: The cross-channel structures have the potential to block movement of plant or animal species. The size of the openings, however, should preclude this from happening. During high flows, organisms would be able to go through the diversion channel. Habitat in the fill area is generally not conducive to feeding, spawning, or breeding.

Dam: Raising the height of the dam would provide no greater hindrance to biotic movement than already exists. The area which would be covered is marginal habitat for aquatic organisms. The rock riprap would probably provide improved habitat.

(5) Effects on special aquatic sites.

(a) Sanctuaries and refuges. Not applicable.

(b) Wetlands. Not applicable.

(c) Mudflats. Not applicable.

(d) Vegetated shallows. Some areas along the shore vegetated mostly with grass, sedge, or rush would be destroyed by the placement of fill.

(e) Coral reefs. Not applicable.

(f) Riffle and pool complexes.

Diversion: The river in this area is uniform in depth, has a clay-silt bottom, and is not considered a riffle/pool complex.

Dam: The outlet channel downstream of the dam would be filled. This area is fairly uniform in depth, has a rock bottom in areas, but is not considered a riffle/pool area.

(6) Threatened and endangered species. Although the bald eagle and peregrine falcon may migrate through the area, they do not nest here. No effects on these species or their habitat are expected. No State threatened or endangered species would be affected.

(7) Other wildlife. There would be minor effects on terrestrial or aquatic organisms predominantly as a result of increases in turbidity during placement and removal of the fill.

(8) Actions to minimize impacts. The use of clean fill, with a composition similar to the existing substrate in the area, and placement/removal by mechanical means would reduce the impacts.

f. Proposed disposal site determinations.

(1) Mixing zone determination. The mixing zone would be small and would not constitute a significant problem because of the nature of the fill material and its placement by mechanical means. No liquid material would be discharged during construction.

(2) Determination of compliance with applicable water quality standards. The Sheyenne River has been classified by the State of North Dakota as a Class 1A stream. The waters of this class "permit the propagation and/or life of resident fish species and shall be suitable for boating, swimming, and other water recreation." Fill activities would conform to applicable State standards and should have no effect on this classification. During construction, turbidity or suspended solids levels could exceed legally acceptable limits, but this would be a temporary situation and would have no long-term environmental or water quality effects.

(3) Potential effects on human use characteristics.

(a) Municipal and private water supply. There would be no effect on water supplies except for residences that pump river water for watering lawns. They may experience some decline in water if the river is diverted during construction.

(b) Recreational and commercial fisheries. The fill activities would have little effect on fishing except at the construction site. The openings in the diversion structure should not prohibit fish movement. The structure at the dam should not restrict fish movement any more than existing conditions do.

(c) Water-related recreation. The cross-channel structures at the diversions would restrict canoe passage and would necessitate a portage.

(d) Aesthetics.
Diversion: The cross-channel structures and riprap would produce adverse aesthetic impacts in the urban environment. However, these effects are expected to be minor.

Dam: The fill activities would produce some adverse aesthetic impacts. However, because of the existing dam and modified setting of the area, these impacts are not expected to be major.

(e) Parks, National and Historic Monuments, National Seashores, wilderness areas, research sites, and similar preserves. Not applicable.

g. Determination of cumulative effects on the aquatic ecosystem. The impacts resulting from placement of the fill are expected to be minor. They would result from the burying and displacement of aquatic species and the increases in turbidity in the construction area and immediately downstream. This turbidity would affect the feeding and survival of some aquatic organisms.

h. Determination of secondary effects on the aquatic ecosystem. Secondary impacts would include the beneficial value of a more diverse and higher quality substrate provided by the riprap. The cross-channel structures should not significantly affect aquatic organisms.

III. Findings of Compliance or Noncompliance with the Restrictions on Discharge

a. Adaption of the Section 404(b)(1) guidelines to this evaluation. This evaluation is based on the Section 404 guidelines.

b. Evaluation of availability of practicable alternatives to the proposed discharge site which would have less adverse impact on the aquatic ecosystem. Alternative flood damage reduction measures were discussed in the EIS and Design Memorandum. Alternatives are rather limited and would not significantly reduce the impacts. The dam has to be upgraded, even under the no action conditions, to conform to present standards, and alternatives to the modification of the dam are therefore not practical. The impacts resulting from the diversion structures could not be significantly reduced by changing their locations because the habitat in the area is consistent in type. The no action alternative would reduce the environmental impacts. However, it would not alleviate flood damages to an acceptable degree and is therefore not a practical alternative.

c. Compliance with applicable State water quality standards. The activities would comply with State standards with the possible exception of turbidity or suspended solids levels during and immediately following construction.

d. Compliance with applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act. The activities should not violate any toxic effluent standards.

e. Compliance with Endangered Species Act of 1973. The fill activities comply with the Endangered Species Act.

f. Compliance with specified protection measures for marine sanctuaries designed by the Marine Protection, Research, and Sanctuaries Act of 1972. Not applicable.

g. Evaluation of extent of degradation of the waters of the United States.

(1) Significant adverse effects on human health and welfare.

(a) Municipal and private water supplies. The fill activities would not affect water supplies except possibly during construction if the river is diverted. Individuals that obtain river water for watering lawns may then experience some insignificant declines.

(b) Recreation and commercial fisheries. During construction, the fill would have a minor adverse effect on the recreational fishery as a result of construction activities and temporary increases in turbidity.

(c) Plankton. The impacts on plankton would be minor, resulting mostly from burying and increased turbidity during construction.

(d) Fish. The impacts on fish would be minor, resulting mostly from disturbance caused by construction activities.

(e) Shellfish. The impacts on shellfish would be minor, resulting from destruction and burying by construction activities and a temporary increase in turbidity.

(f) Wildlife. The impacts on terrestrial or aquatic wildlife would be minor, resulting mostly from the direct effects of construction activities.

(g) Special aquatic sites. Not applicable.

(2) Significant adverse effects on life stages of aquatic life and other wildlife dependent on aquatic ecosystems. No significant adverse or beneficial impacts would occur.

(3) Significant adverse effects on aquatic ecosystem diversity, productivity, and stability. No significant adverse or beneficial impacts would occur.

(4) Significant adverse effects on recreational, aesthetic, and economic values. The fill activities would result in minor adverse impacts to recreation and aesthetics because the cross-channel structures would be unnatural in the area and would necessitate a canoe portage.

h. Appropriate and practicable steps taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem. The use of clean fill with substantially the same composition as the existing substrate in the area, and mechanical methods of placement and removal would reduce impacts on aquatic and terrestrial ecosystems. The only feasible alternatives to open-water disposal are in the no action and the nonstructural measures, neither of which would solve the existing flood damage problem to an acceptable degree. The fill activities are required to accomplish the goals of the project. There are no practical methods to further reduce the impacts.

i. On the basis of the guidelines, the proposed disposal sites for the discharge of dredged or fill material are specified as complying with the requirements of these guidelines.

LETTERS OF COMMENT

Federal and State Agencies

U.S. Dept. of Agriculture, SCS, Washington, D.C.
U.S. Dept. of Agriculture, SCS, Bismarck, N.D.
U.S. Dept. of Agriculture, Forest Service, Custer N.F.
U.S. Dept. of Commerce, NOAA, Washington, D.C.
U.S. Dept. of Commerce, NOAA, Rockville, MD
U.S. Dept. of Commerce, NOAA, Kansas City, MO
U.S. Environmental Protection Agency, Washington, D.C.
U.S. Environmental Protection Agency, Denver, CO
Federal Energy Regulatory Commission
U.S. Dept. of Health & Human Services, Atlanta, GA
U.S. Dept. of Health & Human Services, Denver, CO
U.S. Dept. of Housing & Urban Development, Denver, CO
U.S. Dept. of Interior, Fish and Wildlife Service, Denver, CO
Minnesota Pollution Control Agency
North Dakota Federal Aid Coordinator Office
North Dakota State Highway Dept.
North Dakota Dept. of Human Services
North Dakota Parks & Recreation Dept.
North Dakota State Water Commission

Regional and Local Governments

Barnes County Water Resource District
City of Valley City
City of West Fargo
Griggs County
Riverside Township
Southeast Cass Water Resource District
Steele County
Sverdrup Township
Traill County
Washburn Township

Individuals and Organizations

Abraham, Lester M. (with inclosures)
Dakota Water Users, Inc. (with inclosure)
First Evangelical Free Church
National Wildlife Federation (with inclosure)
North Dakota Wildlife Federation, Inc.
The University of North Dakota
United Methodist Church
Valley City Flood Committee
Weiland, Ronald

**LETTERS of COMMENT
and
CORPS RESPONSES**

C



Soil Conservation Service

P.O. Box 2800
Bismarck, D.C.
58010

Colonel William W. Sadger
St. Paul District, Corps of Engineers
U.S. Department of the Army
1125 U.S. Post Office and Custom House
St. Paul, Minnesota 55108

GMT 2, 6 1962

Dear Colonel Sadger:

This is in response to your letter of May 14, 1962, transmitting your draft Phase I General Design Memorandum and Environmental Impact Statement for Flood Control and Related Purposes, Snyrna River, North Dakota, dated January 1962.

Any Soil Conservation Service (SCS) comments on this project will be provided to you by the SCS State Conservationist, Mr. J. Michael McHenry, Roomer Avenue and Third Street, Federal Building, P.O. Box 1458, Bismarck, North Dakota 58002. You will not receive comments directly from this office.

We appreciate the opportunity to review this report.

Sincerely,

EDGAR A. NELSON
Director
Soils and Area Planning

The comments furnished by the Bismarck office follow.



10-10-1
10-10



United States
Department of
Agriculture

P. O. Box 1458
Bismarck, ND
58502

Soil
Conservation
Service

July 7, 1962

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

File Code: 190-15-13-5

Dear Colonel Rapp:

The Soil Conservation Service has reviewed the draft "General Design Memorandum Phase I and Environmental Impact Statement for Flood Control and Related Purposes on the Sheyenne River, North Dakota." We have the following comments:

1. The prime farmlands maps are based on general soil maps. The source of the data is described on page D-22.
2. Comment noted.
3. The correction has been made.
4. The paragraph has been modified.
5. The waterfowl density estimates are based on general population estimates developed by the North Dakota Game and Fish Department. These estimates may be lower for any particular year but they are based on long-term averages over a broad area.

1. If the prime farmlands maps in Appendix D are based on the general soil maps published by the North Dakota Agricultural Experiment Station in the 1960's, it would be helpful to so state. The maps in Appendix D are "general prime farmland maps." By so labeling the map someone would not be inclined to compare them to the "detailed prime farmland maps" for Wells County, for example.
2. The "general prime farmlands maps" seem most appropriate for this level of study; however, "detailed prime farmland maps" are more appropriate for structure locations, for example.
3. Page D-85, 5th paragraph under Grass Seeding -- Line 4 should read "be moved no shorter than . . ." not "be moved shorter than . . ."
4. Page 88 -- Fourth paragraph addresses land treatment rather mildly. Considering this watershed and the erosion that is occurring there, there is no doubt that better land treatment would improve water quality and reduce soil erosion.
5. Volume 2, Phase I, Page D-13, Table D-6 -- Waterfowl breeding pair per square mile appears to be too low.

We appreciate the opportunity to comment.

Sincerely,

J. Michael Methery
State Conservationist

The Soil Conservation Service
is an agency of the
Department of Agriculture

SCS-AS-1
10-78



Forest Service

Custer National Forest

2602 First Avenue North
P. O. Box 2556
Billings, MT 59103

Phone 2560

Date July 1, 1982

Department of the Army
Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Gentlemen:

The Custer National Forest has reviewed the Draft Environmental Impact Statement for Flood Control and Related Purposes for the Shyenne River. We support the decision to drop the Kindred Dam alternatives because of significant adverse social and environmental impacts in and around the Shyenne National Grassland.

The tentatively selected plan appears to adequately address the public concerns and has a significant positive benefit/cost ratio. We can support any of the other alternatives, since none adversely affect the Shyenne National Grassland. The final decision should be based on benefits, costs, and impacts.

Sincerely,

John P. Dunn
JAMES P. HARRIS
Forest Supervisor

No response required. We will keep the Forest Service informed on the progress of the project and send a copy of the final report.





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
 Washington, D. C. 20230
 OFFICE OF THE ADMINISTRATOR

June 10, 1982

Colonel William W. Badger
 District Engineer
 Department of the Army
 St. Paul District, Corps of Engineers
 1135 U.S. Post Office and Custom House
 St. Paul, Minnesota 55101

Dear Colonel Badger:

This is in reference to your draft Phase I General Design Memorandum and Environmental Impact Statement entitled "Seyenne River, North Dakota." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving one copy of the final environmental impact statement.

Sincerely,

Joyce M. Wood
 Joyce M. Wood
 Director
 Office of Ecology and Conservation

Enclosure: Memo from Robert B. Rollins
 National Ocean Survey

A copy of the final report and environmental impact statement will be sent.



10TH ANNIVERSARY 1970-1980
National Oceanic and Atmospheric Administration
 A young agency with an old tradition of service to the Nation



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE CENTRAL REGION
Room 1836
801 East 12th Street
Kansas City, Missouri 64106

May 28, 1982

WFCZxl

Colonel William W. Bедger
District Engineer
St. Paul District, Corps of Engineers
Attn: W33ED-7B
1135 U. S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Bедger:

The Corps of Engineers and the National Weather Service have always had a close and successful relationship with regard to alleviation of flood related problems.

Because of that common concern, I would like to make a few brief comments with regard to the review draft of the General Design Memorandum and Environmental Impact Statement for the Sheyenne River in North Dakota (dated January 1982).

With support from the Corps, the National Weather Service currently provides flood forecast services in the Sheyenne Basin at Baldhill Dam, Valley City, Lisbon, Kindred and West Fargo. Perhaps it would be appropriate to mention this in Appendix L of the document.

Implementation of this Design Memorandum would result in some changes to the forecast program. For example, raising Baldhill Dam or construction of a multi-purpose dam on Dead Colt Creek would affect forecast procedures. Also, data collection should probably be reviewed both to its availability and timeliness. The National Weather Service, both this office and the River Forecast Center at Minneapolis, would be happy to work with the Corps on this problem. Also, the National Weather Service offices in North Dakota, USPO Sismark and WFO Fargo, are both concerned and interested in future flood control projects in the Sheyenne Basin.

Thank you for the opportunity to comment on this document.

Sincerely,

Glenn L. Audsley
Glenn L. Audsley
Regional Hydrologist

1. References have been added in the main report and Appendix L to the flood forecast services provided by the National Weather Service.
2. After authorization of the project and as the final designs and operating plans are being developed, the data collection needs and operating plans of the flood control projects will be coordinated with the appropriate offices of the National Weather Service. The Dead Colt Creek Dam will be constructed and operated by the North Dakota State Water Commission and other non-federal agencies. Information on the operation of the Dead Colt Creek Dam should be obtained directly from the Commission.

June 10, 1982

TO: PP/EC - Joyce M. Wood
FROM: OA/CS - Robert B. Rollins *RB*
SUBJECT: DEIS 8206.10 - Sheyenne River, North Dakota

The subject statement has been reviewed within the areas of the National Ocean Survey's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

Geodetic control survey monuments may be located in the proposed project area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. NOS recommends that funding for this project includes the cost of any relocation required for NOS monuments. For further information about these monuments, please contact Mr. John Spencer, Director, National Geodetic Information Center (OA/C18) or Mr. Charles Novak, Chief, Network Maintenance Branch (OA/C172), at 5001 Executive Boulevard, Rockville, Maryland 20852.

If any geodetic survey monuments are located in the project area, the National Geodetic Center will be notified. The cost of relocation for NOS monuments would be a project cost.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 26 1982

OFFICE OF
THE ADMINISTRATOR

Dear Mr. Blackburn:

I am writing to verify the official filing of the EIS entitled:

Draft: Phase I General Design Memorandum, Flood Control and
Related Purposes, Sheyenne River, North Dakota (P220320)

This EIS was received by the Office of Federal Activities on May 21, 1982.
It has been determined the above document meets the requirements for filing
an EIS as set forth under Section 1506.9 of the CEQ Regulations.
Accordingly, EPA has scheduled publication of the Notice of Availability
in the Federal Register dated May 28, 1982 and the public review
period is scheduled to terminate on July 12, 1982.

If you have any questions or concerns relating to this matter, please do
not hesitate to contact me or Ms. Jan Lott of my staff on 245-3006.

Sincerely,

Kathi L. Wilson
Management Analyst
Office of Federal Activities (A-104)

Mr. Robbin R. Blackburn
St. Paul District
US Army Corps of Engineers
1135 US Post Office and Custom House
St. Paul, Minnesota 55101



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII

1640 LINCOLN STREET
DENVER, COLORADO 80295-0699

DEC 19 1982

Ref: BPH-EA


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

Dear Colonel Repp:

We have reviewed the Phase I General Design Memorandum and Draft Environmental Impact Statement (EIS) for flood control and related purposes on the Shayenne River in North Dakota. The program described as the selected plan for flood control resolves many of EPA's long standing concerns about the water quality impacts and other environmental effects of a major flood control reservoir on the Shayenne by proposing a combination of other kinds of flood control measures that accomplish the needed flood protection without a major main stream reservoir. We applaud the efforts of the Corps, other government agencies and the citizens involved in the planning process for the results they have achieved in terms of flood control and environmental protection under the proposed alternative.

As work toward implementation of the selected plan progresses, we encourage your agency to make the most of any opportunities to mitigate the impacts of flood pool fluctuations behind Baldhill Dam through encouragement of stable, permanent wetlands adjacent to the reservoir. Such wetlands should help protect water quality in the reservoir by filtering runoff and floodwaters entering the reservoir. We also strongly support the inclusion of wetland restoration and on land storage of floodwaters for the same reason. These measures, together with best management practices for the protection of water quality during construction are essential parts of the overall environmental mitigation and enhancement features of the selected plan.

We have rated the draft EIS LO-1, which signifies that EPA has no major objections to the proposed action based on our areas of environmental responsibility and that the draft EIS adequately sets forth the environmental impact of the proposed action and its alternatives. Our conclusion as to the adequacy of the draft EIS is based in large measure on the information and analysis documented in the Phase I General Design Memorandum and Technical Appendices furnished for our review and incorporated in the EIS by reference and our assumption that a more complete discussion of the expected water quality impacts of the Colt Creek Reservoir will be included in the final EIS.

Sincerely yours,

Steven J. Durham
Regional Administrator

The impacts of the Dead Colt Creek Dam were not discussed in detail because, although it is part of the overall plan, it is not a part of the plan being recommended for Corps of Engineers implementation, and it is expected that the Water Commission will construct it with or without further Corps involvement. The description of the water quality impacts is therefore considered the responsibility of the Water Commission. The water quality of the reservoir is anticipated to be similar to that of other existing reservoirs in the area, such as Clausen Springs. Algal blooms could be expected and if inflow is low or zero at various times of the year some stagnation may result. Water quality would probably be relatively poor but adequate for many recreational activities. The water quality discussion on page EIS-24 has been expanded to include the broad impacts of the Dead Colt Creek Dam.



FEDERAL ENERGY REGULATORY COMMISSION
CHICAGO REGIONAL OFFICE
230 SOUTH DEARBORN STREET, ROOM 313C
CHICAGO, ILLINOIS 60604

In reply refer to:
OEPR-CH-88A

June 7, 1982

Colonel William V. Badger, District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger: Your Reference: NCSFD-77

This is in response to your recent request inviting our review and comments on the Draft Environmental Impact Statement and General Design Memorandum for Flood Control and Related Purposes, Shayenne River, North Dakota.

Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our review of the Draft Environmental Impact Statement is to determine the effect on matters concerning the Federal Energy Regulatory Commission's responsibilities. Such responsibilities stem from the Federal Power Act and the Natural Gas Act and relate to the licensing of non-federal hydroelectric projects and associated transmission lines; participation in planning and development of Federal hydroelectric projects; certification for construction and operation of natural gas pipeline facilities, defined to include both interstate pipelines and terminal facilities; and the permission and approval required for the abandonment of natural gas pipeline facilities.

Because the above-noted proposed plan would not pose a major obstacle to the construction or operation of such facilities and because the Draft does not indicate that existing natural gas or hydroelectric developments would be adversely affected, we have no specific comments.

These comments are of this office and therefore do not necessarily represent the views of the Federal Energy Regulatory Commission.

Thank you for the opportunity to comment on this Draft Environmental Impact Statement.

Sincerely,

Lawrence F. Coffill
Lawrence F. Coffill, P.E.
Regional Engineer

No response required. We will keep FERC informed on the progress of the project and send a copy of the final report.

Centers for Disease Control
Atlanta, Georgia 30333
(404) 262-6649

July 9, 1982

Colonel William V. Soderger
District Engineer
Department of the Army
St. Paul District
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Soderger:

We have reviewed the Draft Environmental Impact Statement (EIS) for Phase I - Proposed Plan for the Reduction of Flood Damages in the Sheyenne River Basin, North Dakota. We are responding on behalf of the U.S. Public Health Service and are offering the following comments for your consideration in preparing the final document.

Public Health

We believe the public health effects should be compared for the recommended plan and each alternative plan. Table 2 of the EIS could be revised to include a public health impact category. Both the beneficial and detrimental impacts of each plan upon public health and safety should be addressed and considered in the EIS.

Flood Protection

While we recognize that Federal regulations and policies generally provide national flood insurance and protection for those flood events which have a one percent or greater chance of occurrence in any given year, Executive Order 11980 stipulates that each agency "... shall provide leadership and shall take action to reduce risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. . . ." This action is "... to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. . . ." Since "the term 'floodplain' shall mean . . . the lowland and relatively flat areas adjoining inland . . . waters . . . including at a minimum, that area subject to a one percent or greater chance of flooding in any given year," "leadership" is still needed to inform local entities of the long-term consequences of floodplain development in flood prone areas even outside the 100-year floodplain. The environmental health effects upon a floodplain outside of and protected for a base flood from a much greater flood event are consequences that should be disclosed. This information will assist responsible local entities in better understanding their flood problems so that more stringent local controls can be developed if desired.

1. Because the public health effects of all the plans are similar and are an improvement over existing conditions, one statement describing the effects has been provided for all alternatives on page 78. Table 2 is used to describe the significant concerns that have been identified by the public or agencies during the study. Because all the plans would improve the public health of the area by reducing flooding, public health has not been identified as a significant concern and was not included in the table.
2. We agree that information should be provided to local interests on the magnitude and effects of floods greater than the 1-percent chance flood. The outlines of the 500-year flood have been added to the flooded area outline maps in the main report at Valley City, Lisbon, and West Fargo. Also, the level of protection to be provided by the proposed levees at West Fargo is the standard project flood level, which exceeds the 1-percent chance flood level. In the regulation of the floodplain, especially in the reach from Kindred to the mouth of the Sheyenne River, the recognition of the larger floods and their effects is especially important and was discussed on pages 82 and 83 of the draft report.

The potential for increased development in the floodplain to be benefited by the proposed project should be better described. If additional development is predicted to occur in this area, to what extent would flood damages and associated health effects be aggravated in the future from a flood event greater than the flood event for which protection will be provided? The potential long-term effects upon public health and safety from encouraging and perpetuating the continued use of partially protected floodplain areas is another issue that should be discussed. The effectiveness of each practicable alternative (similar to that done for the Selected Plan in Table 17, page 93) in reducing flood damages, flood-related injuries, and potential loss of life should be summarized in the EIS.

It is stated that while Valley City is not interested in being the local sponsor of any relocations (the nonstructural plan), "... a plan of gradual relocations might be acceptable to the affected citizens if available promptly after they have experienced flood damages." Is Valley City suggesting that structural flood protection measures be designed not to protect some of the more flood prone buildings and land uses because the owners would accept relocation after experiencing flood damage?

The flood control benefits to be contributed by the proposed multiple-purpose dam on Dead Colt Creek should be quantified. Is the watershed of the dam of sufficient size to provide "... significant flood damage reduction effects to downstream agricultural areas..." (page 86).

While we recognize that a dam breach or failure may be remote, the EIS should indicate if breach inundation areas have been designated downstream for both project dams in order to assist local government interests in preventing any non-compatible future development in those potential breach inundation zones.

REPLY

We believe that the EIS should address the potential impacts associated with vectorborne disease or nuisance problems in the area. The design and construction of this project should not allow any increase to occur in local vector populations which have the potential to cause vectorborne disease or nuisance problems. We suggest that the local health department be contacted for a history of the vectorborne disease and nuisance problems in the area and the steps necessary to mitigate and prevent the occurrence of any potential problems. While the preservation or creation of wetlands are important national environmental objectives, these objectives need to be and can be compatible with vector control measures to protect public health.

We appreciate the opportunity to review this Draft EIS. Please send us one copy of the final document when it becomes available. Should you have any questions about our comments, please contact Mr. Robert Kay of my staff at FTS 236-6669.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

3. The major area where future development will occur in areas protected by the project is in the reach from Horace through West Fargo. This development is projected to occur with or without the project. In West Fargo, where the greatest amount of future growth will take place, protection from the standard project flood is recommended and the likelihood of the level of protection being exceeded is remote. The nature of the flooding is such that the increased threat to public health and safety is not very great. The flooding is generally relatively slow rising, with relatively low velocities and shallow depths, and does not constitute a significant threat of loss of life. The various practical plans have very similar effectiveness and no significant differences would be brought out by adding this display to the table.
4. No. The city of Valley City has stated only that they are not interested in a relocation plan for the flood-prone parts of the city. Our observation, however, is that after suffering significant flood damages, affected residents and communities support a nonstructural evacuation plan immediately (within weeks) after the flood.
5. The flood control benefits of Dead Colt Creek Dam were quantified in the preliminary evaluation levels, but they were not used by the Water Commission in its justification for the project. The dam would reduce the first flood peaks along the Sheyenne River from above Kindred to the mouth of the river. Preliminary estimates of the benefits are presented in Appendix L; however, final estimates have not been made. Although the primary drainage area controlled by the dam would be about 6 percent of the drainage area between Kindred and Baidhill Dam, the reduction in the first peak is important to the flood-prone area downstream of Kindred, and, when considered with the other plan components, especially to the agricultural areas.
6. Dam breach inundation maps have been prepared by the Corps for the existing Baidhill Dam project. This information will be available for emergency preparedness planning. The Water Commission would be the agency responsible for maps of the Dead Colt Creek project. The possibility of such an occurrence is remote, and relatively low growth of development is projected for the areas potentially affected downstream.
7. As stated in response to comment 1, the public health of the area would be improved by reducing flooding in the area and reducing health problems associated with flooding, including vector problems. The North Dakota Public Health Department has been contacted concerning the project. At one time, the project included the creation of ponds in the diversion channel, but they were eliminated because of the potential to enhance mosquito problems. However, the Fargo area does have a mosquito control program. Wetland restoration has the potential to increase the vector populations in the area. However, during wet periods, vector populations would probably be high with or without restoration. In any case, wetland restoration would probably not take place near highly populated areas.
8. A copy of the final document will be furnished.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the
Principal Regional Official

Region VII
Federal Office Building
1911 Stout Street
Denver, CO 80204
BOFEC

June 21, 1962

Colonel William V. Badger, C. E.
District Engineer
St. Paul District, Corps of Engineers
1135 W. S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

We have reviewed the DEIS for Flood Control and Related Purposes for the
Sheyenne River in North Dakota.

The DEIS indicates that a number of "social factors" were considered and
were determined to be not significantly affected. These factors include
population density, housing, employment, public services and others.

We have no basis for disputing this conclusion. Moreover, we suggest that
that the North Dakota Department of Human Services be added to the list of
agencies for EIS distribution.

Sincerely yours,

E. V. McIntire
Director, BOFEC

The North Dakota Department of Human Services has been contacted
through the State Intergovernmental Clearinghouse. In addition,
the Corps has furnished a copy of the draft report directly to
the Department.



U.S. Department of Housing and Urban Development
Chief Engineer/Area Chief, Region VII
Executive Tower Building
1400 Curtis Street
Denver, Colorado 80202

June 9, 1982

Mr. William W. Dodger
Colonel
District Engineer
Department of the Army
St. Paul, Minnesota 55101

Dear Colonel Dodger:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for Flood Control and Related Purposes in the Stuyvesant River Basin, North Dakota.

Your draft has been reviewed with specific consideration for the areas of responsibility assigned to the Department of Housing and Urban Development (HUD). The review considered the proposal's compatibility with local and regional comprehensive planning and impacts on urbanized areas.

Please indicate the number of construction workers necessary to construct any of the proposal alternatives and where the housing for these persons is likely to occur. Other than this addition we believe the statement adequate for our purposes.

If you have any questions regarding these comments, please contact Mr. Carroll F. Goodwin, Area Environmental Officer at (303) 837-3102 or PVS 327-3102.

Sincerely,

Robert J. Matschek
Director
Office of Regional Community
Planning and Development, DC

Construction schedules and labor force needs have not yet been determined. However, about 50 workers may be needed for the raise of Baldhill Dam for two to three construction seasons. Housing and schooling for this size work force and their families should be available in the Valley City area without negative impacts on the community.

Workers on the West Fargo components should be easily accommodated in the growing metropolitan area of Fargo-Moorhead.



United States Department of the Interior
FISH AND WILDLIFE SERVICE

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U.S. GPO: 1977 O-300-000
ER 82/973

JUL 14 1982

District Engineer
St. Paul District, Corps of Engineers
ATTN: NCSED-PR
1155 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Sir:

We have reviewed the Draft Environmental Impact Statement (DEIS) and Draft Phase I General Design Memorandum, Flood Control, Shyenne River, North Dakota (ER 82/973) and have the following comments.

Fish and Wildlife Resources

We have no objection to the project or recommendations as mentioned in the above documents.

Recreation/Cultural Resources

The discussion of recreation on page EIS-16 of the DEIS mentions the Nationwide Rivers Inventory update, published in September 1980. The final list of components for the Nationwide Rivers Inventory was published in January 1982 by the National Park Service, and does not include the Shyenne River. However, in view of the numerous references in the General Design Memorandum to the river's outstanding recreation development opportunities, we recommend that further project implementation encourage such development to the greatest extent possible.

We also recommend that Table 2, on pages E-12 and E-13 of the DEIS include an analysis of comparative impacts on recreation.

The Corps of Engineers is to be commended for their consideration of cultural resources during project planning, their early coordination with the North Dakota State Historic Preservation Officer, and their commitment to further cultural resource surveys as needed during subsequent stages of this project.

Water Resources

The EIS should address effects of the proposed change in the levels of Ahtabula Lake on ground water levels and utilization in the vicinity of the dam and downstream.

1. We agree. The final list of components for the Nationwide Rivers Inventory was not available to this office when the DEIS was prepared. Appropriate changes to the planning document and EIS have been made.
2. We feel that recreation aspects are adequately addressed by other categories such as aesthetic values, fishery, wildlife, wild and scenic rivers, and hunting. In addition, recreation is discussed in other portions of the EIS and Appendixes D, I, and H.
3. Temporary increases in flood pool elevations would produce only short-term changes in the groundwater levels. These changes are not expected to be significant or result in any change in land or groundwater use in the area.

Mineral Resources

The major elements of the proposed project include raising Baldhill Dam 5 feet to increase flood-water storage by 31,400 acre feet, levees and a diversion channel at West Fargo and Riverside, and a flood diversion channel from Horace to West Fargo.

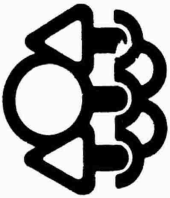
Personnel of the Bureau of Mines investigated the area in 1973 and prepared a report, "Mineral Resources at Four Reservoir Sites, Garrison Diversion Unit, North Dakota." Conclusions of that investigation were that mineral deposits in the area are limited to sand, gravel, and clay. Although sand and gravel had been produced from within the Baldhill reservoir site, other deposits nearby are adequate to supply anticipated needs of the local market. Clay deposits in the area also could supply any need for that commodity. Thus, construction of the project would not significantly affect mineral supply in the area.

We appreciate the opportunity to provide comments and recommendations on the DEIS and Draft Phase I General Design Memorandum.

Sincerely,

Robert F. Stewart
Regional Environmental Officer

4. Comment noted. No response required.



Minnesota Pollution Control Agency

July 6, 1982

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

Dear Colonel Rapp:

This letter is in response to the general distribution and request for comments on Volumes 1 and 2 of the Technical Appendix to the draft Phase I General Design Memorandum and Environmental Impact Statement for Flood Control and Related Purposes on the Sheyenne River in North Dakota.

The State of Minnesota has no direct involvement with the Sheyenne River Watershed; therefore, our comments are brief, general, and directed more toward impacts on the Red River of the North.

This Agency encourages the use and development of existing and drained wetlands as a viable component of a comprehensive flood control program rather than depending entirely on large dams and flood storage reservoirs. We would also encourage the Corps and the State of North Dakota to manage this watershed so that the release of flood waters will not allow peak flows in the Red River of the North to increase. Finally, any effort to improve the water quality of the Sheyenne River, which ultimately impacts the Red River of the North, is encouraged.

Thank you for the opportunity to comment on this project. If you have any questions, feel free to contact Deborah Pile (612/296-7216) of my staff.

Sincerely,

Louis J. Bruburst
Louis J. Bruburst
Executive Director

LJB:es

cc: Willis Mattison
Louis Flynn

Phone (612) 296-7301
1935 West County Road B2, Roseville, Minnesota 55113-2785
Regional Offices • Duluth Brainerd Detroit Lakes Marshall Rochester
Equal Opportunity Employer

No response required. We will keep the MPCA informed on the progress of the project and send a copy of the final report.



The State of North Dakota
FEDERAL AID COORDINATOR OFFICE

DALE E. HANEY
FEDERAL AID COORDINATOR

ALLEN I. OWSEN
GOVERNOR

State Capitol
Bismarck, North Dakota 58505
224-2094

June 25, 1982

"LETTER OF CLEARANCE" IN CONFORMANCE WITH OMB CIRCULAR NO. A-95

To: Department of the Army, Corps of Engineers - St. Paul

STATE APPLICATION IDENTIFIER: ND8205250222

Mr. William M. Badger, Colonel
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Mr. Badger,

Thank you for the copy of the Draft Environmental Impact Statement for the Sheyenne River General Design Memorandum Phase I for Flood Control and Related Purposes.

No response required. We will keep the clearinghouse informed on the progress of the project and send a copy of the final report.

This draft BIS was received in this office on May 25, 1982.

Thank you for submitting your draft environmental impact statement for review and comment through the North Dakota State Intergovernmental Clearinghouse.

Your draft was referred to the appropriate agencies, and no comments were received to this date.

Please send copies of the final environmental impact statement and any supplemental impact statements to the North Dakota agencies that have commented on the draft and to this office. The opportunity to review your draft is appreciated, and if this office as Clearinghouse can be of further assistance with this project, please let me know.

Sincerely yours,

Danni G. Banks

Mrs. Leonard E. Banks
Coordinator
State Intergovernmental Clearinghouse

D. J. Manning Director
224-2012

Lawson Assistant Office
224-2449

North Dakota Emergency Office
224-2258

July 6, 1982

Mr. William A. Badger
Colonel
Corps of Engineers
Department of the Army
1135 US Post Office and Custom House
St. Paul, MN 55101

SHEYENNE RIVER EIS MCSPD-2D

This is in response to your letter of May 14, 1982, soliciting comments on the above referenced project. Our main concerns, of course, are the temporary disruption to the transportation system during construction and the added burden of financing those projects not considered eligible as part of your project cost.

It is our understanding that all local roads affected by the raising of Baldhill Dam will be considered as part of the project cost. We would recommend that you coordinate your activities with the county and township road departments to determine what should be rebuilt and what could possibly be abandoned.

For the diversion channel from Horace to and around West Fargo, it is our understanding that Federal Highway Administration funds could be utilized to make the necessary modifications to street and roads which are part of the Federal aid system. Once again, it will be very important for your staff to coordinate with this office as well as the county and township road departments in your future planning.

I would also like to call your attention to the fact that we will soon be replacing the two Drain #21 structures at Interstate 94. As soon as our Bridge Division begins their preliminary studies, they will coordinate with your office the development of the plans.

1. Future activities on roads potentially affected by raises of Baldhill Dam and the higher flood pool level will be coordinated with the county and township road departments.
2. The question of the use of Federal Highway Administration funds to make necessary modifications to streets and roads which are part of the Federal aid system is not clear at this time. The authorization language for cost sharing on this project may affect how other Federal funds are used and/or credited. Coordination with the Highway Department and local interests will be continued on this subject.
3. Modifications to the Drain No. 21 structures at Interstate 94 are important in the design of the diversion channel crossings and could have a significant bearing on a portion of the diversion channel alignment. Future coordination on these crossings is important.

Mr. William W. Badger
Page 2
July 6, 1982

4 Since this proposal will affect a number of federal, state and county highways, we would appreciate being kept informed of the progress and planning for this project.

Thank you for this opportunity to comment on this project.

Charles A. Gullicks

Charles A. Gullicks, P.E.
Program and Project Development Engineer

JMP

4. We will keep the Highway Department informed on the progress of the project and provide a copy of the final report and environmental impact statement.

NORTH DAKOTA
DEPARTMENT OF HUMAN SERVICES



ECONOMIC ASSISTANCE
HUMAN SERVICES
DEPARTMENT OF HUMAN SERVICES
1000 North Dakota
Bismarck, ND 58103
Telephone: (701) 222-2110

STATE CAPITOL, BISMARCK, ND 58103
Telephone: (701) 222-2110

July 15, 1982

Louis Kowalski, Chief
Planning Division
Department of the Army
St. Paul District Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MI 55101

Reply to Attention of: MCRPD-PT

Dear Mr. Kowalski:

As you requested in your letter dated July 1, 1982, I reviewed the draft of Phase I General Design Memorandum and Environmental Impact Statement for Flood Control and Related Purposes, Sheyenne River, North Dakota, and the selected technical appendices of Phase II which contains detailed information on the social and institutional analysis aspects of the study. Our review was directed toward the current impact of the project on individuals in the project area that are served by our department and the county social service board, and the impact the project would have on our department's responsibilities during a natural disaster in the state.

We do not have any significant concerns. We know the lower Sheyenne River area has been flooded several times in the past, especially during the spring of 1979. These floods have had a serious and detrimental impact on all aspects of the area. It is essential that flood control measures be implemented to minimize future damages in this area. This goal appears to have been accomplished in the project proposal. At the same time, the project proposes a variety of environmental protection measures. We believe that the proposed project will be beneficial and has our endorsement.

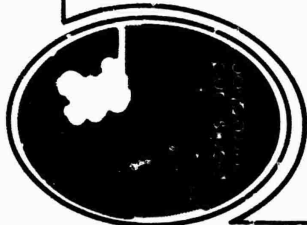
Thank you for the opportunity to review the proposed projects materials.

Sincerely,

Lawrence M. DeBilram, Administrator
Energy Assistance and Emergency Services

LMD:djl

No response required. We will keep the Department informed on the progress of the project and send a copy of the final report.



NORTH DAKOTA PARKS AND RECREATION DEPARTMENT

Finchurst Office Park
1424 West Century Avenue
P.O. Box 700
Bismarck, ND 58502
Phone: (701) 224-4887

July 23, 1982

William W. Badger, District Engineer
Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Mr. Badger:

Concerning the Review Draft Phase I GDM and EIS for the Sheyenne River basin flood control, the North Dakota Parks and Recreation Department has the following comments relating to environmental and recreational issues.

We strongly endorse your decision to exclude the Kindred Dam from the selected plan. The recreational and unique biological aspects of that part of the Sheyenne River basin would be an irreplaceable loss to North Dakotans if the dam is built.

We are also pleased to see control of drainage as an essential component of the selected plan, and agree that this control should be regulated on a basinwide watershed approach by regulation boards or panels. These boards could not only monitor future drainage projects, but could also deal with the "important" plan component of increasing the floodwater storage capacity of existing or drained wetlands. We are pleased that the uncontrolled drainage of wetlands is recognized as an important contributing factor to flood magnitude and frequency, and recognize that this is a very positive aspect of the plan.

There are several points in the review draft that we feel are inadequate or questionable, however. These are listed below by page number or subject heading.

Rare Species. (Pages 16, 17, EIS Page 20 and various places in appendix D)

Your use of the term "rare" species is very loose and ambiguous. Rare can be defined on a local, statewide, regional, or worldwide basis! A "rare" bird species is especially confusing. If the definition is not confined to breeding species, an irregular migrant could be considered rare. For example, white pelican and osprey are listed as rare species in the basin, but we know of no breeding records for these birds in the Sheyenne basin.

We also found some inconsistencies and inaccuracies in Appendix D, Page 7-17 and 49:

- The pileated woodpecker is found outside the Sheyenne River basin (see Stewart, R.S. 1975. Breeding Birds of North Dakota. Tri-College Center for Env. St., Fargo, North Dakota, 295 pp).
- The scarlet tanager, yellow-bellied sapsucker, and yellow-throated vireo are lumped as "rare" species along with the yellow-billed cuckoo and American woodcock. We question why the former are called rare species, and suggest the latter be called hypothetical (see Stewart, 1975).

1. The term "rare" is used to signify that a species is not common in the area or the State. Rare is used by Stewart (1975) in Breeding Birds of North Dakota and by North Dakota State University for its Plant "List of Rare and Unique North Dakota Species Found in the Sheyenne Basin" (Barker 1977). It is not possible in a report of this type to describe in detail the breeding status or abundance of each species. The reader could, however, go to specific publications for the information. For purposes of this report, the species are grouped and referred to in general terms to signify abundance. The term "uncommon" has been added to the narrative.

2. Information on the pileated woodpecker was obtained from a 1970 U.S. Forest Service impact survey report on the proposed Kindred Reservoir. Although Stewart (1975) located the species in the Red River basin, it should be noted that observations were made in the Sheyenne River basin. In either case, the pileated woodpecker is not common in North Dakota and is of special interest. The description has been modified.

3. As stated in response 1 above, for the purposes of this report, the species are grouped in general categories to signify abundance. Stewart (1975) lists the scarlet tanager, yellow-bellied sapsucker, and yellow-throated vireo as rare in many portions of the State. The term "uncommon" has been added to the narrative.

- 4 - The gray treefrog and wood frog are not restricted to the gallery forests in the lower Sheyenne River basin as your statement implies, but are also found in other eastern areas of the state. Also, the gray treefrog is considered a peripheral species by the Endangered Species Committee of The Wildlife Society.
- 5 - There is no mention of the prairie skink (*Scincus septentrionalis*) as a reptile in the Sheyenne River basin. This is also a peripheral species, and is found only in sandy areas in the southeastern part of the state.
- 6 - The list of rare plants in the basin is also incomplete. *Equisetum palustre*, *Asplenium filix-femina*, *Dryopteris cristata*, *D. spinulosa*, *Oncoclea sensibilis*, *Manisuris recurvatus*, *Pilea fontana*, *Silene scutellata*, *Agrostis americana*, *Menyanthes trifoliata*, *Campylopus sparganoides*, *Potamogeton filiformis* (in North Dakota known only from the Sheyenne River below Valley City), and *Cyperus tivarialis* are also plants found in the Sheyenne River Valley that are rare in the state because they are at the periphery of their range. This is not a complete list for the basin, but only includes those plants most likely to be affected by flood control projects in the basin.
- 7 - There are also several species of fish listed by the Endangered Species Committee of The Wildlife Society as threatened, endangered, or peripheral species. These are the black nose shiner (*Notropis heterolepis*), rosyside shiner (*Notropis rubellus*), and greater redbone (*Ameiostoma valenciennesi*).
- 8 - Two very good references were ignored in this section of the report. They are Stewart (1975) and the publication, McKenna, M.G. and R.W. Seabloom, 1979, "Endangered, Threatened, and Peripheral Wildlife of North Dakota. Inst. for Ecological Studies, Research Report No. 28. University of North Dakota, Grand Forks, 52 pp.
- 9 - We request that you include the species mentioned above, plus those already in the document, in the FHS and address the issue of impact on these threatened, endangered, and peripheral (rare) species.
- 10 Woodlands. (Page 19)
It is unclear what the term "managed woodlands" speaks of when you discuss compensating woodland losses. Natural woodlands would be very preferable to shelterbelts or planted woodlands that do not have the diversity and unique species found in natural woodlands.
- 11 Planning Objectives. (Page 41)
We would encourage the inclusion of preservation of unique areas and threatened, endangered, and peripheral species as one of your planning objectives. We are especially concerned that there is no mention of rare and unique plant preservation.
- 12 Outdoor Recreational Needs
Recreational resources should include the activity of snowmobiling in the sentence on page 22 - "Major recreational opportunities within the valley include hunting, trapping, fishing, canoeing, camping, and hiking." The North Dakota Parks and Recreation Department currently provides two snowmobiling trails in the Sheyenne River Valley.
According to the 1980 State Comprehensive Outdoor Recreation Plan (SCORP) bicycling is listed as the number one participation sport statewide as well as the Sheyenne River Valley. This should be addressed in this plan.

4. The paragraph has been modified. The Wildlife Society list has not been officially adopted by the State of North Dakota.
5. The description has been modified.
6. As stated earlier, the lists presented in the report are not intended to be complete. All of the species you list plus others are included in an environmental inventory prepared under contract by Tri-College University. The exception is *Pilea fontana* which was not listed at the time the study was conducted. The description on page D-7 has been expanded.
7. The blacknose shiner is discussed on page D-9. The discussion has been expanded to include the other two species.
8. The references were not ignored. These references or earlier versions were used by Tri-College University to prepare a report on the existing environmental setting in the Sheyenne River Basin. This report is on file at the St. Paul District office of the Corps.
9. Most of the discussions on threatened, endangered, or otherwise uncommon species have been modified on the basis of your comments. At this stage of the planning process, based on preliminary information, none of these species would be adversely affected. As the study progresses, impacts on endangered species will continue to be evaluated.
10. Mitigation requirements have not been finalized. As discussed on pages EIS-10 and EIS-19 and in the Fish and Wildlife Coordination Act Report, mitigation could include managing existing woodlands or replanting some areas. Natural woodlands would be used if existing habitat is used for compensation. Shelterbelts and planted woodlands would probably not be used for mitigation unless they have sufficient extent and vegetative diversity to make them suitable for wildlife management. Natural woodlands, shelterbelts, and planted woodlands can all be managed through a variety of techniques designed to increase their wildlife habitat value.
11. The objectives have been modified to include these concerns.
12. The sentence has been modified to reflect the comment.

R2. Budget
June 23, 1962
Page 3

Page 35 addresses the anticipated future resource base of recreational resources. We recognize the need for additional recreational development, particularly in the east. Limited recreation exists in this area, however, the potential is great. The supply of opportunities must grow to meet the demand.

The North Dakota Parks and Recreation Department feels the Shyenne River Valley is a major potential source of future growth for recreation opportunities. This river basin provides an excellent resource base for various activities.

Sincerely,



Tom Mueller, Assistant Director
Planning, Development & Community Services

13. Comment noted.

96/nd



GOVERNOR ALLEN L. OLSON
MONTANA

HERMON F. BART
MONTANA

July 7, 1962

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

Dear Colonel Rapp:

Re: Shyenne River Flood Control Project
SNC Project No. 1344

It is the intent of the State Water Commission, an agency of the State of North Dakota, to work with local government entities to establish agreements adequate to provide assurances to the Federal Government that certain non-federal actions will be taken in support of the Shyenne River Flood Control Project.

These actions will include considerations of the following:

Non-federal cost sharing in accordance with congressionally approved cost sharing program.

Regulation of floodways, levee construction and drainage activities to assure that the project is not adversely affected.

Dissemination of information supportive of sound floodplain management programs.

Assumption of maintenance and operation of channel and levee portions of project in accordance with prescribed regulations. This responsibility to be assumed upon the expiration of the fifth year following project completion. The United States would be saved harmless from damages arising as a result of the work performed by non-federal interests in the continuing maintenance program.

The St. Paul District will be happy to work with the North Dakota State Water Commission and local government entities in the implementation of the plan.

Colonel Edward G. Zapp
July 7, 1962
Page 2

I trust that the foregoing will be adequate for your purposes in forwarding project documents to higher levels for consideration and approval.

Sincerely,

Wm Faby
Wm Faby
State Engineer

WF:01

Barnes County
Water Management District

Valley City, North Dakota 58072

July 20, 1967



Department of the Army
St. Paul Dist. Corp of Engineers
1145 U.S. Post Office & Custom House
St. Paul, Minn. 55101

Louis Kowalski
Chief, Planning Division
Dear Mr Kowalski:

This letter is to express the feelings of the Barnes County Water Resources District relative to the solving of the flooding in the Sherenne River below the Baldhill Dam.

We are in support of the plan as you have it at this time; but we oppose raising of the Baldhill Dam five feet. We are in favor of Timber Creek Dam; Diversion # 21 around "Leg" Farvo, river dikes around farmsteads; and the plan in general.

Respectfully yours,

W. H. Farvo
Russel L. McKay

CORPS RESPONSES TO BARNES COUNTY WATER MANAGEMENT DISTRICT

Your views are appreciated. However, the raise of Baldhill Dam is being retained as part of the recommended plan because the benefits to be gained through the addition of flood control storage outweigh the costs. Also, the properties in Barnes County and Valley City which will benefit are greater in number than those which must be acquired for the project. Dead Colt Creek Dam is included as part of the overall plan, but at this time Timber Coulee Dam is not. However, if non-federal interests were to construct an impoundment on Timber Coulee in the future, the additional flood control storage would increase the level of protection provided by existing flood control projects in the basin. We will continue to coordinate with you as the plan proceeds toward implementation.

CITY OF VALLEY CITY



P. O. Box 220
Telephone 645-1700

August 17, 1982

Mr. William Spychalla, Engineer
St. Paul District Corps of Engineers
Department of the Army
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

RE: Shyenne River
Flood Control Project

Dear Mr. Spychalla:

At its meeting on Monday, August 16, 1982, the Valley City Commission unanimously adopted the following motion pertaining to the Shyenne River Flood Control Project and the raising of Baldhill Dam in particular:

"That the Valley City Commission refrain from taking any position on the Shyenne River Flood Control Project and specifically the raising of Baldhill Dam until further information is available to determine the impact of the project on the floodway and the floodplain within the City of Valley City."

At the same meeting the Valley City Commission received a report from the Valley City Flood Committee outlining their position and comments on the Shyenne River Flood Control Project. A copy of said report is enclosed.

It is requested that this letter setting forth the action taken by the Valley City Commission and the enclosed report from the Valley City Flood Committee be included in the report to be forwarded by the Corps of Engineers, St. Paul District, to its headquarters in Washington, D.C.

Thank you for your attendance at our Commission meeting on August 16th and for your comprehensive review of the Shyenne River Flood Control Project.

Sincerely,

Dale Olson
President
VALLEY CITY COMMISSION

DS:wh
Enclosures

CORPS RESPONSES TO CITY OF VALLEY CITY

1. Information on the modified flows to be expected with a 5-foot raise of Baldhill Dam is provided in Appendix B, Hydrology. This information has been provided to the North Dakota State Water Commission and will assist you in determining the effect of the raise on the "floodway" through Valley City. Resolution of the issue of how accurate the water surface profile model is that was used to delineate the floodway and floodplain would be needed to more accurately assess effects on them.
2. The enclosure to your letter has been published as part of this Environmental Impact Statement.

CORPS RESPONSE TO THE CITY OF WEST FARGO

We look forward to working with the City of West Fargo, the North Dakota State Water Commission, and others toward future implementation of the plan.

August 2, 1962

Department of the Army
St. Paul District
Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Re: Sheyenne River, North Dakota

ATTENTION: Bill Spychalla

Dear Mr. Spychalla:

The City of West Fargo supports the recommended plan as set forth in Phase I General Design Memorandum.

Please also be advised that the City is in agreement that the North Dakota State Water Commission should act as the local sponsoring agent.

Sincerely yours,

CITY OF WEST FARGO

Clayton A. Loulsen, Mayor

cc: North Dakota State Water Commission

Cooperstown

COUNTY COMMISSIONERS
 JOHN B. BROWN 4th Dist
 FREDERICK W. BROWN 5th Dist
 ALAN J. BROWN 6th Dist
 J. C. BROWN 7th Dist
 JAMES B. BROWN 8th Dist
 JAMES B. BROWN 9th Dist
 JAMES B. BROWN 10th Dist

Griggs County



April 8, 1982

North Dakota

COUNTY OFFICERS
 JOHN B. BROWN 4th Dist
 FREDERICK W. BROWN 5th Dist
 ALAN J. BROWN 6th Dist
 J. C. BROWN 7th Dist
 JAMES B. BROWN 8th Dist
 JAMES B. BROWN 9th Dist
 JAMES B. BROWN 10th Dist

CORPS RESPONSES TO GRIGGS COUNTY

Your views are appreciated. Any lands, farmsteads, or other structures that would be affected by the proposed raise of Baldhill Dam would be acquired as a part of the project. The estimated costs of the project include the costs of these acquisitions. The cost of acquiring the Cooperstown Bible Camp has been included as a project cost; however, more detailed topographic information on the camp must be obtained prior to land acquisition to determine its exact needs and the effects of the proposed raise of Baldhill Dam. There would be about 200 acres of woodland affected by periodic inundation, which over time would affect the scenic quality of the area. Although no project benefits are expected in Griggs County, compensation would be provided to those whose property is acquired as discussed in the General Reevaluation and Environmental Impact Statement.

Colonel William Badger
 Department of Army
 St. Paul District, Corps of Engineers
 1135 U. S. Postoffice & Custom House
 St. Paul, MN 55101

Dear Sir:

The Griggs County Commissioners are opposed to any raise of Bald Hill Dam. The damage done in our county, by such a raise would be significant. Farm land, farmsteads, roads, bridges, Cooperstown Bible Camp and considerable scenic wooded river valley would all be impacted in our area.

We see no benefits to our area, consequently we are opposed to such a raise.

Sincerely,

Griggs County Commissioners
 Joe Graman, Chairman

Finley, North Dakota
April 15, 1962

Col. William V. Redger
District Engineer, Department of the Army
St. Paul District, Corps of Engineers
1185 U.S. Post Office, Custom House
St. Paul Minnesota 55101

Dear Colonel:

At their Board of Equalization meeting on Monday, April 12, the Board of Supervisors of Riverside Township, Steele County, N. Dak., went on record as opposing any increase in height of the Ball Fill Dam on the Sheyenne River. The Sheyenne River runs through sections 30 and 31 of the township. The Ueland family lost their best land when the dam was first built. They had to move their buildings and were not adequately compensated for their loss at that time. Any raising of the dam would only add to their loss.

As Riverside township is near the Sheyenne River it is directly concerned about the roads, bridges and the Cooverstown Bible Camp on the river. Riverside residents are frequent shoppers in Valley City and cross the Sheyenne two times on the regular route to Valley City and are familiar with problems caused by the dam and are well aware of all the trees that have been destroyed.

By Order of the Township Board

Edward Johnson
Edward Johnson, Clerk
R. 3 Box 29
Finley, ND 58250.

CORPS RESPONSE TO RIVERSIDE TOWNSHIP

Your views are appreciated. About 200 acres of land would have to be acquired in Sections 30 and 31 of Riverside Township. See response to letter of comment from Griggs County.

SOUTHEAST CASS WATER MANAGEMENT DISTRICT

HOWARD EMMERSON, Chairman
West Fargo, ND 58078
DANIEL R. TWICHELL, Secretary
West Fargo, ND 58078

133 West Main
WEST FARGO, ND 58078

HOWARD QUALLEY, Member
Route 3 Box 226 Fargo, ND 58103
E. M. GREGORY, Member
Fargo, ND 58102

CORPS RESPONSE TO SOUTHEAST CASS WATER MANAGEMENT DISTRICT

The St. Paul District will be happy to work with Southeast Cass Water Resource District, the North Dakota State Water Commission, and other local government entities to implement needed flood control measures on the Sheyenne River.

July 30, 1982

Department of the Army
St. Paul District
Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Re: Sheyenne River, North Dakota

Attention: Bill Spychalla

Dear Mr. Spychalla:

This is to advise you that the Water Resource District supports the Sheyenne River flood control project as proposed by your office. Please also be advised that the Water Resource District will work with the State Water Commission which is the local sponsor.

The district looks forward to working with the Corps of Engineers and the State Water Commission to provide the flood control measures needed in the Sheyenne River.

Thank you.

Sincerely yours,

SOUTHEAST CASS WATER RESOURCE DISTRICT



Daniel R. Twichell
Secretary

DKF:lj
cc: North Dakota State Water Commission

CORPS RESPONSE TO SVERDRUP TOWNSHIP

Your views are appreciated. About 1,000 acres of lands would be acquired in Sverdrup Township for a 5-foot raise of the Baldhill Dam. No benefits are anticipated for residents of Sverdrup Township as a result of the raise; however, the owners of the lands, farmsteads, etc., to be acquired would be compensated based on the fair market value of the properties. The raise of Baldhill Dam is being included as part of the overall plan for flood damage reduction, which will benefit Barnes, Ransom, Richland, and Cass Counties, Valley City, Lisbon, and other communities downstream of the dam. The overall plan requires non-Federal sponsorship for implementation. The North Dakota State Water Commission has indicated its willingness to sponsor the overall plan, including the raise of Baldhill Dam.

Col. Wm. V. Badger
Dept. of the Army
St. Paul District Corps of Engineers
1135 U.S. Post office & Customs House
St. Paul, Minn. 55101

May 11, 1982

Dear Sir:

Sverdrup Township, at their annual meeting on March 16, 1982 voted to unanimously oppose any raise of Bald Hill dam. This township is one of the most severely impacted of them all. Impacts, such as: farmland, farmsteads, roads, bridges, a Bible Camp, naturally wooded areas, are all realized here, with no visible benefits.

We do not see a concerted effort, other than the Corps of Engineers, to promote this raise.

We have in our township several people who were severely impacted on the original construction of Bald Hill. Now these same people are being asked to sacrifice again. We think this is totally unfair and unjustified.

Sverdrup Township

Irvin Loge
Irvin Loge
Chairman

Trail County North Dakota

Mr. Joseph E. Olson
 Trail County Auditor
 100 North Main Street
 Trail, North Dakota 58570
 Phone: 785-3311
 Fax: 785-3311

Mr. Joseph E. Olson
 Trail County Auditor
 100 North Main Street
 Trail, North Dakota 58570
 Phone: 785-3311
 Fax: 785-3311

CORPUS RESPONSE TO TRAILL COUNTY, NORTH DAKOTA

Your views are appreciated. No measureable adverse impacts or benefits are expected to occur in Traill County as a result of a 5-foot raise of Baldhill Dam. Properties to be acquired for the raise are located in Griggs, Steele, and Barnes Counties. The location of any needed mitigation lands has not yet been determined; however, none of the more likely locations are in Traill County.



HILLBROOK NORTH DAKOTA 58571

June 27, 1982

Commissioner Ashland moved to adopt the following Resolution at the June 22, 1982 meeting of the Board of County Commissioners. The motion was seconded by Commissioner Meyer. On roll call, all members voted Aye as follows: Roy Ashland, Hartman Ulland, Sidney Rosholt, Alvin Meyer and Gilman Mastvedt. Resolution declared adopted.

RESOLUTION

Whereas, the Board of County Commissioners feel the impacts that would occur in our area do not balance any benefits we might receive.

Be It Resolved that the Traill County Board of Commissioners go on record as being opposed to any raise of the Bald Hill Dam.

Yours truly,
Mildred Olson
 Mildred Olson
 Traill County Auditor

CORPS RESPONSE TO WASHBURN TOWNSHIP

Your views are appreciated. Although it is not anticipated that any lands in Washburn Township will be affected, the majority of the 2,000 acres of lands to be purchased for the raise of Baldhill Dam are located in Griggs County. Substantial benefits will result from the raise of the dam, although these will not occur in Griggs County.

April 14, 1962

Col. William W. Maurer
District Engineer
Dept. of the Army
Civil District Corps of Engineers
1135 West Post Office and Custom House
St. Paul, Minnesota 55101

Dear Col. Maurer:

The Supervisors and Officers of Washburn Township, Griggs County, North Dakota are in strong opposition to the raising of the Bald Hill Dam on the Sheyenne River. The preservation of the Sheyenne River Valley is significant to insure a future for its residents and families. The destruction of this project will create will only harm the agriculture sector and also the ethnic and scenic values.

We serve the people of this area and again oppose this project.

Yours Truly,

Supervisors and Officers

Clayton Dean
Arthur J. G. Smith
Leyle Pfeiffer
Ronald Cooper
Alfred John

CORPS RESPONSE TO LESTER M. ABRAHAM

July 19, 1962

William W. Badger
Colonel Corp of Engineer
District Engineer

Dear Sir:

After reviewing the data compiled in the technical appendixes of Volumes 1, 2, and 3 on flood control for the Sheyenne River, N.D. I still come to only one conclusion. I would agree to the plan as proposed but with one exception. They drop the raising of Bald Hill Dam. Revise or repair it and add small detention dams throughout the entire flood plains. There is a time when common sense should take precedence over cost factors.

The people above the dam have felt the impact by giving up many acres of their farm land when the dam was built and are now asked to give more so people down stream can build in the flood plains. You must control drainage all the way to the mouth including detention dams and it will work.

Enclosed are two letters from concerned organizations and a copy of the minutes of our East Central County Commissioners Association, which consists of Barnes, Cass, Griggs, Steel, and Trail counties of N.D. I would appreciate it if you could make these letters a permanent part of your records.

Sincerely,

Lester M. Abraham
Lester M. Abraham

Your views are appreciated. The raise of Bald Hill Dam is part of a comprehensive plan for flood damage reduction for the basin. The control of drainage throughout the basin as well as the regulation of building in the flood-plain are included as part of the plan. The letters you inclosed are printed following this letter.

CORPS RESPONSE TO LAKE ASHTABULA LANDOWNERS AND USERS ASSOCIATION

This letter was an inclosure to the Lester Abraham letter. The views of the Lake Ashtabula Landowners and Users Association are appreciated. Significant downstream flood control benefits are projected from the increased flood control storage at Baldhill Dam which will result from the 5-foot raise of the dam. These benefits are described in the General Reevaluation Report and in Appendices C, L, and M. While no communities or areas are completely removed from the floodplain, the floodplain areas are substantially reduced.

June 15, 1962

TO WHOM IT MAY CONCERN:

This is to advise that the membership of the Lake Ashtabula Landowners and Users Association at their annual meeting in March, 1962, passed a Resolution which in effect stated that the membership was in all things opposed to the raising of the Baldhill Dam as was outlined by the Corps of Engineers.

Also, the Board of Directors of this organization has in the past taken a stand in opposition to this proposed raising of Baldhill Dam for the reason that it has not been conclusively shown that this proposal will alleviate any of the flooding problems experienced by the communities on the downstream portion of the Sheyenne River.

Sincerely yours,

Henry A. Boyer Chairman Baldhill Landowners & Users Assn

CORPS RESPONSE TO EAST CENTRAL COUNTY COMMISSIONERS ASSOCIATION

These minutes were an inclosure to the Lester Abraham letter. Your views are appreciated. Small detention dams in the Sheyenne and Maple River basins were evaluated as part of this study, and it was concluded that a 5-foot raise of Baldhill Dam would be more cost-effective and less socially and environmentally disruptive than the same degree of flood control through the use of small detention dams upstream of Baldhill Dam. Small detention dams such as the Dead Colt Creek Dam could be developed throughout the Sheyenne and Maple River basins, primarily by non-Federal interests, and could supplement the flood control provided by the raise of Baldhill Dam.

EAST CENTRAL COUNTY COMMISSIONERS ASSOCIATION

June 14, 1982

The East Central County Commissioners Association met on June 16, 1982 at 10:00 o'clock a. m. at the Coachman Inn in Cooperstown. There were 24 members present

Minutes of the previous meeting were read and approved.

The Treasurer's report was given and there is \$548.63 cash on hand.

Guests of the meeting were Mike Erickson and Orville Tranby of the Organization for the Preservation of the Lower Sheyenne Valley, also present were some residents of Barnes County who live along Lake Auktakula. Les Abraham withdrew his previous motion and Charles Matland withdrew his second on the raising of the level of Bald Hill Dam. Mike Erickson and Orville Tranby talked on the effects of the raising of the Bald Hill Dam.

Motion by Les Abraham, second by Charles Matland and carried, all eyes, no ways to adopt the following resolution:

RESOLUTION

The members of the East Central County Commissioners Association go on record as being opposed to the raising of Bald Hill Dam. And that we prefer the small detention dams being placed throughout the Sheyenne and Maple River flood plains for the control of flood waters.

Uniformity of lead limits was discussed. It was decided to have an engineer from the State at the next meeting at Finley in September.

Motion by E. A. Nansen, second by Francis Vandrovec to adjourn the meeting.

Walter F. Farberugh
Secretary-Treasurer

* A copy of this Resolution is to be sent to the State Water Commissioner.

Dakota Water Users, Inc.

P.O. BOX 476
FINLEY, NORTH DAKOTA 58230

Phone
524-2393



CORPS RESPONSE TO DAKOTA WATER USERS, INC.

Your views are appreciated. The resolution of the Dakota Water Users Inc., follows this letter.

March 5, 1982

Corps of Engineers
1155 US Post Office & Custom House
ATTN: William V. Badger
St. Paul, MN 55101

Dear Mr. Badger:

Attached is a resolution DAKOTA WATER USERS, INC.
Board of Directors adopted for your review.

Thank you for your time.

Sincerely,

Larry Lundson

Larry Lundson, Manager
DAKOTA WATER USERS, INC.

CC: North Dakota State Water Commission

CORPS RESPONSES TO DAKOTA WATER USERS, INC.

Your concerns are recognized. A preliminary evaluation of the potential effects of a raised flood pool level at Lake Ashtabula on the pipeline crossings in Sverdrup and Riverside Townships shows the following:

- Water velocities and erosion caused by flood flows should be reduced in areas affected by the raised lake level.
- The lake level would be raised to level 1267 about once every 10 years, to level 1269 about once every 25 years, and to level 1271 about once every 50 years. General ground elevations in the area of the pipeline/river crossings range between 1270 and 1275, and the pipeline is buried 7 feet below ground and at least 2 feet below the river thalweg. This area is subject to flooding under natural conditions. The proposed raise of the flood pool would increase the depth of water on these lands from 1 to 3 feet once every 28 to 50 years. The magnitude of this effect on the operation of the pipeline crossing appears to be negligible.

As additional information about the pipeline crossings is gained during subsequent studies, we will coordinate with you to assure that your concerns are fully considered.

RESOLUTION

WHEREAS, Dakota Water Users, Inc. owns and operates a water supply distribution system with a capacity currently capable of serving customers lying in the areas of Steele County, Griggs County, Barnes County, Nelson County, and Grand Forks County; and

WHEREAS, it has been brought to the attention of the Board of Directors of Dakota Water Users, Inc. that there is a proposal presently being considered by the Corps of Engineers to raise the Bald Hill Dam and Ashtabula Reservoir in the State of North Dakota five feet above its normal spring run off peak levels; and

WHEREAS, such proposed project would adversely or could adversely affect our six inch river crossing main supply line which is located in Sverdrup Township in Griggs County and in Riverside Township in Steele County; and

WHEREAS, such river crossings are a very expensive item to install, remove, and maintain; and

WHEREAS, such proposed project would, or could, affect said river crossing and cause increased maintenance and operating costs to Dakota Water Users, Inc.;

NOW, THEREFORE, be it resolved by the Board of Directors of Dakota Water Users, Inc. that the United States Corps of Engineer review such proposed project in view of the information contained within this resolution and that the United States Corps of Engineer find that it is in the best interest of all considerations and persons involved that the Bald Hill Dam and Ashtabula Reservoir not be raised to a new proposed water level.

Dated this 15 day of February, 1982.

DAKOTA WATER USERS, INC.
Janley, North Dakota

By [Signature]
Its President

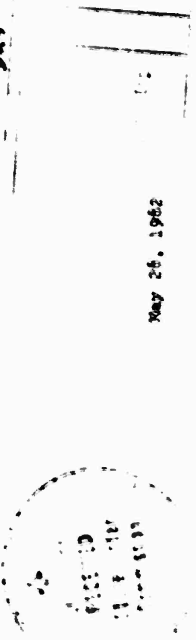
By [Signature]
Its Secretary

(over)



First Evangelical Free Church

10th Street and Avenue F
Bismarck, North Dakota 58501
Phone 223 6271



May 26, 1962

North Dakota State Water Commission
900 E. Boulevard
Bismarck, North Dakota 58501

Gentlemen:

I understand that plans are underway to raise by some five feet the Bald Hill Dam.

1. Personally, as well as this church, am very interested in Cooperstown Bible Camp. We are a part of the Cooperstown Bible Camp Association. The raising of this dam would greatly affect the use of the camp during the prime time of the year. I, therefore, am in opposition to the plans of raising the dam.

2. I believe an alternative plan can be developed to achieve the needed results without putting our camp in this undesirable position.

Sincerely,

George A. Walker
Pastor

CAW:ev

CORPS RESPONSES TO FIRST EVANGELICAL FREE CHURCH

1. Our current assessment of possible impacts of the 5-foot raise of Bald Hill Dam indicates that portions of the Cooperstown Bible Camp would have to be acquired through either flowage easements or fee title and that these costs are part of the cost estimates. However, detailed evaluation data (accurate to within 1 or 2 feet) are not now available for the camp area. Therefore, it is not possible at this time to accurately determine the magnitude of the impacts of the 5-foot raise of Bald Hill Dam on the camp. However, some portions of the camp are below the elevations used as a guideline for land acquisition and would therefore have to be purchased. During future studies on the project, detailed topographic information around and upstream of Lake Ashtabula would be obtained to determine the potential impacts on the camp and to determine specifically which portions of the camp would in fact have to be purchased. You will be informed of the status of these studies and any further impact assessments as they are done.
2. Alternative plans were evaluated, and the 5-foot raise of Bald Hill Dam was found to be an important part of the most acceptable plan when economic, environmental, and social impacts were considered.

The end of your search for a Bible Church



NATIONAL WILDLIFE FEDERATION

1412 Sixteenth Street, N.W., Washington, D.C. 20036 202-797-6000

July 19, 1982

District Engineer
St. Paul District, Corps of Engineers
ATTN: MCS8D-PS
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

This letter is our comment on your proposed plan to reduce flood damages along the lower reaches of the Sheyenne River in North Dakota. The 4 million members and supporters of the National Wildlife Federation have a longstanding interest in our nation's natural resources.

The tentatively selected plan presented in the Phase I General Design Memorandum consists of levees and a diversion channel at West Fargo, a diversion channel from Morace to West Fargo, a 5-foot raise of the Baldhill Dam to provide additional flood-prevention storage, and other structural and nonstructural measures that might be implemented.

We compliment the study for its effort to seriously formulate and evaluate alternatives to the Kindred Dam and Lake alternative which was authorized by Congress in 1970. The reanalysis recognized changes in conditions since 1968 and attempted to incorporate the environmental quality objective into the planning process. However, we cannot completely agree with the recommended plan.

The raise of the Baldhill Dam will result in several adverse effects on recreation and environmental properties of Lake Ashtabula. The North Dakota Wildlife Federation will submit comments outlining their reasons for opposing the dam addition.

Each increment of a plan should produce benefits that are estimated to be greater than the costs of that increment. The Report does not demonstrate that the incremental benefits of the dam raise would be greater than the costs of over \$30 million. The incremental analysis should be prepared.

We agree with the position statement of the U.S. Fish and Wildlife Service (October 17, 1980) that the Red River Basin is a hydrologic unit which requires a comprehensive and integrated planning approach to the flooding and other water and land related

COMPS RESPONSES TO NATIONAL WILDLIFE FEDERATION

1. A discussion of the incremental economic justification of recommended plan components has been included in the General Reevaluation report.
2. The position statement of the U.S. Fish and Wildlife Service submitted with your letter follows this letter. That statement was written in response to a reconnaissance report for the overall Red River of the North basin and not specifically in response to the Review Draft, Phase I General Design Memorandum and Environmental Impact Statement. The views of the U.S. Fish and Wildlife Service submitted in response to this report appear with the other comments received from Federal agencies and also in the Fish and Wildlife Coordination Act Report, dated July 1982 (Appendix K of this report).

Colonel Rapp

-2-

July 19, 1982

resource problem. Nonstructural measures should be emphasized to a much greater extent. The nonstructural measures presented in the GDM are very tentative and are much less likely to be implemented than the three structural segments. In addition, the suggestion that ring levees be placed around individual farms requires a separate study for each site because such measures can increase flooding elsewhere. We have included a copy of the U.S. Fish and Wildlife Service report and intend that it be part of our official comments.

We believe that because the recommended plan has been drastically altered from the original authorization for the kindred Dam in Public Law 91-611, Title II, Sec. 201, that new authorization is needed from Congress.

3. Several of the non-structural components of the selected plan are more definite than others. The ring levees and restoration of drained wetlands do not have a fully identified path to implementation. However, regulation of future drainage, regulation of private levee construction, and floodplain regulation are all clearly defined. One of the reasons for recommending ring levees at individual farmsteads and residences in certain reaches was to minimize any potential increases in flood stages in surrounding areas. This factor would be evaluated for each ring levee proposal.

4. The Office, Chief of Engineers will determine if the report should be sent to Congress for a new authorization. The most recent guidance from Congress will be used in making that decision.

Sincerely,

David C. Campbell
Resource Economist

encl.

cc: Robert Nelson, President
North Dakota Wildlife Federation

POSITION STATEMENT OF THE USFWS REGARDING THE CORP'S SEPTEMBER 1980
DRAFT SUMMARY REPORT FOR THE RED RIVER OF THE NORTH RECONNAISSANCE STUDY-1/

2

BASED ON OUR REVIEW OF THE OVERALL DRAFT SUMMARY REPORT, WE BELIEVE THAT THE EMPHASIS IS STILL BEING PLACED ON "PROTECTIVE TYPE" STRUCTURAL MEASURES, RATHER THAN ADDRESSING THE CAUSES OF THE FLOOD DAMAGE PROBLEMS (WETLAND DRAINAGE, CHANNELIZATION, LAND USE CHANGES, UNSOUND AGRICULTURAL LAND USE PRACTICES, ETC.) AND IMPLEMENTING THOSE MEASURES WHICH COULD ULTIMATELY REDUCE DOWNSTREAM FLOOD PEAKS AND RESULTING FLOOD DAMAGES ALONG THE MAINSTEM AND MAJOR TRIBUTARIES OF THE RED RIVER OF THE NORTH. PURSUING A "PROTECTIVE" AS OPPOSED TO A "PREVENTIVE" APPROACH TO THE FLOODING PROBLEMS WOULD ALLOW THESE UNSOUND LAND USE PRACTICES TO CONTINUE AND WOULD LIKELY FURTHER INCREASE THE FLOODING AND OTHER RELATED LAND RESOURCE PROBLEMS WITHIN THE RED RIVER BASIN.

IN OUR OPINION, CONSTRUCTING AGRICULTURAL LEVEES ALONG BOTH SIDES OF THE RED RIVER AND ALONG THE LOWER REACHES OF ITS MAJOR TRIBUTARIES TO PROTECT AGRICULTURAL LAND WITHIN THE FLOODPLAIN WOULD NOT ONLY BE INAPPROPRIATE FOR THE REASONS ADDRESSED ABOVE, BUT ALSO WOULD NOT PROVIDE AN EFFECTIVE LONG-TERM SOLUTION TO THE FLOODING PROBLEMS ALONG THE RED RIVER OF THE NORTH OR WITHIN THE RED RIVER BASIN. IN ADDITION, IF THE MINNESOTA-NORTH DAKOTA AGRICULTURAL LEVEE CRITERIA (WHICH PRESENTLY STIPULATES THAT FLOOD STAGES NOT BE INCREASED BY MORE THAN 0.5 FEET) ARE CHANGED OR DISREGARDED ALLOWING NEW LEVEES TO BE CONSTRUCTED CLOSER TO THE RIVER TO PROTECT MORE AGRICULTURAL LAND, THE DOWNSTREAM FLOODING PROBLEMS WOULD BE MORE SUBSTANTIAL. WE DO NOT BELIEVE CONSTRUCTING AGRICULTURAL LEVEES ALONG BOTH SIDES OF THE RED RIVER OF THE NORTH, OR ALONG

THE MAJOR TRIBUTARY STREAMS, SIMPLY TO ALLOW LOCAL LANDOWNERS TO CONTINUE TO FARM WITHIN THE FLOODPLAIN DIRECTLY ADJACENT TO THESE RIVERS, WOULD BE IN THE BEST OVERALL PUBLIC INTEREST. PEOPLE LIVING IN THE DOWNSTREAM AREAS SHOULD NOT HAVE TO CONTINUE TO SUFFER HARDSHIPS, OR THE PUBLIC BE EXPECTED TO CONTINUE TO PAY FOR INCREASING ANNUAL FLOOD DAMAGES, SO THAT THE ADDITIONAL ECONOMIC GAINS OBTAINED BY LOCAL LANDOWNERS FARMING WITHIN THESE FLOOD DAMAGE PRONE AREAS CAN BE MAINTAINED.

WE BELIEVE THAT STREAM CHANNELIZATION PROPOSALS ARE INAPPROPRIATE AND NOT IN THE BEST OVERALL PUBLIC INTEREST. IN OUR VIEW, CHANNELIZATION PROJECTS (DEEPENING, WIDENING OR STRAIGHTENING) CONSTITUTE SHORT-TERM, PIECEMEAL AND LOCALIZED ATTEMPTS TO REDUCE FLOODING PROBLEMS THAT DISREGARD EFFECTIVE LONG-TERM SOLUTIONS AND PLACE AN ADDED BURDEN OF FLOODWATERS ON PEOPLE AND PROPERTY DOWNSTREAM. IN ADDITION, THE EFFECTS OF CHANNELIZATION ON THE RIVER OR STREAM, ADJACENT RIPARIAN FLOOD-PLAIN VEGETATION AND ASSOCIATED FISH AND WILDLIFE RESOURCES ARE USUALLY SEVERE.

WE AGREE THAT THE RED RIVER BASIN IS A HYDROLOGIC UNIT AND THAT A COMPREHENSIVE AND INTEGRATED (BASINWIDE) PLANNING APPROACH, USING A COMBINATION OF BOTH STRUCTURAL AS WELL AS STRUCTURAL MEASURES, WOULD BE THE MOST APPROPRIATE SOLUTION TO THE FLOODING AND OTHER WATER AND RELATED LAND RESOURCE PROBLEMS WITHIN THE RED RIVER BASIN. WE BELIEVE, HOWEVER, THAT NONSTRUCTURAL MEASURES SHOULD BE EMPHASIZED TO A MUCH GREATER EXTENT. THE PLAN SHOULD BE A COMPREHENSIVE WATER AND RELATED LAND RESOURCE PLAN AND NOT SIMPLY A STRUCTURAL FLOOD DAMAGE REDUCTION PROJECT.

1/ To be presented at the October 17, 1980, meeting to the Chief of Engineers, North Central Division, of the U.S. Army Corps of Engineers and various other State and local interests.

ALTHOUGH WE CONCUR THAT THE FLOODING PROBLEM IS THE MAJOR IMMEDIATE CONCERN WITHIN THE BASIN, WE BELIEVE THAT THE DRAINAGE OF WETLANDS, CONVERSION OF GRASSLANDS AND RIPARIAN WOODLAND VEGETATION TO OTHER LAND USES, LOSS OF VALUABLE TOP SOIL, DEGRADATION OF THE WATER QUALITY OF THE RIVERS AND STREAMS AND DETERIORATING WATER SUPPLIES ARE ALSO SUBSTANTIAL AND SERIOUS PROBLEMS THAT MUST BE RESOLVED.

IN OUR OPINION, THE FINAL OVERALL BASIN PLAN SHOULD RECOMMEND MEASURES THAT WILL RETAIN THE WATER AND SOIL ON THE LAND, MAXIMIZE ENVIRONMENTAL QUALITY, MINIMIZE ENVIRONMENTAL IMPACTS, REDUCE THE DOWNSTREAM FLOOD FLOWS, FLOOD PEAKS, AND FLOOD DAMAGES ALONG THE RED RIVER OF THE NORTH, AND MINIMIZE, TO THE EXTENT POSSIBLE, THE FLOODING, EROSION, WATER QUALITY, WATER SUPPLY AND OTHER WATER AND RELATED LAND RESOURCE PROBLEMS THROUGHOUT THE RED RIVER BASIN.

THE POINT WHICH WE BELIEVE SHOULD BE EMPHASIZED AND REALIZED, IS THAT NO MATTER WHAT MEASURES ARE UNDERTAKEN, THERE WILL ALWAYS BE SOME DEGREE OF FLOODING ALONG THE RED RIVER OF THE NORTH AND ITS MAJOR TRIBUTARIES WITHIN THE RED RIVER BASIN. NATURE HAS A WAY OF RECLAIMING THAT WHICH IS HERS. FLOOD PLAINS BELONG TO THE RIVER, AND THE RIVER WILL ATTEMPT PERIODIC RECLAIMING. PLANNING EFFORTS REGARDING FLOOD DAMAGE ABATEMENT IN THE RED RIVER OF THE NORTH BASIN SHOULD REFLECT THIS PERCEPTION.

FINALLY, WE BELIEVE ALL INTERESTS SHOULD WORK TOWARD INSURING THAT RESOURCE ORIENTED LEGISLATION AND DIRECTIVES ARE ADHERED TO DURING THIS PLANNING PROCESS. SOME OF THESE INCLUDE THE WATER RESOURCE COUNCIL'S PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES, THE NATIONAL ENVIRONMENTAL

POLICY ACT, THE FISH AND WILDLIFE COORDINATION ACT, THE CLEAN WATER ACT AND THE PRESIDENT'S EXECUTIVE ORDERS REGARDING FEDERALLY ASSISTED DEVELOPMENT IN FLOOD PLAINS AND WETLANDS.

WE APPRECIATE THE OPPORTUNITY TO PROVIDE YOU WITH OUR COMMENTS AND CONCERNS WITH RESPECT TO THIS IMPORTANT RECONNAISSANCE STUDY ON THE RED RIVER BASIN.

North Dakota Wildlife Federation, Inc.

Division of FLICKERTALES
North Dakota's Leading Conservation Publication

Box 65
Emt, North Dakota 58025

Phone 685-2304

CORPS RESPONSE TO NORTH DAKOTA WILDLIFE FEDERATION, INC.

Your views are appreciated. Regulation of future drainage to ensure that it does not worsen downstream flood conditions is part of the proposed plan. A moratorium on drainage would accomplish a similar purpose, but would also have other significant implications concerning the control of land use. From a fish and wildlife perspective, the wetlands should be preserved because they are valuable habitat. Building small dams and plugging illegal drains could supplement the flood control provided by the raise of Baldhill Dam.

April 23, 1962

Mr. William W. Spychalla
Corps of Engineers
St. Paul District
1135 Post Office & Customs House
St. Paul, MN 55101

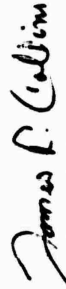
Dear Mr. Spychalla:

I am writing to inform you of recent action taken by the North Dakota Wildlife Federation's Board of Directors which places our organization against the proposal to raise the Baldhill Dam on Lake Ashtabula as part of the flood control plan for the Sheyenne River.

We feel there are far more detrimental effects for both man and wildlife to this proposal than there are benefits.

The following motion is the one which was approved unanimously by our board: "The North Dakota Wildlife Federation opposes the raising of the Baldhill Dam in favor of other water retention alternatives which would retain the water in the upper reaches of the watershed such as: building small retention dams, plugging illegal drains, and placing a moratorium on future drainage in the Sheyenne River watershed."

Sincerely,



James R. Collins
Executive Director
North Dakota Wildlife Federation

JRC/ah
cc: Vern Fahy, N.D. State Water Commission
cc: Dale Henegar, N.D. Game & Fish Department

Education - Legislation - Cooperation
"Better lives for wildlife and man"

AFFILIATED WITH THE NATIONAL WILDLIFE FEDERATION

The United Methodist Church of Turtle Lake & Underwood

Box 888 - Turtle Lake, North Dakota 58579 - Telephone (701) 488-8225

July 7, 1977

Col. William C. Rader
District Engineer
Dept. of the Army
St. Paul, Minn. Corps Engineers
1125 W. 5th Post Office
Austin, Texas
Attn: Paul, Minnesota 55101

Dear Sir,

It has been brought to my attention that the Corps of Engineers is proposing to raise the height of the Baldhill Dam on the Sheyenne River near Valley City, N.D. I would like to go on record as opposing this kind of action.

The United Methodist Church (North Dakota Conference) owns a campground, "Wesley Acres", on the shore line of Lake Ashtabula. The area of Wesley Acres is a flat, tree-shaded plot just above the lake where which have backed up the Bald Hill Creek. Any raise in water level would destroy the usefulness of the campgrounds.

For thirty years I have worked with my head, my hands, and my heart (along with thousands of other United Methodists) to develop a camping facility adequate for our church camping needs. After a flash flood in 1970, thousands of dollars were poured into the restoration of the campground only by the United Methodists in North Dakota, but by the national church as well.

Financial investments in Wesley Acres are only a part of my concern, however. The dam has come to symbolize the worst of our tradition in the area of artificial barriers. My own spiritual journey has many of the significant events happening at Wesley Acres, not only as a youth but as an adult also. I continue to be thrilled as others share with me their stories which put similar importance on the campground. Tradition-orientation--all it what you wish, this aspect of Wesley Acres has always been the greatest value of the camp to me. I do not want to lose the camp.

Sincerely,

W. Gerald Fike

Rev. Gerald Fike, Chairman
Board of Directors, United Methodist Camps
North Dakota Annual Conference

COMPS RESPONSE TO THE UNITED METHODIST CHURCH OF TURTLE LAKE & UNDERWOOD

Your views are appreciated. The raise of Baldhill Dam would require the acquisition of at least part of the land and facilities of the Wesley Acres camp, particularly the low-lying areas. The permanent pool of Lake Ashtabula would remain at the same level it is now. During flood periods, however, the pool level would be raised temporarily, generally from 1 to 3 feet above levels experienced during past floods.

THE
UNIVERSITY
OF
NORTH
DAKOTA

ANTHROPOLOGY - ARCHAEOLOGY
Box 8254 University Station
Grand Forks, North Dakota 58202
(701) 777-3009

CORPS RESPONSE TO THE UNIVERSITY OF NORTH DAKOTA

Your views are appreciated. Cultural resources in the project area will continue to be evaluated as project planning proceeds.

May 27, 1982

William V. Badger
Colonel, Corps of Engineers
St. Paul District
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

Thank you for sending a copy of the review draft of the GENERAL DESIGN MEMORANDUM, PHASE I AND ENVIRONMENTAL IMPACT STATEMENT FOR FLOOD CONTROL AND RELATED PURPOSES, SNEYDEN RIVER, NORTH DAKOTA. I will see that it becomes a holding in our departmental library.

My interests lie only with cultural resources considerations on the project. It is clear that Mr. Pfitzenreuter of your Environmental Resources Branch, Engineering Division has provided appropriate recommendations for intensive survey and National Register eligibility evaluations as per the directives of Executive Order 11593.

Sincerely,

Michael L. Gregg

Michael L. Gregg
Research Director, University of
North Dakota Archaeological Research

FLOOD COMMITTEE REPORT
TO CITY COMMISSION
AUGUST 16, 1982

The Valley City Flood Committee has reviewed the proposal of the Corps of Engineers, St. Paul District, recommending that the Lower Sheyenne River Basin be given further flood protection by constructing levees at West Fargo, by constructing a diversion channel around West Fargo and by raising the controlled flood pool level of Baldhill Dam by five (5) feet.

The Corps of Engineers has advised that the raising of Baldhill Dam by the five feet would reduce 100 year floodwater flows by from 2,400 to 3,000 CFS, reduce the 100 year flood stage 2 to 3 feet, and allow 100 year floodwater flows to be contained within the existing river channel and banks. Based on these assurances from the Corps of Engineers the Flood Committee determined that the proposed raising of Baldhill Dam would have substantial benefit to the City of Valley City.

The following matters will continue to be studied by the Flood Committee and will have a bearing upon the benefits the City would derive from the raising of Baldhill Dam:

1. The Flood Committee is continuing to obtain new field data from which to rerun the hydraulic analysis of the floodway and floodplain areas within the City of Valley City. This new study will allow for a more specific analysis of the effect of the reduced flows from the raising of Baldhill Dam upon the floodway and floodplain boundaries within Valley City.

CORPE RESPONSES TO VALLEY CITY FLOOD COMMITTEE

1. The raise of Baldhill Dam and flood control pool of Lake Ashtabula by 5 feet would reduce the one percent chance discharge at Valley City by about 2,400 cubic feet per second, although greater reductions are possible if the timing of flood flows and the shape of the runoff hydrograph would be similar to the 1979 or 1966 floods. The 2,400 cubic feet per second reduction in discharge would result in about a 2-foot reduction in the one percent chance flood stage. The 5-foot raise would not, however, contain floodwater flows within the existing river channel and banks. The floodplain and floodway areas of the city would be reduced; however, the specific magnitude would have to be determined by the Federal Emergency Management Agency. The specific reductions and effects on flood levels from the raise of Baldhill Dam would be determined after additional detailed evaluations of the operating plan and design of the spillway and outlet works. This would be done after authorization of the project.

2. The operation and management of Baldhill Dam will continue to be coordinated with the city of Valley City. The operational plan for the 5-foot raise will be developed in further detail during the next phase of studies. Flood flows and conditions at Valley City, as well as other downstream points such as Lisbon and Kindred, are also considered in the determination of amount and timing of water releases from Baldhill Dam.
3. Property acquisition for a raise of Baldhill Dam would follow standard Corps of Engineers policies. During the assessment of need for acquisition of lands, reasonable guidelines will be used to determine which properties must be acquired.
4. The diking needs of the city to supplement the flood protection provided by Baldhill Dam could be assessed cooperatively by the city, the North Dakota State Water Commission, and the Corps of Engineers. However, no Federal involvement through the Corps of Engineers is projected for the construction of such levees unless it is done under flood emergency authorities. The cost of the levees would be a non-Federal expense, unless constructed under flood emergency authorities, in which case some of the cost could be borne by the Federal government.
5. The non-Federal share of the raise of Baldhill Dam cannot be determined at this time because of uncertainty in the cost-sharing policies. However, under traditional cost-sharing policies, the entire cost would be Federal. Any distribution of a non-Federal share among local interests would have to be determined by the North Dakota State Water Commission, the overall sponsor of the plan.

2. The Flood Committee would further suggest that the City request the Corps of Engineers to clarify its operation and management plan regarding pool levels and water releases from Baldhill Dam to be assured of maximum flexibility in controlling the timing and amount of water releases from Baldhill Dam.

3. The Committee continues to believe that increased emphasis should be placed upon drainage control and small upstream dams to be implemented by appropriate local, state and federal agencies to further control water flow into Baldhill Dam impoundment.

The Flood Committee also discussed other concerns that are not directly pertinent to our assignment but are matters that we would suggest the City Commission give its attention:

1. The Corps should be encouraged to adopt a reasonable plan for the relocation, purchase and lease back of buildings and land needed if Baldhill Dam is raised.
2. The diking that the City would have to put in place and the cost thereof to the City, if any, should be determined.
3. The cost of the proposed raising of Baldhill Dam to state and local governments, if any, should be determined.

VALLEY CITY FLOOD COMMITTEE

By  George Gaskler, Chairman

2. The 200 acres of forest that will be affected by the raise of Baldhill Dam will be flooded on a temporary basis when floodwaters are stored. The potential effects of flooding on these trees are described in Appendix D, Environmental Resources.

3. The raise of Baldhill Dam is included as part of a comprehensive basin plan and it gains benefits as part of the plan. It has also been evaluated on an incremental basis and is economically justified. The economic evaluation in the General Reevaluation report has been expanded to include a discussion on incremental economic justification.

4. The opposition to the raise of Baldhill Dam has been recognized in the report and in the decision-making process. However, the raise of Baldhill Dam has been included in the final recommended plan because the overall benefits outweigh the adverse impacts, and it is concluded that it is in the best interest of the public.

of Baldhill Dam will flood 200 acres of bottomland forest, a unique and rare plant community in North Dakota which has valuable recreational assets as well.

These comments are only a few of the criticisms I have heard about raising the dam. This letter would be too lengthy to address all reasons for my opposition.

About the Impact Statement written, I wonder whether it is lawful to combine projects such as the raising of Baldhill dam with other projects with much higher ^{benefit} cost-benefit ratios. I would think that raising Baldhill Dam would have to be evaluated for its own merit. It is extremely difficult to evaluate the Flood Control Project with all aspects lumped together.

I suggest the Corps reconsiders the raising of the Baldhill dam, develop an environmental impact statement solely for the \$32 million dollar project, and drop There is strong opposition to raising the dam, and the Corps should recognize this opposition.

Thank you for considering this statement of opposition to raising the Baldhill Dam.

Truly yours,
Ronald Wickland

CORPUS RESPONSES TO RONALD WIELAND

1. The EIS has been modified to reflect the increase in upstream opposition to the proposed raise in Baldhill Dam. Coordination with all interested groups will continue in the next stage of study.

7/15/82

Cross Ranch Nature Preserve
Hewler, ND 58547

William W. Spychalla
Acting Chief, Plan Formulation Branch
Dept. of Army, St. Paul District Corps of Engineers
1135 U.S. Post Office and Custom House
St Paul, MN 55101

Dear Mr. Spychalla:

This letter has been written to make known my opposition to the proposed raising of Baldhill Dam. Regarding the EIS written, the opposition for this project has been under-rated. (EIS, pg 23 Accept. of Proj. Components)

I can accurately say that there is strong opposition, not only from the Lake Users Association, the Sudbustlers Club, and the Committee for the Preservation of the Sheyenne River Valley but from the general populace throughout the Lake Region. If the Corps considers this group of 100's of families a non-significant voice then so are the Valley City and Fargo populations living on the Sheyenne River Flood Plains downstream from the impacted area.

As temporary Cross Ranch Nature Preserve Manager, I recognize the high value of gallery forests. Cross Ranch Nature Preserve has preserved 1,200 acres of gallery forests. Nature Conservancy has valued the Nature Preserve at several million dollars. The raising