SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4

THE WINGER DAM

Polk County, Minnesota
December, 1988

Minnesota Department of Natural Resources

FINAL ENVIRONMENTAL IMPACT STATEMENT

STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

Celebrate MINNESOTA 1990

DNR INFORMATION
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To: Final EIS Distribution List Parties
Other interested parties

Date: March 2, 1989

From: Thomas W. Balcom, Supervisor T.B.
N.R. Planning and Review Services

Phone: 296-4796

Subject: PROPOSED SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4
FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS) ADEQUACY DECISION

The Department of Natural Resources (DNR) has issued an Adequacy Determination and Decision the proposed Sand Hill River Watershed District Project No. 4 (Winger Dam) in Polk County south of the City of Winger. The DNR has determined that the Final EIS is adequate. The attached Adequacy Decision outlines the justification for this decision, and summarizes the comments received on the Final EIS and the DNR response to those comments.

A public notice of this decision will also be published in the EQB Monitor.

Attachment

Winger 56/WING2

STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

In the Matter of the Final Environmental Impact Statement (EIS) for the Proposed Sand Hill River Watershed District Project No. 4, Polk County, Minnesota Pursuant to Minnesota Rules part 4410.2800 (1987)

FINDINGS OF FACT
CONCLUSIONS OF LAW
AND ORDER

Based upon and after having considered the entire record of the proceeding, including written reports, written and oral data, information and statements, the Department of Natural Resources makes the following:

FINDINGS OF FACT

1. The preparation of an Environmental Impact Statement (EIS) is required to comply with the rules of the Minnesota Environmental Quality Board (EQB) for the construction of a Class I dam (Minn. Rules part 4410.4400, subp. 18). The Department of Natural Resources (DNR) is the Responsible Government Unit (RGU) for the EIS.

2. According to EQB rules, the Final EIS shall be determined adequate if it: (a) addresses the issues raised in the scoping process so that all issues for which information can be reasonably obtained have been analyzed; (b) provides responses to the substantive comments received during the Draft EIS review concerning issues raised in the scoping process; and (c) was prepared in compliance with the procedures of the Minnesota Environmental Policy Act and the Minnesota Environmental Review Program rules (Minn. Rules part 4410.2800, subp. 4). The RGU is to determine the adequacy of the Final EIS (Minn. Rules part 4410.2800, subp. 1).

3. The proposed Sand Hill River Watershed District Project No. 4 (also referred to as the Winger Dam) is a proposal of Sand Hill River Watershed District to construct a Class I (high hazard) dam on the Sand Hill River in southeastern Polk County one mile south of Winger, Minnesota. The purpose of the proposed project is to provide for flood damage reduction for downstream areas, to provide a recreational lake, and to facilitate an upgraded crossing of the Sand Hill River for T.H. 59. The project involves the construction of an earth-fill flood reduction dam with a recreational pool. The reservoir is 6.8 miles long with a permanent or recreational pool of 1,217 acres surface area and a depth of approximately 20.0 feet at the dam. The temporary flood pool for flood water storage with 1,613 acres surface area will be above the permanent pool with a depth of approximately 26.0 feet at the dam. The dam will provide a total of 6,881 acre-feet of gate-controlled flood storage and 1,548 acre-feet of upgraded or temporary flood storage.

4. Environmental review of the proposed project was initiated in 1985 with the preparation by the DNR of a Scoping Environmental Assessment Worksheet (EAW) to identify issues to be addressed during the EIS process.

5. The Scoping EAW was issued on November 18, 1985 to parties on the Environmental Quality Board's EAW Distribution List and to other interested persons.

6. According to the "summary of issues" section of the EAW, issue or impact areas to be addressed in the EIS include dam safety considerations; the influence on the natural flow within the Sand Hill River; impacts on and downstream flow needs for fish, wildlife, recreation, aesthetics, water quality, and protecting of downstream users; impact of the proposed project on existing fisheries resources and the potential for management of the reservoir; the type of fishery that may be expected to occur if the proposed project were constructed; the type of fisheries techniques that would be incorporated to provide a certain level of fishery; reservoir and downstream fluctuations and their effect on fisheries; the need for the development of a public access if fisheries management by the DNR is provided; the impact of the proposed project upon the wildlife resources of the area; the wildlife benefits and impacts attributable to the proposed project; an evaluation of existing wildlife habitat conditions and potential mitigation needs resulting from the project's impacts; an evaluation of the reservoir and downstream fluctuations and their effect on wildlife resources; impacts on any archaeological resources in the immediate project area; benefits (agricultural, flood damage reduction, recreational and fish and wildlife) associated with the proposed project; the relationship between upstream land treatment measures and sediment yield in the impoundment area; the significance of changes to the reservoir area as a result of the project; and the potential for recreational and residential development. The Scoping EAW also indicated the types of alternatives to be evaluated in the EIS.

7. Notice of a 30-day scoping period was published in the EQB Monitor on November 18, 1985, and a press release was supplied to at least one newspaper in Polk County, near the proposed project vicinity. A public scoping meeting originally scheduled for December 3, 1985 was rescheduled (due to inclement weather) and was held on December 17, 1985 at the Fertile Community Center. A notice of the rescheduled meeting was sent on December 4, 1985 to all parties on the EAW Distribution List. A notice of the rescheduled meeting was also published in the EQB Monitor on December 16, 1985. The DNR extended the public review and comment period, which was originally scheduled to conclude on December 18, 1985, to December 27, 1985. Written comments were also received and accepted after the close of the comment period up to January 15, 1986. A summary of any comments at the public meeting and of the written comments was presented in the Scoping Decision Document in the impact areas of dam safety, Sand Hill River instream flow, fisheries, project and downstream water quality, wildlife, agriculture, land management practices and land use changes, and archaeological considerations. The comments received were also reflected in the Scoping Decision Document.

8. The DNR issued a Scoping Decision Document on March 24, 1986. A copy of the Scoping Decision Document was sent to all parties who had received a copy of the EAW, requested a copy of the Scoping Decision Document, or requested copies of written reports on the proposed project. The DNR submitted an EIS preparation notice to the EQB on April 23, 1986. The EIS preparation notice, including a summary of the Scoping Decision, was published in the EQB Monitor on May 5, 1986. A press release announcing the EIS preparation notice was also supplied to at least one newspaper in Polk County in the vicinity of the proposed project. No evidence exists in the record to indicate that any person objected to the scope of the EIS as proposed in the Scoping Decision Document.

9. The Scoping Decision Document contains the required content specified in Minnesota Rules part 4410.2100, subp. 6, including the issues to be addressed in the EIS, the alternatives to be addressed in the EIS, and the identification of studies to be undertaken. The topics identified for study and identification, and their location in the Draft EIS are identified in Findings 10 to 25 by underlining.

10. A description of the purpose of the Draft Environmental Impact Statement and the cross-referencing of other documents of interest to reviewers. This topic is treated on page 1-1.

11. A description of the project proposal of the Sand Hill River Watershed District including specific descriptions of the earth-fill dam, the reservoir, the principal spillway, the emergency spillway, the operation and maintenance plan, easements, road relocations, and construction methods control measures. This topic is treated on pages 1-1 to 1-14, and 2-1.

12. A description of the nature of the environmental setting including specific information on the pre-settlement vegetation, present vegetation, rare plants and animals, glacial till prairie, land use and topography, geology and groundwater levels and flow patterns, shoreland management considerations, the nature and extent of flooding problems, and floodplain management considerations. This topic is treated on pages 1-1 to 1-14, and 2-1.

13. A description of the responsibilities associated with the maintenance, liability and insurance of the proposed dam. This topic is treated on pages 1-25 to 1-26. The operation and maintenance plan proposed by the Watershed District is presented in Appendix A.

14. A description of the alternatives (including the alternative of the project proposed by the Sand Hill River Watershed District). This topic is treated on pages 2-1 to 2-8.

15. A description and discussion of construction-associated impacts. This topic is treated on page 3-1. Temporary air and water pollution, soil erosion, and siltation control plans, as well as stream diversion and foundation dewatering plans as proposed by the project proposers are presented in Appendix E. Erosion control mitigation measures are presented on pages 4-1 to 4-2.

16. A description and discussion of dam safety impacts including project justification, alternatives, comparisons of hazard classifications, quantifiable benefits, consequences of a dam failure, risk assessment and analysis, the design flood, operation and maintenance plan and easements. This topic is treated on pages 3-1 to 3-4. Dam safety mitigation measures including information on the emergency action plan and the operation and maintenance plan are presented on page 4-2.

17. A description and discussion of fisheries resources and impacts including a description of the stream survey and fisheries study area, a description of the fisheries investigations, the existing fisheries resources impact, the projected fisheries for the proposed reservoir and alternatives, fish management techniques to provide a desired fishery and fisheries management plan development (including the need for and development of an aeration system and a public access). This topic is treated on pages 3-5 to 3-20. Requirements and policies regarding public access sites are presented in Appendix B. DNR Commissioner's Orders regarding aeration systems are presented in Appendix C.

18. A description and discussion of wildlife resources and impacts including a description of the Habitat Evaluation Procedures study process and methodology, the study area and cover type, the species model selection, the baseline conditions, the future projections (for each alternative), and the habitat unit analysis by alternatives. This topic is treated on pages 3-20 to 3-32. Wildlife resources mitigation measures including the criteria to be used and requirements for upland and wetland mitigation are presented on pages 4-3 to 4-4. Definitions of wetland types are presented in Appendix F.

19. A description and discussion of Sand Hill River downstream flow analysis developed by the DNR including downstream effects and the instream flow operation plan (including a discussion of required modifications to the plan proposed by the project sponsors). This topic is treated on pages 3-33 to 3-42. The operation and maintenance plan proposed by the Watershed District is presented in Appendix A. Downstream resources mitigation measures including the criteria to be used, the need for, and the requirements and process for downstream wetland mitigation are presented on pages 4-4 to 4-7. Definitions of wetland types are presented in Appendix F.

20. A description and discussion of project and downstream water quality including the results of water quality sampling conducted by the DNR. This topic is treated on pages 3-42 to 3-46.

21. A description and discussion of land management practices and projected land-use changes (for each of the alternatives) including information on sediment yield and sedimentation problems. This topic is treated on pages 3-47 to 3-49.

22. A description and discussion of agricultural impacts associated with each of the alternatives (including the project proposal of the Watershed District). This topic is treated on pages 3-49 to 3-52.

23. A description and discussion of the economic analysis and methodology including comparisons among alternatives. This topic is treated on pages 3-52 to 3-55.

24. A description and discussion of the results of an independent archaeological investigation undertaken for the Watershed District. This topic is treated on pages 3-56 to 3-57 and in Appendix D.

25. An identification of governmental permits, licenses and approvals required for the proposed project as well as information on the governmental unit responsible for each action. This topic is treated on pages 5-1 to 5-2.

26. EQB rules governing environmental impact statements require the discussion of impacts in an EIS to "be a thorough but succinct discussion" and "shall concentrate on those issues considered to be significant as identified by the scoping process. Data and analyses shall be commensurate with the importance of the impact,..." (Minn. Rules part 4410.2300, item H.)

27. The Final EIS addresses the issues raised in the scoping process and for which information can be reasonably obtained.

28. The Draft EIS was distributed to parties on the official EQB distribution list and to all parties on an expanded DNR distribution list (all persons sent a copy of the Scoping or EAW Scoping Decision Document, and all persons who requested copies of environmental documents concerning the project proposal) on June 29, 1987. Copies were placed in four public libraries. A copy of the Draft EIS and of seven reports (prepared by the DNR, other governmental agencies, or private consultants to the Sand Hill River Watershed District) referenced in the EIS (as sources of additional information) were also provided to the public review locations at the DNR Central Office, the DNR Bemidji Regional Headquarters, and the Winger City Hall.

29. A Notice of Availability of the Draft EIS was published in the EQB Monitor on June 29, 1987. A press release announcing the availability of the Draft EIS, the public review locations, and information concerning the public meeting and the review and comment period was issued to at least one newspaper of general circulation in the county in the vicinity of the proposed project. Copies of the Draft EIS were also sent to any person requesting a copy.

30. A public meeting to solicit comments on the Draft EIS was held on July 21, 1987 at the Winger Community Center. Posted notices announcing the meeting were provided by local interests in the Winger area. At least 48 people attended the meeting as noted by attendance sheets provided by the DNR.

31. Copies of the Draft EIS were made available at the Draft EIS public meeting. Persons attending the meeting were also provided with an agenda listing the individual presentations to be made, an expanded table of contents from the Draft EIS which identified each item discussed in the Draft EIS, a copy of the Draft EIS Summary, and a map depicting the site of the project proposal of the Sand Hill River Watershed District. Comments presented at the public meeting were reflected in the Final EIS.

32. The public comment period originally scheduled to conclude August 4, 1987 was informally extended to August 12, 1987 to respond to the requests of three reviewing agencies.

33. Twelve different letters of comment involving 66 specific comments were submitted. These letters are reproduced in the Final EIS in section 3.1.

    Comments or questions presented orally at the public meeting were summarized in the Final EIS in section 3.2. These comments concerned the topics of proposed project funding, existence of groundwater wells within proposed flood pools, projected fisheries resource in the proposed reservoir under Alternative No. 1, the financing and co-sponsoring of aeration system costs, recreational costs, benefits and economic evaluation, and the existence of similar dam and reservoir projects in Minnesota.

34. The Draft EIS and the Final EIS documents constitute the entire Final EIS. The DNR has made revisions to the Draft EIS in response to or as warranted by certain comments and has presented these revisions in Chapter 2.0 of the Final EIS document. The topics addressed by these revisions are proposed T.H. 59 modification (Final EIS section 2.1.2, pages 3 to 4), proposed roadway relocation and modifications (Final EIS section 2.1.3, pages 4 to 8), updated cost projections for Alternative No. 1 (Final EIS section 2.2, pages 4, 9 to 13), groundwater site location and flow patterns (Final EIS section 2.3, pages 13 to 14), governmental approvals (Final EIS section 2.4, pages 13, 15), revised instream flow specific plan of operation (Final EIS section 2.5, pages 15 to 17), revised description of construction method control measures (Final EIS section 2.6, pages 17 to 18), revised description of Alternative No. 5 - no build (Final EIS section 2.7, pages 18, 20), revised construction associated impacts (Final EIS section 2.8, pages 20 to 21), and dam and roadway operation and maintenance responsibilities (Final EIS section 2.9, pages 21 to 22).

35. The DNR has responded to each of the comments received on the Draft EIS in Chapter 3.0 of the Final EIS document, presenting these responses in a format to facilitate cross-referencing between the particular comment and response.

36. Substantive comments on the Draft EIS concerning issues raised in the scoping process have been addressed in the Final EIS.

37. Comments requesting additional or expanded information were provided with individual responses which also identify where in the Final EIS document the text has been revised in response to the comments. Finding 34 outlines the sections and general topics of the Draft EIS that were revised in the Final EIS document. Two completely new sections were also added to the Final EIS document to respond to requests for additional or expanded information. Final EIS section 2.1.1 discusses and summarizes information in the Draft EIS on the proposed reservoir description and the fishery resource potential; the section also provides information on Sand Hill Lake in Polk County as an additional evaluation of the type and extent of fishery resource that might be anticipated to result from the construction of proposed Alternative No.1. Final EIS section 2.10 discusses recreational opportunities and impacts including the availability of recreational opportunities, a recreational impact assessment discussion, and information concerning typical costs, development and acquisition assumptions, and construction specifications related to development of a public access.

38. Personal views and opinions on the merits of the project proposal of the Sand Hill River Watershed District (Alternative No. 1) or recommendations regarding the selection of one or more Alternatives were provided a response. The response acknowledged the comment and emphasized that comments related to the merits of the Watershed District's project proposal, while not within the purview of the Final EIS, were referred to applicable regulatory authorities through the issuance of the Final EIS document.

39. Comments dealing with issues outside or beyond the scope of the Scoping Decision and Draft EIS were provided a response in the Final EIS document. The response in Chapter 3.0 explained why the issue was beyond the established EIS scope, whether a substantive response was provided in the Final EIS document, and whether any revisions to the Draft EIS or additional or expanded information had been provided as a component of the Final EIS. No substantive comments or arguments were submitted to warrant any modifications to the established EIS scope.

40. Copies of the Final EIS coordination correspondence and reports between the end of the Draft EIS public review period and the issuance of the Final EIS document are reproduced in Final EIS Chapter 4.0. A list summarizing the content of the particular elements is presented in section 4.1 and copies of the actual correspondence are presented in section 4.2. These elements may be useful in the final design and permitting of the project.

41. The Final EIS was distributed on January 5, 1989 to all parties who received the Draft EIS and to any party who requested a copy of either the Final EIS or a copy of environmental studies related to the Sand Hill River Watershed District's project proposal. Copies of the document were placed in four public libraries. A copy of the Final EIS and of eight other reports (prepared by the DNR, other governmental agencies, or private consultants to the Sand Hill River Watershed District) were also provided to the public review locations at the DNR Central Office, the DNR Bemidji Regional Headquarters, and the Winger City Hall.

42. A Notice of Availability of the Final EIS was published in the EQB Monitor on January 9, 1989. A press release announcing the availability of the Final EIS, the public review locations, and the opportunity for public review of the Final EIS was issued to at least nine newspapers in and around the area of the proposed project. An information letter transmitted with the Final EIS document also identified the three criteria from the EQB rules (Minn. Rules. part 4410.2800, subp. 4) to be used in the Determination of Adequacy.

43. Written comments were received following distribution and notice of the Final EIS document from January 6, 1989 until February 6, 1989. Three comment letters were received.

44. The written comments of Mr. Blanchad Krogstad on the adequacy of the Final EIS address six questions related to both issues in the EIS documents and issues related to the project proposal of the Sand Hill River Watershed District: (a) inadequacy of the discussion of the potential for the proposed permanent pool to function as a dry dam after a period of time; (b) discrepancies between and the validity of different reports prepared on the Watershed District's proposed project about the proposed downstream flood control benefits; (c) the failure of the general public in the project area to be appraised on a continual basis on the various costs associated with the proposed project; (d) the adequacy of the discussion of downstream water quality impacts and the relationship between water quality impacts and current recreational development in the Fertile area, downstream of the proposed reservoir; (e) adequacy of the discussion related to disposition of silt that is likely to accumulate at the proposed dam site; (f) and the extent of changes in local regulation within the watershed.

45. Regarding Mr. Krogstad's comments concerning the inadequacy of the response in the Final EIS relative to the potential for the permanent pool proposed under Alternative No. 1 to function as a dry dam, Final EIS response 3C (Final EIS section 3.1.4) discusses this issue. That discussion notes that a purpose of the project proposal of the Sand Hill River Watershed District is to maintain a permanent pool suitable for certain recreational and aesthetic purposes, and to maintain the lower and deeper portions of the proposed reservoir in an open water environment. The Final EIS acknowledges that periodic harvest or removal of vegetation may be necessary to control emergent or submergent vegetation. The Final EIS also acknowledges that algae blooms are likely to occur since the vast majority of sediment and nutrient input will come from the upstream watershed area. At the present time, there is no intention to have the permanent pool function as a dry dam.

46. Regarding Mr. Krogstad's comments concerning the potential flood control benefits associated with the proposed project which were identified in a 1984 U.S. Army Corps of Engineers Section 205 Initial Appraisal Report, both the Draft EIS and Final EIS documents discuss the issue of potential flood control impacts and benefits (Draft EIS sections 1.11.8, 1.11.9, 3.2, 3.8 and 3.9, and Final EIS sections 3.1 and 3.2).

The U.S. Army Corps of Engineers document was prepared to assess the feasibility of the Watershed District's project proposal as a federal flood control project. The Sand Hill River Watershed District's position is that benefits to downstream areas on the Red River of the North do exist, and the District's evaluation of such benefits is provided in an economic analysis developed by the Watershed District and noted in the EIS. This information was also used to evaluate the benefits on the Red River as developed by the Lower Red River Watershed Management Board.

47. Regarding Mr. Krogstad's comments that the general public should be appraised in a public forum, on a continual basis of the costs associated with the proposed project, this comment is not an issue within the scope of the EIS, but it is rather a recommendation to the project proposers for informing the general public about financial implications of the proposed project. The Final EIS included updated cost projections for proposed Alternative No. 1 in Final EIS section 2.2. The recommendation in this comment is a valid one, and the DNR encourages the Sand Hill River Watershed District on a routine and continuing basis to appraise the general public in the proposed project vicinity of the costs associated with the development of the proposed project. These costs should include not only construction costs but also the costs associated with bubbler equipment, electricity, liability insurance, and the cost associated with vegetation removal and equipment. This information should be presented in a variety of public forums included but not limited to publication in local newspapers, Watershed District regular meetings, and Watershed District public meetings or hearings associated with development of the project proposal. Presenting this information to the public would facilitate DNR compliance with the directive from the Legislature which requires the Commissioner of DNR to determine that additional financing necessary to complete the proposed project has been committed from other sources (1984 Minn. Laws, c. 597, Section 5, Subd. 4(d)).

48. Regarding Mr. Krogstad's comments concerning the potential for discharge of hypolimnetic waters to produce water quality impacts downstream, the effect of water quality impacts on recreational development underway on the Sand Hill River downstream of Winger, and the regulatory decisions relating to whether the released water satisfies the standards of Section 401 of the Clean Water Act, these comments have either been addressed in the Final EIS documents, are beyond the scope of the EIS, or are functions of federal and state regulatory processes. The EIS documents discuss the water quality impacts of the proposed project in Draft EIS Chapter 3.0, and in Final EIS sections 3.1 and 3.2. Recreational development in the Fertile area which may be underway at this time and any potential impacts on such development attributable to the Sand Hill River Watershed District were not within the scope of the EIS as identified in the Scoping Decision. Limiting the Final EIS scope to addressing those issues raised in the scoping process complies with the requirements of the EQB rules governing EIS adequacy (Minn. Rules part 4410.2800, Subp. 4.A.).

The determination of whether the water released from the proposed reservoir satisfies the standards of the Clean Water Act are to be addressed by the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the Minnesota Pollution Control Agency (MPCA) as a component of those agencies' permitting processes. The specific permits were identified in Draft EIS Chapter 5.0 and Final EIS section 2.4. In addition, the monitoring of water quality is within the jurisdiction of the MPCA's permitting authority.

49. Regarding Mr. Krogstad's questions concerning the disposition of silt estimated in the Draft EIS to accumulate at a rate of 21,900 tons per year and the effect of the accumulation on the morphometry of the proposed dam, dredging and maintenance activities are generally a component of the DNR permitting processes associated with the proposed project. Requirements for maintenance and silt disposition would be included as conditions of the DNR permit. Draft EIS section 3.7 includes information which shows that if no removal of sediment occurs, at year 100 there will be 89% of the designed storage remaining.

50. Regarding Mr. Krogstad's comments about the potential for and nature of local shoreland management regulations to be imposed to reduce or minimize the extent of algae bloom, these comments are related to decisions by local jurisdictions and are not concerns about the adequacy of the Final EIS. Land use and shoreland regulations are within the jurisdiction of local authorities. The DNR does have permitting authority over aquatic nuisance control (as noted in Draft EIS Chapter 5.0 and Final EIS section 2.4) and could provide assistance in determining methods to deal with such problems if they arise. However, and as noted in Draft EIS section 1.11.7 as part of the permitting process, the local government will be required to apply an appropriate shoreland classification and standards to the constructed reservoir.

51. The Minnesota Pollution Control Agency (MPCA) submitted written comments with identifying reasons for that agency to conclude that the Final EIS is inadequate and specifying their position on four items which, if included in the Final EIS, would from their perspective result in an adequate Final EIS. These items are: (a) an analysis of benefits and costs which fully considers all benefits and all costs; (b) a complete discussion of the environmental impacts, including downstream water quality impacts, of all alternatives; (c) the District's plan for mitigation of project impacts and the costs associated with that plan, for all alternatives; and (d) a realistic assessment of the ability of this project to provide recreation.

Issues raised by the MPCA and the MPCA's conclusions will be addressed in Findings 52 to 61.

52. Regarding the MPCA's comments on its certification responsibilities under Section 401 of the Clean Water Act (CWA) and its position that the EIS should contain sufficient information to judge whether applicable water quality standards would be met, these issues basically concern differences of opinion on the extent of information, evaluation, and analysis to be included in an environmental impact statement instead of as components of regulatory processes. Findings 9 to 25, 27, and 34 to 37 discuss that the Final EIS documents provide, consistent with the provisions outlined in the Scoping Decision Document, an identification, discussion, evaluation and analysis of environmental impacts (including water quality considerations) associated with the proposed Sand Hill River Watershed District Project No. 4. The Final EIS documents do not leave major unanswered questions for the permitting processes. The approach to the identification and analysis of impacts, alternatives, and mitigation measures complies with the provisions of Minnesota Rules part 4410.0300, subpart 4 that an EIS is to contain information that addresses the significant environmental issues of a proposed action, and that environmental documents are to be used as guides in issuing, amending, and denying permits (Minn. Rules part 4410.0300, subp. 4).

The inclusion in an EIS of all permit information is only required for those permits which are identified during the scoping process and in the Draft EIS as being those for which all necessary information will be gathered for presentation in the EIS (Minn. Rules part 4410.2300, item F.). None of the permits identified in the Scoping EAW, Scoping Decision Document, or in the EIS documents were identified in the Scoping EAW, Scoping Decision Document, or in the EIS documents as those for which all necessary information would be concurrently gathered, developed, and presented in the EIS documents. The Final EIS is not inadequate because all information for all required permits was not presented in the Final EIS documents.

53. Regarding the MPCA comments concerning downstream water quality impacts (specifically the recommendations for additional calibration and verification analysis to predict dissolved oxygen responses, for discussion of nuisance conditions which may result from construction and operation of the proposed project, and for a complete analysis of water quality impacts), these comments relate to issues involving the MPCA permitting process and the extent of information required for MPCA water quality certification of the U.S. Army Corps of Engineers (USCE) permit. The October 20, 1988 report referenced in the MPCA letter was a report prepared by the Sand Hill River Watershed District to respond principally to issues raised by the MPCA and it related to additional and more specific information which the MPCA would require as part of its permitting processes. The DNR included the MPCA staff review of this report in Final EIS chapter 4.0. This MPCA review identifies the specific information which will still be required for the MPCA to make a decision on a section 401 water quality certification. The MPCA comments regarding the extent of downstream water quality information and analysis required for its regulatory decision-making processes are issues related to the level of information required by the project proposer as part of the MPCA permitting processes.

Findings 52 to 61 discuss that the Final EIS documents provide an identification and assessment of water quality impacts consistent with the provisions outlined in the Scoping Decision Document. The Final EIS is not inadequate because it does not include information which has been requested or which still may be required to be addressed by the Watershed District and submitted to the MPCA as a component of the USCE and MPCA permitting processes.

54. Regarding the MPCA comments that the Final EIS documents do not adequately address the recreational interest of the public in the proposed project, the subject of public interest in the project from a recreational standpoint, consistent with the Scoping Decision is addressed in both the Draft EIS and Final EIS documents (Draft EIS Chapter 1.0, Chapter 2.0, Chapter 3.0, Chapter 4.0, and Final EIS sections 2.1.1, 2.2, 2.5, 2.10, 3.1 and 3.2). Finding 37 outlines specific information which was added to the Final EIS to respond to concerns raised in the Draft EIS addressing the issue of recreational opportunities, availability, resources and impacts. The MPCA comment letter, based in part on the results of MPCA public perception surveys, questions the DNR's conclusions in the Final EIS concerning estimates of recreational use and demand. The data used by the DNR (in part) to develop the analysis, evaluations, and conclusions presented in the Final EIS are based on public participatory survey work, specifically actual use events. The MPCA comment letter does not present specific instances or examples questioning the validity of the information developed by the DNR and included in the Final EIS. The MPCA's comment letter argues simply that the Final EIS conclusions are "highly unlikely"; such a statement without specific examples or other data is not sufficient to warrant revisions in the Final EIS conclusions. The Final EIS presents a sufficient identification and evaluation of recreational impacts, opportunities, facilities, and uses associated with the Watershed District's proposed project.

55. The MPCA written comments address the agency's recommendations for the extent of an economic analysis which it feels should be included in the Final EIS documents. Issues related to economic evaluation, the identification of the approach and extent of economic evaluation presented in the EIS documents, and the approach and extent of additional analysis which might be required in subsequent permitting processes are presented in Draft EIS section 3.9 and Final EIS sections 2.10, 3.1 and 3.2. The MPCA contends the Final EIS needs to respond to the question of whether a publicly-funded flood control project would in fact control floods sufficiently to make the project a worthwhile public expenditure. The Scoping Decision did not indicate that the EIS would contain such a determination, and the issue of a particular public expenditure of funds is not a subject to be decided in the EIS but rather it may be an issue related to decisions to be made as part of various regulatory processes. Final EIS section 3.1.8 and Finding 47 address the requirement that prior to any release of funds for proposed project construction, the DNR must determine that sufficient funds to complete the project have been committed from other sources.

Final EIS section 3.1 (more specifically sections 3.1.9, 3.1.10, 3.1.11 and 3.1.12) discuss the project justification required by the Sand Hill River Watershed District as part of the DNR permitting process for new Class I dam construction. The Final EIS includes the extent of the information and discussion that the DNR indicated, in June 23, 1988 correspondence to the MPCA (copy included in Final EIS chapter 4.0), would be included in the Final EIS in the topic areas of flood control benefits, recreational benefits, mitigation and the benefit cost ratio.

The MPCA written comments related to the potential that the DNR modifications to the Watershed District's proposed operation plan may limit flood control benefits, is an issue related to permitting decisions. The recommended specific instream flow plan of operation, the purpose of the plan, and the implementation of the parameters of the plan through the DNR permitting process are identified in Final EIS section 2.5.

56. Regarding the MPCA comment identifying a series of specific considerations which the MPCA feels should be included in the economic evaluation, Findings 27, 36 and 55 address this concern through a showing that the Final EIS documents provide the extent of the identification, discussion, evaluation, and analysis related to economic issues as outlined in the Scoping Decision. The Final EIS document specifically discusses the issues of the cost of an appropriate aeration system, the costs of wildlife mitigation, the cost of certain components of recreational development, the commitment of the project proposer to mitigation measures, and the methods by which further identification and clarification of these items would occur (Final EIS chapter 2.0, and Final EIS sections 3.1 and 3.2). Issues related to a further accounting of flood control benefits and explanations of project feasibility as expressed in a benefit-cost ratio, are not specific EIS issues, are beyond the scope of the EIS, and are recommendations most appropriately directed to the Watershed District since they deal with components of ultimate proposed project design to achieve proposed objectives. The inclusion of capital and operation or maintenance costs related to pumping is also beyond the scope of the EIS because pumping was not a component of project features during the EIS process, and the specific instream flow plan of operation outlined in Final EIS section 2.4 does not specify pumping as the method to maintain the instream and downstream protected flow requirements specified in the Final EIS.

57. Regarding the MPCA comments that changes to the benefit cost analysis developed by the Watershed District are needed and should be included in the Final EIS, the Final EIS (Final EIS section 3.1) already discusses the approach and extent of the proposed benefit and cost information presented in the Final EIS documents consistent with the provisions of the Scoping Decision. The Final EIS identifies the extent of further economic evaluation that may occur as components of agency regulatory processes. The Final EIS presents the level of information on this issue consistent with the provisions of the Scoping Decision. This issue is also addressed in Findings 27, 36 and 55.

The MPCA written comments related to lack of agreement with the position of the DNR concerning the inclusion in the EIS of costs and benefits of publicly-funded projects, are a misinterpretation of the contents of the June 23, 1988 correspondence between the DNR and the MPCA. The position of the DNR as specified in that correspondence (a copy of which is included in Final EIS chapter 4.0) is that a formal benefit-cost ratio is neither a necessity for state publicly-funded projects nor required by the Minnesota Environmental Review Program rules.

58. Regarding the MPCA comments related to distinctions between the environmental review and permitting processes, this issue for this EIS is addressed in the June 23, 1988 correspondence between the DNR and the MPCA which is included in Final EIS section 4.2, and in Findings 52 and 53. The Final EIS documents, as established in Findings 9, 27 and 36, comply with the content requirements of Minnesota Rules part 4410.2300 and part 4410.2700, subp. 1.

59. Regarding the MPCA comments suggesting that no mitigation plan has been presented in the EIS, the Final EIS documents present a substantial amount of information on mitigation measures and requirements (Draft EIS chapters 3.0 and 4.0 and Final EIS chapter 2.0, sections 3.1 and 3.2) for various aspects of the project proposal of the Sand Hill River Watershed District. The Final EIS explained throughout section 3.1 that while certain specific aspects of mitigation would be formalized as components of agency permitting processes, the requirements governing such mitigation are as discussed in the Final EIS documents.

60. Regarding the MPCA's comments on the discussion of alternatives in the Final EIS documents, particularly in relation to water quality considerations, the Final EIS documents contain the discussion of impacts of the various alternatives (the proposal of the project sponsors being only one such alternative) consistent with the terms of the Scoping Decision and in compliance with the intent of Minnesota Rules part 4410.2300. The impact discussion of alternatives was not limited to fishery resource impacts but included, for example, the issues of dam safety, proposed project features, downstream wetland systems, wildlife resources impacts, economics, agricultural impacts, and land management changes and impacts. The MPCA comments fail to provide sufficient justification that the DNR's treatment of alternatives in the Final EIS is contrary to the requirements of the EQB rules or to the issues determined in the scoping process.

61. The MPCA written comments recommend the addition of four items (delineated in Finding 51) which that agency contends are necessary to be included in the Final EIS in order for the Final EIS documents to be adequate. As established in the Findings presented in this Determination of Adequacy and specifically in the foregoing Findings 52-60, the Final EIS documents either sufficiently address the issues raised in the scoping process so that issues for which information can be reasonably obtained have been analyzed and provide responses to the substantive comments received during the Draft EIS review

period concerning issues raised in the scoping process or modifications are unwarranted as being beyond the scope of the EIS. The four items identified by the MPCA were addressed in the Final EIS documents in accordance with the established scope of this EIS.

62. The U.S. Environmental Protection Agency (EPA) submitted written comments expressing the position of that agency that the Final EIS documents do not satisfactorily address the issues of: (a) alternatives, (b) water quality, (c) wetland impacts, and (d) the extent and use of information which may be required in order for the EPA to fulfill its review and comment responsibilities associated with the permit required by the U.S. Army Corps of Engineers (USCE) for the proposed project. Many of the EPA's comments appear to be primarily the result of some confusion and misinterpretation regarding the function and purpose of the Final EIS documents as components of the state and federal environmental review and regulatory processes.

The issues raised by the EPA and the EPA's position on those issues will be addressed in Findings 63 to 66.

63. Regarding the EPA's comments on the sufficiency of the discussion of alternatives presented in the Final EIS documents, these comments relate to confusion regarding the scope and function of the Final EIS documents (both the Draft EIS and Final EIS documents), and to a difference of opinion regarding the need and justification for expansion of the alternatives analyzed in the Draft EIS as recommended by the EPA.

The Draft EIS and Final EIS documents both constitute the complete Final EIS (see Finding 34). The EIS prepared for the proposed Sand Hill River Watershed District Project No. 4 evaluated a total of five alternatives, two of which included the project proposal of the Sand Hill River Watershed District and the no-build alternative. Further information, discussion or evaluation for only those alternatives was presented in the Final EIS document since Chapter 2.0 of that document included revisions to the Draft EIS document to respond to substantive comments submitted during the Draft EIS public review period (see Findings 34 and 37). The written comments submitted on the Draft EIS by the EPA included four recommendations regarding alternatives as follows: (a) elimination of Alternative No. 1, (b) additional evaluation of Alternative No. 2, (c) an additional alternative or combination of alternatives comprising a dry dam with downstream flood protection and flood proofing measures, and (d) alternatives at other locations which might obviate the need for a Class I dam. The EPA did not provide specific justification for the need to expand the discussion of alternatives and some of the EPA's recommendations were for alternatives already evaluated in the Draft EIS.

The DNR responses provided to these comments (responses 12E, 12F, 12G, and 12H in Final EIS section 3.1.12) sufficiently addressed these comments and explained that a dry dam alternative was already evaluated in the Draft EIS (Alternative No. 2), outlined the negative impacts on natural resources associated with a dry dam, addressed the relationship of nonstructural flood control measures within the DNR permitting process and referred to the Draft EIS section on flood plain management considerations, and explained the extent of the discussion of alternatives as specified in the Scoping Decision document. The EQB rules governing environmental impact statements require data and analyses to be commensurate with the importance of the impact (see Finding 26; Minn. Rules part 4410.2300, item H.), require the documents to address the issues raised in the scoping process and to respond to substantive comments on the Draft EIS concerning issues raised in the scoping process (see Findings 27 and 36). Environmental documents are to be used as guides in issuing, amending, and denying permits (see Finding 52; Minn. Rules part 4410.0300, subp. 4). As noted in the response to the comments of the EPA (response 12G in Final EIS section 3.1.12) and in Findings 8 and 39, no comments were received objecting to the content of the parameters of the EIS as specified by the Scoping Decision document, and no substantive comments or arguments were submitted to warrant any modifications to the established EIS scope. The EPA comments fail to provide sufficient justification that the DNR's treatment of alternatives in the Final EIS documents is contrary to the requirements of the EQB rules or to the issues determined in the scoping process.

The EPA also contends that expansion of the treatment of alternatives is necessary to provide an equal discussion and presentation of all alternatives for regulatory decisions, and to comply with requirements in Section 404(b)(1) of the Clean Water Act (the guidelines used by the USCE in issuing Section 404 permits) and with the provisions of federal Executive Order 11990 regarding protection of wetlands. This EIS on proposed Sand Hill River Watershed District Project No. 4 was prepared by the DNR to fulfill and to comply with the requirements of the EQB and of the Minnesota Environmental Review Program for projects involving the construction of Class I high hazard dams (see Finding 1). Though federal rules or requirements may apply to the proposed project and are relevant in regulatory decisions, the responsibilities and requirements regarding the EIS, and the adequacy and sufficiency of the Final EIS documents are based on the criteria specified in the EQB rules (see Finding 2). The scope of the alternatives discussion as presented in the Final EIS documents is consistent with the terms of the Scoping Decision document and is in compliance with the intent of Minnesota Rules part 4410.2300. (The scope of alternatives evaluated was discussed in Final EIS sections 3.1.9 and 3.1.12; these issues are also discussed in Findings 9 to 27, 34, 36 to 39, 51 to 52, and 60.)

The EIS was prepared to comply with state and not federal requirements and the adequacy of the Final EIS documents is not dependent upon compliance with the provisions of Section 404(b)(1) of Clean Water Act (or with the provisions of guidelines promulgated under that section). Further, the adequacy of the Final EIS documents is not dependent upon specific compliance with federal Executive Order 11990. The DNR response in the Final EIS to the comments of the U.S. Fish and Wildlife Service (response 4F in Final EIS section 3.1.4) emphasizes that specific compliance with the executive order is not required because no federal monies are intended to be expended in connection with proposed project construction. In addition, the provisions of the executive order apply to actions by federal agencies and the executive order does not apply to the issuance by federal agencies of permits, licenses, or allocations to private parties for activities involving wetlands on non-Federal property. (Exec. Order 11,990, 3 C.F.R. 121, 1977 Comp.)

64. Regarding the EPA's comments concerning water quality impacts associated with the project proposal of the Sand Hill River Watershed District, the identification, discussion, and evaluation of water quality issues and impacts are discussed and analyzed throughout the Draft EIS (Chapters 3.0 and 4.0) and Final EIS (Chapters 2.0, 3.0 and 4.0) documents consistent with the provisions outlined in the Scoping Decision document. These issues are also delineated and addressed in Findings 9 to 27, 34 to 37, 45, 48 to 49, 52 to 53, and 60.

Issues cited by the EPA regarding the potential for proposed reservoir eutrophication to result in violations of water quality standards are concerns related to permitting processes and regulatory decisions. The function of the EIS is to provide for a presentation of potential impacts consistent with the terms of the Scoping Decision document. Issues specifically related to compliance with various regulatory standards are functions of permitting processes and beyond the scope of the EIS. This issue is also discussed in Findings 48, 52 to 53, and 61.

65. Regarding the EPA's comments on wetland impacts (specifically that lack of feasible alternatives to the filling or impacting of wetlands be shown, that adverse impacts resulting in the loss of wetlands be discussed, that negative impacts related to wetland loss be addressed, and that losses of wetlands be kept to a minimum and be mitigated), the Final EIS documents present these issues (including a substantial amount of data, evaluation and analysis of wetland, wildlife and habitat impacts and losses for all of the alternatives) throughout the documents. The Draft EIS included a thorough Habitat Evaluation Procedure (HEP) analysis which delineated upland and wetland gains and losses for all of the alternatives (Draft EIS section 3.4), identified the extent of losses required to be mitigated, and outlined required methods to mitigate such losses (Draft EIS section 4.3). The Draft EIS also included the evaluation of downstream wetland impacts and losses (Draft EIS section 3.5) and the required measures to mitigate downstream wetland losses and

impacts (Draft EIS section 4.4). The Final EIS emphasized throughout Final EIS section 3.1 that the identification, evaluation and analysis of wetland impacts and losses, as well as the requirements governing mitigation measures are as discussed in the Final EIS documents. No comments were received on the Final EIS documents from any of the HEP Team participating agencies regarding the HEP analysis or evaluation.

Further, the issues regarding wetland impacts and losses in the EPA's written comments are concerns related to compliance with federal Executive Order 11990. Finding 63 explains why Final EIS adequacy does not require specific compliance with the executive order.

66. The EPA's written comments also include that agency's current position and recommendations regarding Sand Hill River Watershed District project proposal and states that since the requirements of Section 404 of the Clean Water Act could not successfully be met, the EPA will recommend denial of the USCE's Section 404 permit and will continue to maintain that recommendation until all of the requirements for the USCE's permit (including the requirements of any guidelines established by which the USCE grants permits) have been met. These issues raised are concerns related to the federal permitting processes and are beyond the established scope of the EIS.

The purpose and function of this EIS is to fulfill the DNR's responsibilities as an RGU under the EQB rules and under the provisions of the Minnesota Environmental Review program (see Finding 1). The Final EIS documents are adequate when the criteria for the Determination of Adequacy outlined in Finding 2 are met. Compliance with these criteria has been established by these Findings (see in particular Findings 5, 7 to 9, 27 to 37, 41 to 43, and 67 to 71). One function of EIS is that it contains information that addresses the significant environmental issues of a proposed action and that it can be used as a guide in issuing, amending, and denying permits (Minn. Rules part 4410.0300, subp. 4). The function of the EIS is not to comply with all of the permit requirements associated with the project proposal or to comply with federal environmental review requirements. Findings 52 and 53 establish that the Final EIS is not inadequate because all of the regulatory requirements have not been met or because all information for all required permits has not been included in the Final EIS documents.

The EPA also indicated that if the U.S. Army Corps of Engineers prepares an environmental document on its permit, depending on the extent of new information, the EPA would refer the proposed project to the federal Council on Environmental Quality (CEQ) under the provisions for predecision referral of proposed federal actions determined to be environmentally unsatisfactory (40 C.F.R. part 1504). The preparation by the USCE of a federal environmental document is a decision not connected with the Minnesota Environmental Review process but is a decision to be made by the USCE as a component of its regulatory process. Referral of environmentally unsatisfactory projects to the CEQ applies to major federal actions involving federal agencies, and as established in Finding 63, such a referral is inapplicable to the adequacy of this particular EIS.

67. The public has been offered opportunities for input into the scope of the EIS, the content of the Draft and Final EISs, and the adequacy decision on the Final EIS in accordance with all applicable provisions of the Minnesota Environmental Review Program rules.

68. The EIS document meets the content requirements of Minnesota Rules part 4410.2300, including a cover sheet, summary, table of contents, list of preparers, project description, governmental approvals, alternatives, environmental, economic, employment, and sociological impacts, mitigation measures, and appropriate appendices.

69. The EIS provides an evaluation and analysis of effects and alternatives, which is commensurate with their importance as identified by the scoping process, and identifies reasonable mitigative measures and requirements for identified adverse effects.

70. The Final EIS has been prepared in accordance with the procedures of Minnesota Statutes, section 116D.04 (1988) and Minnesota Rules part 4410.0200 to 4410.7800 (1987).

71. The Final EIS document satisfies the conditions of adequacy set forth at Minnesota Rules part 4410.2800, subpart 4.

72. At least seven working days prior to the final decision of any state agency if an EIS has been prepared for that project, that state agency shall provide the EQB with notice of its intent to issue a decision (Minn. Rules part 4410.3200, subps. 1 and 2). The EQB or the EQB Chair has the authority to delay implementation and to determine whether to affirm, reverse or modify the governmental unit's decision where there is substantial reason to believe that the project or its approval is inconsistent with the policies and standards of Minnesota Statutes, sections 116D.01 to 116D.06 (Minn. Rules part 4410.3200, subps. 3, 4, and 5.C.). A state agency for these purposes is "any officer, board, commission, bureau, division, department, or tribunal..., having a statewide jurisdiction and authorized by law to make rules or to adjudicate contested cases." (Minn. Stat. § 14.02, subd. 2).

73. Proposed Sand Hill River Watershed District Project No. 4 is a project to be wholly or partially conducted by a state agency for which an EIS was prepared. At least seven working days prior to a final decision, any and all state agencies with governmental permits, approvals or licenses associated with the project shall provide the EQB with notice of intent to issue a final decision to enable the EQB or EQB Chair to determine compliance with the provisions of Minnesota Rules part 4410.3200. The notice shall include a brief description of the project; the date the final decision is expected to be issued; the title and date of EISs prepared on the project; and the name, address, and phone number of the project proposer and parties to any proceeding on the project (Minn. Rules part 4410.3200, subp 2).

74. Officials responsible for the issuance of permits for natural resources management and development shall give due consideration to the provisions and policies of Minnesota Statutes, sections 116D.01 to 116D.06 (Minn. Stat. § 116D.04, subd. 7). In deciding whether to issue permits, the DNR shall be guided by the policies and requirements of Minnesota Statutes chapter 116D (Minn. Rules parts 6115.0150 and 6115.0300).

75. The Department shall document in written form, for all permits, licenses, and approvals to be issued by the Department of Natural Resources in connection with proposed Sand Hill River Watershed District Project No. 4, the extent to which such permits, licenses, and approvals are consistent with the provisions, policies and requirements of Minnesota Statutes sections 116D.01 to 116D.06 and adhere to the recommendations, evaluations, requirements, findings, and conclusions established in the Final EIS (Draft EIS and Final EIS) and in this Determination of Adequacy.

CONCLUSIONS

A. The Department of Natural Resources has the authority to determine the adequacy of the EIS for proposed Sand Hill River Watershed District Project No. 4.

B. The DNR has fulfilled procedural requirements relating to the determination of adequacy.

C. An EIS is adequate if it meets the criteria set forth in Minnesota Rules part 4410.2800, subp. 4.

D. The Final EIS document for the proposed Sand Hill River Watershed District Project No. 4 is adequate because:

1. it adequately addresses the issues raised in scoping so that all issues for which information can reasonably be obtained have been analyzed;

2. it provides responses to timely substantive comments received on the draft EIS; and

3. it was prepared in compliance with the procedures of the act and the environmental review program rules.

E. Proposed Sand Hill River Watershed District Project No. 4 is a project to be wholly or partially conducted by a state agency for which an EIS was prepared. At least seven working days prior to a final decision, any and all state agencies with governmental permits, approvals or licenses associated with the project shall provide the EQB with notice of intent to issue a final decision to enable the EQB or EQB Chair to determine compliance with the provisions of Minnesota Rules part 4410.3200. The notice shall include a brief description of the project; the date the final decision is expected to be issued; the title and date of EISs prepared on the project; and the name,

address, and phone number of the project proposer and parties to any proceeding on the project (Minn. Rules part 4410.3200, subp. 2).

F. The DNR will document in written form, for all permits, licenses, and approvals to be issued by the Department of Natural Resources in connection with Sand Hill River Watershed District Project No. 4, the extent to which such permits, licenses, and approvals are consistent with the provisions, policies and requirements of Minnesota Statutes sections 116D.01 to 116D.06 and adhere to the recommendations, evaluations, requirements, findings, and conclusions established in the Final EIS (Draft EIS and Final EIS) and the Determination of Adequacy.

G. That any Findings which might properly be termed Conclusions and any Conclusions which might properly be termed Findings are hereby adopted as such.

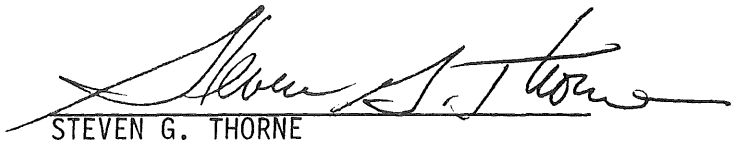
ORDER

Based on the Findings of Fact and Conclusions contained herein and the entire record of the proceeding:

The Department of Natural Resources hereby determines that the Final Environmental Impact Statement for the Proposed Sand Hill River Watershed District Project No.4 is adequate.

Approved and adopted March 1, 1989.

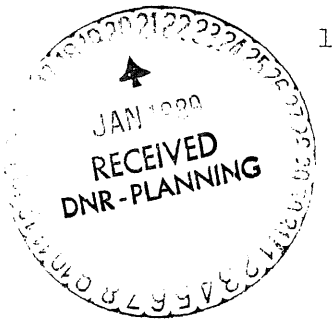
STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES



STEVEN G. THORNE
Deputy Commissioner

Winger 55/WING2

16 January 1989



Thomas J. Balcolm
Minn. Dept. of Natural Resources
Environmental Review Coordinator
Office of Planning
500 Lafayette Road
St. Paul, Minn 55155 - 4010

Dear Mr. Balcolm:

The following comments are made because I believe they should be considered before final approval of the EIS.

1. The question which I posed, which was labelled as 3C in the FEIS was totally avoided; that is, could this permanent pool dam be made to function as a dry dam, if, in time, even the most casual observer couldn't stand the smell?

2. It is stated that the Finger Dam is a Flood Control Dam, primarily. But the Section 205 Initial Appraisal Report conducted by the U.S. Army Corps of Engineers in 1984 came to the conclusion that there would be no flood control benefits from this dam beyond the small dam at Bear Park (about 8 miles downstream). Is this report valid or did the Corps use improper parameters or make an error in their calculations?

3. The tax-paying public should be filled in on the costs of this dam on an continuing basis--not construction costs, but such things as maintaining bubbler equipment, electricity, liability insurance, cost of, storage of and maintenance of the harvester used in getting rid of vegetation . No effort has been made to show this in the local newspapers.

4. The prospect seems very real that discharge of hypolimnetic waters with near zero ppm of oxygen would produce water quality impacts downstream. How would this affect the recreational development underway on the Sand Hill River at Fertile? How will the decision be made, eventually, whether or not the released water meets the criteria spelled out in Sect 401 of the Clean Water Act?

5. The draft EIS suggests that the amount of silt that will enter the Dam will exceed 20,000 Tons annually. In 20 years or so this will have a profound effect on the morphometry of the dam, especially the original channel. What will, eventually, be the disposition of this silt? (this is mud, not sand!). Does this dam have a planned lifespan, or is this dictated by when it chokes to death from silt?

6. The water and silt will continue to carry their load of Phosphorous, pesticides and the like, into the dam. Do the farmers in the Sandhill Watershed (and above the dam) realize the nature of the regulations that could be imposed on them by a Shoreland Management Board intent on cutting down on the blue-green algal blooms? If they knew, it could make some real differences in their attitude toward land easement.

Thank you for your consideration of the above.

Sincerely,

Blanchard C. Krogstad

Blanchard C. Krogstad
rr
Finger, MN 56592

Minnesota Pollution Control Agency

January 30, 1989

Joseph N. Alexander
Commissioner
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, Minnesota 55155

Dear Mr. Alexander:

Re: Winger Dam Final Environmental Impact Statement

The above document has been reviewed by Minnesota Pollution Control Agency (MPCA) staff.

HISTORY OF MPCA INVOLVEMENT IN THE WINGER DAM PROJECT

MPCA first commented on this project in a letter dated January 13, 1986. Since that time, we have addressed the following issues in various communications.

1. 401 certification
2. effects of low flows on water quality and water quality-dependent uses
3. flow regulation
4. sediment transport
5. effects of the project on downstream dissolved oxygen
6. the need for the project in quantifiable benefits
7. the adverse impacts of not building the project
8. evaluation of alternatives, and
9. an economic analysis including flood reduction benefits associated with the project.

Items 1 through 5 were raised by MPCA in our comments on the Scoping environmental assessment worksheet (EAW). Items 6 through 9 were raised by others.

The Scoping Decision, dated March 4, 1986, committed the environmental impact statement (EIS) to discussing these issues, as well as analyses of benefits and costs, the impacts of the project and all major alternatives, mitigation and the public's recreational interest in the project. (The draft EIS contained a plan to draw down the reservoir if necessary to maintain the protected flow, which obviated the concern over low flow effects.)

We did not comment on this Scoping Decision.

The draft EIS was received in our offices on June 30, 1987. In our comments on it dated August 10, 1987, we noted that several of the issues we raised in the scoping process had not been fully addressed in the draft EIS, among them 401 certification, flow regulation, and the effects of the project on downstream water quality. In addition, we noted some problems with the draft EIS's treatment of scoped issues raised by others and in which we have an interest, such as the recreational potential of the impoundment, and the costs of the project compared with project benefits. Both relate to areas where MPCA has jurisdiction through water quality standards and the 401 certification process. We anticipated that the Sand Hill River Watershed District's responses to these and other comments would fulfill the letter and spirit of the Environmental Quality Board (EQB) rules and address the issues by filling in gaps and setting the stage for inclusion of requested information in the final EIS.

The District's Response to the draft EIS comments did not meet this expectation. As we noted in our April 8, 1988, letter to you, the District's response did not acknowledge their responsibility to fully justify the project, assess environmental impacts, devise mitigation, and fully address the key environmental issues in the EIS.

This brings us to the present, and our review of the final EIS. Our comments will address the issue areas we have identified previously.

REVIEW OF FINAL EIS

401 Certification

MPCA has the responsibility, under section 401 of the Clean Water Act (CWA), to certify to the Corps of Engineers (COE) that project construction and implementation will not result in violations of water quality. This certification is required before COE can issue a 404 permit. It is our belief that the EIS should contain sufficient information to judge whether applicable water quality standards would be met. We believe the project justification must be weighed against projected impacts in the course of the EIS process, as opposed to leaving major unanswered questions for the permitting process to deal with.

Downstream Water Quality Impacts

The District addressed, in a Supplementary Environmental Studies report dated October 20, 1988, the question of dissolved oxygen violations downstream resulting from the routine release of water from the bottom of the impoundment. In our comment letter dated December 8, 1988, we noted our belief that the modeling requires additional calibration and verification analysis in order to effectively predict dissolved oxygen responses.

Further, the District has not yet addressed the possible development of nuisance conditions which may result from construction and operation of this project. A complete analysis of water quality impacts will be required for 401 certification, and should have been in the EIS, since that document's primary function is to assess impacts.

The above deficiencies were not corrected in the final EIS.

Recreation

The recreational interest of the public in this project was identified in the Scoping Decision Document as an issue to be addressed in the EIS. Since this interest has not, to our knowledge, been defined in project documents, we drew the conclusion that it encompasses the usual uses the public has traditionally made of Minnesota lakes, including swimming, fishing and boating. In our comments on the draft EIS we documented, in terms of water quality, our concern about this impoundment's ability to supply these recreational pursuits.

Our interest in this issue stems from the following:

* it is the job of this agency to regulate the water quality upon which Minnesota's water-based recreation is based; and

* it has time and again been the perception of the public that it is the state's responsibility to correct water quality problems which threaten recreation. Lake shore lot owners whose water quality expectations are not met by this project may try to obtain state funding for cleanup (i.e., via the Clean Lakes Program).

We believe it incumbent upon a project whose bottom line depends in significant part on recreational benefits, to demonstrate that those benefits will in fact exist. As we have shown, we doubt that they will, and have seen little information which would show otherwise.

In the expanded section on recreation on page 22 of the final EIS, it is estimated that, based on the "average" to "maximum" levels of use experienced by "lakes in Greater Minnesota," the Winger Dam impoundment would support 65,000 to 165,000 hours of recreation annually. Based upon water quality and public perception survey work we have done and referenced elsewhere, we find

this conclusion highly unlikely. The final EIS itself casts considerable doubt on this projection on page 44 where it notes that application of this data "...did not take into consideration the type and limitations of a reservoir as proposed by the....District..." and that "therefore (aside from total acreage) these estimates of recreational potential and activity do not consider the particular aspects of the proposal of the Watershed District".

We note that the Department of Natural Resources (DNR) projects conditions at Sand Hill Lake, a shallow headwater lake that tends to winterkill, as representative of project conditions. Perhaps the public use of this lake for various purposes should be determined as an index of reservoir use.

Project Costs and Benefits

The economic analysis for this project should include a comparison of all costs to build and maintain the project with the benefits accruing to it.

Since this is a flood control project, the flood control benefits it offers are of paramount concern. We noted in our letter of April 8, 1988, that project-related documents differed significantly in their assessment of whether the project would result in flood control benefits. The basic question, whether a publicly-funded flood control dam would in fact control floods sufficiently to make the project a worthwhile public expenditure, needs to be answered. We understood from your letter to us of June 23, 1988, that more information on this topic would be presented in the final EIS.

We are also concerned, as we noted in our comment letter (dated December 8, 1988,) on the Supplemental Studies, that the operation plan, as modified by DNR, may severely limit any flood control benefits.

However, a number of important considerations were not included in the economic analysis, among them:

a. the costs of the aeration system which will be needed to maintain even a marginal fishery (we note on page 133 of the final EIS that the amount allocated for right-of-way, which includes aeration, has not been increased from the 1986 figure, which was first presented at a time when aeration was not a project feature);

b. the costs of wildlife mitigation

c. the capital and operation/maintenance costs of pumping to maintain the protected flow downstream if inflow falls below 2.4 cfs, as called for in the modified operation plan;

d. costs of recreational development;

e. a full accounting of flood control benefits, particularly on the Red River mainstem, and particularly with the operation plan modification proposed by DNR, and an explanation of how this accounting squares with the COE finding that this project would have no flood control benefits below the Bear Park Dam, 10 miles downstream (we find the derivation of flood control benefits on pages 106-107 unpersuasive and unacceptable, since it relies on intuitive arguments rather than quantitative methods); and,

f. an explanation of why this project is felt to be feasible when the COE found the benefit/cost ratio to be .47 some years ago.

The Scoping Decision Document states that costs and benefits must be presented in the EIS, and the changes that have been noted above raise concern that the benefit/cost analysis is no longer accurate. In light of the fact that the benefit/cost ratio as calculated by the District is only 1.06, and considerable question is raised over benefits as well as additional costs, this issues needs to be revisited. We do not agree with the explanation in your letter dated June 23, 1988, that the EIS need not address the costs and benefits of publicly-funded projects.

Relationship of Environmental Review and Permitting Processes

As we have discussed in other communications, we disagree that what clearly are EIS issues can be left to be dealt with in permitting processes. One example of this is the District's intention to wait until the permitting stage to develop detailed dam operating procedures although these procedures may have ramifications for water quality impacts and mitigation of those impacts.

Mitigation

We earlier raised the concern that no mitigation plan had been presented in the EIS. We here reiterate both that concern and our contention that this is an EIS issue which must be addressed in the course of environmental review. In the absence of such a plan, a full range of mitigation alternatives which would minimize project impacts might be deemed minimally acceptable, taking into account the effect this would have on calculation of the benefit/cost analysis.

Alternatives

We noted in our letter to you of April 8, 1988, that discussing the water quality impacts of only alternative 1 made it difficult to compare the feasibility of the various alternatives. Dispensing with this discussion because, as you put it in your letter of June 30, 1988, "...none of the other alternatives was suited to supporting even a limited sport fish population," is not appropriate. The fishery is only one dimension of the discussion. There are other dimensions to be evaluated including the fact that different alternatives would have different downstream water quality impacts.

CONCLUSION

We previously concluded, based on our review of the District's response to draft EIS comments, that the EIS as it then existed was inadequate to perform its intended function under law. Rather than wait until the final EIS was published, at which time little opportunity would exist for corrections, we raised the issue at that time in order to give the involved parties the opportunity to correct the deficiencies and/or to show that the deficiencies did not in fact exist.

Unfortunately, our review of the final EIS provides no reason to change our assessment of this EIS. For the reasons outlined above, we find that it still cannot be considered adequate for its intended purpose. In order to be considered adequate it would have to contain the following information:

1. An analysis of benefits and costs which fully considers ALL benefits and ALL costs.

2. A complete discussion of the environmental impacts, including downstream water quality impacts, of all alternatives. The Scoping Decision Document contains a commitment to provide this discussion.

3. The District's plan for mitigation of project impacts and the costs associated with that plan, for all alternatives.

4. A realistic assessment of the ability of this project to provide recreation.

Please contact William J. Lynott or Clifford T. Anderson of my Office of Planning and Review staff if you wish to discuss this matter further.

Sincerely,

Gerald L. Willet

Gerald L. Willet
Commissioner

GLW:pnk

cc: Environmental Protection Agency Region V
Sandhill River Watershed District
Donald Ogaard, Chairman, Lower Red River Board
MPCA Detroit Lakes Regional Office

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

6 FEB 1989

REPLY TO THE ATTENTION OF:

Thomas W. Balcom
Environmental Review Coordinator
Natural Resources Planning and Review Section
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, Minnesota 55155

Dear Mr. Balcom:

The Environmental Review Branch has reviewed the Final Environmental Impact Statement (FEIS) for Sand Hill Watershed District Project No. 4, the Winger Dam on the Sand Hill River in southeastern Polk County, Minnesota. The proposed project consists of the construction of a Class I high hazard dam on the Sand Hill River. The intent of the action is to provide flood damage reduction for downstream areas, a recreation lake, and to upgrade the crossing of the Sand Hill River by State Trunk Highway 59 (T.H. 59). The preferred alternative is the construction of a 35-foot high, earth-fill dam. The dam would create a 6.8 mile long reservoir with a 1,217 acre permanent/recreational pool that would be 20 feet deep at the dam. The floodwater storage would have a surface area of 1,613 acres, and would be approximately 26 feet deep at the dam. The dam would provide approximately 6,881 acre-feet of controlled floodwater storage, and 1,548 acre-feet of uncontrolled floodwater storage. The FEIS considered one other alternative. The no-build alternative would consist of the nonconstruction of the earth-fill dam, and the construction of a new bridge for T.H. 59.

The proposed project is not sponsored by a Federal agency, however a Federal permit must be obtained from the U. S. Army Corps of Engineers for the placement of fill in wetlands under Section 404 of the Clean Water Act (CWA). The U.S. Environmental Protection Agency (USEPA) is responsible for the review and comment on the permit. Therefore, our comments are advisory on the FEIS but these comments reflect our concerns and position that will be taken on the permit. During the permit process we will provide these detailed comments. The following comments are on alternatives, water quality, and wetland impacts.

The FEIS fails to satisfactory fulfill the document's objective. The stated objective of the FEIS is to present all of the alternatives with accurate and complete information, and not to designate a preferred alternative. The purpose of the FEIS is to provide the basis for good decision making. However, in terms of alternatives the FEIS has only addressed the preferred alternative, and the no build alternative. The FEIS has also dismissed all alternatives recommended in our Agency's letter, August 10, 1987 from further study. Before a environmentally sound decision can be made, all of the alternatives must be equally discussed and presented for the external review/comment process. Section 404 (b)(1) of the CWA also requires a thorough evaluation of alternatives. Executive Order 11990 requires that there be no loss of wetlands, which the Corps of Engineers must attain.

Before any wetlands can be filled or impacted it must be proven that there is no other feasible alternative. Each of these alternatives must be addressed in a complete manner. In addition, adverse impacts resulting in the loss of wetlands must be discussed. The negative impacts related to wetland loss such as, loss of wildlife habitat, natural flood control, and change in water quality must be addressed. After complete evaluation, if the project can proceed then the loss of wetlands must be kept to a minimum, and any loss mitigated.

The water quality impacts associated with the project would be directly related to construction of the project. These adverse impacts to water quality are significant and unacceptable. The significant change in chemical, and physical characteristics would adversely affect the water quality of the reservoir. The change in dissolved oxygen, temperature, and siltation in the reservoir would negatively impact the aquatic habitats, the limited fisheries, and significantly alter species diversity. Furthermore, the projected rate of 10 years for significant eutrophication of the reservoir is an adverse environmental impact which cannot be permitted. The eutrophication within the lake would violate water quality standards which neither our Agency or the Minnesota Pollution Control Agency can accept. The substantial nitrogen and phosphorus load in the river system combined with the change in chemical and physical properties would lead to routine alga blooms, and an increase in the rate of eutrophication. Depending on the species of algae, bloom size, and occurrence the result could be a significant fish kill.

Based on the information provided, the proposed project would not successfully meet the requirements of Section 404 of the CWA. Therefore, we will recommend denial of the 404 permit. We will continue to have this recommendation until all of the requirements for the Section 404 (b)(1) permit are satisfactory fulfilled. If the Corps of Engineers prepares an environmental document on the permit for this project and no additional information is provided we will refer this project to the Council on Environmental Quality. The referral will be under the regulations implementing the National Environmental Policy Act.

Thank you for the opportunity to comment on the FEIS for the Winger Dam Project. If you have any questions or comments, please contact Al Fenedick of my staff at (312) 886-6872.

Sincerely yours,

William D. Franz

William D. Franz, Chief
Environmental Review Branch
Planning and Management Division

FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)
PROPOSED SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4
THE WINGER DAM, POLK COUNTY, MINNESOTA

PREPARED BY:
MINNESOTA DEPARTMENT OF
NATURAL RESOURCES

ASSISTANCE OF:
SAND HILL RIVER WATERSHED
DISTRICT AND
HOUSTON ENGINEERING, INC.

FOR FURTHER INFORMATION CONTACT:

Minnesota Department of
Natural Resources (RGU)

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(218) 755-3974

Roland Gullekson, Chairman
Sand Hill River Watershed
District
Route 2, Box 218D
Fertile, MN 56540
(218) 945-6299

December 13, 1988
Date of Approval

Steven G. Thorne
Deputy Commissioner

ABSTRACT

This document together with the Draft EIS constitutes the Final EIS. The Final EIS discusses the impacts, alternatives, and mitigation requirements, and provides the responses of the Department of Natural Resources to the public comments submitted on the Draft EIS for a project proposal associated with the construction of a 1,600-acre Class I High Hazard dam for flood damage reduction, for recreational purposes and to facilitate a crossing of the Sand Hill River for State Trunk Highway 59.

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1.0 INTRODUCTION

1.1 PURPOSE OF FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

The purpose of this Final Environmental Impact Statement (EIS) for the proposed Sand Hill River Watershed District Project No. 4 - the Winger Dam, is to provide additional information supplementing or revising the Draft EIS, to provide clarification on issues discussed in the Draft EIS, and to respond to comments on the Draft EIS submitted during the Draft EIS public review period and the Draft EIS public meeting. This document, together with the Draft EIS, constitutes the Final EIS for the proposed Sand Hill River Watershed District Project No. 4.

The proposed Sand Hill River Watershed District Project No. 4 is a proposal by the Sand Hill River Watershed District to construct a Class I or high hazard dam on the Sand Hill River in southeastern Polk County at the State Trunk Highway (T.H.) 59 crossing of the Sand Hill River. The Department of Natural Resources (DNR) is responsible for the preparation of environmental documents related to construction of Class I dams under the rules of the Minnesota Environmental Quality Board, Environmental Review Program (Minn. Rules part 4410.4410, subp. 18).

The Draft EIS was officially distributed and the public comment period began when the Draft EIS notice of availability was published in the EQB Monitor on June 29, 1987. The public meeting on the Draft EIS was held on July 21, 1987 in Winger, and the public comment period concluded on August 12, 1987. Throughout the public comment period and at the public meeting, the DNR received comments related to several issues. This Final EIS was then prepared by the DNR to respond to these comments and concerns.

Chapter 3.0 of this Final EIS addresses the public comments on the Draft EIS, individually, in a comment and response format. In situations where the response to a comment requires substantial changes to sections or pages of the Draft EIS, those sections or pages are rewritten, reissued in this Final EIS as Chapter 2.0, and noted within the individual response in Chapter 3.0. Final EIS 4.0 includes various additional letters of coordination relevant to the environmental review process, and may provide a reader or reviewer with additional information.

2.0 REVISIONS AND SUPPLEMENTARY INFORMATION TO DRAFT EIS

2.1 PROPOSED PROJECT AND ALTERNATIVES DESCRIPTION

2.1.1 Summary proposed reservoir description and fishery resource potential

The Draft EIS addresses the technical characteristics of the reservoir for the project proposed by the Sand Hill River Watershed District (Draft EIS section 1.4), the nature of the existing fishery resource (Draft EIS section 3.3.1), the results of fisheries investigations completed by the DNR at the site of the proposed reservoir (Draft EIS sections 3.3.2 and 3.3.3), the projected fisheries resource which might be expected to occur under reservoir conditions (Draft EIS section 3.3.4), fish management techniques which could be implemented to provide a particular fishery resource (Draft EIS section 3.3.5), and analysis of water quality sampling data at various locations along the Sand Hill River (Draft EIS section 3.6.). The evaluations and analyses contained in these sections demonstrate the limited fishery resource and recreational resource (based on the potential fishery resource) which can be anticipated to result from the project proposal of the Sand Hill River Watershed District. The results of these analyses are summarized and combined with information on Sand Hill Lake in Polk County to provide an additional evaluation of the type and extent of fishery resource that might be anticipated to result from the construction of proposed Alternative No. 1. As noted by the DNR at the 1987 public meeting on the Draft EIS, a reservoir as proposed by the Sand Hill River Watershed District is likely to display a fishery resource similar to the characteristics of Sand Hill Lake.

The proposed reservoir would be generally shallow with a maximum depth of 20.0 feet at the proposed dam site. At the recreational pool elevation, the surface area would be 1,217 acres. In 1986, aquatic plants in the Sand Hill River were abundant by mid-June and the river was weed-choked from mid-summer until fall, particularly in the low gradient areas of the stream. Secchi disc readings (readings of water clarity) ranged from 4.8 feet (proposed reservoir location) to 6.0 feet (proposed dam site) to 3.5 feet (downstream of proposed dam site). A fisheries investigation revealed that the species composition of the Sand Hill River in the vicinity of the proposed project is comprised mostly of white sucker, black bullhead, northern pike, and a number of minnow species. Overall species diversity was low. Populations of the large fish species were low as with many small streams in their middle or headwaters sections. Effective establishment of a healthy fish community structure is limited in part by oxygen deficiencies. The low oxygen conditions result in part from an overabundance of submerged aquatic vegetation. The overall catch per unit of effort (fish/hour) for the large fish species (northern pike, white sucker, and black bullhead) was 63.7. The small fish species catch was 191.9 (fish/hour).

Based on the existing fish community and the expected reservoir morphology and water quality, black bullheads are likely to dominate a reservoir fish community. During the beginning stages of a reservoir (up to the first ten years), habitat and limited competition provide suitable conditions for northern pike populations. As a reservoir ages, northern pike spawning habitat deteriorates and the population levels decrease. Northern pike reproductive success is usually low in reservoirs managed for flood control as a result of fluctuating water levels. In addition, as a reservoir becomes more eutrophic, the lake type shifts from walleye to bullhead. The physical and chemical

characteristics of the reservoir proposed by the project sponsors has been found to be closely related to a bullhead type lake, and is anticipated to be very eutrophic.

The fishery potential of the proposed reservoir is limited by a number of factors including water quality parameters which influence the species composition and productivity of a reservoir, physical parameters such as mean and maximum depth and surface area, and other factors such as length of the growing season, reservoir age, water level fluctuations, and winter oxygen levels. The evaluation presented in the Draft EIS noted high water fertility, shallow depth of the proposed reservoir, and low flows on the Sand Hill River as factors which increase the probability that the proposed impoundment will experience frequent winterkill conditions.

The fishery management potential of the reservoir proposed by the Watershed District is also severely limited by physical and chemical characteristics and by the flow characteristics of the Sand Hill River. Winterkill due to oxygen depletion will result from the combination of shallow depth, inundation of vegetation, and low input flows containing high nutrient levels. Frequent winterkill will occur often enough to limit the development of a game fish population. To maintain even a minimal or marginal fishery resource, installation and operation of an effective aeration system would be required. The addition of an aeration system may not appreciably improve the anticipated marginal nature of the fishery resource. Decomposition of inundated wetland and upland vegetation (initially), and the contribution of commercial fertilizers, agri-chemicals and animal waste all contribute to a high biochemical oxygen demand. Aeration systems are often costly means to prevent winterkill. Continuous aeration systems are also hazardous during the winter months.

For comparison purposes, the proposed reservoir is likely to exhibit characteristics similar to Sand Hill Lake. Sand Hill Lake is a 598-acre marginal fish lake, located at the headwaters of the Sand Hill River. It has a maximum depth of 17 feet and a median depth of eight feet. The lake fluctuates annually approximately one foot. Lake surveys for Sand Hill Lake were conducted in 1977 and 1985. At the time of the surveys, the lake's color was characterized as pea green (1977 survey) or green (1985 survey) with Secchi disc readings of 1.5 feet (1977 survey) and 2.4 feet (1985 survey). Winterkill occurred in 1976. There is a weir type dam at the outlet which operates as a barrier to fish movement. The shoal water soils are characterized as 70% muck and 30% sand and muck. Sand Hill Lake suffers from frequent winterkills due to its shallow depth and abundant aquatic plant growth. The lake surveys revealed that the Sand Hill Lake fishery is dominated by bullhead and small northern pike. While it will support stocked walleyes, walleye populations are subject to frequent winterkill. Good walleye fishing may be produced from fry stocking when the lake survives two to four winters without winterkill. Frequent winterkills also limit panfish populations. Fish spawning conditions for northern pike and panfish range from poor to fair, and for walleye and largemouth bass the conditions range from unsuitable to fair. Historically, bullhead spawn successfully.

2.1.2 Proposed T.H. 59 modifications

In 1985, the Minnesota Department of Transportation (MNDOT) finished the last of a number of projects designed to upgrade T.H. 59 from Detroit Lakes to Thief River Falls. The section of T.H. 59 through the Sand Hill River Valley is the only remaining section in a reconstruction project initially proposed by MNDOT from the South Polk County line to the junction of T.H. 2 in Polk County. Through an agreement with the Sand Hill River Watershed District, MNDOT delayed planned development of a replacement bridge and approach roadways over the Sand Hill River until the

Watershed District could pursue plans to build an earthen dam at that location. MNDOT further agreed to contribute $1,020,000 to the District's proposed water impoundment project, which is the equivalent of 1986 planned bridge replacement and approach roadways costs. The proposed roadway is proposed to consist of two 12-foot wide driving lanes with eight-foot wide shoulders. A combination of six-foot paved and two-foot gravel shoulders are proposed. The flowage control facility of the proposed dam is to serve as a bridge for T.H. 59. Because the highway portion of the proposed project is a major component of the dam, the Sand Hill River Watershed District will be responsible for designing and constructing the roadway to MNDOT specifications.

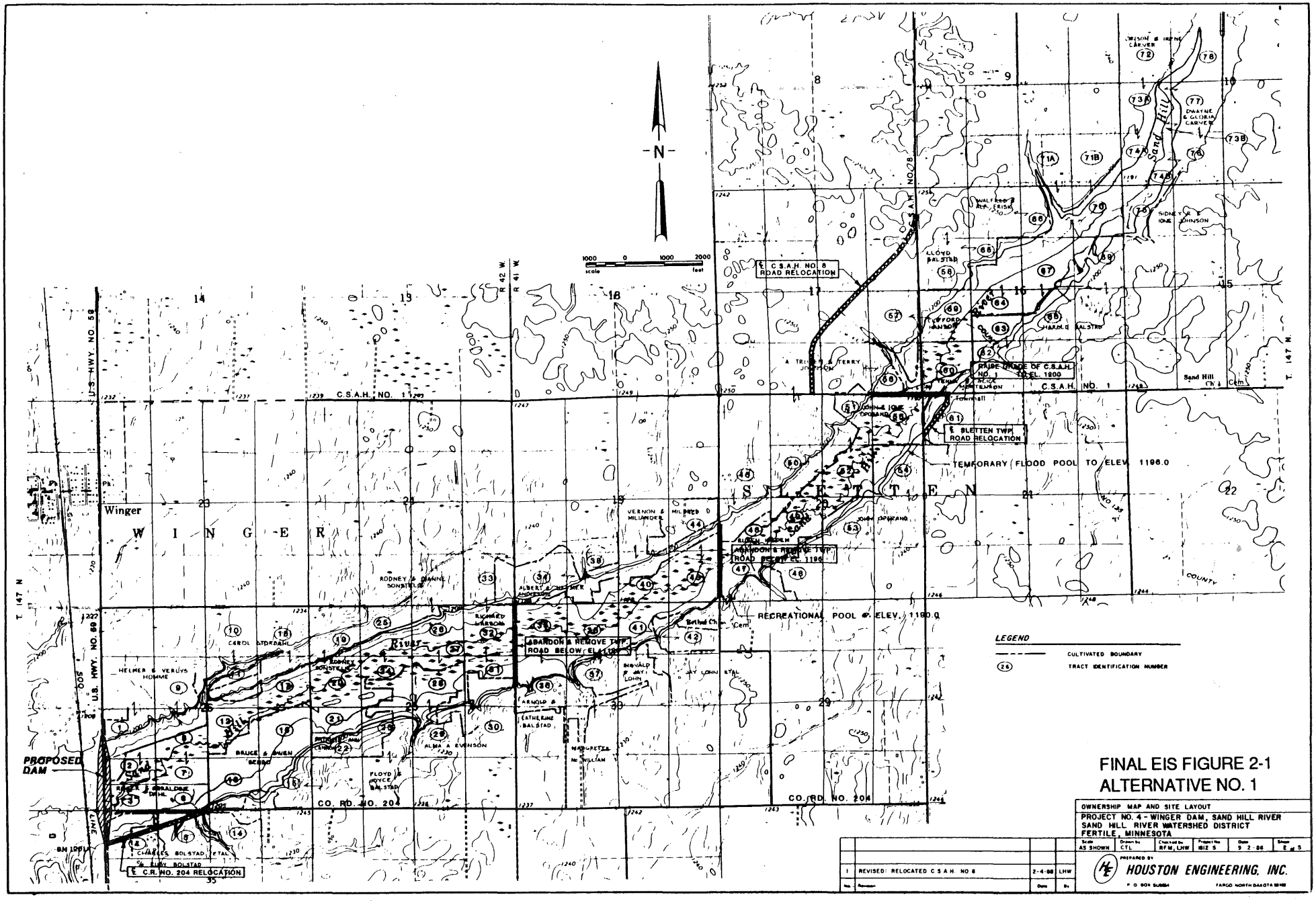
2.1.3 Proposed roadway relocations and modifications

The Polk County Highway Department has designed (as of 1985) Polk County State Aid Highway (CSAH) No. 8 for relocation to the west to avoid a proposed reservoir location at existing CSAH No. 8. The maps depicting the locations of the project proposal and the construction alternatives (Figures 1-4, 2-1, 2-2 and 2-3, respectively) have been revised with the new alignment, and are shown in this section as Final EIS Figures 2-1, 2-2, 2-3, and 2-4 respectively. Draft EIS section 1.9, which described road relocations, has been revised to reflect the realignment design of CSAH No. 8 as follows:

> Approximately 1/2 mile of Polk County Road No. 204 will be relocated to the south of its present location and rebuilt at an elevation equal to or above the temporary flood pool elevation (1196.0 M.S.L.). This work is located in Winger Township in the NW 1/4 of Section 35. Polk County State Aid Highway (CSAH) No. 1 will be raised to an elevation above the temporary flood pool of 1200.0 M.S.L. The work involves about 2,150 feet of CSAH No. 1 and is located at the corner in Sletten Township (T147N, R41W) common to Sections 16, 17, 20, and 21. CSAH No. 8 will be relocated to the west of its present location to generally the NE 1/4 of the NE 1/4 and the W 1/2 of the SE 1/4 of Section 17 in Sletten Township (T147N, R41W). This work involves relocating 6,088 feet of CSAH No. 8. Approximately 1.4 miles of Sletten Township Road in the NW 1/4 of Section 21 will be relocated to the east and built at an elevation equal to or above the temporary flood pool elevation of 1196.0 M.S.L. Approximately 2,200 feet of Sletten Township Road below elevation 1196.0 M.S.L. between Section 25 of Winger Township and Section 30 of Sletten Township will be abandoned and removed. Approximately 1,900 feet of Sletten Township Road below elevation 1190.0 M.S.L. between Sections 19 and 20 of Sletten Township will also be abandoned and removed. Part of the submerged roadbed in both locations may be retained, if needed, for fisheries enhancement.

2.2 UPDATED COST PROJECTIONS FOR ALTERNATIVE NO. 1

An updated project cost estimate for Alternative No. 1 submitted by the project proposers is shown in Table 2-1. Estimated future costs at the projected time of project construction (January 1, 1987 to December 31, 1989) were taken into consideration. A few unit prices were updated based on more recent data. The cost estimate was modified to include the current cost estimates for Polk County Road relocations, principal spillway access appurtenances, reservoir fencing, soils investigation and engineering, and issues related to water wells and septic systems. The project proposers are committed to the need for mitigation and aeration systems as shown by the inclusion of mitigation costs and aeration system costs within right-of-way costs.



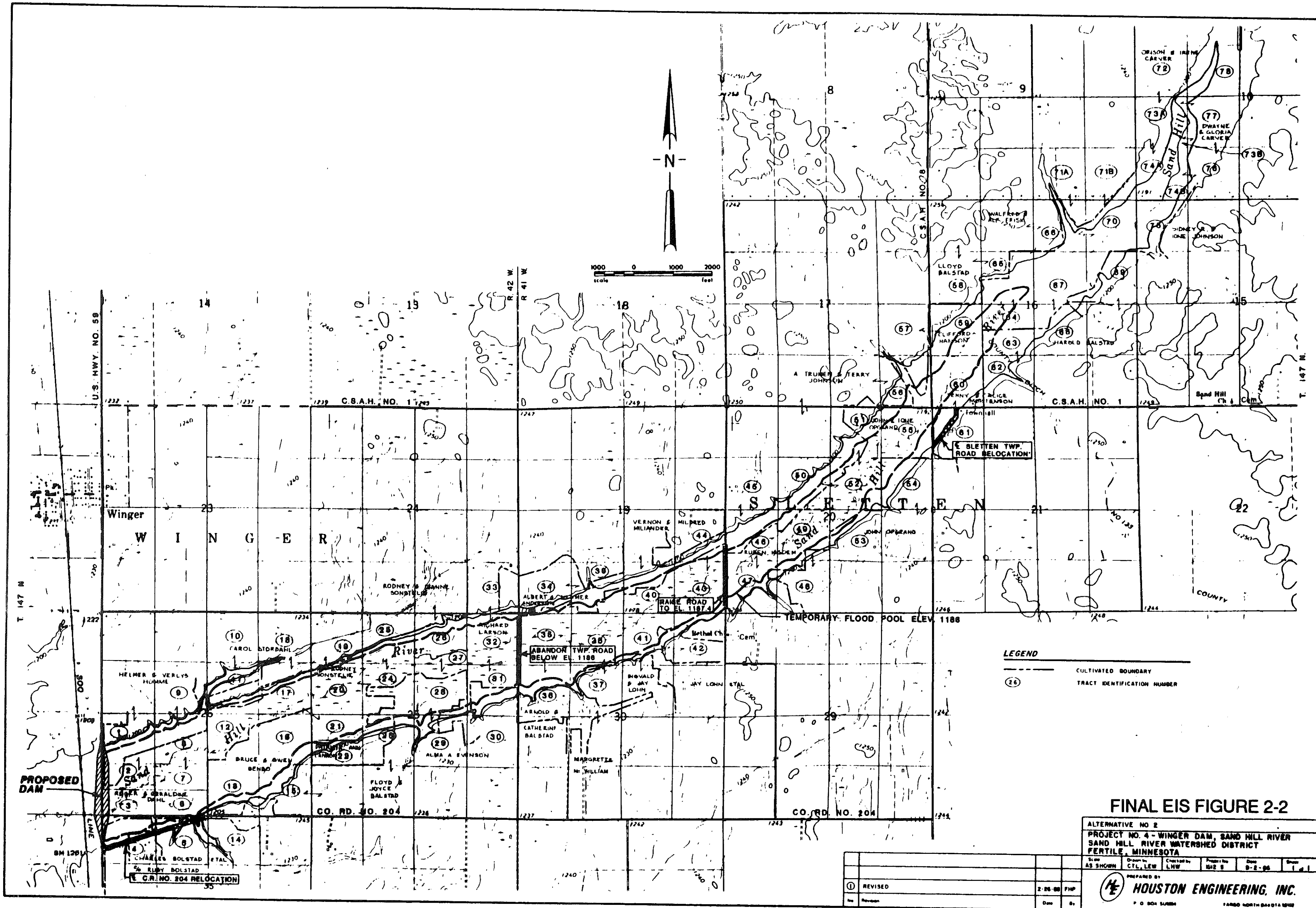
FINAL EIS FIGURE 2-1
ALTERNATIVE NO. 1

OWNERSHIP MAP AND SITE LAYOUT
PROJECT NO. 4 - WINGER DAM, SAND HILL RIVER
SAND HILL RIVER WATERSHED DISTRICT
FERTILE, MINNESOTA

Scale	Drawn by	Checked by	Project No.	Date	Sheet
AS SHOWN	CTL	RFM, LHW	1812.5	9-2-88	E of 5

No.	Revision	Date	By
1	REVISED: RELOCATED C.S.A.H. NO. 8	2-4-88	LHW

PREPARED BY
HOUSTON ENGINEERING, INC.
P.O. BOX 583564 FARGO, NORTH DAKOTA 58102

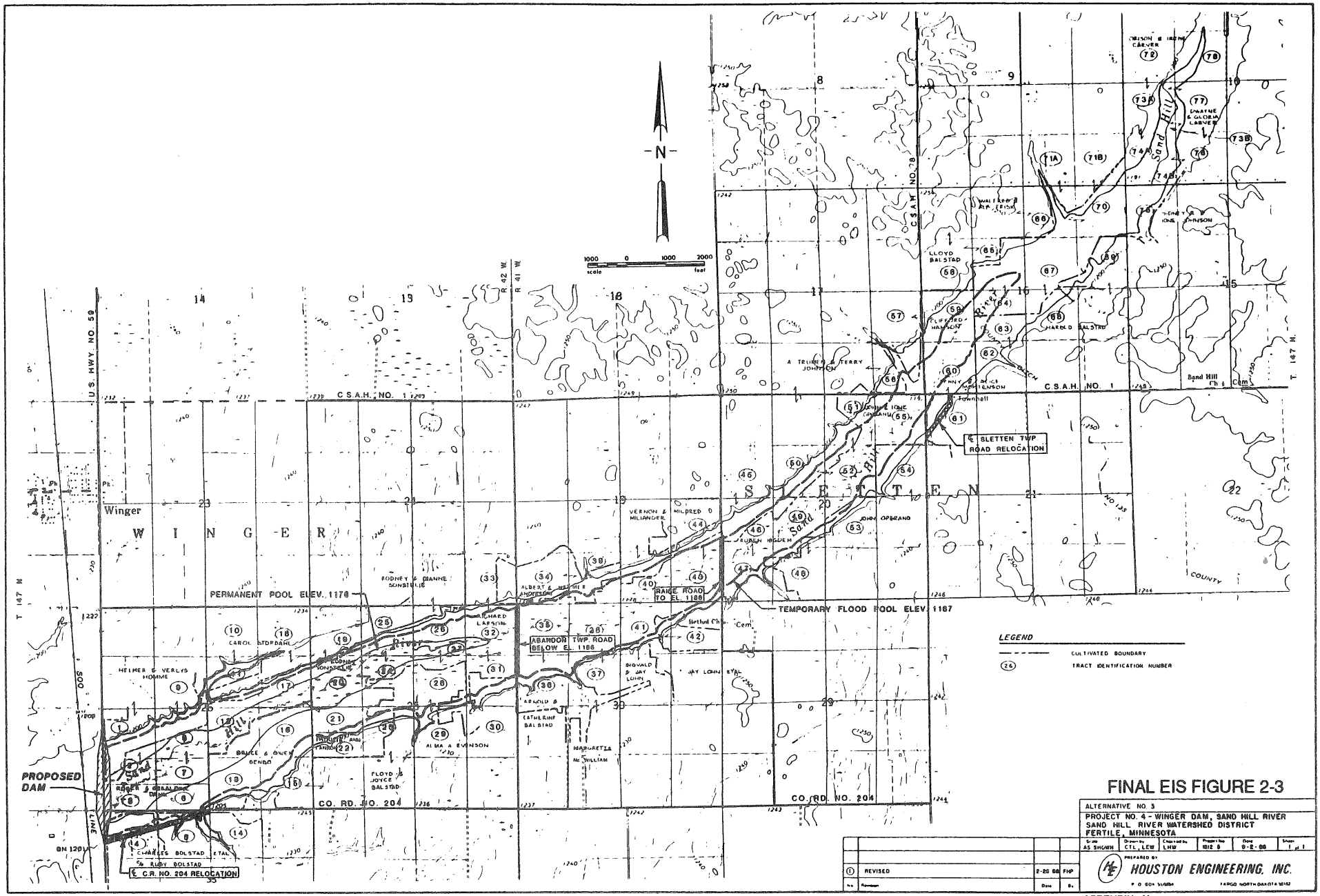


FINAL EIS FIGURE 2-2

ALTERNATIVE NO 2
PROJECT NO. 4 - WINGER DAM, SAND HILL RIVER
SAND HILL RIVER WATERSHED DISTRICT
FERTILE, MINNESOTA

PREPARED BY HOUSTON ENGINEERING, INC.

APPENDIX M



FINAL EIS FIGURE 2-3

ALTERNATIVE NO. 3
PROJECT NO. 4 - WINGER DAM, SAND HILL RIVER
SAND HILL RIVER WATERSHED DISTRICT
FERTILE, MINNESOTA

Scale	Drawn by	Checked by	Project No.	Date	Sheet
AS SHOWN	CTL, LEW	LHW	1812 B	9-2-88	1 of 1

No.	Revision	Date	By
1	REVISED	2-25 88	FHP

PREPARED BY
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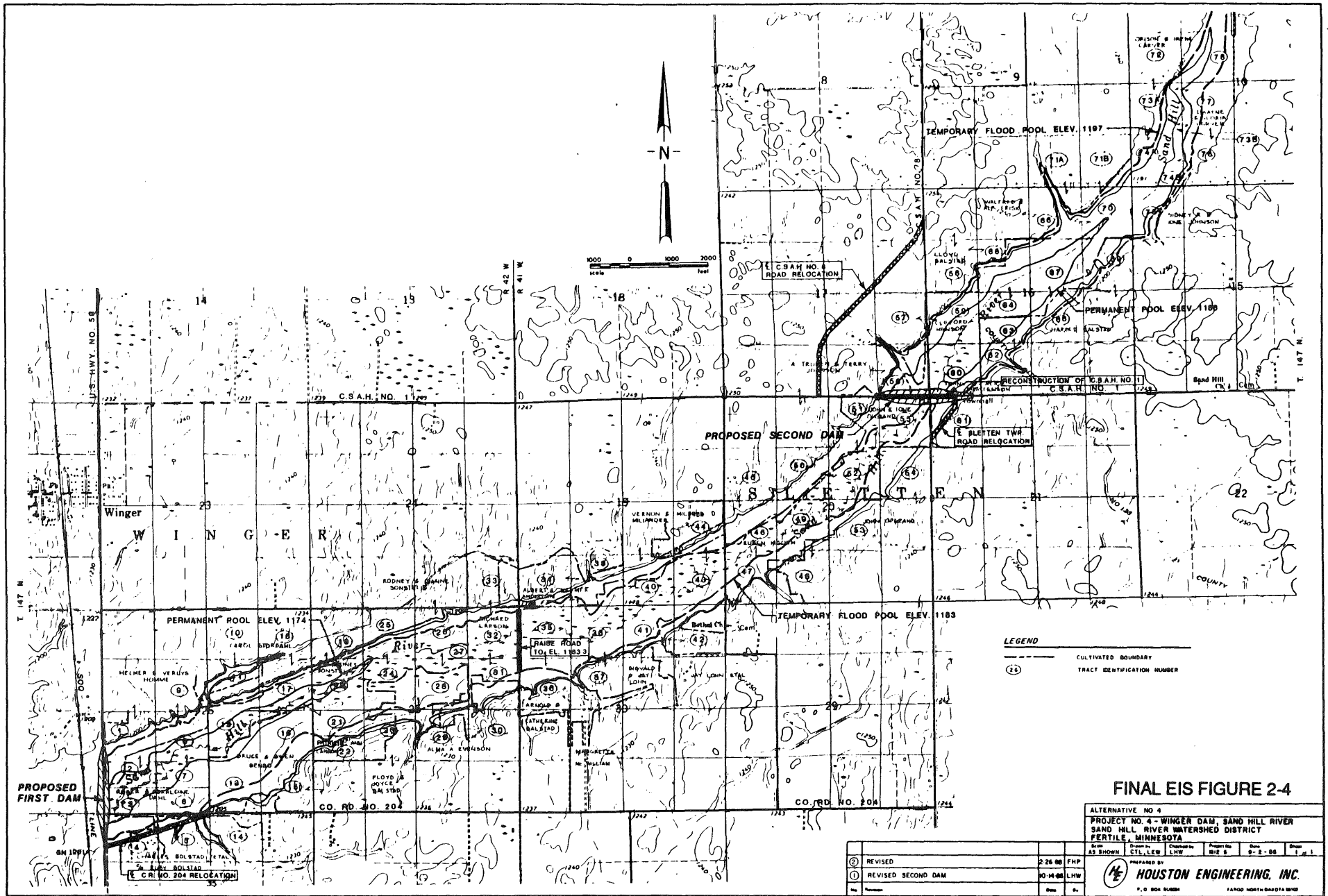


FINAL EIS FIGURE 2-4

2	REVISED	2-26-88	FHP
1	REVISED SECOND DAM	10-14-86	LHW
No.	Revision	Date	By

ALTERNATIVE NO. 4
PROJECT NO. 4 - WINGER DAM, SAND HILL RIVER
SAND HILL RIVER WATERSHED DISTRICT
FERTILE, MINNESOTA

Scale: AS SHOWN | Drawn by: CTL, LEW | Checked by: LHW | Project No.: 8112.0 | Date: 9-2-86 | Sheet: 1 of 1

PREPARED BY
HOUSTON ENGINEERING, INC.
P.O. BOX 81688 FARGO NORTH DAKOTA 58102

APPENDIX O

TABLE 2-1
SAND HILL RIVER WATERSHED DISTRICT
DETAILED ESTIMATE OF COSTS FOR ALTERNATIVE NO. 1
(AS OF JANUARY 1987 TO DECEMBER 1989)

	Item	Unit	Quantity	Unit Cost	Total Estimated Costs
A.	Relocations:				
	1. County State Aid Highway No. 1	l.s.	1	$400,000	$400,000
	2. County State Aid Highway No. 8	l.s.	1	330,000	330,000
	3. County Road No. 204	l.s.	1	100,000	100,000
	4. Sletten Twp. Road (Sec. 20/21)	l.s.	1	18,000	18,000
	Contingencies				85,000
	Total Relocations				$933,000
B.	Reservoir:				
	Remove Bridge	ea.	2	$5,000	$10,000
	Twp. Roads (Fish Habitat Structures)	ea.	2	-0-	-0-
	Clearing - Woodland	ac.	105	1,000	105,000
	Clearing - Wetland	ac.	325	300	97,500
	Clearing	ac.	1,900	10	19,000
	Recreational Enhancement	l.s.		50,000	50,000
	Contingencies				31,500
					$313,000

	Item	Unit	Quantity	Unit Cost	Total Estimated Costs
C.	Trunk Highway No.59:				
	Mobilization	l.s.	1	$30,000.00	$30,000
	Maint. & Restoration of Haul Roads	l.s.	1	30,000.00	30,000
	Clearing	ac.	1	1,000.00	1,000
	Grubbing	ac.	1	500.00	500
	Remove Pipe Culverts	l.f.	60	5.00	300
	Remove Concrete Pavement	s.y.	16,111	2.50	40,280
	Salvage Pipe Culverts	l.f.	301	10.00	3,010
	Excavation	c.y.	158,946	1.50	238,420
	Aggregate Shouldering	ton	9,236	4.50	41,560
	Bituminous Material for Mixture	ton	603	200.00	120,600
	Binder Course Mixture	ton	1,595	9.00	14,355
	Base Course Mixture	ton	9,475	9.00	85,275
	Shoulder Mixture	ton	1,748	9.00	15,730
	Temporary Lane Marking	Rd. Sta.	363	50.00	18,150
	Bituminous Material for Mixture	ton	96	200.00	19,200
	Wearing Course Mixture	ton	1,595	9.00	14,355
	Bit. Material for Tack Coat	gal.	2,513	1.10	2,765
	Remove Old Bridge	l.s.	1	10,000.00	10,000
	Traffic Barriers & Detour Signs	l.f.	3,200	3.50	11,200
	Twisted End Treatment	ea.	64	200.00	12,800
	36" C.S. Pipe Culvert	l.f.	162	50.00	8,100
	18" R.C. Pipe Culvert	l.f.	48	17.10	820
	36" C.S. Pipe Aprons	ea.	2	250.00	500
	18" R.C. Pipe Aprons	ea.	2	85.00	170
	18" C.S. Safety Apron	ea.	1	250.00	250
	Random Riprap Class II	c.y.	5	50.00	250
	Geotextile Fabric	s.y.	14	20.00	280
	Roadside Seeding	ac.	26	50.00	1,300
	Seed Mixture Special	lb.	1,040	0.85	885
	Sodding	s.y.	22,774	1.50	34,160
	Mulch Material Type I	ton	52	95.00	4,940
	Disc Anchoring	ac.	26	27.50	715
	Comm. Fertilizer Anal. 6-24-24	ton	5	220.00	1,100
	Hay or Straw Bales	ea.	50	10.00	500
	Contingencies				76,120
	Total Trunk Highway No. 59				$839,590

	Item	Unit	Quantity	Unit Cost	Total Estimated Costs
D.	Dam:				
	1. Mobilization	l.s.	1	$30,000.00	$ 30,000
	2. Earthwork Items:				
	Water Control	l.s.	1	35,000.00	35,000
	Excavation	c.y.	139,624	3.00	418,870
	Slurry Cut-Off	s.f.	80,000	2.00	160,000
	Embankment	c.y.	441,582	1.70	750,690
	Drain Fill	c.y.	40,212	6.00	241,270
	Total Earthwork Items:				$1,605,830
	3. Principal Spillway Components:				
	Structural Concrete	c.y.	925	225.00	208,125
	Reinforcing Steel	lb.	168,100	0.45	75,645
	Structural Steel	lb.	24,700	0.25	30,875
	Copper Water Stop	ft.	532	15.00	7,980
	48" Dia. RCP	ft.	70	110.00	7,700
	4' x 4' Gate w/Appurtenances	ea.	1	30,000.00	30,000
	22' x 6' Roller Gate w/Appurtenances	ea.	2	60,000.00	120,000
	Piling	l.s.	1	15,000.00	15,000
	Access Appurtenances	l.s.	1	5,000.00	5,000
	Total Principal Spillway Components:				$ 500,325
	4. Emergency Spillway Components:				
	Enkamat 7020	s.y.	2,367	10.00	23,670
	Sheet Piling	s.f.	1,560	15.00	23,400
	Sod	s.y.	2,367	1.50	3,550
	Total Emergency Spillway Components:				$ 50,620
	5. Riprap	c.y.	5,600	45.00	252,000
	6. Fencing	l.f.	1,500	15.00	22,500
	7. Seeding	l.s.	1	10,000.00	10,000
	Contingencies				321,815
	Total Dam				$2,793,090

Item	Unit	Quantity	Unit Cost	Total Estimated Costs
E. Summary:				
Relocations				$ 933,000.00*
Reservoir				313,000.00
Trunk Highway No. 59				839,590.00
Dam				2,793,090.00
Total Construction				$4,878,680.00
Utility Relocation				40,000.00
Soil Testing and Soil Engineering				137,280.00
Aerial Mapping				9,400.00
Engineering - Design and Inspection				300,000.00
Legal and Administrative				75,000.00
Right-of-Way (Includes Conformance to Minnesota Department of Health Regulations relative to Water Wells and Septic Systems, mitigation costs and aeration system costs)				900,000.00**
TOTAL COSTS				$6,340,360.00*
FUNDING SOURCES				
State of Minnesota Bonding				$2,500,000.00
Minnesota Department of Transportation				1,020,000.00
Lower Red River Watershed Management Board				962,360.00
Sand Hill River Watershed District				275,000.00
Polk County				913,000.00*
Local Right-of-Way Donations				600,000.00
Wild Rice Electric Co. (Power Line Relocation)				20,000.00
Winger and Sletten Townships (Work in Lieu of Cash)				50,000.00
TOTAL FUNDING SOURCES				$6,340,360.00

* Cost increase due to Polk County Engineer's updated cost estimate for road relocations. Sletten Township road relocation cost estimate updated by Houston Engineering. Funding is totally provided by Polk County and Sletten Township.

** Costs of an aeration unit are between $22,000 and $26,000. The District will solicit the cooperation of other state and local entities for installation and maintenance of an aeration system.

However, the project proposers have not increased the actual $900,000 amount for right-of-way from previous estimates submitted to the Department in 1986 when the determination of the need for an aeration system and for mitigation as components of direct proposed project implementation had not been established. The project proposers estimate costs to comply with Minnesota Health Department regulations related to the existing flowing well at $5,000, and estimate the cost related to an existing domestic water wells and septic systems of two impacted farmsteads at $500 for each system. The total estimated cost related to water well and septic systems is $7,000.

The project proposers estimate costs for reconstruction of T.H. 59 to require an adjustment for bituminous material unit cost due to lower anticipated petroleum prices. The unit cost of "clearing" was adjusted to be consistent with the estimated unit cost for reservoir clearing work. The Minnesota Department of Transportation (MNDOT) funding contributions, according to the project proposers, are based on the cost estimate for MNDOT's originally planned bridge and reconstruction design.

2.3 GROUNDWATER SITE LOCATIONS AND FLOW PATTERNS

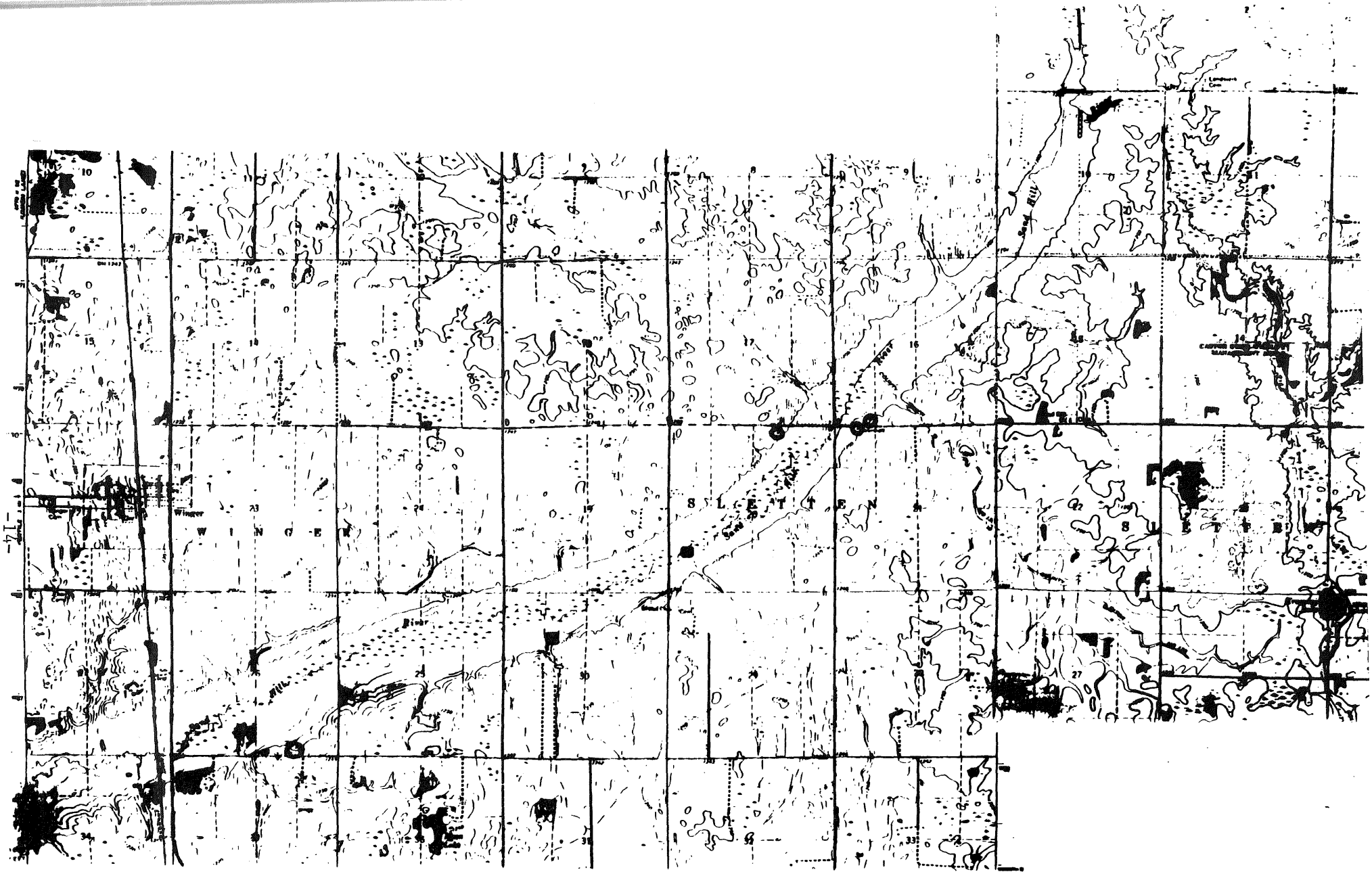
The Draft EIS Figure on page 1-20 entitled "Groundwater Site Location Map for Structures Affected by the Proposed Impoundment" was incorrectly labeled in the Draft EIS and is revised to be correctly labeled "Draft EIS Figure 1-9". Further, the map is revised to show the location of a flowing well in the SW 1/4 of the SW 1/4 of Section 20 of Sletten Township (T147N, R41W) and is reprinted in this section as Final EIS Figure 2-5.

2.4 GOVERNMENT APPROVALS

The list of permits, licenses and approvals required for the project proposed by the Sand Hill River Watershed District has been revised to reflect the addition of a DNR Aquatic Nuisance Control Permit due to the potential need to periodically harvest or remove vegetation along the periphery of the proposed reservoir.

The type of permit, license and approval required and the agency responsible for each action are revised are listed below:

LEVEL OF GOVERNMENT	TYPE OF APPLICATION
Federal	
U.S. Army Corps of Engineers	Sec. 404
State	
Minnesota Department of Health	Licensed well driller as required for well abandonment Compliance with rules for septic systems and wells



DOMESTIC WELLS OR SEPTIC SYSTEMS

FLOWING WELLS

FINAL EIS FIGURE 2-5 (DEIS FIGURE 1-9)
SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4 - THE WINGER DAM
GROUNDWATER SITE LOCATION MAP FOR STRUCTURES AFFECTED BY PROPOSED IMPOUNDMENT

Minnesota Department of Natural Resources	Protected Waters Permit (Dam construction) (work in Sand Hill River and wetlands) Establishment of public access Aeration permit Shoreland management Reclassification Flood Plain Management ordinance amendment approval Aquatic Nuisance Control Permit
Minnesota Department of Transportation (MNDOT)	Work within MNDOT Right-of-Way Cooperative agreement covering plan approval on the project MNDOT partial funding contribution for roadway improvements
Minnesota Pollution Control Agency (MPCA)	Sec. 401 Water Quality certification Compliance with Water Quality standards
State of Minnesota bonding	Partial project funding
Local	
Sand Hill River Watershed District	Partial project funding
Polk County	Road relocation Shoreland Management reclassification Flood Plain Management ordinance amendment
Winger and Sletten Townships	Partial project construction
Wild Rice Electric Co-op	Powerline relocation
Lower Red River Watershed Management Board	Partial project funding

2.5 REVISED INSTREAM FLOW SPECIFIC PLAN OF OPERATION

Draft EIS sections 3.5.2 (in part) and 3.5.3 which described the specific instream flow plan of operation and reservoir effects are reorganized and revised to more clearly outline the pattern and to specify the relationship between the outflow pattern and permitting requirements as follows:

Specific instream flow plan of operation

Historically, damage to human activities has weighed strongly on flood control decisions. Concomitant with elimination of flooding is the possible decline of the plant and animal communities which are dependent on inundation of their environment. Since riparian ecosystems are subjected at different times to a variety of hydrologic regimes, geomorphic processes and catastrophic forces, generalizations from broad geographic areas are sometimes difficult to apply to site situations and it is speculative what changes will occur. It is certain, however, that changing the small flood regimes will change the riparian character in a matter of time; this change will occur more quickly if the area becomes farmed in response to lower water levels on the floodplain.

The operation plan proposed would not be in conflict with the purposes of flood control in that only the one-year 10-day spring flood event is recommended to be released. The plan may be in conflict with the project alternatives to maintain the reservoir pool at 1190.0 M.S.L.

The Upper Mississippi River Basin Commission (1977) reported a major problem in the Sand Hill River subbasin in that streamflows in later summer, fall and winter are inadequate to assimilate wastes and meet minimum streamflow requirements for recreational and environmental uses. The size of the watershed above the project, the inadequate streamflows during high evaporation periods, and evaporation from the reservoir (evaporation exceeds inflow in the months of July to September) combine to create a depletion problem.

A preliminary HEC-1 analysis of incoming flow, based on median year hydrograph with evaporation, shows there will be depletions in the reservoir. This scenario is modeled from the operation plan in the Preliminary Engineer's Report and does not include the change identified and proposed in this section of the Final EIS. Based on the scenario described by the project sponsors, depletions will occur if existing conditions downstream are maintained (not augmented). Depletions will occur even if existing conditions downstream are not maintained. The proposed recreational reservoir design appears to be too optimistic for the size and inputs of the watershed.

An amendment to the operation and maintenance plan proposed by the project sponsors is necessary in order to maintain, as specified in the Preliminary Engineer's Report, existing downstream conditions as nearly as practicable to provide for downstream users and waste assimilation needs. The dam design may need modification to accommodate this change.

The following operation plan amendment attempts to replicate the natural occurrence of flow required to maintain riparian wetland communities downstream of the dam. Implementation of this amendment will provide the best chance for the wetland communities to be maintained given the understanding of the many complex relationships involved. The recommended plan of operation is:

From March 25 to June 15:

1) When the inflow (as measured at a gage at the stream inflow point in the reservoir) is less than 50 cfs, the minimum outflow will be 70% of the inflow or 1.7 cfs, whichever is greater. However, when the inflow, as measured at the stream inflow point to the reservoir, is less than 1.7 cfs, then the reservoir outflow will equal the inflow.
2) When the inflow is equal to or greater than 50 cfs but less than 165 cfs, the outflow will be 100% of the inflow.
3) When the inflow is equal to or greater than 165 cfs, the minimum outflow will be maintained at 165 cfs.

For periods from January 1 to March 24 and June 16 to December 31:

1) When the inflow, as measured at the stream inflow point to the reservior, is equal to or greater than 1.7 cfs, the minimum outflow will equal 30% of the inflow or 1.7 cfs, whichever is greater.
2) If the inflow, as measured at the stream inflow point to the reservoir, is less than 1.7 cfs, then the reservoir outflow will equal the inflow.

The specific operation of the dam and the exact methods to accomplish the identified plan of operation and the outflow pattern will be established during the DNR permitting process. The success of the operating plan will be monitored and modified by the DNR as warranted.

2.6 REVISED DESCRIPTION OF CONSTRUCTION METHOD CONTROL MEASURES

Draft EIS section 1.10 which described construction methods is expanded to include information on rerouting T.H. 59 traffic during construction as follows:

The proposed project will consist of an earth-fill dam with associated spillway works. The embankment is proposed to be a zone fill. The core of the embankment will be constructed of clay till select fill with compaction at maximum dry density and optimum moisture content. The outside zones of the embankment will be designated as random fill. The random fill zones will be constructed of a more free draining material than the core. Preliminary soil borings indicate that the upland areas adjacent to the dam site contain sufficient clay till of suitable quality for the core zone. Random fill may be obtained from existing roadway embankment and other required excavations adjacent to the dam site.

The project proposers have identified, based on commonly used construction practices, the following general sequence of construction:

(1) Remove old bridge and existing roadway embankment within the project area. Equipment utilized would include scrapers, dozers, backhoes, and draglines.
(2) Prepare embankment foundation and cut core trench using scrapers, dozers, backhoes, and draglines.

(3) Install impervious cutoff to clay till stratum. A slurry trench cutoff is presently being proposed for this purpose. The clay slurry would be installed using backhoes and draglines.

(4) Construct select and random fill sections of dam in lifts of approximately one foot. Scrapers, sheeps-foot compactors, and dozers would be utilized for this purpose.

(5) Construct principal spillway components in coordination with embankment components. This work consists of forming and placing reinforced concrete as required.

(6) At the same time as embankment and spillway construction, the river flow must continue to be passed through the work area. Although river control is normally left up to the contractor, the location of the principal spillway is such that the existing T.H. 59 bridge could be used until the principal spillway is completed. At that time, the river could be rerouted through the principal spillway and the bridge removed.

(7) After completion of the embankment and spillway facilities, the embankment side slopes will be seeded and the T.H. 59 roadway surface constructed.

(8) Prior to gate closure, all required upstream road relocations, abandonments, or raisings must be completed.

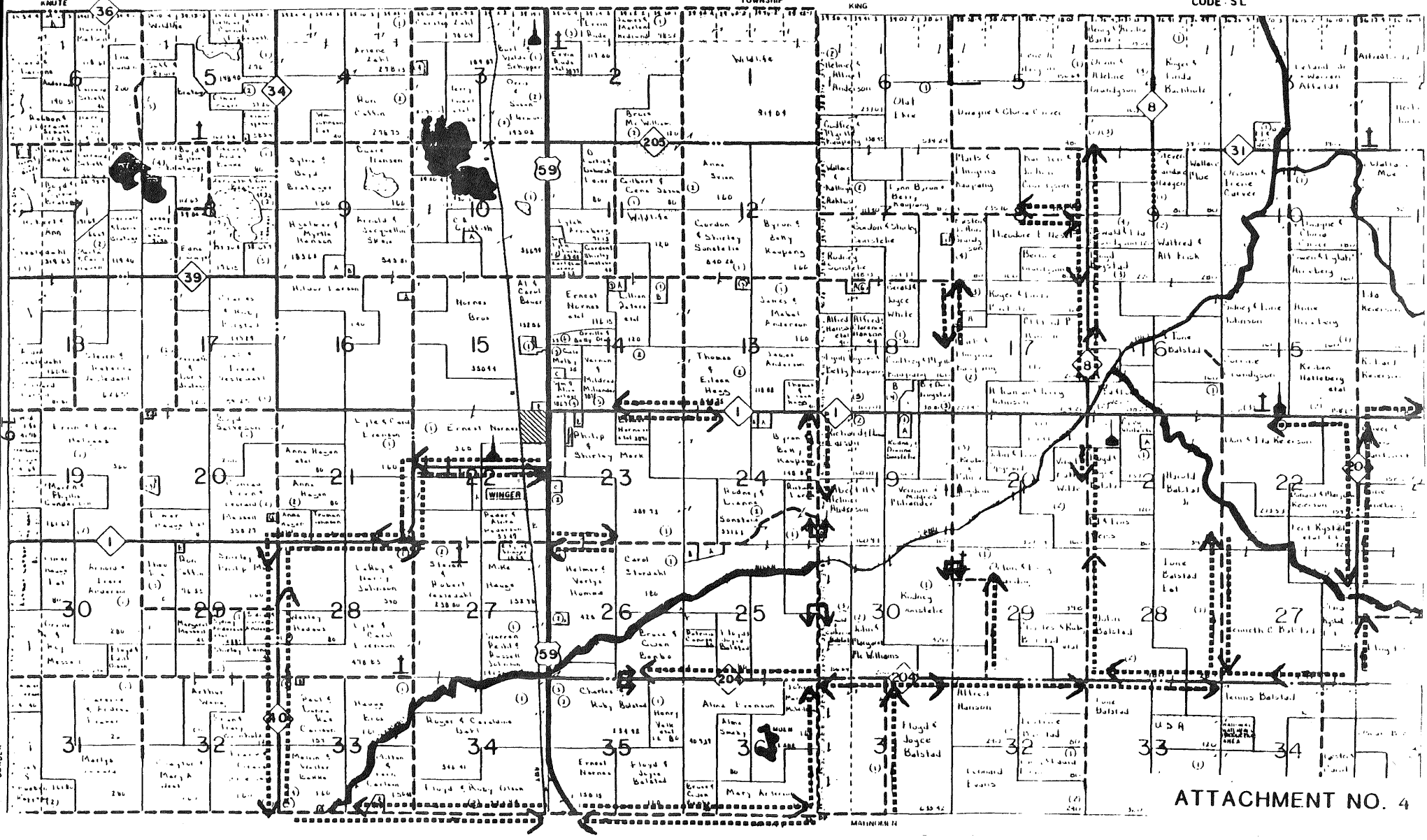
(9) Upon completion of all project features, the dam would be closed by closing the 4' x 4' low sluice gate and the permanent pool would be formed.

Rerouting of T.H. 59 traffic will follow procedures established by MNDOT for the proposed bridge replacement at the T.H. 59 and Sand Hill River location. While the duration of rerouting could be substantially longer.(than would occur for T.H. 59 bridge reconstruction) due to longer construction for a proposed reservoir, the procedures and traffic flow route are intended to be similar. The proposal of the Sand Hill River Watershed District is to complete major portions of any proposed construction in one construction season to minimize the need for lengthy traffic detours. The local traffic rerouting plan, schedule and route map, as developed by the project proposers is shown in Final EIS Figure 2-6. Both interstate and intrastate traffic are proposed to be rerouted east and west from Mahnomen for northbound traffic, and east and west from Erskine for southbound traffic. These proposed traffic rerouting plans will be both a component of the required cooperative agreement with MNDOT for the proposed project, and a requirement of the documentation prepared on construction specifications.

2.7 REVISED DESCRIPTION OF ALTERNATIVE NO. 5 - NO BUILD

Draft EIS section 2.6 which described Alternative No. 5 (no-build) is expanded as follows to include a discussion and description of MNDOT planned T.H. 59 roadway and bridge improvements in the area that would occur if the proposal of the project proposers is not constructed:

Alternative No. 5 proposes no Class I high hazard dam development on the site. Existing land use character and specific uses would be maintained essentially as described in Nature of the Environmental Setting (Draft EIS section 1.11).



FINAL EIS FIGURE 2-6

SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4 - THE WINGER DAM

PROPOSED PROJECT CONSTRUCTION TRAFFIC REROUTING PLANS

With the no-build alternative, Minnesota Department of Transportation roadway and bridge improvements to T.H.59, planned prior to the proposal for construction of a Class I dam at the Sand Hill River, would be implemented. Under the no-build alternative, present deficiencies in roadway approaches and in the bridge over the Sand Hill River would be eliminated and these facilities would be brought up to current MNDOT standards.

The present bridge would be replaced by a new structure. The new centerline grade on the bridge would be approximately seven feet above the existing bridge. The bridge would be a concrete beam span structure 110 feet long. The horizontal alignment of the approach roadway would be the same as the present alignment, however the pavement width would be widened to 24 feet with eight-foot shoulders to be consistent with the remainder of the rural T.H. 59 roadway. All improvements would be designed to a 60-mile per hour non-striping sight distance standard. Total length of the bridge and approach roads would be 1.4 miles.

2.8 REVISED CONSTRUCTION ASSOCIATED IMPACTS

Draft EIS section 3.1, which discussed construction associated impacts is expanded as follows to include a discussion and description of impacts to persons traveling T.H. 59 and impacts resulting from the relocation of county roads:

The impacts of the construction process on the surrounding environment are unavoidable. However, they can be mitigated within the plans and specifications. Detailed specifications for the control of temporary air and water pollution, soil erosion, and siltation will be included as part of the construction contract. Under the proposed specifications, the contractor must supply to the engineer a schedule to accomplish both temporary and permanent erosion control work and the methods of operation. No work shall be started until approved by the engineer. The engineer also has authority to limit the area of erodible material exposed during construction and to direct the contractor to provide immediate measures to minimize erosion. The contractor will be required to incorporate all permanent erosion control features at the earliest practicable time.

Construction of the proposed project is planned to occur over two construction seasons. The Department of Transportation is concerned with the amount of time the proposed project could result in the closing of T.H. 59 and the necessity for a detour of that major arterial. The project proposers have indicated that certain elements of the project could be completed in each construction season to minimize the impacts of road closings. The exact closing date and duration for both T.H. 59 and the other road relocations discussed in Draft EIS section 1.9 have as yet not been conclusively determined.

Impacts on the area population resulting from the proposed construction of Alternative No. 1 are expected by the project proposers to be similar to those that would have been experienced during MNDOT's planned replacement of the T.H. 59 bridge crossing of the Sand Hill River. Construction of the proposed embankment dam and associated road relocation would however occur over a longer time period, and therefore the impacts would be of a longer duration.

Proposed construction scheduling may permit road relocations to occur either prior to closing of T.H. 59 or after completion of the dam structure and the reopening of T.H. 59. Installation and maintenance of detour route signs and traffic devices will be required as components of the construction specifications. The project proposers estimate only minor impacts to result from slightly longer travel times associated with detour routes. Maintenance of safe detour routes suitable for emergency and commercial vehicle travel will be incorporated into any cooperative agreement with MNDOT.

Specific county road relocation and abandonment will be handled by the Polk County Highway Department and traffic flow control on county roads will be coordinated under the county's authority. Proposed construction scheduling for the proposed dam and road relocations will be coordinated between the Sand Hill River Watershed District and Polk County to minimize or prevent simultaneous road closures.

2.9 DAM AND DAM ROADWAY OPERATION AND MAINTENANCE RESPONSIBILITIES

The discussion of dam safety environmental impacts in the Draft EIS (section 3.2.8) is revised and expanded as follows to clarify the extent of responsibilities between the project proposers and the Minnesota Department of Transportation related to the reconstruction of the proposed roadway in the event of roadway surface deterioration:

Operation and Maintenance of the Dam

An operation and maintenance plan for the dam must be documented and submitted to the DNR for approval before the dam is placed in operation. The plan shall describe all operational features and procedures for the dam. Operation during periods of normal flow, as well as during floods and droughts, needs to be described. Provisions for maintaining adequate streamflow through the dam at all times shall be part of the plan. The operation and maintenance plan is needed for the proper and safe operation of the dam and to ensure that the multipurpose intended benefits are realized.

The preliminary engineering report describes the proposed operation of the dam to be that normal pool elevation would be 1190.0 M.S.L. (10 feet below the roadway crest). During the 100-year flood event, the pool would not exceed elevation 1196.0 M.S.L. and all discharge would be through the principal spillway. An 1,420 feet long depressed highway section would be used to provide additional discharge capacity for floods larger than the 100-year event. A 48-inch diameter conduit will serve as a low discharge pipe to pass normal base flows without excessive pool fluctuations. This conduit will remove water from the bottom of the reservoir and will also serve as a draw down device, should it become necessary to totally drawdown the reservoir.

The Sand Hill River Watershed District will be responsible for the operation and maintenance of the dam. According to the project sponsors, if the proposed project is constructed, a maintenance and repair agreement will have to be executed between the Sand Hill River Watershed District and MNDOT. The project proposers anticipate that such an agreement would provide for costs associated with normal maintenance and repair of the roadway due to normal

wear and tear to be a responsibility of MNDOT. However, costs incurred for repair of the roadway, embankment, and structural components due to a flood or to normal reservoir regulation and operation (including damage due to overtopping of the roadway by a flood of large magnitude) would be a responsibility of the Sand Hill River Watershed District.

2.10 RECREATIONAL OPPORTUNITIES AND IMPACTS

Examination of a wide area surrounding the vicinity of the proposed project area reveals a variety of existing recreational and fishery resources. Table 2-2 lists 512 recreational resources sites within an 11-county vicinity (50-mile radius) of T.H.59 and the Sand Hill River. The distance was selected in order to standardize the data on current resources availability with the activity occasion analysis presented in this section. The information in Table 2-2 shows, on a county-by-county basis, public recreation facilities administered by federal, state, regional or local government units. The name of the facility, the administering agency, the acreage, and the location by township and range are shown. The types of facilities include public access sites, recreational trails, wildlife refuges, wildlife management areas, waterfowl production areas, forests, parks, beaches, campgrounds and campsites, scientific and natural areas, bike trails, athletic fields, landings, rest areas, picnic grounds, golf courses, and historical sites. The total number of sites in each county is identified at the conclusion of the section of the list for each county. Final EIS Figure 2-7 graphically illustrates the geographic area for the data and identifies the total number of recreational resources in each county.

The current availability of fishing resources, by county, for counties within a 50-mile radius of T.H. 59 and the Sand Hill River is shown in Table 2-3. This table lists the DNR fisheries survey information according to ecological lake classification and lake management classification. A lake which has been surveyed is indicative of a demonstrated fishing potential. The ecological lake classification refers to the description of the lake without management efforts while the lake management classification refers to the description of the lake with management efforts. The table lists the name of the lake, the relevant ecological and management classifications, and the acreage. No data is presented for counties within the 50-mile radius for which no survey information exists. The total number of lakes surveyed for each county is provided and these county totals are depicted graphically in Final EIS Figure 2-8.

According to the Sand Hill River Watershed District, one purpose of the reservoir proposed by the project proposers is to provide recreational opportunities. However, the exact nature, extent, benefits, and costs of such opportunities have not been provided. To estimate the potential recreational aspects of the project proposal, the DNR examined the existing use of lakes in Greater Minnesota to develop a measure of potential recreational use which could be supported if Alternative No. 1 were constructed.

The DNR estimates that a reservoir proposed by the Sand Hill River Watershed District could support between 65,000 and 165,000 hours of recreation per year. The lower end of the range assumes average Greater Minnesota lakeshore development, and the upper end of the range assumes maximum allowable development. On the basis of applying existing Greater Minnesota lake use to potential recreational use which could be supported by an Alternative No. 1 scenario, the demand for fishing would range from 40,000 hours per year to 105,000 hours per year and the remainder of

* WINGER RECREATIONAL STUDY * Facilities in 11-County NW MN Study Area MN DNR - RECFAC Data Base Printed 10/06/1988

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Becker Co.	BLACKBIRD LAKE PUB ACC	USFWS (NAT WILD REF)	.50	140	39W	01/31/86	032021	
Becker Co.	BLACKBIRD/RICE CHANNEL A	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032022	
Becker Co.	BOOTH LAKE TRAIL	USFWS (NAT WILD REF)	.00	140	39W	09/22/86	032010	
Becker Co.	CARMAN LAKE PUBLIC ACC	USFWS (NAT WILD REF)	.00	141	39W	01/31/86	032020	
Becker Co.	HEIGHT OF LAND LK PA (N)	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032019	
Becker Co.	MUD LAKE PUBLIC ACCESS	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032018	
Becker Co.	OLD INDIAN TRAIL	USFWS (NAT WILD REF)	3.00	140	39W	09/22/86	032006	
Becker Co.	PINE LAKE PUBLIC ACCESS	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032013	
Becker Co.	PINE LAKE TRAIL	USFWS (NAT WILD REF)	5.80	140	39W	08/15/88	032004	
Becker Co.	RICE LAKE PUBLIC ACC-SW	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032014	
Becker Co.	RICE LAKE PUBLIC ACCESS	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032017	
Becker Co.	TAMARAC LK -DIKE PUB ACC	USFWS (NAT WILD REF)	5.00	140	40W	01/31/86	032015	
Becker Co.	TAMARAC LK -HORSTAD P.A.	USFWS (NAT WILD REF)	1.00	140	40W	01/31/86	032016	
Becker Co.	TAMARAC LK PUB ACC EAST	USFWS (NAT WILD REF)	.00	140	39W	01/31/86	032011	
Becker Co.	TAMARAC LK SUGARBUSH PA	USFWS (NAT WILD REF)	1.00	140	40W	01/31/86	031002	
Becker Co.	TAMARAC NAT WILDLIFE REF	USFWS (NAT WILD REF)	42,382.00	139	39W	03/01/72	032005	
Becker Co.	TAMARAC NAT WILDLIFE REF	USFWS (NAT WILD REF)	.00	139	40W	03/01/72	031001	
Becker Co.	TAMARAC SKI TRAIL	USFWS (NAT WILD REF)	.00	140	39W	09/22/86	032008	
Becker Co.	WABOOSE LAKE PUBLIC ACC	USFWS (NAT WILD REF)	2.00	141	39W	01/31/86	032007	
Becker Co.	WINTER (LOST) LAKE P A	USFWS (NAT WILD REF)	1.00	141	39W	01/31/86	032012	
Becker Co.	SUMMARY BECKER CO. WPA'S	USFWS (WAT PRO AREA)	.00	139	39W	08/01/79	032003	
Becker Co.	SUMMARY BECKER CO. WPA'S	USFWS (WAT PRO AREA)	5,733.00	139	40W	03/01/72	031005	
Becker Co.	CEDAR LK PUBLIC ACCESS	DNR FORESTRY DIVIS'N	3.00	141	36W	01/31/86	032034	
Becker Co.	HUNGRY MEN LK CPGD/ACC.	DNR FORESTRY DIVIS'N	3.00	141	36W	01/31/86	032032	
Becker Co.	NORTH SMOKY HILLS TRAIL	DNR FORESTRY DIVIS'N	.00	140	37W	08/15/88	032027	
Becker Co.	SMOKEY HILLS ST. FOREST	DNR FORESTRY DIVIS'N	13,850.00	140	37W	02/20/85	032025	
Becker Co.	TWO INLETS STATE FOREST	DNR FORESTRY DIVIS'N	14,429.28	141	36W	02/20/85	032029	
Becker Co.	TWO INLETS TRAIL	DNR FORESTRY DIVIS'N	.00	141	36W	08/15/88	032030	
Becker Co.	WHITE EARTH STATE FOREST	DNR FORESTRY DIVIS'N	7,224.00	142	37W	02/20/85	032036	
Becker Co.	WHITE EARTH TRAIL	DNR FORESTRY DIVIS'N	.00	142	38W	08/15/88	032038	
Becker Co.	ATLANTA WMA W 153	DNR FISH & WILDLIFE	178.80	141	43W	10/01/81	031015	
Becker Co.	AUDUBON WMA W 135	DNR FISH & WILDLIFE	29.20	140	42W	10/01/81	031017	
Becker Co.	CALLAWAY WMA W 569	DNR FISH & WILDLIFE	321.50	141	41W	10/01/81	031019	
Becker Co.	COBURN WMA W 56	DNR FISH & WILDLIFE	241.80	142	42W	10/01/81	031021	
Becker Co.	CUBA WMA W 323	DNR FISH & WILDLIFE	88.20	140	43W	10/05/83	031023	
Becker Co.	FRANK WMA W 688	DNR FISH & WILDLIFE	338.45	139	41W	10/05/83	031025	
Becker Co.	GREENWATER LAKE SNA	DNR FISH & WILDLIFE	.00	0	00	02/01/86	032052	(location unk)
Becker Co.	HUBBEL POND WMA W1276	DNR FISH & WILDLIFE	.00	139	39W	10/01/81	032040	
Becker Co.	HUBBEL POND WMA W1276	DNR FISH & WILDLIFE	3,041.69	139	40W	09/20/84	031010	
Becker Co.	LINBOM WMA W 705	DNR FISH & WILDLIFE	.00	140	37W	10/01/81	032047	
Becker Co.	LUNDE WMA W 19	DNR FISH & WILDLIFE	50.87	139	43W	10/01/81	031027	
Becker Co.	MELBYE WMA W 89	DNR FISH & WILDLIFE	60.60	141	43W	10/01/81	031029	
Becker Co.	MOCCASIN WMA W 345	DNR FISH & WILDLIFE	.00	142	43W	10/01/81	031030	
Becker Co.	OGEMA SPRINGS WMA W 134	DNR FISH & WILDLIFE	183.50	141	41W	10/05/83	031031	
Becker Co.	PEDNOR WMA W 136	DNR FISH & WILDLIFE	242.80	141	42W	10/01/81	031035	
Becker Co.	PICKEREL WMA W 74	DNR FISH & WILDLIFE	320.00	139	40W	10/01/81	031037	
Becker Co.	RICHWOOD WMA W 233	DNR FISH & WILDLIFE	0	140	41W	10/01/81	031039	
Becker Co.	RIPARIA WMA W 620	DNR FISH & WILDLIFE	0	141	42W	10/01/81	031041	
Becker Co.	SHELLY ISLAND WMA W1229	DNR FISH & WILDLIFE	107.80	139	40W	08/30/84	032045	
Becker Co.	SPRING CREEK WMA W 16	DNR FISH & WILDLIFE	764.00	142	42W	10/01/81	031043	
Becker Co.	TEIKEN-DALVE WMA W 142	DNR FISH & WILDLIFE	72.40	142	41W	02/03/84	031045	
Becker Co.	WHITE EARTH WMA W 555	DNR FISH & WILDLIFE	41.00	142	41W	10/01/81	031047	
Becker Co.	BIG FLOYD LK P A (UNDEV)	DNR T & W - ACCESS	1.80	139	41W	01/25/88	031075	
Becker Co.	BOOT LAKE PUBLIC ACCESS	DNR T & W - ACCESS	1.50	142	36W	01/25/88	032059	
Becker Co.	BUFFALO LK PUBLIC ACCESS	DNR T & W - ACCESS	.90	140	40W	01/25/88	031057	
Becker Co.	COTTON LK. PUBLIC ACCESS	DNR T & W - ACCESS	3.00	140	40W	01/25/88	031063	
Becker Co.	HANSON LK PUBLIC ACCESS	DNR T & W - ACCESS	5.00	139	39W	01/25/88	032071	
Becker Co.	HEIGHT OF LAND LK PUB AC	DNR T & W - ACCESS	1.10	139	39W	01/25/88	032058	
Becker Co.	HOWE LAKE PUBLIC ACCESS	DNR T & W - ACCESS	2.00	139	40W	01/25/88	031061	
Becker Co.	ISLAND LK PUBLIC ACCESS	DNR T & W - ACCESS	5.50	140	38W	01/25/88	032063	
Becker Co.	LITTLE BEMIDJI LK ACCESS	DNR T & W - ACCESS	10.00	142	39W	01/25/88	032073	
Becker Co.	LITTLE CORMORANT LK P A	DNR T & W - ACCESS	.80	139	42W	01/25/88	031081	
Becker Co.	LITTLE FLOYD LK PUB ACC.	DNR T & W - ACCESS	3.00	139	41W	01/25/88	031073	
Becker Co.	LITTLE SUGAR BUSH LK ACC	DNR T & W - ACCESS	1.40	141	40W	01/25/88	031065	
Becker Co.	LITTLE TOAD LAKE PUB ACC	DNR T & W - ACCESS	.50	139	39W	01/25/88	032067	
Becker Co.	MANY POINT LK PUB ACCESS	DNR T & W - ACCESS	12.80	142	39W	01/25/88	032066	
Becker Co.	MARSHALL LAKE PUB ACCESS	DNR T & W - ACCESS	2.50	139	42W	01/25/88	031083	
Becker Co.	PICKEREL LAKE PUB ACCESS	DNR T & W - ACCESS	.10	139	40W	01/25/88	031055	
Becker Co.	ROCK LAKE PUBLIC ACCESS	DNR T & W - ACCESS	.80	140	40W	01/25/88	031058	
Becker Co.	ROUND LAKE PUBLIC ACCESS	DNR T & W - ACCESS	7.70	141	38W	01/25/88	032064	
Becker Co.	SHELL LAKE PUBLIC ACCESS	DNR T & W - ACCESS	2.10	140	38W	01/25/88	032062	
Becker Co.	STRAWBERRY LK PUB ACCESS	DNR T & W - ACCESS	1.50	141	40W	01/25/88	031059	
Becker Co.	TWO INLETS LK PUB ACCESS	DNR T & W - ACCESS	.60	141	36W	01/25/88	032057	
Becker Co.	ITASCA STATE PK (BECKER)	DNR PARKS & REC DIV.	.00	142	36W	08/16/88	032080	
Becker Co.	BAD MEDICINE LK-NRTH PA	MINN DEPT TRANSPORT.	.00	142	37W	07/01/81	032086	
Becker Co.	BAD MEDICINE LK.R.A. 113	MINN DEPT TRANSPORT.	3.00	142	37W	04/01/75	032085	
Becker Co.	DETROIT LK PA NORTHEAST	MINN DEPT TRANSPORT.	3.00	139	41W	01/31/86	031105	
Becker Co.	DETROIT LK REST AREA 10	MINN DEPT TRANSPORT.	3.00	139	41W	04/01/75	031104	
Becker Co.	PINE GROVE REST AREA 34	MINN DEPT TRANSPORT.	1.80	140	37W	04/01/75	032087	

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Becker Co.	BAD MEDICINE LK-EAST PA	COUNTY PARKS DEPT.	.00	142	37w	01/31/86	032096	
Becker Co.	BASS LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	140	38w	01/31/86	032101	
Becker Co.	BASS LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	142	37w	01/31/86	032097	
Becker Co.	BASS LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	142	40w	01/31/86	031139	
Becker Co.	BIG BASSWOOD LK PUB ACC	COUNTY PARKS DEPT.	.00	142	37w	01/31/86	032099	
Becker Co.	BIG RUSH LAKE PUBLIC ACC	COUNTY PARKS DEPT.	.00	141	37w	01/31/86	032111	
Becker Co.	BIG SUGAR BUSH LK PUB AC	COUNTY PARKS DEPT.	.00	141	40w	01/31/86	031143	
Becker Co.	CHERRY LAKE PA (UNDEV)	COUNTY PARKS DEPT.	.00	142	40w	01/31/86	031112	
Becker Co.	DETROIT MOUNTAIN TRAIL	COUNTY PARKS DEPT.	.00	0	00	08/15/88	031131	(location unk)
Becker Co.	DUNTON LOCKS COUNTY PARK	COUNTY PARKS DEPT.	36.00	0	00	04/01/79	031125	(location unk)
Becker Co.	ELBOW LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	142	38w	01/31/86	032091	
Becker Co.	FOREST RIDER TRAIL	COUNTY PARKS DEPT.	.00	141	36w	08/15/88	032090	
Becker Co.	HEIGHT OF LAND LK PA (E)	COUNTY PARKS DEPT.	.00	140	39w	01/31/86	032108	
Becker Co.	JUGGLER LK PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	142	38w	01/31/86	032095	
Becker Co.	LITTLE BASS LAKE PUB ACC	COUNTY PARKS DEPT.	.00	142	40w	01/31/86	031141	
Becker Co.	MAHNOMEN COUNTY TRAIL	COUNTY PARKS DEPT.	.00	142	38w	08/17/88	032037	
Becker Co.	NETT LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	142	40w	01/31/86	031137	
Becker Co.	PERCH LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.00	139	40w	01/31/86	031147	
Becker Co.	PICKERAL LAKE ACCESS	COUNTY PARKS DEPT.	.00	143	38w	01/21/86	032093	
Becker Co.	ST. CLAIR LAKE PUB ACC	COUNTY PARKS DEPT.	.00	141	41w	01/31/86	031145	
Becker Co.	WHITE EARTH LAKE PUB ACC	COUNTY PARKS DEPT.	.00	142	40w	01/31/86	031135	
Becker Co.	WINTER WONDERLAND TRAIL	COUNTY PARKS DEPT.	.00	142	38w	08/15/88	032110	
Becker Co.	DET. LAKES LEGION BEACH	CITY PARKS DEPARTMNT	2.00	139	41w	01/01/76	031167	
Becker Co.	DETROIT LAKE PA (NORTH)	CITY PARKS DEPARTMNT	.00	139	41w	01/31/86	031177	
Becker Co.	DETROIT LAKE PUB ACC-NW	CITY PARKS DEPARTMNT	.00	139	41w	01/31/86	031178	
Becker Co.	DETROIT LAKES CITY BEACH	CITY PARKS DEPARTMNT	5.00	139	41w	01/01/76	031165	
Becker Co.	DETROIT LAKES CITY PARK	CITY PARKS DEPARTMNT	11.00	139	41w	01/01/76	031164	
Becker Co.	LAKE PARK VILLAGE PARK	CITY PARKS DEPARTMNT	.00	0	00	04/01/79	031180	(location unk)
Becker Co.	LONG LAKE CITY PARK	CITY PARKS DEPARTMNT	5.00	139	41w	01/01/76	031170	
Becker Co.	OGEMA CITY PARK	CITY PARKS DEPARTMNT	1.00	142	41w	01/01/76	031155	
Becker Co.	ROSSMAN CITY PARK	CITY PARKS DEPARTMNT	3.50	139	41w	01/01/76	031168	
Becker Co.	TILDE LAKE PUBLIC ACCESS	CITY PARKS DEPARTMNT	1.20	141	43w	01/31/86	031160	
Becker Co.	KANE LAKE PUBLIC ACCESS	TOWNSHIP PARKS DEPT.	2.00	142	36w	01/31/86	032114	

Number of Sites in County - 112

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Beltrami Co.	BEMIDJI-ITASCA TRAIL	DNR FORESTRY DIVIS'N	.00	146	34w	08/15/88	041048	
Beltrami Co.	MISS. HEADWATERS ST.FOR.	DNR FORESTRY DIVIS'N	6,343.00	146	34w	02/20/85	041040	
Beltrami Co.	ROGNLIEN DAY USE AREA	DNR FORESTRY DIVIS'N	3.00	146	34w	01/31/86	041052	
Beltrami Co.	LONG WMA W 283	DNR FISH & WILDLIFE	155.00	148	34w	10/01/81	041089	
Beltrami Co.	MISS. RV REPORTING STATN	GAUGING STATION	.00	0	00	01/25/88	041092	(location unk)
Beltrami Co.	BALM LAKE PUBLIC ACCESS	DNR T & W - ACCESS	4.00	150	35w	01/25/88	041113	
Beltrami Co.	CAMPBELL LAKE PUBLIC ACC	DNR T & W - ACCESS	2.13	148	34w	01/06/88	041104	
Beltrami Co.	DEER LAKE PUBLIC ACCESS	DNR T & W - ACCESS	1.50	148	34w	01/25/88	041109	
Beltrami Co.	ISLAND LK PUBLIC ACCESS	DNR T & W - ACCESS	.90	150	34w	01/25/88	041111	
Beltrami Co.	SANDY LAKE PUBLIC ACCESS	DNR T & W - ACCESS	.40	149	35w	01/25/88	041117	
Beltrami Co.	SPRING LK PUBLIC ACCESS	DNR T & W - ACCESS	1.00	148	35w	01/25/88	041042	
Beltrami Co.	BEAR DEN CPGRD & ACCESS	DNR T & W - CAN/BOAT	2.00	146	35w	01/25/88	041044	
Beltrami Co.	FOX TRAP CAMPSITE	DNR T & W - CAN/BOAT	.00	146	35w	01/25/88	041121	
Beltrami Co.	IRON BRIDGE CAMPGROUND	DNR T & W - CAN/BOAT	.00	146	34w	01/25/88	041046	
Beltrami Co.	IRON BRIDGE CAMPSITE	DNR T & W - CAN/BOAT	.00	146	34w	01/25/88	041118	
Beltrami Co.	MISS. RV REPORTING STATN	DNR T & W - CAN/BOAT	.00	0	00	01/25/88	041091	(location unk)
Beltrami Co.	MISS. RV REPORTING STATN	DNR T & W - CAN/BOAT	.00	0	00	01/25/88	041093	(location unk)
Beltrami Co.	PINE POINT CPGRD/ACCESS	DNR T & W - CAN/BOAT	2.00	146	35w	01/25/88	041050	
Beltrami Co.	STUMP LAKE CAMPSITE	DNR T & W - CAN/BOAT	.00	0	00	01/25/88	041119	(location unk)
Beltrami Co.	LT BUZZLE/WHITEFISH TRL	COUNTY FORESTRY DEPT	.00	148	35w	09/01/82	041139	
Beltrami Co.	BUENA VISTA SKI TRAIL	COUNTY PARKS DEPT.	.00	0	00	08/17/88	041153	(location unk)
Beltrami Co.	CSAH #7 BRIDGE ACCESS	COUNTY PARKS DEPT.	.00	146	34w	01/31/86	041149	
Beltrami Co.	LITTLE BUZZLE LAKE P A	COUNTY PARKS DEPT.	.40	148	35w	01/31/86	041145	
Beltrami Co.	MANOMIN LAKE P A (UNDEV)	COUNTY PARKS DEPT.	.20	146	35w	01/31/86	041147	
Beltrami Co.	PINETREE COUNTY PARK	COUNTY PARKS DEPT.	27.00	0	00	07/01/81	041142	(location unk)
Beltrami Co.	WHITE FISH LAKE PUB ACC	COUNTY PARKS DEPT.	.40	148	35w	01/31/86	041141	
Beltrami Co.	MISSISSIPPI HDWATERS RIV	VARIOUS REGIONAL	.00	146	34w	01/01/81	041138	
Beltrami Co.	WILTON CITY PARK	CITY PARKS DEPARTMNT	80.00	147	34w	12/01/75	041148	

Number of Sites in County - 28

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Clay Co.	HOTSIE LAKE ACCESS	USFWS (NAT WILD REF)	1.00	140	45w	01/31/86	141002	
Clay Co.	SUMMARY CLAY CO. WPA	USFWS (WAT PRO AREA)	4,807.00	139	44w	03/01/72	141003	
Clay Co.	ASPEN WMA W 295	DNR FISH & WILDLIFE	40.00	141	44w	10/01/81	141008	
Clay Co.	BICENTENNIAL PRAIRIE SNA	DNR FISH & WILDLIFE	.00	0	00	02/01/86	141006	(location unk)
Clay Co.	BLAZING STAR PRAIRIE SNA	DNR FISH & WILDLIFE	0	0	00	12/01/81	141007	(location unk)
Clay Co.	BLUESTEM PRAIRIE SNA	DNR FISH & WILDLIFE	.00	0	00	02/01/86	141005	(location unk)
Clay Co.	CROMWELL WMA W 128	DNR FISH & WILDLIFE	278.10	140	45w	10/01/81	141016	
Clay Co.	FELTON WMA W 5	DNR FISH & WILDLIFE	400.00	142	46w	10/01/81	141018	
Clay Co.	GOOSE PRAIRIE WMA W 138	DNR FISH & WILDLIFE	474.10	141	44w	10/01/81	141020	
Clay Co.	GRUHL WMA W 516	DNR FISH & WILDLIFE	307.70	140	45w	10/01/81	141022	
Clay Co.	HAWLEY WMA W 547	DNR FISH & WILDLIFE	160.00	139	45w	10/01/81	141024	
Clay Co.	HIGHLAND GROVE WMA W 183	DNR FISH & WILDLIFE	80.00	140	44w	10/01/81	141028	
Clay Co.	HITTERDAL WMA W 232	DNR FISH & WILDLIFE	261.20	140	44w	10/01/81	141030	
Clay Co.	JERAL WMA W 300	DNR FISH & WILDLIFE	74.35	140	45w	10/01/81	141036	
Clay Co.	LAMON WMA W 217	DNR FISH & WILDLIFE	0	140	44w	10/01/81	141038	
Clay Co.	ULEN WMA W 258	DNR FISH & WILDLIFE	399.28	142	44w	08/30/84	141043	
Clay Co.	SAND LAKE PUBLIC ACCESS	DNR T & W - ACCESS	4.00	139	44w	01/25/88	141049	
Clay Co.	SILVER LK PUBLIC ACCESS	DNR T & W - ACCESS	399.28	139	45w	01/25/88	141044	
Clay Co.	20TH STREET BIKE TRAIL	CITY PARKS DEPARTMNT	.00	0	00	04/09/82	141089	(location unk)
Clay Co.	3RD STREET BIKE TRAIL	CITY PARKS DEPARTMNT	.00	0	00	09/22/86	141091	(location unk)
Clay Co.	8TH STREET SO. BIKE TRL	CITY PARKS DEPARTMNT	.00	0	00	04/09/82	141093	(location unk)
Clay Co.	HAWLEY MUN. GOLF COURSE	CITY PARKS DEPARTMNT	73.00	139	45w	01/01/76	141092	
Clay Co.	HAWLEY MUN.RECREATION A.	CITY PARKS DEPARTMNT	20.00	139	45w	01/01/76	141090	
Clay Co.	LEE LAKE PUBLIC ACCESS	CITY PARKS DEPARTMNT	1.00	139	44w	01/31/86	141047	
Clay Co.	M.B. JOHNSON MUNICIPAL P	CITY PARKS DEPARTMNT	108.00	0	00	05/01/79	141067	(location unk)
Clay Co.	RIVERFRONT PARK	CITY PARKS DEPARTMNT	.00	0	00	09/22/86	141097	(location unk)
Clay Co.	ULEN PARK	CITY PARKS DEPARTMNT	40.00	142	44w	08/15/88	141094	
Clay Co.	WAGNER MUNICIPAL PARK	CITY PARKS DEPARTMNT	22.00	0	00	05/01/79	141101	(location unk)
Clay Co.	WOODLAWN MUNICIPAL PARK	CITY PARKS DEPARTMNT	19.00	0	00	09/22/86	141062	(location unk)

Number of Sites in County - 29

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Clearwater Co.	ARROW POINT CGD./ACCESS	DNR FORESTRY DIVIS'N	2.00	143	38w	01/31/86	151009	
Clearwater Co.	BEMIDJI-ITASCA TRAIL	DNR FORESTRY DIVIS'N	.00	144	36w	08/15/88	151013	
Clearwater Co.	BUCKBOARD LK PUB ACCESS	DNR FORESTRY DIVIS'N	1.00	144	38w	01/31/86	151008	
Clearwater Co.	BUNGO LK. PUBLIC ACCESS	DNR FORESTRY DIVIS'N	1.00	143	38w	01/31/86	151007	
Clearwater Co.	EAST CRANBERRY PUB ACC	DNR FORESTRY DIVIS'N	.50	143	38w	01/31/86	151018	
Clearwater Co.	MISS. HEADWATERS ST.FOR.	DNR FORESTRY DIVIS'N	2,040.00	144	36w	02/20/85	151014	
Clearwater Co.	WALKER BROOK LK PUB ACC	DNR FORESTRY DIVIS'N	1.00	146	37w	01/31/86	151023	
Clearwater Co.	WHITE EARTH STATE FOREST	DNR FORESTRY DIVIS'N	17,734.00	143	38w	02/20/85	151005	
Clearwater Co.	WHITE EARTH TRAIL	DNR FORESTRY DIVIS'N	.00	144	36w	08/15/88	151010	
Clearwater Co.	BAGLEY LAKE WMA W 268	DNR FISH & WILDLIFE	23.90	149	36w	08/30/84	151048	
Clearwater Co.	BLAIR LAKE WMA W1125	DNR FISH & WILDLIFE	0	148	37w	10/01/81	151111	
Clearwater Co.	BLAKELY LAKE PUB ACCESS	DNR FISH & WILDLIFE	1.00	144	38w	01/31/86	151090	
Clearwater Co.	CARTER WMA W1345	DNR FISH & WILDLIFE	.00	148	38w	02/21/85	151105	
Clearwater Co.	CLEARWATER VS 9WMA W1300	DNR FISH & WILDLIFE	42.40	149	36w	08/30/84	151046	
Clearwater Co.	DANIEL LAKE WMA W1297	DNR FISH & WILDLIFE	40.00	146	36w	08/30/84	151040	
Clearwater Co.	EVEY LAKE PUBLIC ACCESS	DNR FISH & WILDLIFE	1.00	143	38w	01/31/86	151079	
Clearwater Co.	FRELLSEN LAKE WMA W1305	DNR FISH & WILDLIFE	54.25	143	37w	08/30/84	151060	
Clearwater Co.	GARDNER LAKE WMA W1308	DNR FISH & WILDLIFE	26.75	143	37w	08/30/84	151066	
Clearwater Co.	GILL LAKE WMA W1294	DNR FISH & WILDLIFE	31.70	144	36w	08/30/84	151032	
Clearwater Co.	GLANDERS LAKE WMA W1304	DNR FISH & WILDLIFE	36.90	143	37w	08/30/84	151058	
Clearwater Co.	IRON SPRINGS BOG SNA	DNR FISH & WILDLIFE	.00	0	00	02/01/86	151025	(location unk)
Clearwater Co.	ISLAND LAKE WMA W1316	DNR FISH & WILDLIFE	34.70	144	38w	08/30/84	151086	
Clearwater Co.	ITASCA WILDRNSS SANC SNA	DNR FISH & WILDLIFE	.00	0	00	02/01/86	151026	(location unk)
Clearwater Co.	LE BLANC WMA W 284	DNR FISH & WILDLIFE	162.64	150	38w	10/01/81	151104	
Clearwater Co.	LITTLE BASS WMA W1311	DNR FISH & WILDLIFE	36.20	143	38w	05/20/85	151074	
Clearwater Co.	LITTLE PINE WMA W 362	DNR FISH & WILDLIFE	316.70	148	38w	02/24/88	151106	
Clearwater Co.	LITTLE PINE WMA PUB ACC	DNR FISH & WILDLIFE	1.00	148	38w	01/31/86	151109	
Clearwater Co.	LITTLE ROCK LK WMA W1312	DNR FISH & WILDLIFE	40.00	143	38w	08/30/84	151076	
Clearwater Co.	LONE LAKE NORTH W1310	DNR FISH & WILDLIFE	.75	147	37w	08/30/84	151072	
Clearwater Co.	LONE LAKE WMA W1319	DNR FISH & WILDLIFE	15.50	145	38w	08/30/84	151094	
Clearwater Co.	LONG LOST LAKE WMA W1303	DNR FISH & WILDLIFE	57.50	143	37w	08/30/84	151054	
Clearwater Co.	LONG LOST LAKE-SO. W1307	DNR FISH & WILDLIFE	20.10	143	37w	08/30/84	151064	
Clearwater Co.	LONG LOST LK P.A.(SOUTH)	DNR FISH & WILDLIFE	1.00	143	37w	01/31/86	151057	
Clearwater Co.	LONG LOST LK PUB ACCESS	DNR FISH & WILDLIFE	1.00	143	37w	01/31/86	151056	
Clearwater Co.	LOST RIVER WMA W1119	DNR FISH & WILDLIFE	0	148	38w	10/01/81	151107	
Clearwater Co.	LOWER RICE WMA W 774	DNR FISH & WILDLIFE	560.00	144	38w	10/05/83	151108	
Clearwater Co.	MALLARD LAKE WMA W1293	DNR FISH & WILDLIFE	24.60	144	36w	08/30/84	151030	
Clearwater Co.	MC KENZIE LAKE WMA W1318	DNR FISH & WILDLIFE	35.50	144	38w	08/30/84	151092	
Clearwater Co.	MINNOW LAKE WMA W1320	DNR FISH & WILDLIFE	10.00	147	38w	01/31/86	151096	
Clearwater Co.	MUD LAKE WMA W1298	DNR FISH & WILDLIFE	4.00	146	36w	08/30/84	151042	
Clearwater Co.	OLD RED LAKE TR WMA W489	DNR FISH & WILDLIFE	1,082.21	148	37w	01/31/86	151112	
Clearwater Co.	PERCH LAKE PUBLIC ACCESS	DNR FISH & WILDLIFE	1.00	145	38w	01/31/86	151102	
Clearwater Co.	PERCH LAKE WMA W 607	DNR FISH & WILDLIFE	227.15	145	38w	10/05/83	151100	
Clearwater Co.	PICKEREL LAKE WMA W1314	DNR FISH & WILDLIFE	34.95	143	38w	01/31/86	151080	
Clearwater Co.	PINE LAKE WMA W1321	DNR FISH & WILDLIFE	2.65	149	38w	08/30/84	151098	
Clearwater Co.	ROBINSON LAKE WMA W1402	DNR FISH & WILDLIFE	40.00	144	36w	08/30/84	151028	
Clearwater Co.	ROY LAKE WMA W1315	DNR FISH & WILDLIFE	41.05	144	38w	08/30/84	151082	
Clearwater Co.	SOLBERG LAKE PUB ACCESS	DNR FISH & WILDLIFE	1.00	148	37w	01/31/86	151114	
Clearwater Co.	SPIKE LAKE WMA W1301	DNR FISH & WILDLIFE	40.00	149	36w	08/30/84	151050	
Clearwater Co.	STASSEN LAKE WMA W1306	DNR FISH & WILDLIFE	34.00	143	37w	08/30/84	151062	
Clearwater Co.	SUCKER LAKE PUB ACCESS	DNR FISH & WILDLIFE	25.00	144	36w	01/31/86	151036	
Clearwater Co.	SUCKER LAKE WMA W1295	DNR FISH & WILDLIFE	25.85	144	36w	08/30/84	151034	
Clearwater Co.	SUGAR BUSH LK WMA W1302	DNR FISH & WILDLIFE	20.35	143	37w	08/30/84	151052	
Clearwater Co.	UPPER CAMP LK WMA W1313	DNR FISH & WILDLIFE	24.50	143	38w	08/30/84	151078	
Clearwater Co.	UPPER RICE LAKE N. W1309	DNR FISH & WILDLIFE	64.08	145	37w	08/30/84	151068	
Clearwater Co.	UPPER RICE LK EAST W1296	DNR FISH & WILDLIFE	24.35	145	36w	08/30/84	151038	
Clearwater Co.	UPPER RICE WMA W 715	DNR FISH & WILDLIFE	321.00	145	36w	01/31/86	151116	
Clearwater Co.	W FOUR LEGGED LAKE W1299	DNR FISH & WILDLIFE	20.90	148	36w	08/30/84	151044	
Clearwater Co.	WAPATUS LAKE PUB ACCESS	DNR FISH & WILDLIFE	1.00	144	38w	01/31/86	151115	
Clearwater Co.	WAPATUS LAKE WMA W1317	DNR FISH & WILDLIFE	40.00	144	38w	08/30/84	151088	
Clearwater Co.	CLEARWATER LK PUB ACCESS	DNR T & W - ACCESS	1.40	149	36w	01/25/88	151120	
Clearwater Co.	HEART LK P A (CLOSED)	DNR T & W - ACCESS	1.00	144	37w	01/25/88	151130	
Clearwater Co.	MINERVA LK PUBLIC ACCESS	DNR T & W - ACCESS	2.40	145	37w	01/25/88	151128	
Clearwater Co.	PINE LK P A 1 (UNDEVEL)	DNR T & W - ACCESS	1.10	149	38w	01/25/88	151124	
Clearwater Co.	PINE LK PUBLIC ACCESS 2	DNR T & W - ACCESS	5.00	149	38w	01/25/88	151122	
Clearwater Co.	UPPER RICE LK PUB ACCESS	DNR T & W - ACCESS	2.00	145	36w	01/25/88	151126	
Clearwater Co.	COFFEE POT LANDING CG/A	DNR T & W - CAN/BOAT	2.00	145	36w	01/25/88	151022	
Clearwater Co.	GULSVIG CANOE LANDING	DNR T & W - CAN/BOAT	2.00	144	36w	01/25/88	151133	
Clearwater Co.	MISS. RV REPORTING STATN	DNR T & W - CAN/BOAT	.00	0	00	01/25/88	151118	(location unk)
Clearwater Co.	WANNAGAN LANDING CG/ACC	DNR T & W - CAN/BOAT	.00	144	36w	01/25/88	151016	
Clearwater Co.	ELK LAKE GROUP CAMP	DNR PARKS & REC DIV.	0	143	36w	02/01/76	151150	
Clearwater Co.	ELK LAKE PUBLIC ACCESS	DNR PARKS & REC DIV.	1.00	143	36w	01/31/86	151148	
Clearwater Co.	ITASCA LK PUB ACC SOUTH	DNR PARKS & REC DIV.	1.00	143	36w	01/31/86	151141	
Clearwater Co.	ITASCA SP E. ARM CAMPGD	DNR PARKS & REC DIV.	0	143	36w	04/01/72	151146	
Clearwater Co.	ITASCA SP HQ CAMPGROUND	DNR PARKS & REC DIV.	0	143	36w	02/01/76	151138	
Clearwater Co.	ITASCA STATE PARK	DNR PARKS & REC DIV.	.00	143	36w	08/16/88	151136	
Clearwater Co.	LAKE ITASCA PUB. ACCESS	DNR PARKS & REC DIV.	1.50	143	36w	01/31/86	151140	
Clearwater Co.	MARY LAKE PUBLIC ACCESS	DNR PARKS & REC DIV.	.50	143	35w	01/31/86	151149	
Clearwater Co.	SQUAW LAKE GROUP CAMP	DNR PARKS & REC DIV.	0	143	36w	12/01/77	151144	

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case
Clearwater Co.	SQUAW LAKE PUB. ACCESS	DNR PARKS & REC DIV.	1.00	143	36w	01/31/86	151142
Clearwater Co.	SOURCE OF MISSISSIPPI RV	MINN HISTORICAL SOC.	.00	143	36w	10/01/76	151901
Clearwater Co.	CLEARWATER CO.MEM.FOREST	COUNTY FORESTRY DEPT	77,606.60	147	36w	01/01/76	151155
Clearwater Co.	BAGLEY LK. PUBLIC ACCESS	COUNTY PARKS DEPT.	1.90	150	36w	01/31/86	151162
Clearwater Co.	BIG LA SALLE PUBLIC ACC	COUNTY PARKS DEPT.	1.00	144	36w	01/31/86	151165
Clearwater Co.	BORG LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	7.00	150	36w	01/31/86	151160
Clearwater Co.	COX LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	2.00	143	37w	01/31/86	151183
Clearwater Co.	DEEP LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	2.00	149	37w	01/31/86	151168
Clearwater Co.	FALK LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	2.00	149	36w	01/31/86	151164
Clearwater Co.	FIRST LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	1.00	147	38w	01/31/86	151176
Clearwater Co.	FOREST RIDER TRAIL	COUNTY PARKS DEPT.	.00	143	37w	08/15/88	151173
Clearwater Co.	GREAT RIV RD WYSD PK/ACC	COUNTY PARKS DEPT.	2.70	150	37w	01/31/86	151158
Clearwater Co.	JOHNSON LAKE PUB. ACCESS	COUNTY PARKS DEPT.	1.90	149	37w	01/31/86	151166
Clearwater Co.	LINDBERG LAKE PUB.ACCESS	COUNTY PARKS DEPT.	2.00	148	38w	01/31/86	151172
Clearwater Co.	LITTLE BASS LK PUB ACC	COUNTY PARKS DEPT.	1.00	143	38w	01/31/86	151159
Clearwater Co.	LONE LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.60	147	38w	01/31/86	151181
Clearwater Co.	LONG LAKE CO.PARK/ACCESS	COUNTY PARKS DEPT.	53.00	144	37w	01/31/86	151184
Clearwater Co.	LONG LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	2.00	150	36w	01/31/86	151161
Clearwater Co.	MAHNOMEN COUNTY TRAIL	COUNTY PARKS DEPT.	.00	143	38w	08/17/88	151171
Clearwater Co.	MCKENZIE LAKE PUB ACCESS	COUNTY PARKS DEPT.	.00	144	38w	01/31/86	151167
Clearwater Co.	MOOSE LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	7.00	146	36w	01/31/86	151180
Clearwater Co.	PETERSON LAKE PUB.ACCESS	COUNTY PARKS DEPT.	5.50	148	37w	01/31/86	151170
Clearwater Co.	ROCKSTAD LAKE PUB ACCESS	COUNTY PARKS DEPT.	1.00	144	37w	01/31/86	151169
Clearwater Co.	SCHOOL HOUSE LK PUB ACC	COUNTY PARKS DEPT.	7.50	150	36w	01/31/86	151163
Clearwater Co.	SECOND LAKE PUB. ACCESS	COUNTY PARKS DEPT.	1.00	147	38w	01/31/86	151178
Clearwater Co.	TRAILBLAZERS TRAIL	COUNTY PARKS DEPT.	.00	147	37w	08/15/88	151174
Clearwater Co.	MISSISSIPPI HDWATERS RIV	VARIOUS REGIONAL	.00	144	36w	01/01/81	151186
Clearwater Co.	BAGLEY CITY GOLF COURSE	CITY PARKS DEPARTMNT	62.00	147	37w	08/01/77	151188
Clearwater Co.	BAGLEY CITY PARK	CITY PARKS DEPARTMNT	40.00	147	37w	01/31/86	151189
Clearwater Co.	SPIKE LAKE PUBLIC ACCESS	CITY PARKS DEPARTMNT	1.00	149	36w	01/31/86	151190

Number of Sites in County - 109

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Hubbard Co.	BEMIDJI-ITASCA TRAIL	DNR FORESTRY DIVIS'N	.00	143	35w	08/15/88	291013	
Hubbard Co.	MISS. HEADWATERS ST.FOR.	DNR FORESTRY DIVIS'N	1,029.00	145	35w	02/20/85	291011	
Hubbard Co.	PAUL BUNYAN STATE FOREST	DNR FORESTRY DIVIS'N	59,931.00	143	35w	02/20/85	291014	
Hubbard Co.	BIRCH CREEK WMA W 513	DNR FISH & WILDLIFE	52.20	143	35w	10/01/81	291045	
Hubbard Co.	ROCKWOOD WMA W 414	DNR FISH & WILDLIFE	80.00	145	34w	10/01/81	291051	
Hubbard Co.	FRONTENAC LK PUB ACCESS	DNR T & W - ACCESS	4.90	145	34w	01/25/88	291077	
Hubbard Co.	HENNEPIN LAKE PUB ACCESS	DNR T & W - ACCESS	1.40	145	35w	01/25/88	291079	
Hubbard Co.	STUMPHGES RAPIDS PUB ACC	DNR T & W - ACCESS	.00	145	35w	01/25/88	291056	
Hubbard Co.	STUMPHGES RAPIDS CAMPGND	DNR T & W - CAN/BOAT	.00	145	35w	01/25/88	291078	
Hubbard Co.	ITASCA STATE PK(HUBBARD)	DNR PARKS & REC DIV.	.00	142	35w	08/16/88	291083	
Hubbard Co.	BECIDA TRAIL	COUNTY PARKS DEPT.	.00	0	00	08/15/88	291130	(location unk)
Hubbard Co.	EVERGREEN LK PUBLIC ACC	COUNTY PARKS DEPT.	5.00	144	34w	01/31/86	291098	
Hubbard Co.	HUBBARD #1 TRAIL	COUNTY PARKS DEPT.	.00	143	35w	08/15/88	291114	
Hubbard Co.	LAKE TWENTY PUBLIC ACC	COUNTY PARKS DEPT.	1.00	144	34w	01/31/86	291094	
Hubbard Co.	LITTLE MANTRAP LK ACCESS	COUNTY PARKS DEPT.	1.00	142	35w	01/31/86	291111	
Hubbard Co.	MINNIE LK PUBLIC ACCESS	COUNTY PARKS DEPT.	2.00	144	34w	01/31/86	291100	
Hubbard Co.	NEWMAN LAKE PUB. ACCESS	COUNTY PARKS DEPT.	2.00	145	34w	01/31/86	291096	
Hubbard Co.	MISSISSIPPI HDWATERS RIV	VARIOUS REGIONAL	.00	145	35w	01/01/81	291081	

Number of Sites in County - 18

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Mahnomen Co.	MOORE LK WATERFOWL PROD	USFWS (NAT WILD REF)	.00	143	42w	01/31/86	441004	
Mahnomen Co.	SUMM.MAHNOMEN CO. WPA'S	USFWS (WAT PRO AREA)	3,500.00	143	40w	03/01/72	441005	
Mahnomen Co.	WHITE EARTH STATE FOREST	DNR FORESTRY DIVIS'N	16,320.00	143	39w	02/20/85	441010	
Mahnomen Co.	BEAULIEU WMA W 144	DNR FISH & WILDLIFE	280.00	145	40w	10/01/81	441020	
Mahnomen Co.	BEJOU WMA W 75	DNR FISH & WILDLIFE	1,533.87	146	42w	10/10/83	441022	
Mahnomen Co.	BLUESTEM WMA W 795	DNR FISH & WILDLIFE	.00	143	42w	10/01/81	441024	
Mahnomen Co.	BUDDE MEADOWS WMA W 554	DNR FISH & WILDLIFE	280.69	145	40w	10/01/81	441026	
Mahnomen Co.	COBURN WMA W 56	DNR FISH & WILDLIFE	80.00	143	42w	10/01/81	441028	
Mahnomen Co.	DEEP POTHOLE LK PUB ACC	DNR FISH & WILDLIFE	.00	0	00	01/31/86	441021	(location unk)
Mahnomen Co.	DITTMER WMA W 92	DNR FISH & WILDLIFE	561.68	145	42w	10/01/81	441030	
Mahnomen Co.	FOOT WMA W 351	DNR FISH & WILDLIFE	80.00	146	41w	10/01/81	441032	
Mahnomen Co.	GREGORY WMA W 352	DNR FISH & WILDLIFE	411.65	146	41w	09/20/84	441034	
Mahnomen Co.	KILLIAN WMA W 350	DNR FISH & WILDLIFE	80.00	146	41w	10/01/81	441036	
Mahnomen Co.	LONCRACE WMA W 149	DNR FISH & WILDLIFE	249.75	146	42w	10/01/81	441038	
Mahnomen Co.	MAH SOO WMA W 405	DNR FISH & WILDLIFE	.00	145	42w	10/01/81	441042	
Mahnomen Co.	MAHGRE WMA W 349	DNR FISH & WILDLIFE	120.00	146	41w	10/01/81	441040	
Mahnomen Co.	RUSH WMA W 270	DNR FISH & WILDLIFE	712.00	145	41w	10/01/81	441044	
Mahnomen Co.	SANTWIRE WMA W1098	DNR FISH & WILDLIFE	500.00	143	41w	02/24/88	441045	
Mahnomen Co.	VANOSE WMA W 354	DNR FISH & WILDLIFE	1,831.11	145	40w	10/01/81	441046	
Mahnomen Co.	WAMBACH WMA W 73	DNR FISH & WILDLIFE	1,280.58	145	41w	10/01/81	441048	
Mahnomen Co.	WARREN WMA W 406	DNR FISH & WILDLIFE	64.75	145	41w	10/01/81	441050	
Mahnomen Co.	WAUBUN WMA W 35	DNR FISH & WILDLIFE	1,794.50	143	41w	10/01/81	441052	
Mahnomen Co.	ERIE (PRIEST) LK PUB ACC	DNR T & W - ACCESS	2.50	144	40w	01/25/88	441062	
Mahnomen Co.	ISLAND LAKE PUBLIC ACC	DNR T & W - ACCESS	1.25	146	39w	01/25/88	441060	
Mahnomen Co.	LONE LAKE PUBLIC ACCESS	DNR T & W - ACCESS	1.00	145	39w	01/25/88	441012	
Mahnomen Co.	N TWIN LK P A (UNDEVEL)	DNR T & W - ACCESS	5.00	144	39w	01/25/88	441064	
Mahnomen Co.	SARGENT LAKE PUBLIC ACC	DNR T & W - ACCESS	2.10	144	40w	01/25/88	441063	
Mahnomen Co.	SOUTH TWIN LAKE PUB ACC	DNR T & W - ACCESS	.50	143	39w	01/25/88	441066	
Mahnomen Co.	MCCRANEY L.REST AREA 113	MINN DEPT TRANSPORT.	6.00	143	40w	04/01/75	441082	
Mahnomen Co.	TULABY LK PUBLIC ACCESS	MINN DEPT TRANSPORT.	1.00	143	39w	01/31/86	441081	
Mahnomen Co.	TULABY LK. REST AREA 113	MINN DEPT TRANSPORT.	10.00	143	39w	04/01/75	441080	
Mahnomen Co.	MAHNOMEN CO. MEM. FOREST	COUNTY FORESTRY DEPT	920.00	143	40w	01/01/76	441087	
Mahnomen Co.	BASS LAKE PUBLIC ACCESS	COUNTY PARKS DEPT.	.50	143	39w	01/31/86	441092	
Mahnomen Co.	MAHNOMEN COUNTY TRAIL	COUNTY PARKS DEPT.	.00	144	39w	08/17/88	441093	
Mahnomen Co.	SNIDER LAKE PUB. ACCESS	COUNTY PARKS DEPT.	1.00	143	39w	01/31/86	441094	
Mahnomen Co.	MAHNOMEN CITY PARK	CITY PARKS DEPARTMNT	7.00	144	42w	01/01/76	441100	

Number of Sites in County - 36

County	Facility Name		Administrator	Acres	Twp	Rng	Date	Case	
Marshall Co.	AGASSIZ NAT. WILDLIFE R.		USFWS (NAT WILD REF)	61,487.00	0	00	01/01/76	452005	(location unk)
Marshall Co.	AGDER WMA	W 342	DNR FISH & WILDLIFE	240.00	155	42w	10/01/81	452012	
Marshall Co.	ELM LAKE WMA	W 319	DNR FISH & WILDLIFE	15,560.00	155	41w	10/10/83	452018	
Marshall Co.	ESPELIE WMA	W 124	DNR FISH & WILDLIFE	160.00	155	39w	10/01/81	452020	
Marshall Co.	EXCEL WMA	W1014	DNR FISH & WILDLIFE	.00	155	43w	10/01/81	452021	
Marshall Co.	LOST RIVER POOL		DNR FISH & WILDLIFE	.00	155	41w	01/31/86	451003	
Marshall Co.	MOYLAN WMA	W 936	DNR FISH & WILDLIFE	.00	155	40w	12/01/81	452023	
Marshall Co.	NEW SOLUM WMA	W1017	DNR FISH & WILDLIFE	.00	155	44w	02/06/84	452029	
Marshall Co.	ROSEWOOD WMA	W1006	DNR FISH & WILDLIFE	.00	154	44w	10/01/81	452025	
Marshall Co.	SANDHILL WMA	W1292	DNR FISH & WILDLIFE	.00	154	45w	11/30/84	451080	
Marshall Co.	SEM WMA	W1007	DNR FISH & WILDLIFE	.00	154	39w	10/01/81	452027	
Marshall Co.	SHARP WMA	W1018	DNR FISH & WILDLIFE	.00	155	40w	12/01/81	452019	
Marshall Co.	SHOWSHOE WMA	W1019	DNR FISH & WILDLIFE	.00	155	42w	12/01/81	452017	

Number of Sites in County - 13

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Norman Co.	AGASSIZ DUNES S/NA	DNR FISH & WILDLIFE	.00	146	44w	12/01/81	541004	
Norman Co.	AGASSIZ-NELSON WMA W 184	DNR FISH & WILDLIFE	120.00	146	45w	10/01/81	541005	
Norman Co.	AGASSIZ-OLSON WMA W 215	DNR FISH & WILDLIFE	1,406.34	146	45w	10/01/81	541007	
Norman Co.	CUPIDO WMA W 407	DNR FISH & WILDLIFE	240.00	143	45w	10/01/81	541009	
Norman Co.	DALBY WMA W 434	DNR FISH & WILDLIFE	120.00	143	45w	10/01/81	541011	
Norman Co.	FAITH WMA W 412	DNR FISH & WILDLIFE	380.00	144	43w	10/01/81	541013	
Norman Co.	HOME WMA W 353	DNR FISH & WILDLIFE	103.10	143	44w	10/01/81	541015	
Norman Co.	IDA WMA W 662	DNR FISH & WILDLIFE	80.00	144	45w	10/01/81	541017	
Norman Co.	MOCCASIN WMA W 345	DNR FISH & WILDLIFE	177.60	143	43w	10/01/81	541019	
Norman Co.	NEAL WMA W 17	DNR FISH & WILDLIFE	1,278.16	143	44w	10/01/81	541021	
Norman Co.	RANUM WMA W 835	DNR FISH & WILDLIFE	180.00	146	43w	10/01/81	541023	
Norman Co.	ROCKWELL WMA W 890	DNR FISH & WILDLIFE	207.77	143	45w	10/01/81	541025	
Norman Co.	SYRE WMA W 365	DNR FISH & WILDLIFE	341.60	143	44w	10/01/81	541027	
Norman Co.	TWIN VALLEY PRAIRIE SNA	DNR FISH & WILDLIFE	.00	143	45w	12/01/81	541003	
Norman Co.	TWIN VALLEY WMA W 159	DNR FISH & WILDLIFE	905.62	143	44w	10/01/81	541029	
Norman Co.	VANGSNESS WMA W 411	DNR FISH & WILDLIFE	315.00	143	44w	10/01/81	541031	
Norman Co.	ADA MUN. ATHLETIC FIELD	CITY PARKS DEPARTMNT	2.00	144	46w	03/01/72	541040	
Norman Co.	ADA MUNICIPAL SWIM. POOL	CITY PARKS DEPARTMNT	.20	144	46w	03/01/72	541038	
Norman Co.	BOSWORTH MUNICIPAL PARK	CITY PARKS DEPARTMNT	8.40	144	46w	03/01/72	541042	
Norman Co.	HALSTED VILLAGE PARK	CITY PARKS DEPARTMNT	.00	0	00	06/01/79	541046	(location unk)
Norman Co.	RIVERSIDE CITY PARK/ACC	CITY PARKS DEPARTMNT	5.00	145	49w	01/31/86	541045	
Norman Co.	TWIN VALLEY MUN. PARK	CITY PARKS DEPARTMNT	2.50	144	44w	01/01/76	541035	
Norman Co.	TWIN VALLEY VILLAGE PARK	CITY PARKS DEPARTMNT	.00	144	44w	06/01/79	541036	

Number of Sites in County - 23

County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Pennington Co.	GOODRIDGE WMA W 986	DNR FISH & WILDLIFE	8.04	153	40w	10/01/81	571011	
Pennington Co.	HIGINBOTHAM WMA W 180	DNR FISH & WILDLIFE	867.40	152	44w	06/12/84	571001	
Pennington Co.	JACKSNIPE WMA W1265	DNR FISH & WILDLIFE	150.00	153	42w	06/12/84	571052	
Pennington Co.	ORINIAK WMA W1287	DNR FISH & WILDLIFE	314.14	152	41w	11/30/84	571051	
Pennington Co.	PEMBINA WMA W 325	DNR FISH & WILDLIFE	1,646.92	152	45w	06/12/84	571002	
Pennington Co.	REINER WMA W1257	DNR FISH & WILDLIFE	120.00	154	39w	02/24/88	571050	
Pennington Co.	ROSEWOOD WMA W1006	DNR FISH & WILDLIFE	.00	154	44w	10/01/81	571013	
Pennington Co.	SANDERS WMA W1093	DNR FISH & WILDLIFE	.00	153	44w	02/24/88	571003	
Pennington Co.	STAR WMA W1409	DNR FISH & WILDLIFE	0	153	39w	02/25/88	571009	
Pennington Co.	REDELK RV REPORTNG STATN	GAUGING STATION	.00	0	00	01/25/88	571100	(location unk)
Pennington Co.	THIEF R.FALLS REST A 1	MINN DEPT TRANSPORT.	4.00	154	43w	04/01/75	571005	
Pennington Co.	THIEF RIV PUBLIC ACCESS	MINN DEPT TRANSPORT.	.00	154	43w	01/31/86	571004	
Pennington Co.	NORTHLAND ST COMM COLLG	STATE COMM. COLLEGES	62.00	154	43w	08/16/88	571006	
Pennington Co.	KRATKA LANDING	COUNTY PARKS DEPT.	1.00	153	41w	01/31/86	571014	
Pennington Co.	OAKLAND COUNTY PARK	COUNTY PARKS DEPT.	.00	0	00	02/09/82	571007	(location unk)
Pennington Co.	RED LAKE RIV.CANOE ACC-1	COUNTY PARKS DEPT.	1.20	153	42w	01/31/86	571016	
Pennington Co.	RED LAKE RIV.CANOE ACC-4	COUNTY PARKS DEPT.	1.00	153	40w	01/31/86	571012	
Pennington Co.	RED LAKE RIV.CANOE ACC-5	COUNTY PARKS DEPT.	1.00	152	39w	01/31/86	571018	
Pennington Co.	RED LK RV (HIGH LANDING)	COUNTY PARKS DEPT.	.90	153	40w	01/31/86	571010	
Pennington Co.	WAPITI TRAIL	COUNTY PARKS DEPT.	.00	154	43w	08/16/88	571008	
Pennington Co.	BLOCK-38 MUNICIPAL PARK	CITY PARKS DEPARTMNT	1.00	154	43w	02/01/76	571021	
Pennington Co.	BOYSCOUT MUN.PARK/ACCESS	CITY PARKS DEPARTMNT	.70	154	43w	01/31/86	571028	
Pennington Co.	CENTENNIAL MUN. PARK	CITY PARKS DEPARTMNT	7.00	154	43w	01/31/86	571019	
Pennington Co.	EASTSIDE MUN. ATH. FIELD	CITY PARKS DEPARTMNT	2.00	154	43w	02/01/76	571030	
Pennington Co.	ELKS MUNICIPAL PARK	CITY PARKS DEPARTMNT	2.00	154	43w	02/01/76	571032	
Pennington Co.	PENNINGTON CO.FAIRGROUND	CITY PARKS DEPARTMNT	6.00	154	43w	02/01/76	571024	
Pennington Co.	RED LAKE R. MI. 123.8 CP	CITY PARKS DEPARTMNT	.00	0	00	10/01/82	571020	(location unk)
Pennington Co.	RIVERSIDE MUN PARK/CMPGD	CITY PARKS DEPARTMNT	14.00	154	43w	02/01/76	571022	
Pennington Co.	ST. HILAIRE MUN PK & CGD	CITY PARKS DEPARTMNT	3.00	152	43w	01/31/86	571036	
Pennington Co.	TINDOLPH MUNICIPAL BEACH	CITY PARKS DEPARTMNT	4.00	154	43w	02/01/76	571026	

Number of Sites in County - 30

County	Facility Name	Administrator	Acres	Twp Rng	Date	Case	
Polk Co.	SUMM. POLK COUNTY WPA	USFWS (WAT PRO AREA)	6,100.00	147 39W	03/01/72	602001	
Polk Co.	SUMM. POLK COUNTY WPA	USFWS (WAT PRO AREA)	.00	148 45W	08/01/79	601003	
Polk Co.	AGASSIZ DUNES SCI/NAT AR	DNR FISH & WILDLIFE	.00	147 44W	12/01/81	601008	
Polk Co.	BEE WMA W 357	DNR FISH & WILDLIFE	88.10	148 42W	10/01/81	602005	
Polk Co.	BELGIUM WMA W 242	DNR FISH & WILDLIFE	192.10	152 46W	02/24/88	603005	
Polk Co.	BRANDSVOLD WMA W 288	DNR FISH & WILDLIFE	145.80	148 40W	10/01/81	602007	
Polk Co.	BROOKS WMA W1094	DNR FISH & WILDLIFE	.00	149 42W	10/01/81	602008	
Polk Co.	BURNHAM WMA W 860	DNR FISH & WILDLIFE	600.00	148 45W	02/24/88	601005	
Polk Co.	CASTOR WMA W 564	DNR FISH & WILDLIFE	78.28	147 41W	10/01/81	602009	
Polk Co.	CHICOG WMA W1036	DNR FISH & WILDLIFE	1,624.00	148 45W	09/20/84	601007	
Polk Co.	CHICOG WMA PUBLIC ACCESS	DNR FISH & WILDLIFE	1.00	148 45W	01/31/86	602022	
Polk Co.	CRANE WMA W1275	DNR FISH & WILDLIFE	.00	151 39W	03/03/88	602010	
Polk Co.	CROOKSTON PRAIRIE SNA	DNR FISH & WILDLIFE	.00	0 00	02/01/86	601012	(location unk)
Polk Co.	DORR WMA W 322	DNR FISH & WILDLIFE	374.90	148 42W	11/30/84	602011	
Polk Co.	DUGDALE WMA W 737	DNR FISH & WILDLIFE	792.00	148 44W	10/01/81	601009	
Polk Co.	ENERSON WMA W 449	DNR FISH & WILDLIFE	254.25	149 40W	10/01/81	602013	
Polk Co.	ERSKINE WMA W 315	DNR FISH & WILDLIFE	1,149.70	149 42W	02/24/88	602015	
Polk Co.	FOXBORO WMA W1085	DNR FISH & WILDLIFE	.00	148 45W	10/01/81	601010	
Polk Co.	GODFREY WMA W 708	DNR FISH & WILDLIFE	143.80	148 44W	10/01/81	601011	
Polk Co.	GULLY WMA W 62	DNR FISH & WILDLIFE	440.00	151 39W	10/01/81	602017	
Polk Co.	HANGAARD WMA W 373	DNR FISH & WILDLIFE	25.00	150 39W	10/01/81	602019	
Polk Co.	HASSELTON WMA W 151	DNR FISH & WILDLIFE	211.00	147 40W	02/24/88	602021	
Polk Co.	HILL RIVER WMA W 563	DNR FISH & WILDLIFE	135.09	148 40W	10/01/81	602023	
Polk Co.	HOVLAND WMA W 146	DNR FISH & WILDLIFE	217.00	147 40W	10/01/81	602025	
Polk Co.	KAAKAIK WMA W 566	DNR FISH & WILDLIFE	151.70	149 42W	05/20/85	602027	
Polk Co.	KERTSONVILLE WMA W 625	DNR FISH & WILDLIFE	360.00	149 45W	10/01/81	601013	
Polk Co.	KROENING WMA W 546	DNR FISH & WILDLIFE	20.80	147 41W	10/01/81	602029	
Polk Co.	LA VOI WMA W 486	DNR FISH & WILDLIFE	50.70	147 40W	10/01/81	602031	
Polk Co.	LARIX WMA W1199	DNR FISH & WILDLIFE	.00	150 39W	02/06/84	602014	
Polk Co.	LENGBY WMA W 483	DNR FISH & WILDLIFE	120.50	147 39W	10/01/81	602033	
Polk Co.	LESSOR WMA W 624	DNR FISH & WILDLIFE	320.56	149 41W	10/01/81	602035	
Polk Co.	LIBERTY WMA W 279	DNR FISH & WILDLIFE	1,360.00	147 45W	10/01/81	601015	
Polk Co.	MAC MEADOW WMA W 818	DNR FISH & WILDLIFE	.00	148 41W	10/01/81	602037	
Polk Co.	MALMBERG PRAIRIE SCI/NAT	DNR FISH & WILDLIFE	.00	149 48W	12/01/81	601004	
Polk Co.	MAPLE MEADOWS WMA W 748	DNR FISH & WILDLIFE	1,360.00	148 44W	10/01/81	601017	
Polk Co.	MULEJOHN WMA W1118	DNR FISH & WILDLIFE	120.00	148 39W	01/31/86	602038	
Polk Co.	ONSTAD WMA W 681	DNR FISH & WILDLIFE	281.44	148 44W	10/01/81	601019	
Polk Co.	PEMBINA TRAIL SCI/NAT AR	DNR FISH & WILDLIFE	.00	148 45W	12/01/81	601006	
Polk Co.	PEMBINA WMA W 325	DNR FISH & WILDLIFE	1,921.20	152 46W	02/06/84	603007	
Polk Co.	POLK WMA W 805	DNR FISH & WILDLIFE	2,724.30	149 41W	07/11/85	602039	
Polk Co.	RINDAHL WMA W 348	DNR FISH & WILDLIFE	80.00	147 42W	10/01/81	602041	
Polk Co.	ROSEBUD WMA W1167	DNR FISH & WILDLIFE	45.00	147 40W	02/06/84	602020	
Polk Co.	SAGAIIGAN WMA W 480	DNR FISH & WILDLIFE	165.10	147 39W	10/01/81	602043	
Polk Co.	SHYPOKE WMA W 476	DNR FISH & WILDLIFE	80.00	148 44W	10/01/81	601021	
Polk Co.	STIPA WMA W1137	DNR FISH & WILDLIFE	160.00	150 45W	10/01/81	601022	
Polk Co.	TILDEN WMA W 281	DNR FISH & WILDLIFE	422.70	149 44W	10/01/81	601023	
Polk Co.	TIMBER DOODLE WMA W1186	DNR FISH & WILDLIFE	160.00	149 42W	10/01/81	602046	
Polk Co.	TRAIL WMA W1034	DNR FISH & WILDLIFE	320.00	148 45W	10/01/81	601024	
Polk Co.	TYMPANUCHUS WMA W 714	DNR FISH & WILDLIFE	840.00	149 45W	10/01/81	601025	
Polk Co.	WOODSIDE WMA W1271	DNR FISH & WILDLIFE	80.00	148 43W	09/20/84	602050	
Polk Co.	HILL RIV LK PUB ACCESS	DNR T & W - ACCESS	27.50	149 40W	01/25/88	602057	
Polk Co.	SAND HILL LK PUB ACCESS	DNR T & W - ACCESS	1.90	147 40W	01/25/88	602049	
Polk Co.	SARAH LAKE PUBLIC ACCESS	DNR T & W - ACCESS	2.70	148 42W	01/25/88	602053	
Polk Co.	TURTLE LAKE PUB. ACCESS	DNR T & W - ACCESS	2.00	148 39W	01/25/88	602051	
Polk Co.	UNION LAKE PUBLIC ACCESS	DNR T & W - ACCESS	.50	148 43W	01/25/88	602055	
Polk Co.	WHITEFISH LK PUB. ACCESS	DNR T & W - ACCESS	3.20	147 39W	01/25/88	602047	
Polk Co.	CLIMAX REST AREA 75	MINN DEPT TRANSPORT.	1.50	148 48W	04/01/75	601027	
Polk Co.	CROOKSTON REST AREA 2	MINN DEPT TRANSPORT.	1.50	149 46W	04/01/75	601028	
Polk Co.	FISHERS LANDING REST A.2	MINN DEPT TRANSPORT.	72.00	150 47W	10/01/79	601026	
Polk Co.	LENGBY REST AREA 2	MINN DEPT TRANSPORT.	5.00	147 39W	04/01/75	602060	
Polk Co.	OAK LAKE REST AREA 2	MINN DEPT TRANSPORT.	3.00	148 42W	04/01/75	602062	
Polk Co.	U OF M TECH C.-CROOKSTON	UNIVERSITY OF MINN.	152.00	150 46W	01/01/76	601043	
Polk Co.	MAPLE LAKE CO. PARK/ACC	COUNTY PARKS DEPT.	25.30	148 43W	01/31/86	602069	
Polk Co.	MAPLE LAKE INLET PUB ACC	COUNTY PARKS DEPT.	4.00	148 43W	01/31/86	602067	
Polk Co.	MAPLE LAKE OUTLET PIC.GD	COUNTY PARKS DEPT.	10.00	149 43W	01/01/76	602071	
Polk Co.	MCINTOSH COMMUNITY PARK	COUNTY PARKS DEPT.	1.00	0 00	06/01/79	602074	(location unk)
Polk Co.	POLK KNIGHT RIDERS TRAIL	COUNTY PARKS DEPT.	.00	147 40W	09/29/88	602070	
Polk Co.	TILBERG COUNTY PARK/ACC.	COUNTY PARKS DEPT.	20.20	148 39W	01/31/86	602065	
Polk Co.	CASTLE MUNICIPAL PARK	CITY PARKS DEPARTMNT	23.70	150 46W	01/01/76	601041	
Polk Co.	CENTRAL MUNICIPAL PARK	CITY PARKS DEPARTMNT	17.00	150 46W	10/01/82	601039	
Polk Co.	CENTRAL PARK PUB ACC	CITY PARKS DEPARTMNT	.00	150 46W	01/31/86	602076	
Polk Co.	CLIMAX MUN. CAMPSITE	CITY PARKS DEPARTMNT	2.00	148 48W	01/01/76	601033	
Polk Co.	ERSKINE CITY PARK/ACCESS	CITY PARKS DEPARTMNT	1.50	148 42W	01/31/86	602083	
Polk Co.	FERTILE MUN FRGRNDS & AF	CITY PARKS DEPARTMNT	10.00	147 44W	04/01/78	601031	
Polk Co.	FERTILE MUNICIPAL PARK	CITY PARKS DEPARTMNT	5.00	147 44W	01/01/76	601032	
Polk Co.	FERTILE MUNICIPAL PARK	CITY PARKS DEPARTMNT	152.00	150 46W	01/01/76	601029	
Polk Co.	FOSSTON MUN. CAMPGROUND	CITY PARKS DEPARTMNT	5.00	147 40W	01/01/76	602078	
Polk Co.	HIGHLAND MUNICIPAL PARK	CITY PARKS DEPARTMNT	40.00	150 46W	01/01/76	601036	
Polk Co.	MELLAND MUNICIPAL PARK	CITY PARKS DEPARTMNT	3.00	147 40W	01/01/76	602079	

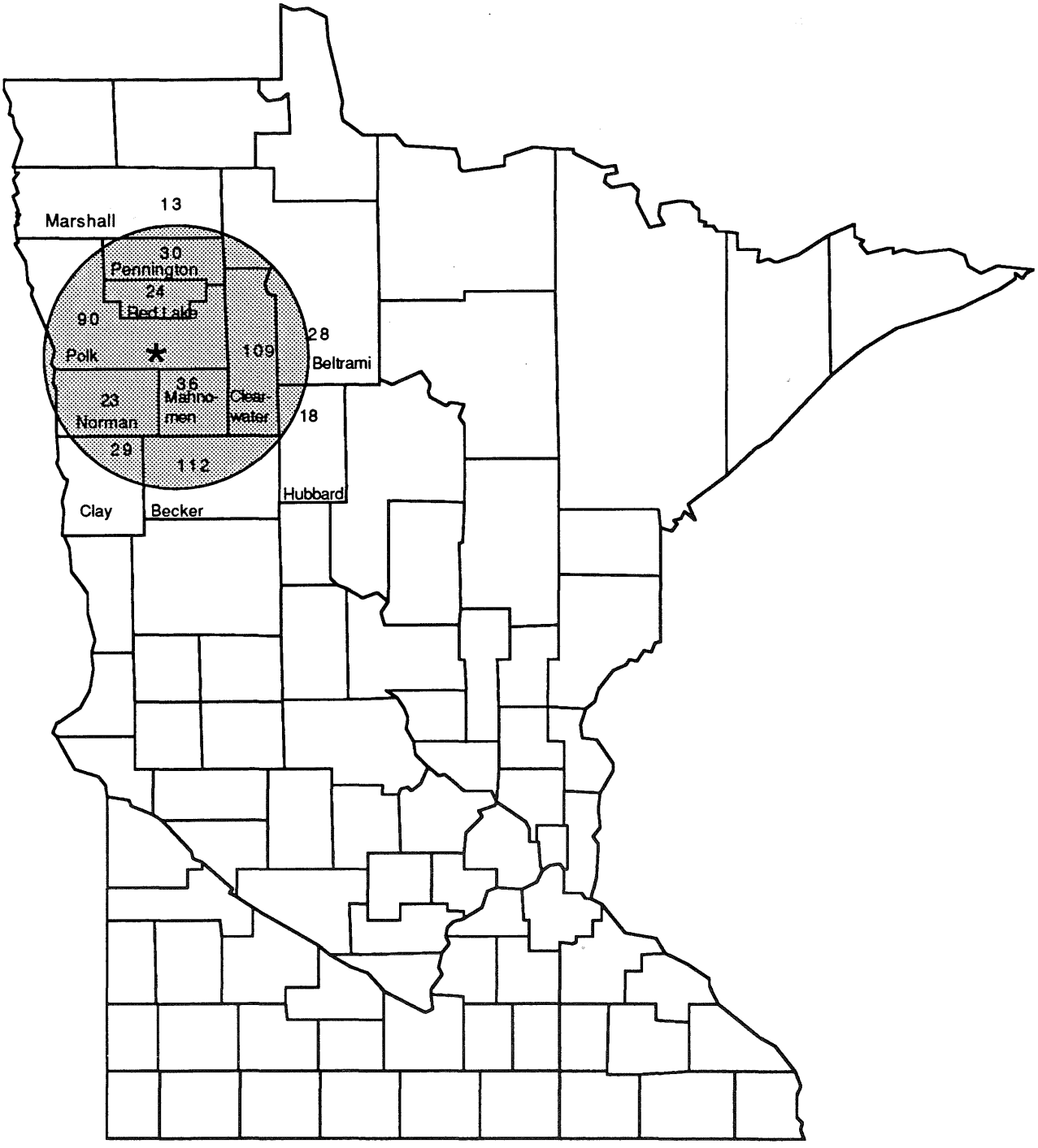
County	Facility Name	Administrator	Acres	Twp	Rng	Date	Case	
Polk Co.	MENTOR MUNICIPAL PARK	CITY PARKS DEPARTMNT	3.00	149	43w	01/01/76	602073	
Polk Co.	NORTH BROADWAY MUN. PARK	CITY PARKS DEPARTMNT	.40	150	46w	01/01/76	601037	
Polk Co.	OLEARY MUNICIPAL PARK	CITY PARKS DEPARTMNT	.00	0	00	06/01/79	603016	(location unk)
Polk Co.	RIVER HEIGHTS PARK	CITY PARKS DEPARTMNT	.00	0	00	08/16/88	603015	(location unk)
Polk Co.	SCHUSTER MUNICIPAL PARK	CITY PARKS DEPARTMNT	5.90	150	47w	01/01/76	601038	
Polk Co.	SHERLOCK MUNICIPAL PARK	CITY PARKS DEPARTMNT	20.50	151	49w	04/01/72	603012	
Polk Co.	SPRING LAKE PARK/ACCESS	CITY PARKS DEPARTMNT	3.00	147	39w	01/31/86	602075	
Polk Co.	STAFFORD-BERGE MUN. PARK	CITY PARKS DEPARTMNT	15.00	147	40w	01/01/76	602080	
Polk Co.	STAUSS MUNICIPAL PARK	CITY PARKS DEPARTMNT	5.40	151	49w	04/01/72	603014	
Polk Co.	WILDERNESS MUNICIPAL PRK	CITY PARKS DEPARTMNT	700.00	0	00	06/01/79	601030	(location unk)
Polk Co.	WILDWOOD MUNICIPAL PARK	CITY PARKS DEPARTMNT	13.20	150	47w	01/01/76	601035	

Number of Sites in County - 90

County	Facility Name		Administrator	Acres	Twp	Rng	Date	Case	
Red Lake Co.	BROOKS WMA	W1094	DNR FISH & WILDLIFE	.00	150	42w	10/01/81	631002	
Red Lake Co.	CRANE WMA	W1275	DNR FISH & WILDLIFE	680.00	151	40w	03/03/88	631004	
Red Lake Co.	EMARDVILLE WMA	W1133	DNR FISH & WILDLIFE	80.00	152	42w	02/21/85	631003	
Red Lake Co.	GERVAIS WMA	W 481	DNR FISH & WILDLIFE	80.00	151	43w	10/01/81	631005	
Red Lake Co.	HUOT WMA	W1171	DNR FISH & WILDLIFE	354.07	151	44w	10/01/81	631014	
Red Lake Co.	MARCOUX WMA	W 709	DNR FISH & WILDLIFE	368.29	150	43w	10/01/81	631007	
Red Lake Co.	MORAN WMA	W 170	DNR FISH & WILDLIFE	426.20	151	45w	05/20/85	631009	
Red Lake Co.	OKLEE WMA	W 482	DNR FISH & WILDLIFE	.00	151	41w	10/01/81	631010	
Red Lake Co.	PEMBINA WMA	W 325	DNR FISH & WILDLIFE	48.00	152	45w	10/01/81	631012	
Red Lake Co.	TERREBONNE WMA	W 987	DNR FISH & WILDLIFE	1.60	150	42w	10/01/81	631013	
Red Lake Co.	CLEARWATER RIVER PUB ACC		DNR T & W - ACCESS	2.40	151	44w	01/25/88	631016	
Red Lake Co.	OLD CROSS TREATY WAY ACC		DNR PARKS & REC DIV.	.00	151	45w	01/31/86	631026	
Red Lake Co.	OLD CROSSING HIST. SITE		DNR PARKS & REC DIV.	.00	151	45w	10/01/76	631901	
Red Lake Co.	OLD CROSSING TREATY WAY.		DNR PARKS & REC DIV.	.00	151	45w	01/01/83	631025	
Red Lake Co.	RED LAKE RIVER CANOE ACC		COUNTY PARKS DEPT.	2.60	151	44w	01/31/86	631030	
Red Lake Co.	BROOKS VILL. PLAYGROUND		CITY PARKS DEPARTMNT	4.50	150	42w	04/01/72	631056	
Red Lake Co.	OAKNOLLS MUNICIPAL GOLF		CITY PARKS DEPARTMNT	.00	0	00	06/01/79	631047	(location unk)
Red Lake Co.	OKLEE MUNICIPAL PARK		CITY PARKS DEPARTMNT	5.00	150	41w	03/01/72	631052	
Red Lake Co.	PLUMMER MUN. ATH. FIELD		CITY PARKS DEPARTMNT	4.80	151	42w	01/01/76	631044	
Red Lake Co.	PLUMMER MUN. PARK #1		CITY PARKS DEPARTMNT	2.90	151	42w	01/01/76	631040	
Red Lake Co.	PLUMMER MUN. PARK #2		CITY PARKS DEPARTMNT	2.20	151	42w	01/01/76	631042	
Red Lake Co.	RED LAKE FALLS MUN.BEACH		CITY PARKS DEPARTMNT	1.00	151	44w	01/01/76	631048	
Red Lake Co.	RIVERSIDE CITY PARK		CITY PARKS DEPARTMNT	9.00	151	44w	07/01/81	631046	
Red Lake Co.	SPORTSMEN MUNICIPAL PARK		CITY PARKS DEPARTMNT	.00	0	00	06/01/79	631049	(location unk)

Number of Sites in County - 24

Total Number of Sites - 512



FINAL EIS FIGURE 2-7
SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4
THE WINGER DAM - TOTAL RECREATIONAL RESOURCES
(BY COUNTY)
(50-mile radius of T.H. 59 and the Sand Hill River)

TABLE 2-3
LAKES HAVING SPORTFISHING OR SPORTFISHING POTENTIAL
WITHIN 50-MILE DISTANCE OF T.H.59 AND THE SAND HILL RIVER[1]

COUNTY	LAKE NAME	ECOLOGICAL[2] CLASSIFICATION	MANAGEMENT[3] CLASSIFICATION	ACRES
BECKER COUNTY TOTAL = 62				
Becker	Two Inlets	Centrarchid-Walleye	Walleye-Centrarchid	578
Becker	Boot	Centrarchid-Walleye	Walleye-Centrachid	370
Becker	Kane	Centrarchid	Centrarchid	24
Becker	Dinner	Centrarchid	Centrarchid	57
Becker	Little Dinner	Bullhead	Regular winterkill	13
Becker	Bad Medicine	Centrachid-Walleye	Trout	799
Becker	Bass	Centrarchid	Walleye-Centrarchid	178
Becker	Shell	Roughfish-gamefish	Warmwater gamefish	3,140
Becker	Big Rush	Bullhead	Regular winterkill	917
Becker	Dumbell	Bullhead	Warmwater gamefish	120
Becker	Pihlajas	Bullhead	Regular winterkill	14
Becker	Bass	Centrarchid	Walleye-Centrarchid	135
Becker	Juggler	Centrarchid-Walleye	Walleye-Centrarchid	365
Becker	Pike	Centrarchid	Centrarchid	120
Becker	Island	Centrarchid-Walleye	Walleye-Centrarchid	1,160
Becker	Round	Centrarchid-Walleye	Walleye-Centrarchid	1,086
Becker	Ice Cracking	Centrarchid-Walleye	Walleye-Centrarchid	364
Becker	Maney Point	Centrarchid-Walleye	Walleye-Centrarchid	1,737
Becker	Elbow	Centrarchid-Walleye	Walleye-Centrarchid	1,001
Becker	Hanson	Unclassified	Trout	33

1 Compiled from DNR Lake Survey data.
2 Ecological classification describes the type of fish population which would likely be present if no management were undertaken.
3 Management classification refers to species of fish or game that the lake should be managed for.

Becker	South Twin	Centrarchid	Centrarchid	139
Becker	Little Toad	Centrarchid-Walleye	Walleye-Centrarchid	345
Becker	Height of Land	Centrarchid-Walleye	Walleye	3,520
Becker	Little Bemidji	Centrarchid	Centrarchid	275
Becker	Tamarack	Centrarchid-Walleye	Walleye-Centrarchid	1,480
Becker	Perch	Centrarchid	Centrarchid	40
Becker	Colton	Centrarchid-Walleye	Walleye-Centrarchid	1,668
Becker	Pickerel	Centrarchid	Walleye-Centrarchid	332
Becker	Spring	Unclassified	Regular winterkill	52
Becker	Rice	Bullhead	Centrarchid	178
Becker	Rock	Centrarchid	Walleye-Centrarchid	1,048
Becker	Momb	Bullhead	Warmwater gamefish	43
Becker	Big Sugar Bush	Centrarchid-Walleye	Walleye-Centrarchid	320
Becker	Unnamed	Bullhead	Regular winterkill	55
Becker	Little Sugar Bush	Centrarchid-Walleye	Walleye Centrarchid	202
Becker	Fish	Centrarchid	Centrarchid	82
Becker	Fagen	Unclassified	Regular winterkill	76
Becker	Strawberry	Centrarchid-Walleye	Walleye Centrarchid	1,522
Becker	White Earth	Hard-water Walleye	Walleye	2,079
Becker	Becker	Game	Game	135
Becker	Bass	Centrarchid	Centrarchid	123
Becker	Net	Centrarchid-Walleye	Walleye-Centrarchid	213
Becker	Buffalo	Centrarchid	Walleye-Centrarchid	376
Becker	Little Floyd	Centrarchid-Walleye	Centrarchid	205
Becker	Big Floyd	Centrarchid-Walleye	Walleye-Centrarchid	1,212
Becker	Wheeler	Bullhead	Regular winterkill	61
Becker	St. Clair	Bullhead	Regular winterkill	100
Becker	Sand	Game	Game	55
Becker	Canary	Bullhead	Regular winterkill	62
Becker	North Barnes	Bullhead	Regular winterkill	48
Becker	Marshall	Roughfish-gamefish	Warmwater gamefish	159
Becker	Boyer	Centrarchid	Walleye-Centrachid	310
Becker	Lee	Bullhead	Warmwater gamefish	98
Becker	Forget Me Not	Bullhead	Regular winterkill	361
Becker	Gourd	Bullhead	Regular winterkill	117
Becker	Beseau	Centrarchid	Walleye-Centrarchid	226
Becker	Peach	Unclassified	Unclassified	65
Becker	East LaBelle	Bullhead	Warmwater gamefish	146

Becker	Lime	Bullhead	Regular winterkill	98
Becker	Stinking	Bullhead	Regular winterkill	370
Becker	Sand	Centrarchid-Walleye	Walleye	199
Becker	Axberg	Bullhead	Regular winterkill	43

BELTRAMI COUNTY TOTAL = 20

Beltrami	Three Corner	Roughfish-gamefish	Trout	20
Beltrami	Unnamed	Unclassified	Warmwater gamefish	7
Beltrami	Boot	Roughfish-gamefish	Warmwater gamefish	267
Beltrami	Stone	Centrarchid	Centrarchid	32
Beltrami	Grant	Centrarchid	Centrarchid	208
Beltrami	Harley	Bullhead	Regular winterkill	95
Beltrami	Long	Centrarchid-Walleye	Walleye-Centrarchid	755
Beltrami	Deer	Centrarchid-Walleye	Walleye-Centrarchid	262
Beltrami	Island	Centrarchid	Regular winterkill	368
Beltrami	Big Buzzle	Centrarchid	Centrarchid	189
Beltrami	Little Buzzle	Centrarchid	Centrarchid	68
Beltrami	Whitefish	Centrarchid	Centrarchid	120
Beltrami	Myrtle	Centrarchid	Centrarchid	116
Beltrami	Sandy	Centrarchid	Walleye-Centrarchid	100
Beltrami	Sand	Centrarchid	Centrarchid	186
Beltrami	Moose	Centrarchid	Centrarchid	117
Beltrami	Balm	Centrarchid-Walleye	Walleye-Centrarchid	512
Beltrami	Delwater	Centrarchid-Walleye	Walleye-Centrarchid	180
Beltrami	Moose	Roughfish-gamefish	Walleye-Centrarchid	124
Beltrami	Clearwater	Centrarchid-Walleye	Walleye-Centrarchid	1,008

CLAY COUNTY TOTAL = 5

Clay	Lee	Centrarchid	Walleye-Centrachid	134
Clay	Fifteen	Unclassified	Unclassified	29
Clay	Perch	Bullhead	Warmwater gamefish	34
Clay	Burk	Unclassified	Unclassified	36
Clay	Silver	Centrarchid	Walleye-Centrarchid	114

CLEARWATER COUNTY TOTAL = 30

Clearwater	Squaw	Centrarchid	Centrarchid	151
Clearwater	Elk	Centrarchid-Walleye	Walleye-Centrarchid	271
Clearwater	Itasca	Centrarchid-Walleye	Walleye-Centrarchid	1,077
Clearwater	Daniel	Centrarchid	Centrarchid	0
Clearwater	Falk	Centrarchid	Walleye-Centrarchid	65
Clearwater	Bagley	Centrarchid	Warmwater gamefish	94
Clearwater	Long	Trout	Stream trout	145
Clearwater	Walkerbrook	Centrarchid	Walleye-Centrarchid	90
Clearwater	Long Lost	Centrarchid-Walleye	Walleye-Centrarchid	390
Clearwater	Cox	Centrarchid	Centrarchid	43
Cearwater	Glanders	Centrarchid	Centrarchid	39
Clearwater	Rogstad	Hardwater Walleye	Walleye	128
Clearwater	Minerva	Roughfish-gamefish	Warmwater gamefish	236
Clearwater	Lomond	Centrarchid	Centrarchid	91
Clearwater	Peterson	Centrarchid	Warmwater gamefish	77
Clearwater	Johnson	Centrarchid	Centrarchid	564
Clearwater	Deep	Centrarchid	Centrarchid	47
Clearwater	Lone	Centrarchid	Walleye-Centrarchid	69
Clearwater	Angus	Centrarchid	Centrarchid	46
Clearwater	Lower Camp	Centrarchid	Centrarchid	28
Clearwater	Bungo	Centrarchid-Walleye	Walleye-Centrarchid	87
Clearwater	McKenzie	Centrarchid	Centrarchid	0
Clearwater	Wapatus	Unclassified	Stream trout	24
Clearwater	Blakely	Centrarchid	Centrarchid	38
Clearwater	Jackson	Roughfish-gamefish	Centrarchid	120
Clearwater	Minnow	Centrarchid	Walleye-Centrarchid	102
Clearwater	First	Roughfish-gamefish	Warmwater gamefish	58
Clearwater	Second	Roughfish-gamefish	Warmwater gamefish	69
Clearwater	Lindberg	Bullhead	Warmwater gamefish	88
Clearwater	Pine	Roughfish-gamefish	Warmwater gamefish	1,188

HUBBARD COUNTY TOTAL = 8

Hubbard	Evergreen	Centrarchid	Unclassified	200
Hubbard	Minnie	Centrarchid	Centrarchid	76
Hubbard	Newman	Trout	Trout	39
Hubbard	Spearhead	Centrarchid	Centrarchid	173

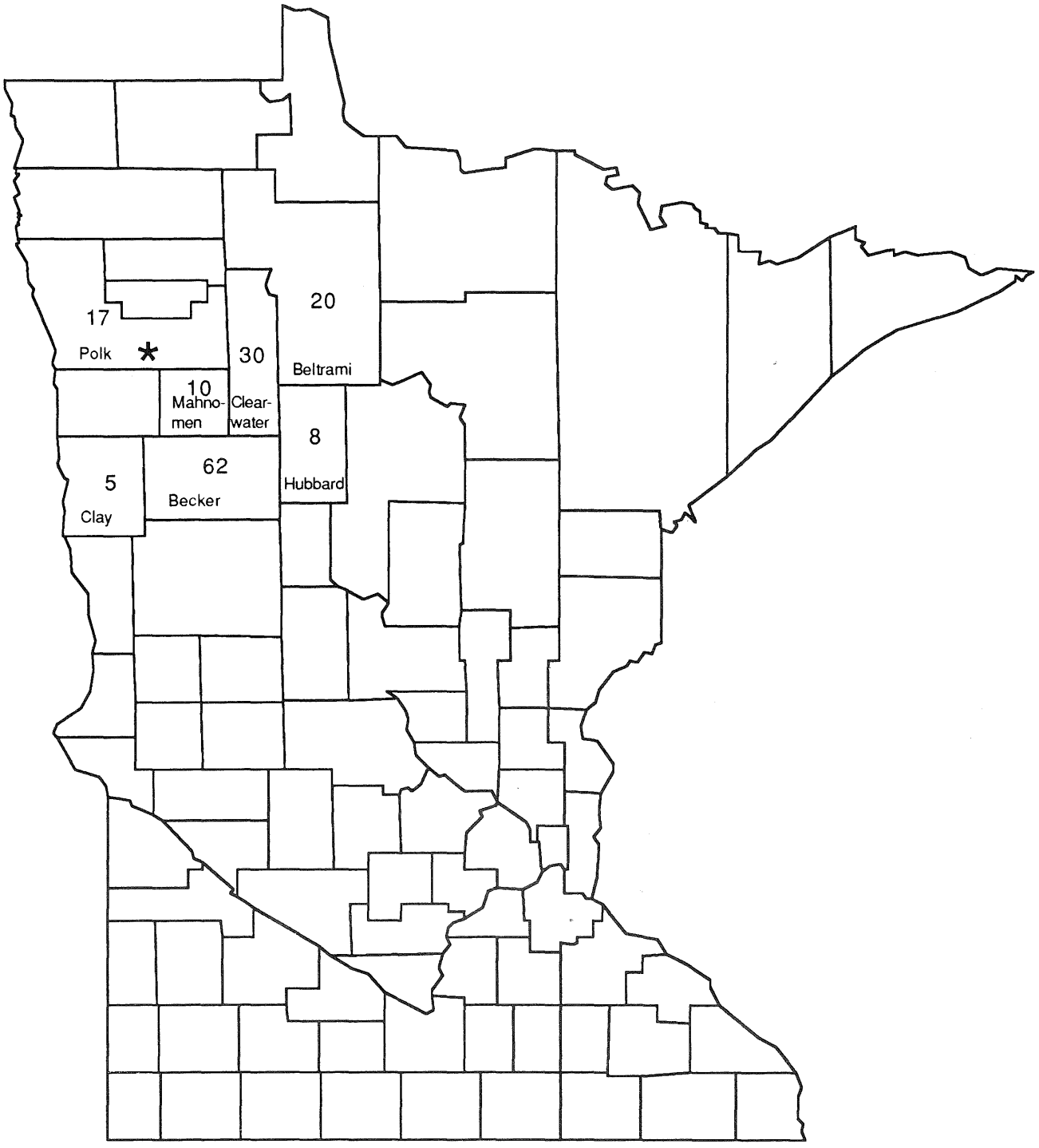
Hubbard	Frontenac	Centrarchid	Northern pike	204
Hubbard	Blacksmith	Trout	Trout	37
Hubbard	Coon	Centrarchid	Centrarchid	80
Hubbard	Hattie	Centrarchid	Centrarchid	259

MAHNOMEN COUNTY TOTAL = 10

Mahnomen	Lone	Centrarchid-Walleye	Walleye-Centrarchid	115
Mahnomen	Big Bass	Centrarchid-Walleye	Walleye-Centrarchid	689
Mahnomen	Little Elbow	Centrarchid	Walleye-Centrarchid	149
Mahnomen	South Twin	Centrarchid-Walleye	Walleye-Centrarchid	1,000
Mahnomen	North Twin	Centrarchid-Walleye	Walleye-Centrarchid	901
Mahnomen	Island	Centrarchid	Walleye-Centrarchid	611
Mahnomen	Snider	Centrarchid-Walleye	Walleye-Centrarchid	632
Mahnomen	McCraney	Centrarchid-Walleye	Walleye-Centrarchid	268
Mahnomen	Sargent	Centrarchid	Centrarchid	128
Mahnomen	Little Vanose	Centrarchid-Walleye	Walleye-Centrarchid	144

POLK COUNTY TOTAL = 17

Polk	Poplar	Unclassified	Walleye	75
Polk	Spring	Centrarchid	Centrarchid	136
Polk	Whitefish	Centrarchid-Walleye	Walleye-Centrarchid	226
Polk	Mule John	Centrarchid	Centrarchid	0
Polk	Cross	Centrarchid	Warmwater gamefish	328
Polk	Turtle	Centrarchid	Warmwater gamefish	545
Polk	Moe	Unclassified	Regular winterkill	0
Polk	Perch	Unclassified	Northern pike	0
Polk	Sand Hill	Roughfish gamefish	Warmwater gamefish	510
Polk	Store	Centrarchid	Walleye	0
Polk	Jeppson	Centrarchid	Centrarchid	0
Polk	Hill River	Centrarchid	Walleye-Centrarchid	96
Polk	Cameron	Centrarchid	Centrarchid	204
Polk	Sarah	Centrarchid-Walleye	Walleye-Centrarchid	296
Polk	Union	Centrarchid-Walleye	Walleye-Centrarchid	734
Polk	Cable	Centrarchid	Warmwater gamefish	143
Polk	Maple	Bullhead	Warmwater gamefish	1,477



FINAL EIS FIGURE 2-8
SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4
THE WINGER DAM
TOTAL LAKES HAVING SPORTFISHING OR SPORTFISHING POTENTIAL
(BY COUNTY)
(50-mile radius of T.H. 59 and Sand Hill River)

the hours of recreation would be attributable to boating and fishing. The existing data on lakes in Greater Minnesota generally assumes lakes over 150 acres with a permanent fish population. Applying this data to develop a measure of potential recreational use under an Alternative No. 1 scenario did not take into consideration the type and limitations of a reservoir as proposed by the Sand Hill River Watershed District and as established and addressed in the Draft and Final EIS. Therefore (aside from total acreage) these estimates of recreational potential and activity do not consider the particular aspects of the proposal of the Watershed District.

Water recreation use estimates for a potential impoundment in the Winger area, based on typical conditions prevalent in Greater Minnesota reveal a total of 53 to 62 activity hours per water surface acre devoted to fishing, other boating, and swimming. An activity hour represents one person doing some activity for one hour. Approximately 39 to 46 of these total activity hours would be expected to occur during the summer boating season, and 14 to 16 of the total activity hours would be expected to occur the rest of the year. Table 2-4 shows the activity hours per water surface acre according to the specific activity and the particular season.

In addition, water recreation use estimates for a potential impoundment in the Winger area, based on typical conditions prevalent in Greater Minnesota, reveal a total of 64,501 to 75,454 activity hours for the proposed 1,217 acres of the proposed reservoir devoted to fishing, other boating, and swimming. Approximately 47,463 to 55,982 hours of these total activity hours would be expected to occur during the summer boating season, and 17,038 to 19,472 hours of the total activity hours would be expected to occur the rest of the year. Table 2-5 shows the activity hours for the proposed 1,217 acres of the proposed reservoir.

TABLE 2-4
WATER RECREATION USE ESTIMATES OF POTENTIAL WINGER DAM RESERVOIR
BASED ON TYPICAL CONDITIONS FOUND IN GREATER MINNESOTA
ACTIVITY HOURS PER WATER SURFACE ACRE

SEASON	ACTIVITY			
	Fishing	Other Boating	Swimming	Total
Summer Boating	21-24[1]	9-11[1]	9-11[3]	39-46
Rest of Year	12-14[2]	2-2[2]	0	14-16
Total	33-38	11-13	9-11	53-62

1 In Greater Minnesota (nonmetropolitan), regional boating surveys indicated that the typical density of summer lake use ranged between 30 and 35 hours per acre of water surface, with 70% of the use being fishing. "Summer", as used in these estimates, extends from the Saturday of the Memorial Day weekend to Labor Day. (See: W. Barstad and D. Karasov, 1987, Lake Development: How Much is Too Much?, Minnesota Department of Natural Resources, Division of Waters, pp. 4 and 7.)

2 The figures for fishing and other boating for the rest of the year are based on the figures for the "Summer Boating Season" and the ratio of the amount of each type of activity in the summer to its total amount for the year. Ratios for each activity were taken from the following general population survey of outdoor recreation: Minnesota Department of Natural Resources, 1985-86 Outdoor Recreation and Expenditure Survey of Minnesotans. The geographic area for which the activity amounts were totaled in order to derive the ratios included the following counties in the general area adjacent to (approximately 50-mile radius) the proposed project site: Marshall, Pennington, Red Lake, Beltrami, Polk, Clearwater, Norman, Mahnomen, Hubbard, Becker and Clay.

3 The figures for swimming are based on fishing in addition to other boating for the "Summer Boating Season" and the ratio of swimming to fishing in addition to other boating found in the following general population survey of outdoor recreation: Minnesota Department of Natural Resources, 1985-86 Outdoor Recreation and Expenditure Survey of Minnesotans. The geographic area for which the activity amounts were totaled in order to derive the ratios included the following counties in the general area adjacent to (approximately 50-mile radius) the proposed project site: Marshall, Pennington, Red Lake, Beltrami, Polk, Clearwater, Norman, Mahnomen, Hubbard, Becker and Clay. In the general population survey, no swimming in lakes was found outside of summer in the target geographic area.

TABLE 2-5
WATER RECREATION USE ESTIMATES OF POTENTIAL WINGER DAM RESERVOIR BASED ON TYPICAL CONDITIONS FOUND IN GREATER MINNESOTA
ACTIVITY HOURS FOR PROPOSED 1,217 ACRES OF PROPOSED RESERVOIR[1]

SEASON	ACTIVITY			
	Fishing	Other Boating	Swimming	Total
Summer Boating Season	25,557-29,208	10,953-13,387	10,953-13,387	47,463-55,982
Rest of Year	14,604-17,038	2,434-2,434	0	17,038-19,472
Total	40,161-46,246	13,387-15,821	10,953-13,387	64,501-75,454

1 Values in this table were derived by multiplying the values in Table 2-4 by 1,217 acres.

Water recreation use estimates for a potential impoundment in the Winger area, based on maximum riparian-residential and public-access development as recommended by current DNR public policy, reveal a total of 68 to 136 activity hours per water surface acre devoted to fishing, other boating, and swimming. Approximately 50 to 100 of these total activity hours would be expected to occur during the summer boating season, and 18 to 36 of the total activity hours would be expected to occur the rest of the year. Table 2-6 shows the activity hours per water surface acre according to the specific activity and the particular season.

TABLE 2-6
WATER RECREATION USE ESTIMATES OF POTENTIAL WINGER DAM RESERVOIR
BASED ON
MAXIMUM RIPARIAN RESIDENTIAL AND PUBLIC ACCESS DEVELOPMENT
AS RECOMMENDED BY DNR CURRENT PUBLIC POLICY
ACTIVITY HOURS PER WATER SURFACE ACRE

SEASON	ACTIVITY			
	Fishing	Other Boating	Swimming	Total
Summer Boating Season	27-54[1]	11-23[1]	12-23[3]	50-100
Rest of Year	16-32[2]	2-4[2]	0	18-36
Total	43-86	13-27	12-23	68-136

1 Figures are based on a simulation of the impact of riparian development in Greater Minnesota (nonmetropolitan) on lake use levels. The range of values in the table are the low and high estimates from the simulation model. (See: W. Barstad and D. Karasov, 1987, Lake Development: How Much is Too Much?, Minnesota Department of Natural Resources, Division of Waters, pp. 11-16.)

2 The figures for fishing and other boating for the rest of the year in each case are based on the figures for the "Summer Boating Season" and the ratio of the amount of each type of activity in the summer to its total amount for the year. Ratios for each activity were taken from the following general population survey of outdoor recreation: Minnesota Department of Natural Resources, 1985-86 Outdoor Recreation and Expenditure Survey of Minnesotans. The geographic area for which the activity amounts were totaled in order to derive the ratios included the following counties in the general area adjacent to (approximately 50-mile radius) the proposed project site: Marshall, Pennington, Red Lake, Beltrami, Polk, Clearwater, Norman, Mahnomen, Hubbard, Becker and Clay.

3 The figures for swimming are based on fishing in addition to other boating numbers for the "Summer Boating Season" and the ratio of swimming to fishing in addition to other boating found in the following general population survey of outdoor recreation: Minnesota Department of Natural Resources, 1985-86 Outdoor Recreation and Expenditure Survey of Minnesotans. The geographic area for which the activity amounts were totaled in order to derive the ratios included the following counties in the general area adjacent to (approximately 50-mile radius) the proposed project site: Marshall, Pennington, Red Lake, Beltrami, Polk, Clearwater, Norman, Mahnomen, Hubbard, Becker and Clay. In the general population survey, no swimming in lakes was found outside of summer in the target geographic area.

Development amounts used in the simulation model for Table 2-6 are the maximum recommended by DNR current public policy. The development amounts are 50 assumed public access vehicle/trailer parking spaces and 320 riparian residential housing units for each 150 feet of lake frontage for a lake with a Recreational Development shoreland management classification. The 50 vehicle/trailer parking spaces are equivalent to the amount for lakes in Greater Minnesota between 1,000 and 1,500 acres, and the reservoir proposed by the Watershed District is 1,217 acres (proposed permanent pool water surface acreage). The 320 riparian residential housing units represent one unit for each 150 feet of lake frontage, and are assumed based on the recommendation in Draft EIS Section 1.11.7 for a Recreational Development shoreland management classification under Alternative No. 1. The project proposers estimate 9.1 miles of lake frontage is suitable for development under Alternative No. 1.

In addition, water recreation use estimates for a potential impoundment in the Winger area, based on maximum riparian residential and public access development as recommended by DNR current public policy, reveal a total of 82,756 to 165,512 activity hours for the proposed 1,217 acres of the proposed reservoir devoted to fishing, other boating, and swimming. Approximately 60,850 to 121,700 hours of these total activity hours would be expected to occur during the summer boating season, and 21,906 to 43,812 hours of the total activity hours would be expected to occur the rest of the year. Table 2-7 shows the activity hours for the proposed 1,217 acres of the proposed reservoir.

TABLE 2-7
WATER RECREATION USE ESTIMATE OF POTENTIAL WINGER DAM RESERVOIR BASED ON MAXIMUM RIPARIAN RESIDENTIAL AND PUBLIC ACCESS DEVELOPMENT AS RECOMMENDED BY DNR CURRENT PUBLIC POLICY
ACTIVITY HOURS FOR PROPOSED 1,217 ACRES OF PROPOSED RESERVOIR[1]

SEASON	ACTIVITY			
	Fishing	Other Boating	Swimming	Total
Summer Boating Season	32,859-65,718	13,386-27,991	14,604-27,991	60,850 121,700
Rest of Year	19,472-38,944	2,434-4,868	0	21,906-43,812
Total	52,331-10,4662	15,821-32,859	14,604-27,991	82,756-165,512

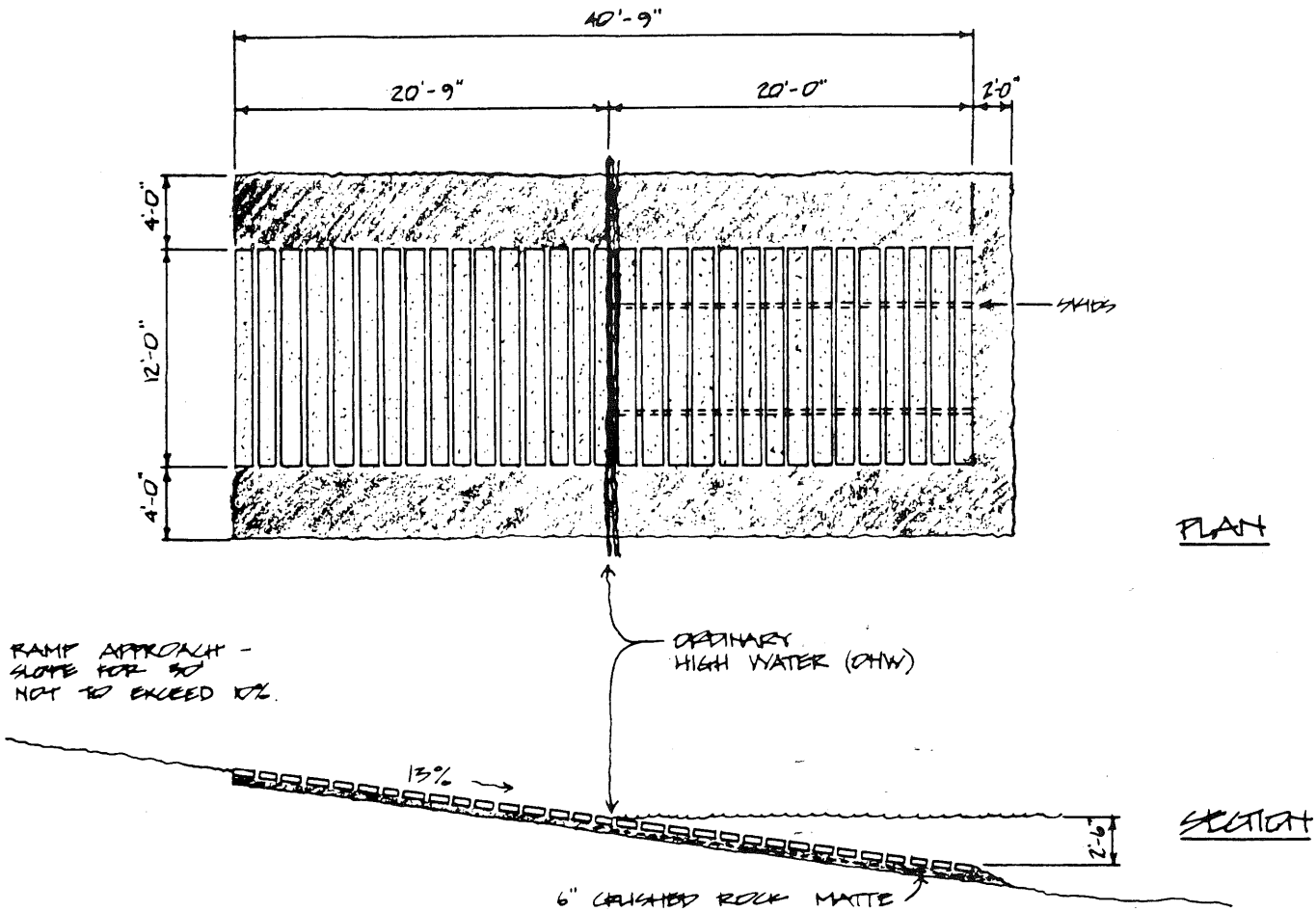
1 Values in this table were derived by multiplying the values in Table 2-6 by 1,217 acres.

As noted in Draft EIS section 3.3.5, implementation by the DNR of a fish management technique such as stocking requires the establishment of a public access. Department experience reveals the planning, development, acquisition, and construction by the DNR of a public access in this geographical vicinity involves costs of between $74,750 and $78,000. The typical costs associated with a public access are estimated to include:

* 15 car/trailer parking lot with roadway services of standard and or typical length
* Class V gravel surfaces and single concrete plank boat ramp
* Acquisition costs averaging $35,000
* Development costs averaging $30,000
* Administrative costs averaging $74,750 to $78,000 (15 to 20% of access project costs)
* Facility involves:
  - Roadway dimension of 22' wide
  - Ramp dimension of 12' X 40'
  - Landscaping, sodding costs of $1,500 to $2,000 (cost included in above listed development costs)
  - Parking stall dimensions of 12' X 50' for each parking stall

Final EIS Figures 2-9, 2-10, 2-11, and 2-12 show drawings illustrating a construction typical of a concrete plank single ramp public access, a screening typical of a public access landscape plan, a construction typical of road sections of public access road and parking areas, and a typical layout for a Class V public access, respectively.

In addition, at the Draft EIS public meeting, the project proposers indicated their intention to use two local roads as potential public accesses by keeping those roads open. Any DNR public access, however, must be designed to comply also with the above identified criteria and specifications.



NOTES:

- REINFORCED PRECAST CONCRETE PLANKS - 12 FEET LONG, 12 INCHES WIDE, AND 4 INCHES THICK. (SEE DETAIL # 16)
- SKIDS: 2 - 4" x 4" x 10' MEMBERS LAID END TO END AND EXTEND SLIGHTLY ABOVE THE 6" CRUSHED ROCK MATTE.
- 3/4" - 1½" CRUSHED ROCK TO BE USED FOR THE RAMP SHOULDERS, MATTE AND TO FILL THE SPACE BETWEEN PLANKS.
- USE 4' GRAVEL SHOULDER ONLY IN CRITICAL SITUATIONS FOR STABILIZATION.

FINAL EIS FIGURE 2-9

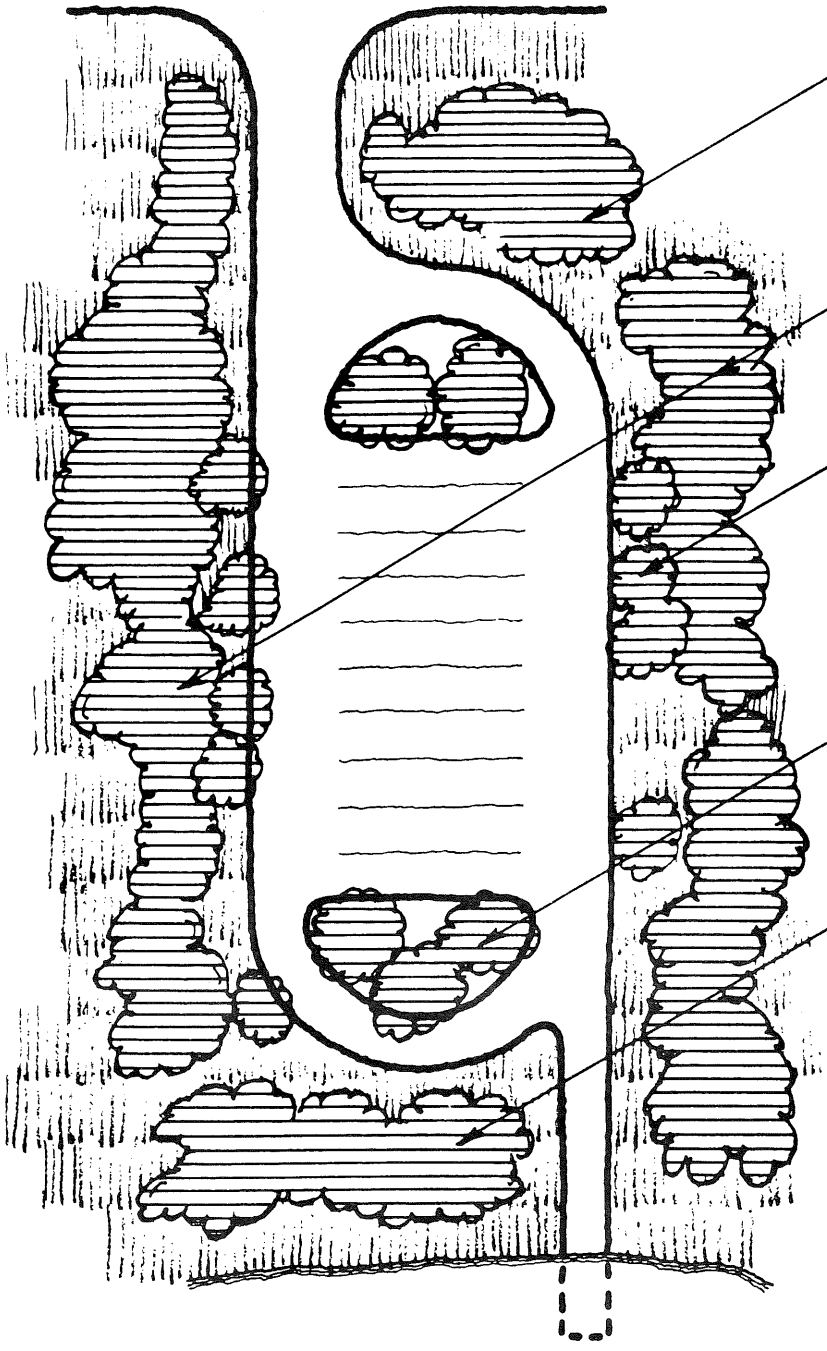
MINNESOTA DEPARTMENT OF NATURAL RESOURCES

BUREAU OF ENGINEERING

Designed BRACKE 9-79	Drawn BRACKE 9-79	CONSTRUCTION TYPICAL CONCRETE PLANK SINGLE RAMP
rvey	Checked LKKA 9-79	
Datum	Revised	

Keith C. Englesby
Date 12-12-79 ACTING Administrator

Sec.	T. N.	R. W.	
Dept. Code	Proj.	Sheet 11	File T-026



SCREEN FROM ROAD OR HIGHWAY - PRIMARILY UNDERSTORY WITH SOME OVERSTORY.

SCREEN FROM ADJACENT PROPERTY OWNERS - PRIMARILY UNDERSTORY WITH SOME OVERSTORY.

LARGE SHADE TREES - BOTH SIDES OF PARKING AREA.

PLANT ISLANDS WITH LARGE TREES FOR SHA[illegible] AND UNDERSTORY TO VISUALLY BREAK UP PARKING AREA.

SCREEN FROM LAKE - PRIMARILY UNDERSTORY WITH SOME OVERSTORY

NOTES:
MATCH PLANT MATERIAL WITH SPECIES THAT EXIST ON OR NEAR THE ACCESS SITE.

SEE PLANT MATERIAL INSTALLATION TYPICALS, T-011, SHEETS 1, 2, 3, & 4.

FINAL EIS FIGURE 2-10

SCALE 1" = 50'-0"

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

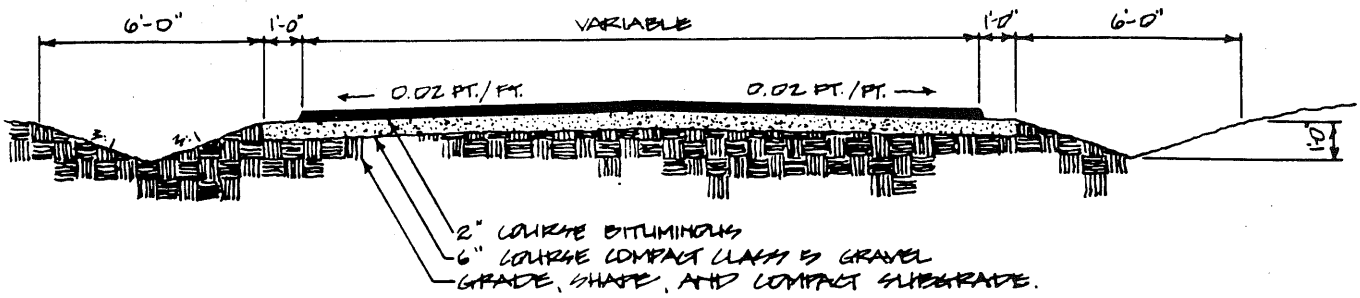
BUREAU OF ENGINEERING

Designed BRACKE 9-79	Drawn BRACKE 9-79	SCREENING TYPICAL	
Survey	Checked LISKA 9-79	LANDSCAPE PLAN	
Datum	Revised		

Keith C. Englesby
Date 12-12-79 ACTING Administrator

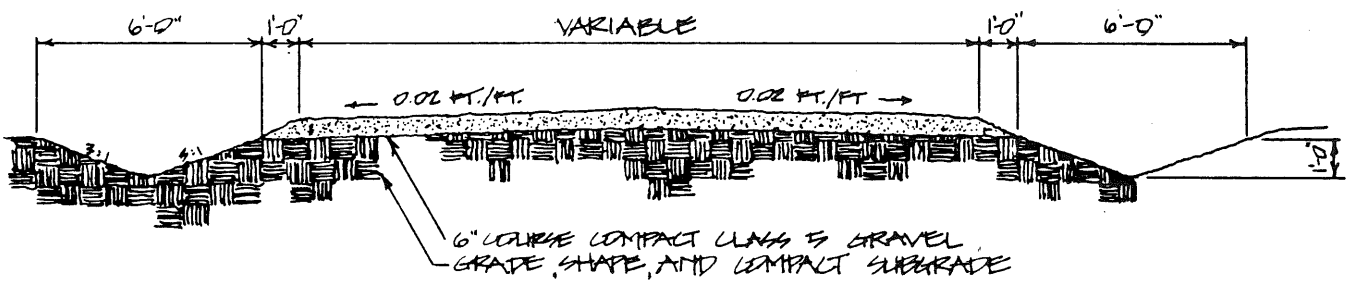
Sec.	T. N.	R. W.	
Dept. Code	Req.	Sheet 8	File T-026

TYPICAL SECTION - BITUMINOUS ROADS AND/OR PARKING AREAS



NOTE: DITCHES AND CURBS OPTIONAL RELATIVE TO SPECIFIC SITE REQUIREMENTS.

TYPICAL SECTION - COMPACTED GRAVEL ROADS AND/OR PARKING AREAS.



NOTE: DITCHES OPTIONAL RELATIVE TO SPECIFIC SITE REQUIREMENTS

FINAL EIS FIGURE 2-11

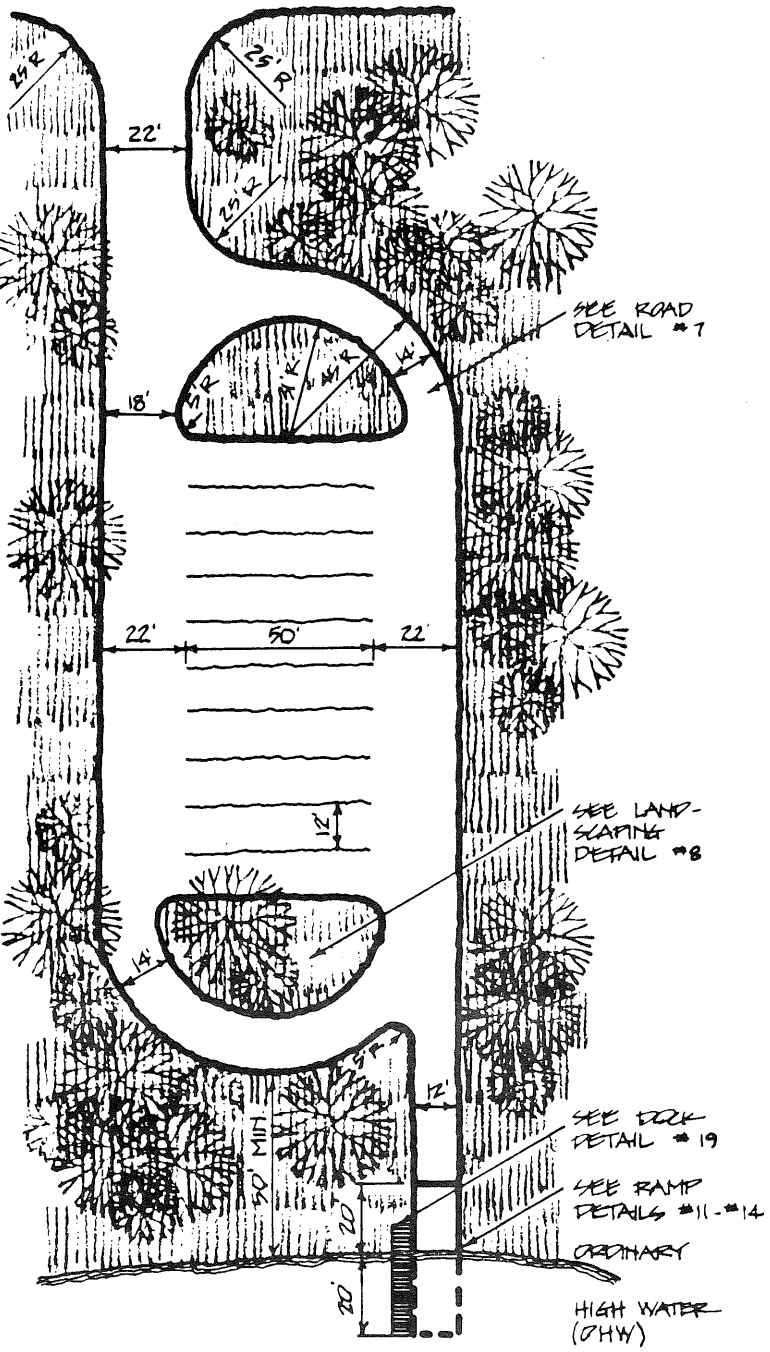
MINNESOTA DEPARTMENT OF NATURAL RESOURCES

BUREAU OF ENGINEERING

Designed BRACKE 9-79	Drawn BRACKE 9-79	CONSTRUCTION TYPICAL ROAD AND PARKING AREA. ROAD SECTIONS
Survey	Checked LISKA 9-79	
Datum	Revised	

Keith C. Englesby
Date 12-12-79 ACTING Administrator

Sec.	T. N.	R. W.	
Dept. Code	Req.	Sheet 7	File T-026



ACCESS - CLASS V

- FROM 5 TO 25 PARKING SPACES WITH ONE RAMP.
- PRE-CAST PLANK OR POURED CONCRETE RAMPS TO BE USED.
- A 13% SLOPE IS TO BE MAINTAINED FOR ENTIRE LENGTH OF RAMP.
- PLACING 20 FEET OF RAMP INTO WATER AT 13% SLOPE ALLOWS 2.6 FEET OF WATER DEPTH TO BE OBTAINED AT END OF RAMP.
- PARKING LOTS TO BE GRAVELED
- DOCK INSTALLATION OPTIONAL

SCALE: 1" = 50'-0"

FINAL EIS FIGURE 2-1

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

SECTION OF ENGINEERING		LAYOUT TYPICAL	
Designed BRAUKE 9-79	Drawn BRAUKE 9-79		
Survey	Checked LISKA 9-79	ACCESS - CLASS V	
Datum	Revised		

Keith C. Englesby
Date 12-12-79 ACTING Administrator

Sec.	T. N.	R. W.	
Dept. Code	Req.	Sheet 4	File T-026

3.0 RESPONSES TO WRITTEN AND PUBLIC MEETING COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

The Draft EIS public review and comment period began June 29, 1987 and concluded August 12, 1987. The public meeting on the Draft EIS was held on July 21, 1987 in Winger, Minnesota. The audio-recorded transcript of the meeting is available for review at:

Minnesota Department of Natural Resources
Office of Planning - 6th Floor
500 Lafayette Road
St. Paul, MN 55155-4010

Comments on the Draft EIS were received at the public meeting and during the official public comment period. All timely and substantive comments on the Draft EIS along with the Department's responses are included in this chapter. The comments and responses are organized as follows:

Section 3.1 - written comments on the Draft EIS, including those submitted at the public meeting.

Section 3.2 - statements and questions made orally at the public meeting and the responses to those statements.

3.1 DRAFT ENVIRONMENTAL IMPACT STATEMENT WRITTEN PUBLIC COMMENTS AND DEPARTMENT OF NATURAL RESOURCES RESPONSES

Const. 2 Project4.COR

TELEPHONE 218-281-3962

POLK COUNTY

HIGHWAY DEPARTMENT

TH 75 AND CR 233
P.O. BOX 27
CROOKSTON, MINNESOTA 56716

July 9, 1987

Ms. Charlotte Cohn
Minnesota Dept. of Natural Resources
Office of Planning
500 Lafayette Road
St. Paul, Minnesota 55146

Re: Proposed Sand Hill River Watershed District Project No. 4
Winger Dam Draft Environmental Impact Statement (DEIS)

Dear Ms. Cohn:

Upon review of the Draft Environmental Impact Statement (DEIS) for the proposed Winger Dam we noticed incorrect statements on the relocation of County State Aid Highway No. 8.

1 Section 1.9 (Road Relocations) and Fig. 1-4 indicate that C.S.A.H. No. 8 will be maintained at the current alignment but be raised to an elevation of 1200.0. The Polk County Highway Department has designed C.S.A.H. No. 8 to change its alignment to the west to avoid the proposed resulting reservoir. This would result in the relocation of 6088 feet of C.S.A.H. 8. We have anticipated this proposed design and alignment change since 1985 and completed the design in December of 1985. We are unaware of why the DEIS shows the incorrect alignment.

In order that all issues would be correctly stated in the DEIS we feel that the before mentioned correction should be made.

If you have any questions please contact our office.

Sincerely,

Michael P. Rardin, P.E.
Polk County Highway Engineer

MPR:cmb

RESPONSES:

3.1.1 POLK COUNTY HIGHWAY DEPARTMENT

1. The project engineers, Houston Engineering, Inc., were aware as of October 1985 that Polk County was designing Polk County State Aid Highway (CSAH) No. 8 for relocation to the west to avoid a proposed reservoir location at existing CSAH No. 8. However the exact location of the alignment was unknown prior to Polk County's comments on the Draft EIS. The proposed realignment would result in the relocation of 6,088 feet of CSAH No. 8.

Draft EIS Figure 1-4 (ownership map and site layout) and the Draft EIS figures depicting proposed Alternatives No. 2, No. 3, and No. 4 (Figures 2-1, 2-2, and 2-3, respectively) are reprinted in Final EIS section 2.1 reflecting the CSAH No. 8 realignment. The discussion of road relocations (Draft EIS section 1.9) has been combined with the Final EIS discussion of transportation facilities associated with the project proposal of the Sand Hill River Watershed District, as Final EIS

section 2.1.3 and revised to reflect the correct length and general location of the CSAH No. 8 realignment.

The project engineer will update current project plan sheets, road relocation descriptions, and cost estimates to reflect the completed Polk CSAH No. 8 relocation design. The project proposers have provided an updated project cost estimate for proposed Project No. 4 (Alternative No. 1) which is presented in Final EIS section 2.2. This updated cost estimate includes, among other items, current cost estimates for Polk County Road relocations based on information from the Polk County Engineer's office.

Daniel C. Thul
Bemidji Regional Office, DNR

8 July 87

I'd like to comment on 2 matters relative to the Winger Dam project since I can't attend the meeting on July 21st.

2 (1) No mention is made of closing the man-made flowing well that has been mining an aquifer 160' below the surface terrain for a decade. The pressure has gone down a lot in the last 2 or 3 years. Should this have appeared in the E.I.S.?

(2) I hope someone from DNR makes a firm disclaimer that this was not designed to be a fishing lake but a flood control dam. Many people are still talking about walleye fishing and since they won't read the report they will put the blame for poor fishing squarely on the DNR. (For some reason D.N.R. is a "Whipping boy" in rural Minn. and this will just be one more "I told you so").

I've gotten some ribbing for having suggested 2 yrs ago that we should plant Channel Cat in the dam & make a trip to Iowa to learn how to catch them.

I hope DNR will paint a clear verbal picture of the fishery aspect of the dam & tell them you didn't campaign for a recreational dam at this site.

My regards to Merlyn W. (We were on the Itasca advisory committee together).

Sincerely
Blanchard Krogstad
R1 Box 152
Winger, Mn 56592

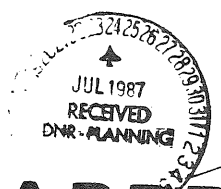
RESPONSES:

3.1.2 MR. BLANCHARD KROGSTAD

2. Draft EIS section 1.11.6 (Geology and groundwater levels and flow patterns) identified five sites as known to the DNR at the time of Draft EIS preparation which may adversely affect the area's water quality because they may have wells or septic systems located near or within the 1200 foot contour. These five sites were shown in the Draft EIS on page 1-20 in a map entitled "Groundwater Site Location Map for Structures Affected by Proposed Impoundment." Page 1-18 of the Draft EIS specified that minimum setbacks from an impoundment for wells and septic systems are governed by either the Minnesota Water Well Construction Code (Minn. Rules, Chapter 4725) or local Shoreland

Management ordinances, and identified that these codes and ordinances should be examined for the extent of proper remedial action for wells and septic systems affected by a proposed impoundment. Specifically, Minnesota Department of Health Rules require sealing (abandonment) of wells subject to flooding (Minn. Rules parts 4725.2500 and 4725.2900). Further, Draft EIS Chapter 5.0 (the listing of governmental permits, licenses and approvals), identified a Minnesota Department of Health regulatory requirement for a licensed well driller associated with well abandonment.

The project proposers will be responsible for insuring that abandoned flowing wells are sealed, or treated as required by Minnesota Department of Health regulations, other state regulation, or local ordinances. The project proposers have estimated these costs at $5,000 and have added these costs to its detailed estimate of costs for Alternative No. 1. Refer to Final EIS section 2.2 for the description and listing of these costs.



Name Blanchard & Krogstad
Address R 1, Box 152
City Wing
State MN Zipcode 56592

WE APPRECIATE ANY COMMENTS.

Please feel free to write down your comments on this sheet and leave it on the sign-in table.

Ms Charlotte Cohn.
DNR
St Paul
Dear Ms Cohn.

3 A

This is to confirm the fact that the "gusher" man made flowing well I referred to is in Sect. 20 in Sletten Twp., maybe 300 or 400 feet upstream. You can just see it when you stand on the bridge on the road that runs between sect. 19 and 20 (a casing sticking about 3' out of ground).

Thanks for a good review of the E.I.S.

3 B

I have one criticism of the entire development of this recreation pool dam & I know it is NOT the fault of the DNR: A vivid picture of the shoreline, siltation high BOD, & the general severe eutrophic nature of this dam was predictable, & should have been brought out when the land owners were clamoring for a "lake, not the dry dam By the time I moved to this area the die was cast. Most of these people have "stars in their eyes" →

RESPONSES:

3.1.3 MR. BLANCHARD KROGSTAD

3A. Draft EIS section 1.11.6 (Geology and groundwater levels and flow patterns) identified five sites known to the DNR at the time of Draft EIS preparation which may adversely affect the area's water quality because they may have wells and septic systems. These sites were shown on the map on Draft EIS page 1-20 entitled "Groundwater Site Location Map for Structures Affected by the Proposed Impoundment" located near or within the 1200 foot contour. The flowing well discussed at the public meeting and identified in this letter was not shown on the map on Draft EIS page 1-20 since its location was not part of the technical information researched and evaluated for the referenced section of the Draft EIS. The location of this flowing well has now been identified as being

in the SW 1/4 of the SW 1/4 of section 20 of Sletten Township (T147N, R41W) and the location is shown on a revised map which is reprinted in Final EIS section 2.3 as Final EIS Figure 2-5. The reprinted map is also revised with "DEIS Figure 1-9" as the correct figure number.

3B. Comment acknowledged by the DNR. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

3 B about the beautiful lake & its walleyes.
I'm happy that it was brought out so
strongly tonite (most people don't read EIS Report) -
Maybe the word will get around. I heard a comment
from behind me, "Why didn't they tell us this before?".

My question: If, later, I see this turn
into a mass of emergent & submerged vegetation
3 C and a mat of blue-green algae & the public becomes
disillusioned, could it revert to Alternative
2 (dry dam)?

Sincerely,
[signature]

RESPONSES:

3C. According to the project proposers, a purpose of their project proposal is to maintain a permanent pool suitable for recreational and aesthetic purposes. It is recognized that the upper reaches of the reservoir will be more characteristic of wetland type habitat. However, it is the Sand Hill River Watershed District's intent that the lower and deeper portion of the reservoir be maintained in an open water or lake type environment. In the deeper portions of the reservoir, it will be difficult for emergent or submerged vegetation to establish itself. Along the periphery of the reservoir, it may be necessary to periodically harvest or remove vegetation which becomes established. Removal of vegetation will require a DNR Aquatic Nuisance Control Permit. Since the need to periodically harvest or remove vegetation along the periphery of the proposed reservoir was not a component of the description of the proposal of the project sponsors (Alternative No. 1) outlined in the Draft EIS, the requirement of a DNR Aquatic Nuisance Control Permit was also not identified in the Draft EIS and the list of permits in Chapter 5.0 of the Draft EIS has been revised in Final EIS section 2.4 to reflect this change.

County Shoreland Management ordinances might aid in the control of human encroachment along the shorelines, thus limiting sediment and nutrient input and preventing algae blooms. While algae blooms can only survive with a sufficient input of such nutrients, algae blooms are likely to occur because the vast majority of sediment and nutrient input will come from the upstream watershed which would be unaffected by the operation of Shoreland Management ordinances for the adjacent reservoir.

Removal of vegetation which becomes established will reduce wildlife benefits and may affect the Habitat Evaluation Procedure (HEP) analysis for mitigation.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ST. PAUL FIELD OFFICE, (ES)
50 Park Square Court
400 Sibley Street
St. Paul, Minnesota 55101

IN REPLY REFER TO:

July 27, 1987

Ms. Charlotte Cohn
Minnesota Department of Natural Resources
Office of Planning
500 Lafayette Road
St. Paul, Minnesota 55155-4010

Dear Ms. Cohn:

This is in response to your June 29, 1987 letter requesting our review and comment on the Draft Environmental Impact Statement (EIS) for the proposed Winger Dam project located in Polk County, Minnesota. This project involves the construction of an earth-fill flood reduction dam designed to provide approximately 6800 acre-feet of flood storage. Five project alternatives have been analyzed including a no-build alternative.

4 A Alternative 1 which is identified as the preferred alternative involves the construction of an earth-fill flood reduction dam with a permanent recreational pool having a surface area of 1217 acres and a temporary flood pool of 396 acres for a total of 1613 inundated acres. Except for the no-build alternative, the remaining alternatives involve design modifications of this general concept.

4 B Based on our review of the Draft EIS, we are concerned with several aspects of the preferred alternative. Of primary concern is that the incoming flow into the proposed impoundment will not sustain the proposed recreational pool water elevations. As stated on page 3-42 of the Draft EIS, "A preliminary HEC-I analysis of incoming flow, based on a median year hydrograph with evaporation, shows there will be depletions in the reservoir."... "Based on the scenario described by the project sponsors, depletion will occur if existing conditions downstream are maintained (not augmented). Depletions will occur even if existing conditions downstream are not maintained. The proposed recreational reservoir design appears to be too optimistic for the size and inputs of the watershed". Inasmuch as these findings indicate that permanent recreational pool elevations cannot be maintained throughout the summer months, many of the benefits, i.e., recreation, fisheries, and land value, associated with this alternative should be reevaluated. The concept of this alternative functioning as a high quality recreational lake for boating, fishing, and swimming is questionable if pool elevations cannot be maintained.

RESPONSES:

3.1.4 U.S. FISH AND WILDLIFE SERVICE (USFWS)

4A. In Minnesota, for an EIS prepared to comply with Minnesota Environmental Review Program requirements, the agency responsible for EIS preparation (Responsible Governmental Unit or RGU) does not select a preferred alternative during the Final EIS process.

According to the Minnesota Environmental Policy Act, an EIS is to describe the proposed action in detail, analyze significant environmental impacts, discuss appropriate alternatives to the proposed action and their impacts, and explore methods by which adverse environmental impacts of an action could be mitigated (Minn. Stat. 116D.04, subd. 2a). The Environmental Quality Board (EQB) rules for the state Environmental Review Program require that the Final EIS respond to timely substantive comments on the Draft EIS consistent with the Scoping Decision document, and discuss responsible opposing views relating

to scoped issues which are not adequately discussed in the Draft EIS, identifying the position of the RGU on such issues (Minn. Rules part 4410.2700, subp. 1). When the DNR as the RGU determines whether the Final EIS is adequate, that decision is based on whether the Final EIS (1) addresses the issues raised in scoping so that all issues for which information can reasonably be obtained have been analyzed, and (2) provides responses to the substantive comments received during the Draft EIS review concerning issues raised during the Scoping Process (Minn. Rules part 4410.2700, subp. 4).

In addition, comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

4B. The DNR shares the concern of the USFWS that incoming flows into the reservoir proposed with Alternative No. 1 may not be sufficient to sustain recreational pool water elevations. As the USFWS notes in its comment letter, the instream flow operation plan presented in the Draft EIS (Draft EIS section 3.5) already specified that reservoir depletions will occur whether downstream conditions are maintained (not augmented) or are not maintained (Draft EIS page 3-42).

According to calculations submitted by the Sand Hill River Watershed District and based on data for shallow lakes and reservoirs, the project sponsors estimate mean the monthly evaporation in inches from April through September to be:

MONTH	MEAN MONTHLY EVAPORATION (IN INCHES)
April	1.30
May	2.50
June	3.60
July	4.75
August	5.20
September	4.20

The HEC-1 analysis completed by the DNR calculated inflow in cubic feet per second (cfs) during a median flow year from April through September to be:

MONTH	IN FLOW (IN CFS)
April	72.9
May	12.9
June	7.7
July	3.6
August	2.2
September	7.0

According to the DNR's analysis, and as discussed in the Draft EIS, inflow as balanced against evaporation in the summer months is not sufficient to sustain constant reservoir levels irrespective of maintenance of a protective flow downstream. The purpose of the instream flow analysis and the instream flow operation plan presented in the Draft EIS is to replicate the natural stream conditions.

The project sponsors estimate that based on their own evaluation, adequate hydrologic conditions exist to sustain the permanent reservoir pool level and to maintain required downstream flow conditions. The project sponsors also contend that no modifications to the proposed recreational opportunities or land value benefits are warranted at this time since they also anticipate the area's hydrologic conditions are capable of maintaining the design permanent pool level. Since the project proposers are not altering any plans relative to proposed reservoir water level and downstream conditions, there are no additional plans for water level augmentation.

The specific instream flow plan of operation presented in the Draft EIS (Draft EIS sections 3.5.2 in part, and 3.5.3) has been reorganized and revised in Final EIS section 2.5 to emphasize that while the exact methods and terms of operation to accomplish the outflow pattern will be determined during the DNR permitting process, the specific outflow pattern will remain as identified in the Draft EIS. The section as revised in the Final EIS also clarifies that the success of the operation plan will be monitored and modified by the DNR as required.

While the Draft EIS was also specific in its evaluation of the extremely limited recreational potential of the reservoir proposed by the Sand Hill River Watershed District, the description of the proposed reservoir (Draft EIS section 1.4) has been revised in Final EIS section 2.1.1 to more thoroughly discuss the nature of the proposed reservoir and the recreational and fishery potential which might be expected to occur under the scenario described for Alternative No. 1. As discussed in the Draft EIS, while one of the purposes of the project proposed by the Watershed District is to provide a recreational lake, the evaluation in the Draft EIS concluded that the recreational potential would be marginal at best and did not conclude that a "high quality recreational lake for boating, fishing, and swimming" could be anticipated to occur.

4 C

To meet established protected flow requirements on the Sand Hill River at Climax, Minnesota, a minimum flow of 1.7 cfs must be released from the reservoir on a continuous basis. This requirement, together with the limited size of the watershed above the project area, and inadequate streamflows during high evaporation periods (evaporation exceeds inflow in the months of July to September), would result in a depletion problem in the reservoir and insufficient stream flows to assimilate wastes from downstream sources. Although addressed in the Draft EIS, this point was not sufficiently discussed relative to its impact on maintenance of the pool elevation and the ensuing downstream impacts.

4 D

In Section 1.11.8, the nature and extent of the flooding problem witin the Sand Hill River basin is discussed. The most evident effects of spring and summer flooding described in this section are those associated with delayed spring planting and damage to maturing crops. Although not specifically stated, we concluded that a majority of the crop damage occurs within the floodplain of the Sand Hill River. Inasmuch as a major emphasis of the 1985 Farm Bill involved a commodity crop reduction program, you may want to consider identifying lands within the floodplain areas as set-aside lands and either retiring this acreage or allowing haying/grazing as the season permits.

4 E

Recent fishery data indicates a relatively poor diversity of fish within the project area due to low flows and oxygen deficiencies during the summer months. Maintenance of sufficient water elevations within the reservoir to effect a significant change in fish diversity is not expected. While total biomass may increase, species composition within the reservoir will remain similar to the existing conditions and will in all probability be dominated by black bullhead, white sucker, and northern pike. Unless a substantial effort is directed toward fishery enhancement, i.e., installation and operation of an aeration system, any sport fishery within the proposed reservoir would be subject to frequent winterkill conditions. Based on the above considerations, we believe that the sport fishery value of the proposed reservoir has been overestimated and its justification for the preferred alternative is questionable. The statement on page 3-20 that, ". . . it may be more economical to improve these local vicinity lakes for fishing than to develop a reservoir with low water quality and a marginal fishery" seems to us to be a valid conclusion.

A recently completed Habitat Evaluation Procedure (HEP) analysis documents the wildlife impacts associated with the various alternatives. By comparison, Alternative 1 significantly impacts more

RESPONSES:

4C. The Draft EIS discussion of the instream flow operation plan (Draft EIS sections 3.5.2 and 3.5.3) as revised in Final EIS section 2.5 already identifies the reservoir depletion problems that are likely to result as a result of natural streamflow and the size and inputs of the watershed. According to the specific instream flow plan of operation, releases from the proposed reservoir are not a minimum flow of 1.7 cfs on a continuous basis, but rather are the minimum of 1.7 cfs or the inflow. Depending on actual conditions, the required outflow may be more than 1.7 cfs. Refer also to the response to Comment 4B in this section for further information on the purpose of the instream flow operation plan and the plans of the project sponsors which do not provide for any streamflow augmentation.

The Minnesota Pollution Control Agency regulates standards for discharges and dischargers to waters of the state (Minn. Rules part 7050.0210) and the MPCA would likely control and adjust existing or proposed discharge permits to account for streamflow to adequately assimilate waste to be discharged downstream of the proposed reservoir.

4D. According to information from the project proposers, the Sand Hill River Watershed District does not have jurisdiction to identify or designate set-aside lands or to retire land outside of the area of the proposed project area. The Sand Hill River Watershed District is, however, committed to encouraging and promoting good land use practices in the proposed project vicinity.

4E. The Draft EIS Summary and section 3.3 presented a thorough assessment of the fishery potential resulting from construction of the reservoir proposed by the Sand Hill River Watershed District. The analysis presented in the Draft EIS included the results of a 1986 electrofishing survey at four different stations on the Sand Hill River (Draft EIS section 3.3.2), an assessment of existing fisheries resources (Draft EIS section 3.3.3), an evaluation of a projected fishery for the proposed project and proposed alternatives (Draft EIS section 3.3.4), and a description of various fish management techniques which could be implemented to manage a fisheries resource (Draft EIS section 3.3.5). As the Draft EIS identified, these evaluations concluded:

a) Habitat reduction and oxygen deficiencies during low flows are primary limiting factors to the establishment of a healthy fish community structure.
b) Reproductive success for northern pike is usually low in flood control reservoirs due to fluctuating water levels.
c) The physical and chemical characteristics of the reservoir proposed by the project proposers are most closely related to a bullhead type of lake.
d) The fishery potential of a reservoir on the Sand Hill River is limited by a number of parameters.
e) The fish management potential of the reservoir on the Sand Hill River is severely limited by results of water quality analysis, physical characteristics of the reservoir proposed by the Sand Hill River Watershed District, and the flow characteristics of the Sand Hill River.
f) Due to the potential for frequent winterkill, an aeration system is necessary to maintain any kind of a sport fishery. Nine factors need to be considered before aerating a marginal lake. Without an aeration system, it likely that winterkills will occur often enough to limit the development of a game fish population.
g) Based on water quality and physical data, the most appropriate species for a fish stocking program would be limited to largemouth bass, bluegill, and channel catfish.
h) Other marginal fish lakes close to the Winger, Minnesota area experience periodic winterkills due to oxygen depletion.
i) The fishery potential from development of the proposed reservoir is marginal.

The DNR, at the Draft EIS public meeting, stated that a primary finding and recommendation of the fisheries investigation presented in the Draft EIS was that "to maintain any kind of sport fishery, installation and operation of an aeration system would be required." Refer also to Final EIS section 2.1.1 for a revised discussion and summary of the description of the proposed reservoir and of the fishery resource potential that might be anticipated to occur under an Alternative No. 1 scenario.

4 F wetland habitat, (approximately 500 acres lost) and upland habitat than the remaining alternatives. Is federal monies are used in support of this project, the Final EIS should address compliance with Executive Order 11990, concerning wetland protection.

4 G As identified on page 3-31, "Alternative No. 1 would have a negative impact on HEP wildlife species within the study area and mitigation would be needed to offset these impacts." Should an alternative be selected which requires wetland/upland compensation, specific mitigative measures should be coordinated with and endorsed by the HEP team. Once accepted by the HEP team, the mitigation plan should then be presented and discussed in the Final EIS. It would therefore be possible to include any cost associated with mitigation in total project costs.

If an alternative is selected which requires wildlife mitigation, the criteria identified in Section 4.3.1, page 4-3 should be adhered to. The Service also recommends that any wildlife mitigation be accomplished concurrent with project construction to reduce to the extent possible, potential losses of annual habitat units.

4 H Based on our review of the material provided we recommend selection of Alternative 4. This alternative provides equal flood protection as do the other alternatives, requires less easement acreage, appears less cost prohibitive and requires no wetland compensation. While Alternative 1 has been suggested as the preferred alternative, we believe the justification for this project is based on unsubstantiated assumptions that have been questioned by various reviewers. Of considerable concern, is that maintenance of the proposed water elevations within the proposed reservoir may not be possible. In addition, impacts to wildlife would be greater with Alternative 1 and considerable wildlife compensation, i.e., wetland/upland, would be required.

4 I We appreciate the opportunity to provide these comments and look forward to working with representatives of your agency as you deem appropriate.

Sincerely,

Robert F. Welford
Field Office Supervisor

RESPONSES:

4F. Final EIS section 2.2 and Table 2-1 describe and show the detailed estimate of costs for the project proposal of the Sand Hill River Watershed District (Alternative No. 1) as submitted by the project proposers. According to this information, since no federal monies are intended to be used for the proposed project, specific compliance with Federal Executive Order 11990 for wetland protection is not required to be addressed.

4G. As the Draft EIS specifies, wetland species mitigation is required for Alternative No. 1 (proposed project) and Alternative No. 2 (flood reduction dam without permanent pool), and upland species mitigation is required for all alternatives except Alternative No. 5 (no-build). The wildlife mitigation measures, mitigation requirements, and methods to accomplish wildlife mitigation discussed in Draft EIS section 4.3 remain valid and no changes are warranted for discussion in the Final EIS.

The project proposers are committed to working with the DNR and with the HEP team in developing a satisfactory mitigation plan (including potential sites and costs) for impacts to wildlife resources. Since the specific extent of wildlife mitigation will occur as components of regulatory processes, the final plan will

not be presented and discussed in the Final EIS. However, it is the Department's position that wildlife mitigation will adhere to the criteria delineated in Draft EIS section 4.3.1, and the specific mitigative measures will be coordinated with and endorsed by the HEP team.

The project proposers concur with the DNR's position that mitigation of impacts to wildlife resources will be required as a part of any DNR permits, and that the mitigation plan must be in place prior to the issuance of DNR permits required for proposed construction. Since the mitigation plan will be in place prior to the issuance of DNR permits, wildlife mitigation will occur concurrent with project construction, to reduce potential losses of annual habitat units.

Though the comments submitted by the U.S. Fish and Wildlife Service were limited to wildlife resources mitigation, this response is equally applicable to the specifications and criteria outlined for mitigation measures for downstream resources in Draft EIS section 4.4.

Final EIS section 2.2 provides a discussion of updated cost projections for Alternative No. 1 as submitted by the project proposers. Table 2-1 in that section shows the project proposer's detailed estimate of total project costs for that alternative, and part E (summary section) delineates mitigation costs as an element of right-of-way costs. The project proposers are committed to the need for wildlife resources mitigation as shown by the inclusion of mitigation costs within right-of-way costs. However, the project proposers have not increased the actual $900,000 amount for right-of-way from previous estimates submitted to the Department in 1986 when the determination of the need for mitigation as a component of direct proposed project implementation had not been established.

4H. Comments and concerns acknowledged by the DNR. See also the response to Comment 4A in this section which describes the purpose of an Environmental Impact Statement and the responsibilities of the DNR as the preparer of the Final EIS. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

4I. Comment acknowledged by the DNR. The Department appreciates the cooperation and participation of the U.S. Fish and Wildlife Service as a member of the HEP team on the HEP study, evaluation and analysis completed as a component of the Draft EIS.

LAND OF QUALITY FOODS

90 W. PLATO BOULEVARD
SAINT PAUL, MN 55107
(612) 296-1488

STATE OF MINNESOTA
DEPARTMENT OF AGRICULTURE

July 31, 1987

Ms. Charlotte Conn
Environmental Planner
DNR Office of Planning
500 Lafayette Road
St. Paul, MN 55146

Dear Ms. Conn:

The Minnesota Department of Agriculture has completed its review of the Draft Environmental Impact Statement on the Sand Hill River Watershed District Winger Dam Project.

The Draft Environmental Impact Statement (DEIS), and the preceding documents do a very good job of identifying the direct impacts to agricultural lands, and the indirect impacts of the project on agricultural transportation systems and "severance and triangulation" issues.

5 The one area we would like to see more detail on is the issue of the economic impact to the agricultural economy in the area caused by the loss of cropland due to the project. The preliminary engineer's report states that "the impact of the loss of this cropland on the agricultural economy of the area is expected to be non-significant." (Page 25). I would hope that the final EIS could explain how this conclusion was reached, perhaps by using some of the figures from the economic analysis.

Thank you for the opportunity for continuing comment on this project. Please contact me with any questions.

Yours truly,

MINNESOTA DEPARTMENT OF AGRICULTURE

Paul Burns

Paul D. Burns, Program Coordinator
Natural Resources Planning

PDB:cd

cc: J. Nichols
G. Heil
J. Birkholz

AUG 1987
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RESPONSES:

3.1.5 MINNESOTA DEPARTMENT OF AGRICULTURE

5. A summary of the potential for agricultural cropland loss due to creation of a proposed reservoir(s) as presented in the Draft EIS indicates that this loss for each of the proposed alternatives is:

Alternative	Cropland loss due to proposed reservoir (acres)
No. 1	- 248 acres
No. 2	- 49 acres
No. 3	- 48 acres
No. 4	- 24 acres
No. 5	- 0 acres

The proposed proposers estimate that a large percentage of the cropland affected by creation of a reservoir is currently subject to periodic flooding. Current costs for planting and harvesting in the proposed project vicinity are about $75 per acre per year. Gross revenues from these crops are estimated to average about $90 per acre per year. The project proposers estimate net profit from agricultural utilization of these croplands to be $15 per acre per year, and to represent the annual impact on the regional economy. However, net profit is not the only impact on the regional economy. Current per acre per year production costs generate some activity in the regional economy and this activity would be lost under any of the construction alternatives. The average annual regional economic loss has been based, for each alternative, on a calculation of the amount of acres of lost cropland (inundated acres) X the estimated net profit from agricultural utilization of the croplands proposed to be inundated. The project proposers have estimated the average annual regional economic loss for each of the alternatives to be:

Alternative	Estimated average annual regional economic loss
No. 1	$ 3,720
No. 2	$ 725
No. 3	$ 720
No. 4	$ 360
No. 5	$ 0

This economic loss due to any of the proposed project alternatives is estimated to represent the elimination of net agricultural productivity. As a result of current periodic flooding, the affected lands are already marginal (in terms of agricultural productivity) which partially accounts for the relatively low net profit of $15 per acre per year. The project proposers also estimate that the impact on the local agricultural economy from Alternative No. 1 is not considered to be significant since approximately 907 acres of downstream cropland could be made more productive as a result of proposed reservoir construction.

GEE, MINN
JULY 31, 197

DEPT. OF N. R.
ST PAUL, MN.

GENTLE EN:

I WROTE A LETTER TO YOU ABOUT A YEAR AGO VOICING MY OPPOSITION TO THE BUILDING OF THE WINGER DAM. THIS IS TO REAFFIRM THE SAME.

WE HAVE ENOUGH POT HOLES IN MINNESOTA WITHOUT ADDING ANOTHER ONE COSTING 5.2 MILLION DOLLARS. AND A POT HOLE IT WILL BE COMPLETE WITH TREELESS BLACK LOAM SOIL SHORE LINES AND SHALLOW DORMANT WATER BREEDING MOSQUITOES AND UNFIT FOR FISH.

6

WE HAVE PLENTY OF NATURAL LAKES IN OUR AREA-YES, WITHIN 5 OR 6 MILES.

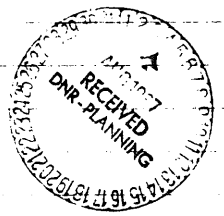
I CAN'T UNDERSTAND HOW SO MANY SENSIBLE PEOPLE CAN BE SO UNSENSIBLE WHEN IT COMES TO WEIGHING THE PROS AND CONS OF THES PROJECT.

THIS PROJECT SHOULD BE ABANDONED WITHOUT FAIL BEFORE IT BECOMES THE BOONDOGGLE OF THE CENTURY.

THANK YOU FOR YOUR ATTENTION.

SINCERELY,

Wesley Hodous



RESPONSES:

3.1.6 MR. WESLEY HODOUS

6. Comments and concerns acknowledged by the DNR. See also the response to Comment 4A in section 3.1.4 which describes the purpose of an Environmental Impact Statement and the responsibilities of the DNR as the preparer of the Final EIS. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

Recd Aug 4

Minnesota Department of Transportation

Transportation Building, St. Paul, MN 55155

July 31, 1987

Phone 296-1652

Charlotte Cohn
Minnesota Department
of Natural Resources
Office of Planning
500 Lafayette Road
St. Paul, MN 55155-4010

Re: Sand Hill River Watershed District Project No. 4
The Winger Dam
Draft Environmental Impact Statement

Dear Ms. Cohn:

The Minnesota Department of Transportation has completed a review of the Draft Environmental Impact Statement (EIS) on the proposed Winger Dam. We offer the following comments for your consideration in preparing the Final EIS on this project.

1. Page 1-13. Section 1.6, paragraph 2 discusses the design of approaches to the emergency spillway and states that the approaches are designed with vertical curve transitions to maintain sufficient sight distance. Mn/DOT believes that these sight distances are minimally acceptable.

Generally, when Mn/DOT designs new grades, they are developed with more desirable sight distance criteria. In fact, prior to development of a plan for a dam to facilitate crossing of Trunk Highway (TH) 59, a bridge was designed for the valley crossing. In Mn/DOT's bridge design, a "60 MPH non-striping sight distance" was used. Since we do not view the proposed design as being as safe as Mn/DOT's proposed design, we would suggest additional language being added in the Final EIS to explain why the proposed curve transitions were selected. We also suggest that the project proposer continue to work with Mn/DOT's District Office to assure that safe operation of TH 59 is maintained with the proposed dam design.

7 A

2. Page 1-13. Following Section 1.6, Mn/DOT would like to see the inclusion of a new section which would discuss construction of transportation facilities associated with the proposed project. We feel this is needed since construction of TH 59 over the dam is an important element of the project equal to construction of spillways. Perhaps Section 1.9 Roadway Relocation could be combined within this larger section.

7 B

An Equal Opportunity Employer

RESPONSES:

3.1.7 MINNESOTA DEPARTMENT OF TRANSPORTATION

7A. According to information from the Sand Hill River Watershed District, final design of the proposed Class I dam structure will determine the exact location of specifications of the emergency spillway. The transition from the dam surface roadway to the roadway north and south of the proposed dam will include vertical curve alignments to satisfy Minnesota Department of Transportation 60-mile per hour non-striping sight distance criteria. The T.H. 59 alignments shown in Draft EIS Chapter 1.0 and as part of information incorporated by reference in the Draft EIS (preliminary design data prepared by project engineers), were intended primarily to identify the proposed emergency spillway location. Final alignments will be determined and designed when the exact location of the emergency overflow spillway is ascertainable.

7 B The new section should include information regarding the history of the decision to incorporate the crossing of Sand Hill River as part of the dam embankment and to leave TH 59 unimproved until the Watershed District could develop the project.

7 C 3. Page 1-14. Section 1.10 construction methods should be expanded to include plans for rerouting TH 59 traffic during construction. Road closures and detours should be identified and time frames for closures and duration of closures should be discussed. We are particularly concerned about detours during the winter.

7 D 4. Page 2-8. We would suggest adding language to Section 2.6 to more clearly describe planned TH 59 roadway and bridge improvements that would occur if the dam were not built.

7 E 5. Page 2-9. We believe that Section 3.1 concerning construction associated impacts should more specifically address impacts to persons traveling TH 59 as well as impacts resulting from relocation of county roads. Rerouting and relocation of traffic can have significant social impacts, as well as safety impacts, should emergencies arise in nearby communities.

7 F 6. Page 3-4. Section 3.2.8 discusses operation of the dam during flooding conditions. Since a 1,420 foot depressed section of TH 59 will be utilized for discharge, we believe more information should be provided about rerouting of TH 59 during these periods and how switching traffic will be accomplished.

7 G Since utilization of the highway as a spillway could result in deterioration of the roadway surface, Mn/DOT would suggest that the Final EIS clarify responsibility for reconstruction of the roadway should it be required.

7 H Thank you for the opportunity to review the Draft EIS for the proposed Winger Dam. If you require any additional information from Mn/DOT or have any questions regarding our comments, please contact George Welk, Design Engineer at Mn/DOT's District Office in Bemidji, or myself.

Sincerely,

Cheryl Heide

Cheryl Heide
Environmental Coordination Unit

RESPONSES:

7B. The DNR concurs that the discussion of roadway relocations in the Draft EIS should be expanded to include a discussion of construction of transportation facilities associated with the project proposal of the Sand Hill River Watershed District (Alternative No. 1) because of the importance of reconstruction of T.H. 59 over the proposed dam. The discussion of roadway relocations in Draft EIS section 1.9 has been revised and expanded in Final EIS sections 2.1.2 and 2.1.3 to address both proposed modifications to T.H. 59 associated with Alternative No. 1 and roadway relocations impacting county roads, county state aid highways, and township roads.

7C. The discussion of construction method control measures (Draft EIS section 1.10) has been expanded in Final EIS section 2.6 to include the proposed plans of the project proposer to reroute T.H. 59 traffic during construction, and the

identification and estimated time schedules for road closures and detours (especially detours during the winter months).

7D. The DNR concurs that the Final EIS should include a discussion and description of MNDOT planned T.H. 59 roadway and bridge improvements in the area that would occur if the project proposed by the Sand Hill River Watershed District were not constructed. The Draft EIS description of Alternative No. 5, the no-build alternative, has been revised and expanded in Final EIS section 2.7 to include this additional discussion.

7E. The DNR concurs that the discussion in the Draft EIS concerning construction associated impacts should be expanded to address impacts to persons traveling T.H. 59 as well as impacts resulting from the relocation of county roads. Draft EIS section 1.10 is revised and expanded to reflect this additional information in Final EIS section 2.8.

7F. According to the project proposers, as currently proposed, use of the depressed T.H. 59 road section as an overflow spillway could occur only if the 100-year, 10-day event is exceeded. Normal hydraulic criteria for the design of bridges and culverts for highways with average daily traffic (ADT) volumes comparable to T.H. 59, require sufficient capacity to pass the 50-year frequency flood. On protected watercourses, stage increases must not exceed 0.5 feet over the 100-year flood. The project proposers assume that a risk based design will result in some large floods exceeding and overflowing the structure. The position of the project proposers is that the proposed dam will experience less frequent overtopping than a standard bridge design at the same location. Flooding conditions that would result in overtopping of the proposed dam would most likely cause similar or more severe problems at all downstream Sand Hill River crossings. A flood of a magnitude to result in overtopping, would most likely affect other state highways in the general area of the proposed project. Any plan for rerouting traffic would be dependent on flooding conditions at other locations throughout the region. The project proposers assume that rerouting of traffic will be coordinated through MNDOT as part of emergency response operations and would likely depend upon the nature of the specific flood event and details related to outlining emergency response actions will likely be developed.

7G. The discussion of dam safety environmental impacts in the Draft EIS (section 3.2.8) accurately identifies that the Sand Hill River Watershed District would be responsible for the operation and maintenance of the proposed project including the proposed dam. However, to clarify the extent of responsibilities between the project proposers and the Minnesota Department of Transportation related to the reconstruction of the proposed roadway in the event of roadway surface deterioration, Draft EIS section 3.2.8 has been revised and expanded in Final EIS section 2.9 to specify these responsibilities.

7H. Comment acknowledged by the DNR. The Department appreciates the cooperation and participation of the Minnesota Department of Transportation as a member of the HEP team on the HEP study, evaluation and analysis completed as a component of the Draft EIS.

Winger,MN
August 2, 1987

Ms Charlotte Cohn
D.N.R., Box 10c
500 Lafayette Road
St. Paul, MN 55146

Dear Ms Cohn:

The Following comments are a composite analysis of the opponents to the Winger dam project.

The very first action that should have been taken eight (8) years ago by the Land Mill Board of this project would have been a cost-benefit feasibility study by unbiased qualified personnel. There is some evidence that a study was made from our contact with the Polk Co. Engineer's office, but the results were never revealed to the taxpayers.

When the justification for flood control diminished, in so much as no benefit would accrue to the upper valley (above the dam), a new approach was offered to the area residents. This was described as a beautiful lake that would quickly become a recreational mecca in an otherwise barren land. However this area (East Polk Co.) already has 76 natural lakes, the majority of them as yet undeveloped in the first 100 years of occupancy.

8 A

The proponents of the project begin to analyze the proposed lake more carefully, and made some astounding discoveries. The fluctuating shoreline made for difficulty in erecting dwellings and docking facilities. The shore would consist of a variety of soils, but no gravel and very few trees. This meant additional expense to establish a desirable beach.

A further study was made of existing impoundments, i.e. Fort Peck at Glasgow, MT and the Pipestone Dam and Jamestown Dam in N DAK. Fort Peck built in 1936, the largest earth-filled dam in the world, where a huge resort hotel had been constructed at the dam site, appeared to be abandoned and falling into disrepair. There was no evidence of any recreational activity---no beaches, no boats, and no buildings. However, they do have a huge hydro-electric plant at the dam which undoubtedly is very beneficial. This observation was made in June of this year at the peak of vacation season.

We spoke to a few residents about the lack of interest in developing the recreational assets, and they mainly preferred going east to MN for walleye fishing at some of our 10,000 lakes with sandy beaches backed by beautiful forests.

The consensus was similar at the Pipestone and Jamestown dams. The Jamestown was built about 25 years ago and the Pipestone in 1972-74, so ample time

has gone by for developing these areas and it appears unlikely in the forseeable future. Also there seems to be a problem in the establishment of desirable fish species. At present there are bull-heads and pan fish. A recent attempt was made by the state to introduce the zander, but this effort was aborted due to a virus infection.

The conclusion appears to be that it is quite difficult to create a lake that can compete with our abundant natural lakes. The observations made by Mr. Dan Thule, at Winger on July 21, 1987, were further proof that the expenditure of many millions of dollars was indeed an exercise in futility. How much proof is needed before the taxpayers in MN realize that these funds would be more wisely spent to sustain our educational system, our existing roads and bridges, and all the other accepted facilities that are already in place and in need of constant maintenance. Taking another mortgage of this magnitude for the purpose of creating a known liability does not qualify as "a perfect plan".

8 A The loss of the two excellent roads across the valley will present a costly inconvenience to the residents from now on and could become greater if highway 59 would be banned for farm equipment. The utilities, electric and phone companies, have an added expense to pass on to the consumer in future billings. The loss of the valley for grazing purposes will put several diversified farmers out of business and thus hasten the growing number of farms lost to the Winger trade area. This loss of population is the principal reason for the demise of small towns like Winger, and any action that accelerates this should be the first concern of our remaining populace. Since many of the 27 farmers losing land to this project are smaller farmers, they will bear the burden of loss to their holdings and in some instances have no chance, but to sell to existing larger farms at usually depreciated valuation.

Two actual, verifiable polls have been made of these projects. The first, recorded in the clerk's records of K-ute Township taken in February 1985, show 89 of 93 taxpayers opposed the Winger impoundment. The other, made by members of our group, showed 80% opposed. This included several residents of Winger and farmers affected by loss of acreage.

8 B Further proof of the unacceptability of this project is evident in the manner in which financial figures were misrepresented in putting together the financial package necessary to proceed. The following figures are taken from a release dated 3-1-85 prepared for the Sand Hill District listed under "financial commitments to date"---Item 1 - $50,000 by Gletten Township and Winger Township. This item is false. Item 2--$600,000-"Right of Way Donations" from project land owners. This is also false. We have specifically contacted responsible parties, and in all cases we found, NO commitments of the above were ever made.

This is a partial list of the grievances we wish to express for your

RESPONSES:

3.1.8 MR. JOHN W. MCWILLIAM

8A. Comments and concerns acknowledged by the DNR. See also response to Comment 4A in section 3.1.4 which describes the purpose of an Environmental Impact Statement and the responsibilities of the DNR as the preparer of the Final EIS. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

future consideration in determining the feasibility of this project.

Respectfully yours,

John W. McWilliam
Representative, Taxpayers Protest Group

RESPONSES:

8B. The Scoping Environmental Assessment Worksheet (EAW) for this proposed project, distributed by the DNR in 1985, included an identification of financial commitments for the project proposed by the Sand Hill River Watershed District as of September 1985 (Scoping EAW attachment 5). This information has been updated by the project proposers and is provided as a component of Final EIS section 2.2 which includes a discussion of updated cost projections for Alternative No. 1 as submitted by the project proposers. Table 2-1 in that section shows the project proposer's detailed estimate of total project costs for Alternative No. 1 and this updated information is listed as part of "Funding Sources." The monies associated with the funding sources remain the same as those shown in the Scoping EAW in 1985 with the exception of the Polk County Engineer's estimate for costs of road relocations.

In addition, the 1984 legislation which provides an appropriation for construction of the proposed project requires that prior to the formal release of funds, the DNR make a determination that additional financing necessary to complete the proposed project has been committed by other sources.

August 4, 1987

RR 3, Box 116
Fosston, Mn 56542
218-435-1138

and

370 W. Finn
St. Paul, Mn 55104
612-645-7333

Ms. Charlotte Conn
Office of Planning
Mn Department of Natural Resources
500 Lafayette Road
St. Paul, Mn 55155

Dear Ms. Conn:

Thank you for supplying me with the draft EIS and Scoping Decision on the Winger Dam project.

My comments on the draft EIS are enclosed.

Sincerely,

Paul Stolen

Paul Stolen
Independent Environmental Analyst

Winger Dam Project Draft EIS

Paul Stolen
Independent Environment
Analyst
Fosston, Minnesota

9 A

Comment 1. The technical quality of the studies presented in the individual sections of the EIS is high. There are few similar impoundments in Minnesota from which to obtain guidance about impacts. The DNR staff should be commended for this quality and for the decision to do the independent studies necessary for this EIS. Most of my remaining comments pertain to how the information is to be brought together and used.

9 B

Comment 2. Three of the studies have major findings demonstrating that the project as conceived may not be feasible. The studies are the fisheries, downstream flow, and economic analyses.

The Scoping Decision, and EQB rules, state that alternatives are to be fully evaluated. The draft EIS will not be complete until the implications of these studies are incorporated into the evaluation of alternatives and the evaluation of the project. (See Comments 3-8, 10)

9 C

Comment 3. (pages 3-52 through 3-55). The Scoping Decision states that an economic analysis will be done and that it will assess recreational interest and recreational benefits, other project costs and benefits, and so forth. The draft EIS only points out major problems with the economic analysis done by the sponsors. It does not contain the analysis called for in the Decision. Done correctly, such an economic analysis would be a valuable decision tool for the project. An example, done for a hydroelectric dam in Montana, is enclosed.

The EQB rules require that the RGU is the DNR, not the agency sponsoring the project. It is therefore the responsibility of the DNR to conduct an appropriate and adequate study.

9 D

Comment 4. (pages 1-1, 1-21, 3-2,3-50, 3-52 through 55, and others.) The major flaw of the draft EIS is the failure to address the finding of the fisheries study that the project, as proposed, would not support a recreational fishery in the reservoir. In fact, at the Winger public hearing, a DNR biologist said that in some years even bullheads would die and that an effective aeration system could be expensive. None of the proposed alternatives contain such an aeration system.

The final EIS should fully address either an alternative that includes an effective aeration system--incorporating costs into project design--or explore an alternative that realistically addresses recreational development assuming the existence of no sport fishery in the reservoir. As written, the draft EIS contains a glaring contradiction: the term "recreational pool" is used frequently, but there is little logical basis to conclude there will be appealing recreational opportunity adequate to invite people to invest in lots

RESPONSES:

3.1.9 MR. PAUL STOLEN

9A. Comment acknowledged by the DNR.

9B. The Draft EIS included descriptions of five alternatives including the project proposed by the Sand Hill River Watershed District (Alternative No. 1) and the no-build alternative (Alternative No. 5). The description of Alternative No. 5 has been revised and expanded in the Final EIS (section 2.7) to incorporate an additional discussion and description of MNDOT planned T.H. 59 roadway and bridge improvements in the area that would occur if the project proposed by the Sand Hill River Watershed District were not constructed. The data, analysis, and discussion of impacts in an EIS are to be thorough, succinct, and commensurate with the importance of the impact.

The Draft EIS discussion of projected fisheries for the proposed reservoir and proposed alternatives (Draft EIS section 3.3.4) explained that no predictions of the proposed fishery were conducted for Alternative No. 2, No. 3, No. 4, and No. 5 due to the study results which indicated high probability for summerkill and winterkill, and determined that none of these construction alternatives (excluding Alternative No. 5) were suited to supporting a fishable population. The Draft EIS downstream flow analysis (Draft EIS section 3.5) explained that the downstream flow study did not differentiate for each alternative since all of the proposed construction alternatives would have similar effects on downstream resources. The Draft EIS economic analysis (Draft EIS section 3.9) presented a summary of tangible annual benefits for Alternative No. 1 at two different discount rates (Draft EIS Table 3-20), and a summary of economic analyses (annual economic cost, annual economic benefit, benefit-cost ratio, and annual net benefits) for all the construction alternatives at two different discount rates.

9C. The Draft EIS provided a discussion of the current extent of flooding damage and the potential of the project proposed by the Sand Hill River Watershed District to provide for flood damage reduction (Draft EIS sections 1.4, 1.5, 1.6, and 1.11.8 on the reservoir, the principal spillway, the emergency spillway and the nature and extent of flooding problems, respectively). Further evaluation of the potential for flood damage reduction, such as less frequent flooding, was provided for in the Draft EIS discussion of land management/land use practices (Draft EIS section 3.7). That section also examined the estimates of the potential for recreational and residential development. The Draft EIS section on agricultural impacts (Draft EIS section 3.8) addressed the potential for agricultural impacts due to acreage losses because of permanent and temporary inundation associated with the proposed project. That section also discussed the extent of lands that might be subject to less frequent flooding, the extent of downstream agricultural lands which might be protected, and the associated flood damage reduction potential.

The Draft EIS discussions of shoreland management considerations (Draft EIS section 1.11.7), land management practices/land use changes (Draft EIS section 3.7), and agricultural impacts (Draft EIS section 3.8) addressed the potential for recreational development under all of the proposed construction alternatives (including Alternative No. 1). The Draft EIS also included a thorough analysis of the existing and potential fish and wildlife resources, impacts, losses enhancement potential, and future projections for these resources under all of the proposed alternatives (Draft EIS sections 3.3, 3.4, 4.3 and 4.4). These analyses included evaluations of management techniques that could be incorporated and of mitigation measures that would be necessary to achieve a certain level of fish and wildlife resources management and development.

The economic analysis in the Draft EIS (Draft EIS section 3.9) also included a summary of tangible annual benefits for Alternative No. 1 at two different discount rates and a summary of economic analyses for all of the structural alternatives, based on information provided by the project sponsors.

The Draft EIS discussion of the project proposal and of the alternatives also addressed the local public interest in the proposed project and the economic hardship that might likely occur if Alternative No. 1 was not constructed (Draft EIS chapters 1.0 and 2.0).

The Final EIS also provides further discussion of issues relevant to the economic analysis of the project proposal of the Sand Hill River Watershed District. Final EIS section 2.1.1 provides a summary from the Draft EIS of a description of the proposed reservoir and of the fishery resource potential in order to supply additional information on the fishery resource and recreational resource which might be expected to result from an Alternative No. 1 scenario. This summary also includes information on Sand Hill Lake in Polk County as an example of the type and extent of fishery resource that might be anticipated to result from the construction of proposed Alternative No. 1.

Final EIS section 2.2 and Table 2-1 in that section provide the updated cost projections for Alternative No. 1 as submitted by the project proposers. These updated projections include mitigation costs and aeration system costs as a component of direct project right-of-way costs. These cost projections also identify various items connected with the proposed reservoir construction such as recreational enhancement and fish habitat structures.

A new section addressing recreational opportunities and impacts is included in the Final EIS (Final EIS section 2.10). This section describes fishing resources and recreational facilities and sites in an 11-county vicinity of the proposed project. According to the project sponsors, one purpose of the proposed reservoir is to provide recreational opportunities, even though the Sand Hill River Watershed District has not identified the exact nature, extent, benefits, and costs of providing such recreational opportunities. Thus, this Final EIS section on recreational opportunities provides DNR estimates, based on the existing use of lakes in Greater Minnesota, of potential recreational and residential development aspects under an Alternative No. 1 scenario. The costs and locational requirements associated with acquisition, development, and construction of a public access are also included in Final EIS section 2.10.

Refer also to the other responses in this section and to the responses to the comments in Final EIS sections 3.1.4, 3.1.5, 3.1.8, 3.1.10, and 3.1.11 for additional discussion of economic aspects and analysis. Also refer to the Final EIS sections cited in those responses. Further, use of information provided by a project proposer (and reviewed by the RGU for its adequacy) is consistent with the Minnesota Environmental Review Program rules since that is one effective method of assessing current information about a project proposal.

9D. The Draft EIS includes a thorough evaluation of both the existing fishery resource in the Sand Hill River and of the limited or marginal projected fishery resource which could be anticipated to result from the implementation of the project proposed by the Sand Hill River Watershed District (Alternative No. 1). In addition, this information from the Draft EIS, along with the results of other fisheries investigations, has been summarized in the revised discussion on the description of the proposed project and alternatives (Final EIS section 2.1.1). Refer also to the response to Comment 4E in section 3.1.4 for a further summary of the assessment of the fishery resource potential, and to the response to Comment 9B in this section for the reasons the scope of the projected fishery resource analysis was limited to Alternative No. 1.

As the DNR testified at the Draft EIS public meeting, while it was reasonable that an aeration system was not a component of the project proposal until the results of the Draft EIS became available, the Draft EIS conclusively established the need for an aeration system as a fish management technique associated with

the Watershed District's proposed project. Final EIS section 2.2 provides a discussion of updated cost projections for Alternative No. 1 as submitted by the project proposers. Table 2-1 in that section shows the project proposer's detailed estimate of total project costs for Alternative No. 1, and part E (summary section) delineates aeration system costs as an element of right-of-way costs. The project proposers are committed to the need for aeration systems as shown by the inclusion of aeration system costs within right-of-way costs. However, the project proposers have not increased the actual $900,000 amount for right-of-way from previous estimates submitted to the Department in 1986 when the determination of the need for an aeration system as a component of direct proposed project implementation had not been established. As noted in Draft EIS section 3.3.5, the costs of aeration systems must also include insurance and electricity costs. Refer also to the response to Comment 4B in Final EIS section 3.1.4 which indicates the position of the project sponsors that no modifications to proposed recreational opportunities or to land value benefits are warranted. Refer also to the response to Comment 9J in this section which documents the manner in which the 60% anticipated shoreline development potential projection was derived and identifies the position of the Sand Hill River Watershed District relative to the validity of that projection.

According to the Sand Hill River Watershed District, one objective of its project proposal is to provide a warm-water fishery in the proposed reservoir. The Watershed District is committed to working with the Department of Natural Resources during the permitting process and intends to incorporate reasonable and practical fish management practices, including aeration, to achieve various objectives for the proposed reservoir.

The use of the term "recreational pool" in the Draft EIS means the equivalent of the term "permanent pool" without any inference to any recreational potential of the pool. These terms are general terms of usage in technical or environmental documents to refer to permanent pools. "Temporary pools" generally infer "flood storage pools."

and cabins.

9 E Comment 5. (page 3-54) The economic analysis should re-assess the recreational costs and benefits listed on this page in light of the finding that a sport fishery is unlikely to occur. Again, the EIS authors have to deal with the project as proposed, and no effective aeration system has been proposed in any alternative.

Comment 6. (pages 3-52 through 3-55) The discussion of the use of different discount rates only points out one aspect of the problems with the proposers economic analysis. There are other points that are more important: a) The purpose of the dam is to reduce ongoing flood damage downstream. This is therefore the "base case" that construction alternatives should be weighed against; b) It is very important to keep in mind that the discount rate discounts the importance of the future. The higher the rate used, the more the future is discounted.

9 F A dam on the Sand Hill River is likely only one of many flood control projects that may be necessary in the long term to control the flood damage caused by the naturally flat terrain of the Red River Valley and by historical agricultural land practices that have greatly increased the rate and amount of runoff. Such a situation requires long range planning. Neither the economic analysis done by the sponsor nor the additional discussion in the EIS is helpful to decision makers attempting to do such planning. The enclosed section of another EIS detailing a more complete economic analysis demonstrates a more useful economic analysis.

The draft EIS implies that an 8 7/8 discount rate is better "at today's prices." This is short-sighted. What about tomorrow's prices? The planning time frame for the project is 50-100 years. A lower rate is more appropriate, especially if one is confident that the Red River Valley farmland that is often flooded will remain some of the most productive land in North America. Only long-range planning can protect and enhance this land.

In conclusion, the economic analysis is not very appropriate for making decisions for or against the project. Rather, it is best used to weigh alternatives. The existing analysis is flawed because the proposer and the DNR did not use the No Build Alternative as the base case and because the proposer used apparently nonexistent recreational benefits to enhance the overall situation of Alternative #1.

9 G A more realistic assessment of recreational benefits would probably make Alternative #2--or some variation of it--a more attractive alternative. Again, the DNR, as the RGU has the responsibility to carry out the mandate of the Scoping Decision, not the project sponsor.

9 H Comment 7. (pages 1-1,2-1, and 3-20) The final EIS should fully address the issue of an aeration system, including incorporation of costs into project design, if the sponsors continue to maintain that the reservoir serves the dual purpose of flood control and recreation.

RESPONSES:

9E. Final EIS section 2.1.1 contains a summary of the reservoir description and fishery resource potential for the project proposal of the Sand Hill River Watershed District and reiterates the requirement for an aeration system as a component of proposed project development. The response to Comment 4E in Final EIS section 3.1.4 provides an additional summary of the proposed reservoir fishery potential and necessary management options.

Refer also to the response to Comment 4B in Final EIS section 3.1.4 which outlines the position of the project proposers that no modifications to the proposed recreational opportunities or land value benefits are warranted and therefore no additional information to complete a reassessment was submitted to the DNR. There are also no additional plans to augment water levels within a proposed reservoir. The response to Comment 9B in this section outlines the reasons the Draft EIS discussion of aeration systems was limited to Alternative No. 1. In addition, the response to Comment 9D in this section and Final EIS section 2.2 describe the updated cost projections for the project proposal of the Sand Hill River Watershed District, which include the costs of an aeration system as a component of direct project costs. As noted in that response,

aeration system costs must include the insurance and electricity costs identified in Draft EIS section 3.3.5. The response to Comment 9D also outlines the commitment of the project sponsors to incorporate fish management practices to achieve their proposed reservoir objectives including a warm-water fishery. Refer also to the response to Comment 9J in this section which documents the manner in which the 60% anticipated shoreline development potential projection was derived and identifies the position of the Sand Hill River Watershed District relative to the validity of that projection.

9F. The project description in the Draft EIS was based on the project described in the Scoping Environmental Assessment Worksheet (EAW) and in the Scoping Decision document. The proposed project was limited to the project proposal of the Sand Hill River Watershed District, a Class I multipurpose dam for flood control, for recreation, and for a T.H. 59 bridge crossing of the Sand Hill River. While it may be relevant that this project proposal may only be one of many types of flood control works necessary to reduce Red River mainstem flood damages, the inclusion of any other specific projects in either the project description or in the economic analysis is beyond the scope of the EIS. The EIS is designed to examine the impacts of a concrete project proposal on its own merits.

The purpose of the discount rate, irrespective of the actual level used, is to evaluate all benefits and costs at a comparable rate in constant dollars. A discount rate is used to place future benefits and costs in terms of today's prices. A lower discount rate will increase the importance of future benefits and costs as compared to a higher discount rate.

For comparison purposes, the DNR in the Draft EIS used two different discount rates. The lower rate was identical to that submitted by the project proposers. The DNR used the higher rate of 8 7/8% for comparison purposes only. This rate was selected since it is used by the U.S. Army Corps of Engineers (USCE), a federal agency with expertise in planning and implementing public sector water development projects. The rate used by the USCE is based on an established rate of return on long-term government bonds, and is as specified by U.S. Water Resources Council rules and regulations.

As stated in the economic analysis in Draft EIS section 3.9, the base case used by the DNR was the no-build alternative (Alternative No. 5) in order to compare construction options against the status quo (of not doing a proposed project). According to the Draft EIS, "[t]he analysis of the dam should focus on benefits and costs that occur 'with' the project versus 'without.'" (Draft EIS page 3-53). As noted in Draft EIS chapter 2.0, the discussion of alternatives, included the alternative of the project proposal of the Sand Hill River Watershed District (Alternative No. 1), other construction alternatives (Alternatives No. 2, No. 3, and No. 4), and the no-build alternative (Alternative No. 5). The base case was not Alternative No. 1. The Draft EIS also cited the problem with the recreational benefits as proposed by the Sand Hill River Watershed District.

9G. Comments and concerns acknowledged by the DNR. See also the response to Comment 4A in section 3.1.4 which describes the purpose of an Environmental Impact Statement and the responsibilities of the DNR as the preparer of the Final EIS. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS,

provided to various decision makers for their consideration in regulatory decisions under their control.

In addition, from a fish and wildlife management perspective, a dry dam alternative such as Alternative No. 2 which provides only flood water storage may be detrimental to fish and wildlife habitat and resources. According to the HEP analysis in Draft EIS section 3.4.6, Alternative No. 2 would result in a net loss of average annual habitat units for both upland and wetland habitat species and mitigation to offset these losses is required as specified in Draft EIS section 4.3.

9H. Refer to the responses to Comment 9B, Comment 9D, and Comment 9E in this section and to the other sections and responses noted in the text of those responses for the further discussion of the issue of the need for an aeration system, the fishery potential of a proposed reservoir, the incorporation of aeration system costs into direct proposed project costs, and the commitment of the Sand Hill River Watershed District to providing adequate fish management techniques. The position of the project proposers is that the costs of the final fish management plan are dependent on the specific practices implemented and these practices and costs will ultimately be determined as a component of the regulatory processes.

9 I The last paragraph in Section 3.3.5 (p. 3-20) is basically a recommendation that it would be better public policy to put aeration money and volunteer efforts elsewhere and drop the idea of a recreational reservoir. Can there even be such volunteers?

9 J Comment 8. (p. 3-48) The Scoping Decision stated that the EIS would "assess potential for recreational and residential development." Page 3-48 states that "up to 60% of the shoreland" could be developed to lakeshore lots but page 3-50 states that this is the assumption of the project sponsors, not an independent assessment. Given the near certainty of a poor sport fishery developing, the final EIS should contain an independent assessment of this issue. It is highly important because the choice of alternatives hinges on it.

9 K Comment 9. (pages 1-4, 1-10) What precipitation figures were used in running the HEC-1 program to obtain the storm events used in Tables 1-3 & 4? According to hydrogeological atlases of the area, precipitation substantially increases over short distances from west to east. For example, annual precipation is about 5 inches higher 40 miles east of Erskine than at Erskine. Also, what is the amount of precipitation in inches of each of these events? This information would be helpful to assess the potential for shoreline lot development.

9 L Comment 10. The statement is made that the Sand Hill River will dry up if the proposed operation plan is followed, and that the "recreational reservoir design appears to be too optimistic . . ." What are the implications of this to the project sponsors, downstream users, and to water quality standards if the propsed modifications to the operating plan are not adopted? What are the implications to the selection of the best project construction alternative? Does not this finding call for the selection of Alternative #2, or some variation of it?

9 M Comment 11. The EIS does not contain a clear and useful description of the appearance of the reservoir. By this I mean: What will the shoreline be like? Will it advance and retreat dramatically with each rainfall event in the areas (60% of the shoreline) where recreational lots supposedly would develop? Will it be sandy or muddy? Will lot owners be able to have docks or will they be inundated by a rising reservoir after a heavy (but normal) thunderstorm?

RESPONSES:

9I. Comment and concern noted by the DNR. The last paragraph relating to fish management techniques in Draft EIS section 3.3.5 remains valid and no changes are warranted to the text at this time.

9J. The Draft EIS assessed the potential for recreational and residential development in the Draft EIS section on land use management practices and land use changes (Draft EIS section 3.7). As noted in the Draft EIS, approximately 60% of the shoreline between the proposed dam site at T.H. 59 and Polk CSAH No. 1 could be developed for lakeshore lots within a 10-year period. This estimate was based on the potential for lakeshore lots which could be developed assuming the minimum lot size of 20,000 square feet (100 feet by 200 feet) as required by the Polk County Shoreland Management ordinance and the Department of Natural Resources minimum standards and criteria. The Draft EIS also noted that this minimum lot size could be increased to 40,000 square feet (100 feet by 267 feet) if a shoreland management district reclassification occurred as a result of construction of the project proposal of the Sand Hill River Watershed District (Alternative No. 1).

According to the project proposers, the reservoir proposed to be constructed under Alternative No. 1 is anticipated to be suitable for recreational activities such as water skiing, boating, fishing, waterfowl hunting, and nature observation. The project proposer's estimate that only about 60% of the shoreline would either be suitable for these recreational activities or could be developed for residential uses was based initially on the length of existing shoreline at the proposed permanent pool elevation. This length was then reduced by a

calculation of the amount of shoreline unsuitable for proposed development because of proximity to the proposed dam structure, or land unsuitable for either development or for marginal recreational areas. Land unsuitable for development includes land with steep slopes, shallow offshore water depths, difficult access, or other limitations for development. Only about 60% was reasonably assumed to be suitable for recreational or residential development.

The anticipated limited fishery resource or other limitations to recreational and residential development (such as water quality considerations) were apparently not determined (by the project proposers) to be factors influencing these projections. The project proposer's position remains that the initial projection as presented in the Draft EIS is valid and no changes are warranted. However, refer also to the response to Comment 9K in this section which shows the Sand Hill River Watershed District's projections of changes in water levels anticipated for different flood events, since water level fluctuations may impact the extent of recreational or residential use which might be anticipated to occur under an Alternative No. 1 scenario. These water level fluctuations vary from 0.9 feet to 4.4 feet.

9K. The precipitation data used by the project proposers for the HEC-1 analysis submitted to the DNR for the Draft EIS was derived from U.S. Weather Service Technical Papers Nos. 40 and 49, and U.S. Weather Service Hydrometerological Report No. 48. These data for various storm events are:

SAND HILL RIVER WATERSHED DISTRICT
PRECIPITATION DATA FOR HEC-I ANALYSIS

Flood Event	Precipitation (inches)	Design Inflow (cfs)	Design Outflow (cfs)	Peak Reservoir Water Elevations (M.S.L.)	Change in Water Level (ft.)
2 Yr., 24 Hr.	2.27	269	114	1190.9	0.9
5 Yr., 24 Hr.	3.00	487	274	1191.6	1.6
10 Yr., 24 Hr.	3.49	735	394	1192.0	2.0
25 Yr., 24 Hr.	3.77	1004	554	1192.5	2.5
50 Yr., 24 Hr.	4.19	1241	700	1193.0	3.0
100 Yr., 24 Hr.	4.82	1656	954	1193.7	3.7
2 Yr., 10 Day	4.00	239	136	1191.0	1.0
5 Yr., 10 Day	5.15	465	320	1191.7	1.7
10 Yr., 10 Day	6.20	783	519	1192.4	2.4
25 Yr., 10 Day	7.20	1194	798	1193.0	3.0
50 Yr., 10 Day	8.00	1510	1014	1193.8	3.8
100 Yr., 10 Day	8.88	1873	1261	1194.4	4.4

Refer also to the response to Comment 9J in this section which identifies the water level changes of between 0.9 to 4.4 feet and notes that these changes are relevant to assess the potential for recreational and residential development and uses.

9L. The Draft EIS accurately notes that based on the preliminary flow analysis completed by the DNR, as modeled from the operation plan proposed by the

Sand Hill River Watershed District, in-reservoir depletions will occur whether existing conditions downstream are maintained (not augmented) or are not maintained. This analysis assumed a median year hydrograph with evaporation. This depletion problem is likely to result from the size of the watershed above the proposed reservoir site, inadequate streamflows during high evaporation periods, and evaporation from the proposed reservoir.

The DNR modifications to the operation plan proposed by the project sponsors identified in Draft EIS section 3.5.2 and restated in Final EIS section 2.5 (revised instream flow specific plan of operation) are designed to address the depletion problem. The emphasis of the modified plan is to replicate the natural occurrence of flow required to maintain riparian wetland communities downstream of the proposed dam. Under the terms of the modified plan the minimum allowable outflow when the inflow is smallest would be:

1) From March 25 to June 15, the greater of 1.7 cfs of 70% of the inflow when the inflow is less than 50 cfs.
2) During other times of the year, the greater of 1.7 cfs or 30% of the inflow.
3) Whenever the inflow is less than 1.7 cfs, the outflow must be equal to the inflow.

The modified plan as described in Final EIS section 2.5 is designed to assure the occurence of a minimum flow. Assuring adequate minimum streamflow through modifications to the operational plan proposal of the Sand Hill River Watershed District will be a required component of any DNR permit issued, therefore the modifications outlined in the Final EIS will be adopted as a condition of any DNR permit issued in connection with proposed project construction.

Since a minimum flow will be maintained, the selection of a particular construction alternative by the various regulatory authorities does not fundamentally influence the selection of any particular alternative. Refer also to the response to Comment 4A in Final EIS section 3.1.4 which describes the purpose of an Environmental Impact Statement and the responsibilities of the DNR as the preparer of the Final EIS. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

9M. According to the project proposers, the proposed reservoir is expected to function to reduce downstream impacts of flood events and of heavy rain storms by stabilizing runoff inflows. Proposed reservoir water levels will be anticipated to fluctuate (or "bounce") from 0.9 feet to 4.4 feet depending on the particular storm or flood event. Refer to the response to Comment 9K in this section for the data showing these water level fluctuations. The degree of the fluctuation will depend on the magnitude of the runoff event.

If residential development were to occur under Alternative No. 1, individual shoreline lot owners may elect to install docks. The project proposers estimate that these docks would be affected relatively infrequently by the fluctuating water levels. Docks installed with two feet of freeboard are expected to be safe from submergence for precipitation events equal to or less than the 10-year, 24-hour storm.

The reservoir will extend approximately 6.8 miles to the northeast from T.H. 59 and will be nearly one-half mile wide at its widest point. Normal reservoir depth will be 20 feet at the proposed dam and the depth will gradually decrease towards the northeast. Once the reservoir is filled, the water table will stabilize at a higher elevation along the shoreline. The project sponsors do not expect the water level fluctuations to cause significant landward migration of the shoreline. The proposed reservoir is anticipated to have a gently sloping shoreline which will become more level towards the northeast. Clay type soils predominate in the area of the proposed reservoir shoreline, and prevailing weather conditions and land management practices may further influence shoreline conditions.

Refer also to Chapter 4.0 (Environmental Review Process Coordination) which includes a copy of 1986 correspondence between the DNR and the Sand Hill River Watershed District. This DNR correspondence outlines issues related to shoreline erosion, parent soil material, colonizing vegetation, wind generated wave action and turbidity in the water column, and the DNR recommendations regarding documentation the Watershed District should examine regarding these issues. The District's response to these recommendations and its commitment to address these issues as part of the Final Engineer's Report is also included in Chapter 4.0. The Final Engineer's Report will be issued by the Sand Hill River Watershed District subsequent to the Environmental Review process.

Draft
ENVIRONMENTAL IMPACT STATEMENT

on the
Proposed Kootenai River Hydroelectric Project
at
Kootenai Falls

Addendum to the Federal Energy Regulatory Commission
Final Environmental Impact Statement

July, 1982

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
ENERGY DIVISION
DNRC

higher loads than the Kootenai Falls option over the forecast period. If the forecast were carried out over a longer period this situation would reverse, because power from the proposed project would be cheaper than Colstrip power after 2001. By that year Kootenai Falls energy would cost 19.43 mills, compared to 20.08 mills for Colstrip.

The Dam/Conservation/Retrofit option relies on Kootenai Falls power along with power provided by residential conservation and dam retrofits. In the medium demand scenario, power from this option is cheaper than any except from Colstrip by the end of the forecast period. In the long run the Dam/Conservation/Retrofit option would show the lowest retail rates and consequent highest loads of the five supply options.

Although the Dam/Conservation/Retrofit option uses the lowest levelized cost resources, it has higher costs initially than either the BPA or Colstrip option.

As shown in table 6-9 the retail prices for electricity from any of the supply options increase at different rates over time. The price of power from each resource is predicted to decrease at some periods during the forecast period, but by different amounts and in different years. This variation makes the prices hard to compare. There are also different load patterns over time associated with each supply option, so DNRC used the concepts of consumers' surplus and net present value to compare the alternatives (see the following section). Furthermore, the levelized costs used in examining the Dam/Conservation/Retrofit option considered only internal costs borne by WMED exclusive of external or environmental benefits and costs, which must be considered in any comprehensive comparison of alternatives. DNRC did this in its cost benefit analysis, in the next section.

COST-BENEFIT ANALYSIS

Definitions

In discussing cost-benefit analysis, it is necessary to use some economic terms that are not in common use with the public. These terms are defined as follows.

Present value is the value today or in any given year of a series of future payments, such as the income produced by sale of power from a generating facility. Future payments are discounted to reflect the idea that society at any given time values a dollar that would be received next year less than one received today. This concept is reflected in the payment of interest on savings accounts.

Discount rate is the factor used to adjust future values to their present value. The discount rate is a measure of how much less payments next year are worth today. The *real discount rate* is the discount rate adjusted for the rate of inflation.

Net benefits of a project are determined by subtracting the project costs from the benefits. If the costs exceed the benefits the difference is called *net cost.*

Internal costs are project costs that must be borne by its owners. If dollar values can be assigned to these costs, then they are added to the price of the output from a project. An example of an internal cost is the turbines in the Kootenai Falls dam, whose costs are part of the cost per kilowatt hour that will be paid by the utility customers.

Internal benefits are benefits received by the owners of a project. An example of an internal benefit of the Kootenai Falls dam is the value of the electricity that would be produced.

External costs are project related costs borne not by the project owners but by others or by the environment. An example of an external cost associated with building the Kootenai Falls dam is the loss of the falls in its present undeveloped state.

External benefits are the counterpart of external costs. An example of an external benefit of the Kootenai Falls dam would be the picnic area improvements proposed by the applicant as part of the project.

Monetary costs are project related costs that can be quantified in dollars. Many costs, such as worker salaries or benefits, or a given amount of electricity, have a market value, and their dollar value is easily estimated. The monetary value of other costs and benefits can be estimated using techniques developed by economists. Both internal and external costs can be monetary. An example of a monetary cost associated with the Kootenai Falls dam is the cost of turbines that would be used in the dam.

Monetary benefits are the counterpart of monetary costs. An example of a monetary benefit is the value of the electricity that would be generated by the project.

Nonmonetary costs are project-related costs that have no market value, and which cannot be expressed in dollars. Both internal and external costs can be nonmonetary. An example of a nonmonetary cost

associated with the Kootenai Falls dam is the aesthetic impact of dewatering the channel downstream from the dam.

Nonmonetary benefits are the counterpart of nonmonetary costs. An example of a nonmonetary benefit would be the increased control the applicant would have over its power supply if the dam were built.

Consumers' surplus is a measure of value that reflects the difference between what consumers are willing to pay for a product and what they actually pay.

Purpose of Cost-Benefit Analysis

Cost-benefit analysis is a method of comparing the costs and benefits of a project, and comparing a proposed project with alternative proposals. It is used to help determine if the economic welfare of society would be increased or decreased as a result of building a project. It is also used in making decisions about whether society would be better off building an alternative rather than the proposed project. Cost-benefit analysis can aid in making public decisions because it views costs and benefits from the perspective of society rather than from that of a project developer, as done by WMED (HARZA 1980, Chen 1982). If a cost benefit analysis is to present a true picture, it must consider all costs and benefits to society. However, it is impossible to assign dollar values to some costs and benefits, so there must be a comparison between monetary values and nonmonetary values.

This cost-benefit analysis provides a framework for making these comparisons in order to show how the costs and benefits of the proposed project compare to the costs and benefits of alternatives to the project. The analysis also identifies the factors that could cause this ranking to change.

The result of a cost-benefit analysis sometimes is expressed as a benefit-cost (B/C) ratio—for example, 1 to 1, meaning the benefits are equal to the costs. But such ratios can be misleading. For example, a project with a B/C ratio of 2 to 1 could have benefits of $200,000, and costs of $100,000, for a net benefit of $100,000, while a larger project with a ratio of 1.5 to 1 could have benefits of $1.5 million and costs of $1 million, for a net benefit of $500,000. Thus, society would be better off selecting the project with the lower B/C ratio because of its greater net benefits. Furthermore, impacts that cannot be expressed in dollars cannot be incorporated into a B/C ratio analysis. Finally, the results of a B/C ratio can change significantly depending on how certain costs and benefits are defined. For example, recreational losses, when expressed in monetary terms, can be treated either as "negative benefits" or as costs, and the B/C ratio of a project will change accordingly. For these reasons, DNRC did not use B/C ratios.

Limitations of Cost-Benefit Analysis

Cost-benefit analyses are based on assumptions about future events and their accuracy depends on the accuracy of those assumptions. These analyses assume that society's preferences in the future will be the same as they are today. However, when calculating the present value of the benefits and costs of a project, it is assumed that the benefits and costs would be worth less in the future than they are in the present, which ignores the value of these impacts on future generations.

Cost-benefit analysis does not address the question of equity. Collectively, society may be better or worse off if a project is built, but the issue of who benefits and who pays is not addressed in the analysis.

The most serious limitation of cost-benefit analysis results from the problem of how to compare benefits and costs that can be measured in dollars with those that cannot. For example, how does the loss of trout fisheries compare with the value of electricity generated from a dam?

Normally, dollar values are used for comparing costs and benefits, but it is difficult to determine the monetary value of certain costs and benefits when there is no market for them. Further, there is great variation in how the costs and benefits are valued by different individuals and groups, increasing the difficulty of making a statement about societal impact. Economists have developed methods to place monetary values on certain impacts, and these methods have some merit in decision making. The magnitude of an impact must be determined before a monetary value can be assigned. Assigning dollar values to impacts, if done cautiously, can help put the value of external costs in perspective so they can be compared to the internal monetary benefits of a project.

The most common misuse of cost-benefit analysis is to consider only monetary benefits and costs and ignore the nonmonetary impacts of a project. Although there is no easy way to integrate monetary and nonmonetary impacts, both must be considered when making a decision concerning society's welfare.

DNRC limited its cost benefit analysis to the effects the proposed project would have in Montana. It is possible that the most beneficial method of providing power to the WMED service area or to Montana in general might not be the most beneficial to the Pacific Northwest or the nation as a whole. Nevertheless, the Board of Natural Resources and Conservation is responsible for ensuring that the facility represents the minimum adverse environmental impacts, considering the state of available technology and the nature and economics of the various alternatives.

Most of the impacts of building the Kootenai Falls dam would occur within Montana. Kootenai Falls is near the border of Montana and has national scenic importance, so some of the costs identified in chapter four would be felt beyond the state border. These costs were scaled back for use in determining the costs to Montana alone. On the other hand, the benefits would be somewhat greater if the analysis were done from a national perspective, because inexpensive power from the dam is more valuable when compared to the relatively higher costs of power elsewhere in the United States.

DNRC analyzed the benefits and costs to Montana of five alternative supply options identified earlier in this chapter.

To determine the relative merit of each supply option, the changes to Montana that would result from each option are measured by comparison with a "business as usual" alternative, referred to as the base-case. For the purposes of this analysis, the BPA supply option is the base case and represents the historical practice of WMED in obtaining all its power from BPA.

This analysis separates the costs and benefits into two major categories, internal and external. These two categories will be further divided into monetary and nonmonetary components.

Internal Benefits and Costs

By definition, the internal benefits and costs of any of the supply options would accrue to the members of WMED. Only the internal benefits and costs in excess of those that would result from the BPA supply option are considered.

Calculation of Internal Monetary Net Benefits

The internal monetary benefit of each supply option is the benefit that the WMED customers would receive if that option would allow them to purchase power more cheaply than it could be purchased under the BPA supply option. Monetary net benefits of an option are calculated by multiplying the price difference between the BPA supply option and the particular option being compared by the average yearly electrical load. The total annual dollar savings are then discounted over the 50-year life of the Kootenai Falls project to determine the present value of the internal monetary net benefits. An example of the calculation is given in table 6-11, and actually measures the change in what economists call "consumers' surplus." Initially, power under the BPA supply option would be less expensive than power from any of the other options considered so there would be an internal monetary net cost to the WMED customers.

The monetary cost of each supply option is included in the price the customer must pay for the electricity. Price and consumption estimates come from the retail rates and load growth forecasts made in the Supply Demand Integration section.

Assumptions used in the internal monetary net benefit calculations are as follows.

1. For each resource option, DNRC's medium demand scenario is used to predict prices and loads up to 1998 and loads are forecast to grow at the 1997-1998 growth rate throughout the remainder of the projected life of the Kootenai Falls dam (Nordell 1982c).
2. All prices for each supply option are a weighted average of the price of power from each individual supply source in that option (i.e., under the Proposed Project supply option, the price would represent the weighted average of 58 average MW from Kootenai Falls and the additional power that would be required from BPA) (see Supply Demand Integration). The price includes the cost of energy, distribution, administration, and payback of the completed portion of the WPPSS plants (Nordell 1982c).

3. The difference between the amount of power available from any option and the projected load is met by purchasing power from the BPA.
4. It is assumed the supply options are independent.
5. Implementation of a particular supply option is the only change from the base case, i.e., real prices of other goods and services, consumer preferences, population, and income distribution are assumed to remain the same.
6. The entire WMED service area is assumed to be in Montana because the only available load projections are for the entire service area. However, between 85 and 90 percent of the WMED load is in Montana.
7. The internal monetary net benefit of each supply option is calculated to the year 2038, corresponding to the assumed 50-year life of the Kootenai Falls dam if it were to become operational in 1988. The Colstrip plants are assumed to become operational in 1986 and have a useful life of 37 years, after which their share of the load would be met by purchase from BPA. All interim power would be purchased from BPA.
8. All values are calculated in 1981 dollars.
9. A real discount rate of 4.31 percent is used (see DNRC Cost Estimation Method in chapter five).

Results

Table 6-12 presents the estimated internal monetary net benefits for each supply option, discounted to 1983, the first year any costs would be incurred for the Kootenai Falls dam. A real discount rate of 4.31 percent is used. Based on internal monetary net benefits only, the Dam/Conservation/Retrofit supply option would have the greatest net benefits, followed by the Proposed Project option, Colstrip, the Conservation/Retrofit option, and the BPA option.

TABLE 6-11. INTERNAL MONETARY BENEFITS OF THE PROPOSED PROJECT

Calculation for 1998

Price of power under the proposed project option	(table 6-9)	49.81 mills/kWh	($.04981)
Price of power under BPA supply option	(table 6-9)	50.98 mills/kWh	($.05098)
Load projected under the proposed project option	(table 6-10)	203.2 Avg. MW	
Load projected under the BPA option	(table 6-10)	202.8 Avg. MW	
Number of kWh per year per Avg. MW		8,760,000	

Computation for 1998:

$$(\$.05098 - \$.04981) \times \frac{(203.2 + 202.8)}{2} \times 8{,}760{,}000 = \$2{,}080{,}588$$

Discounting to 1983: $\$2{,}080{,}588 \times \frac{1}{1.0431^{16}} = \$1{,}059{,}183$

TABLE 6-12. PRESENT VALUE OF INTERNAL MONETARY NET BENEFITS TO MONTANA FOR EACH SUPPLY OPTION (1981 dollars)

Supply Option	Internal Monetary Net Benefits Millions of Dollars
Dam/Conservation/Retrofit*	$83.7
Proposed Project*	46.7
Colstrip	37.8
Conservation/Retrofit	27.9
BPA**	-0-

* *The internal monetary net benefits of the proposed project and the Dam/Conservation/Retrofit options may be overstated because the possible Canadian diversion in 2024 (see Water Rights section, chapter four) is not included, some of the benefits may accrue to non-Montanans, and sedimentation may stop operation in less than 50 years.*

** *The analysis measures deviations from the base case (the BPA supply option), so this value is zero.*

Sensitivity

The internal net monetary benefits from each option are sensitive to two major factors. The first is the uncertainty about future prices of BPA power. The price of BPA power would affect the ranking in two ways. First, BPA power would be purchased under any of the supply options, because no single option can meet all projected needs. Second, each supply option is compared to the BPA supply option when calculating net benefits.

The second factor affecting sensitivity is the use of different discount rates to calculate the net present value of internal monetary net benefits. A higher discount rate places a lower value on future benefits and a higher value on benefits that occur in the near rather than distant future, whereas a lower discount rate places a relatively higher value on benefits in the distant rather than near future. The results of using different discount rates are shown in table 6-13. DNRC regards the 4.31-percent real discount rate as reasonable (see chapter five for a discussion of how this rate was derived). The other results are shown to illustrate that changing the value placed on the future can change the results of the analysis.

Internal Nonmonetary Benefits

If the Kootenai Falls dam were built, the members of WMED would benefit by reducing their dependence on BPA as a supplier of electricty. This benefit would have two major components. The cooperative members would have more control over their rates and be less susceptible to BPA rate fluctuations over which they have no control. WMED also would be less vulnerable to BPA curtailment policies, should they be invoked. Conservation and the dam retrofits would provide these benefits, but to a much lesser extent. Purchasing a share of Colstrip would give WMED some control over its share of the output, but the degree of control would be less than that of Kootenai Falls because other parties own a larger share of the Colstrip plants.

External Benefits and Costs

The WMED decision to apply to build the Kootenai Falls dam is based on the internal costs and benefits that would accrue to it. External costs and benefits—impacts and advantages that accrue to others or to the environment—would not necessarily enter into the WMED decision. However, these costs

TABLE 6-13. RANKING OF SUPPLY OPTIONS BASED ON INTERNAL MONETARY NET BENEFITS USING DIFFERENT DISCOUNT RATES

	Discount Rate (Percent)					
	3	4.31	6	8	10	12
Ranking:*						
1	Dam/Conservation /Retrofit	Dam/Conservation /Retrofit	Dam/Conservation /Retrofit	Dam/Conservation /Retrofit	Conservation/Retrofit	Conservation/Retrofit
2	Proposed Project	Proposed Project	Colstrip	Conservation/ Retrofit	Colstrip	BPA
3	Colstrip	Colstrip	Conservation/ Retrofit	Colstrip	BPA	Colstrip
4	Conservation/Retrofit	Conservation/Retrofit	Proposed Project	BPA	Dam/Conservation/ Retrofit	Dam/Conservation/ Retrofit
5	BPA	BPA	BPA	Proposed Project	Proposed Project	Proposed Project

* *1 = highest internal monetary net benefits; 5 = lowest.*

and benefits, both monetary and nonmonetary, must be considered by DNRC under MFSA. As with the internal benefits and costs, only the external benefits and costs in excess of the BPA supply option are considered.

External Benefits

DNRC estimated the external benefits of taxes and labor, which, from the perspective of society, are adjustments to the costs of the project.

Labor. From the perspective of society, the cost of building a project is reduced if laborers that would otherwise be unemployed are used to construct the project. Wages paid for such workers are costs to the owner, but not to society. Lincoln County has high levels of unemployment and a number of experienced dam workers that were employed on Libby Dam. To assess the effects the Kootenai Falls project would have on these workers, DNRC calculated the probability that unemployed workers in the county or elsewhere in Montana would be hired (Davis, A. 1982) using methods developed by Haveman and Krutilla (1968). The percentage of unemployed Montana workers hired on the dam was estimated to be 13.7 percent of the work force. This figure was applied to the total yearly work force and multiplied by the average wage rate to determine the amount of the benefit (Davis, A. 1982). Employment value was calculated for each of the five years it would take to complete the dam and discounted using a real discount rate of 4.31 percent. The resulting value is $1.9 million which should be added to the monetary net benefits of the Proposed Project supply option and the Dam/Conservation/Retrofit option. No data were available to make these same computations for the Colstrip and Conservation/Retrofit supply options, but patterns of unemployment among properly trained workers in counties where these projects are or would be are not the same as for potential dam workers in Lincoln County.

Taxes. From the perspective of society, the power cost estimate used in calculating internal monetary net benefits overstated the cost of the dam to Montana because it included the taxes paid on the dam. For the purpose of cost benefit analysis, taxes are considered transfer payments that have a neutral effect on society since one group incurs the costs while another reaps the benefits. This perspective obviously ignores the equity consequences of taxation. In the case of Kootenai Falls, the Montana customers in the WMED service area pay the cost of

taxes in their electric bills, while the residents of Lincoln County, including those of Libby and Troy, which are not served by WMED, reap most of the tax benefits.

To properly adjust the costs of the dam to a societal perspective, the actual cost used in the price computations for the forecast and net benefits calculations should be reduced by the value of these tax payments. As with the labor adjustment, the value of taxes paid can be added as a monetary net benefit. Assuming a 50-year dam life, a constant real level of payments over the life of the project, and a 4.31-percent real discount rate, the net present value of tax payments for the Kootenai Falls dam is $21.0 million in 1981 dollars (Davis, A. 1982). Using the same assumptions (except assuming a 37-year life) for the Colstrip supply option, the net monetary benefits of taxes paid on the WMED share of Colstrip would be $13.9 million (Davis, A. 1982). The value of the taxes on the dam retrofits using the same assumptions as the Kootenai Falls calculation would be $4.0 million. The $21.0 million should be added to the net present value of the Proposed Project and the Dam/Conservation/Retrofit supply options, and the $13.9 million should be added to the net present value of the Colstrip option. The $4.0 million should be added to the Conservation/Retrofit and the Dam/Conservation/Retrofit options. The total to be added to the Dam/Conservation/Retrofit option is $25.0 million.

External Costs

Although most external costs cannot be valued in monetary terms, DNRC made monetary estimates for one external cost, the value of the recreational resource that would be lost if the Kootenai Falls dam were built. Other external costs that cannot be quantified are described following the Recreation section below.

Recreation Loss. Duffield (1981) estimated the net annual loss to Montana of current recreational uses of the Kootenai Falls area should the Kootenai Falls dam be built. The estimates of net recreational loss were based upon total visitor use of the falls (including non-Montanans) so the value of the net recreational loss was scaled back to address only the use by Montanans.

Several methods were used to calculate the net recreational loss which resulted in a range of estimates. The total impact of these annual values is calculated over the 5-year construction period and the assumed 50-year life of the dam. The annual values are assumed to grow at the same rate as inflation, which means the estimate each year remains constant when valued in 1981 dollars. This understates the future value that would result if use in the future were to increase. The values are discounted using a real discount rate of 4.31 percent to be consistent with the rest of the cost-benefit analysis, and are shown in table 6-14.

TABLE 6-14. ESTIMATED VALUE OF RECREATIONAL LOSS TO MONTANA IF THE KOOTENAI FALLS DAM WERE BUILT (1981 dollars)

(assuming 50-year life and 4.31 percent real discount rate)

Method of Estimation	Millions of Dollars
Compensation	$47.0
Willingness-to-Pay	3.4
Travel Costs	2.1
Daily Entrance Fee	.6

These values are actually estimates of external monetary net costs associated with building the dam at Kootenai Falls and should be subtracted from the monetary net benefits (table 6-12) of the Proposed Project supply option and the Dam/Conservation/Retrofit option. There are no recreational adjustments to be made for the Colstrip and Conservation/Retrofit option.

Other External Costs

A cost-benefit analysis is not complete unless it considers all costs and benefits. Table 6-15 shows a general picture of those environmental effects to which no monetary values have been or can be assigned.

Table 6-16 shows ways in which these environmental "costs" could be reduced. The tables summarize the detailed impact discussions from chapter four.

As in the case of the assessment of monetary benefits, there are uncertainties inherent in the summaries contained in tables 6-15 and 6-16 and chapter four.

For example, there are differences in the precision with which the actual magnitude and likelihood of each impact to each resource can be predicted. The type and extent of vegetation that would be inundated by the reservoir is known more or less precisely, but the number of fish that would be killed in passing through the turbines is estimated with less precision.

TABLE 6-15. SUMMARY OF LONG-TERM ENVIRONMENTAL IMPACTS*

Category of Concern	Impact	Magnitude of Effect
Fishery**	Decline in high quality fishery through decreased movement of fish and aquatic invertebrates downstream, reduced water velocity and sedimentation, the prevention of upstream movement of fish, turbine mortality to fish, loss of the falls as a source of oxygen to reduce deficiency caused by Libby Dam, replacement of "blue ribbon" trout stream segment with reservoir fish habitat.	Highly adverse
Wildlife**	Decline of wildlife and and habitat diversity, through loss of riparian vegetation, loss of the harlequin duck population, probable losses to mountain sheep from effects on the Corps replacement habitat.	Highly adverse to adverse, although new reservoir habitat could benefit some aquatic mammals

TABLE 6-15. (CONTINUED)

Recreation and Aesthetics	Loss of recreation and aesthetic resources through inundation of China Rapids, dewatering of falls and canyon, placement of a concrete and steel structure in an otherwise natural scene, decline in fishing, loss of opportunity to view harlequin ducks and possible decrease in opportunities to see mountain sheep.	Highly adverse
History and Archaeology	Cumulative loss through construction, inundation vandalism, and theft (impacts of Libby Dam and the proposed Kootenai Falls and re-regulating dams) of historical and archaeological materials and sites that could be essential to defining the history and prehistory of the Kootenai valley.	Highly adverse
Kutenai Indians	Loss of sacred area, and of sources of food that have cultural or religious significance.	Highly adverse
Water Quality	Loss of water oxygenation provided by the falls causing reduction in the number of stoneflies, an important trout food species, below the falls.	Adverse
Visitor Safety	Safety hazard from wadeability of the partially dewatered reach, combined with the possible malfunction in the powerhouse (predicted to happen once a year) leading to sudden major increases in water level in the dewatered area.	Adverse

* *Long-term is defined as extending past the construction period. Only the most significant impacts are included in the table. As a result, few beneficial environmental impacts are listed because most are minor.*

** *In most instances, these impacts could not be reduced in the sense that the effects on specific resources in certain places could be softened. That is to say, for example, that little or nothing can be done to prevent loss of trout stream habitat in the reservoir, although it might be possible to create or enhance a trout fishery within reach of the people that now fish above the falls, thus somewhat easing the lost opportunities to fish for trout.*

TABLE 6-16. POSSIBLE METHODS OF REDUCING IMPACTS

	Method	Resource Affected	Amout of Impact + Reduction	Cost Effec-tiveness + + +
1	Construction of dam at Kootenai Falls with a reservoir elevation of 1,990 ft, rather than 2,000 ft	Wildlife, fishery recreation and aesthetics, history and archaeology	Low to moderate	Low*
2	Maintenance of minimum flow of 4,000 cfs over the falls, except during emergencies when flow may be reduced to 2,000 (this would be consistent with the agreement on releases from Libby Dam)	Wildlife, fishery recreation and aesthetics, history and archaeology	Low to moderate	Low*
3	Combination of the two above	Same as above	Moderate	Low*
4	Allow the entire river flow over the falls at night during the two month downstream migration season, preferably in combination with (3) above	Fishery	Moderate	Low*
5	Improve spawning conditions in tributaries downstream from the dam	Fishery	Moderate**	Possibly high
6	Build and operate an artificial spawning channel downstream from the dam	Fishery	Unknown**	Unknown
7	Plant trout from suitable brood stock	Fishery	Low	Unknown

TABLE 6-16. (CONTINUED)

8	Improvement of fisherman access downstream from the dam	Fishery/ recreation	Low to moderate**	Possibly high
9	Purchase of trout water elsewhere with permanent protection from development	Fishery	Moderate**	Unknown
10	Procurement of flow reservations in Kootenai River tributaries	Fishery	Unknown**	Unknown
11	Design turbines to improve fish survival	Fishery	Unknown	Unknown
12	Purchase and improve land elsewhere to replace lost habitat	Wildlife	High**	Unknown
13	Post bond to ensure proper reclamation	Wildlife	Moderate	High
14	Same as above	Wildlife (waterfowl)	High	High
15	Excavation of some affected prehistoric campsites + +	Archaeology	Low	Unknown

\+ *Pertains to long-term impacts only.*

* *Costs from these measures would result primarily from lost generating capacity and/or shortened lifespan of the project.*

** *These measures would reduce the impacts to a given resource in a given area, for example by improving fishery quality elsewhere in the Kootenai, but would have no effect on the impacts that would result from the dam.*

\+ + *Excavation of prehistoric sites would not reduce the impact to the Kutenai Indians who do not want the sites disturbed.*

\+ + + *A cost effectiveness rating of "low" means that relatively little would be gained for the money spent.*

SUMMARY OF ENVIRONMENTAL IMPACTS OF ALTERNATE SUPPLY OPTIONS

Conservation/Retrofits

Weatherization restricts air movement in and out of houses, which can contribute to indoor air pollution. This problem can be alleviated by taking steps to maintain adequate air interchange when weatherizing.

The dam retrofits would entail placement of turbines in existing dams. There will be some environmental impacts, largely downstream sedimentation, during construction, and fish mortality caused by the turbines. The long-term impacts should be small if normal river flow patterns were not affected. One archaeological site, a prehistoric campsite, would be inundated when the retrofit resulted in a 1.6 ft increase in the Broadwater Dam reservoir.

BPA

The environmental impacts associated with the BPA supply option are the impacts to Montana that would occur if BPA were to contract for new additional generation facilities to meet that portion of WMED load that would otherwise have been met by the proposed facility. DNRC believes other existing or planned sources could meet these future loads and that there would not be any additional environmental impacts to Montana associated with this supply option.

Dam/Conservation/Retrofit

The environmental impacts associated with the Dam/Conservation/Retrofit option are the sum of all the individual impacts associated with the proposed project, the dam retrofits, and conservation, as discussed individually above.

Colstrip

The environmental impacts of the Colstrip supply option are difficult to determine. The impacts associated with building and operating Colstrip Units 3 and 4 will occur whether the members of WMED purchase a share or not. It can be argued that, as with the BPA supply option, the environmental impacts associated with the Colstrip option are the ones that would occur in Montana if WMED's purchase of a 7 percent share (73.5 MW) were to require the members of the Colstrip consortium to build or purchase a share of new facilities. In other words, other customers will demand another 73.5 MW from the consortium members. Seventy percent of the Colstrip output is owned by utilities operating outside of Montana, so 70 percent of the 73.5 MW share would be met by new facilities outside Montana, and would cause no environmental impact in Montana. Thus, the environmental impacts that might result in Montana from the Colstrip supply option would be those impacts associated with the 30 percent (22 MW) of the 73.5 MW that would belong to Montana Power.

The next major facilities scheduled for construction by Montana Power are a dam at Carter's Ferry on the Missouri River and a coal-fired plant near Great Falls. If the schedule of these proposed facilities were to be accelerated as a result of Montana Power needing the 22 MW or if selling 22 MW to WMED were to force Montana Power to build these facilities, then the environmental impacts from the new facilities would result in part from WMED's purchase of the Colstrip power. If the 22 MW is met by conservation, on the other hand, there would be almost no environmental impacts in Montana as a result of the purchase.

Differential Comparison of Nonmonetary Costs and Benefits of Supply Options

The major nonmonetary costs and benefits to Montana of the five supply options are compared in table 6-17. Each option is compared to the BPA option.

TABLE 6-17. COMPARISONS OF MAJOR NONMONETARY EFFECTS OF ALTERNATE SUPPLY OPTIONS

Nonmonetary Costs*	Proposed Project	Dam/Conservation/Retrofit	Conservation/ Retrofit	Colstrip
Fisheries	Substantially Worse	Substantially Worse	Neutral	Neutral
Bighorn Sheep Habitat	Substantially Worse	Substantially Worse	Neutral	Neutral
Aesthetics	Substantially Worse	Substantially Worse	Neutral	Neutral
Archaeological and Historical Sites	Substantially Worse	Substantially Worse	Worse	Neutral
Religious freedom of Kutenai Indians	Substantially Worse	Substantially Worse	Neutral	Neutral

* *The effects of each option are stated in comparison to the effects of the BPA option*

Conclusions

As stated in the introduction to the cost-benefit analysis, this analysis only provides a framework method for comparing a proposed project with alternatives to that project. The decision on which alternative is the best is not easy to make.

Table 6-18 summarizes the cost-benefit section. The table is a balance sheet. The benefits of each supply option listed on one side can be compared to the adverse effects on the other side. Although all impacts must be considered when evaluating the project, only the major nonmonetary impacts are listed in the table. DNRC defines impacts as major if they are sufficient to alter the relative ranking of the supply options.

Table 6-18 compares nonmonetary benefits and costs of the alternative supply options. The supply option in which the benefits surpass the costs by the greatest amount is the best option. Implementation of a supply option with higher costs than benefits would reduce Montana's welfare.

There are no major nonmonetary benefits associated with any option in table 6-18, so any option that has a net monetary cost is dropped from further consideration.

The most difficult portion of this analysis is the comparison of monetary benefits and nonmonetary adverse effects. In order to make this comparison, the relative importance of the nonmonetary impacts must be estimated. DNRC has already done preliminary weighting by identifying the impacts of major importance. However, such weighting is not possible in some cases. For example, the impacts to the Kutenai Indians appear to be to their civil rights and religious freedom, which cannot be assigned a relative value.

As with the comparison of monetary costs and benefits, only the options with higher benefits than costs should be compared in the final analysis. This final analysis is the determination of which of the remaining alternatives has the greatest benefit to Montana. If no option yields greater benefits than the BPA option, then BPA is the best choice. It is the role of the Board to assign the weights to the nonmonetary impacts, and to decide which is the best supply option for Montana, primarily on the basis of information contained in this document.

TABLE 6-18. COST-BENEFIT SUMMARY
(millions of 1981 dollars)

Benefits	Costs
PROPOSED PROJECT	
Monetary - $69.6*	Monetary - $0.6 -$47.0** Nonmonetary - Major Adverse Impacts to: Fisheries Bighorn Sheep Habitat Aesthetics Archaeological and Historical Sites Religious Freedom of Kutenai Indians
DAM/CONSERVATION/RETROFIT	
Monetary -$110.6	Monetary -$ 0.6 - $ 47.0 Nonmonetary -same as proposed project
CONSERVATION/RETROFIT Monetary - $31.9	No Major Impacts
COLSTRIP	
Monetary - $51.7	No Major Impacts

* *Monetary benefits include price benefits to the consumer and adjustments to taxes and labor costs.*

** *The range in dollar figures shows the present value at Kootenai Falls as estimated by various methods.*

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1135 U.S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101-1479

REPLY TO ATTENTION OF

AUG 07 1987

RECEIVED DNR PLANNING

Construction-Operations
Regulatory Functions (86-499-30)

Ms. Charlotte Cohn
Environmental Planner
Minnesota Department of Natural Resources
Office of Planning
500 Lafayette Road
St. Paul, Minnesota 55155-4010

Dear Ms. Cohn:

This responds to your June 29, 1987 request for comments on the draft environmental impact statement (EIS) for the Winger Dam proposal. The project would require a Department of the Army Section 404 permit.

We believe that the following general and specific issues should be addressed in the final EIS to enhance its adequacy for the Corps Section 404 permit process.

General Comments

10 A A separate subsection within Section 3.0, possibly entitled "Recreation Impacts/Opportunities," should be developed. This subsection should describe the current availability and demand for recreational/fishery resources within the region, proposed plans and costs for recreational development at this reservoir, and a calculation of activity occasions based on demand. The proximity of this site in relation to other recreational/fishery resources should also be shown. We believe that separately showing this information would help clarify the recreational aspects of this project.

Specific Comments:

1.4 Reservoir (pg. 1-10)

10 B This section should quantify the effect the planned spring and summer operation would have on the flood flows on the mainstem of the Red River. It should translate this information into the amount of land presently being flooded at various flows and the amount of land that would be protected with the reduction in peak flows attributed to this project. This information should be shown in table form for ease of comparison.

RESPONSES:

3.1.10 U.S. ARMY CORPS OF ENGINEERS (USCE)

10A. A new impact assessment section entitled "recreational opportunities and impacts" has been added to Chapter 2.0 as Final EIS section 2.10. This additional analysis describes the current availability and demand for recreational and fishery resources within the region, presents an approximate calculation of activity occasions based on demand, and discusses the proximity of the site in relation to other recreational and fishery resources. The Sand Hill River Watershed District has not provided the DNR with any information concerning specific plans or costs for proposed recreational development which might be anticipated to occur at the proposed reservoir site if Alternative No. 1 was constructed. Therefore this additional Final EIS section on recreational opportunities and impacts does not include a discussion of proposed plans and costs for recreational development at the proposed reservoir. However, since the Draft EIS states that development of a public access is required for implementation of management techniques such as stocking (Draft EIS section 3.3.5), the new Final EIS section on recreational opportunities and impacts outlines the general costs involved in developing a public access in northwestern

Minnesota. The project proposers have provided an updated detailed estimate of project costs for Proposed Project No. 4 (Alternative No. 1). This information is presented in Final EIS section 2.2 and Table 2-1 of that section. Refer also to the response to Comment 4B in section 3.1.4 which outlines the position of the project sponsors that no modifications to proposed recreational opportunities or to land value benefits are warranted at this time.

10B. The Draft EIS (Draft EIS section 1.4) discusses generally the proposed operation of the gated flood storage during spring and summer gate operation as planned by the Sand Hill River Watershed District. According to information submitted to the DNR by the project proposers, the effect of the project proposer's planned spring and summer operation on Red River of the North mainstem flood flows is highly variable and depends on Red River flood flows at downstream USGS gaging stations. Generally, removal of 6,800 acre-feet of flood flows through reservoir storage will attenuate downstream Sand Hill River flood flows. This reduction in flow contributions to the Sand Hill River at Climax, Minnesota would then lower Red River flood flows downstream. The Watershed District has estimated the amount of reduced Red River downstream flood flows as a result of the proposed reservoir storage of 6,800 acre-feet. Data illustrating these estimated Red River mainstem flow reductions and volume reductions for the 1969 and 1979 flood years are presented as follows:

Flood Year	Red River Mainstem Location	Peak Flood Flow (cfs)	Estimated Flow Reduction (cfs)	Estimated Volume Removed from "8-day window" (Acre-Feet)
1969	Grand Forks, North Dakota	53,500	250	
	Emerson, Manitoba	54,700	225	3,100
1979	Grand Forks, North Dakota	82,000	300	
	Emerson, Manitoba	92,700	275	3,900

Based on information from the Lower Red River Watershed Management Board, a reasonable and achievable goal is to reduce the 100-year flood flows at Emerson, Manitoba by 20,000 cfs which represents a reduction from 109,000 cfs to 89,000 cfs. In order to achieve this goal, it has been estimated that approximately 163,000 acre-feet of floodwater would have to be removed from the flood peak at Emerson within an 8-day period or "window." The "8-day window" is defined as the period approximately four days before and four days after the peak. Flood benefits associated with the proposed project for the Red River mainstem are based on the reduction of the "8-day window" flood peak at Emerson and not on land flooded as balanced against protected acreage. Based on data from a May 1984 study prepared for the Lower Red River Watershed Management Board by McCombs-Knutson, Inc., floodwaters removed from the

100-year flood peak at Emerson (8-day window) would reduce average annual damages along the mainstem by $245 per acre-foot of floodwater removed.

Red River mainstem benefits attributable to the proposed Watershed District project were then derived by applying this flood peak reduction value to the volume of floodwater removed from the 8-day window at Emerson for the 1979 flood year as a result of proposed reservoir storage (3,900 acre-feet X $245 per acre-foot = $955,500). The agricultural flood damages used in the economic analysis prepared by the project proposers are composed of crop, livestock, and poultry losses. The additional cost of replanting, refertilization, additional spraying, and the reduction in crop yields and similar losses are included. Land damages due to scour and gully erosion and deposition of sediment and debris are included, as are damages to equipment and farm buildings and their contents. Agricultural flood damages were computed from data provided by the U.S. Army Corps of Engineers, St. Paul District, and updated utilizing Minnesota Department of Agriculture statistics. Damage curves for agricultural damages in relation to discharge at Emerson, Manitoba were utilized in determining mainstem benefits for the proposed project. According to the project proposers, the land area inundated at various flood flows and the amount of land that would be protected with any reduction in peak flows attributable to the proposed project is not readily available.

1.11.8 Nature and extent of flooding problems (pg. 1-24)

10 C The project's flood benefits to the local area and the Red River are mentioned, but there are no tables or data showing the acreage presently being flooded or how many acres would be protected from flooding if the project is completed. That information should be contained in this section.

3.2.4 Quantifiable Benefits (pg. 3-2)

10 D Within this section, the annual economic costs are placed in three categories. The final EIS should identify and include the cost of mitigation (upstream and downstream) and lake aeration systems. This could be incorporated into the existing categories or added as a separate category.

3.7 Land Management Practices/Land Use Changes (pg. 3-48)

10 E Given the projected fishery resource and water quality of this reservoir, it seems that the expected shoreland development (60 percent) should be adjusted accordingly. If the current projection is still considered accurate, example data for a similar lake and fishery resource within the region should be shown.

3.8 Agricultural Impacts (pg. 3-50)

10 F It appears that paragraph 4 of this subsection contradicts paragraph 6 of subsection 3.7. We believe all the factors cited as affecting potential recreational development must have been considered when the estimated land-use changes were made. We suggest that this paragraph be deleted or clarified.

10 G Paragraph 5 on this page states that the amount of benefit to lands along the Red River is unknown, but that economic benefits have been assigned anyway. This information needs to be clarified and quantified in the final EIS. If more projects similar to this one are needed before any quantifiable effects on the Red River occur, then these projects need to be discussed.

10 H Paragraph 3 on page 3-51 states that two farmsteads would be within the flood pool of this project. The final EIS should address the fate of these farmsteads. It is not clear whether these farmsteads are within the flood pool of any of the other alternatives. This should be clarified.

3.9 Economic Analysis (pg. 3-52)

10 I The economic analysis appears inadequate. The pages 3-52 and 3-53 of the document identifies various inadequacies of the economic analysis. A clear evaluation is needed which discloses the data, assumptions, and appropriate interest rate. The shortcomings of the evaluation should be corrected because project benefits are a decision criterion for the construction of a high hazard dam in Minnesota. The report in 3.2.1 states "Minnesota Dam Safety

RESPONSES:

10C. The Draft EIS (Draft EIS section 1.11.8) addressed the general nature and extent of flooding problems in the vicinity of the proposed project. According to information submitted to the DNR by the Sand Hill River Watershed District, data to document the acreage presently subject to flooding, or the amount of acreage which might be protected from flooding if the Watershed District's proposed project were constructed, are not readily available. The project proposers have estimated the local land area of the Sand Hill River watershed proposed to be impacted by the proposed project on an average annual basis. Watershed District summary estimates of both the average annual area flooded (in acres) with and without the proposed project, and of the reduction in average area flooded (in acres) are as follows:

INSERT SUMMARY OF REACHES FLOODED REACHES.DOC

SAND HILL RIVER BASIN
SUMMARY OF AVERAGE ANNUAL AREA FLOODED BY REACH

Reach	Description	Average Annual Area Flooded (acres) Without Proposed Project	With Proposed Project	Reduction in Average Area Flooded (acres)
1.	Sand Hill River from the Red River of the North to the upstream end of the existing 1958 Corps of Engineers channel project	1,080	640	440
2.	Sand Hill River from the upstream end of the existing 1958 Corps of Engineers project to Fertile, Minnesota	130	72	58
3.	From Fertile, Minnesota to Sand Hill River Watershed District Project No. 1 (Bear Park Dam)	438	192	246
4.	From Sand Hill River Watershed District Project No. 1 (Bear Park Dam) to a location at the midpoint between Project No. 1 and the proposed Sand Hill River Watershed District Project No. 4	139	46	93
5.	Sand Hill River from the midpoint between Sand Hill River Watershed District Project No. 1 and the proposed Sand Hill River Watershed District Project No. 4 dam site to the proposed Sand Hill River Watershed District Project No. 4 dam site	131	61	70
1-5	Sand Hill River from the Red River of the North to the proposed Sand Hill River Watershed District Project No. 4 dam site	1,918	1,011	907

Flood reduction benefits for the Sand Hill River drainage basin were calculated based on actual land areas. The project proposers estimated, in its Preliminary Engineers Report - Economic Analysis prepared for the DNR in October 1986, the average annual agricultural damages and benefits, the average annual other agricultural damages and benefits, and annual average urban flood damages along the Sand Hill River. These agricultural damages and benefits are presented in Table 3-1 and Table 3-2.

Urban flood damages occur in the towns of Climax and Beltrami. The Sand Hill River Watershed District calculated average annual urban flood damages using a methodology similar to that provided in a 1984 U.S. Army Corps of Engineers Section 205 Flood Control Reference Document for Initial Appraisal Report. This study estimated average annual urban damages for Climax and Beltrami to be $14,000. The Watershed District has estimated the average annual urban damages with the proposed project (Alternative No. 1) based on the following ratios at:

$$\text{Damage with Project} = \$14{,}000 \text{ (from U.S. Army Corps of Engineers estimate)} \times \frac{\text{Agricultural Crop Damage with Project (Reach 1)}}{\text{Agricultural Crop Damage Without Project (Reach 1)}}$$

$$= \$14{,}000 \times \frac{\$60 \text{ X } (640 \text{ acres})}{\$60 \text{ X } (1{,}080 \text{ acres})}$$

$$= \$\ 8{,}295$$

Reach 1 in the above calculations refers to Reach 1 as shown in the Summary of Average Annual Area Flooded by Reach listing which appears earlier in this response. The project proposers estimate that the average annual urban damages as previously calculated could be reduced with construction of Alternative No. 1 from $14,000 to $8,295. Based on these computations, the Watershed District estimates the annual average urban benefit attributable to the proposed project at $5,705 ($14,000 - $8,295).

10D. Draft EIS section 3.2.4 addresses quantifiable benefits as they apply to dam safety analysis issues, and the Draft EIS economic analysis is addressed in Draft EIS section 3.9. The DNR concurs that the cost of upstream and downstream mitigation, and of lake aeration systems should be identified and included in the Final EIS. Refer to the responses to Comments 4E and 4G in Final EIS section 3.1.4, and to the responses to Comments 9D, 9E, 9H, and 9L in Final EIS section 3.1.9 as well as to the Final EIS text sections noted in those responses for the discussion on the need for an aeration system, the need for upstream and downstream mitigation as identified in the Draft EIS (Draft EIS section 3.4 on wildlife resources, section 3.5 on Sand Hill River downstream flow analysis, section 4.3 on wildlife resources mitigation requirements, and section 4.4 on downstream resources mitigation requirements), the incorporation of aeration system and wetland and wildlife mitigation costs into direct proposed project costs, and the commitment of the Sand Hill River Watershed District to provide both required mitigation consistent with the Draft EIS (as a component of the DNR regulatory process) and adequate fish management techniques.

INSERT TABLE 3-1 AND TABLE 3-2 DAMAGES.DOC

TABLE 3-1
AVERAGE ANNUAL AGRICULTURAL DAMAGES AND BENEFITS
(ALONG SAND HILL RIVER)

Item	Damages No Project	Damages With Project	Benefits
Area Flooded	1,918 acres	1,011 acres	907 acres
Total Weighted Damage (1986)	$60 x 1918 = $115,080	$60 x 1011 = $60,660	$60 x 907 = $54,420
Total Weighted Damage (2011)	1.25 x 115,080 = $143,850	1.25 x 60,660 = 75,825	1.25 x 54,420 = $68,025
Agricultural Growth 25 Years	143,850 - 115,080 = $28,770	75,825 - 60,660 = $15,165	68,025 - 54,420 = $13,605
Average Annual Agricultural Growth (1)	.515859 x 28,770 = $14,845	.515859 x 15,165 = $7,825	.515859 x 13,605 = $7,020
Total	115,080 + 14,845 = $129,925	60,660 + 7,825 = $68,485	54,420 + 7,020 = $61,440

(1) The annual equivalent factor is 0.515859.

TABLE 3-2
AVERAGE ANNUAL OTHER AGRICULTURAL DAMAGES AND BENEFITS (2)
(ALONG SAND HILL RIVER)

Item	Damages No Project	Damages With Project	Benefits
Area Flooded	1,918 acres	1,011 acres	907 acres
Total Weighted Damage (1986)	$20 x 1918 = $38,360	$20 x 1011 = $20,220	$20 x 907 = $18,140
Total Weighted Damage (2011)	1.25 x 38,360 = $47,950	1.25 x 20,220 = $25,275	1.25 x 18,140 = $22,675
Agricultural Growth 25 Years	47,950 - 38,360 = $9,590	25,275 - 20,220 = $5,055	22,675 - 18,140 = $4,535
Average Annual AgriculturalGrowth (1)	.515859 x 9,590 = $4,950	.515859 x 5,055 = $2,610	.515859 x 4,535 = $2,340
Total	38,360 + 4,950 = $43,310	20,220 - 2,610 = $22,830	18,140 - 2,340 = $20,480

(1) The annual equivalent factor is 0.515859, as derived in Table 3-1.
(2) No definition of other agricultural damages and benefits is provided by the Watershed District.

In particular, the response to Comment 4G (Final EIS section 3.1.4) emphasizes that both the wildlife resources and downstream resources mitigation measures, mitigation requirements, and methods to accomplish mitigation remain valid. That response and the response to Comment 9D (Final EIS section 3.1.9) also outlines that Final EIS section 2.2 (refer also to that section) provides a discussion of updated cost projections for Alternative No. 1 as submitted by the project proposers. Table 2-1 in Final EIS section 2.2 shows the project proposer's detailed estimate of total project costs for Alternative No. 1, and part E (summary sections) delineates mitigation costs and aeration system costs as elements of right-of-way costs. The project proposers are committed to the need for mitigation and aeration systems as shown by the inclusion of mitigation costs and aeration system costs within right-of-way costs. However, the project proposers have not increased the actual $900,000 amount for right-of-way from previous estimates submitted to the Department in 1986 when the determination of the need for an aeration system and for mitigation as components of direct proposed project implementation had not been established.

10E. The position of the Sand Hill River Watershed District remains as discussed in Draft EIS section 3.7 that approximately 60% of the shoreline between the proposed dam site at T.H.59 and Polk CSAH No. 1 could be developed for lakeshore residential lots within a 10-year period if Alternative No. 1 were constructed. Refer to the response to Comment 9J in Final EIS section 3.1.9 which documents the manner in which the 60% anticipated shoreline development potential projection was derived and identifies the position of the Sand Hill River Watershed District relative to the validity of that projection. The response to Comment 4B in Final EIS section 3.1.4 also identifies the position of the Watershed District that no modifications to proposed recreational opportunities noted in the Draft EIS are warranted.

In addition, Final EIS section 2.1.1 contains a summary of the information in the Draft EIS concerning the evaluation and analysis of both the existing fishery resource in the Sand Hill River and the limited projected fishery resource which could be anticipated to result from the implementation of the project proposed by the Sand Hill River Watershed District (Alternative No. 1). That section of the EIS also provides a summary of DNR fisheries and fish survey information on Sand Hill Lake in Polk County in order to provide an additional evaluation of the type and extent of fishery resource that might be anticipated to result from the construction of the Watershed District's project proposal. This additional information on Sand Hill Lake is provided in the Final EIS, because as noted by the DNR at the public meeting on the Draft EIS, a reservoir as proposed by the Sand Hill River Watershed District is likely to result in a fishery resource with similar characteristics to Sand Hill Lake.

10F. The DNR agrees with this comment from the USCE that the fourth paragraph of Draft EIS section 3.8 (Agricultural impacts) addressing estimates of agricultural lands lost due to recreational development and use (Draft EIS page 3-50) is inconsistent with the sixth full paragraph of Draft EIS section 3.7 (Land management practices/land use changes) which addresses the potential for recreational development to account for possible land use changes surrounding the proposed project vicinity (Draft EIS page 3-48). To resolve this inconsistency, the conflicting paragraph in the Draft EIS agricultural impacts section (Draft EIS section 3.8, fourth paragraph, page 3-50) is deleted from the Final EIS.

10G. The Draft EIS agricultural impacts section (Draft EIS 3.8, page 3-50) indicates that while a quantifiable amount of protected lands (attributable to Alternative No. 1) along the Red River is not available, the Sand Hill River Watershed District's economic analysis has quantified benefits to agricultural lands.

According to the project proposers, the protected land area estimated for the Sand Hill River downstream from the proposed reservoir to the Red River of the North was calculated utilizing a HEC-I model. Based on this model, the Watershed District estimated that its project proposal could reduce the average number of acres subject to flooding on the Sand Hill River by 907 acres (Draft EIS section 3.7, page 3-48). The project proposers calculated, for both with and without proposed dam situations (see also the response to Comment 10C in this section), flood elevations downstream at various flood years (2-year, 5-year, 10-year, 25-year, 50-year and 100-year). These elevations were then applied to U.S. Army Corps of Engineers area inundation storage curves to determine the proposed project (Alternative No. 1) has the potential to protect 907 acres from flooding. Land value benefits from a U.S. Army Corps of Engineers Sand Hill River Flood Control Project were then applied to the 907 acres of protected lands. Urban damages and the methodology for determining benefits were derived from the U.S. Army Corps of Engineers Section 205 Flood Control Reference Document for Initial Appraisal Report (cited in the Draft EIS) which evaluated the potential for a dam and reservoir at the proposed project location.

A 1984 study by McCombs-Knutson, Inc. for the Lower Red River Watershed Management Board (LRRWMB) was used to determine agricultural and urban benefits attributable to the project for the Red River mainstem. According to the project proposers, this LRRWMB study was used to evaluate the influence on peak flows attributable to the proposed project for the 1979 flood and determined through HEC-1 modelling that the peak flow could have potentially been reduced by about 300 cfs at Grand Forks, North Dakota and by about 275 cfs at Emerson, Manitoba while removing about 3,900 acre-feet of floodwater from the "8-day window" at Emerson.

The project proposers then applied the economic strategy of the LRRWMB (value of removing an acre-foot of water from the 8-day window is $245) to determine the value of removing 3,900 acre-feet from the 8-day window at Emerson. The area of protected land for the Red River mainstem was not quantified by the project proposers in calculating mainstem benefits.

10H. The Draft EIS discussion of agricultural impacts (Draft EIS section 3.8, page 3-51) noted the existence of two farmsteads near the proposed pools, both of which would require protection from flood pool levels. The Benbo farmstead is in the S 1/2 of the SE 1/4 of Section 26, T147N, R42W (Winger Township) and the Mortenson farmstead is in the SW 1/4 of the SW 1/4 of Section 16, T147N, R41W (Sletten Township). Both farmsteads are located above the recreational pool elevations but below the temporary flood pool elevations of the proposed project and will be impacted by the fluctuating flood pools under Alternative No. 1. The Benbo farmstead has 7± acres and the Mortenson farmstead has 5± acres within the flood pool. The Sand Hill River Watershed District intends to purchase these two farmsteads, remove all the buildings and secure the sites for inundation by the reservoir flood pool. Other than Alternate No. 1, only Alternate No. 4 will impact area farmsteads. Specifically, the Mortenson farmstead will be impacted in the same manner as under Alternate No. 1. The Benbo farmstead will not be impacted under alternative No. 4.

10 I

Rules require that there be adequate justification before a high hazard dam can be constructed" and then proceeds to discuss an analysis of quantifiable project benefits which is described as inconclusive by the EIS preparer, see P3-52. The consequences of dam failure, as described in 3.2.5, upon 41 farmsteads, 4 communities, 39 roadways, and potential for loss of life, is significant. Thus, better economic documentation appears needed to address project justification and the dam safety issue.

4.3 Wildlife Resources

10 J

The final EIS should identify the mitigation that is proposed to compensate for the adverse natural resource impacts identified. Also, the Sand Hill Watershed District could hire a consultant to determine whether the operation plan proposed by the DNR to minimize downstream impacts would allow a recreational pool to be maintained at the desired elevation. The draft EIS indicates that this could be a serious problem and that it should be addressed in the final EIS. The proposed plan of operation identified in the draft should be used as a guide to determine the amount of mitigation for this project. This concludes our specific comments on the DEIS.

10 K

Also, we advise that our regulatory review of the application for a Section 404 permit must include the following criteria, as stated at 33 CFR 320.4(k):

"To insure that all impoundment structures are designed for safety, non-Federal applicants may be required to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons and, in appropriate cases, that the design has been independently reviewed (and modified as the review would indicate) by similarly qualified persons."

We look forward to receipt of the final document and we will resume processing of the Section 404 permit application for the project at that time. Mr. Paul Richert, 612-725-7772, is our point of contact concerning this EIS. Ms. Mary Marx, 612-725-7712, is our contact concerning the processing of the permit applications.

Sincerely,

For Wm. L. Goetz
Chief, Construction-Operations Division

RESPONSES:

10I. The USCE notes various insufficiencies with the economic analysis presented in the Draft EIS (Draft EIS section 3.9). The DNR Scoping Decision document for the EIS identified and the Draft EIS included an analysis of flood damage reduction, recreational and fish and wildlife benefits associated with the proposed project, an identification of proposed project costs and benefits, an identification of the public interest in the proposed project, and an assessment of economic hardship that might result to the area if the proposed project were not constructed.

An economic evaluation prepared by the Sand Hill River Watershed District in 1986 (Sand Hill River Watershed District Preliminary Engineers Report - Economic Analysis) and addressed by the DNR in the Draft EIS identified the Watershed District's enumeration of flood damage reduction, recreational and fish and wildlife benefits and proposed project costs. This report though, not incorporated by reference, was cited in the Draft EIS. The data, assumptions, and interest rate used by the project proposers are shown in this report (a copy of which was previously provided to the USCE). A copy of this report is also available for review and inspection at Final EIS review locations.

Further, the DNR review of aspects of this report as discussed in Draft EIS section 3.9 outlined the basic methodology used by the DNR in its review of the Sand Hill River Watershed District's analysis. The DNR raised specific issues concerning various methodologies used in the Watershed District's analysis. These included the incorporation of highway construction benefits and costs in the analysis, the method of calculating urban and downstream transportation damages, the omission of any costs for developing recreation facilities (when benefits were included), and the particular discount rate used. Refer also to the responses to Comments 9B and 9F in Final EIS section 3.1.9, and to the responses to the comments in this section (Final EIS section 3.1.10) for an explanation of the economic data analysis and assumptions, and the selection of the 8 7/8% interest rate to provide an appropriate comparison.

Though the DNR rules applicable to dam construction generally require adequate justification prior to construction of a high hazard dam, the actual justification is provided by the project proposer while the DNR determines the extent to which that justification appears adequate. The project need element of the DNR rules is generally limited to an identification of benefits and costs. Various proposed project benefits were identified in the Draft EIS. Refer to the response to Comment 4B in Final EIS section 3.1.4 for the Watershed District's position that no modifications to proposed recreational opportunities or to land value benefits are warranted.

Benefits and costs may need to be revised during the DNR permitting process to address inaccuracies in methodology. Quantifiable benefits as required by Dam Safety rules do exist for the proposed project proposal even though the magnitude of the benefits are subject to reduction due to errors in methodology. The DNR Dam Safety rules do not require a proposed project to have a benefit/cost ratio greater than 1.0. Hazards due to dam failure can be significantly reduced by proper methods of mitigation required to be implemented by the Sand Hill River Watershed District as conditions of permits. These measures include zoning, hazard signing, and the Emergency Action Plan which was discussed in Draft EIS section 3.2.8.

Final EIS section 2.2 and Table 2-1 provide an updated proposed project cost estimate for Alternative No. 1 as submitted by the project proposers. Estimated future costs at the projected time of project construction were considered. Some unit prices were updated based on more recent data. The proposed cost estimate includes estimates for county road relocation, principal spillway access appurtenances, reservoir fencing, soils investigation and engineering, and septic system and water well costs. Mitigation costs and aeration system costs are included within right-of-way costs even though the estimate does not reflect any change (from 1986) in the dollar amount of right-of-way costs as a result of mitigation requirements or aeration system costs,

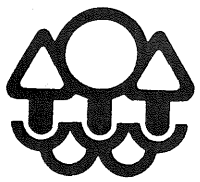
Prior to construction of any project proposal, numerous governmental approvals as identified in Draft EIS Chapter 5.0 and Final EIS section 2.4 are required. Further economic evaluation could also be required by any regulatory agency in connection with various permitting responsibilities and requirements.

10J. Refer to the response to Comment 4G in Final EIS section 3.1.4 for the discussion the continued validity of the mitigation measures, mitigation requirements and methods to accomplish upstream and downstream wildlife and wetland mitigation. That response also outlines the commitment of the Sand

Hill River Watershed District to mitigation and to the development of a mitigation plan, and the timing of such activities. The response to Comment 4G in Final EIS section 3.1.4 also identifies the incorporation of costs of mitigation as components of direct proposed project implementation.
The Department appreciates the cooperation and participation of the U.S. Army Corps of Engineers as a member of the HEP Team on the HEP Study, evaluation and analysis completed as a component of the Draft EIS.

Refer also to the responses to Comments 4B and 4C (Final EIS section 3.1.4), and to the Final EIS sections noted in those responses for the further discussion of the issues related to flows to sustain recreational pool levels, reservoir depletion and relationship to downstream augmentation, purpose of DNR specific inflow plan of operation, and streamflow augmentation plans of the Sand Hill River Watershed District.

10K. The comment on dam safety criteria required by non-federal applicants for USCE Section 404 permits is acknowledged by the DNR. Copies of all Draft EIS public comments were sent to the Sand Hill River Watershed District at the conclusion of the public review and comment period and the Watershed District is therefore aware of this requirement for non-federal permit applicants.



Minnesota Pollution Control Agency

August 10, 1987

Charlotte Cohn, Environmental Planner
Minnesota Departmart of Natural Resource
Office of Planning Environmental
and Management Analysis Section
500 Lafayette Road
St. Paul, Minnesota 55155

Dear Ms. Cohn:

Re: Winger Dam Draft Environmental Impact Statement (EIS)

The staff of the Minnesota Pollution Control Agency (MPCA) have reviewed the above document. We have the following comments on it.

11 A

1. The construction plans and specifications could be more detailed than they are. One example would be to specify deadlines and\or dates of completion or the time periods within which construction tasks are to be completed.

11 B

2. The operation plan given in the document is generally adequate. However, some questions remain. In particular we are concerned that adequate provision be made for maintenance of the protected flow requirement of 1.7 cubic feet per second (cfs) at the dam. This protected flow may be jeopardized in a number of ways, among them:

   a. Cutoff of flow from the dam while the reservoir is filling;

   b. Occurrence of the 7-day/10-year low flow event (1.8 cfs at Fertile) with concurrent losses of water to evaporation and groundwater.

   We note on page 3-39 that appropriations must be suspended when the discharge at Climax drops below 8 cfs. We believe also that the reservoir should be drawn down if necessary to maintain the 1.7 cfs discharge at the dam. Additionally, the EIS should discuss the means by which the minimum flow will be maintained if and when a. and b. above occur.

11 C

3. This project has yet to obtain 401 Certification. As noted in our comments (dated 1/13/86) on the scoping environmental assessment worksheet (EAW), the proposer must submit the operational plan to MPCA in order to obtain this certification. This plan should address the issues raised in item 2. above. The 401 Certification must be obtained before construction begins.

Phone:_____
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RESPONSES:

3.1.11 MINNESOTA POLLUTION CONTROL AGENCY (MPCA)

11A. Final design and construction plans and specifications for the proposed project have not been completed. Development of final design and construction plans and specifications would not occur or be appropriate until completion of the state environmental review process in order that those plans reflect the result of the process. At that time, regulatory agencies will be addressing the selection of alternative options.

Once all preliminary project review and approval stages have been satisfied, detailed plans and specifications will be prepared. Draft plans and specifications will then be submitted for final approval as part of proposed project permitting

processes. A specific construction schedule will be developed. An estimated project timetable developed by the Watershed District is suggested below based on an Final EIS adequacy decision in January, 1989.

Proposed project element	Estimated timetable
Final EIS adequacy decision	January, 1989
Final Engineer's Report filed	February, 1989
DNR Director's Report filed	March, 1989
Draft plans and specifications developed	June, 1989
Permit applications filed	June, 1989
Notice of Sand Hill River Watershed District public hearing	June, 1989
Permits and agreements issued	August, 1989
Final Sand Hill River Watershed District public hearing	August, 1989
Establishment of project	August, 1989
Final plans and specifications	October, 1989
Advertise for construction bids	October, 1989
Award construction contract	November, 1989
Start construction	December, 1989
Mobilization	December, 1989
Site preparation/vegetation removal	December, 1989 - March 1990
Construct embankment (maintain river control & reroute T.H. 59 traffic)	April - November, 1990
Construct principal spillway components	April - November, 1990
Open T.H. 59 with gravel surface	December, 1990
Pave T.H. 59 (reroute traffic)	May - June, 1991
Road relocations, abandonments, or raising and reroute traffic	July - September, 1991
Construction contract close-out	October - December, 1991
Fill reservoir (set low flow sluice gate to maintain base river flows)	March - April, 1992

11B. As noted in the Draft EIS section on Sand Hill River downstream flow analysis (Draft EIS section 3.5), the draft operation and maintenance plan proposed by the Sand Hill River Watershed District (Draft EIS Appendix A) is modified by the instream flow plan of operation developed by the DNR. This instream flow plan of operation is designed to replicate the natural occurrence of flow required to maintain riparian wetland communities downstream of the dam, and to assure the occurrence of a minimum streamflow. The revised instream flow specific plan of operation is discussed in Final EIS section 2.5. The revisions pertain to organization to make the section more clear without any substantive changes from Draft EIS section 3.5.

The purpose and the intent of instream flow plan is designed to maintain a protected flow and to avoid the potential for either of the occurrences noted in the MPCA comment letter. Since the specific instream flow plan will be a component of the DNR permit for a proposed project, the minimum flow of 1.7 cfs (or the inflow only if the inflow is less than 1.7 cfs) will be required to be maintained under the terms of the DNR permit. The DNR does not concur with the position of the MPCA that the proposed reservoir should be drawn down to maintain a 1.7 cfs outflow when the inflow is less than 1.7 cfs.

Refer also to the responses to Comments 4B and 4C (Final EIS section 3.1.4), and to the response to Comment 9L (Final EIS section 3.1.9) for the discussion of the issues related to potential for reservoir depletion, the effect of evaporation on reservoir levels, and reservoir and downstream streamflow augmentation. As noted in the response to Comment 4B, the Sand Hill River Watershed District is not altering any plans relative to proposed reservoir water level and downstream conditions, and there are not additional plans for water level augmentation.

11C. The DNR has reiterated in the various environmental documents the requirement of Section 401 certification for water quality effects as a component of the U.S. Army Corps of Engineers Section 404 permitting process. Specifically these requirements were identified in the Scoping Environmental Assessment Worksheet, the Scoping Decision Document, and Draft EIS Chapter 5.0. The Draft EIS list of governmental approvals has been revised in Final EIS section 2.4 as a result of the need for a permit not relevant to the Section 401 issue, and this revised Final EIS text continues to identify the Section 401 certification requirement. Copies of all Draft EIS public comments were sent to the Sand Hill River Watershed District at the conclusion of the public review and comment period and, therefore, the Watershed District at that time was additionally informed of the requirement of Section 401 certification. The project sponsors were therefore at that time also again informed, through the MPCA comment letter, that the project sponsor must submit an operational plan to the MPCA in order to obtain Section 401 certification. Section 401 certification issues become particularly relevant when a permit application for a project proposal is formally submitted to the U.S. Army Corps of Engineers. The specific MPCA requirements associated with Section 401 certification of water quality effects are not matters between the MPCA and the DNR as the RGU, but between the project proposers and the MPCA as the Section 401 regulatory agency.

11 D

4. The dam will discharge from a 48 inch pipe at the bottom of the reservoir. Although the intent of this design was to prevent anaerobic conditions, stratification may occur during low flow periods in the summer or under the ice. Water at the bottom during stratification can be expected to be turbid, rich in nutrients, low in dissolved oxygen, high in biochemical oxygen demand and sulfides. When this bottom water spills over the dam there is a possibility that water quality standards will be exceeded and fish kills may occur. The Sand Hill River Watershed District should provide an estimate of the hypolimnetic oxygen depletion rate and reaeration rate over the spillway to show that fish kills or water quality standard violations will not occur. (Note: other dams that have bottom turbine intakes still have stratification occuring. Temperature/dissolved oxygen profiles from the Blanchard Dam on the Mississippi River at Little Falls show that an intermittent hypolimnion exists.)

11 E

5. The total phosphorus concentrations analyzed by the Minnesota Department of Natural Resource (MDNR) indicate that the impoundment would probably have algae blooms (>30 ug/l chlorophyll a) and severe algae blooms (>60 ug/l chlorophyll a) for most of the growing season (Wilson, unpublished). Although MPCA standards do not include phosphorous standards, such blooms could certainly cause nuisance conditions mentioned in Minnesota Rules 7050.0210 Subpart 2 or the undesirable growths of aquatic plants in Minnesota Rules 7050.0220 Class 2. A related concern is that one purpose of this project is to provide a recreational lake. The recreational value of a shallow, hypereutrophic water body that would destroy natural habitat and, without intensive management, would only a support a bullhead fishery is questionable.

11 F

6. According to the most recent data the MDNR could obtain, the benefits of building the dam exceed the costs by $23,120 annually. (None of the other alternatives have benefits exceeding cost.) The ratio of benefit to cost is only 1.06. This seems like a very small benefit considering the likely recreational quality of the reservoir, destruction of natural habitat, probable increase in water quality standard violations, and the risk of dam failure, given that this dam is classified as a class I, or high hazard, facility. The need for aeration systems for fishery management (page 3-17) and cleanup/capping of wells and septic systems below the 1200-foot contour (see next item) seem to prejudice this ratio still further. We are not economists but we do suggest that a second look at the need for this project in light of the above would be a good idea.

11 G

7. There are five sites within the 1200 foot contour that may have wells or septic systems to be cleaned up or capped. Since a flooded septic system is an obvious source of nutrients to the impoundment, we believe that the EIS should address this issue. In addition, the wells should be capped according to MDH abandonment rules since water from the impoundment could contaminate the ground water. Also, the cost of cleaning up and capping should be included in the cost analysis. (This is assuming the Sand Hill River Watershed District will be reimbursing the owners of the wells and septic systems.)

RESPONSES:

11D. The Sand Hill River Watershed District estimates dissolved oxygen levels within the reservoir will be dependent on interrelationships between physical, chemical, and biological processes. The Watershed District anticipates that dissolved oxygen concentrations would be highest near that lake surface, gradually decrease with depth, and be highest during the cooler months. According to the project proposers, ice and snow cover on a lake during the winter may hamper natural reoxygenation processes and lead to an overall dissolved oxygen depletion rate below acceptable levels for some fish.

Temperature levels in the downstream river would normally be decreased during the summer months because low flows would be taken from the cooler lower portion of the proposed reservoir. Temperature effects are estimated to diminish in the downstream direction from the proposed dam due to natural processes. Temperature levels within the proposed reservoir would vary, depending on the time of the year. In the summer, temperatures would be

highest at the lake surface, and decrease with depth. During the winter, the deeper waters would be expected to have higher temperatures.

Reservoir stratification can sometimes result from temperature and water density conditions within the lake. The potential for stratification is dependent on reservoir depth and the ability of physical processes (i.e. normal inflow and wind) to mix impounded water. Generally, shallower waters are more likely to undergo complete mixing than the deeper waters. Stratification is also dependent on the ability of the ability of the natural mixing forces to overcome the strength of the thermocline to resist mixing. The thermocline is defined by a steep temperature gradient which separates the upper warmer less dense water for the lower cooler and more dense water. For shallow lakes, the thermocline is weak and unable to resist the mixing forces. Draft EIS section 3.3.4 (projected fisheries discussion) addresses the limited potential for stratification with Alternative No. 1 as a result of a small area of any depth, the mixing of the water column through wave action and the composition of the anticipated fishery resource.

Refer to the responses to Comments 4E (Final EIS section 3.1.4), and 9D and 9E (Final EIS section 3.1.9) for the additional discussion of the need for an aeration system as a fish management technique established in the Draft EIS, the commitment of the Watershed District to providing an aeration system, and the incorporation of the costs associated with an aeration system as a component of direct proposed project implementation costs. Final EIS section 2.1.1 includes a revised discussion which summarizes the nature of the proposed reservoir and the recreational and fishery potential which might be expected to occur under an Alternative No. 1 scenario. Final EIS section 2-2 and Table 2-1 in that section provide a discussion and identification of updated cost projections for Alternative No. 1 (as submitted by the Watershed District) which include the cost of an aeration system as an element of right-of-way costs.

The low flow conduit is designed to pass base flow by removing lower reservoir water automatically with no provision for manual control of water withdrawal at varying depths. The project proposers anticipate that downstream dissolved oxygen levels would be increased from water releases immediately below the proposed dam. The increased dissolved oxygen would result from a 25-foot vertical drop of the reservoir outflow through the principal spillway/energy dissipation system and the associated turbulence. The increased level of dissolved oxygen would gradually diminish in the downstream direction due to natural process of deoxygenation. Reaeration and deoxygenation data would have to be developed to model the reaeration/deoxygenation processes and the Watershed District is not committed to completion of such modeling.

The project proposers do not anticipate aquatic weed growth or algae blooms in the downstream river regime to be of major significance. However, they expect these phenomenon around the periphery of the proposed reservoir. The magnitude of adverse effects from these phenomenon are difficult to predict without further study and the project sponsors are not committed to such further analysis. The magnitude of effects is highly dependent on lake nutrient loading.

The Draft EIS (Draft EIS section 3.6) includes an analysis of existing Sand Hill River water quality based on a 1986 water quality sampling program at five locations during five sampling periods. The sampling locations included two sites upstream of the proposed reservoir, one site within the proposed reservoir,

one site at the proposed dam location, and one site downstream of the proposed dam. An assessment of the water quality of the proposed reservoir completed by the MPCA in April, 1988 under an Alternative No. 1 scenario is included in the Final EIS as Appendix A. While the water quality evaluation in the Draft EIS examined existing stream water quality, the purpose of the MPCA modeling was to use three levels of modeling to generate estimates of potential reservoir water quality.

11E. Though the Draft EIS was specific in its evaluation of the extremely limited recreational potential of the reservoir proposed by the Sand Hill River Watershed District, the description of the proposed reservoir (Draft EIS section 1.4) has been revised in Final EIS 2.1.1 to more thoroughly discuss the nature of the proposed reservoir and the recreational and fishery potential which might be expected to occur under the scenario described for Alternative No. 1. This revised section also provides information on the characteristics and nature of the fishery resource for Sand Hill Lake in Polk County in order to provide an additional evaluation of the type and extent of a fishery resource that might be anticipated to result from the construction of proposed Alternative No. 1.

Refer also the response to Comment 4E in Final EIS section 3.1.4 which summarizes the Draft EIS evaluations of the fishery potential from the project proposal of the Sand Hill River Watershed District.

11F. Comments acknowledged by the DNR. Final EIS section 2.2 and Table 2.1 in that section provide an updated detailed estimate of cost projections for Alternative No. 1 as submitted by the Sand Hill River Watershed District. During the DNR permitting process, the project proposers have the responsibility to provide sufficient justification to the DNR of the need for a Class I dam in terms of quantifiable benefits. This generally requires an identification of standard benefits and costs. The DNR rules applicable to dam construction do not require a positive benefit and cost relationship.

Further economic evaluation could be required by any regulatory agency in connection with various permitting responsibilities and requirements.

11G. A flooded residential septic system may be a source of nutrients to the proposed reservoir. Draft EIS section 1.11.6 notes five sites which may have wells and septic systems located near or within the 1200 foot contour and therefore susceptible to flooding. As discussed in the Draft EIS, these sites need to be capped or abandoned, according to the Minnesota Water Well Construction Code, Minnesota Department of Health Rules, or local Shoreland Management Ordinances to assure protection from flooding and to avoid impacts to the proposed reservoir. The Sand Hill River Watershed District will comply with appropriate state and/or local regulations relative to wells and septic systems within the proposed project area as part of property condemnation, acquisition and/or easement procedures. These procedures will be documented and costs will be incurred by the Watershed District through the property condemnation, acquisition and/or easement processes.

Final EIS section 2.2 and Table 2-1 in that section provide an updated project cost estimate for Alternative No. 1 as submitted by the project proposers. This cost estimate was specifically modified to incorporate (among other items) the costs to address issues related to water wells and septic systems as costs associated with direct proposed project implementation. The revised list of

governmental approvals in Final EIS section 2.4 also includes a more specific reference (than that provided in the Draft EIS) to compliance with Minnesota Department of Health rules.

Refer also to the response to Comment 2 in Final EIS section 3.1.2 for a further discussion of rules applicable to wells and septic systems and for the discussion of the commitment of the Watershed District to this issue.

11 H

8. The document states there are no MPCA routine monitoring stations on the river, so the MDNR had to collect water quality samples. While it is true there are no MPCA routine monitoring stations, we do have water quality data on the Sand Hill River at Fertile. The Program Development section of the MPCA Water Quality Division is interested in providing an update on the kinds of data available and the contact people in the section who can provide data. Some information to be covered includes the monitoring programs, the Water Quality Management Plan, the nonpoint source, toxics and lakes programs, and the nondegradation rule. Program Development staff would like to present this information to the MPCA Office of Planning and Review (OPR), the MPCA's Environmental Assessment writers in the Municipal Wastewater Treatment section of Division of Water Quality, and the Environmental Planners at the MDNR Office of Planning. If you would be interested in such a session, please inform us. You may also know of others who would benefit from such a presentation.

Sincerely,

Clifford T. Anderson
Director
Office of Planning and Review

CTA:mfl

cc: Lou Flynn, MPCA, Division of Water quality
Carri Lohse-Hanson, MPCA, Division of Water Quality
Wayne Gorski, EPA Chicago
Tom Braidech, EPA Denver

RESPONSES:

11H. Comment acknowledged by the DNR. According to inquiries made to the MPCA, the scope of MPCA available water quality monitoring data includes:

1) The first source of data is a water quality study conducted at Fertile in 1980 when the city had a collection system that discharged directly to the river. The study compiled water quality and flow data to predict effluent limits that would apply to a future wastewater treatment facility. (The city is presently building a pond system, which will have predetermined discharges.)

2) The water chemistry data collected for this study is stored in the second data source, STORET (EPA's STOrage and RETrieval water quality data base). STORET contains temperature, flow, turbidity, DO, BOD, pH, total suspended solids, organic nitrogen, NH3+NH4, NO2+NO3, total phosphorus, ortho phosphorus and chlorophyll-a data for four stations upstream and downstream from Fertile.

3) The third source of data is a 1980 stream assessment survey. The purpose of the survey was to determine a MPCA proper use classification for the Sand Hill River near Fertile. The MPCA's conclusion of the survey was that the Sand Hill had been properly classified by the MPCA (for water quality purposes) as a 2B, 3B, 4A, 4B, 5 and 6 stream.

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

REPLY TO THE ATTENTION OF
5ME-14

10 AUG 1987

Ms. Charlotte Cohn
Minnesota Department of Natural Resources
Office of Planning
500 Lafayette Road
St. Paul, Minnesota 55155-4010

Dear Ms. Conn:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA), Region V, has reviewed the Draft Environmental Impact Statement (DEIS) for the Sand Hill Watershed District Project No. 4, the Winger Dam. Although the project is not sponsored by a Federal agency, a Federal permit must be obtained from the U.S. Army Corps of Engineers for placement of fill in wetlands under Section 404 of the Clean Water Act. Because USEPA has the responsibility to comment on that permit, we are taking the opportunity to provide advisory comments on the proposed project during the DEIS review process, rather than waiting until the permit application stage. We will submit more detailed comments at the time the Section 404 permit application is provided for our review.

Description of Proposed Project

The Sand Hill River Watershed District has proposed to construct a Class I (high hazard) dam on the Sand Hill River in southeastern Polk County, Minnesota, approximately one mile south of the town of Winger. The project is intended to provide flood damage reduction for downstream areas, to provide a recreational lake, and to facilitate the upgrading of the crossing of the Sand Hill River for State Trunk Highway 59 (T.H. 59). The preferred alternative (Alternative No. 1) is the construction of a 35-foot-high, earth-fill dam. The dam would create a 6.8-mile-long reservoir with a 1,217-acre permanent or recreational pool that would be 20 feet deep at the dam. The temporary flood pool for floodwater storage would have a surface area of 1,613 acres and would be approximately 26 feet deep at the dam. The dam would provide a total of 6,881 acre-feet of gate-controlled floodwater storage and 1,548 acre-feet of ungated, temporary floodwater storage. A 1,420-foot-long depressed section of T.H. 59 would serve as the emergency spillway.

12 A | Four other alternatives were considered: three design modifications to the proposed project (Alternatives No. 2, No. 3, and No. 4), and the no-build alternative (Alternative No. 5). All alternatives except Alternative No. 5 would provide approximately 6,800 acre-feet of gated floodwater storage, and would have similar flood control benefits. The volume of

12 A flood storage was mandated by the flood reduction goals for the Red River of the North, and is a required condition for financial assistance for the project from the Lower Red River Management Board.

Alternatives 1 through 3 involve the construction of a 35-foot-high earthen dam at T.H. 59 on the Sand Hill River. Alternative No. 1 would have a permanent recreation pool; Alternative 2 would not. Alternative No. 3 would have a pool, but it would be significantly reduced in depth and area, and would be approximately 6 feet deep at the dam. Alternative No. 4 involves the construction of two multipurpose earth-fill dams, a 35-foot-high dam at T.H. 59 and a 15-foot-high dam at Polk County State Aid Highway (CSAH) No. 1, along with a highway crossing at each structure. The permanent pool for the larger dam would have a surface area of 113 acres, a maximum depth at the dam of 4 feet, and a volume of 263 acre-feet. The permanent pool for the smaller dam would have a surface area of 124 acres, a maximum depth at the dam of 5 feet, and a volume of 264 acre-feet.

Evaluation of the Proposed Project

The principal design difference between the four alternatives is the size of the dam, and the major difference in environmental impacts between the alternatives is related to the balance between the amount of water impounded and that released to the downstream areas for water quality maintenance.

12 B Based on our review of the information provided in the DEIS, we believe that the construction of the proposed project would result in serious impacts on the water quality of the Sand Hill River and on portions of the Red River of the North, an interstate water body.

12 C The present fishery is characterized as having few large fish species and poor species diversity (page 3-10), due to habitat reduction, sedimentation, and low dissolved oxygen levels. Drop structures in a channelized stretch of the river constitute in-stream barriers that prevent fish migration from the Red River of the North. The proposed project does not appear to offer any potential to correct existing water quality problems. The aerators proposed to be installed would not result in any significant improvement in water quality unless they were operated continuously. Such continuous operation would be required to support a fish population of recreational importance. This conclusion is supported by the statement on page 3-13 that the "Physical and chemical characteristics of the proposed reservoir are most closely related to a bullhead type of lake." As indicated in the DEIS, the high phosphorus levels, shallow depths, and low flows of the Sand Hill River likely would lead to winter fishkills.

12 D Under Minnesota law, a high-hazard dam must be justified on the basis of quantifiable benefits. The only benefits to the environment from the construction of the proposed dam discussed in the DEIS are recreational in nature. Given the currently poor fishery situation at present, and the adverse impacts that would result from the construction of the dam, it is unlikely that the proposed project would result in the development of a fish population of recreational importance. Therefore, the benefits to this type of recreation, if any, would be minimal.

RESPONSES:

3.1.12 U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

12A. The requirement for 6,800 acre-feet of gated floodwater storage associated with all of the proposed project construction alternatives was determined by mutual agreement between the Lower Red River Water Management Board (LRRWMB) and the Sand Hill River Watershed District. This storage requirement is based on estimated economic and benefit considerations of the impact of the proposed project on the Red River of the North. The LRRWMB has conditioned its proposed project funding contribution of approximately $962,000 on a proposed project in the T.H.59 and Sand Hill River vicinity providing for 6,800 acre-feet of gated flood storage. In addition, the 6,800 acre-feet storage requirement represents the remaining available storage between the minimum proposed reservoir elevation required to maintain permanent pool depth and the maximum reservoir water elevation controlled by area topography.

12B. According to the Sand Hill River Watershed District, the effects of water release from the proposed project on dissolved oxygen, temperature, aquatic weed growth, and algae blooms on the Sand Hill River and the Red River of the North can only be addressed in a limited qualitative manner at this time.

The Watershed District anticipates that downstream dissolved oxygen levels would be increased from water releases immediately below the proposed dam. The increased dissolved oxygen would result from a 25-foot vertical drop of the reservoir outflow through the principal spillway/energy dissipation system and from the associated turbulence. The increased level of dissolved oxygen would gradually diminish in the downstream direction due to natural process of deoxygenation. Reaeration and deoxygenation data would have to be developed to effectively model the reaeration/deoxygenation process and the project proposers are not committed to such an effort.

The project proposers do not anticipate aquatic weed growth or algae blooms in the downstream river regime to be of major significance. However, these phenomenon can be expected around the periphery of the proposed reservoir. The magnitude of adverse effects from these phenomenon are difficult to predict without further study and the project sponsors are not committed to such further analysis. The magnitude of effects is highly dependent on lake nutrient loading.

The Draft EIS (Draft EIS section 3.6) includes an analysis of existing Sand Hill River water quality based on a limited water quality sampling program at five locations during five sampling periods. The sampling locations included two sites upstream of the proposed reservoir, one site within the proposed reservoir, one site at the proposed dam location, and one site downstream of the proposed dam. As a component of Section 401 permitting discussions with the Watershed District, the Minnesota Pollution Control Agency (MPCA) completed an assessment in April, 1988 of the water quality of the proposed reservoir under the Alternative No. 1 scenario. The purpose of the modeling was to use three levels of modeling to generate estimates of potential reservoir water quality. The entire MPCA report is included in the Final EIS as Appendix A.

12C. A new section in the Final EIS presents summaries of the proposed reservoir characteristics and of the fisheries resource evaluations and projections as discussed throughout the Draft EIS. These evaluations demonstrate the limited fishery resource potential which can be anticipated to result from the project proposal of the Sand Hill River Watershed District. Also in this Final EIS section, the DNR has provided fish survey information on Sand Hill Lake in Polk County to provide an additional evaluation of the type and extent of fishery resource that might be anticipated to result from the construction of proposed Alternative No. 1. This section reiterates the need for an aeration system as a component of proposed project development and addresses the problems and hazards associated with continuous aeration systems designed to prevent winterkill.

Refer also to the response to Comment 4E in Final EIS section 3.1.4 which outlines the conclusions in the Draft EIS relative to reservoir characteristics, fisheries, fishery resource potential, and fish management techniques which could be implemented to manage the resource. That response emphasizes the need for an aeration system (as established in the Draft EIS) to maintain any form of a sport fishery. The responses to Comments 9D, 9E, and 9H further

address the need for an aeration system, the Sand Hill River Watershed District's incorporation of aeration system costs as a component of direct proposed project implementation costs, and the commitment of the Watershed District to incorporate fish management practices (including aeration) to achieve their proposed reservoir objectives. The Watershed District has not identified specific plans for continuous reservoir aeration. The incorporation of aeration system costs as identified by the project proposers is discussed in Final EIS section 2.2 (updated cost projections for Alternative No. 1) and is shown in Table 2-1 in that section. Refer also to the responses to Comments 10D and 10E in Final EIS section 3.1.10 for the discussion of similar issues.

12D. Final EIS section 2.2 and Table 2-1 in that section provide the updated cost projections for Alternative No. 1 as submitted by the Sand Hill River Watershed District. Item B in Table 2-1 delineates a recreational enhancement item. According to information from the project sponsor, benefits related to recreation are a small part of total proposed project benefits. Refer to the response to Comment 4B in Final EIS section 3.1.4 which outlines the position of the Watershed District that no modifications to proposed recreational opportunities or land value benefits are warranted.

Refer also to the response to Comment 10I in Final EIS section 3.1.10 for a discussion on the level to which benefits are evaluated by the DNR in connection with DNR permit applications for construction of new dams, and the responsibilities of a project applicant to provide an appropriate justification to the DNR.

USEPA Recommendations

The content of the Final Environmental Impact Statement (FEIS) should reflect the considerations outlined in the following recommendations:

12 E | 1. Alternative No. 1, the preferred alternative in the DEIS, is not acceptable from an environmental standpoint, and should be eliminated from further consideration.

12 F | 2. Based upon the expressed requirement in the DEIS for the provision of 6,800 acre-feet of flood storage, we recommend that Alternative No. 2, a dry dam, receive detailed consideration in the FEIS.

12 G | 3. We request that an additional alternative, or combination of alternatives, be included in the FEIS: a dry dam structure with a smaller capacity, combined with downstream flood protection and floodproofing measures.

12 H | 4. Alternatives may exist elsewhere in the Red River of the North Watershed to provide for additional flood storage that would alleviate the need for a Class I high-hazard impoundment on the Sand Hill River. We recommend that preapplication discussions be conducted with our Aquatic Resources Unit staff, located in the Water Division, and with the U.S. Army Corps of Engineers, to select the alternatives for detailed evaluation in the FEIS that would fulfill the requirements for a Section 404 fill permit application.

We appreciate having the opportunity to review the DEIS. We also would like to review the FEIS when that document is prepared. Although our comments are advisory only at this stage of the project, we anticipate providing more detailed comments during the permit review process. If you have any questions concerning our comments, please contact me at 312/886-7500, or Ms. Kathleen Brennan of my staff at 312/886-6873.

Sincerely yours,

William D. Franz

William D. Franz, Chief
Environmental Review Branch
Planning and Management Division

RESPONSES:

12E. Comments and concerns acknowledged by the DNR. Refer to the response to Comment 4A in Final EIS section 3.1.4 which describes the purpose of an Environmental Impact Statement and the responsibilities of the DNR as the preparer of the Final EIS. As noted in that section, the agency responsible for EIS preparation does not select a preferred alternative during the Draft or Final EIS process. Comments related to the merits of the project proposed by the Sand Hill River Watershed District are, with the publication of the Final EIS, provided to various decision makers for their consideration in regulatory decisions under their control.

12F. The Draft EIS included consideration of Alternative No. 2, a dry dam. The discussion of alternatives in the Draft EIS was consistent with the parameters of such discussion outlined in the Scoping Decision document which determined the scope of the EIS. Further, many of the impact analyses evaluated the impact of all the alternatives. Refer to the response to Comment 9B in Final EIS section 3.1.9 which addresses the issue that the extent of a discussion in an EIS is to be succinct and commensurate with the importance of the impact.

A dry dam, functioning solely for flood damage reduction purposes generally results in adverse impacts to fish and wildlife resources, and inhibits the use of the resource to provide for wetland management and fish and wildlife habitat

and management. A dry dam similar to that proposed by the Sand Hill River Watershed District lacks a permanent pool and would result in adverse impacts to wetland fish, and wildlife resources. As noted in the Draft EIS, Alternative No. 2 would require both wetland and upland habitat species mitigation to offset average annual habitat net losses. The only other alternative which requires both wetland and upland mitigation is Alternative No. 1.

From solely a dam safety perspective, a dry dam is preferable since without a permanent pool, less operation and maintenance are required, and seepage and hydraulic loading would be reduced during times when the pool is empty.

12G. The DNR Scoping Decision document, sent to all parties on the Minnesota Environmental Quality Board distribution list outlined the alternatives to be addressed in the EIS. The DNR did not receive any comments on the content of the Scoping Decision.

The Draft EIS (Draft EIS section 1.11.9) discusses flood plain management aspects associated with the proposal of the Sand Hill River Watershed District and notes the requirements of the Minnesota Flood Plain Management program, DNR rules applicable to flood plain areas, and flood plain zoning as a component of the DNR permitting authority. Minnesota state statutes applicable to the DNR's regulatory authority provide that structural methods of flood control must occur along with traditional nonstructural measures such as flood protection and flood proofing. Therefore, these issues will be addressed as part of any DNR permit for dam construction for flood control.

12H. See the response to Comment 12F in this section which explains the parameters of alternatives evaluated in the EIS as specified by the Scoping Decision document. Refer also to the response to Comment 9F in Final EIS section 3.1.9 which emphasizes that while alternatives may exist elsewhere in the Red River of the North watershed to alleviate the need for a Class I dam at this proposed location, the EIS scope is designed to examine the impacts of a concrete project proposal on its own merits.

3.2 DRAFT ENVIRONMENTAL IMPACT STATEMENT PUBLIC MEETING COMMENTS AND DEPARTMENT OF NATURAL RESOURCES RESPONSES

This section of the Final EIS includes the statements presented or questions asked at the July 21, 1987 public informational meeting on the Draft EIS, and the response of the Department of Natural Resources to those comments. The statements or questions are organized according to general topic areas along with a statement outlining the nature of the concern raised and the response of the DNR (the Responsible Governmental Unit) to the particular comment.

3.2.1 Proposed project funding

CONCERN: A question was raised concerning the status of funding commitments from the Minnesota Department of Transportation (MNDOT) for MNDOT's proposed project financial contribution of $1,020,000.

RESPONSE: Final EIS section 2.2 and Table 2-1 in that section reflect a $1,020,000 contribution from the Minnesota Department of Transportation for proposed project financing. In the summer of 1987, MNDOT announced the deferral of a variety of proposed projects from its 1988-89 construction program. The bridge and roadway work associated with Sand Hill River Watershed District Project No. 4 was among the deferred projects. At the Draft EIS public meeting, a representative of MNDOT indicated that the proposed project could be considered again for the 1990-91 construction program. MNDOT also emphasized that action during the 1988 legislative session could restore highway funding for the project proposal in 1989. The MNDOT representative also indicated that proposed project development could continue during the interim.

At the present time, MNDOT's share of the Sand Hill River Watershed District's proposed project has been rescheduled for the 1990-91 construction program with a proposed October 1989 letting date. This revised date is contingent upon the appropriate federal, state, and local project approvals and authorizations.

3.2.2 Groundwater wells within proposed flood pools

CONCERN: Mr. Blanchard Krogstad requested information about the status and ultimate disposition of a man-made flowing well in Sletten Township within the proposed flood pool. The comment also concerned whether the location of this well was shown in the Final EIS.

RESPONSE: Mr. Krogstad's comments address the same issues as in his written comments to the DNR which are reprinted as Comments 2 (Final EIS section 3.1.2) and 3A (Final EIS section 3.1.3). At the Draft EIS public meeting, the Department agreed to assure that the location of this flowing well was included in the Final EIS on the maps of wells and septic systems within the prosed impoundment, and agreed that requirements associated with the abandonment of wells would be identified in the Final EIS.

Refer to Final EIS section 2.3 on groundwater site locations and flow patterns and to the responses to Comments 2 and 3A in the above listed sections for the discussion of the revised Final EIS information on the location of groundwater wells to reflect the location of this particular well in Sletten Township. Final EIS Figure 2-5 in Final EIS section 2.3 now specifically shows the location of this well.

In addition, the responses to Comments 2 and 3A address the requirements of the Minnesota Department of Health relative to the capping or abandonment of wells within areas subject to flooding. These responses also discuss the commitment of the Sand Hill River Watershed District to comply with applicable regulatory requirements.

3.2.3 Projected fisheries resource in proposed reservoir (under Alternative No. 1)

CONCERN: Mr. Blanchard Krogstad also raised issues concerning the type of fishery resource that might be anticipated to occur if Alternative No. 1 were constructed. Comments were also made (from Mr. Krogstad and others) about the need for and success of aeration systems.

RESPONSE: The DNR, at the public meeting reiterated the information in the Draft EIS (Draft EIS section 3.3) concerning the results of the fisheries investigation undertaken by the DNR, the DNR's projections of the type of fishery that might occur with the proposed reservoir, the various fish management techniques that could be implemented to provide a particular fishery resource (including the finding in the Draft EIS of the need for an aeration system), and the requirements for a public access if fish management techniques were to be implemented by the DNR.

The Final EIS has been revised with a new section which summarizes the information from the Draft EIS on the description of the proposed reservior and of the fishery resource potential (Final EIS section 2.1.1). This new section clarifies the information in the Draft EIS concerning the fishery resource and recreational resource that might be anticipated to occur from the project proposal of the Sand Hill River Watershed District. Information on Sand Hill Lake in Polk County is also included to provide an additional evaluation of the type and extent of fishery resource that might be anticipated to result from the construction of proposed Alternative No. 1, because as noted by the DNR at the Draft EIS public meeting, a reservoir as proposed by the Sand Hill River Watershed District is likely to display a fishery resource similar to that of Sand Hill Lake. For example, the potential for winterkill, evaporation rates, and minimum flow of the proposed reservoir was indicated to be similar to the winterkill, evaporation and minimum flow characteristics of Sand Hill Lake.

In addition, Final EIS section 2.2 and Table 2-1 in that section show an updated cost estimate for Alternative No. 1 as provided by the Sand Hill River Watershed District. As noted in that section, the project proposers are committed to the need for an aeration system as shown by the inclusion of aeration system costs within right-of-way costs.

Refer also to the responses (and to the Final EIS text noted in those sections) to Comments 4E in Final EIS section 3.1.4 (summary of Draft EIS evaluation on fishery resource potential and the need for an aeration system); Comments 9B, 9D, 9E, 9H, 9I, and 9J in Final EIS section 3.1.9 (discussion of limited fishery resource potential associated with Alternative No. 1, need for aeration system as a fish management technique, and the commitment of the project sponsors to incorporating reasonable and practical fish management practices including aeration); and Comment 10E in Final EIS section 3.1.10 (discussion of summary of Draft EIS information concerning the evaluation and analysis of the existing and projected fishery resource, and the comparison between Sand Hill Lake and the proposed reservoir).

3.2.4 Financing and co-sponsoring of aeration system costs

CONCERN: A question was raised concerning the financing and sponsoring of aeration systems by local individuals or a watershed district.

RESPONSE: As noted in the Draft EIS, generally all the costs associated with an aeration system (permit fees, equipment, insurance, electricity, operation and maintenance are the responsibility of the permittee who is normally a sportsman group, unit of government, or project sponsor.

One method of co-sponsoring the costs of aeration systems is the CORE (Cooperative Opportunities for Resource Enhancement) program. Under this program a local unit of government or a private group is responsible for the operation and maintenance of an aeration system. Generally, the State funds the purchase or purchases the equipment itself while the permittee covers the operating and maintenance expenses including the permit, insurance ($500,000 minimum combined single limit general liability coverage policy), other liability costs, electricity, signs, and public notices. The state generally retains the ownership responsibilities of the units. CORE funds can only be used for pump and baffle aeration systems.

The DNR would require assurance of maintenance of a certain pool level to be assured the system could be maintained.

The DNR also indicated (at the Draft EIS public meeting) that it is important to look at the options for the aeration system and things that can be done during the initial design to reduce the front end costs at future times assuming that aeration systems are going to be installed. A substantial amount of state dollars are already committed to this proposed project. The DNR position is that if the proposed project is going to require aeration up front, then it should be designed as an up front aspect of the proposed project.

Refer also to the responses to Comments 9B, 9D, 9E, and 9H in Final EIS section 3.1.9 and to the text noted in those sections which discuss the commitment of the Sand Hill River Watershed District to incorporate fish management practices (including aeration) to achieve various objectives for the proposed reservoir.

Final EIS section 2.2 and Table 2-1 in that section provide an updated project cost estimate for Alternative No. 1 as submitted by the project proposers. The project proposers are committed to the need for aeration systems as shown by the inclusion of aeration system costs within right-of-way costs. However, the project proposers have not increased the actual $900,000 amount for right-of-way from previous estimates submitted to the Department in 1986 when the determination of the need for an aeration system as a component of direct proposed project implementation had not been established.

3.5.5 Recreational costs, benefits and economic evaluation

CONCERN: Mr. Paul Stolen raised a number of issues concerning the Draft EIS economic impact section (Draft EIS section 3.9), the inclusion of recreational costs and benefits (including an aeration system), and the sensitivity associated with the use of a particular interest rate in any economic evaluation.

RESPONSE: The issues identified by Mr. Stolen at the public meeting are the same as those outlined in his written comments to the DNR during the public review period. Mr. Stolen's letter and the DNR's responses to those issues are provided in Final EIS section 3.1.9. Refer to the response to Comment 9D in that section which indicates that aeration system costs were not included in the economic evaluation and review included in the Draft EIS. An aeration system was not a component of the project proposal information provided to the DNR since the need for an aeration system was not established until the Draft EIS was issued. In addition, at the Draft EIS public meeting, the project engineer noted that an aeration system was not a component of the initial project proposal because an objective of the Sand Hill River Watershed District was to concentrate on "flood control benefits and the lake situation would be more or less left up to the locals." Final EIS section 2.2 (and Table 2-1 in that section) which include the Watershed District's updated cost projections for alternative No. 1, as well as the response to Comment 9D in Final EIS section 3.1.9 discuss the commitment of the Watershed District to including and aeration system and other practical fish management techniques as a part of proposed project implementation.

The response to Comment 9F (Final EIS section 3.1.9) explains the selection of the interest rates used in the economic evaluation in the Draft EIS (Draft EIS section 3.9). At the Draft EIS public meeting, the project engineers outlined the reasons for use of a 5 7/8% interest rate in the economic analysis completed by the Sand Hill River Watershed District. According to the project engineer, the 5 7/8% interest rate used is a interest rate which is used by the Lower Red River Watershed Management Board (LRRWMB) to evaluate flood control projects in the Red River Valley. The LRRWMB based their contribution to flood control projects based on a prior study which utilized the 5 7/8% interest rate and converted that rate to a $245 per acre-foot perceived value of flood control storage. The 5 7/8% interest rate was used because it is used locally throughout the Red River Valley for water development projects.

Refer also to Final EIS section 2.10 which addresses recreational opportunities and impacts in the vicinity of the Winger area and outlines design information and parameters for the construction of a public access. The response to Comment 10A in the Final EIS section 3.1.10 also discusses the components and limitations of this recreational impact section. In addition, the response to Comment 10I (Final EIS section 3.1.10) also provides information on the economic methodology used in the Draft EIS.

3.1.6 Similar existing dam and reservoir projects in Minnesota

CONCERN: A question was raised concerning whether there were other existing dams (Class I, high hazard) in Minnesota similar to the proposed project and whether those existing dams contained a fishery resource similar to the type of resource projected under an Alternative No. 1 scenario.

RESPONSE: At the Draft EIS public meeting, the DNR indicated that there are not existing dams and reservoirs of a similar area and length that are artificial basins. However, one example of the fishery for an artificial basin is Byllesby Lake at the Byllesby dam on the Cannon River is southeastern Minnesota. Byllesby Lake is a fairly large lake and supports a significant rough fish population. Lake Byllesby is stocked annually with catfish and smallmouth bass. It doesn't have an aeration system because the lake is too large for such a system. The DNR also indicated that the proposed reservoir is going to be much more eutrophic than Lake Byllesby.

4.0 FINAL ENVIRONMENTAL IMPACT STATEMENT PROJECT COORDINATION

4.1 LIST OF FINAL ENVIRONMENTAL IMPACT STATEMENT PROJECT COORDINATION CORRESPONDENCE

This chapter of the Final Environmental Impact Statement includes copies of particular project coordination correspondence to provide readers and reviewers of this document with additional relevant information concerning the project proposed by the Sand Hill River Watershed District. The majority of this section involves project coordination during the period between the Draft EIS public comment period and Final EIS preparation. The list of coordination elements is as follows:

DNR correspondence to project engineers on need to address shoreline erosion issues (DNR request to project proposers on need for summary analysis of reservoir shoreline erosion potential including slope, parent soil material, colonizing vegetation, wind generated waves, and turbidity in the water column to be included in the Sand Hill River Watershed District Final Engineer's Report).	October 1986
Sand Hill River Watershed District response outlining the time shoreline erosion issues will be addressed (summary analysis of reservoir shoreline erosion potential and long-term implications to be addressed as a component of Sand Hill River Watershed District Final Engineer's report).	October 1986
DNR correspondence to Sand Hill River Watershed District requesting draft responses to public comments submitted on Draft EIS (DNR request to project proposers for draft responses to the majority of the public comments submitted during public review period, including the type and extent of the responses, to facilitate preparation of the Final EIS and to adequately respond to the issues raised in the comment letters by providing the DNR with the position of the project sponsor concerning Draft EIS comments).	October 1987
Sand Hill River Watershed District draft responses to public comments submitted on Draft EIS (Sand Hill River Watershed District prepared draft responses, including additional data and technical information, to public comments submitted during public review period outlining the position of the project sponsors to the issues raised on the Draft EIS; many of the responses have been incorporated into the Final EIS text, and where appropriate, the specific position of the project proposer and/or of the DNR is indicated).	January 1988

Minnesota Pollution Control Agency correspondence to DNR on Sand Hill River Watershed District draft responses (comments of the MPCA based on review of the Sand Hill River Watershed District draft responses to the Draft EIS public comments and request for additional data and analysis in areas of water quality, flood control benefits, recreation benefits, mitigation, and economic impacts to be addressed as components of the EIS and permit review processes).	April 1988
Minnesota Pollution Control Agency correspondence to Sand Hill River Watershed District on Watershed District draft responses to public comments and on data needed in connection with permitting requirements (comments of the MPCA based on review of the adequacy of the Sand Hill River Watershed District draft responses to the Draft EIS public comments and request for additional data and analysis as components of the EIS and the MPCA permit requirements and processes in areas of impoundment and watershed characteristics, downstream effects, water quality management, and the operational plan for the proposed reservoir, dam and downstream).	April 1988
White Earth Reservation Tribal Council correspondence to DNR requesting information on proposed project (request for name and address of project sponsor, and for a copy of the Draft EIS).	April 1988
Consultant proposal submitted to Sand Hill River Watershed District for additional water quality studies and analysis (private consultant proposal submitted to Sand Hill River Watershed District for additional studies to be initiated for the project proposers in areas of water quality and alternative dam proposals, recreational benefits, habitat compensation, erosion and sediment control and water quality modeling to respond to MPCA request for additional data, information and analysis).	May 1988
DNR response to White Earth Reservation Tribal Council providing information on project proposal (response identified project proposers and provided names of individuals to contact for further informated, outlined general purpose of project proposal and status of environmental review process, and transmitted copy of Draft EIS to Tribal Council).	June 1988
DNR response to Minnesota Pollution Control Agency correspondence on Sand Hill River Watershed District draft responses (response of DNR to request of MPCA for additional data and analysis to be included in the Final EIS outlining issues to be addressed in Final EIS, issues most appropriately addressed as components of permit review processes, and time schedules for public and agency comments and for preparation of the Final EIS).	June 1988

Consultant correspondence to Sand Hill River Watershed District on status of additional water quality studies and analysis (correspondence outlining preparation status of additional consultant studies initiated for the Sand Hill River Watershed District to respond to concerns raised by the MPCA).	August 1988
Consultant report entitled "The Winger Dam Project" prepared for the Sand Hill River Watershed District (report prepared to respond to correspondence outlining additional EIS and permit requirement concerns raised by the MCPA and includes additional data, analysis, and evaluation in areas of hydrologic aspects of proposed project, reservoir water quality, downstream water quality, reservoir operational aspects, watershed erosion and sediment control, and habitat compensation; only the Executive Summary portion of the report is provided in Final EIS section 4.2).	October 1988
Minnesota Pollution Control Agency correspondence to Sand Hill River Watershed District comprising MPCA review of October 1988 consultant report prepared for the Sand Hill River Watershed District (comments of the MPCA address sufficiency of data and information for MPCA section 401 water quality certification requirements, reservoir and downstream water quality issues, sufficiency of water quality data, information and modeling, operating plans for the reservoir and dam associated with MPCA permitting requirements, and other requirements associated with MPCA regulatory requirements).	December 1988

4.2 PROJECT COORDINATION CORRESPONDENCE

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX 25, 500 LAFAYETTE ROAD • ST. PAUL, MINNESOTA • 55146

DNR INFORMATION
(612) 296-6157

October 1, 1986

Larry Woodbury
Houston Engineering, Inc.
2505 N. University Drive
Fargo, ND 58105

Dear Larry:

As we discussed at the September 25th meeting here in St. Paul, the Division of Fish and Wildlife has serious concerns regarding shoreline erosion at the proposed reservoir site on the Sand Hill River. Unless slope, parent soil material and colonizing vegetation are suitable, wind generated waves could destroy shoreline habitat and negatively impact water quality. Turbidity in the water column could prevent the establishment of desirable submerged aquatic plants and the associated fish populations that reservoir conditions generally favor.

In am enclosing an abstract from a study conducted for the Corps of Engineers on shoreline erosion processes. The study was conducted by John R. Reid, University of North Dakota on Orwell Reservoir (Ottertail River). While not totally analogous there are some parallels between the two projects. It is our opinion that Mr. Reid or someone within your organization with the same expertise review the site and available information in regard to erosion. A summary analysis of the reservoir shoreline erosion potential should then be incorporated into the final engineering report. We would also appreciate any preliminary information that might come up before the final report.

At our last meeting, Roland Gullekson (watershed district) mentioned several 10' drop structures in the Sand Hill River somewhere downstream from Bear Park. We would appreciate receiving some information that describes the nature and location of these structures as well as any information on other instream barriers between Winger and Climax. I need and would appreciate this information as soon as possible so we can comply with our schedule of providing a preliminary EIS fisheries write-up.

Thank you for your cooperation.

Sincerely,

Jack Enblom
River Survey Project Supervisor
Ecological Services Section
Division of Fish and Wildlife

JWE:blt
Enclosure
cc: Charlotte Cohn
Earl Huber
Joe Geis
Tom Keefe
Roland Gullekson

HOUSTON ENGINEERING, INC.
2505 N UNIVERSITY DRIVE P O BOX 5054 FARGO, NORTH DAKOTA 58105 PHONE (701) 237-5065

October 14, 1986

Mr. Jack Enblom
River Survey Project Supervisor
Ecological Services Section
Division of Fish and Wildlife
Minnesota Department of Natural Resources
Box 25
500 Lafayette Road
St. Paul, MN 55146

Re: Sand Hill River Watershed District Project No. 4
Winger Dam

Dear Jack:

With reference to your letter of October 1, 1986, we are enclosing herewith a set of drawings relating to the channel improvement project installed by the Corps of Engineers in the late 1950's and early 1960's. These are as-built drawings extracted from the Corps of Engineers Operation and Maintenance Manual. They show details of drop structure locations and dimensions.

Thank you for the information relative to the shoreline erosion at Orwell Lake. We will address this issue in the Final Engineer's Report with respect to its potential and its long-term implications.

If you have any further questions, please call our office at any time.

Sincerely,

HOUSTON ENGINEERING, INC.

Lawrence H. Woodbury, P.E.

LHW:gz
Encl.
cc: Mr. Roland Gullekson, Fertile, MN
Charlotte W. Cohn, DNR

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX , 500 LAFAYETTE ROAD • ST. PAUL, MINNESOTA • 55155-40_____

DNR INFORMATION
(612) 296-6157

October 28, 1987

Mr. Roland Gullekson, Chairman
Sand Hill River Watershed District
Route 2, Box 218 D
Fertile, MN 56540

Mr. Lawrence Woodbury
Houston Engineering, Inc.
2505 N. University Drive
Fargo, N.D. 58105

Dear Roland and Larry:

The comments submitted to the Department of Natural Resources on the Draft Environmental Impact Statement (EIS) for the proposed Sand Hill River Watershed District Project No. 4 have been evaluated. As we have previously discussed, the project sponsors and the project engineers will need to supply draft responses for many of the comments submitted. This letter outlines the type and extent of responses which are necessary to adequately respond to the issues raised in the comment letters. For your assistance in reviewing the letters and the following items in this letter, each comment is assigned a Comment Number. These numbers refer to the order in which the letter will appear in the Final Environmental Impact Statement (EIS) and are generally based on the order in which the letter was received. The comment letters and associated Comment Numbers are as follows:

Comment submitted by	Comment Number(s)
Mr. Michael P. Rardin, Polk County Highway Department	1
Mr. Blanchard Krogstad	2
Mr. Blanchard Krogstad	3A to 3C
Mr. Robert F. Welford, U.S. Fish and Wildlife Service	4A to 4J
Mr. Paul D. Burns, Minnesota Department of Agriculture	5
Mr. Wesley Hodous	6
Ms. Cheryl Heide, Minnesota Department of Transportation	7A to 7G
Mr. John W. McWilliam	8A to 8B
Mr. Paul Stolen	9A to 9K
Mr. Wm. L. Goetz, U.S. Army Corps of Engineers	10A to 10J
Mr. Clifford T. Anderson, Minnesota Pollution Control Agency	11A to 11G
Mr. William D. Franz, U.S. Environmental Protection Agency	12A to 12I

In order to establish a time schedule for final EIS preparation, please submit these responses to the DNR by December 1, 1987. The Department will then review the sufficiency of the draft responses and inform you within two weeks of receiving your responses whether additional information is required or whether those responses are sufficient. At that time, we can meet to discuss a time schedule for Final EIS preparation. Please contact me if you wish to schedule a meeting to discuss the items identified in this letter.

Sincerely,

Charlotte W. Cohn
Office of Planning

Att.
c: Vonny Hagen
Tom Balcom
Ron Harnack
Dan Thul
Dave Johnson

PROPOSED SAND HILL RIVER WATERSHED DISTRICT PROJECT NO. 4
FINAL ENVIRONMENTAL IMPACT STATEMENT PREPARATION
IDENTIFICATION AND DISCUSSION OF COMMENT LETTERS
AND DRAFT WATERSHED RESPONSE

COMMENT 1

Polk County Highway Department points out that it has designed C.S.A.H. No. 8 altering the road alignment to the west to avoid a proposed reservoir in Sections 16, 17, 20 and 21 of Sletten Township. Polk County's proposed realignment involves 6,088 feet of C.S.A.H. No. 8. However, as their letter specifies, the Draft EIS indicates that C.S.A.H. No. 8 is to be located at its present alignment. Since the project description and maps used in the Draft EIS were based on information submitted by the Watershed District, the District needs to respond to this comment and explain the reasons why this realignment, with a completed design since 1975 was not indicated in the information submitted to the DNR for inclusion in the Draft EIS.

COMMENT 2

Mr. Blanchard Krogstad raises the question of the flowing well. Figure 1-9 (the second Figure 1-8 in the Draft EIS) identifies the location of flowing wells and domestic wells or septic systems within the proposed project area as known to the DNR. Minnesota Department of Health regulations require wells within an impoundment area to be capped and abandoned. The DNR testified at the Draft EIS public meeting that the Final EIS would state this requirement definitively. However, the Watershed District needs to provide a response which identifies who will be responsible for this capping and abandonment process. The extent of the response should identify whether the capping and abandonment is a part of the project to be completed by the proposer, or a responsibility of a particular local landowner.

COMMENT 3A

Mr. Blanchard Krogstad submitted a second comment letter which indicates the general location of the flowing well (the same well noted in Comment 2) in Section 20 of Sletten Township. Figure 1-9 in the Draft EIS does not show a flowing well in this location. The Watershed District needs to display the exact location of this well on either a copy of the Ownership Map and Site Layout or a copy of a topographic map. The DNR will then be able to include in the Final EIS a corrected Figure 1-9 which shows the location of this well.

COMMENT 3B

The Draft EIS was specific in its projections for the type of reservoir, reservoir water quality and reservoir fishery that might be expected to occur. While the Final EIS will reiterate these points, no further response from the Watershed District is required for this comment.

COMMENT 3C

The Watershed District needs to answer Mr. Krogstad's question regarding the potential, after a 10-year period, for the proposed reservoir to revert to a dry dam.

COMMENT 4A

In the Final EIS, the DNR will reiterate the previously stated position that the Responsible Governmental Unit (RGU) does not select an alternative as a component of the Environmental Review Process. No further response from the Watershed District is necessary for this comment.

COMMENT 4B

The U.S. Fish and Wildlife Service (USFWS) raises a concern as to the ability of the incoming flow to sustain proposed recreational pool water elevations. The Draft EIS already states that the recreational reservoir design appears to be too optimistic for the size and inputs of the watershed.

The Watershed District and the project engineers need to respond to this comment by identifying information to support a conclusion that the incoming flow based on the size and inputs of the watershed is sufficient to sustain proposed recreational pool water elevations. The second component of this response needs to document whether it is reasonable to assume that recreational opportunities (marginal fishing, boating, and swimming) and land value benefits associated with the project proposal of the Sand Hill River Watershed District can be obtained based on the proposed permanent recreational pool elevations.

Finally, the Draft EIS identified a problem with depletions in the reservoir based on the maintenance of downstream conditions. The Watershed District needs to identify whether based on the findings and information in the Draft EIS, a change to augment reservoir and/or downstream conditions has occurred in the plans submitted to DNR (as outlined in the Project No. 4 Preliminary Engineers Report).

COMMENT 4C

This comment raises an issue similar to that raised in the previous comment. The Watershed District's response to satisfy the items identified for Comment 4B does not necessitate a further response to this comment.

COMMENT 4D

The USFWS points out the commodity reduction program in the 1985 Farm Bill and suggests there could be an identification of lands within floodplain areas as set-aside lands. The Watershed District should provide a response to this comment indicating whether it intends to identify lands as set-aside lands, the acreage involved, the extent to which the acreage is intended to be either retired or to allow haying/grazing, and a map should be provided which shows this acreage.

COMMENT 4E

The Draft EIS is thorough in its assessment of the fishery potential of the proposed reservoir and no further response from the Watershed District is required for this comment.

COMMENT 4F

The DNR prepared the Draft EIS on the assumption that federal monies were not intended to be used. The Watershed District needs to document whether this assumption remains valid so that the DNR can determine whether the Final EIS would need to further address compliance with Federal Executive Order 11990 for wetland protection.

COMMENTS 4G and 4H

The USFWS in these comments addresses the importance of incorporating wildlife mitigation measures as a component of a constructed project. The Watershed District needs to identify their commitment to the mitigation plan outlined in the Draft EIS. The HEP Team can then begin working with the project proposers to identify mitigation sites(s) and costs associated with various mitigation scenarios. The Watershed District also needs to specify their acceptance of the cost of mitigation as a component of upfront project costs. The District in response to Comment 4H needs to document their intention to accomplish mitigation concurrent with project construction, since mitigation for impacts to protected waters and wetlands will be a part of the Division of Waters permitting process.

COMMENTS 4I and 4J

The USFWS provides its recommendations for selection among the various alternatives. The Final EIS response will be similar to that identified for Comment 4A. No response from the Watershed District is required for these comments. For your information, these comments provide important recommendations for all of the various decision-makers, which along with the Draft EIS and Final EIS present the information to be used in the relevant permitting processes.

COMMENT 5

The Minnesota Department of Agriculture recommends additional detail in the Final EIS on the issue of the economic impact to the agricultural economy caused by the loss of cropland. As the comment letter points out, the Preliminary Engineer's Report concludes the loss of cropland on the agricultural economy to be non-significant. However, this conclusion is reached without substantiation. The Watershed District and project engineers need to respond to this comment by documenting how this conclusion was reached. Since the Draft EIS included estimates of cropland loss associated with each alternative, this information should be documented for all alternatives. You should work with Dan Thul on this response since he was responsible for the preparation of the majority of the Agricultural Impacts section of the Draft EIS.

COMMENT 6

Mr. Wesley Hodous outlines specific concerns with the project proposed by the Sand Hill River Watershed District. Comments such as this will appear in the Final EIS with a response to indicate that the comment has been noted by the DNR. For your information, you should refer to the discussion on Comments 4I and 4J for recommendations on how general project comments can be used by various decision-makers. No further response from the Watershed District is required for this comment.

COMMENT 7A

The Minnesota Department of Transportation (MNDOT) submitted comments regarding approaches to the emergency spillway specifically addressing the concern that the proposed sight distances are minimally acceptable. The comment recommends a 60 MPH non-striping sight distance. The Watershed District needs to respond to this comment identifying either a change in the design for the proposed project to assure acceptable sight distances, or justification for selection of the proposed curve transition.

COMMENT 7B

MNDOT staff have previously agreed to provide the text recommended in this comment. No further response from the Watershed District is required for this comment.

COMMENT 7C

The Watershed District needs to respond to this comment by providing specific information related to the plans for rerouting T.H. 59 traffic during construction. All road closures and detours need to be identified and the time frames for closures and the duration of the closures need to

be discussed. Detours, closures, and time frames particularly during the winter concern MNDOT.

COMMENT 7D

MNDOT staff have previously agreed to provide the text recommended in the comment. No further response from the Watershed District is required for this comment.

COMMENT 7E

The Watershed District needs to respond to this comment by providing specific information to address impacts to persons traveling T.H. 59 and impacts from the relocation of county roads. These impacts involve social impacts, safety impacts, emergency vehicle travel, and information basically concerning how people, goods and services are moved during construction.

COMMENT 7F

The Watershed District needs to respond to this comment by providing more specific information on the rerouting of T.H. 59 and the switching of traffic during times when the proposed T.H. 59 depressed section may be used during flooding conditions.

COMMENT 7G

The Draft EIS contains numerous references indicating maintenance responsibilities of the T.H. 59 roadway. MNDOT is concerned that while T.H. 59 normal wear and tear is its responsibility, deterioration of the roadway surface and reconstruction of the roadway due to the use of the T.H. 59 as a spillway is not normal wear and tear. The Watershed District needs to provide a response to this comment which clarifies responsibility for roadway deterioration and reconstruction based on the use of T.H. 59 for the spillway.

COMMENT 8A

Mr. John McWilliam outlines specific concerns with the project proposed by the Sand Hill River Watershed District. Comments such as this will appear in the Final EIS with a response to indicate that the comment has been noted by the DNR. No further response from the Watershed District is required for this comment. For your information, you should refer to the discussion on Comments 4I and 4J for recommendations on how general project comments can be used by various decision-makers.

COMMENT 8B

Mr. McWilliam also raises a concern regarding the status of financial commitments. As you may recall, the Environmental Assessment Worksheet (EAW) included an identification of financial commitments as of September 1985 (see attached EAW attachment 5). This information was not included in the Draft EIS since it was not a specific component of the Scoping Decision. However, the status of financial commitments is a requirement of the legislation authorizing funding for a proposed Winger Dam project. Therefore the Watershed District needs to respond to this comment by providing an update on the status of financial commitments associated with the proposed project.

COMMENT 9A

Mr. Paul Stolen raises a concern with the specific level of detail associated with the discussion of alternatives in the Draft EIS. The DNR will respond to this comment in the Final EIS, and no further response from the Watershed District is required for this comment.

COMMENT 9B

Mr. Stolen raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENTS 9C and 9D

Mr. Stolen also addresses the failure of the Draft EIS to address the need for an aeration system particularly in view of the clear finding in the Draft EIS that an aeration system is needed to facilitate the development of any type of fishery resource, even a minimal sport fishing resource. As DNR testified at the public meeting, prior to the issuance of the Draft EIS, the lack of an aeration system as a component of any of the alternatives was not erroneous. However since the Draft EIS establishes the need for an aeration system, the Watershed District needs to respond to these comments by specifying its intention to incorporate an effective aeration system into the design of the alternatives proposed by the District (Alternatives No. 1 to No. 5). This response should also include a provision which incorporates the cost of such systems as a component of upfront project costs.

The DNR will directly respond to those comments suggesting analysis of additional alternatives and inferring a specific meaning to the term recreational pool. No further response from the Watershed District is required for this part of the comments.

COMMENT 9E

Mr. Stolen raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENT 9F

Mr. Stolen raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENT 9G

The discussion accompanying Comments 9C and 9D outlines much of the additional information required by the Watershed District regarding inclusion of an aeration system into the design of the proposed project. The Draft EIS sufficiently addresses the clear need for an aeration system. However, the project proposers need to submit updated cost information which documents the extent to which the costs of an aeration system have been incorporated into the design of the proposed project.

COMMENT 9H

The Watershed District needs to respond to the concern expressed by Mr. Stolen regarding the potential for residential and recreational development associated with the project proposed by the Sand Hill River Watershed District. The most appropriate method to respond to this concern is to document the manner in which the 60% development projection was derived. In addition, the District should clarify the extent to which this projection remains valid based on the finding of the Draft EIS for an extremely limited fishery resource.

COMMENT 9I

The Watershed District needs to respond to the questions posed by Mr. Stolen regarding precipitation estimates. This response should document the source of the precipitation figures used in the HEC-1 analysis, and indicate the precipitation in inches for each event noted in Draft EIS Table 1-2, Table 1-3, and Table 1-4.

COMMENT 9J

This comment is related to findings and statements sufficiently covered in the Draft EIS regarding the proposed operation plan for instream flow. The DNR will respond to these comments in the Final EIS, and no further response from the Watershed District is required for this comment.

COMMENT 9K

The Watershed District needs to respond to this comment by providing answers to the specific questions posed by Mr. Stolen regarding the physical appearance of the reservoir proposed by the District.

COMMENT 10A

The U.S. Army Corps of Engineers (USCE) raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENT 10B

The Watershed District needs to respond to this comment by quantifying the effect the planned spring and summer operation of the dam and reservoir proposed by the District would have on mainstem Red River of the North flood flows; specifically what effect will reservoir fluctuation have on mainstem flood flows? This information then needs to be translated into the amount of land presently flooded at various flows and the amount of land that would be protected with the reduction in peak flows attributed to the Sand Hill River Watershed District's proposed project. This information should be submitted in tabular form along with documentation which substantiates the information provided.

COMMENT 10C

The Watershed District needs to respond to this comment regarding flood benefits associated with the project proposed by the Sand Hill River Watershed District. Data showing flood benefits attributable to the local area and to the Red River need to be provided which document the acreage presently being flooded, or how many acres would be protected from flooding if the proposed project by the Watershed District is not completed. The most readily understandable form of this data would be presentation in tables.

COMMENT 10D

The USCE raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENT 10E

The USCE also raises a concern with the validity of the estimates regarding anticipated shoreland development in consideration of the projections in the Draft EIS related to the fishery resource and water quality. The Watershed District needs to respond to this comment by documenting the methods by which the 60% estimate was derived indicating the extent to which this estimate remains accurate, and by demonstrating the validity using data for a similar lake and fishery resource within the region. For example, the Area Fishery Manager at the public meeting indicated the proposed reservoir can be expected to support a fishery similar to Sand Hill Lake and therefore data from Sand Hill Lake could be used as part of the sample data.

COMMENT 10F

Based on the other responses provided, the DNR will clarify the discrepancy raised by the USCE regarding agricultural impacts and no further response from the Watershed District is required for this comment.

COMMENT 10G

The USCE also notes an inconsistency in the last paragraph on Draft EIS Page 3-50 which the Watershed District needs to clarify and document. According to the Draft EIS, while quantifiable amounts of protected lands

along the Red River is not available, the Watershed District's Economic Analysis (Sand Hill River Watershed District Preliminary Engineers Report - Economic Analysis) has quantified benefits to agricultural lands. Obviously if benefits have been quantified then it is erroneous to state that a quantifiable amount of protected lands is unavailable. This comment can be responded to by either quantifying the amount of protected lands which have been assigned benefits, or by not assigning benefits to agricultural lands, if infact those benefits cannot be quantified. As the comment indicates, if the quantifiable effects are dependent on other activities, then those activities also need to be described and discussed.

COMMENT 10H

The Watershed District needs to respond to this comment regarding the extent of, and the proposed plans to affect two farmsteads within the flood pool of the reservoir proposed by the project sponsors. The response should identify the acreage of the farmsteads and how these properties are proposed to be affected. The District's response also needs to include similar information on the extent and nature of the impact to the farmsteads under each of the alternatives.

COMMENT 10I

The USCE raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENT 10J

The issues raised by the USCE in this comment regarding the mitigation required to compensate for identified natural resource impacts and the relationship between downstream mitigation and reservoir plans can be responded to by a satisfactory response to Comments 4G and 4H (USFWS comment letter). The discussion for those items provides the necessary guidance.

COMMENT 11A

The Minnesota Pollution Control Agency (MPCA) raises a concern with the detail and specificity of the construction plans and specifications. The Watershed District needs to respond to this comment by providing more detailed information on proposed construction plans including construction

deadlines and/or dates of completion or time periods in which construction tasks are to be completed. One possible way to respond to this comment could be to establish a beginning date based on a realistic assessment of completion of proposed project plans and specifications or on acquisition of required approvals, and then to establish the construction schedule based on that beginning date.

COMMENT 11B

The DNR in the Final EIS will reiterate the emphasis of the discussion on the operation plan and stress the intention of the operation plan to assure that if the inflow is less than 1.7 cfs, the inflow will have to be released. Further, the reservoir was not designed to function as augmentation of the natural flow situation. No further response from the Watershed District is required for this comment.

COMMENT 11C

The MPCA notes the requirement of 401 Certification identified in both the Environmental Assessment Worksheet and the Draft EIS. The DNR in the Final EIS will reiterate the information noting responsibility of the project proposer to obtain any and all permits, licenses, approvals, certifications, etc. No further response from the Watershed District is required to respond to this comment.

COMMENT 11D

The Watershed District needs to respond to this comment of the MPCA regarding the potential for fish kills and exceedance of water quality standards due to conditions when bottom water spills over the dam. The MPCA suggests the Watershed District provide an estimate of hypolimnetic oxygen depletion rate and reaeration rate over the spillway to document the absence of fish kills or water quality violations. You should work with staff in the MPCA Water Quality Division to assure an understanding of the scope of the information required. The DNR can provide a contact person at the MPCA for this effort.

COMMENT 11E

The DNR will respond to this comment in the Final EIS by noting the relationship between this comment and findings in the Draft EIS. No further response from the Watershed District to respond to this comment is required.

COMMENT 11F

The MPCA raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENT 11G

The Watershed District needs to respond to this comment regarding the existence of septic systems below the proposed 1200 foot contour and identify specific plans for addressing septic systems below this elevation. Assuming a response to the issues raised by Mr. Krogstad in Comments 2 and 3A, the District won't need to respond to the issue raised in this comment regarding the need to cap the wells. However as identified in the discussion accompanying Comment 2, the response does need to identify the party responsible for the cost of capping and abandoning wells and septic systems, and the intention of the Watershed District to either reimburse landowners or pay those costs directly. In addition, these costs should be added as up front project costs and shown in a manner which reflect that addition.

COMMENT 12A

This comment of the Environmental Protection Agency (EPA), regarding the selection of alternatives, will be responded to in a manner similar to that discussed for Comment 4A.

COMMENT 12B

The EPA also raises the issue of the 6,800 acre-feet of storage requirement associated with all of the alternatives. This requirement was also mentioned at the public meeting. The exact nature of the requirement and the reason for this storage amount as a condition of partial financial assistance needs to be explained and clarified. This explanation should include the source of the requirement and whose requirement it is. If this explanation can be documented by another prepared report, that documentation should be indicated.

COMMENT 12C

The Watershed District needs to respond to this comment regarding the potential for serious impacts on the water quality of both the Sand Hill River and the Red River of the North by providing documentation to indicate

the nature of downstream water quality attributable to the project proposed by the District. Water quality sampling data, if available, could provide the greatest assistance.

COMMENT 12D

This comment regarding an aeration system can be responded to as indicated in the discussion accompanying Comments 9C, 9D, and 9G. However, to adequately respond to this comment, the Watershed District needs to identify the extent of the aeration system to be incorporated into a proposed project design, particularly noting whether operation is proposed on a periodic or continuous basis.

COMMENT 12E

The U.S. EPA raises a number of concerns regarding the adequacy of the economic analysis presented in the Draft EIS. Based on the sufficiency of the responses submitted by the Watershed District to the items identified in this letter (particularly the responses for Comments 2A, 4B, 4G, 4H, 5, 7C, 7E, 7G, 8B, 9C, 9D, 9G, 9H, 10B, 10C, 10E, 10G, 10H, 10J, 11A, 11G, 12B, 12D, and Miscellaneous Comments), the DNR will respond to this comment and the Watershed District does not need to provide a further response to this comment.

COMMENTS 12F TO 12I

These comments by the EPA reflect serious questions regarding alternatives and the discussion of alternatives. The DNR will respond to these comments in the Final EIS based on provisions in the Rules governing Environmental Impact Statements and the burdens associated with the complexity of the analysis suggested by the recommendations. No further response from the Watershed District is required for these comments.

MISCELLANEOUS COMMENTS

A number of additional concerns have been identified based on concerns raised either at the public informational meeting or indirectly related to comment letters submitted to the DNR. These concerns are discussed as follows according to general issue areas:

Project costs

Appendix L in the Sand Hill River Watershed District Preliminary Engineer's Report contains the Watershed District's detailed estimate of costs. Based upon a review of this information, it appears this is the same data as provided in the February 21, 1985 Preliminary Data and Cost Estimate. For example, the Trunk Highway No. 59 costs identified total $859,590 while the

Minnesota Department of Transportation programmed amount is noted in July 1985 to be $1,020,000.00. It is important that the Final EIS provide the most current estimates of proposed project costs. Therefore the Watershed District needs to provide updated estimates of project costs. To assure this estimate is an accurate reflection of current project costs, this updated information also needs to include:

-Cost of capping and abandonment of wells (see discussion accompanying Comments 2, 3A, and 11G);
-Cost of capping and abandonment of septic systems (see discussion accompanying Comment 11G);
-Cost of installation and operation of an aeration system (see discussion accompanying Comments 9C, 9D, 9G, and 12D); and
-Cost of proposed project and downstream upland and wetland mitigation (see discussion accompanying Comments 4G and 4H).

The public informational meeting included discussion of the Minnesota Department of Transportation project deferrals. As is evident from the attached deferral position statement, at the present time the $1,020,000 MNDOT portion of proposed funding has been deferred. The Watershed District needs to identify the extent to which these deferral plans impact the District's proposed plans and schedule, since at the public meeting it was indicated that plans and specifications are anticipated to be completed in December 1987 or January 1988.

Permitting issues and general project comments

A significant number of comments include concerns with the project proposed by the Sand Hill River Watershed District, the needs for permits, approvals, and certifications, and recommendations to the DNR regarding the selection of a particular alternative. As noted in the discussion accompanying many of these comments, the DNR will indicate in the Final EIS that the DNR as the Responsible Governmental Unit does not select a particular alternative. However, as the DNR has suggested previously, the Watershed District should be discussing proposed plans with the various agencies and submitting relevant permit or approval applications.

HOUSTON ENGINEERING, INC.
2505 N. UNIVERSITY DRIVE • P.O. BOX 5054 • FARGO, NORTH DAKOTA 58105 • PHONE (701) 237-5065

January 6, 1988

Charlotte W. Cohn
Office of Planning
Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155

Re: Proposed Sand Hill River Watershed District Project No. 4 - Draft Responses to Draft Environmental Impact Statement Comments

Dear Charlotte:

The Sand Hill River Watershed District (SHRWD) Board has prepared and approved the attached referenced draft responses to the Draft Environmental Impact Statement Comments, and is forwarding six copies for your review and inclusion in the Final Environmental Impact Statement document.

Please contact the SHRWD Board if you have any questions or require additional information.

Sincerely,

HOUSTON ENGINEERING, INC.

Frank H. Peloubet

Frank H. Peloubet

FHP:gz
Encl.

Sand Hill River Watershed District
Box 535
Fertile, MN 56540

January 5, 1988

Charlotte W. Cohn
Office of Planning
Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155

Re: Proposed Sand Hill River Watershed District Project No. 4, Draft Responses to Draft Environmental Impact Statement Comments

The Sand Hill Watershed District Board has prepared the following responses to the Draft EIS referenced comments. Each comment, as it was presented and numbered in your letter dated October 28, 1987, is restated preceding the comment response.

COMMENT 1: Submitted by Mr. Michael P. Rardin, Polk County Highway Department.

Polk County Highway Department points out that it has designed C.S.A.H. No. 8 altering the road alignment to the west to avoid a proposed reservoir in Sections 16, 17, 20 and 21 of Sletten Township. Polk County's proposed realignment involves 6,088 feet of C.S.A.H. No. 8. However, as their letter specifies, the Draft EIS indicates that C.S.A.H. No. 8 is to be located at its present alignment. Since the project description and maps used in the Draft EIS were based on information submitted by the Watershed District, the District needs to respond to this comment and explain the reasons why this realignment, with a completed design since 1975, was not indicated in the information submitted to the DNR for inclusion in the Draft EIS.

Response:

Houston Engineering was aware since October, 1985 that Polk County S.A.H. No. 8 was being designed for relocation (see Attachment 1). Until receipt of a copy of the Polk County Highway Department letter to you dated July 9, 1987, we were unaware of the exact location for C.S.A.H. No. 8 realignment (see Attachment 2). Houston Engineering will update current project plan sheets, road relocation descriptions, and cost estimates to reflect the completed Polk C.S.A.H. No. 8 relocation design.

COMMENT 2: Submitted by Mr. Blanchard Krogstad.

Mr. Blanchard Krogstad raises the question of the flowing well. Figure 1-9 (the second Figure 1-8 in the Draft EIS) identifies the location of flowing wells and domestic wells or septic systems within the proposed project area as known to the DNR. Minnesota Department of Health regulations require wells within an impoundment area to be capped and abandoned. The DNR testified at the Draft EIS public meeting that the Final EIS would state this requirement definitively. However, the Watershed District needs to provide a response which identifies who will be responsible for this capping and abandonment process. The extent of the response should identify whether the capping and abandonment is a part of the project to be completed by the proposer, or a responsibility of a particular local landowner.

Response:

The Sand Hill River Watershed District will be responsible for insuring that abandoned flowing wells are capped or otherwise addressed in a manner consistent with Minnesota Health Department or other pertinent State regulations.

COMMENT 3A: Submitted by Mr. Blanchard Krogstad.

Mr. Blanchard Krogstad submitted a second comment letter which indicates the general location of the flowing well (the same well noted in Comment 2) in Section 20 of Sletten Township. Figure 1-9 in the Draft EIS does not show a flowing well in this location. The Watershed District needs to display the exact location of this well on either a copy of the Ownership Map and Site Layout or a copy of a topographic map. The DNR will then be able to include in the Final EIS a corrected Figure 1-9 which shows the location of this well.

Response:

Figure 1-9 in the Draft EIS was prepared by DNR. Neither the Watershed District nor Houston Engineering are aware of how the flowing well location was arrived at. The correct location of the flowing well is in Section 20 of Sletten Township. This location is depicted on the map enclosed as Attachment 3.

COMMENT 3C: Submitted by Mr. Blanchard Krogstad.

The Watershed District needs to answer Mr. Krogstad's question regarding the potential, after a 10-year period, for the proposed reservoir to revert to a dry dam.

Response:

A primary purpose of the proposed project is to maintain a permanent pool suitable for recreational and aesthetic purposes. It is recognized that the upper reaches of the reservoir will be more characteristic of wetland type habitat. However, it is the Watershed Board's intent that the lower and deeper portion of the reservoir be maintained in an open water or lake type environment. In the deeper portions of the reservoir, it will be difficult for emergent or submerged vegetation to establish itself. Along the periphery of the reservoir, it may be necessary to periodically harvest or remove vegetation which becomes established. County Shoreland Management Ordinances should aid in the control of human encroachment along the shoreline, which in turn will control sediment and nutrient input to the reservoir. Algae blooms can only survive with a sufficient input of such nutrients.

COMMENT 4B: Submitted by Mr. Robert F. Welford, U.S. Fish and Wildlife Service.

The U.S. Fish and Wildlife Service (USFWS) raises a concern as to the ability of the incoming flow to sustain proposed recreational pool water elevations. The Draft EIS already states that the recreational reservoir design appears to be too optimistic for the size and inputs of the watershed.

The Watershed District and the project engineers need to respond to this comment by identifying information to support a conclusion that the incoming flow based on the size and inputs of the watershed is sufficient to

sustain proposed recreational pool water elevations. The second component of this response needs to document whether it is reasonable to assume that recreational opportunities (marginal fishing, boating, and swimming) and land value benefits associated with the project proposal of the Sand Hill River Watershed District can be obtained based on the proposed permanent recreational pool elevations.

Finally, the Draft EIS identified a problem with depletions in the reservoir based on the maintenance of downstream conditions. The Watershed District needs to identify whether based on the findings and information in the Draft EIS, a change to augment reservoir and/or downstream conditions has occurred in the plans submitted to DNR (as outlined in the Project No. 4 Preliminary Engineers Report).

Response:

As part of the Preliminary Engineer's Report, hydrological analysis of available stream flow data, drainage basin characteristics and climatilogical data (ref. pages 17-19) was performed. The evaluation found adequate hydrologic conditions to sustain the permanent reservoir pool level and maintain required downstream flow conditions. Unusual or short term fluctuations in hydrologic conditions may temporarily affect this situation. Reservoir operational procedures is the best option for addressing these infrequent occurrences.

Since it is anticipated that the area's hydrologic conditions are capable of maintaining the design permanent pool level, no modifications to proposed recreational opportunities or land value benefits are warranted at this time.

No change has occurred in the plans submitted to the DNR at this time to alter previous findings of reservoir level and downstream conditions. Area hydrology and dam operational procedures are believed to be adequate to maintain reservoir levels and downstream conditions based on available information and under normal conditions.

COMMENT 4D: Submitted by Mr. Robert F. Welfard, U.S. Fish and Wildlife Service.

The USFWS points out the commodity reduction program in the 1985 Farm Bill and suggests there could be an identification of lands within floodplain areas as set-aside

lands. The Watershed District should provide a response to this comment indicating whether it intends to identify lands as set-aside lands, the acreage involved, the extent to which the acreage is intended to be either retired or to allow haying/grazing, and a map should be provided which shows this acreage.

Response:

The Sand Hill River Watershed District does not have jurisdiction with respect to set-aside lands or retiring any land outside of the designated project area. The District will encourage and promote good land use practices.

COMMENT 4F: Submitted by Mr. Robert F. Welfard, U.S. Fish and Wildlife Service.

The DNR prepared the Draft EIS on the assumption that federal monies were not intended to be used. The Watershed District needs to document whether this assumption remains valid so that the DNR can determine whether the Final EIS would need to further address compliance with Federal Executive Order 11990 for wetland protection.

Response:

No Federal monies are involved in this project, therefore, Federal Executive Order No. 11990 does not apply.

COMMENTS 4G and 4H: Submitted by Mr. Robert F. Welfard, U.S. Fish and Wildlife Service.

The USFWS in these comments addresses the importance of incorporating wildlife mitigation measures as a component of a constructed project. The Watershed District needs to identify their commitment to the mitigation plan outlined in the Draft EIS. The HEP Team can then begin working with the project proposers to identify mitigation site(s) and costs associated with various mitigation scenarios. The Watershed District also needs to specify their acceptance of the cost of mitigation as a component of upfront project costs. The District in response to Comment 4H needs to document their intention to accomplish mitigation concurrent with project construction, since mitigation for impacts to protected waters and wetlands will be a part of the Division of Waters permitting process.

Response:

The Sand Hill River Watershed District is committed to working with the HEP team and the Department of Natural Resources in developing a satisfactory mitigation plan as part of the permitting process. The Sand Hill River Watershed District also understands that a satisfactory mitigation plan has to be in place in order for a DNR permit to be issued. Therefore, the mitigation requirement will be a part of the DNR Division of Waters permitting process.

COMMENT 5: Submitted by Mr. Paul D. Burns, Minnesota Department of Agriculture:

The Minnesota Department of Agriculture recommends additional detail in the Final EIS on the issue of the economic impact to the agricultural economy caused by the loss of cropland. As the comment letter points out, the Preliminary Engineer's Report concludes the loss of cropland on the agricultural economy to be non-significant. However, this conclusion is reached without substantiation. The Watershed District and project engineers need to respond to this comment by documenting how this conclusion was reached. Since the Draft EIS included estimates of cropland loss associated with each alternative, this information should be documented for all alternatives. You should work with Dan Thul on this response since he was responsible for the preparation of the majority of the Agricultural Impacts section of the Draft EIS.

Response:

A summary of agricultural cropland lost by creation of the reservoir is provided below for each proposed project alternative as presented in the Draft E.I.S. Report pages 3-50 through 3-52.

SUMMARY OF AGRICULTURAL CROPLAND AFFECTED BY PROJECT

Project Alternative	Lost Cropland Due to Reservoir (acres)	Average Annual Regional Economic Loss
No. 1	-248	$ 3,720
No. 2	-49	$ 735
No. 3	-48	$ 720
No. 4	-24	$ 360
No. 5	-0-	-0-

A large percentage of the cropland affected by creation of the reservoir is presently subject to periodic flooding. Current costs for planting and harvesting a crop on this land is about $75 per acre per year. Gross revenues from these crops are reported to average about $90 per acre per year. Therefore, the net profit from the agricultural utilization of these croplands is $15 per acre per year. This net profit represents the annual impact on the regional economy. Therefore, the average annual regional economic loss due to cropland inundated by the reservoir is equal to the net profit per acre multiplied by the number of acres of lost cropland. As can be seen from the above table, the average annual regional economic loss for each alternative is relatively small when compared to normal levels of economy for the area. The economic loss due to the project is simply the elimination of net agricultural productivity. Because of current periodic flooding, the affected lands are already marginal in production, thus accounting for the relatively low net profit of $15 per acre per year. In contrast, it is noted that approximately 907 acres of downstream cropland are made more productive due to the project (reference Preliminary Engineer's Report, Economic Analysis, dated October 16, 1986). The increased productivity of these downstream farmlands will more than counteract the economic loss of cropland occupied by the flood control reservoir. For these reasons, the impact on the local agricultural economy from the construction of the proposed project is not considered to be significant.

COMMENT 7A: Submitted by Ms. Cheryl Heide, Minnesota Department of Transportation.

The Minnesota Department of Transportation (MNDOT) submitted comments regarding approaches to the emergency spillway specifically addressing the concern that the proposed sight distances are minimally acceptable. The comment recommends a 60 MPH non-striping sight distance. The Watershed District needs to respond to this comment identifying either a change in the design for the proposed project to assure acceptable sight distances, or justification for selection of the proposed curve transition.

Response:

Following final design of the dam structure, that will fix the location of the emergency spillway, the transition from the dam surface roadway to the roadway north

and south of the dam will be accomplished with vertical curve alignments that satisfy MnDOT "60 MPH non-striping sight distance" criteria. Trunk Highway 59 alignments shown in the preliminary design data are conceptual to identify the proposed emergency spillway location. Actual alignments can not be designed until the exact location of the emergency overflow spillway is known.

COMMENT 7C: Submitted by Ms. Cheryl Heide, Minnesota Department of Transportaiton.

The Watershed District needs to respond to this comment by providing specific information related to the plans for rerouting T.H. 59 traffic during construction. All road closures and detours need to be identified and the time frames for closures and the duration of the closures need to be discussed. Detours, closures, and time frames particularly during the winter concern MNDOT.

Response:

Rerouting of T.H. 59 traffic will follow procedures established by the MnDOT for their bridge replacement at this same site. While the duration of rerouting could be substantially longer due to the longer construction time, the procedures and traffic flow route will be the same. Given favorable weather conditions, it is a goal of the Sand Hill River Watershed District to complete the major part of the construction in one construction season. The local traffic rerouting plan, schedule and route map are given in Attachment 4. Inter- and intrastate traffic can be rerouted east and west from Mahnomen for northbound traffic and east and west from Erskine for southbound traffic. This information will be part of the required cooperative agreement with MnDOT on this project and a requirement in the construction specifications document.

COMMENT 7E: Submitted by Ms. Cheryl Heide, Minnesota Department of Transportation.

The Watershed District needs to respond to this comment by providing specific information to address impacts to persons traveling T.H. 59 and impacts from the relocation of county roads. These impacts involve social impacts, safety impacts, emergency vehicle travel, and information basically concerning how people, goods and services are moved during construction.

Response:

Impacts on the area population referenced in this comment due to this project are expected to be similar to those that would have been experienced during MnDOT's replacement of the T.H. 59 bridge crossing of the Sand Hill River. Construction of the embankment dam and associated road relocations would occur over a longer time period, therefore, the impacts would be of a longer duration. Construction scheduling may permit road relocations to occur either prior to closing of T.H. 59 or after completion of the dam structure and reopening of T.H. 59. Installation and maintenance of detour route signs and traffic devices will be a requirement in the construction specifications document. Only minor impacts are anticipated resulting from slightly longer travel times that will result from following detour routes. Maintenance of safe detour routes suitable for emergency and commercial vehicle travel will be incorporated into the cooperative agreement with the MnDOT.

Road relocations and abandonments will be handled by the Polk County Highway Department. Therefore, traffic flow control on County roads will also be coordinated under their authority. Construction scheduling for the dam and road relocations will be coordinated between the Sand Hill River Watershed Board and Polk County to minimize or prevent simultaneous road closures.

COMMENT 7F: Submitted by Ms. Cheryl Heide, Minnesota Department of Transportation.

The Watershed District needs to respond to this comment by providing more specific information on the rerouting of T.H. 59 and the switching of traffic during times when the proposed T.H. 59 depressed section may be used during flooding conditions.

Response:

As currently proposed, use of depressed Trunk Highway No. 59 road section as an overflow spillway could occur only if the 100-year, 10-day event is exceeded. It should be noted that this frequency of overtopping is more stringent than normal MnDOT hydraulic criteria calls for. For a highway with an average daily traffic comparable to that of Trunk Highway 59, normal hydraulic criteria calls for the design of bridges and culverts of sufficient capacity to pass the 50-year frequency flood. In addition, on protected watercourses, a check is made of the 100-year flood with the objective that a stage

increase will not exceed 0.5 feet. As with all hydraulic structures, a risk based design assumes that there will be some large flood which will exceed and overflow the structure. Therefore, it is the District's position that the proposed dam will experience less frequent overtopping than a standard bridge design at the same location. In fact, flooding conditions that would result in overtopping of the proposed dam would most likely cause similar or more severe problems at all downstream Sand Hill River crossings. A flood of this magnitude would most likely affect other state highways in the general area of the proposed project. Any plan for rerouting of traffic would be dependent on flooding conditions at other locations throughout the region. It is assumed that rerouting of traffic would have to be coordinated through MnDOT as part of their emergency response operations. Of course, such a response by rerouting traffic would depend upon the nature of the specific flood event.

COMMENT 7G: Submitted by Ms. Cheryl Heide, Minnesota Department of Transportation.

The Draft EIS contains numerous references indicating maintenance responsibilities of the T.H. 59 roadway. MNDOT is concerned that while T.H. 59 normal wear and tear is its responsibility, deterioration of the roadway surface and reconstruction of the roadway due to the use of the T.H. 59 as a spillway is not normal wear and tear. The Watershed District needs to provide a response to this comment which clarifies responsibility for roadway deterioration and reconstruction based on the use of T.H. 59 for the spillway.

Response:

Assuming that the proposed project becomes a reality, a maintenance and repair agreement will have to be executed between the Sand Hill River Watershed District and the Minnesota Department of Transportation. It is anticipated that such an agreement would provide for costs associated with normal maintenance and repair of the roadway due to normal wear and tear, with such costs being assumed by the Minnesota Department of Transportation. The Watershed District would assume any costs incurred for repair of the roadway, embankment, or structural components due to the occurrence of a flood or normal reservoir regulation and operation. This includes damage due to overtopping of the roadway by a flood of large magnitude.

COMMENT 8B: Submitted by Mr. John W. McWilliam; reprsentative, Taxpayers Protest Group.

Mr. McWilliam also raises a concern regarding the status of financial commitments. As you may recall, the Environmental Assessment Worksheet (EAW) included an identification of financial commitments as of September 1985 (see attached EAW attachment 5). This information was not included in the Draft EIS since it was not a specific component of the Scoping Decision. However, the status of financial commitments is a requirement of the legislation authorizing funding for a proposed Winger Dam project. Therefore, the Watershed District needs to respond to this comment by providing an update on the status of financial commitments associated with the proposed project.

Response:

Financial commitments associated with the proposed project remain the same as previously reported.

COMMENTS 9C and 9D: Submitted by Mr. Paul Stolen.

Mr. Stolen also addresses the failure of the Draft EIS to address the need for an aeration system particularly in view of the clear finding in the Draft EIS that an aeration system is needed to facilitate the development of any type of fishery resource, even a minimal sport fishing resource. As DNR testified at the public meeting, prior to the issuance of the Draft EIS, the lack of an aeration system as a component of any of the alternatives was not erroneous. However, since the Draft EIS establishes the need for an aeration system, the Watershed District needs to respond to these comments by specifying its intention to incorporate an effective aeration system into the design of the alternatives proposed by the District (Alternatives No. 1 to No. 5). This response should also include a provision which incorporates the cost of such systems as a component of upfront project costs.

Response:

It is an objective of the Sand Hill River Watershed District to provide a warm-water fishery in the proposed lake. The District will work with the Department of Natural Resources during the permit process and, as appropriate, incorporate reasonable and practical fish management practices, including aeration, to achieve this objective.

COMMENT 9G: Submitted by Mr. Paul Stolen.

The discussion accompanying Comments 9C and 9D outlines much of the additional information required by the Watershed District regarding inclusion of an aeration system into the design of the proposed project. The Draft EIS sufficiently addresses the clear need for an aeration system. However, the project proposers need to submit updated cost information which documents the extent to which the costs of an aeration system have been incorporated into the design of the proposed project.

Response:

The costs of the final fish management plan are dependent on the specific practices implemented. These specific practices and their associated costs will be determined later, during the permitting process.

COMMENT 9H: Submitted by Mr. Paul Stolen.

The Watershed District needs to respond to the concern expressed by Mr. Stolen regarding the potential for residential and recreational development associated with the project proposed by the Sand Hill River Watershed District. The most appropriate method to respond to this concern is to document the manner in which the 60% development projection was derived. In addition, the District should clarify the extent to which this projection remains valid based on the finding of the Draft EIS for an extremely limited fishery resource.

Response:

The proposed reservoir is expected to be suitable for several recreational activities such as water skiing, boating, fishing, waterfowl hunting and nature observation. When considering the total length of shoreline, only about 60% is suitable for these types of activities or can be developed. Deducting shoreline in close proximity to the dam structure, sites unsuitable for development and marginal recreational areas, only about 60% could be reasonably assumed suitable for development. The entire reservoir shoreline length was calculated for the permanent pool elevation. Lengths of shoreline in close proximity to the dam structure, with steep slopes, shallow offshore water depths, difficult access or other hinderances to suitable development were measured and deducted from the total. The remaining suitable shoreline is about 60% of the total.

COMMENT 9I: Submitted by Mr. Paul Stolen.

The Watershed District needs to respond to the questions posed by Mr. Stolen regarding precipitation estimates. This response should document the source of the precipitation figures used in the HEC-1 analysis, and indicate the precipitation in inches for each event noted in Draft EIS Table 1-2, Table 1-3, and Table 1-4.

Response:

The source of precipitation data in question was the U.S. Weather Service Technical Paper Nos. 40 and 49 and Hydrometeorlogical Report No. 48. The requested data is given below:

Flood Event	Precipitation (inches)	Design Inflow (cfs)	Design Outflow (cfs)	Peak Reservoir Water Elevations (M.S.L.)	Change in Water Level (ft.)
2 Yr., 24 Hr.	2.27	269	114	1190.9	0.9
5 Yr., 24 Hr.	3.00	487	274	1191.6	1.6
10 Yr., 24 Hr.	3.49	735	394	1192.0	2.0
25 Yr., 24 Hr.	3.77	1004	554	1192.5	2.5
50 Yr., 24 Hr.	4.19	1241	700	1193.0	3.0
100 Yr., 24 Hr.	4.82	1656	954	1193.7	3.7
2 Yr., 10 Day	4.00	239	136	1191.0	1.0
5 Yr., 10 Day	5.15	465	320	1191.7	1.7
10 Yr., 10 Day	6.20	783	519	1192.4	2.4
25 Yr., 10 Day	7.20	1194	798	1193.0	3.0
50 Yr., 10 Day	8.00	1510	1014	1193.8	3.8
100 Yr., 10 Day	8.88	1873	1261	1194.4	4.4

COMMENT 9K: Submitted by Mr. Paul Stolen.

The Watershed District needs to respond to this comment by providing answers to the specific questions posed by Mr. Stolen regarding the physical appearance of the reservoir proposed by the District.

Response:

The reservoir will function to reduce downstream impacts of flood events, as well as heavy rain storms, by stabilizing runoff inflows. This will result in a relatively short term "bounce" in the reservoir water levels as shown in the response to comment 9I. The degree of "bounce" will depend on the magnitude of the runoff

event. Shoreline lot owners may elect to have docks and it is anticipated that they would be affected relatively infrequently by fluctuating water levels. Docks installed with two feet of freeboard are expected to be safe from submergence for all precipitation events of 10-year, 24-hour or less.

The reservoir will extend approximately 6.8 miles to the northeast from T.H. 59 and will be nearly one-half mile wide at its widest point. Normal reservoir depth will be 20 feet at the dam and gradually decreasing to the northeast. Once the reservoir is filled, the water table will stabilize at a higher elevation along the shoreline. The relatively infrequent fluctuations in water levels are not expected to cause significant migration of the shoreline landward. The reservoir will have a gently sloping shoreline that gradually becomes more level towards the northeast. Clay type soils predominate in the areas of reservoir shoreline with prevailing weather conditions and land management practices influencing shoreline conditions.

COMMENT 10B: Submitted by Mr. Wm. L. Goetz, U.S. Army Corps of Engineers.

The Watershed District needs to respond to this comment by quantifying the effect the planned spring and summer operation of the dam and reservoir proposed by the District would have on mainstem Red River of the North flood flows; specifically what effect will reservoir fluctuation have on mainstem flood flows? This information then needs to be translated into the amount of land presently flooded at various flows and the amount of land that would be protected with the reduction in peak flows attributed to the Sand Hill River Watershed District's proposed project. This information should be submitted in tabular form along with documentation which substantiates the information provided.

Response:

Information for the Red River mainstem relative to the land area inundated at various flood flows is not readily available. The impact of the proposed project on Red River flood flows is highly variable. The effects depend on hydrological, climatological, land use, and other conditions, as well as the peak "8-day window" Red River flood flows at downstream USGS gage stations. Generally, removal of the 6800 acre-feet through reservoir storage will attenuate downstream Sand

Hill River flood flows. This reduction in flow contributions to the Red River at Climax, MN, would then lower Red River flood flows downstream.

Analyses by Mr. Daniel Thul, DNR Red River Coordinator, of two flood events for the years 1969 and 1979 are presented below:

Flood Year	Red River Main Stem Location	"8-Day Window" Peak Flood Flow (cfs)	"8-Day Window" Flow Reduction (cfs)	"8-Day Window" Volume Reduction (Acre-Feet)
1969	Grand Forks, ND	53,500	250	
	Emerson, Manitoba	54,700	225	3,100
1979	Grand Forks, ND	82,000	300	
	Emerson, Manitoba	92,700	275	3,900

From further data provided by the LRRWMB through their planning and development efforts, it appears that the Winger Dam would have the potential for similar results for the recent flood years including 1948, 1950, 1965, 1966, 1969, 1970, 1974, 1975 and 1978.

A data source that quantifies Red River mainstem land area flooded at various flows does not appear to be available. The LRRWMB has determined that a reasonable and achievable goal is to reduce the 100-year flood flows at Emerson, Manitoba by 20,000 cfs which represents a reduction from 109,000 cfs to 89,000 cfs. In order to reach this goal, it has been estimated that approximately 163,000 acre-feet of floodwater would have to be removed from the flood peak at Emerson within an 8-day period or "window" defined as the period approximately 4 days before the peak and 4 days after the peak.

COMMENT 10C: Submitted by Mr. Wm. L. Goetz, U.S. Army Corps of Engineers.

The Watershed District needs to respond to this comment regarding flood benefits associated with the project proposed by the Sand Hill River Watershed District. Data showing flood benefits attributable to the local

area and to the Red River need to be provided which document the acreage presently being flooded, or how many acres would be protected from flooding if the proposed project by the Watershed District is completed. The most readily understandable form of this data would be presentation in tables.

Response:

Information for the Red River mainstem relative to the land area presently being flooded at various flood events is not readily available. Local land area of the Sand Hill River Watershed impacted by this proposed project is presented on an average annual basis. A complete discussion of ecnomic analysis methodology is covered in the Preliminary Engineer's Report - Economic Analysis, dated 16 October 1986. Tabulated data excerpted from this report are presented as follows.

Sand Hill River Basin

Summary of Average Annual Area Flooded by Reach

Reach	Description	Average Annual Area Flooded (acres) Without Project	Average Annual Area Flooded (acres) With Project	Reduction in Average Area Flooded (acres)
1.	Sand Hill River from the Red River of the North to the upstream end of the existing Corps of Engineers project	1080	640	440
2.	Sand Hill River from the upstream end of the existing Corps of Engineers project to Fertile, Minnesota	130	72	58
3.	From Fertile, Minnesota to SHRWD Project No. 1 (Bear Park Dam)	438	192	246
4.	From Project No. 1 (Bear Park Dam) to a location at the midpoint between Project No. 1 and the proposed Winger Dam	139	46	93

Reach	Description	Average Annual Area Flooded (acres) Without Project	Average Annual Area Flooded (acres) With Project	Reduction in Average Area Flooded (acres)
5.	Sand Hill River from the midpoint between Project No. 1 and the Winger Dam site to the proposed Winger Dam	131	61	70
1-5	Sand Hill River from the Red River of the North to the proposed Winger Dam	1918	1011	907

Flood benefits associated with the proposed project for the Red River mainstem are based on the reduction of the "8 day window" flood peak at Emerson and not on flooded versus protected acreage. Based on data from the McCombs-Knutson Study dated May, 1984, prepared for the LRRWMB, floodwaters removed from the 100-year flood peak at Emerson (8-day window) would reduce average annual damages along the mainstem by $245 per acre-foot of floodwater removed. Project mainstem benefits were then derived by applying this flood peak reduction value to the volume of floodwater removed from the 8-day window at Emerson for the 1979 flood year as a result of reservoir storage.

For the Sand Hill River drainage basin, flood reduction benefits were calculated based on actual land areas, as reproduced from the Preliminary Engineer's Report - Economic Analysis, dated 16 October 1986, and presented below:

Table No. 6

Average Annual Agricultural Damages and Benefits

(Along Sand Hill River)

Item	Damages		Benefits
	No Project	With Project	
Area Flooded	1918 acres	1011 acres	907 acres
Total Weighted Damage (1986)	$60 x 1918 = $115,080	$60 x 1011 = $60,660	$60 x 907 = $54,420
Total Weighted Damage (2011)	1.25 x 115,080 = $143,850	1.25 x 60,660 = $75,825	1.25 x 54,420 = $68,025
Agricultural Growth 25 Years	143,850 - 115,080 = $ 28,770	75,825 - 60,660 = $15,165	68,025 - 54,420 = $13,605
Average Annual Agricultural Growth (1)	.515859 x 28770 = $ 14,845	.515859 x 15,165 = $ 7,825	.515859 x 13,605 = $ 7,020
Total	115,080 + 14,845 = $129,925	60,660 + 7,825 = $68,485	54,420 + 7,020 = $61,440

Table No. 7

Average Annual Other Agricultural Damages and Benefits

(Along Sand Hill River)

Item	Damages		Benefits
	No Project	With Project	
Area Flooded	1918 acres	1011 acres	907 acres
Total Weighted Damage (1986)	$20 x 1918 = $38,360	$20 x 1011 = $20,220	$20 x 907 = $18,140
Total Weighted Damage (2011)	1.25 x 38,360 = $47,950	1.25 x 20,220 = $25,275	1.25 x 18,140 = $22,675
Agricultural Growth 25 Years	47,950 - 38,360 = $ 9,590	25,275 - 20,220 = $ 5,055	22,675 - 18,140 = $ 4,535
Average Annual Agricultural Growth (1)	.515859 x 9,590 = $ 4,950	.515859 x 5,055 = $ 2,610	.515859 x 4,535 = $ 2,340
Total	38,360 + 4,950 = $43,310	20,220 + 2,610 = $22,830	18,140 + 2,340 = $20,480

(1)The annual equivalent factor is 0.515859, as derived in Table No. 6.

Urban flood damages occur in the towns of Climax and Beltrami. A 1984 Corps of Engineers' study (Section 205 Initial Appraisal Report) estimates the average annual urban damages for these towns at $14,000. Following Corps of Engineers methodology, the average annual damage with the proposed project is computed as follows:

$$\text{Damage with Project} = \$14{,}000 \frac{\text{Agricultural Crop Damage with Project (Reach 1)}}{\text{Agricultural Crop Damage Without Project (Reach 1)}}$$

$$= \$14{,}000 \frac{\$60 \text{ (640 acres)}}{\$60 \text{ (1080 acres)}}$$

$$= \$8{,}295$$

Therefore, the annual average urban benefit from the proposed project is $14,000 -$8,295 = $5,705.

COMMENT 10E: Submitted by Mr. Wm. L. Goetz, U.S. Army Corps of Engineers.

The USCE also raises a concern with the validity of the estimates regarding anticipated shoreland development in consideration of the projections in the Draft EIS related to the fishery resource and water quality. The Watershed District needs to respond to this comment by documenting the methods by which the 60% estimate was derived indicating the extent to which this estimate remains accurate, and by demonstrating the validity using data for a similar lake and fishery resource within the region. For example, the Area Fishery Manager at the public meeting indicated the proposed reservoir can be expected to support a fishery similar to Sand Hill Lake and therefore data from Sand Hill Lake could be used as part of the sample data.

Response:

Other recreational activities in addition to sport fishing may impact shoreland development. Consideration currently being given to water quality enhancement systems will augment the reservoir as a recreational resource. Of the total newly created shoreland, approximately 40% was believed to be unsuitable for recreational development due to its proximity to the dam structure, steepness of the shoreline, presence of deep sloped tributaries and/or shallow off-shore waters. Comparison of various Minnesota fishery resources is

outside of Houston Engineering's areas of expertise and was not a basis in this determination. However, the Minnesota DNR should have a sufficient data base on fishery resources to address fishery issues.

COMMENT 10G: Submitted by Mr. Wm. L. Goetz, U.S. Army Corps of Engineers.

The USCE also notes an inconsistency in the last paragraph on Draft EIS Page 3-50 which the Watershed District needs to clarify and document. According to the Draft EIS, while quantifiable amounts of protected lands along the Red River is not available, the Watershed District's Economic Analysis (Sand Hill River Watershed District Preliminary Engineers Report - Economic Analysis) has quantified benefits to agricultural lands. Obviously if benefits have been quantified then it is erroneous to state that a quantifiable amount of protected lands is unavailable. This comment can be responded to by either quantifying the amount of protected lands which have been assigned benefits, or by not assigning benefits to agricultural lands, if in fact those benefits cannot be quantified. As the comment indicates, if the quantifiable effects are dependent on other activities, then those activities also need to be described and discussed.

Response:

Section II,C.1. of the Preliminary Engineer's Report Economic Analysis dated October 16, 1986, addresses this issue. Protected land area was determined for the Sand Hill River downstream from the proposed Winger Dam to the Red River of the North utilizing the HEC-I hydrology computer model. The U.S. Army Corps of Engineers Sand Hill River Flood Control Project land benefit values were then applied to the 907 identified acres of protected lands. Urban damages and methodology for determining benefits were taken directly from a 1984 Corps of Engineers Section 205 study for a potential dam and lake at the project location.

The McCombs-Knutson Study done for the LRRWMB, and dated 1984, was used as the basis for determining agricultural and urban benefits of the project for the Red River Mainstem. Based on an evaluation of the Winger Dam project influence on flood flows for the 1979 flood, it was determined that the peak flow at Grand Forks, N.D. could have been reduced potentially by about 300 cfs and by about 275 cfs at Emerson while removing about 3900 acre-feet of floodwater from the "8-day window" at Emerson.

Applying the economic strategy promoted by the LRRWMB, the value of removing 3900 acre-feet from the 8-day window at Emerson at $245 per acre-ft. damage reduction value was calculated. Area of protected land for the Red River Mainstem was not quantified in calculating mainstem benefits.

COMMENT 10H: Submitted by Mr. Wm. L. Goetz, U.S. Army Corps of Engineers.

The Watershed District needs to respond to this comment regarding the extent of, and the proposed plans to affect two farmsteads within the flood pool of the reservoir proposed by the project sponsors. The response should identify the acreage of the farmsteads and how these properties are proposed to be affected. The District's response also needs to include similar information on the extent and nature of the impact to the farmsteads under each of the alternatives.

Response:

Both affected farmsteads are situated between the permanent and temporary pool elevations of the proposed reservoir project and will be impacted by the fluctuating flood pool. The Benbo farmstead has 7± acres and the Mortenson farmstead has 5± acres within the flood pool. Other than Alternate No. 1, only Alternate No. 4 will impact area farmsteads. Specifically, the Mortenson farmstead will be impacted in the same manner as under Alternate No. 1. It is the intention of the Board to purchase these two farmsteads, remove all buildings and secure the sites for inundation by the reservoir flood pool.

COMMENT 11A: Submitted by Mr. Clifford T. Anderson, Minnesota Pollution Control Agency.

The Minnesota Pollution Control Agency (MPCA) raises a concern with the detail and specificity of the construction plans and specifications. The Watershed District needs to respond to this comment by providing more detailed information on proposed construction plans including construction deadlines and/or dates of completion or time periods in which construction tasks are to be completed. One possible way to respond to this comment could be to establish a beginning date based on a realistic assessment of completion of proposed project plans and specifications or on acquisition of required approvals, and then to establish the construction schedule based on that beginning date.

Response:

Final design and construction plans and specifications for the proposed Winger Dam project have not been completed. It is not desirable for construction plans and specifications to precede the EIS. This is because they should reflect the outcome of the EIS process. Once all preliminary project review and approval stages have been satisfied, detailed plans and specifications will be prepared. Draft plans and specifications will then be submitted for final approval as part of the project permitting process. At that time a specific construction schedule will be developed. We believe it is somewhat premature to set a construction beginning date at this time. An estimated project timetable is suggested below.

Project Development	Estimated Timetable
Final EIS Decision Issued	February, 1988
Final Engineer's Report Filed	March, 1988
Director's Report Filed	March, 1988
Draft Plans and Specifications	June, 1988
Permit Applications Filed	June, 1988
Notice of Public Hearing	June, 1988
Permits and Agreements Issued	August, 1988
Final Hearing	August, 1988
Establishment of Project	August, 1988
Final Plans and Specifications	October, 1988
Advertise for Construction Bids	October, 1988
Award Construction Contract	November, 1988
Start Construction	December, 1988
Mobilization	December, 1988
Site Preparation/Vegetation Removal	December, 1988 - March, 1989
Construct Embankment (Maintain River Control & Reroute T.H. 59 Traffic)	April - Nov., 1989
Construct Principal Spillway Components	April - Nov., 1989
Open T.H. 59 with Gravel Surface	December, 1989
Pave T.H. 59 (Reroute Traffic)	May - June, 1990
Road Relocations, Abandonments, or Raising (Reroute Traffic)	July - Sept., 1990
Construction Contract Close-Out	Oct. - Dec., 1990
Fill Reservoir (Set Low Flow Sluice Gate to Maintain Base River Flows)	March - April, 1990

COMMENT 11D: Submitted by Mr. Clifford T. Anderson, Minnesota Pollution Control Agency.

The Watershed District needs to respond to this comment of the MPCA regarding the potential for fish kills and exceedance of water quality standards due to conditions when bottom water spills over the dam. The MPCA suggests the Watershed District provide an estimate of hypolimnetic oxygen depletion rate and reaeration rate over the spillway to document the absence of fish kills or water quality violations. You should work with staff in the MPCA Water Quality Division to assure an understanding of the scope of the information required. The DNR can provide a contact person at the MPCA for this effort.

Response:

D.O. levels within the reservoir will be dependent on highly complicated interrelationships between physical, chemical, and biological processes. Using a qualitative approach, it can be anticipated that D.O. concentrations would be highest near that lake surface and gradually decrease with depth. D.O. concentrations would be highest during the cooler months. However, ice and snow cover on the lake during the winter has been known to hamper natural reoxygenation processes and lead to an overall D.O. depletion below acceptable levels for some fish. This phenomenon is commonly called "winter kill".

Temperature levels in the downstream river would normally be decreased during the summer months because low flows would be taken from the cooler lower portion of the reservoir. Again, temperature effects would diminish in the downstream direction from the dam due to natural processes. Temperature levels within the reservoir would vary, depending on the time of the year. In the summer, temperatures would be highest at the lake surface, and decrease with depth. During the winter, the deeper waters would be expected to have higher temperatures.

Reservoir stratification can sometimes result from temperature and water density conditions within the lake. The potential for stratification is highly dependent on reservoir depth and the ability of physical process (i.e. normal inflow and wind) to mix impounded water. Generally, the shallower waters are more likely to undergo complete mixing than the deeper waters. Stratification is also dependent on the ability of the

natural mixing forces to overcome the strength of the thermocline to resist mixing. The thermocline is defined by a steep temperature gradient which separates the upper warmer less dense water for the lower cooler and more dense water. For shallow lakes, the thermocline is weak and unable to resist the mixing forces. For the proposed project, it is difficult at this time to predict whether the maximum depth of 25 feet is sufficient to produce a strong thermocline and the resulting stratification. DNR experience and data for other Minnesota lakes would provide some direction in this matter.

Should a stratification potential be found, the impact would have to be determined. Consideration of an aeration system to be incorporated in the proposed project operations can then be made to address the stratification potential and maintenance of adequate dissolved oxygen levels. Please refer to page C-1 of the Draft EIS for regulatory information relative to this issue. DNR fisheries personnel would be in the best position to evaluate these impacts. Presently, the low flow conduit is designed to pass base flow by removing lower reservoir water automatically with no provision for manual control of water withdrawal at varying depths.

It can be anticipated that downstream dissolved oxygen levels would be increased from water releases immediately below the proposed dam. The increased D.O. would result from a 25-foot vertical drop of the reservoir outflow through the principal spillway/energy dissipation system and the associated turbulence. The increased level of D.O. would gradually diminish in the downstream direction due to natural process of deoxygenation. The reaeration/deoxygenation process could be hypothetically modelled using classical Streeter-Phelps formulation. However, a great amount of reaeration and deoxygenation data would have to be developed.

The effects of water release from the proposed project on dissolved oxygen (D.O.), temperature, aquatic weed growth, algae blooms and other effects can only be addressed in a qualitative manner at this time. Existing expertise within the Department of Natural Resources would be in a better position to address this topic in a more definitive way.

COMMENT 11G: Submitted by Mr. Clifford T. Anderson, Minnesota Pollution Control Agency.

The Watershed District needs to respond to this comment regarding the existence of septic systems below the proposed 1200 foot contour and identify specific plans for addressing septic systems below this elevation. Assuming a response to the issues raised by Mr. Krogstad in Comments 2 and 3A, the District won't need to respond to the issue raised in this comment regarding the need to cap the wells. However as identified in the discussion accompanying Comment 2, the response does need to identify the party responsible for the cost of capping and abandoning wells and septic systems, and the intention of the Watershed District to either reimburse landowners or pay those costs directly. In addition, these costs should be added as up front project costs and shown in a manner which reflect that addition.

Response:

It is the intention of the Watershed District to comply with appropriate state and/or local regulations relative to wells and septic systems within the proposed project area as part of property condemnation, acquisition and/or easement procedures. These procedures will be documented and costs will be incurred by the Watershed District through the property condemnation, acquisition and/or easement process. The project cost estimate will be updated to reflect and identify these "up front" costs.

COMMENT 12B: Submitted by Mr. Wm. D. Franz, U.S.E.P.A.

The EPA also raises the issue of the 6,800 acre-feet of storage requirement associated with all of the alternatives. This requirement was also mentioned at the public meeting. The exact nature of the requirement and the reason for this storage amount as a condition of partial financial assistance needs to be explained and clarified. This explanation should include the source of the requirement and whose requirement it is. If this explanation can be documented by another prepared report, that documentation should be indicated.

Response:

The 6,800 acre-feet of storage requirement associated with all of the project alternatives was determined by mutual agreement between the Lower Red River Watershed

Management Board and the Sand Hill River Watershed District. This storage requirement is based on economic and benefit considerations of project impact on the Red River of the North. In addition, the 6,800 acre-feet represents the remaining available storage between the minimum reservoir elevation required to maintain an adequate permanent pool depth and the maximum reservoir water elevation controlled by area topography.

COMMENT 12C: Submitted by Mr. Wm. D. Franz, U.S.E.P.A.

The Watershed District needs to respond to this comment regarding the potential for serious impacts on the water quality of both the Sand Hill River and the Red River of the North by providing documentation to indicate the nature of downstream water quality attributable to the project proposed by the District. Water quality sampling data, if available, could provide the greatest assistance.

Response:

The effects of water release from the proposed project on dissolved oxygen (D.O.), temperature, aquatic weed growth, algae blooms and other effects on the Sand Hill and Red Rivers can only be addressed in a qualitative manner at this time. Existing expertise within the Department of Natural Resources would be in a better position to address this topic in a more definitive way.

It can be anticipated that downstream dissolved oxygen levels would be increased from water releases immediately below the proposed dam. The increased D.O. would result from a 25-foot vertical drop of the reservoir outflow through the principal spillway/energy dissipation system and the associated turbulence. The increased level of D.O. would gradually diminish in the downstream direction due to natural process of deoxygenation. The reaeration/deoxygenation process could be hypothetically modelled using classical Streeter-Phelps formulation. However, a great amount of reaeration and deoxygenation data would have to be developed.

Aquatic weed growth, algae blooms, and other effects in the downstream river regime are not anticipated to be of any significance. However, these phenomenon can be expected around the periphery of the proposed reservoir. The magnitude of adverse effects from these phenomenon

are difficult to predict without further study. They are highly dependent on lake nutrient loading in most cases.

The determination of baseline water quality information is dependent upon parameters required for environmental analysis. Neither the District nor Houston Engineering, Inc. has the laboratory facilities to conduct the most common analyses. To date, we do not know which parameters are required. For these reasons, we feel that the DNR is in a better position to develop the required baseline data to suit the needs of the Environmental Impact Statement.

COMMENT 12D: Submitted by Mr. Wm. D. Franz, U.S.E.P.A.

This comment regarding an aeration system can be responded to as indicated in the discussion accompanying Comments 9C, 9D, and 9G. However, to adequately respond to this comment, the Watershed Distirct needs to identify the extent of the aeration system to be incorporated into a proposed project design, particularly noting whether operation is proposed on a periodic or continuous basis.

Response:

The response of the Sand Hill River Watershed District to this comment is contained in its responses to comments 9C, 9D, 9G, and 9H. Therefore, reference is hereby made to these previous responses.

GENERAL COMMENT: Project Costs - MnDOT Funding.

The public informational meeting included discussion of the Minnesota Department of Transportation project deferrals. As is evident from the attached deferral position statement, at the present time the $1,020,000 MNDOT portion of proposed funding has been deferred. The Watershed District needs to identify the extent to which these deferral plans impact the District's proposed plans and schedule, since at the public meeting it was indicated that plans and specifications are anticipated to be completed in December 1987 or January 1988.

Response:

Due to the current project review timetable and design requirements it appears that the actual construction schedule will accommodate this temporary funding delay. The updated project timetable reflects an estimated

construction contract award date in the late fall of 1988. Reconstruction of T.H. 59 would occur during 1989 coinciding with the release of the MnDOT funding.

GENERAL COMMENT: Project Costs - Updated Cost Estimate.

Appendix L in the Sand Hill River Watershed District Preliminary Engineer's Report contains the Watershed District's detailed estimate of costs. Based upon a review of this information, it appears this is the same data as provided in the February 21, 1985 Preliminary Data and Cost Estimate. For example, the Trunk Highway No. 59 costs identified total $859,590 while the Minnesota Department of Transportation programmed amount is noted in July 1985 to be $1,020,000.00. It is important that the Final EIS provide the most current estimates of proposed project costs. Therefore, the Watershed District needs to provide updated estimates of project costs. To assure this estimate is an accurate reflection of current project costs, this updated information also needs to include:

- -Cost of capping and abandonment of wells (see discussion accompanying Comments 2, 3A, and 11G;
- -Cost of capping and abandonment of septic systems (see discussion accompanying Comment 11G);
- -Cost of installation and operation of an aeration system (see discussion accompanying Comments 9C, 9D, 9G, and 12D); and
- -Cost of proposed project and downstream upland and wetland mitigation (see discussion accompanying Comments 4G and 4H).

Response:

An updated project cost estimate is provided below. Review of project item unit prices indicates that estimated future costs at the projected time of project construction (January 1, 1987 - December 31, 1989) were taken into consideration. A few unit prices were updated based on more recent data. The cost estimate was modified to include the current cost estimates for Polk County Road relocations received from the Polk County Engineer's Office, principal spillway access appurtenances, reservoir fencing, soils investigation and engineering, and address water well and septic system issues. The estimated cost to comply with Minnesota Health Department regulations relative to the existing flowing well is $5,000 and to the existing domestic water wells and septic systems of the two impacted farmsteads is estimated to be $500 for each system. The total estimated cost for water well and septic system issues would then be $7,000.

The estimated costs for reconstruction of T.H. 59 still appear to be valid with an adjustment made for bituminous material unit cost due to lower anticipated petroleum prices. The unit cost of "Clearing" was adjusted to be consistent with the estimated unit cost for reservoir clearing work. The funding contributions by the MnDOT for this aspect of the project are based on the cost estimate for their originally planned bridge and reconstruction design.

Detailed Estimate of Costs - Alternative No. 1

Item	Unit	Quantity	Unit Cost	Total Estimated Costs
A. Relocations:				
1. County State Aid Highway No. 1	l.s.	1	$400,000	$400,000
2. County State Aid Highway No. 8	l.s.	1	330,000	330,000
3. County Road No. 204	l.s.	1	100,000	100,000
4. Sletten Twp. Road (Sec. 20/21)	l.s.	1	18,000	18,000
Contingencies				85,000
Total Relocations				$933,000
B. Reservoir:				
Remove Bridge	ea.	2	5,000	$ 10,000
Twp. Roads (Fish Habitat Structures)	ea.	2	-0-	-0-
Clearing - Woodland	ac.	105	1,000	105,000
Clearing - Wetland	ac.	325	300	97,500
Clearing	ac.	1,900	10	19,000
Recreational Enhancement	l.s.	--	50,000	50,000
Contingencies				31,500
				$313,000

Item	Unit	Quantity	Unit Cost	Total Estimated Costs
C. Trunk Highway No. 59:				
Mobilization	l.s.	1	$30,000.00	$ 30,000
Maint. & Restoration of Haul Roads	l.s.	1	30,000.00	30,000
Clearing	ac.	1	1,000.00	1,000
Grubbing	ac.	1	500.00	500
Remove Pipe Culverts	l.f.	60	5.00	300
Remove Concrete Pavement	s.y.	16,111	2.50	40,280
Salvage Pipe Culverts	l.f.	301	10.00	3,010
Excavation	c.y.	158,946	1.50	238,420
Aggregate Shouldering	ton	9,236	4.50	41,560
Bituminous Material for Mixture	ton	603	200.00	120,600
Binder Course Mixture	ton	1,595	9.00	14,355
Base Course Mixture	ton	9,475	9.00	85,275
Shoulder Mixture	ton	1,748	9.00	15,730
Temporary Lane Marking	Rd. Sta.	363	50.00	18,150
Bituminous Material for Mixture	ton	96	200.00	19,200
Wearing Course Mixture	ton	1,595	9.00	14,355
Bit. Material for Tack Coat	gal.	2,513	1.10	2,765
Remove Old Bridge	l.s.	1	10,000.00	10,000
Traffic Barriers & Detour Signs	l.f.	3,200	3.50	11,200
Twisted End Treatment	ea.	64	200.00	12,800
36" C.S. Pipe Culvert	l.f.	162	50.00	8,100
18" R.C. Pipe Culvert	l.f.	48	17.10	820
36" C.S. Pipe Aprons	ea.	2	250.00	500
18" R.C. Pipe Aprons	ea.	2	85.00	170
18" C.S. Safety Apron	ea.	1	250.00	250
Random Riprap Class II	c.y.	5	50.00	250
Geotextile Fabric	s.y.	14	20.00	280
Roadside Seeding	ac.	26	50.00	1,300
Seed Mixture Special	lb.	1,040	0.85	885
Sodding	s.y.	22,774	1.50	34,160
Mulch Material Type I	ton	52	95.00	4,940
Disc Anchoring	ac.	26	27.50	715
Comm. Fertilizer Anal. 6-24-24	ton	5	220.00	1,100
Hay or Straw Bales	ea.	50	10.00	500
Contingencies				76,120
Total Trunk Highway No. 59				$839,590

Item	Unit	Quantity	Unit Cost	Total Estimated Costs
D. Dam:				
1. Mobilization	l.s.	1	30,000.00	$ 30,000
2. Earthwork Items:				
Water Control	l.s.	1	35,000.00	35,000
Excavation	c.y.	139,624	3.00	418,870
Slurry Cut-Off	s.f.	80,000	2.00	160,000
Embankment	c.y.	441,582	1.70	750,690
Drain Fill	c.y.	40,212	6.00	241,270
Total Earthwork Items:				$1,605,830
3. Principal Spillway Components:				
Structural Concrete	c.y.	925	225.00	208,125
Reinforcing Steel	lb.	168,100	0.45	75,645
Structural Steel	lb.	24,700	1.25	30,875
Copper Water Stop	ft.	532	15.00	7,980
48" Dia. RCP	ft.	70	110.00	7,700
4' x 4' Gate w/Appurtenances	ea.	1	30,000.00	30,000
22' x 6' Roller Gate w/Appurtenances	ea.	2	60,000.00	120,000
Piling	l.s.	1	15,000.00	15,000
Access Appurtenances	l.s.	1	5,000.00	5,000
Total Principal Spillway Components:				$500,325
4. Emergency Spillway Components:				
Enkamat 7020	s.y.	2,367	10.00	23,670
Sheet Piling	s.f.	1,560	15.00	23,400
Sod	s.y.	2,367	1.50	3,550
Total Emergency Spillway Components:				$ 50,620
5. Riprap	c.y.	5,600	45.00	252,000
6. Fencing	l.f.	1,500	15.00	22,500
7. Seeding	l.s.	1	10,000.00	10,000
Contingencies				321,815
Total Dam				$2,793,090

Item	Unit	Quantity	Unit Cost	Total Estimated Costs
E. Summary:				
Relocations				$ 933,000*
Reservoir				313,000
Trunk Highway No. 59				839,590
Dam				2,793,090
Total Construction				$4,878,680
Utility Relocation				40,000
Soil Testing and Soil Engineering				137,280
Aerial Mapping				9,400
Engineering - Design and Inspection				300,000
Legal and Administrative				75,000
Right-of-Way (Includes Conformance to Minnesota Department of Health Regulations relative to Water Wells and Septic Systems)				900,000**
TOTAL COSTS				$6,340,360*

FUNDING SOURCES

State of Minnesota Bonding	$2,500,000
Minnesota Department of Transportation	1,020,000
Lower Red River Watershed Management Board	962,360
Sand Hill River Watershed District	275,000
Polk County	913,000*
Local Right-of-Way Donations	600,000
Wild Rice Electric Co. (Power Line Relocation)	20,000
Winger and Sletten Townships (Work in Lieu of Cash)	50,000
	$6,340,360

*Cost increase due to Polk County Engineer's updated cost estimate for road relocations. Sletten Township road relocation cost estimate updated by Houston Engineering. Funding is totally provided by Polk County and Sletten Township.

**Mitigation costs are included in costs for right-of-way. Right-of-way costs also includes provision for an aeration unit at between $22,000 and $26,000. The District will solicit the cooperation of other State and local entities for installation and maintenance of an aeration system.

In addition to the District's responses to the EIS comments outlined above, we would like to comment on the outcome of our meeting with DNR officials on December 22, 1987. We would specifically like to acknowledge the proposed revisions to the wording of the operational procedures on page 3-41 of the EIS. The District concurs that the following statement should be added to the effect that:

> "Specifics on operation of the dam will be established during the permit process" and "the success of the operating plan will be monitored and modified as required."

We feel that the responses contained herein are sufficient, and that the EIS process can now be brought to its conclusion. If you have any questions, don't hesitate to call us immediately.

Sincerely,

SAND HILL RIVER WATERSHED DISTRICT

Roland J. Gullekson

Roland Gullekson, Chairman

RG:gz
cc: Vonny Hagen
Tom Balcom
Ron Harnack
Ron Nargang

ATTACHMENT NO. 1

TELEPHONE 218-281-3952

POLK COUNTY

HIGHWAY DEPARTMENT

TH 75 AND CR 233

P.O. BOX 27

CROOKSTON, MINNESOTA 56716

October 7, 1985

Mr. Gale Fraser
Houston Engineering
2505 N. University Drive
P.O Box SU 5054
Fargo, North Dakota 58105

Dear Gale:

In the past serveral months we have become aware of the Winger Dam that is proposed to be built on the Sand Hill River just east of Trunk Highway 59 near Winger. Because of the lake that will result from the dam several county roads will be affected. In particular C.S.A.H. No. 8 and C.R. 204 will have to be relocated and C.S.A.H. No. 1 will have to be raised in elevation.

We are currently involved in the preliminary survey and design of the road construction that will need to be made. We have tentatively scheduled a letting date for January 1987 with construction scheduled to begin by May or June of 1987.

Because of Houston Engineering's involvement with the design, we would appreciate information you could provide us with on the water elevations of the lake at the intersection of T.H. 59 and C.R. 204 and also at the intersection of C.S.A.H. 1 and C.S.A.H. 8 with the corresponding design frequency. We anticipate the box culvert under C.S.A.H. No. 1 will be extended.

We are contacting you now so that when this information becomes available we may complete the design of the projects in a timely manner.

Please continue to contact Joe McKinnon, Construction Engineer, in our office with information or questions on these projects.

Sincerley,

Michael P. Rardin

Michael P. Rardin, P.E.
Polk County Highway Engineer

MPR:cmb

ATTACHMENT NO. 2

Cons.. 2 Project4.COR

TELEPHONE 218-281-3952

POLK COUNTY

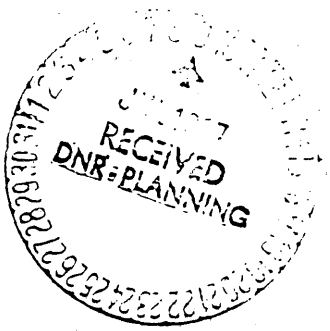
HIGHWAY DEPARTMENT

TH 75 AND CR 233

P.O. BOX 27

CROOKSTON, MINNESOTA 56716

July 9, 1987



Ms. Charlotte Cohn
Minnesota Dept. of Natural Resources
Office of Planning
500 Lafayette Road
St. Paul, Minnesota 55146

Re: Proposed Sand Hill River Watershed District Project No. 4
Winger Dam Draft Environmental Impact Statement (DEIS)

Dear Ms. Cohn:

Upon review of the Draft Environmental Impact Statement (DEIS) for the proposed Winger Dam we noticed incorrect statements on the relocation of County State Aid Highway No. 8.

Section 1.9 (Road Relocations) and Fig. 1-4 indicate that C.S.A.H. No. 8 will be maintained at the current alignment but be raised to an elevation of 1200.0. The Polk County Highway Department has designed C.S.A.H. No. 8 to change its alignment to the west to avoid the proposed resulting reservoir. This would result in the relocation of 6088 feet of C.S.A.H. 8. We have anticipated this proposed design and alignment change since 1985 and completed the design in December of 1985. We are unaware of why the DEIS shows the incorrect alignment.

In order that all issues would be correctly stated in the DEIS we feel that the before mentioned correction should be made.

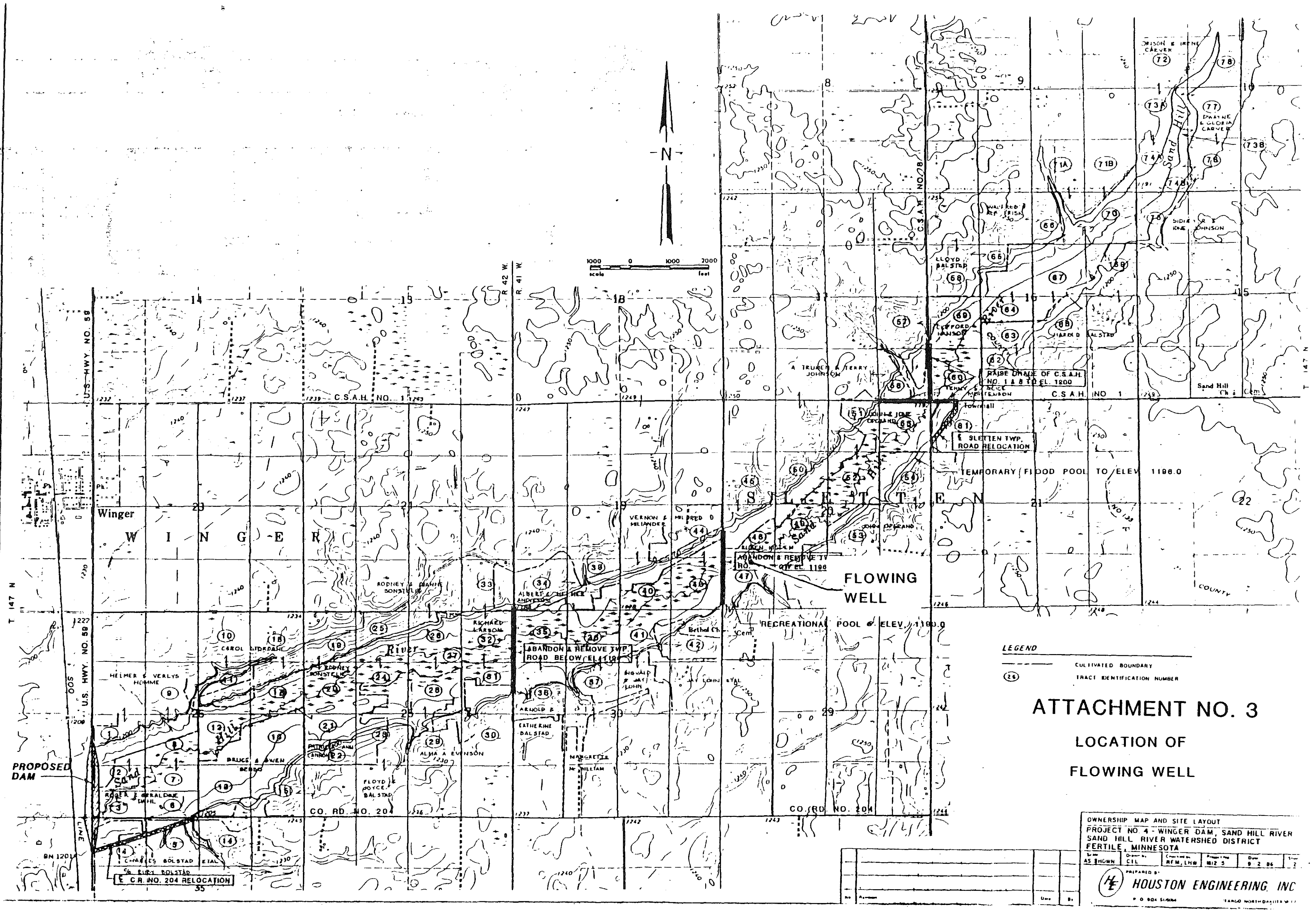
If you have any questions please contact our office.

Sincerely,

P. Faught for M.P.R.

Michael P. Rardin, P.E.
Polk County Highway Engineer

MPR:cmb


ATTACHMENT NO. 3
LOCATION OF
FLOWING WELL
FLOWING WELL
PROPOSED DAM
N
LEGEND
CULTIVATED BOUNDARY
TRACT IDENTIFICATION NUMBER
TEMPORARY FLOOD POOL TO ELEV 1198.0
RECREATIONAL POOL @ ELEV. 1190.0
ABANDON & REMOVE TWP. ROAD BELOW EL 1191
RAISE GRADE OF C.S.A.H. NO. 1 & 8 TO EL. 1200
SLETTEN TWP. ROAD RELOCATION
C.R. NO. 204 RELOCATION
C.S.A.H. NO. 1
C.S.A.H. NO. 8
CO. RD. NO. 204
U.S. HWY. NO. 59
WINGER
SLETTEN
Winger
Sand Hill River
OWNERSHIP MAP AND SITE LAYOUT
PROJECT NO. 4 - WINGER DAM, SAND HILL RIVER
SAND HILL RIVER WATERSHED DISTRICT
FERTILE, MINNESOTA
HOUSTON ENGINEERING, INC.

MAP OF

WINGER

TOWNSHIP: 147N. RANGE: 43W.

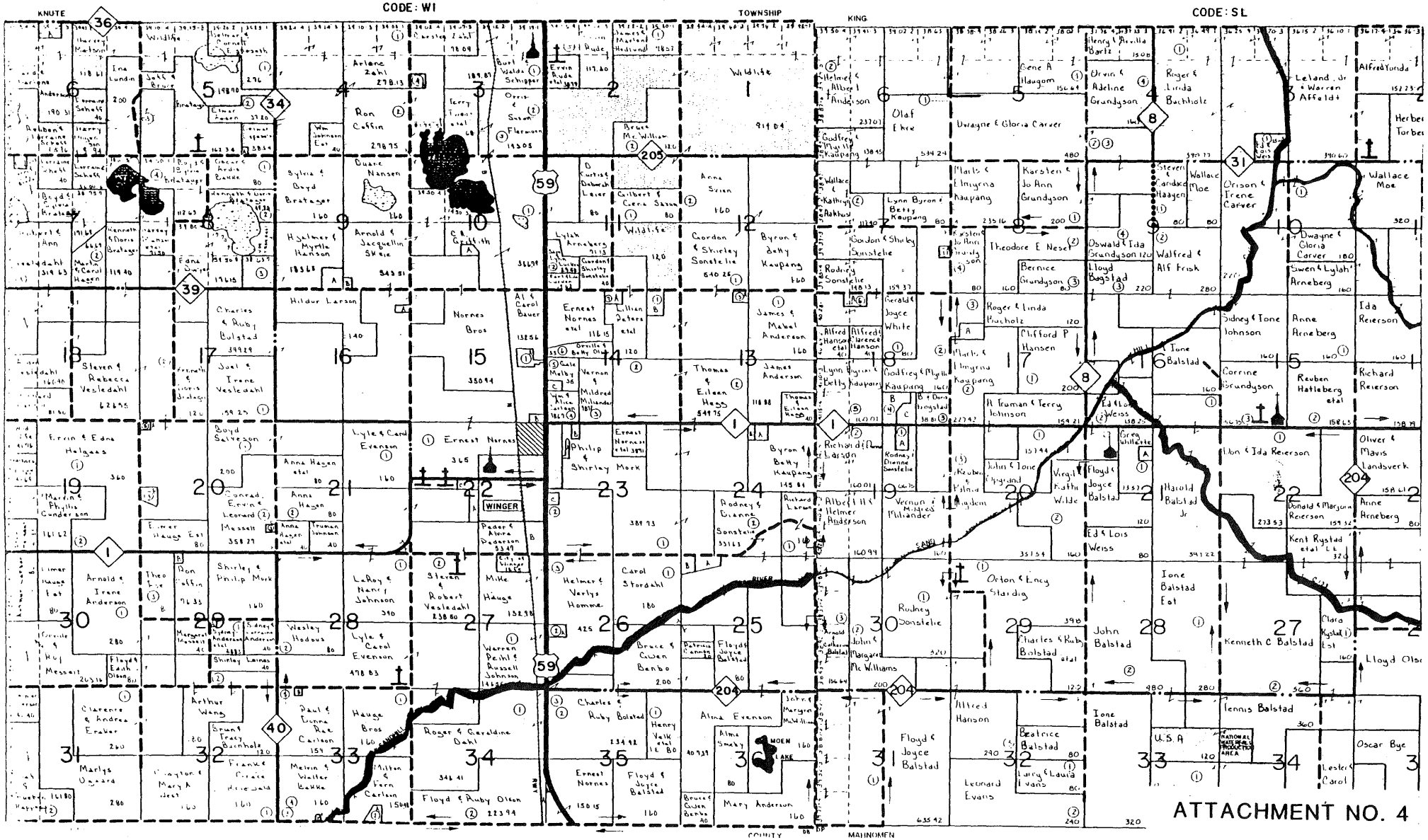
CODE: WI

MAP OF

SLETTEN

TOWNSHIP: 147N. RANGE: 42W.

CODE: SL



ATTACHMENT NO. 4

ATTACHMENT NO. 5

PROJECT FINANCING AND PARTICIPATION (AS OF SEPT. 3, 1985)

Manager Wilkens moved that the following Resolution be adopted by the Board of Managers:

RESOLUTION

RESOLVED, that the construction of an earth-fill flood reduction dam with recreational pool, and related work on the Sand Hill River where U.S. Route No. 59 crosses the Sand Hill River near the north-south section line between Sections 26 & 27 and Sections 34 & 35, Township 147, Range 42 (WINGER TOWNSHIP) of Polk County, Minnesota, shall be undertaken by the Sand Hill River Watershed District. Said improvement is for the public interest and welfare and is practicable and in conformity with the Overall Plan of the District. The cost of the project thereof is estimated at $5,892,035.00. The financing of the project, to date, is from the following scurces:

Sand Hill River Watershed District	$ 275,000.00
Minnesota State Bonding	$2,500,000.00
Polk County (Road Relocations)	$ 464,675.00
Winger & Sletten Townships (work in lieu of cash)	$ 50,000.00
Minnesota Department of Transportation	$1,020,000.00
Wild Rice Electrical Co-Op	$ 20,000.00
Right-of-Way donations	$ 600,000.00
Lower Red River Watershed Management Board	$ 962,360.00
TOTAL	$5,892,035.00

Robert Muscha of Houston Engineering, Inc., is hereby appointed Engineer for the project and is directed to make all necessary surveys and plans for the construction thereof.

Manager Larson seconded the motion for the adoption of said Resolution, and, upon the question being put, the same was declared unanimously carried.

CERTIFICATION

I, the undersigned Secretary of the Sand Hill River Watershed District, hereby certify that I have compared the foregoing copy of a Resolution of the Board of Managers of the Sand Hill River Watershed District with the original thereof in the records of the said Sand Hill River Watershed District, and that the same is a true and correct copy thereof.

Dan Wilkens

Dan Wilkens, Secretary of the Board of Managers of the Sand Hill River Watershed District

Minnesota Pollution Control Agency

RECEIVED

APR 11 1988

COMMISSIONER

April 8, 1988

Mr. Joseph N. Alexander
Commissioner
Department of Natural Resources
500 Lafayette Road
St. Paul, Minnesota 55155

Dear Commissioner Alexander:

Re: Sand Hill Watershed District Responses to Comments on the Winger Dam Draft Environmental Impact Statement

We have reviewed the Sand Hill Watershed District's Response to Public Comments (Response) on the draft Winger Dam environmental impact statement (EIS), submitted in response to the Minnesota Department of Natural Resources' (DNR) letter to the District of October 28, 1987, and transmitted to us by DNR in early February 1988.

Our review of this document indicates that the District's perception of the proper function of the permitting and environmental review processes, and of the roles of the various parties in those processes, is very different from ours. A number of the responses to comments did not fully address concerns raised in the course of environmental review, and the content of the Response as a whole indicates a lack of understanding of how the above processes are supposed to work.

We will discuss the following issues in this letter:

* An EIS must present information sufficient to adequately inform the public about the impacts of the proposed action. The draft EIS does not do this although the means to do so are readily available, and it therefore is not adequate to fully perform the function required of it under law.

* All significant issues ought to be fully addressed in the EIS and we take exception to the District's position that a number of what clearly are EIS issues can wait for resolution until the permitting stage of the project.

* The District has not accepted the responsibility for supplying the data and analysis necessary for proper review of its activities by the public.

Phone:_____
520 Lafayette Road North, St. Paul, Minnesota 55155
Regional Offices • Duluth/Brainerd/Detroit Lakes/Marshall/Rochester

DRAFT EIS DEFICIENCY

The function of an EIS under the law is to set forth as completely and clearly as possible the significant environmental issues regarding a project and its alternatives, so that intelligent and informed decisions as to the appropriateness and feasibility of the project can be made by the public. This includes a detailed description of the proposed action. The state requires by law (Minn. Rules part 4410.0300 subparts 3 and 4) that environmental documents aid in promoting understanding of a project, address the significant issues, be used as guides in permitting processes, provide public accountability in project decisionmaking, and (Minn. Stat. 116D.04 subd. 2a.) be detailed enough so that the above goals can be realized. It is also required (Minn. Rules part 6115.0410 subpart 8C) that the need for Class I dams in terms of quantifiable benefits be shown. It is clearly state policy that EISs must have the kinds of information and level of detail which will assure that these requirements will be met.

The EIS presently contains some of the information needed by a reviewer to analyze the environmental effects of this project. However, as several reviewers noted in their comments on the draft, some major questions remain. The data presented is mostly qualitative, and several significant data gaps exist. We believe that the level of concern expressed by several commenters, coupled with the District's failure to adequately address the issues, as noted elsewhere in this letter, leads to the conclusion that water quality and other issues should receive considerably more attention in the EIS than is now the case.

Specific areas in which the draft EIS is deficient are outlined below.

Water Quality

The draft EIS is generally qualitative in nature, rather than quantitative, despite the fact that the data and models required for the document to be quantitative are readily available. Further, no analysis of downstream water quality impacts was done.

Also,the draft EIS discusses water quality impacts for the preferred alternative only. This makes valid comparisons between alternatives very difficult, and to that extent prejudices the EIS's ability to perform its intended function.

We have previously indicated our willingness to participate in efforts to resolve this problem, and reiterate that willingness here.

Flood Control Benefits

There seems to be conflict among the various documents relating to this project regarding the potential for flood control benefits. The draft EIS does not address this conflict, nor does it resolve it. Since a significant public expenditure is involved here, the ability of the project to perform its intended function should be documented.

Recreation Benefits

The draft EIS does not say what kind of fishery the District intends to provide with the project. It says only that indications are that the reservoir will resemble a "bullhead type of lake." The document should explain what the plan is, as well as the means to be employed by the District to achieve the plan's goals, so that the public can adequately assess the extent to which the plan is feasible and whether benefits outweigh costs.

The EIS does not address the "swimmability" or potential body contact recreation within the reservoir. Minnesota Pollution Control Agency (MPCA) research exists which addresses this characteristic in quantitative terms. Analysis of this research with appropriate modeling would give the public a much better idea of what to expect from the reservoir than the draft EIS now does, and this would not be difficult or time-consuming to do.

Project recreational benefits are directly tied to water quality. Full discussion of the water quality aspects of this project, including the impoundment and downstream water quality impacts of all alternatives, are crucial to understanding what recreational contributions this project will be able to make in the region.

Mitigation and the Benefit/Cost Ratio

Calculation of a meaningful benefit/cost ratio, a necessity for EISs on publicly-funded projects, is not possible unless all project-related expenditures are known. However, the full costs associated with mitigation for this project are not given in this EIS. This is probably because it is not known what the District intends to propose for mitigation, even though the draft EIS makes it clear that various forms of mitigation will be required. Again, the public cannot adequately review this project unless it knows what the sponsor is planning. The place to present the plan is in the EIS. The EIS should clearly state what is proposed for mitigation and what the costs are, for each alternative. The benefit/cost ratio should in turn reflect these costs for each alternative.

THE EIS PROCESS VERSUS PERMITTING AS THE FORUM FOR REVIEW

The District's Response to Comments is indicative of its belief that a number of significant issues need not be addressed in the EIS, but can be relegated to the permitting stage. However, the function of the permitting process is very different from that of environmental review. The function of the EIS has been outlined above. Permitting, on the other hand, is the means by which terms and conditions are placed on projects in order to assure that environmental standards are met. It is not a forum for overall discussions of project feasibility, because each permit process is necessarily focused on the issues associated with that particular permit. Permitting and environmental review are not the same, and one cannot substitute for the other.

Another point is that a properly done EIS assists agencies during the permitting process by indicating where there may be problems meeting standards and what kinds of mitigation will be required. The result is a more efficient permitting process which can focus immediately on the most important issues.

We recognize that the question of whether various issues ought to be addressed in the EIS or in the permitting process is a valid one whose resolution will always require some judgement. However, we also believe that this question is best resolved by asking whether a public reviewer would need the information in order to draw valid conclusions regarding the environmental impacts of a project, and whether the information could reasonably be made available during the process of developing an EIS. If the answer to both questions is yes, the EIS should contain the information. If it does not, then the EIS process is not functioning as it should. We believe that is the case here.

In the Response, the following issues were identified by the District as being left to the permitting process for resolution:

- amount and type of wildlife mitigation
- amount and type of aeration needed for recreation management
- costs of the above
- development of operating procedures for the dam which have ramifications for water quality impacts and mitigation of those impacts.

In our view, the EIS should contain, as a minimum, documentation that mitigation is or is not feasible and practical, an evaluation of mitigative techniques and their costs, and the mitigation proposal of the project sponsor. This should be done for each alternative.

Similarly, the operating procedures for the dam will have effects in a number of important areas, such as water quality downstream and within the impoundment. Evaluation of these effects is difficult unless the EIS addresses them fully.

ROLES OF VARIOUS PARTIES IN THE PROCESSES

The District's Response contains language which makes clear its belief that state agencies have the responsibility for replying to requests for detailed project information. We disagree. While the District can arrange for the compilation and analysis of project data by any entity it chooses, including state agencies if they agree, the ultimate responsibility for making those arrangements and making sure that the data is provided must be the District's.

This in no way conflicts with the fact that MPCA routinely does considerable modeling of project data, nor that agencies routinely share information and expertise to the extent possible and in the public interest. However, it is the responsibility of the project sponsor to arrange for new data gathering and compilation, data analysis, modeling, and other activities in support of a project.

We consider it imperative that the District be made to understand this before we are asked to consider a 401 certification. By separate letter we are informing the District of what we will require and that, while we will share what data and expertise we have to the extent possible, MPCA assumes no responsibility for producing the requisite data and analysis.

We recommend the District be given another opportunity to respond to public comments on the EIS, this time with the understanding that it must (a) fully respond to the comments, and (b) accept full responsibility for the generation and analysis of project data, including that which it arranges to obtain from state agencies. Failing this, the District should be advised that it has this responsibility from this point forward.

CONCLUSION

In summary, we believe the draft EIS in its present form is inadequate to perform its intended function under law. This has apparently resulted from some misunderstandings about the proper roles of environmental review, permitting, and the various affected parties in the process. We believe that publishing the final EIS without the data and analysis discussed above would set a precedent with unfortunate ramifications for the state in the future. We accordingly recommend inclusion of the data and analysis dicussed above.

Please contact Clifford T. Anderson of MPCA Office of Planning and Review if further discussion of this matter is desired.

Sincerely,

Gerald L. Willet

Gerald L. Willet
Commissioner

GLW:pnk

Minnesota Pollution Control Agency

RECEIVED

APR 12 1988

COMMISSIONER

April 8, 1988

Roland Gullekson, Chairman
Sand Hill Watershed District
Route 2, Box 218 D
Fertile, Minnesota 56540

Dear Mr. Gullekson:

Re: Sand Hill Watershed District Winger Dam Proposal

The Minnesota Pollution Control Agency (MPCA) has reviewed the draft Environmental Impact Statement (EIS) and Sand Hill Watershed District's responses to public comments on the draft EIS, which you submitted in response to the Minnesota Department of Natural Resources' (DNR's) letter to you of October 28, 1987.

Based on this review, significant environmental concerns and data deficiencies remain. It is our purpose in writing this letter to clearly spell out what kinds and levels of information are required before any approval process can move forward to completion.

BACKGROUND

In a meeting with Senator Roger Moe on February 1, 1988, MPCA representatives informed Donald Ogaard, former President of the Lower Red River Watershed Management Board, that the U.S. Environmental Protection Agency (EPA) had recommended dismissal of the preferred project alternative from further consideration, based on water quality concerns. The MPCA staff further noted that it had many of the same concerns, and that these concerns bore directly on the MPCA's responsibility to certify the project under Section 401 of the Clean Water Act. This was (and is) an important issue because EPA has the authority to deny permits required for the project even if the MPCA grants certification. Based on information now available, the MPCA cannot dispute the EPA recommendation. This in turn makes it critical that the issues raised by the MPCA, in its comments on the draft EIS, be fully addressed by the District. The MPCA staff recommended that the District work with the various affected agencies to resolve concerns, and stated its willingness to be involved. In this meeting, Mr. Ogaard indicated that MPCA would receive the District's responses to its comments on the draft EIS. We have received the District's responses; however, the information does not provide adequate data which supports approval of the proposed action. The MPCA staff has stated that if the District takes no action on providing the information, the project would be placed in jeopardy.

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GENERAL COMMENTS

We remain concerned about the adequacy of the EIS. We do not believe the EIS sets forth the significant environmental issues regarding a project and its alternatives so that decisions as to the appropriateness and feasibility of a project can be made by the public. We do not believe a proper evaluation of the impacts are provided to guide the permitting processes, provide public accountability in project decision making, and enough detail so that the above goals can be realized.

There is debate whether the response to issues raised is required to be addressed in the EIS or in the permitting process. The EIS already contains some of the information needed by a reviewer to analyze the environmental effects of this project. However, as several reviewers noted in their comments on the draft, some major questions remain. Currently, we believe the EIS does not contain adequate information to allow permits and approvals to be issued. Therefore, the project cannot be approved based on current information.

The Sand Hill River is classified as a 2B, 3B, 4A, 4B, 5, and 6 class water. This classification indicates the river's designated uses include fishing, swimming, other recreational uses, industrial consumption, agricultural and wildlife uses, aesthetic enjoyment, and navigation. A 1979 MPCA stream assessment of the Sand Hill River near Fertile showed the river was definitely used for recreation and DNR data do show the existence of a fishery. According to Minnesota Rules Part 7050.0220, Subpart 3, the project shall not impair the quality of the upstream or downstream waters or "in any manner render them unsuitable or objectionable for fishing, fish culture or recreational uses." The District must demonstrate that the project will not cause impairment of beneficial upstream or downstream uses. Information presently available indicates that the proposed project could result in water quality violations in the reservoir and downstream of the project.

DETAILED COMMENTS

If the proposed project is to be considered further, the information outlined below must be submitted to the MPCA. The District is advised that one or more meetings will be necessary between the MPCA staff and District representatives to assure understanding of this data request. It should also be understood that before a project can be approved, the data must demonstrate that project development will not result in violations of state standards.

Impoundment and Watershed Characteristics

1. For the purposes of predicting impoundment water quality subsequent to creation of the reservoir, various watershed and anticipated impoundment morphometric characteristics must be analyzed. The MPCA staff has run several models to predict reservoir quality. Attached

are the model runs and the interpretations. The District should review the data and conclusions and address the impacts by developing alternatives and/or mitigation measures.

2. The District should estimate the length of time necessary for the lake to reach a "steady state" after construction. When constructing new reservoirs, it should be expected that there will be a start-up period in which the lake will exhibit very low transparencies from shoreline erosion and other sources. It is reasonable to estimate this period based upon water flushing rates and other hydraulic loading estimates. This in turn can be used to indicate when various inlake monitoring and fish stocking measures should be implemented.

3. The District should predict water residence times for average, and one-in-ten year low (7Q10) and high flows.

4. Areal and volumetric hypolimnetic oxygen depletion rates are well correlated to lake TP, chlorophyll-a and Secchi disk depths. The MPCA made estimates as to the nature of the inlake dissolved oxygen profiles over time. These depletion rates along with consideration of lake morphometric characteristices allow the determination of the nature of the lake's oxygenated zones. The hypolimnetic depletion rate along with a determination of the depth of the thermocline will allow prediction of the depth to which oxygen will occur. A discharge pipe placed below this level will mean discharging anoxic waters from the reservoir which may generate downstream water quality violations and other concerns (e.g., fisheries maintenance). The MPCA has provided these estimates and determinations so that this issue can be addressed. Again, the District should review this data and address the impacts by developing alternatives and/or mitigation measures.

Potential Downstream Effects

1. Downstream aquatic habitat is also a concern. According to Minnesota Rules Part 7050.0210, Subpart 2, no discharge from point or nonpoint sources shall cause aquatic habitat degradation. The draft EIS notes that the river downstream from the dam will tend to degrade the channel below the dam and alter the existing wetlands. The District should state the steps that will actually be taken to reduce these effects.

2. Since very hypereutrophic conditions are expected to occur in the reservoir, water released from the reservoir may violate water quality standards. The parameter of most concern is dissolved oxygen (DO). An acceptable model such as QUAL II should be used for analyzing DO impacts downstream. The District should conduct the analysis using the following information:

   a. Initial withdrawal DO values. Assume a value of 0.0 mg/l, unless a basis for a higher DO value is provided and justified.

b. The reaeration factor of the spillway. This will depend on design; however, it is a critical element in determining whether standards can be met. The basis for selection of this factor should be provided.

c. The predicted once in 10-year 7-day low flow (7Q10) leaving the reservoir. If the project will control downstream flows to the extent outlined in the EIS, the exact method of control should be described in detail. The District should predict water losses, especially the evaporation that will occur from the reservoir, and estimate the effect this will have on the reservoir and downstream at 7Q10 flows.

d. Calculate DO sag at the 7Q10, based on expected initial stream values and biochemical oxygen demand (BOD) of the stream after project implementation.

e. The analysis should consider the additive effects of the dam discharge on downstream point and nonpoint sources, and their combined effects on DO sags at the predicted 7Q10 event. Discharges from the controlled ponds at or other sources located at Winger, Fertile and, if needed, at Beltrami and Climax should be analyzed.

f. Analysis of downstream effects due to drawdowns of the reservoir for maintenance, emergencies, and low-flow conditions. Specifically, this should address the sediment releases and sluice effects which may occur if drawdowns are required.

Water Quality Management Considerations

The establishment of management goals is one of the first steps that should be taken in the creation of a new impoundment. It is unclear what the District's goals are for this project. The following should be considered:

1. Does the District hope to manage the reservoir for swimming, other body contact recreation and a sport fishery? If it is to be managed, for example, as a sport fishery, what does the District intend to do to maintain it? If aerators will be employed to support a sport fishery, the number, placement, and cost of the aerators and their maintenance plus other management efforts should be provided.

2. Modeling conducted by MPCA staff predicts hypereutrophic conditions for the reservoir. See the attached analysis.

   Nuisance bloom conditions are likely to be present about 66% of the time during the summer, with severe blooms about 40% of the time. These concentrations of algae would not only make the reservoir objectionable for primary contact recreation but could also make it objectionable for noncontact uses, such as fishing.

The outlook for transparency is even worse due in part to the algal levels, but also the potential for high inorganic turbidities from shoreline erosion, etc. The models estimate mean transparency to be between 0.5 - 1.0 meters. The public will likely perceive the lake as either "swimming impaired" or "no swimming." Lake users in Northern Minnesota have somewhat higher expectations regarding water quality and would associate transparencies in the 1-2 M. range, with no swimming. We predict that based on the high chlorophyll-a concentrations and low transparency that the reservoir would be ill suited for swimming during most of the summer.

Given the relatively high TP values along with expected total nitrogen (TN) concentrations, it is likely that inlake TN:TP ratios will be very low (i.e., 5-10). This would strongly suggest that blue-green algae will dominate the summer phytoplankton. The draft EIS acknowledges the potential for blooms and notes that watershed management practices would have to be improved substantially. Therefore, the District should present a plan to address such improvements and include the costs of such improvements. For example, what percentage of the watershed would have to be treated with conservation practices to achieve average summer secci disks levels exceeding 2 M., total phosphorus of 50 ug/l and average summer Chl-a below 30 ug/l? These are conditions typical of lakes in the area of the project.

Operational Plan

1. The operation of the reservoir will be critical if the project is to have any flood control benefits to the main stem of the Red River. We understand that a HEC-I model has been run for the project. We request that the inputs and outputs of the model be provided to the MPCA staff, along with an analysis of how the results of these models will affect operational plans.

2. At the request of the MPCA, the draft EIS included information, evaluation and analysis related to the Section 401 certification requirements of the MPCA. The draft EIS also included the Sand Hill River Watershed District's Proposed Operation and Maintenance Plan as modified and amended by the downstream resources operation plan and mitigation requirements of the draft EIS.

   The information for the operation and maintenance plan must be brought up to date to address water quality related operation and maintenance procedures. These include procedures for management of:

   a. low-flow conditions, including maintenance of downstream flows.

   b. sediment accumulation at the outfall structure, including how sediment will be removed to maintain downstream flows.

c. drawdowns which will occur due to normal maintenance, emergency repairs, and during low-flow conditions. The plans should address mitigation or avoidance of sediment releases and other impacts which will otherwise occur as a result of these drawdowns.

3. The draft EIS also included the Sand Hill River Watershed District's proposed general Specifications for Temporary Air and Water Pollution, Soil Erosion, and Siltation Control Plans, and for Water Control (draft EIS Appendix E). The Watershed District will also need to submit final plans and specifications to the MPCA for review and approval.

CONCLUSION

The EPA has recommended dismissal of the proposed project, and based on the current information, the state has no evidence to dispute this recommendation.

If the project is to be pursued further, information must be provided by the project sponsor and that information must show that the action will not result in violations of applicable standards.

We recommend that District representatives and consultants meet with us to discuss this letter and the requirements it contains, and to identify existing sources of information within the agencies. Please contact Mr. Curtis Sparks, MPCA Division of Water Quality at (612) 297-1831, if you have any questions about this letter and to arrange this meeting.

Sincerely,

Gerald L. Willet

Gerald L. Willet
Commissioner
Minnesota Pollution Control Agency

GLW:mmf

cc: The Honorable Roger Moe, Minnesota State Senator
The Honorable Edgar Olson, Minnesota State Representative
Mr. Joseph N. Alexander, Commissioner, Minnesota Department of Natural Resources
U.S. Environmental Protection Agency, Region V, Chicago, Illinois

Darrell Wadena,
Chairman

Jerry Rawley,
Secretary/Treasurer

WHITE EARTH

RESERVATION
TRIBAL
COUNCIL

P.O. Box 418
(218) 983-3285

WHITE EARTH, MINNESOTA 56591

April 25, 1988

Commissioner Alexander
Minnesota DNR
500 LaFayette Road
St. Paul, MN 55151

Dear Mr. Alexander:

SUBJECT: Winger Dam Project

We have heard that a group is proposing a dam on the Sand Hill River near Winger.

Would you please send to us either the name and address of the contact person for the sponsoring group or the project's proposal and the environmental impact assessment.

Sincerely,

Dwight Wilcox

DW/ps

COST ESTIMATES REMOVED AT REQUEST OF CONSULTANT

Schilling Environmental Consultants, Inc.

2785 White Bear Avenue, Suite 210 • Maplewood, MN 55109 • (612) 777-6606

May 23, 1988

Mr. Roland Gullekson, Chairman
Sandhill River Watershed District
Route 2, Box 218D
Fertile, Minnesota 56540

RE: Winger Dam Proposal - Additional studies for EIS

Dear Mr. Gullekson:

In response to recent meetings with staff of the Department of Natural Resources and the Minnesota Pollution Control Agency regarding information deficiencies in the Draft EIS for the Winger Dam project, I am transmitting herewith a proposal for consultant services to be undertaken in order to satisfy the review agencies concerns.

As you'll notice, the work involves field, office and related expenses by Schilling Environmental Consultants, Inc. and the subcontractor: Wenck Associates, Inc. The total cost for the entire project is It is our intent to complete this work by September 1, 1988.

We look forward to conducting this work for the Sand Hill River Watershed District and trust that you will look favorably upon this proposal.

Sincerely,

Joel G. Schilling
Principal

Enclosure

THE WINGER DAM PROJECT
Environmental Impact Statement

PROPOSAL FOR STUDIES
IN THE
SAND HILL WATERSHED DISTRICT

Schilling Environmental Consultants, Inc.

Task 1 Water Quality and Alternative Dam Proposals

16 hrs.

Task 2 Recreational Benefits: Fisheries, Boating & Wildlife uses

16 hrs.

Task 3 Habitat Compensation Study

a. Wildlife compensation: enhancement/replacement and/or type (wetland & upland)
b. Aeration of reservior and downstream river
c. Reservior operation procedures

32 hrs.

Task 4 Erosion and Sediment Control Study

20 hrs.

Related Expenses: Travel & Offfice expenses.

Subtotal:

Wenck Associates, Inc. (See Attachment)

Water Quality Modelling

TOTAL:

Wenck Associates, Inc.

May 19, 1988

Consulting Engineers
(612) 475-0858
FAX – (612) 476-0504

Mr. Joel Schilling
Schilling Environmental Consultants
2785 White Bear Avenue, Suite 210
Maplewood, Minnesota 55109

Re: Sand Hill Watershed District - Proposed Winger Dam
Proposal for Professional Engineering Services

Dear Joel:

As you requested and in accordance with our discussions, Wenck Associates, Inc. is pleased to present the following proposal concerning modeling and analysis of water quality aspects for the proposed Winger Dam. We understand that the work is to be conducted under your overall direction and that you will serve as the client's contact.

The nature and scope of the water quality modeling and analysis project are indicated by the concerns of the Minnesota Pollution Control Agency expressed in the April 8, 1988 letter from G. L. Willet to Mr. Gullekson.

The elements of our proposal are as follows:

1. Field Study - Sampling during a low-flow period at approximately 10 stations on the Sand Hill River and significant inflows on two successive days for the parameters in Table 1. In addition, on selected stations, 24-hour monitoring of dissolved oxygen and temperature to investigate biological rates (see enclosed articles).

2. Hydraulic Analysis - Using measured streamflows and water depth observations from the field study, together with previously determined channel cross-sections, mean velocities and times of flow will be determined for the low-flow conditions encountered. The 7Q10 will also be estimated, and velocities and flow times will be determined for this condition as well.

3. QUAL-II Modeling and Analysis - The QUAL-II computer model will be implemented as suggested by the MPCA. Calibration parameters will be primarily based on the field study results. Other information that may be taken into account includes MPCA modeling studies on neighboring rivers, and the earlier water quality data.

832 Twelve Oaks Center
15500 Wayzata Blvd.
Wayzata, MN 55391-1418

Wenck Associates, Inc.

Consulting Engineers
(612) 475-0858
FAX – (612) 476-0504

Incorporated in this element will be an analysis of aeration alternatives for the proposed reservoir and its discharge. A report will be prepared to document the field work and the modeling and analysis results, in answer to the cited MPCA letter

4. Presentation - The report will be presented orally and with visual aids to the Watershed District at its convenience.

The estimated expense for the above is as follows:

1. Field Study
2. Hydraulic Analysis
3. QUAL-II Modeling and Analysis
4. Presentation

TOTAL

If low-flow conditions exist when notice to proceed is received, then we anticipate completion of elements 1 - 3 within a three-month period.

We will be pleased to answer any questions you or the client may have on this proposal and the project in general at any time.

Respectfully submitted,

WENCK ASSOCIATES, INC.

John B. Erdmann

John B. Erdmann, P.E.

JBE/msw

Attachment: Table 1

832 Twelve Oaks Center
15500 Wayzata Blvd.
Wayzata, MN 55391-1418

TABLE 1

FIELD STUDY MONITORING PARAMETERS

Streamflow

Dissolved Oxygen

Temperature

pH

Biochemical Oxygen Demand*

Total Suspended Solids

Total Phosphorus

Ortho-phosphorus

Total Kjeldahl Nitrogen

Ammonia Nitrogen

Nitrate Nitrogen

Nitrite Nitrogen

Chlorophyll-a

*For four selected samples, 2-, 5- and 7-day BOD will be determined.

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

500 LAFAYETTE ROAD • ST. PAUL, MINNESOTA • 55155-40

DNR INFORMATION
(612) 296-6157

June 6, 1988

Mr. Dwight Wilcox
White Earth Reservation Tribal Council
P.O. Box 418
White Earth, MN 56591

Dear Mr. Wilcox:

Thank you for your letter requesting information about the proposal for a Class I, high-hazard dam on the Sand Hill River just south of Winger, Minnesota. The proposed project is called Sand Hill River Watershed District Project No. 4 - the Winger Dam, and is being sponsored by the Sand Hill River Watershed District. The dam itself is proposed to be built at the T.H. 59 crossing of the Sand Hill River and is designed for downstream flood damage reduction, to provide a recreational lake, and to facilitate an upgraded T.H. 59 crossing of the Sand Hill River.

The Department of Natural Resources (DNR) completed a Draft Environmental Impact Statement (EIS) in June 1987. A copy of the document is attached. A public meeting to solicit comments on the Draft EIS was held in Winger last July. The DNR is now working on the preparation of the Final EIS, which is the document where the DNR provides responses to the comments submitted on the Draft EIS. The Final EIS preparation period is lengthy because the DNR is working with the project sponsors and other state and federal agencies to address some of the significant concerns raised regarding this project proposal. I am having the White Earth Reservation Tribal Council added to the list of interested persons to receive the Final EIS (and other official documents) when it is available.

If you have questions regarding the Watershed District's project proposal, you should contact either Roland Gullekson, Sand Hill River Watershed District Chairman, at Route 2, Box 218D, Fertile, Minnesota 56540 (218/945-6299) or Lawrence Woodbury, Project Engineer at Houston Engineering, Inc., 2505 N. University Drive, Fargo, North Dakota, 58105 (701/237-5065). Please contact Thomas Balcom in the DNR Office of Planning at 612/296-4796 if you have any further questions about the Environmental Review Process.

I hope this information will be of assistance to you. I apologize for the delay in responding to your letter.

Yours truly,

Joseph N. Alexander
Commissioner

cc: Steve Thorne
Vonny Hagen
Ron Nargang
Roland Gullekson
Lawrence Woodbury

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX , 500 LAFAYETTE ROAD • ST. PAUL, MINNESOTA • 55155-40_____

DNR INFORMATION
(612) 296-6157

June 23, 1988

Commissioner Gerald L. Willet
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Dear Commissioner Willet:

The purpose of this letter is to respond to your April 8, 1988 letter on the Proposed Sand Hill River Watershed District Project No. 4 (Winger Dam) Environmental Impact Statement (EIS). Your letter outlines the position of the Minnesota Pollution Control Agency (MPCA) regarding the sufficiency of the Draft EIS prepared in 1987 by the DNR, the distinctions between environmental review and regulatory processes (including the responsibilities of various parties) from the perspective of the MPCA, and the extent of information for the regulatory processes that the MPCA feels should be included in the Final EIS.

The Department of Natural Resources (DNR) acknowledges that the purposes of an Environmental Impact Statement are to include a detailed description of a proposed project, serve to promote an understanding of the environmental impacts of a project proposal, address significant environmental issues associated with a proposed project, be used as a guide in permitting processes, and provide for accountability in various decision-making activities.

In addition, while it is desirable that, to the extent possible, an EIS include information with the level of detail necessary to comply with data required for a permit decision, contrary to the implications in your letter, neither state policy nor rule requires an EIS to include all of the information for all permits associated with a project. For example, the DNR rules for construction of new dams provide that the DNR determine an applicant has demonstrated the need for a project in terms of quantifiable benefits (Minn. Rules part 6115.0410, subp. 8, item C). However, irrespective of the extent of information and the exact level of detail presented in the EIS, such a determination and demonstration of need is required in connection with a permit application.

As you know, the rules applicable to an EIS provide a mechanism (at the discretion of the RGU) for information for all permits to be included in the EIS, for information for some permits to be included in the EIS, or for the EIS to include simply a listing of permits associated with a proposed project (Minn. Rules part 4410.2100, subp. 6). The particular approach chosen is to be identified as part of the Scoping Decision Document. For this EIS, the DNR selected (and identified in the Scoping Decision Document) the option of identifying the required governmental approvals and the unit of government responsible for each approval.

The Scoping Decision document did not identify any specific permits for which permit information would be developed currently with the EIS. A similar approach was used in the MPCA Winona County Resource Recovery Facility EIS Scoping Decision Document.

The recent MPCA letter also raises issues on the distinction between the environmental review process and the regulatory processes. The DNR concurs that these processes are complementary and can not substitute for each other. In fact, it is the EIS that is to be used as a guide in the various permitting processes. However, to a certain extent, particularly with projects such as Class I dam proposals, the permitting processes do include evaluations of overall project feasibility. For example, DNR advisory opinions and regulatory decisions on project proposals for construction of Class I dams involve determinations that the overall plans of a project sponsor are adequate, feasible, and practical (Minn. Stat. §112.49 and Minn. Rules parts 6115.0190, 6115.0200, and 6115.0210).

The DNR also concurs that the question of whether issues should be addressed in an EIS or be postponed until the permitting process is a judgment call. The Department's position is that the Scoping Decision Document for this project outlines the study parameters for both existing and new information so that the Final EIS, when concluded, will provide sufficient evaluation for reviewers or reviewing agencies to reach reasonable and valid conclusions regarding the environmental impacts of a project proposal. The MCPA should keep in mind that the draft responses submitted by the Sand Hill River Watershed District represent the position of the project proposer and not necessarily that of the DNR as the RGU.

Your recent letter also describes deficiencies in the Draft EIS in the areas of water quality, flood control benefits, recreation benefits, and mitigation and the benefit/cost ratio. The essential concern for the Department with your identification of further Draft EIS deficiencies is one of appropriate timeframes. A reviewing agency has a responsibility to submit comments on a document during the established review period.

The public review and comment period on the Draft EIS began June 29, 1987 and concluded August 11, 1987. This time period included an extension of the comment period at the request of the federal agencies and the MPCA. The very purpose of the public review period is to solicit comments from interested parties and agencies on the Draft EIS. Various reviewers identified concerns and deficiencies in the Draft EIS which require responses from the DNR as part of the Final EIS. Since the MPCA did submit comments during this public comment period, those comments were the appropriate mechanism for MPCA to address deficiencies in the Draft EIS.

Since that time DNR staff have been involved with the preparation of the Final EIS including responding to concerns identified during the public review period and revising certain sections of the Draft EIS as warranted by the particular concerns outlined for the DNR. The responses from the Sand Hill River Watershed District referred to in your letter are the District's position and responses to information requested by the DNR for the DNR to answer the various concerns raised. The completed Final EIS will include additional information for many of those responses necessary to represent the position of the DNR as the RGU. This approach is consistent with the directive in the EQB Rules that the Final EIS discuss responsible opposing views related to scoped issues (Minn. Rules part 4410.2700, subp. 2).

Your letter citing apparent additional deficiencies, however, is problematic since the Draft EIS review period is concluded and the Final EIS review period has not yet occurred. When the Final EIS is distributed, another review period will occur. At that time, the MPCA can and should indicate to the Department its position on the sufficiency with which the DNR responded to the comments of the MPCA and the adequacy of the Final EIS. Those comments will bear directly on the DNR's determination of the adequacy of the Final EIS consistent with the EQB Rules.

The DNR is particularly concerned with recent requests for additional information to be included in the Final EIS to respond to Draft EIS deficiencies when those concerns were not previously identified. Comments on these specific requests identified in your letter follow:

Water quality

The Final EIS will include additional discussion and evaluation of water quality impacts to respond to comments submitted by reviewing agencies including those of the U.S. Environmental Protection Agency and the MPCA. The DNR acknowledges the additional reservoir modeling completed by the MPCA and submitted to the Sand Hill River Watershed. The DNR will attempt to use that data in the Final EIS to further predict likely water quality of the proposed reservoir. The DNR takes issue with the position in your letter that the Draft EIS did not include an analysis of downstream water quality impacts. The Draft EIS contained the water quality analysis based on the DNR water quality sampling program. The purpose of this analysis was to indicate the impact of the proposed project on the aquatic environment. The sampling included in-reservoir locations as well as locations both upstream and downstream of the proposed reservoir.

It is important to understand the DNR's perspective in the Draft EIS water quality analysis section as reflected in the Scoping Decision Document. The DNR is interested in assessing impacts to natural resources and to determine the extent to which the water quality of the proposed project would impact natural resources.

Therefore, the direction of the water quality evaluation was to determine the relationship between in-reservoir water quality and fishery resource potential, and to determine the relationship between water quality and maintenance of minimum flows to protect downstream resources. In addition, with this perspective in mind, the Draft EIS discussed the reasons why the water quality analysis was limited to the water quality impacts of Alternative No. 1 as none of the other alternatives was suited to supporting even a limited sport fish population.

We note that the MPCA has informed the Sand Hill River Watershed District of the water quality stream classifications applicable to the Sand Hill River. We believe the reliance on the relationship between water quality and stream classifications is overemphasized. Everything not specifically classified becomes these classifications. The classifications of the Sand Hill River could be changed under post-reservoir conditions.

We are encouraged by the MCPA's willingness to participate in efforts to attempt to resolve water quality issues. Your separate letter to the Sand Hill River Watershed District requests various analyses to be completed to determine potential downstream effects. If the Watershed District initiates this additional work, the DNR may be able to include the results of this analysis in the Final EIS after review of the evaluations by the MPCA.

Flood control benefits

The Draft EIS already identifies flood control benefits that might be anticipated to accrue on the Sand Hill River and on the main stem of the Red River based on projections by the project sponsors. The Final EIS will include some further documentation, as identified by the Watershed District, to substantiate the extent of flood control benefits attributable to Alternative No. 1.

Recreation benefits

The Draft EIS does not identify specific proposals of the Watershed District to provide for a fishery resource since providing such plans was not a component of the proposed project description information required by the Watershed District for the Draft EIS. As outlined in the Scoping Decision Document, the EIS evaluated the type of fishery that might be expected to occur. The DNR's

analysis of fishery potential presented in the Draft EIS concluded that a reservoir as proposed by the project sponsors is likely to be a very eutrophic roughfish reservoir with physical and chemical characteristics closely related to that of a bullhead type of lake. Until the information regarding the fishery potential was apparent, the lack of a formal plan for the provision of a particular fishery resource was adequate. The Final EIS will identify the Watershed District's commitment to provide both a fishery resource and other fish management techniques consistent with the limited projections of a fishery that might be expected if Alternative No. 1 were constructed.

The DNR notes the interest of the MPCA that the EIS address swimability or potential body contact recreation within the reservoir. However, such an analysis was not identified in the scoping process as a significant issue to be addressed in the EIS and therefore the EIS is not deficient without such information. The Department recommends that the MPCA work with the Sand Hill River Watershed District to include such modeling and research as part of the MPCA's permitting processes.

Regarding the relationship between recreational benefits and water quality, refer to the above comments on water quality for information on the water quality perspective used in the Draft EIS and on the water quality analyses to be added to the Final EIS.

Mitigation and the benefit cost ratio

Contrary to the position of the MPCA, a "meaningful benefit/cost ratio" is neither a necessity for state publicly funded projects nor required by the Environmental Review Program rules. The Draft EIS presented the costs and benefits identified by the project sponsors and outlined the limitations of the economic information supplied by the project sponsors. The Final EIS will include cost projections (which include mitigation costs) for Alternative No. 1 as submitted by the project sponsors. The Watershed District is committed to providing adequate wildlife mitigation.

The DNR has agreed that while the exact terms of fish, wildlife and instream flow mitigation will be determined during the DNR permitting process, the mitigation requirements and the extent of losses requiring mitigative measures identified in the Draft EIS remain unchanged. Further, the final methods to accomplish the mitigation will be developed and reviewed in cooperation with the HEP Team. The Final EIS also will include costs of wildlife

mitigation and aeration system management techniques for Alternative No. 1, the alternative which would result in the greatest overall loss of habitat units and the only alternative minimally suitable to providing a potential fishery resource. The Draft EIS already included a draft of the Watershed District's operating procedures for the dam and provided the DNR's determination of the changes in that plan that are required to adequately protect instream flow resources and to replicate natural conditions. Therefore, there is already sufficient information in the Draft EIS about the impacts associated with operation of a proposed dam at this location.

CONCLUSION

The DNR appreciates the MPCA's general comments regarding the responsibility of the project proposer to provide data, compilation, modeling, analysis, and other information about specific plans and commitments regarding a project proposal to assure sufficient analysis in the EIS and concurs in those comments. This reinforces the position already expressed on numerous occasions by the DNR to the Watershed District. We note that your separate letter to the Sand Hill River Watershed District informs the District of the extent of information you will require in order to consider 401 certification associated with the proposed project.

The MPCA contends that the Draft EIS is not adequate in its present form. The DNR as the RGU is required ultimately to determine the adequacy of the Final EIS. However, because substantive comments and concerns were raised by the Draft EIS, that decision will obviously not occur until after the Final EIS public review period has concluded. This period between the Draft EIS and the Final EIS is for the DNR to respond to concerns raised by the Draft EIS and to revise the Draft EIS as warranted. This letter outlines some of the additional information which has been generated for the Final EIS. The purpose of the Final EIS review period is to provide an opportunity for interested parties (such as the MPCA) to submit comments on the sufficiency of the responses to concerns identified by the Draft EIS.

The DNR intends to include a section in the Final EIS to address ongoing project coordination. Your letter, this response and other relevant project information correspondence will be included in this new section to further document various coordination efforts. Continued cooperation between the project sponsor and the reviewing and permitting agencies serves the interests of all parties and reinforces the working relationships between our two agencies.

Please contact Thomas Balcom in the DNR Office of Planning if you or your staff would like to further discuss these issues.

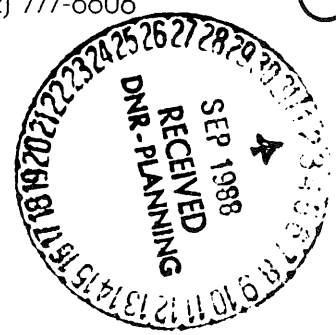
Yours truly,

Joseph N. Alexander
Commissioner

c: Steve Thorne
Vonny Hagen
Ron Nargang
Larry Shannon
Roland Gullekson - Sand Hill River Watershed District
Joel Schilling - Schilling Environmental Consultants

Schilling Environmental Consultants, Inc.

2785 White Bear Avenue, Suite 210 • Maplewood, MN 55109 • (612) 777-6606



August 31, 1988

Mr. Roland Gullekson, Chairman
Sandhill River Watershed District
Box 92
Fertile, Minnesota 56540

RE: **Water Quality Study of proposed Winger Dam Project**

Dear Roland:

Unfortunately, some delays beyond our control will necessitate the final delivery of our report to September 23, 1988. Additional laboratory analyses for Biochemical Oxygen Demand requested by the MPCA resulted in a delay of three weeks longer than we had anticipated in June for data turnaround from the commercial laboratory. We are confident in being able to meet this schedule. Hopefully, this will have a major effect on the issuance of the final Environmental Impact Statement by the Department of Natural Resources.

Please give me a call if you have any questions regarding this schedule.

Sincerely,

Joel G. Schilling
Principal

cc: Mr. Lawrence Woodbury, P.E., Houston Engineering Co.
Mr. Curt Sparks, P.E., MPCA
Mr. Tom Balcom, MDNR
Mr. John Erdmann, P.E., Wenck Associates, Inc.

Sand Hill River Watershed District

DANIEL WILKENS, Secretary
(218) 945-6529
Route 2, Box 218 D
Fertile, Minnesota 56540

October 24, 1988

Commissioner Joseph N. Alexander
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155

Dear Commissioner Alexander:

The Sand Hill River Watershed District is pleased to enclose two copies of the report entitled: **"The Winger Dam Project - Supplementary Environmental Studies to the Environmental Impact Statement"** completed in response to several issues raised in the Minnesota Pollution Control Agency's letter of April 8, 1988. We believe these additional studies address the concerns raised by both the Agency as well as others with respect to possible downstream water quality impacts and the control of watershed nonpoint source pollution relating to this project.

We would reiterate that the District is committed to the completion of this important flood control project and it is our hope that it may now move ahead in a more timely manner with the issuance of the Environmental Impact Statement by the Department. If you or your staff wish to discuss the contents and/or conclusions of this report, please feel free to contact us at (218) 945-6299.

Sincerely,

Roland J. Gullekson

Roland Gullekson
President

Enclosures

cc: The Honorable Roger Moe, Senate Majority Leader [Exec. Summary]
The Honorable Edgar Olson, State Representative [Exec. Summary]
Commissioner Gerald L. Willet, MPCA
U.S. Environmental Protection Agency, Region V
U.S. Fish & Wildlife Service
U.S. Army Corps of Engineers
East Polk Soil & Water Conservation District

THE WINGER DAM PROJECT

Supplementary Environmental Studies
to the
Environmental Impact Statement

Prepared for:

SAND HILL RIVER WATERSHED DISTRICT

Prepared by:

SCHILLING ENVIRONMENTAL CONSULTANTS, INC.
Maplewood, Minnesota

and

WENCK ASSOCIATES, INC.
Wayzata, Minnesota

OCTOBER 1988

Joel G. Schilling 10/20/88
Joel G. Schilling Date

John B. Erdmann 10/20/88 14241
John B. Erdmann, P.E. Date Minn. Reg. No.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Sand Hill River Watershed District has proposed to construct a dam and reservoir near the City of Winger, Minnesota, for the purposes of providing flood control, a recreational lake, and a river crossing for U.S. Highway 59. This report, prepared by Schilling Environmental Consultants, Inc./Wenck Associates, Inc. under contract with the District, answers questions raised by the Minnesota Pollution Control Agency and others regarding possible environmental impacts from the proposed project. The report is supplementary to a draft Environmental Impact Statement previously prepared by the Minnesota Department of Natural Resources.

The key findings from the present study are listed below.

1. The seven consecutive day, once in ten year low flow (7Q10) at the proposed Winger Dam site is zero under existing conditions. With the proposed dam, however, a minimum outflow of 1.7 cubic feet per second would be maintained from March 25 to June 15, so this flowrate would effectively be the "spring 7Q10".

2. The proposed Winger Reservoir hydraulic residence time (period of time necessary for permanent pool filling) based upon average inflow conditions is about one-half year (0.55 year).

3. Water quality conditions within the proposed Winger Reservoir would reach steady state conditions (system maintains a relative equilibrium) in slightly more than one year (1.2 years). This is based on average inflow conditions and should be viewed as a minimum estimate.

4. Significant groundwater discharge occurs throughout the riverine wetlands downstream from the proposed dam, hence these wetlands do not wholly depend upon periodic surface flooding for their existence. Therefore, possible riverine wetland impacts resulting from the project will not be as great as previously stated.

5. The proposed reservoir's water quality will be similar to that of other lakes in agricultural areas of the western and southern portions of Minnesota.

6. The suitability of the proposed reservoir for swimming may be limited due to excessive fertility and consequent algal bloom formation. Conversely, however, with a supplemental winter aeration facility the reservoir will be able to support a very productive warmwater gamefish population.

7. Water quality data from the Sand Hill River in June 1988 (this study) were generally comparable with May-September 1986 data (Department of Natural Resources survey). Both surveys revealed instantaneous dissolved oxygen violations within the 10-river-mile reach downstream from the proposed dam site.

8. The periodic discharge into the Sand Hill River of effluent from the City of Winger's wastewater stabilization ponds results in moderate positive and negative effects on downstream dissolved oxygen. Positive effects derive from enhancement of algal growth; negative effects arise from input of oxygen-demanding materials.

9. The proposed outlet structure, as designed with a 24-foot free-fall, would result in adequate aeration of the reservoir outflow even under summer low-flow (worst-case) conditions.

10. Based on river water quality modeling with QUAL2E, the proposed Winger Dam would not cause downstream violations of the Class 2B dissolved oxygen standard.

11. Winter aeration of 25% of the proposed reservoir's surface area with a subsurface bubbler system is recommended. Using three diffusers with a total power requirement of 4.5 horsepower, about one third of the permanent pool volume would be aerated. A potentially even more energy-efficient and economical system (buoyant jet) may also be retained for consideration as an alternative.

12. During the spring period, the minimum reservoir outflow of 1.7 cubic feet per second can be maintained with adequate dissolved oxygen even under drought conditions by pumping, if necessary, with the discharge at or above the crest elevation of the base flow weir.

13. Protection against downstream impacts during reservoir drawdown from sediment releases and dissolved oxygen depletion will be accomplished by providing a riprapped outlet approach area, and by using the subsurface aeration system if necessary.

14. Control of agricultural runoff in the proposed reservoir's watershed will be accomplished through implementation of two cooperative programs between the Sand Hill River Watershed District and the East Polk Soil & Water Conservation District. The first program will make use of filter strips, sedimentation basins and grassed waterways, while the second will involve minimum tillage, crop rotation and land set-aside efforts.

15. Wildlife habitat compensation will be accomplished during the project permitting process and will likely involve the replacement of upland habitat as part of the

Conservation Reserve Program (CRP) and filter strip acquisition. Replacement through acquisition of lost Type 2 wetland habitat will be a long-term goal of the Sand Hill River Watershed District.

Minnesota Pollution Control Agency

December 8, 1988

RECEIVED

DEC 9 1988

COMMISSIONER

Rolland Gullekson, President
Sand Hill River Watershed District
Route 2, Box 218 D
Fertile, Minnesota 56540

Dear Mr. Gullekson:

Re: Supplementary Environmental Studies to the Environmental Impact Statement

Review of the above document has been completed by MPCA staff. We have the following comments.

We note in general that, despite the assertion in the executive summary that the report "...is supplementary to..." the draft environmental impact statement (EIS), in actuality it addressed points raised in our April 8, 1988, letter to you (which addressed the project primarily from the perspective of 401 certification), rather than our letter to the Minnesota Department of Natural Resources (DNR) of the same date, whose concern was primarily the adequacy of the draft EIS and the integrity of the process. While some mention of the EIS and impact assessment is included, we find little in this document which would cause us to rethink our position on the latter issue. Resolution of this concern must thus await the publication of the final EIS, which we understand is imminent.

The question before us at this point is whether necessary data has been submitted to demonstrate that the project is certifiable under section 401 of the Clean Water Act (CWA) (i.e., addresses the concerns we raised in our April 8, 1988, letter to you). In this letter, the Minnesota Pollution Control Agency (MPCA) requested more specific information in order to conduct a more informed environmental review which would, among other things, perform its mandated function of guiding the permitting process. MPCA believes the following issues from the letter are still unresolved:

1. The District must demonstrate the project will not cause impairment of beneficial uses.

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The consultant has addressed water quality standards, specifically dissolved oxygen (DO), but has not looked at the effect of the flow regime on downstream aquatic habitat (which is part of the 2B classification) or recreation (which MPCA documented during a stream assessment in the late 1970s). The draft EIS and supplement agree with MPCA's assessment of the limited swimmability in the reservoir due to algae blooms. The supplement, in defense of the project, alleges that the impoundment would likely be used despite its condition.

However, when MPCA staff estimated how the lake would be perceived by recreational users, the estimate was made using data accumulated by surveys of actual users. MPCA believes that the District analysis of predicted use should be able to define the particular users they are trying to attract. If they are trying to provide recreational opportunity for the small town of Winger, there may be people who would use the reservoir mostly because it is convenient. However, MPCA's analysis indicates that people from outside the local area are likely, for a variety of reasons, to have fairly high expectations of water quality and would go elsewhere to find it.

MPCA still has substantial concern about the quality of the impounded water. If the project is built as planned and the lake is of poor recreational quality, state funding for cleanup may be viewed as a solution. However, a man-made water body that was built with full knowledge of the predicted low water quality would have a poor chance to receive funding.

We recommend that the District review MPCA model runs and interpretations and develop alternatives for mitigation. The District's consultant has indicated he had no major problems with the modeling efforts of MPCA staff. Yet, the problems with excess phosphorus were not addressed except to acknowledge that swimming in the reservoir is likely to be limited due to algae blooms. Alternatives were not discussed. The proposed mitigation activities appear to include the following:

a) pump water over the spillway in the spring to maintain the protected flow;
b) prevent scour with riprap in the area above the withdrawal structure and baffles at the outfall;
c) prevent excessive nonpoint enrichment by implementing conservation plans,
d) aerate 25 percent of the surface area in winter; and,
e) use the DNR's modification of the operation plan.

We remain concerned about the means by which the phosphorus problem will be addressed. We are not optimistic about the nonpoint pollution control program suggested in the report. True, this worked well on the Clark Lake project, but that project included strict requirements for extensive land treatment upstream of the dam before the Soil Conservation Service (SCS) would proceed with construction. The Winger Dam project includes no such requirements to our knowledge.

2. Data must demonstrate that project development will not result in violation of water quality standards.

   The supplement has addressed the water quality standard of most concern which is dissolved oxygen (DO). The modeling indicates no violation of DO (see the attachment to this letter for a discussion of the modeling). However, there is little analysis of the qualitative standards (i.e., nuisance conditions prohibited [Minn. Rules pt. 7050.0210, subp. 2, 1988]).

3. The District should review MPCA estimates of oxygenated zones and address impacts.

   The District's consultant estimates five percent of the reservoir volume would be subject to low oxygen levels. The derivation of this estimate is not explained in the supplement. According to the consultant, aeration from the weir would result in a summer DO of 7.3 milligrams per liter (mg/l) even if the intake DO was zero (i.e., the intake water was part of the five percent low oxygen water). (See point 7 for an analysis of this prediction.)

4. The District should identify steps that would be taken to reduce downstream habitat degradation.

   Bed erosion and its effect on the aquatic habitat of the stream bed is not addressed in the supplement, other than to acknowledge that it will take place. The draft EIS proposes an outlet structure that would slow velocity to prevent scour.

5. The District must further verify the QUAL2E model with additional water quality data.

   The consultant used the one-dimensional, steady-state model called QUAL2E to simulate water quality conditions in the Sand Hill River near Winger.

Based on data collected by the consultant during a June 7-9, 1988, stream survey, the model was calibrated and used to predict the river's water quality responses under various assumptions with the proposed dam in place. These comments pertain to that application of the QUAL2E model.

The QUAL2E model is a well documented and widely accepted water quality model. However, QUAL2E, like other models, has numerous reaction rates and coefficients which must be calibrated to site-specific conditions and then verified with an independent set of water quality data before its true worth as a predictive tool can be realized. Without proper verification, model predictions of water quality responses under altered conditions are essentially meaningless.

The data used to calibrate the model for the Winger Dam Project were collected under extremely low flow conditions and at a time when the Winger municipal wastewater treatment ponds were discharging. It is clear from the report narrative that these conditions precluded rigorous calibration of the model's hydraulic and water quality routines. The result, in our view, was improper calibration and setup, which resulted in unreliable results. Therefore, after independent review of the data and model calibration, MPCA staff concludes that the QUAL2E model, as currently structured, would require further verification with additional water quality data before it could be used with confidence to predict dissolved oxygen responses in the Sand Hill River.

For a more rigorous analysis of the above issue, see the attachment to this letter.

To improve the application of the QUAL2E model and to reduce the present uncertainties in predicting water quality impacts downstream from the proposed Winger Dam would require the following:

a) Additional water quality data should be collected for use in model calibration/verification. A survey should be conducted during summer dry weather when flows are steady, but measurable, and at a time when the Winger wastewater treatment ponds are not discharging.

b) Dye studies to determine accurate time-of-travel for developing sound hydraulic relationships for the river reaches downstream from the dam site should be conducted.

c) Cross-section data collected by the DNR, Division of Waters, for their hydraulic modeling using HEC-2 should be incorporated into the study to insure hydraulic consistency in the water quality analysis.

d) The aeration potential expected from the proposed dam under low flow conditions should be re-evaluated (see attachment).

6. How will the management goals be attained?

The following points summarize the methods the District will use to achieve its goals:

Flood control - plan of operation based on stage at Grand Forks
Fisheries - winter aeration
Recreation - nonpoint controls, public access, recognition of limitations Highway crossing - maintained by the Minnesota Department of Transportation
Downstream- modify plan of operation

MPCA has questioned most of these methods previously. One particular problem is the attainment of flood control with the operation plan modification. The District originally planned to use the flow gauge at Grand Forks to regulate the Winger dam. Assuming the District is correct in believing that a stream the size of the Sandhill River could have a significant impact on flooding a river the size of the Red River of the North at a point at least 20 miles downstream, the modification proposed by the DNR may negate or severely limit any flood control benefits. Since these benefits were the original justification for the benefit to cost ratio being greater than 1, perhaps the effect of the modification should be more closely examined.

In addition, the modification (which MPCA believes would be necessary to mitigate the effect of altering the flow regime) will require inflow monitoring, which was not part of the original plan. This is another maintenance cost that should be part of the benefit/cost ratio if it is not already.

7. HEC-I input and output must be made available to staff along with analysis of how results will affect operational plans.

DNR staff provided MPCA with the hydraulic input and output from the HEC-2 sampling they did on the Sand Hill River several years ago. However, the District refused to send us data from the Red River. This data relates to the ability of the proposed dam to perform its designed function, and should therefore be made public.

8. Update operational plan. The District must present procedures for the following conditions:

a) low-flow

The consultant notes that spring time inflows greater than 2.4 cubic feet per second (cfs) would be released at 70 percent if the DNR operation plan modification would be followed. At inflows lower than 2.4 cfs, the protected flow of 1.7 cfs would be released, even if the District had to pump over the weir. According to the supplement, this pump would have to

handle up to 765 gallons per minute. There is no estimate of the cost of this pump. The capital cost and operation and maintenance should be a part of the benefit/cost ratio.

In the nonspring times, the outfall would release 30 percent of the inflow down to 5.7 cfs inflow. At that point the protected flow of 1.7 cfs would be maintained until inflow was 1.7 cfs or less. In this case, inflow would equal outflow. Note our earlier point that at nonspring low flows inflow may exist but the reservoir level may drop below base weir elevation and require pumping (see attachment).

b) drawdowns

Neither the original or modified operating plans cover the procedure followed during drawdowns. There is no analysis of critical conditions during drawdown and what steps the District would take to avoid them.

9. Submit final plans for the general Specifications for Temporary Air and Water Pollution, Soil Erosion, and Siltation Control Plans, and for Water Control (draft EIS Appendix E). These will be necessary for the 401 review process.

It appears, then, that the report has not fully addressed the concerns raised by MPCA, and more information will be necessary before MPCA can make a decision on a 401 certification. You may wish to discuss the above in more detail with MPCA technical staff; if so, please contact William J. Lynott of the MPCA Office of Planning and Review at (612) 296-7794.

We reiterate in closing that this report did not address the substance of our environmental review concerns. Therefore, we cannot comment on the responses to those concerns until we have the opportunity to review the final EIS.

Yours truly,

Gerald L. Willet

Gerald L. Willet
Commissioner

GLW:pnk

cc: The Honorable Roger Moe, Minnesota State Senator
The Honorable Edgar Olson, Minnesota State Representative
Joseph N. Alexander, Commissioner, DNR

ATTACHMENT

Following are the more detailed review comments relating to model calibration, dam aeration, and outfall regulation:

Model Calibration

An accurate simulation of stream hydraulics is necessary for water quality models which rely on time-, depth-, and velocity-dependent reaction rates to calculate water quality responses. Unless system hydraulics are reasonably depicted, the critical reaction rates which control the delicate balance between various sources and sinks of dissolved oxygen can not accurately be established during the model calibration process.

To develop hydraulic relationships for use in the model, the consultant used depth, velocity, and discharge measurements at the U.S. Highway 59 station that were recorded periodically by Houston Engineering, Inc. in 1987 and 1988 (Table B-2 of report) in addition to his own channel cross-section and stream discharge measurements obtained during the June 1988 survey. The channel cross-section data for the water quality survey were used to segment the model into typical reach widths and depths. The Houston Engineering data were analyzed by the consultant to establish depth-discharge and velocity-discharge relationships for the stream at Highway 59. Of the 14 observations having concurrent discharge and depth measurements, nine observations were used to develop the hydraulic relationships (Figure 7 in report). The five unused observations had depth measurements but indications of only "trace" discharge. Depths ranging from 1.6 feet to 3.1 feet under "trace" flow conditions indicate that variable channel or backwater effects occur at this location. Consequently, the reliability of derived stage-discharge relationships that were calculated over a relatively short period of record and the general suitability of this site are questionable.

The consultant subsequently used coefficients and exponents from the depth-discharge and velocity-discharge relationships (Figure 7) that were developed for the U.S. Highway 59 site to represent hydraulic relationships over the entire study reach downstream from the proposed dam site. The large spatial variability in stream geometry and hydraulics as shown in Table C of the report indicates that hydraulic relationships developed at the single upstream station can not be expected to represent hydraulic responses over the entire study reach. The model predicts that a parcel of water traveling from near the proposed dam site to Mahnomen County Road 120, a distance of about 8.4 miles, would take about 40 days. However, review of the water quality data indicates that the actual flow time was more on the order of four days. Because normal background concentrations for chloride in the stream appear to be in the 6-7 milligrams per liter (mg/l) range, a peak chloride concentration at mile 8.4 that averaged 10.5 mg/l on June 8-9, 1988, reflects the discharge of effluent from the Winger wastewater treatment ponds, which began discharging on June 4, 1988, at an average chloride concentration of 240 mg/l.

Even though the consultant used reasonable values for most reaction rate coefficients in the model, in order to simulate the observed water quality data required selective and perhaps inconsistent use of rate coefficients and forcing functions. For example, the input value of 30 mg/l carbonaceous biochemical oxygen demand (CBOD) for incremental inflow concentration is unusually high and not typical of ground water inflow quality. Also, recognizing that a portion of the wastewater pond discharge was likely lost to seepage and evaporation in the mile-long tributary before reaching the Sand Hill River would have reduced the need for the larger CBOD and algae settling rates that were used in the model to simulate observed conditions in the river immediately downstream from the tributary.

Dam Aeration

Under low flow conditions the project report indicates that the proposed dam's outlet structure will be designed to withdraw oxygen-depleted water from near the reservoir bottom and pass it over a weir with free-fall of 24 feet into a vertical chamber. An outlet conduit at the bottom of the chamber then transports the flow beneath the earth filled dam for discharge into the downstream river channel. Provided that the final design ensures that the vertical chamber is well vented to the atmosphere, substantial aeration of the oxygen-poor bottom water withdrawn from the reservoir will occur.

The consultant used one of a possible number of empirical equations that have been developed by water resource researchers to represent the aeration characteristics of dams. Typically, changes in dissolved oxygen concentration in a river that are attributable to a dam are mathematically correlated to physical characteristics of the dam, primarily its height and overflow weir design. To properly use an empirically derived dam aeration equation for design purposes, it is important that the proposed facility be of similar configuration to the facilities for which the empirical relationship was developed.

The consultant used an empirical equation of questionable applicability to the proposed Winger Dam. The equation, attributed to studies by Mastropietro of dams on the Mohawk River in New York, is recommended for calculating aeration of dams under 15 feet in height and within a water temperature range of 20-25 degrees Celsius. Without additional documentation of its applicability to this project, use of this equation for a 24-foot high dam introduces additional uncertainty in predicting expected aeration potential. In addition, because oxygen transfer to water is slower at lower temperatures, the use of this equation to predict cold weather aeration potential without adjusting for temperature probably over-estimates the dissolved oxygen concentrations under winter conditions as presented in the report. Adjusting for the temperature influences on aeration could lower winter estimates by about 35 percent. Applied to the report's estimate of downstream concentration at 11.6 mg/l, the temperature correction factor would reduce this estimate to about 7.1 mg/l.

The report's predictions of downstream dissolved oxygen concentrations are also overly optimistic because the calculations did not compensate for atmospheric pressure which affects the oxygen saturation concentration (C_s) in water. Because C_s decreases about 3.5 percent for each 1,000 feet of elevation increase above sea level, a correction factor of 0.958 should have been applied to correctly estimate C_s at the dam site elevation of 1200 feet. Therefore the expected downstream concentrations, as predicted in the report, should be reduced by about 4 percent to compensate for site elevation.

Despite the questionable application of the empirical aeration equation that was used in the project study and the resulting uncertainty in the predicted downstream concentrations for dissolved oxygen, the base flow weir, with its free-fall drop of 24 feet, should provide substantial reaeration. A cursory check of aeration potential by MPCA using several other empirical equations generally indicated that dissolved oxygen concentrations immediately downstream from the dam would be maintained above the 5.0 mg/l standard; however, a more thorough analysis of weir aeration provided by this type of weir configuration (given temperature, height and aeration needs) as well as other aeration alternatives is warranted.

Outfall Regulation

During summer low flow periods, it is conceivable that the reservoir level could drop below the base flow weir elevation, resulting in no downstream discharge. This situation could occur due to evaporative (and possible seepage) losses even though measurable inflow was occurring at the head of the reservoir. Because the operating plan requires that outflow equal inflow under low flow conditions, there may be a need to provide pumping to maintain downstream flow. The report recognizes the potential need for pumping during spring to maintain the required 1.7 cfs, but does not acknowledge the potential for additional summer pumping needs.

In summary, the primary modeling problems at the moment are the calibration of the QUAL2E model and the dam aeration predictions. These and the other items discussed above should be resolved in meetings with MPCA staff before a 401 application is submitted.

APPENDIX A

April 5, 1988

Subject: Assessment of water quality of proposed reservoir at Winger Dam on the Sand Hill River.

Conducted by: C.B. Wilson and S.A. Heiskary, Program Development Section, Division of Water Quality, MPCA

This analysis relates to the proposed development of a reservoir on the Sand Hill River at the City of Winger in southeastern Polk County. The reservoir will be located in the "water rich" portion of Polk County. This area is near the transition between the North Central Hardwood Forests (NCHF) ecoregion and the Red River Valley (RRV) ecoregion. The NCHF ecoregion is water rich containing approximately 40% of Minnesota Lakes (Heiskary et al. 1987). The intended purpose of the reservoir is three fold: 1) provide for flood damage reduction for downstream areas; 2) provide a recreational lake; and 3) facilitate an upgraded crossing of the Sand Hill River for T.H. 59 (MDNR Draft EIS, 1987). This analysis will focus on the potential of this reservoir for meeting the second purpose, i.e., "recreational uses." More specifically we will estimate the water quality of the reservoir which would result from damming this portion of the Sand Hill River. The predicted water quality of the reservoir will be compared and contrasted to typical lakes in this part of the State and will be used to estimate the likelihood that this reservoir could support swimmable uses.

The assessment of the water quality of this reservoir will be done by modelling "in lake conditions" based upon the morphometry of the reservoir, land use in the watershed, areal phosphorus exports and areal runoff values. Stream water quality data collected by MDNR in 1986 will be used as a means to double check or validate inputs to the models. Pertinent variables which have been used and assumptions which were made are noted in Tables 1-3.

Three levels of modelling will be used to generate estimates of water quality in the reservoir. These models progress from most basic - Reckhow and Chapra (1983), to a Minnesota ecoregion specific model, and finally to a model designed for reservoirs - Network (Walker, 1986). Model outputs can be found in the appendix. The following is a summary of results from these models and the assumptions which were made.

Table 1. Winger Dam Reservoir morphometric and watershed characteristics. Estimated from MDNR (1987). Assumes a permanent, recreational pool of 1,217 acres, 6.8 mile fetch, maximum depth of 20 feet at the dam and a mean depth of approximately 9.1 feet.

Area (A_o) = 493 ha
Mean depth (Z) = 2.8 meter
Fetch = 10.8 km
Littoral zone - approximately 85%
Watershed area -

a) Total for Sand Hill River (MDNR, 1987)
"mean width ~ 8 miles x river length ~ 55 miles"

b) Project area - assumes < 8 mile width at this point and a length of 6.8 miles for the reservoir plus about 1.5 miles beyond the head of reservoir as estimated from a county highway and drainage map. Yielding an estimated watershed area of approximately 64 mi^2 or 186 km^2.

Table 2. Estimate of land use in the watershed of the project area for modelling purposes.

	North Central[1] Hardwood Forests	Red River[1] Valley	Project[2] Area	Model[3] Estimates
Forest (%)	16	6	8	8
Cultivated (%)	49	82	34	39
Water & Marsh (%)	8	3	33	30
Pasture & Open (%)	21	8	22	22
Developed (%)	6	1	3	1

1. Average land use composition by ecoregion (Fandrei et al. 1988)
2. As estimated by MDNR, 1987.
3. Estimate based on ecoregion land use composition and observed land use in project area.

Table 3. Water quality of Sand Hill River in project area (MDNR, 1987) compared to typical ecoregion stream water quality (Fandrei et al. 1988).

	Sand Hill River	North Central Hardwood Forest	Red River Valley
Total phosphorus(ug/l)			
median -	125	100	200
typical range - (~25 - 75th % tile)	100-160	70-170	120-320
Total suspended solids (mg/l)			
median	5.2	5-16	10-57

Modelling Summary

Level I: Reckhow and Chapra, 1983. Using NCHF regional values and watershed area of 18,600 ha, A_p = 490 ha, predictions at the @ 51% confidence interval: (a) 58 ug/l < [P] < 130 ug/l; with a most likely yearly mean of 95 ug/l.

(b) Likely mass load 2,918 kg low, 7876 kg/y most likely, ad 10, 734 kg/y high.

Level II: Minnesota Lake Ecoregion Assessment Procedure (MNLEAP) values for North Central Hardwood Forests

Using

Predicted TP, average inflow of ~ 158 ug/l
Tw (water residence time) ~ 0.5 years
Regional P Export ≅ 0.25 kg/ha/yr
Regional P Load ≅ 4,240 kg/yr.
Most likely [TP] ≅ 74 ug/l
Chl-a ≅ 35 ug/l
Secchi depth 0.5 ~ 1.0 m
(See Appendix for Chl-a distribution)

B. Using values for Red River Valley
Annual average inflow TP ≅ 356
Tw ≅ 1.1 years
Regional P export ≅ 0.2 kg/ha/year
Regional P load ≅ 4,400 kg/year
Most likely [TP] ≅ 100 ug/l
Chl-a ≅ 56 ug/l
Secchi depth ~ 0.7 m
(See Appendix for Chl-a distribution)

C. Using Red River Valley characteristics with internal load estimate. Same as above with an internal load of about 1800 kg/year.
Most likely [TP] ≅ 128 ug/l

Chl-a 78 ug/l
Secchi depth ~ 0.6
See Appendix for distribution of Chlorophyll-a

Level III: Network (Walker, 1985)
Reservoirs:
Reservoirs behave differently than natural lakes as noted by Canfield and Bachman (1981) and Walker (1985) and hence different lake models have been developed to account for these differences. Typically, reservoirs have greater inorganic turbidities which cause differences with phosphorus/nutrient dynamics and chlorophyll-a Secchi relationships within the waterbody. Therefore, turbidity values typical of reservoirs, not lakes were used. Natural lake models employed therefore will tend to give a better impression of likely water quality than will be realized in an artificial lake system. Hence, the need for the use of reservoir models such as Network.

Accordingly, we used the Network model with "observed" water quality variables obtained from the Level II analyses for comparative purposes. The lake was segmented into 2 segments, with each having the same surface areas but otherwise different morphometry to reflect the likelihood of greater depths near the dam.

Table 4. Summary of Network Model estimates of reservoir water quality for Winger Dam.

	Segments Upper	Lower
Annual Mean Predicted Inlake [TP](ug/l)	166	109
Annual Mean Chl-a (ug/l)	54	31
Mean Secchi (m)	.4	.6
Water Residence Time (years)	.66	.71
Water Inflow (HM3)	10.3	9.7
Freq. (Chl-a) > 10%	99%	93%
Freq. (Chl-a) > 20%	90%	66%
Freq. (Chl-a) > 30%	74%	40%
Freq. (Chl-a) > 40%	57%	24%

The modelling results are estimates of "steady-state" conditions and reflect the best-case analysis of the likely water quality of the reservoir. Previous experiences (Walker, 1985) indicate that new reservoirs may need considerable time to settle down and reach equilibrium. The largest problem perceptible to resource users will be new erosion, especially if there are several pool elevation fluctuations, etc. Erosion of unprotected clay/loam shorelines can be very significant to the nutrient/sediment dynamics of a new reservoir (Wilson, 1979). Very low transparencies may be possible. This will in turn cause light limitation to algal communities (Golterman, 1979) over most of the growing season and therefore lower chlorophyll-a values than may be predicted from nutrient availability. However, the nutrient potential is always possible, especially during low flow/drought conditions when severe blue-green algal blooms is very likely (due to low N:P, light limitations and mineral turbidities).

Therefore, the Level I and II analyses have prepared best case analyses which showed that inlake TP values would likely be between 70-130 ug/l. Use of Level III models, for reservoir systems using calibrated P export values show that likely inlake values may be expected to be

100-250 ug/l (Upper Winger)
70-190 ug/l (Lower Winger)

Conclusion

Based on these three levels of modelling it appears that a likely inlake phosphorus concentration will be on the order of 70-130 ug/l on the optimistic side with a potential for concentrations into the 170-250 ug/l range. Spatial variation across the reservoir is likely with the upper end of the reservoir having higher phosphorus concentrations and possibly worse water quality. These phosphorus concentrations would be between the 75th to 90th percentile for lakes in the North Central Hardwood Forests. Data from lakes in Polk and nearby counties has been appendixed for comparison.

The high phosphorus concentrations projected for this reservoir (Level III most likely: 109-166 ug/l) would correspond to high chlorophyll-a values with averages ranging from about 30-80 ug/l. A level of 20 ug/l would be perceived as a nuisance bloom, while levels greater than about 30 ug/l would be perceived as a severe nuisance (Heiskary and Walker, in press). Based on a predicted phosphorus concentration of 109 ug/l (Level III, near dam segment) the predicted frequencies of chlorophyll-a are as follows:

Chl-a > 10 ug/l 93%
Chl-a > 20 ug/l 66%
Chl-a > 30 ug/l 40%
Chl-a > 40 ug/l 24%

It should be noted that these frequencies reflect mid lake collections (conditions) and near shore or bay effects could be significantly greater.

This implies that nuisance bloom conditions would be present about 66% of the time during the summer; with severe blooms about 40% of the time. These levels would not only make the reservoir objectionable for primary contact recreation but could also make it objectionable for non-contact uses such as fishing.

The outlook for transparency is even worse due in part to the algal levels but also the potential for high inorganic turbidities from shoreline erosion, etc. All models estimate mean transparency to be between 0.5 - 1.0 meters based on predicted phosphorus and chlorophyll-a values. Transparencies between 0.5 - 1.0 meters would be perceived as either "swimming impaired" or "no swimming" by most lake users in Minnesota (Heiskary and Walker, in press). Lake users in Northern Minnesota have somewhat higher expectations regarding water quality and often associate transparencies in the 1-2 meter range with no swimming.

Thus, using an optimistic phosphorus concentration (109 ug/l) we would predict that based on the high chlorophyll-a concentrations and low transparency that the reservoir would be ill suited for swimming during most of the summer. It also has the potential for very severe algal blooms throughout most of the summer which could limit any use of the reservoir.

Under stratified conditions in the near dam segment it is likely that severely reduced oxygen concentrations will occur in the meta and hypolimnion. A range of phosphorus and chlorophyll-a concentrations were tested and results indicated that oxygen concentrations could drop below 5 mg/l (minimum desirable for game fish survival) in about six days and anoxic conditions could occur within 16 days. Hypolimnetic discharge of these waters could lead to water quality impacts downstream.

Considering the abundance of lakes in a 50 mile radius from the site of this project and the relatively good quality of these lakes (Appendix) it seems unlikely that the project reservoir would be deemed a desirable water body for recreation or shoreline development. For example, Union Lake, less that 10 miles from the project site, exhibits an average transparency > 2 meters and Maple Lake, also nearby, has a phosphorus concentration on the order of 39 ug/l (Appendix).

Thus, based on this assessment we would conclude that the project reservoir would not be well suited for primary contact recreation and may not be well suited for noncontact recreation due to very low transparency levels, high algal levels and frequent algal blooms. Also, hypolimnetic discharge of these waters could lead to water quality impacts downstream.

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APPENDIX

TROPHIC STATUS OF MINNESOTA LAKES: 1978-1987

COUNTY	LAKEID	LAKE	LOC	AREA	DMAX	ME	TP	NP	SD	NS	CHLA	NC	TSIP	TSIS	TSIC	TSI	RTSI	REGION
BECKER	03-0085	BAD MEDICINE 11 MI	N OF PONSFORD	782	80	M	26	2	4.1	4	6	2	51	40	49	47	56	NLF
BECKER	03-0127	BASS	1 MI N OF SNELLMAN	135	48	E	38	1	.	0	.	0	57	.	.	57	14	NLF
BECKER	03-0576	BIG CORMORANT	1 MI N OF CORMORANT	3380	60	M	19	8	3.6	8	4	8	47	42	44	44	92	CHF
BECKER	03-0304	BIG SUGAR BUSH	4 MI SE OF WHITE EARTH	472	42	E	.	0	6.9	10	.	0	.	32	.	32	99	CHF
BECKER	03-0030	BOOT 2 MI NW OF TW	O INLETS	401	100	M	12	14	4.1	37	2	14	40	40	36	39	87	NLF
BECKER	03-0381-01	DETROIT (MAIN BAY)	AT DETROIT LAKES	2000	82	M	29	8	1.9	10	9	8	53	51	53	52	75	CHF
BECKER	03-0387	FLOYD	2 MI N OF DETROIT LKES	1234	26	M	.	0	2.6	88	.	0	.	46	.	46	88	CHF
BECKER	03-0134	GREEN WATER	5 MI NW OF PONSFORD	71	50	E	21	3	4.6	4	.	0	48	38	.	43	71	NLF
BECKER	03-0029	HUNGRY MEN 2 MI E	OF TWO INLETS	91	21	M	15	8	3.5	7	5	8	43	42	46	44	68	NLF
BECKER	03-0153	ISLAND	7 MI NW OF SNELLMAN	1160	43	M	.	0	3.4	36	.	0	.	42	.	42	73	NLF
BECKER	03-0136	JUGGLER	12 MI N OF PONSFORD	365	78	M	.	0	4.2	9	.	0	.	39	.	39	85	NLF
BECKER	03-0575	LEIF	1 MI W OF LAKE CENTER	519	.	E	.	0	1.5	1	.	0	.	54	.	54	66	CHF
BECKER	03-0506	LITTLE CORMORANT	1 MI N OF LAKE CENTER	924	34	M	.	0	1.4	25	.	0	.	55	.	55	63	CHF
BECKER	03-0189	LITTLE TOAD	12 MI E OF DETROIT LK	345	65	M	27	6	2.3	18	8	6	52	48	52	50	37	NLF
BECKER	03-0163	LIZZIE	9 MI NW OF EVERGREEN	89	.	E	31	1	.	0	.	0	54	.	.	54	68	CHF
BECKER	03-0500	MAUD	AT LAKE EUNICE	540	30	M	.	0	3.5	33	.	0	.	42	.	42	95	CHF
BECKER	03-0475	MELISSA	AT SHOREHAM	1855	43	M	.	0	2.6	35	.	0	.	46	.	46	88	CHF
BECKER	03-0602	MIDDLE CORMORANT	2 MI NW OF CORMORANT	377	39	M	15	7	3.1	19	3	6	43	44	42	43	93	CHF
BECKER	03-0180	NORTH TWIN	6 MI E OF ROCHERT	139	28	E	.	0	1.8	11	.	0	.	52	.	52	76	CHF
BECKER	03-0273	PERCH 8 MI E OF D	ETROIT LAKES	40	37	M	97	1	0.6	14	78	1	70	67	73	70	0	NLF
BECKER	03-0359	SALLIE	AT SHOREHAM	1267	58	E	98	3	1.4	2	55	2	70	55	70	65	33	CHF
BECKER	03-0102	SHELL	4 MI NW OF SNELLMAN	3140	16	E	43	1	.	0	.	0	58	.	.	58	56	CHF
BECKER	03-0382	ST. CLAIR	1 MI W OF DETROITLAKES	140	7	E	72	1	.	0	.	0	66	.	.	66	32	CHF
BECKER	03-0647	STINKING	4 MI NW OF LAKE PARK	370	8	E	202	2	.	0	.	0	81	.	.	81	5	CHF
BECKER	03-0107	TOAD	3 MI W OF SNELLMAN	1666	29	M	31	2	1.6	2	13	2	54	53	56	54	21	NLF
BECKER	03-0657	TURTLE 4 MI NE OF	ROLLAG	184	73	M	30	6	5.0	75	2	4	53	37	37	42	94	CHF
BECKER	03-0017	TWO INLETS	9 MI NW PARK RAPIDS	578	60	E	.	0	1.6	3	.	0	.	53	.	53	70	CHF
BELTRAMI	04-0038	ANDRUSIA	4 MI NW OF CASS LAKE	1510	60	E	40	14	2.1	19	24	8	57	49	62	56	15	NLF
BELTRAMI	04-0130	BEMIDJI	AT BEMIDJI	6420	76	M	.	0	2.6	64	.	0	.	46	.	46	57	NLF
BELTRAMI	04-0069	BLACKDUCK	1 MI W OF BLACKDUCK	2742	28	M	59	2	1.3	48	67	2	63	56	72	64	2	NLF
BELTRAMI	04-0030	CASS	AT CASS LAKE	29775	115	M	.	0	3.1	69	.	0	.	44	.	44	68	NLF
BELTRAMI	04-0230	DEER	6 MI SW OF PUPOSKY	262	42	M	24	3	2.5	3	4	3	50	47	45	47	53	NLF
BELTRAMI	04-0166	JULIA	2 MI SE OF PUPOSKY	450	43	M	30	4	3.4	4	6	4	53	42	47	48	50	NLF
BELTRAMI	04-0076	LONG	10 MI NE OF BEMIDJI	395	83	M	.	0	5.0	18	.	0	.	37	.	37	92	NLF
BELTRAMI	04-0122	MEDICINE	5 MI NW OF TENSTRIKE	446	44	E	24	2	.	0	.	0	50	.	.	50	39	NLF
BELTRAMI	04-0011	MOOSE	4 MI N OF PENNINGTON	568	71	M	20	2	3.6	2	3	2	47	42	41	43	70	NLF
BELTRAMI	04-0124	SANDY	6 MI NW OF TENSTRIKE	260	30	E	29	3	.	0	.	0	53	.	.	53	28	NLF
BELTRAMI	04-0137	WHITEFISH	7 MI NW OF TENSTRIKE	330	98	E	.	0	3.7	12	.	0	.	41	.	41	78	NLF
BELTRAMI	04-0079	WOLF	8 MI SE OF BEMIDJI	1051	55	E	44	18	1.9	28	32	12	59	51	65	58	10	NLF
CLEARWATER	15-0010	ELK 5 MI S OF LAK	E ITASCA	271	97	M	31	4	3.3	3	4	3	54	43	44	47	53	NLF
CLEARWATER	15-0057	LONG 5 MI NW OF L	AKE ITASCA	145	80	M	10	4	5.7	3	2	4	37	35	36	36	92	NLF
CLEARWATER	15-0068	LONG LOST	9 MI S OF ZERKEL	390	53	M	.	0	4.8	19	.	0	.	37	.	37	90	NLF
CLEARWATER	15-0005	SQUAW 3 MI SW OF	LAKE ITASCA	151	80	M	14	4	3.2	3	4	4	42	43	43	43	72	NLF
HUBBARD	29-0048	BENEDICT	AT BENEDICT	440	91	M	.	0	3.4	4	.	0	.	42	.	42	73	NLF
HUBBARD	29-0151-01	BIG MANTRAP (EAST B	ASIN)	750	68	E	.	0	3.2	4	.	0	.	43	.	43	70	NLF
HUBBARD	29-0151-05	BIG MANTRAP (HOME B	AY)	80	53	E	.	0	4.8	4	.	0	.	37	.	37	90	NLF
HUBBARD	29-0151-02	BIG MANTRAP (MIDDLE	BASIN)8 MI N DORSET	700	35	E	.	0	3.2	8	.	0	.	43	.	43	70	NLF
HUBBARD	29-0151-04	BIG MANTRAP (WEST A	RM)	200	59	E	.	0	4.0	4	.	0	.	40	.	40	82	NLF
HUBBARD	29-0185	BIG SAND	5 MI NE OF PARK RAPIDS	1640	135	M	.	0	4.5	12	.	0	.	38	.	38	87	NLF
HUBBARD	29-0083	BLADDER	8 MI S OF NEVIS	217	.	E	17	1	.	0	.	0	45	.	.	45	63	NLF
HUBBARD	29-0312	CEDAR 3 MI E OF T	WO INLETS	98	26	M	16	4	3.1	4	6	4	44	44	47	45	63	NLF
HUBBARD	29-0015	CRYSTAL	4 MI SE OF AKELEY	91	.	E	7	1	.	0	.	0	32	.	.	32	96	NLF
HUBBARD	29-0061	GARFIELD	AT LAPORTE	980	30	M	.	0	3.5	44	.	0	.	42	.	42	75	NLF
HUBBARD	29-0188	GILMORE	5 MI NW OF NEVIS	91	54	E	.	0	3.6	9	.	0	.	42	.	42	76	NLF
HUBBARD	29-0074	INDIAN	3 MI W OF AKELEY	49	36	E	12	1	.	0	.	0	40	.	.	40	82	NLF

TROPHIC STATUS OF MINNESOTA LAKES: 1978–1987

COUNTY	LAKEID	LAKE	LOC	AREA	DMAX	ME	TP	NP	SD	NS	CHLA	NC	TSIP	TSIS	TSIC	TSI	RTSI	REGION
HUBBARD	29-0075	KABEKONA	4 MI S OF LAPORTE	2252	133	M	.	0	3.2	8	.	0	.	43	.	43	70	NLF
HUBBARD	29-0001	KETTLE	7 MI SE OF NEVIS	41	27	E	9	1	.	0	.	0	36	.	.	36	93	NLF
HUBBARD	29-0161	LONG	2 MI E PARK RAPIDS	1974	135	M	.	0	3.6	33	.	0	.	42	.	42	76	NLF
HUBBARD	29-0020	LOON	4 MI SE OF NEVIS	112	.	E	.	0	2.0	7	.	0	.	50	.	50	39	NLF
HUBBARD	29-0180	LOWER BOTTLE	8 MI NE PARK RAPIDS	660	110	E	.	0	4.0	10	.	0	.	40	.	40	82	NLF
HUBBARD	29-0066	MIDGE	8 MI SE OF BEMIDJI	588	20	M	.	0	1.9	57	.	0	.	51	.	51	36	NLF
HUBBARD	29-0247	MORAN	4 MI S OF PARK RAPIDS	95	15	E	.	0	3.1	8	.	0	.	44	.	44	68	NLF
HUBBARD	29-0003	NAGEL	8 MI SE OF NEVIS	69	65	E	28	1	.	0	.	0	52	.	.	52	31	NLF
HUBBARD	29-0157	NORTH TWIN	4 MI NE OF MENAHGA	225	12	E	61	10	2.2	13	14	4	63	49	57	56	15	NLF
HUBBARD	29-0250	PORTAGE 4.5 MI NW	OF PARK RAPIDS	412	15	M	.	0	1.2	27	.	0	.	57	.	57	11	NLF
HUBBARD	29-0023	ROBINSON	3 MI S OF AKELEY	46	.	E	16	1	.	0	.	0	44	.	.	44	67	NLF
HUBBARD	29-0085	SECOND CROW WING	8 MI S NEVIS	12	181	E	.	0	1.8	7	.	0	.	52	.	52	34	NLF
HUBBARD	29-0239	SPEARHEAD	6 MI SW OF BEMIDJI	188	80	M	.	0	4.2	46	.	0	.	39	.	39	85	NLF
HUBBARD	29-0117-02	SPIDER (EAST BAY)	2 MI N OF NEVIS	120	66	M	.	0	4.4	25	.	0	.	39	.	39	86	NLF
HUBBARD	29-0022	STEEL	4 MI SE OF AKELEY	55	77	E	12	1	.	0	.	0	40	.	.	40	82	NLF
HUBBARD	29-0077	THIRD CROW WING	6 MI S OF NEVIS	646	35	M	.	0	1.7	42	.	0	.	52	.	52	30	NLF
HUBBARD	29-0148	UPPER BOTTLE	9 MI NE PARK RAPIDS	465	55	E	.	0	4.0	10	.	0	.	40	.	40	82	NLF
HUBBARD	29-0081	WOLF	7 MI S OF NEVIS	261	12	E	23	1	.	0	.	0	49	.	.	49	42	NLF
MAHNOMEN	44-0038	ISLAND 7 MI S OF	LENGBY	611	43	M	57	1	1.2	13	17	1	63	57	58	59	52	CHF
POLK	60-0305	MAPLE	1 MI S OF MENTOR	1445	.	E	39	7	1.0	17	.	0	57	60	.	59	66	RRV
POLK	60-0069	SAND HILL	5 MI W OF LENGBY	598	.	M	.	0	1.3	11	.	0	.	56	.	56	61	CHF
POLK	60-0032	TURTLE 4 MI NE OF	FOSSTON	545	13	M	78	1	2.7	1	5	1	67	46	47	53	69	CHF
POLK	60-0217	UNION	7 MI SE OF MENTOR	734	83	M	.	0	2.6	55	.	0	.	46	.	46	88	CHF

LEGEND FOR LAKE WATER QUALITY ASSESSMENT DATA

LAKEID= MDNR identification number
LOC= location from nearest town
AREA= surface area acres
DMAX= maximum depth feet
ME= monitored or evaluated
TP= mean total phosphorus ug/l
NP= number of TP measurements
SD= mean secchi disk meters
NS= number of SD measurements
CHLA= mean chlorophyll-a ug/l
NC= number of chlorophyll-a measurements
TSIP= Carlson's trophic state index based on TP
TSIS= Carlson's trophic state index based on SD
TSIC= Carlson's trophic state index based on CHLA
TSI= average of all index values
RTSI= percentile ranking of TSI value based on all lakes in ecoregion;
whereby first percentile corresponds to the highest TSI for that ecoregion
REGION= ecoregion Northern Lakes and Forests- NLF
North Central Hardwood Forests- CHF
Western Corn Belt Plains- WCP
Northern Glaciated Plains- NGP

Level I (Reckhow and Chapra, 1983)

RESULTS
USER: WILSON LAKE: WINGER DAM
LOCATION: POLK COUNTY CURRENT DATE/TIME: 3/19/88
REPORT TITLE: WINGER DAM

THE AREAL WATER LOADING = 4.495919 m/yr

TOTAL PHOSPHORUS MASS LOADING:
1. W(high) = 10734 kg/yr
2. W(ml) = 7876.001 kg/yr
3. W(low) = 2918 kg/yr

ANNUAL AREAL PHOSPHORUS LOADING:
1. L(high) = 2.190612 g/m^2-yr.
2. L(ml) = 1.607347 g/m^2-yr.
3. L(low) = .5955102 g/m^2-yr.

LAKE PHOSPHORUS CONCENTRATION
1. P(high) = .1288767 mg/l
2. P(ml) = 9.457707E-02 mg/l
3. P(low) = 3.504011E-02 mg/l

STRIKE ANY KEY TO CONTINUE

RESULTS CONTINUED

USER: WILSON LAKE: WINGER DAM
LOCATION: POLK COUNTY CURRENT DATE/TIME: 3/19/88
WINGER DAM

PREDICTION UNCERTAINTY RESULTS
1. positive model error = 3.241772E-02 mg/l
2. negative model error = 2.414251E-02 mg/l
3. positive loading error = .0171595 mg/l
4. negative loading error = 2.976848E-02 mg/l
5. total positive uncertainty = 3.667925E-02 mg/l
6. total negative uncertainty = 3.832784E-02 mg/l

CONFIDENCE LIMITS RESULTS

PROB[5.816563E-02 mg/l <= P <= .1294224 mg/l]>= .5075408

Level II (MNLEAP, Wilson et al. inp

Region = CHF

71493
WHAT IS THE MEAN DEPTH (M)? 2.8
WHAT IS THE OBSERVED MEAN LAKE TP (ug/l)? 100
WHAT IS THE OBSERVED MEAN CHL-A (ug/l)? 35
WHAT IS THE OBSERVED MEAN SECCHI (m)? .5
WHAT IS THE ATMOSPHERIC EXPORT (.1/.3/.6 KG/HA/YEAR)? .3

INPUT DATA:

LAKE NAME = WINGER DAM
LAKE AREA = (ha) 493
WATERSHED AREA = (ha) 114000
MEAN DEPTH (m) = 2.8
OBSERVED MEAN TP (ug/l) 100
OBSERVED MEAN CHL-A (ug/l) 35
OBSERVED MEAN SECCHI (m) .5

RESULTS:
THE AVERAGE INFLOW TP (UG/L) = 123.8726
TOTAL STREAMFLOW IN HM3 = 84.02099 HYDRAULIC RESIDENCE TIME = .1642923 YEARS
BACK-CALCULATED P EXPORT (VOLLENWEIDER,76) KG/KM2/YR= 10.35765
REGIONAL FLOW MEAN CALC NET P EXPORT (KG/KM2/YR) = 9.129737
PREDICTED tp MASS LOAD TO LAKE (BASED UPON REG FLOW TP) 10407.9 KG/YEAR
PREDICTED TP MASS TO LAKE(VOLLENWEIDER 76)= 11807.72 KG/YEAR
DIFFERENCE IN P SUPPLY (MG/M2/YR)= 283.9394

OBSERVED TP (UG/L) = 100
OBSERVED CHL-A (UG/L)= 35
OBSERVED SECCHI DEPTH (M)= .5
FREQ CHL-A > 10 ppb = 97.20592 %
FREQ CHL-A > 20 ppb = 75.71505 %
FREQ CHL-A > 30 ppb = 49.33884 %
FREQ CHL-A > 60 ppb = 10.9134 %

PREDICTED TP (CANFIELD/BACHMAN) IN UG/L = 79.74793
PREDICTED CHL-A IN UG/L = 39.51043
PREDICTED SECCHI DEPTH (M) = .8867514
PREDICTED FREQ CHL-A > 10 ppb = 98.31779 %
FREQ CHL-A > 20 ppb = 81.84893 %
FREQ CHL-A > 30 ppb = 57.88444 %

Level II (cont)

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LAKE NAME ?
Break in 31
0
WINGER DAM
ECOREGION NUMBER 1=NLF,2=CHF,3=WCP,4=NGP,5=RRV ? 5
WHAT IS THE WATERSHED AREA IN HA? 114000
WHAT IS THE LAKE AREA (HA)? 493
WHAT IS THE MEAN DEPTH (M)? 2.8
WHAT IS THE OBSERVED MEAN LAKE TP (ug/l)? 100
WHAT IS THE OBSERVED MEAN CHL-A (ug/l)? 50
WHAT IS THE OBSERVED MEAN SECCHI (m)? .5
WHAT IS THE ATMOSPHERIC EXPORT (.1/.3/.6 KG/HA/YEAR)? .6

INPUT DATA:

LAKE NAME =  WINGER DAM
LAKE AREA = (ha) 493
WATERSHED AREA = (ha)  114000
MEAN DEPTH (m) =   2.8
OBSERVED MEAN TP (ug/l) 100
OBSERVED MEAN CHL-A (ug/l) 50
OBSERVED MEAN SECCHI (m)  .5

RESULTS:
THE AVERAGE INFLOW TP (UG/L) =  331.1886
TOTAL STREAMFLOW IN HM3 = 84.02099 HYDRAULIC RESIDENCE TIME = .1642923 YEARS
BACK-CALCULATED P EXPORT (VOLLENWEIDER,76) KG/KM2/YR= 10.35765
REGIONAL FLOW MEAN CALC NET P EXPORT (KG/KM2/YR) = 24.40947
PREDICTED tp MASS LOAD TO LAKE (BASED UPON REG FLOW TP) 27826.8 KG/YEAR
PREDICTED TP MASS TO LAKE(VOLLENWEIDER 76)=  11807.72 KG/YEAR
DIFFERENCE IN P SUPPLY (MG/M2/YR)=-3249.306


OBSERVED TP (UG/L) =  100
OBSERVED CHL-A (UG/L)=  50
OBSERVED SECCHI DEPTH (M)=  .5
         FREQ CHL-A > 10 ppb =  99.44051 %
         FREQ CHL-A > 20 ppb =  90.69722 %
         FREQ CHL-A > 30 ppb =  72.962 %
         FREQ CHL-A > 60 ppb =  27.22605 %

PREDICTED TP (CANFIELD/BACHMAN) IN UG/L = 177.2855
PREDICTED CHL-A IN UG/L                = 126.8424
PREDICTED SECCHI DEPTH (M)             = .4455704
PREDICTED FREQ CHL-A > 10 ppb =  99.99845 %
         FREQ CHL-A > 20 ppb =  99.8427 %
         FREQ CHL-A > 30 ppb =  98.75521 %
         FREQ CHL-A > 60 ppb =  84.81216 %


LAKE NAME ?
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Level III (Network, Walker, 1985)

OUTPUT FORMAT: 3 OPTION: 2
CASE: WINGER2

GROSS WATER BALANCE:

ID	T	LOCATION	DRAINAGE AREA KM2	FLOW (HM3/YR) MEAN	FLOW (HM3/YR) VARIANCE	FLOW (HM3/YR) CV	RUNOFF M/YR
1	1	tributary no. 1	.000	.000	.000E+00	.000	.000
2	2	TOTAL SHED	170.000	10.860	.309E+01	.162	.064
PRECIPITATION			4.900	2.695	.291E+00	.200	.550
EXTERNAL INFLOW			850.000	10.860	.309E+01	.162	.013
###TOTAL INFLOW			854.900	13.555	.338E+01	.136	.016
GAUGED OUTFLOW			.000	.000	.000E+00	.000	.000
ADVECTIVE OUTFLOW			854.900	9.684	.473E+01	.224	.011
###TOTAL OUTFLOW			854.900	9.684	.473E+01	.224	.011
###EVAPORATION			.000	3.871	.135E+01	.300	.000
###STORAGE INCREASE			.000	.000	.000E+00	.000	.000

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GROSS MASS BALANCE BASED UPON ESTIMATED CONCENTRATIONS
COMPONENT: TOTAL P

ID	T	LOCATION	LOADING KG/YR	LOADING %(I)	VARIANCE KG/YR##2	VARIANCE %(I)	CV	CONC MG/M3	EXPORT KG/KM2
1	1	tributary no. 1	.0	.0	.000E+00	.0	.000	.0	.0
2	2	TOTAL SHED	5328.0	96.5	.119E+07	99.2	.205	490.6	31.3
PRECIPITATION			196.0	3.5	.960E+04	.8	.500	72.7	40.0
EXTERNAL INFLOW			5328.0	96.5	.119E+07	99.2	.205	490.6	6.3
###TOTAL INFLOW			5524.0	100.0	.120E+07	100.0	.198	407.5	6.5
GAUGED OUTFLOW			.0	.0	.000E+00	.0	.000	.0	.0
ADVECTIVE OUTFLOW			1058.2	19.2	.114E+06	9.5	.319	109.3	1.2
###TOTAL OUTFLOW			1058.2	19.2	.114E+06	9.5	.319	109.3	1.2
###STORAGE INCREASE			.0	.0	.000E+00	.0	.000	.0	.0
###NET RETENTION			4465.8	80.8	.907E+06	75.7	.213	.0	.0

HYDRAULIC OVERFLOW RATE M/YR	HYDRAULIC RESIDENCE TIME YRS	TOTAL P POOL CONC MG/M3	TOTAL P RESIDENCE TIME YRS	TURNOVER RATIO -	RETENTION COEF -
1.98	1.1638	137.5	.2805	3.5646	.7589

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GROSS MASS BALANCE BASED UPON ESTIMATED CONCENTRATIONS
COMPONENT: TOTAL N

ID	T	LOCATION	LOADING KG/YR	LOADING %(I)	VARIANCE KG/YR##2	VARIANCE %(I)	CV	CONC MG/M3	EXPORT KG/KM2
1	1	tributary no. 1	.0	.0	.000E+00	.0	.000	.0	.0
2	2	TOTAL SHED	41860.0	89.5	.714E+08	92.2	.202	3854.5	246.2

EXTERNAL INFLOW	5328.0	96.5	.119E+07	99.2	.205	490.6	6.3
***TOTAL INFLOW	5524.0	100.0	.120E+07	100.0	.198	407.5	6.5
GAUGED OUTFLOW	.0	.0	.000E+00	.0	.000	.0	.0
ADVECTIVE OUTFLOW	1058.2	19.2	.114E+06	9.5	.319	109.3	1.2
***TOTAL OUTFLOW	1058.2	19.2	.114E+06	9.5	.319	109.3	1.2
***STORAGE INCREASE	.0	.0	.000E+00	.0	.000	.0	.0
***NET RETENTION	4465.8	80.8	.907E+06	75.7	.213	.0	.0

HYDRAULIC OVERFLOW RATE M/YR	HYDRAULIC RESIDENCE TIME YRS	TOTAL P POOL CONC MG/M3	TOTAL P RESIDENCE TIME YRS	TOTAL P TURNOVER RATIO -	TOTAL P RETENTION COEF -
1.98	1.1638	137.5	.2805	3.5646	.7589

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GROSS MASS BALANCE BASED UPON ESTIMATED CONCENTRATIONS
COMPONENT: TOTAL N

ID	T	LOCATION	LOADING KG/YR	LOADING %(I)	VARIANCE KG/YR**2	VARIANCE %(I)	CV	CONC MG/M3	EXPORT KG/KM2
1	1	tributary no. 1	.0	.0	.000E+00	.0	.000	.0	.0
2	2	TOTAL SHED	41860.0	89.5	.714E+08	92.2	.202	3854.5	246.2
PRECIPITATION			4900.0	10.5	.600E+07	7.8	.500	1818.2	1000.0
EXTERNAL INFLOW			41860.0	89.5	.714E+08	92.2	.202	3854.5	49.2
***TOTAL INFLOW			46760.0	100.0	.774E+08	100.0	.188	3449.6	54.7
GAUGED OUTFLOW			.0	.0	.000E+00	.0	.000	.0	.0
ADVECTIVE OUTFLOW			14836.0	31.7	.226E+08	29.1	.320	1532.0	17.4
***TOTAL OUTFLOW			14836.0	31.7	.226E+08	29.1	.320	1532.0	17.4
***STORAGE INCREASE			.0	.0	.000E+00	.0	.000	.0	.0
***NET RETENTION			31924.0	68.3	.536E+08	69.3	.229	.0	.0

HYDRAULIC OVERFLOW RATE M/YR	HYDRAULIC RESIDENCE TIME YRS	TOTAL N POOL CONC MG/M3	TOTAL N RESIDENCE TIME YRS	TOTAL N TURNOVER RATIO -	TOTAL N RETENTION COEF -
1.98	1.1638	1743.0	.4201	2.3804	.6390

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CASE: WINGER2

SELECT OUTPUT FORMAT(S)

INPUT GROUP 2 - PRINT OPTIONS

1 LIST INPUTS	1 YES
2 HYDRAULICS AND DISPERSION	1 YES
3 GROSS WATER AND MASS BALANCES	2 ESTIMATED CONCS
4 DETAILED BALANCES BY SEGMENT	2 ESTIMATED CONCS
5 SUMMARIZE BALANCES BY SEGMENT	0 NO
6 COMPARE OBS AND PREDICTED CONCS	1 ALL SEGMENTS
7 DIAGNOSTICS	1 ALL SEGMENTS
8 PROFILES	1 ESTIMATED CONCENTRATIONS
9 PLOTS	2 GEOMETRIC SCALE
10 SENSITIVITY ANALYSIS	2 TOTAL PHOSPHORUS

77 EDIT CASE TITLE
88 DEFINE OUTPUT SEGMENTS
99 LIST ALL FORMATS

OUTPUT TO SCREEN (0) OR DISK (1) ?

OUTPUT FORMAT: 7 OPTION: 1
CASE: WINGER2

OBSERVED AND PREDICTED DIAGNOSTIC VARIABLES
RANKED AGAINST CE MODEL DEVELOPMENT DATA SET

SEGMENT: 1 UPPER WINGER

VARIABLE		----- VALUES ----- OBSERVED	ESTIMATED	--- RANKS (%) --- OBSERVED	ESTIMATED
TOTAL P	MG/M3	120.00	165.74	84.6	91.6
TOTAL N	MG/M3	1500.00	1954.04	73.6	85.2
C.NUTRIENT	MG/M3	82.07	111.35	85.1	92.2
CHL-A	MG/M3	40.00	54.36	97.0	98.9
SECCHI	M	.50	.42	15.5	10.9
ORGANIC N	MG/M3	1200.00	1471.63	96.6	98.7
TP-ORTHO-P	MG/M3	.00	116.36	.0	92.3
ANTILOG PC-1		1784.98	2940.76	93.5	97.1
ANTILOG PC-2		10.16	10.90	80.8	84.2
(N - 150) / P		11.25	10.88	27.2	25.6
INORGANIC N / P		.00	9.77	.0	13.2
TURBIDITY	1/M	1.00	1.00	71.4	71.4
ZMIX * TURBIDITY		1.80	1.80	23.5	23.5
ZMIX / SECCHI		3.60	4.25	31.4	42.1
CHL-A * SECCHI		20.00	23.04	82.9	87.5
CHL-A / TOTAL P		.33	.33	79.8	79.1
FREQ(CHL-a>10)	%	97.29	99.22	.0	.0
FREQ(CHL-a>20)	%	79.05	90.37	.0	.0
FREQ(CHL-a>30)	%	56.13	74.18	.0	.0
FREQ(CHL-a>40)	%	37.82	57.33	.0	.0
CARLSON TSI-P		73.19	77.84	.0	.0
CARLSON TSI-CHLA		66.79	69.80	.0	.0
CARLSON TSI-SEC		69.99	72.37	.0	.0

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SEGMENT: 2 LOWER WINGER

VARIABLE		----- VALUES ----- OBSERVED	ESTIMATED	--- RANKS (%) --- OBSERVED	ESTIMATED
TOTAL P	MG/M3	75.00	109.28	69.1	82.0
TOTAL N	MG/M3	1500.00	1532.01	73.6	74.6
C.NUTRIENT	MG/M3	62.40	79.27	75.7	84.1
CHL-A	MG/M3	55.00	31.19	98.9	94.1
SECCHI	M	.70	.56	28.4	19.5
ORGANIC N	MG/M3	.00	943.47	.0	91.1
TP-ORTHO-P	MG/M3	.00	75.12	.0	83.3
MOD-V	MG/M3-DAY	.00	285.39	.0	96.1
MOD-V	MG/M3-DAY	.00	218.19	.0	95.0
ANTILOG PC-1		1862.27	1322.76	93.9	90.1
ANTILOG PC-2		15.28	8.97	95.0	73.7
(N - 150) / P		18.00	12.65	53.3	33.2
INORGANIC N / P		.00	17.23	.0	29.2
TURBIDITY	1/M	1.00	1.00	71.4	71.4
ZMIX * TURBIDITY		2.80	2.80	44.0	44.0
ZMIX / SECCHI		4.00	4.98	38.1	53.0
CHL-A * SECCHI		38.50	17.53	97.0	77.8
CHL-A / TOTAL P		.73	.29	98.1	72.3
FREQ(CHL-a>10)	%	99.26	93.64	.0	.0
FREQ(CHL-a>20)	%	90.69	65.80	.0	.0

FREQ(CHL-a)10) %	99.26	93.64	.0	.0
FREQ(CHL-a)20) %	90.69	65.80	.0	.0
FREQ(CHL-a)30) %	74.79	40.23	.0	.0
FREQ(CHL-a)40) %	58.08	23.85	.0	.0
CARLSON TSI-P	66.41	71.84	.0	.0
CARLSON TSI-CHLA	69.91	64.35	.0	.0
CARLSON TSI-SEC	65.14	68.31	.0	.0

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SEGMENT: 3 AREA-WTD MEAN

		----- VALUES -----		--- RANKS (%) ----	
VARIABLE		OBSERVED	ESTIMATED	OBSERVED	ESTIMATED
TOTAL P	MG/M3	97.50	137.51	78.5	87.9
TOTAL N	MG/M3	1500.00	1743.02	73.6	80.7
C.NUTRIENT	MG/M3	72.24	95.31	81.1	89.0
CHL-A	MG/M3	47.50	42.77	98.2	97.6
SECCHI	M	.60	.49	22.0	15.1
ORGANIC N	MG/M3	1200.00	1207.55	96.6	96.7
TP-ORTHO-P	MG/M3	.00	95.74	.0	88.9
HOD-V	MG/M3-DAY	.00	285.39	.0	96.1
MOD-V	MG/M3-DAY	.00	218.19	.0	95.0
ANTILOG PC-1		1671.60	2039.64	92.9	94.7
ANTILOG PC-2		13.28	10.23	91.6	81.1
(N - 150) / P		13.85	11.59	38.2	28.7
INORGANIC N / P		.00	12.82	.0	19.9
TURBIDITY	1/M	1.00	1.00	71.4	71.4
ZMIX * TURBIDITY		2.30	2.30	34.3	34.3
ZMIX / SECCHI		3.83	4.67	35.4	48.5
CHL-A * SECCHI		28.50	21.08	92.7	84.7
CHL-A / TOTAL P		.49	.31	92.4	76.6
FREQ(CHL-a)10) %		98.62	97.90	.0	.0
FREQ(CHL-a)20) %		86.11	82.02	.0	.0
FREQ(CHL-a)30) %		66.69	60.35	.0	.0
FREQ(CHL-a)40) %		48.68	41.99	.0	.0
CARLSON TSI-P		70.19	75.15	.0	.0
CARLSON TSI-CHLA		68.47	67.45	.0	.0
CARLSON TSI-SEC		67.36	70.19	.0	.0

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OUTPUT TO SCREEN (0) OR DISK (1) ?

OUTPUT FORMAT: 9 OPTION: 2
CASE: WINGER2

CONFIDENCE LIMITS FOR OBSERVED(O) AND ESTIMATED(E) VALUES (1.0 STD ERRORS)

TOTAL P MG/M3

SEGMENT	MEAN	45.5	60.8	81.2	108.6	145.1	193.9	259.1
1 UPPER WINGER	120.0			----------O----------				
1 UPPER WINGER	165.7				----------E----------			
2 LOWER WINGER	75.0	----------O----------						
2 LOWER WINGER	109.3			----------E----------				
3 AREA-WTD MEAN	97.5			----------O----------				
3 AREA-WTD MEAN	137.5				----------E----------			

OUTPUT FORMAT: 9 OPTION: 2
CASE: WINGER2

CONFIDENCE LIMITS FOR OBSERVED(O) AND ESTIMATED(E) VALUES (1.0 STD ERRORS)

TOTAL P MG/M3

SEGMENT	MEAN	45.5	60.8	81.2	108.6	145.1	193.9	259.1
1 UPPER WINGER	120.0			O				
1 UPPER WINGER	165.7					E		
2 LOWER WINGER	75.0	O						
2 LOWER WINGER	109.3			E				
3 AREA-WTD MEAN	97.5			O				
3 AREA-WTD MEAN	137.5				E			

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TOTAL N MG/M3

SEGMENT	MEAN	823.2	1025.8	1278.3	1592.9	1984.9	2473.4	3082.1
1 UPPER WINGER	1500.0			O				
1 UPPER WINGER	1954.0				E			
2 LOWER WINGER	1500.0			O				
2 LOWER WINGER	1532.0			E				
3 AREA-WTD MEAN	1500.0			O				
3 AREA-WTD MEAN	1743.0				E			

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CHL-A MG/M3

SEGMENT	MEAN	15.6	21.7	30.3	42.3	58.9	82.2	114.7
1 UPPER WINGER	40.0			O				
1 UPPER WINGER	54.4				E			
2 LOWER WINGER	55.0				O			
2 LOWER WINGER	31.2		E					
3 AREA-WTD MEAN	47.5				O			
3 AREA-WTD MEAN	42.8			E				

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                                   SECCHI           M
                          .3      .3      .4      .6      .8     1.0     1.3
SEGMENT                 MEAN+-------+-------+-------+-------+-------+-------+
 1 UPPER WINGER           .5 -----------------0-----------------
 1 UPPER WINGER           .4--------------E--------------

 2 LOWER WINGER           .7          -----------------0-----------------
 2 LOWER WINGER           .6        -------------E-------------

 3 AREA-WTD MEAN          .6     ------------------0-----------------
 3 AREA-WTD MEAN          .5     ------------E------------

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                                  HOD-V  MG/M3-DAY
                         98.3   141.3   203.1   291.9   419.6   603.2   867.1
SEGMENT                 MEAN+-------+-------+-------+-------+-------+-------+
 2 LOWER WINGER        285.4-----------------------E------------------------

 3 AREA-WTD MEAN       285.4-----------------------E------------------------

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                                  MOD-V  MG/M3-DAY
                         91.6   123.1   165.4   222.3   298.7   401.4   539.4
SEGMENT                 MEAN+-------+-------+-------+-------+-------+-------+
 2 LOWER WINGER        218.2-----------------------E-----------------------

 3 AREA-WTD MEAN       218.2-----------------------E-----------------------

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