

DTIC FILE COPY

1

Upper Mississippi River Headwaters Reservoirs Damsites
Cultural Resources Investigation

Lake Winnibigoshish, Leech Lake, Pokegama Lake, Sandy Lake,
Mille Lacs River and Gull Lake Reservoirs, Minnesota

Prepared by
Carole Zellie
Landscape Research
St. Paul, Minnesota

for the

U.S. Army Corps of Engineers
St. Paul District
1935 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Contract No. DACW37-87-1037

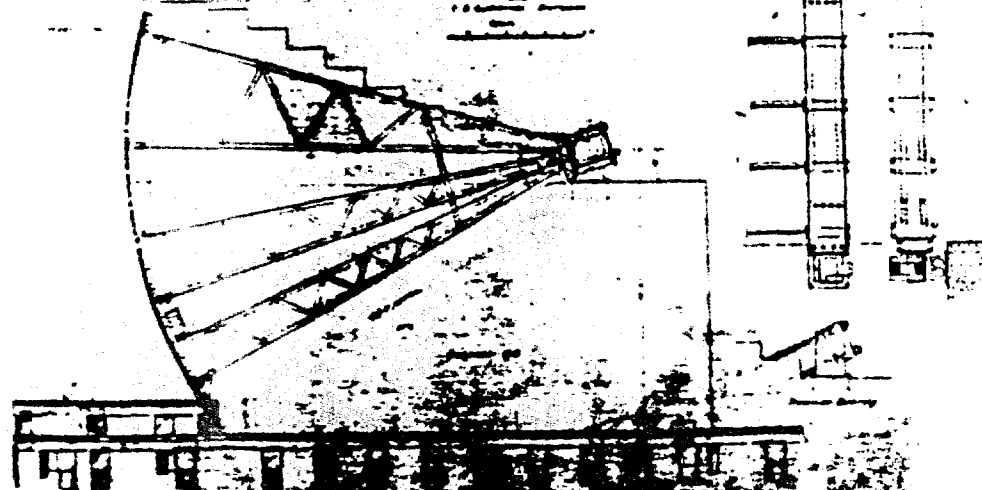
Final Report
February, 1988

DTIC
FLECTE
MAR 15 1991

DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

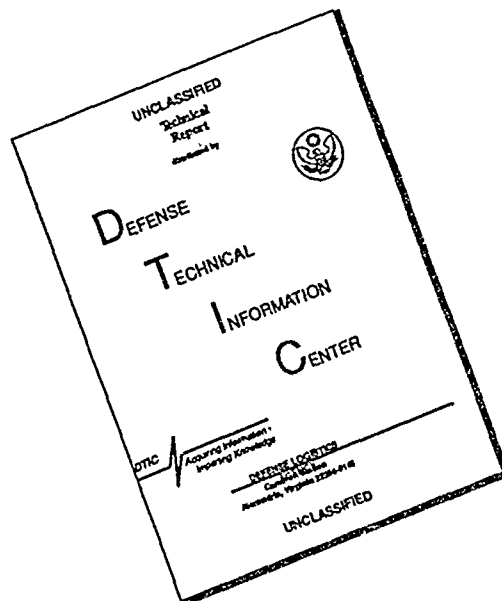
LAKE WINNIBIGOSHISH RESERVOIR DAM

TABULAR GATE



01 3 12 103

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188 Exp. Date Jun 30, 1986	
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			Approved for public release; distribution unlimited		
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION Landscape Research		6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION U.S. Army Engineer District, St. Paul		
6c. ADDRESS (City, State, and ZIP Code) St Paul, MN			7b. ADDRESS (City, State, and ZIP Code) 1421 USPO & Custom House St Paul, MN 55101-1479		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER DACW37-87-1037		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
					WORK UNIT ACCESSION NO
11. TITLE (Include Security Classification) UPPER MISSISSIPPI RIVER HEADWATERS RESERVOIRS DAMSITES CULTURAL RESOURCES INVESTIGATIONS: Lake Winnibigoshish, Leech Lake, Pokegama Lake, Sandy Lake, Pine River and Gull Lake Reservoir					
12. PERSONAL AUTHOR(S) Carole Zellie Mn.					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) Feb. 1988	
15. PAGE COUNT 154					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Reservoirs (Hydraulic)		
			Mississippi River		
			History		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) A cultural resource inventory of the Upper Mississippi River headwaters reservoirs was undertaken to determine their eligibility for the National Register of Historic Places. The damsites are located in north central Minnesota, on the main stem and tributary streams of the Upper Mississippi River. Due to recreational development and accompanying road building, as well as changing lake levels, the damsites are highly disturbed areas. All of the sites have had some level of Corps-sponsored archeological reconnaissance. Excavations have focused on prehistoric rather than historic remains. As a group of structures with shared significance as established in this report, the dams and dam tender's dwellings appear to be eligible for the National Register of Historic Places. The Winnibigoshish Dam and dwelling were listed in 1982. The Corps should attempt to find a method of preserving the dam tender's houses at the Winnibigoshish, Gull and Leech Lake sites.					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL			22b. TELEPHONE (Include Area Code)		22c. OFFICE SYMBOL

①

Upper Mississippi River Headwaters Reservoirs Damsites
Cultural Resources Investigation

Lake Winnibigoshish, Leech Lake, Pokegama Lake, Sandy Lake,
Pine River and Gull Lake Reservoirs, Minnesota

Prepared by
Carole Zellie
Landscape Research
St. Paul, Minnesota

Carole Zellie

for the

U.S. Army Corps of Engineers
St. Paul District
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Contract No. DACW37-87-1037

Final Report
February, 1988

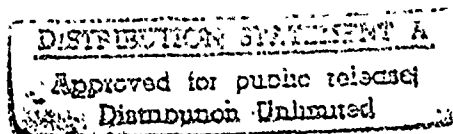


Table of Contents

List of Figures	ii
Introduction	1
Chapter 1	
Theoretical and Methodological Overview	3
Literature Review	4
Chapter 2	
General Background: Upper Mississippi River Improvement	7
Chapter 3	
Description and Assessment of Dams and Dwellings	
Dam Tenders	33
Lake Winnibigoshish	40
Leech Lake	54
Pokegama Lake	67
Pine River	79
Sandy Lake	89
Gull Lake	105
Chapter 4	
Statement of Significance	118
Evaluation and Conclusions	120
References	122
Appendix A: National Register Criteria	126
Appendix B: Winnibigoshish National Register Nomination Form	127
Appendix C: Headwaters Reservoir Data	135
Appendix D: Scope of Work	136
Appendix E: Additional Text from <u>Craftsman Homes</u> (Fig. 62)	144



Accession To	
NTIS CRA&I	J
DTIC TAB	
Unannounced	
Justification	
By	
Date	
Approved	
Dist	
A-1	23

Figures

Maps and plans, unless noted, are from the St. Paul District Corps of Engineers map and plan files. Photographs from the Minnesota Historical Society are credited MHS. Photographs dated 1987 are by Carole Zellie.

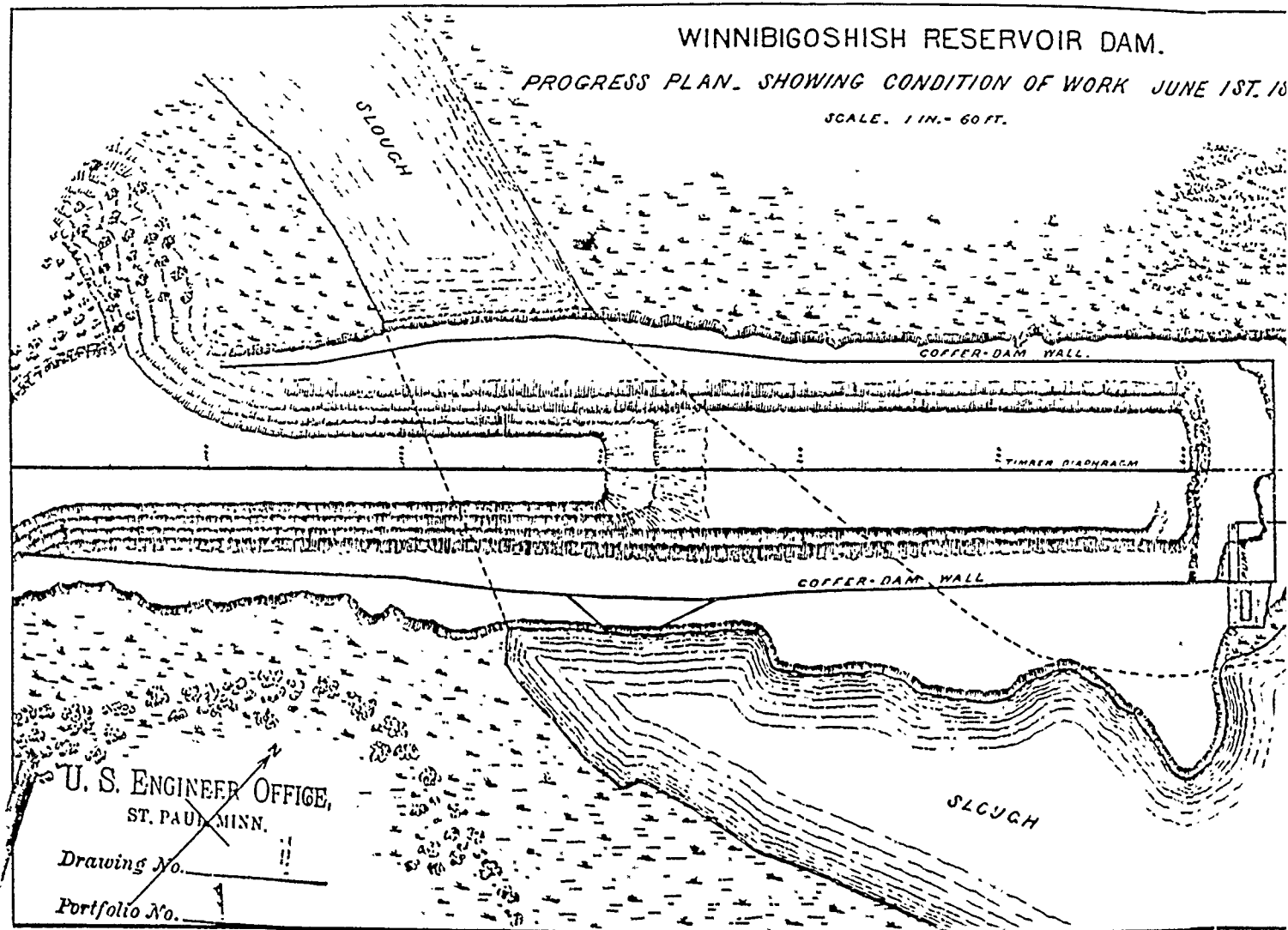
Winnibigoshish Reservoir Dam, Progress Plan, 1883.	vi
1. Headwaters Reservoirs Location Map. Source: Corps of Engineers.	8
2. Reservoir Dam Studies, 1881. Source: Corps of Engineers.	16
3. Reservoir Dam, Lake Winnibigoshish, Modification Plan. 1880. Source: Corps of Engineers.	17
4. 1891-2 List of Rations at Sandy Lake. Source: 1892 <u>Annual Report</u> , p. 1821.	18
5. Reconstruction of Lake Winnibigoshish Dam, 1900. MHS photo.	23
6. Sketch Showing Arrangement of Plant, Lake Winnibigoshish Dam, 1900. Source: Corps of Engineers.	24
7. Plan, Lake Winnibigoshish Dam, 1900. Source: Corps of Engineers.	25
8. After Reconstruction at Lake Winnibigoshish Dam, 1900. MHS photo.	26
9. Master Plan for Public Use Development and Resource Management, 1977. Pine River Dam (Ronald Louis Cloutier Recreation Area). Source: Corps of Engineers.	32
10. Service buildings at Leech Lake Dam, 1937. Source: Corps of Engineers.	37
11. Plan for the Timber Dam at Winnibigoshish, 1880. Source: Corps of Engineers.	41
12. View of Winnibigoshish Dam, north elevation. 1987.	42
13. Bear Trap Gate at Winnibigoshish Dam, ca. 1881. Source: Corps of Engineers.	43
14. Tainter Gate at Winnibigoshish Dam, ca. 1881. Source: Corps of Engineers	43

15. Dam Tender's Dwelling at Lake Winnibigoshish Dam. South and east elevations, 1987 (top). Dam Tender's Dwelling at Lake Winnibigoshish Dam. South and west elevations, 1987 (bottom). Source: Corps of Engineers.	45
16. Dam Tender's Dwelling at Lake Winnibigoshish Dam, 1904. MHS photo.	46
17. Plan for Remodeling the Dwelling at Lake Winnibigoshish Dam, 1910. Source: Corps of Engineers.	47
18. Map of 21 IC 4. Mounds 1 and 2 are near the dam tender's dwelling. Source: Johnson, et.al. <u>Cultural Resources</u> <u>Investigation of Lands Adjacent to Lake Winnibigoshish.</u> Minneapolis: Archaeology Laboratory, University of Minnesota, 1977.	49
19. Map of Winnibigoshish Reservoir Dam and Vicinity, 1883. Source: Corps of Engineers.	50
20. Plan of the Grounds at Lake Winnibigoshish Dam, 1929. Source: Corps of Engineers.	52
21. Leech Lake Dam. West elevation, 1987.	55
22. Dam Tender's Dwelling at Leech Lake Dam. North elevation, 1987 (top). Dam Tender's Dwelling at Leech Lake Dam. South and west elevations, 1987 (bottom).	56
23. Dam Tender's Dwelling at Leech Lake Dam, 1904. MHS photo (top). Dam Tender's Dwelling and Office at Leech Lake Dam, 1937. MHS photo (bottom).	58
24. Dam Tender's Dwelling at Leech Lake Dam. Original sash with six-over-six lights, north elevation, 1987.	59
25. Plan of the Dam Tender's House at Leech Lake Dam, 1902. Source: Corps of Engineers.	60
26. South and east elevations of Dam Tender's House and Garage at Leech Lake Dam, 1987.	61
27. Plan of the Grounds at Leech Lake Dam, 1929. Source: Corps of Engineers.	63
28. Private concession at Leech Lake Dam, 1987.	64
29. Plan of Office Building at Leech Lake Dam, 1913. Source: Corps of Engineers. (This plan was also used at Winnibigoshish.)	65

30. Reconstruction of the Pokegama Lake Dam, 1902. Source: Corps of Engineers.	68
31. Pokegama Dam. South elevation, 1987.	69
32. Map of Mississippi River at Pokegama Falls, 1883. Source: Corps of Engineers.	70
33. Dam Tender's Dwelling at Pokegama Lake Dam, 1904. MHS photo.	71
34. Plan for Dam Tender's Dwelling at Pokegama Lake Dam, 1908. Source: Corps of Engineers.	72
35. New Dwelling at Pokegama Lake Dam, 1908 (under construction). MHS photo.	73
36. New Dwelling and Office at Pokegama Lake Dam, 1909. MHS photo.	74
37. Plan of Office Building at Pokegama Lake Dam, 1908. Source: Corps of Engineers.	75
38. Plan of Grounds at Pokegama Lake Dam, 1920. Source: Corps of Engineers.	77
39. Timber Dam at Pine River, 1904. MHS photo.	80
40. Pine River Dam. South elevations, 1987 (top and bottom).	81
41. Dam Tender's House at Pine River Dam, 1904. MHS photo (top). Dam Tender's House at Pine River Dam, 1937. MHS photo (bottom).	83
42. Plan of Grounds at Pine River Dam, 1929. Source: Corps of Engineers.	84
43. Survey Sheet, Site CW-18, 1978. Source: Johnson, et. al., <u>Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pokegama.</u> Minneapolis: Archaeology Laboratory, University of Minnesota, 1979.	85
44. Survey Sheet, Site CW-24, 1978. Source: Johnson, et. al., <u>Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pokegama.</u> Minneapolis: Archaeology Laboratory, University of Minnesota, 1979.	87
45. Condition of Work at Sandy Lake Dam, 1894. Source: Corps of Engineers.	90
46. Sandy Lake Dam After Reconstruction, 1915. MHS photo.	91

47. Sandy Lake Dam. South elevation, 1987.	91
48. Lock House at Sandy Lake Dam, 1987.	93
49. Sandy Lake Dam Tender's House. West elevation, 1987 (top).	94
Sandy Lake Dam Tender's House. East elevation, 1987 (bottom).	
50. Plan for Watchmen's (Dam Tender's) Quarters at Sandy Lake Dam, 1894. Source: <u>Annual Report</u> , 1894: 1697.	95
51. Plan for Remodeling Keeper's Dwelling at Sandy Lake Dam, 1910. Source: Corps of Engineers.	96
52. Survey Sheet for 21 AK 11, 1979. Source: Hudak, G. Joseph et. al, <u>Cultural Resources Inventory of Lands Adjacent to Big Sandy Lake</u> . St. Paul: Science Museum of Minnesota, 1979.	98
53. Locations of Historic Buildings and Foundation at Sandy Lake Dam. Shown on the Master Plan, 1977. Source: Corps of Engineers.	99
54. Sandy Lake Dam Office Building, 1910. Source: Corps of Engineers.	101
55. Plan and Elevation of Sandy Lake Dam Tender's Dwelling, 1921. (Not constructed.) Source: Corps of Engineers.	102
56. Plan of Grounds at Sandy Lake, 1920. Source: Corps of Engineers.	103
57. Gull Lake Dam. South elevation, 1987.	107
58. Dam Tender's Dwelling at Gull Lake Dam, 1987. East elevation (top).	108
Dam Tender's Dwelling at Gull Lake Dam, 1987. West elevation (bottom).	
59. Detail of Concrete Construction, Gull Lake Dam Tender's Dwelling, 1987.	109
60. Elevation of Dam Tender's Dwelling at Gull Lake Dam, 1911. Source: Corps of Engineers.	110
61. Plan of Dam Tender's Dwelling at Gull Lake Dam, 1911. Source: Corps of Engineers.	111
62. "A Cement House That Shows the Decorative Use of Concrete as a Framework." Source: Gustav Stickley, <u>Craftsman Homes</u> , 1909, p. 24. Additional text appears in Appendix E.	113

- 63. Plan of Grounds at Gull Lake Dam, 1920. Source: Corps of Engineers. 115
- 64. Office (left) and Dam Tender's Dwelling at Gull Lake Dam, 1937. Source: Corps of Engineers. 116
- 65. Shops at Gull Lake Dam, 1911. MHS photo. 117

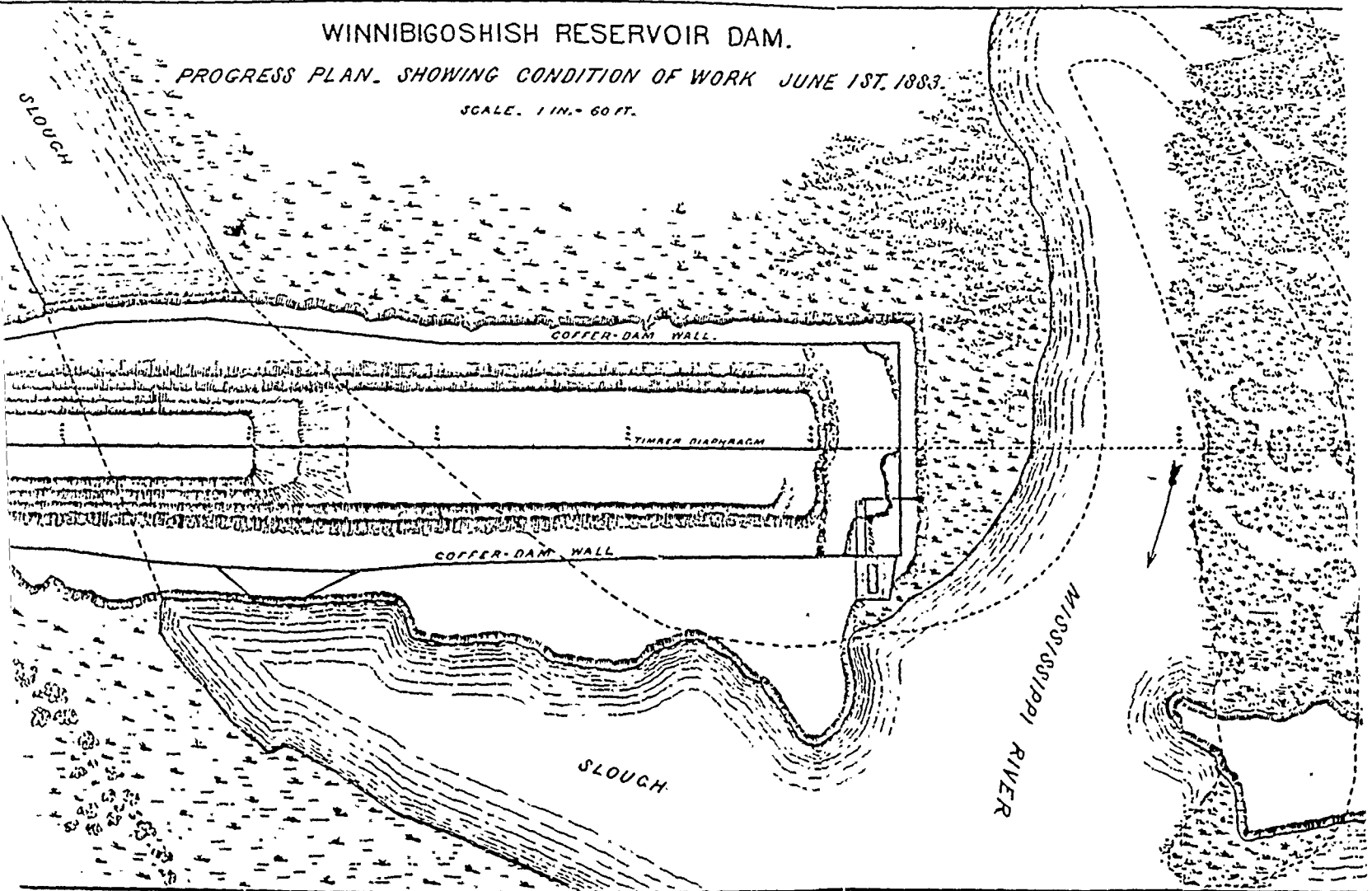


Winnibigoshish Reservoir Dam, Progress Plan, 1883.

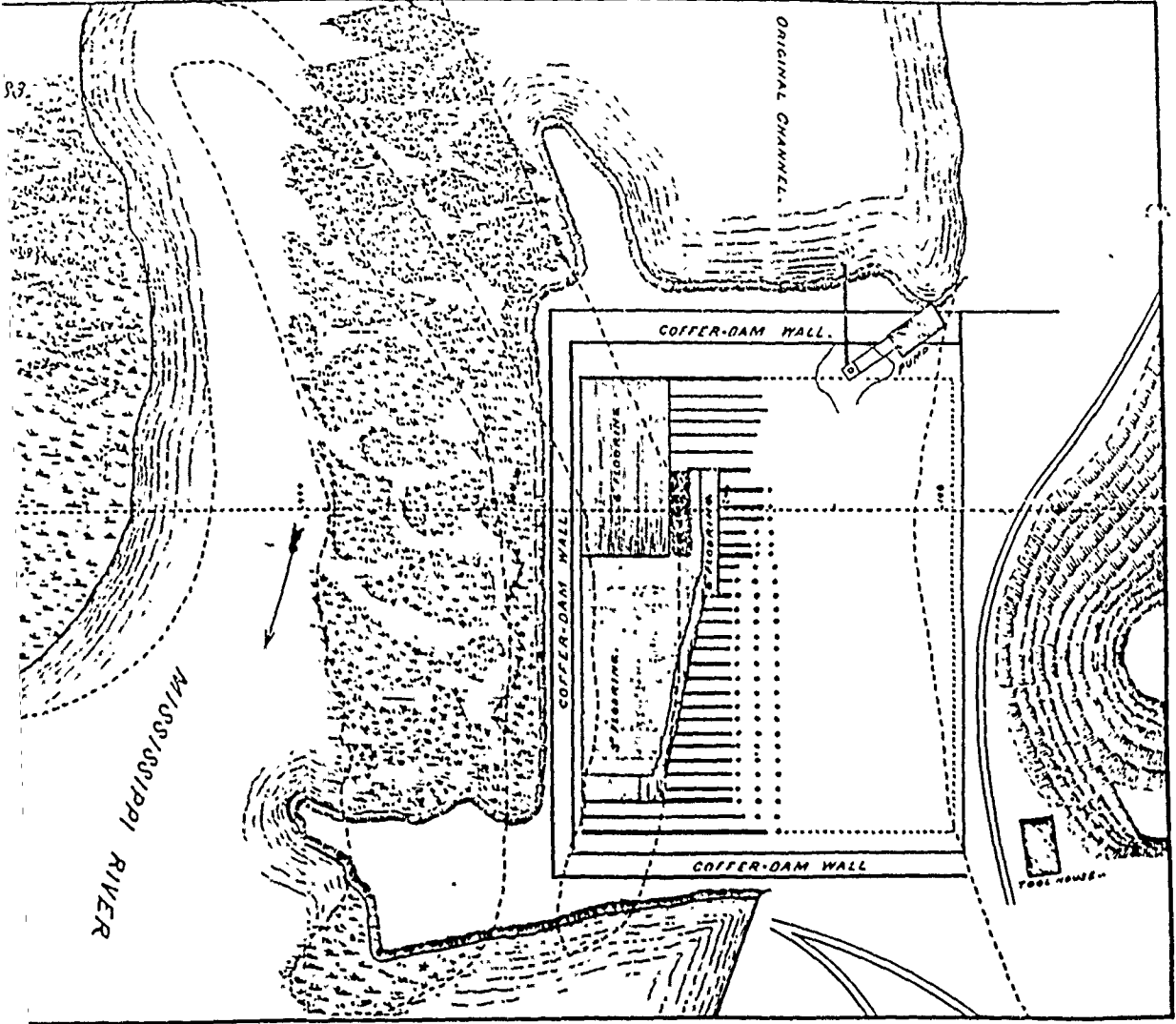
WINNIBIGOSHISH RESERVOIR DAM.

PROGRESS PLAN. SHOWING CONDITION OF WORK JUNE 1ST. 1883.

SCALE. 1 IN. = 60 FT.



Winnibigoshish Reservoir Dam, Progress Plan, 1883.



Introduction

A cultural resources inventory of the Upper Mississippi Headwaters Reservoirs, sponsored by the St. Paul District of the U.S. Army Corps of Engineers, was undertaken in June, 1987 to document the dams as well as existing structures at the damsites. The objective of the study was to determine their eligibility for the National Register of Historic Places. Potential historic archaeological sites were also reviewed. This work was performed under contract DACW37-87-M-1037.

The damsites are located in north central Minnesota, on the main stem and tributary streams of the Upper Mississippi River. They are situated between 408 and 168 river miles upriver from St. Paul and include Gull Lake, 11 miles northwest of Brainerd; Pine River, 23 miles north of Brainerd; Big Sandy Lake, 12 miles above McGregor; Pokegama Lake, 2 miles southwest of Grand Rapids; Leech Lake, 35 miles west of Grand Rapids, and Winnibigoshish, 30 miles west of Grand Rapids. The damsites and reservoirs encompass nine counties: Aitken, Beltrami, Cass, Crow Wing, Clearwater, Hubbard, St. Louis, Carlton, and Itasca. Over 90 natural lakes drain into the total reservoir area.

In addition to this report on the history and significance of the structures at each dam site, a brochure intended for public distribution was also prepared under contract DACW37-87-M-1037. The contract was modified on November 3, 1987 to include a larger brochure format than the original specification. The contractor was Carole Zellie of Landscape Research, St. Paul, MN. Approximately 100 days were devoted to the study, including three site visits to the reservoir damsites between June and September, 1987. An interim Determination of Eligibility report was submitted August 10, and comments received September 30, 1987. The draft report was submitted December 7 and comments received December 28, 1987. The final report was submitted February 5, 1988.

Report Organization

Previous historical studies and the theoretical and methodological overview for this study are discussed in Chapter 1. Chapter 2 provides a discussion of the historical development and significance of the six dams at the Headwaters reservoirs. This chapter also discusses the larger context relative to national waterway planning and more specifically, improvements to the Upper Mississippi above Lake Pepin. The significance

of the Headwaters reservoir system is established in this section, particularly as it is related to commerce and transportation.

Chapter 3 provides a detailed description of each of the six dams and other buildings of potential historic or architectural significance. A review of the historical development of the damsites, and the findings of recent archaeological studies is also presented. The general statement of significance for the dam tender's houses discusses the remaining houses individually and thematically.

Chapter 4, Evaluation and Conclusions, summarizes the National Register significance of the resources described in the report, and provides recommendations for further planning and study.

Chapter 1

Theoretical and Methodological Overview

This study assesses the National Register significance of the dams, dwellings, associated structures, and potential historic archaeological sites at each of the Headwaters reservoirs. National Register criteria used for the evaluation of historic resources are included in Appendix A.

In this assessment, national and regional planning issues related to a system of waterway improvement was also considered. Previous treatments of the damsites, such as those found in the Annual Report of the Chief of Engineers, U.S. Army (hereafter referred to as the Annual Report) are generally very site-specific. However, there is a general lack of broader analysis of the impact of the reservoirs, although there is some good literature on certain conflicts such as flooding.

The scope of work for an earlier and somewhat similar study, Jon Gjerde's Locks and Dams on the Mississippi River and Two Structures and St. Anthony Falls (1983), focused partially on the broad political issues dealing with waterway development as well as the construction history of the locks and dams. The scope of work for the Headwaters reservoirs study requested more focus on the development of individual damsites, particularly with regard to the remaining dam tender's dwellings.

Methodology

As specified in the Scope of Work, the objective of this study was to provide a a chronology of development for each dam site, and to develop a suitable historical context for determining their significance.

The historical overview of the development of the Headwaters reservoirs and a site-specific description and analysis of development at each dam location was based on a review of primary and secondary literature, maps, photographs, and site visits.

In general, the methods used were similar to those employed in conducting National Register surveys. However, particular attention was given to all the structures that had ever been built at each site, regardless of their current status. Most of the sites have been cleared of most their early Corps buildings.

The site visits provided an opportunity to study the dam and other remaining structures, and where possible, to locate the archeological and historical resources identified in earlier surveys. The interior and exterior of each Corps structure was viewed and photographed in detail. (This inspection did not include modern maintenance and recreational buildings.) In most cases, there is no visual evidence--such as foundations or depressions--of the early Corps buildings that were razed or relocated.

Literature Review

Primary Sources

The primary research was based largely on government publications. The earliest construction of the damsites is described in detail in the Corps of Engineers Annual Reports. Planning for the dam construction and the execution of the dam and related structures is usually covered in great detail for the period 1882-1920. Although major alterations and developments for succeeding years to the present are noted, there is a gradual decline of descriptive detail after about 1920. The Annual Reports thus provide an accurate and comprehensive picture of the early years at the damsites and, in some cases, also report on the labor force and other social issues such as the Corps interaction with local Chippewa. About 1977, Roger Just prepared an unpublished summary of sections in the Annual Reports that pertain to the dam sites. A copy is held by the St. Paul District Library. The Master Reservoir Regulation Manual for the Mississippi River Headwaters Reservoirs (1963) provides operating data on each dam. A variety of river improvement congress proceedings also were useful in establishing the chronology of improvements and their economic, social, and political aspects.

Of particular use to this study were the maps and site plans held at the St. Paul District headquarters. Although the maps were not issued at uniform intervals, they nevertheless document the improvements and changes at each site. The maps and plans date from ca. 1881 to 1977. In addition to site plans for each dam, there are a variety of plans, elevations, and sections of dam tender's dwellings, offices, and other structures. A few plans and maps were also published in Annual Reports.

Although not useful for studying the individual damsites, a variety of historic maps and atlases were available for some counties, and they served to illustrate the slow settlement of the reservoir areas. These maps are held by the Minnesota Historical Society.

Photographs taken between ca. 1880 and 1950 were also very useful in describing the original appearance of the structures at each dam site. The Minnesota Historical Society Audio

Visual Division and the St. Paul District headquarters each hold substantial collections of these historic photographs. Of particular interest in the St. Paul District collection is a volume of damsite photos titled "Photographs: Reservoirs." They date from the late 1930s.

The early results of an ongoing Corps-sponsored oral history project conducted by Jo Blatti as the Mississippi Headwaters Reservoirs Oral History Interviews Pilot Project (1987) were useful in interpreting the dam tenders' dwellings.

It appears that for a number of years the dam tender's office at each site was a depository for a variety of manuscript material on the history and operation of the dam. Daily logs and readings, personnel records, correspondence and photographs were among the records held by the dam tender. With changes in the management of the sites, as well as fires and other disasters, many of these items have been lost or relocated. Some of the materials are now collected at the St. Paul District office, and further effort to consolidate these research materials should be made. The few local historical societies and collections that were visited in the Headwaters area do not appear to contain unique research materials on the damsites, although the Crow Wing County Historical Society Museum at Brainerd is the depository for log books and some other Pine River materials.

The St. Paul District library contains a complete set of Annual Reports, and a variety of recent studies of the headwaters area. The Minnesota Historical Society holds a variety of published and unpublished materials on river improvement. The collections of the James J. Hill Library and Minnesota Legislative Reference Bureau were also consulted.

Secondary Sources

There is a good amount of secondary source material on the many aspects of improvement of the Upper Mississippi, but most of it focuses on the area below the Falls of St. Anthony. Gjerde (cited above, 1983) provides a useful analysis of the political as well as physical character of the improvements below St. Anthony Falls that culminated in the nine-foot channel area. The most extensive treatment of the reservoirs in a single published source is Raymond Merritt's Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers (1979). While many of the Upper Mississippi locks and dams of the nine-foot channel period were described and analyzed in contemporary engineering publications such as the Minnesota Engineer and Engineering and Contracting, the Headwaters reservoirs dams received little similar attention.

The publications and articles of civic organizations and manufacturing interests provide good contemporary commentary

on reservoir improvement, as do occasional newspaper articles. The Mississippi Valley Lumberman, published between 1876 and 1900, provides a good view of that industry's perspective. Lucille Kane's The Falls of St. Anthony: The Waterfall That Built Minneapolis (1966) is the best treatment of the controversy which accompanied the construction and operation of the reservoirs, particularly from the perspective of Minneapolis manufacturing interests.

Various aspects of the history and development of the Headwaters region, such as early fur trading activity, lumbering and railroad development, steamboat trade, and the growth of recreation are described in a variety of published sources. Agnes Larson's History of the White Pine Industry (1949) and Grace Lee Nute's "Posts in the Minnesota Fur Trading Area, 1660-1855," Minnesota Archaeologist (1949) are representative of treatments of specific aspects of regional development, while broad surveys such as Theodore Blegen's Minnesota: A History of the State (1963) are also useful.

In 1973, the Center for Environmental Review at Bemidji State College prepared the Environmental Review of the Headwaters of the Mississippi Reservoir Projects. It provides a useful overview of the cultural and natural history of the entire Headwaters area, as well as a detailed analysis of the historical and recent impacts of the reservoirs. Of particular interest to the current study was the chapter titled "Historical Account of the Operations of Headwaters Reservoirs" which was based in part on an examination of correspondence (ca. 1904-1973) between the Corps of Engineers and early twentieth-century lumber, navigation, agriculture, and water power interests.

Prehistoric and historic archaeology studies at the reservoirs began early in the twentieth century, at professional and amateur levels. More recent studies are of particular use to this study. Since 1966, the Corps has sponsored a variety of cultural resource investigations, primarily focusing on archaeology. These investigations have corresponded with the development of public recreational facilities at the damsites. Some archaeological sites, such as Winnibigoshish and Gull Lake, have been excavated and studied under a number of Corps of Engineers contracts. Alan Brew's A Cultural Resources Investigation of Archaeological Sites 21 CA 59, 21 IC 19, and 21 IC 45 Lake Winnibigoshish, Minnesota (1985) is representative of the in-depth work of Elden Johnson, Jeanne Schaaf, and other archaeologists.

Although the damsites are included in the statewide inventory of historic sites, the inventory forms held by the State Historic Preservation Office contain only a small amount of information about the dams. However, the dam and dam tender's house at Winnibigoshish were listed on the National Register in 1982. The nomination form is included in Appendix B.

Chapter 2

General Background: Upper Mississippi Improvement

The Reservoirs, to be of maximum public benefit, must be operated in the interest of navigation, and not be diverted from that purpose.

Annual Report (1881), p. 1762.

The Upper Mississippi River Headwaters reservoirs damsites are located along the first 400 miles of the upper reaches of the Mississippi River and its tributaries, near the river's source at Lake Itasca (Figure 1). Winnibigoshish and Pokegama Dams are located on the main stem of the Mississippi, and the others are on tributary streams. The watershed encompasses approximately 4,535 square miles, and there are over 90 natural lakes which drain into the reservoirs.

Introduction

The Headwaters region is generally flat, and includes hundreds of lakes and large areas of poorly-drained swampland. The area is covered by a "mantle of glacial drift ranging in depth from 100 to 300 feet and is composed of a heterogeneous mixture of sand, gravel, and boulders" (Master Regulation Manual, 1963:9). The most notable outcrop of rock is found in the vicinity of the Pokegama Dam. Merchantable iron ores are present in the sedimentary rock formations underlying the glacial drift in the area extending eastward from Pokegama Lake and in the area between Aitkin and Brainerd.

Before construction of the first reservoirs, the lakes and swamps of the region already functioned as a natural reservoir for river flowage; Corps engineers noted in 1879 that "the lakes at the sources of the Mississippi furnish a compact reservoir system, almost as if laid out by an engineer" (Annual Reports, 1879: 1205). This system, however, needed improvement for navigation, flood control, and power generation (Kane, 1966: 128).

Beginning with the first dam at Winnibigoshish completed in 1883, it was possible to collect and store surplus water, primarily in winter, spring, and early summer, and systematically release it to benefit navigation during low water periods (Annual Reports, 1887: 1000). The river corridor to be improved extended from St. Paul to Prairie du Chien. Surplus water was defined as "the excess over and above the mean low water discharge" (Annual Reports, 1882:



1827). The stated initial goal of the government's involvement in reservoir construction, one reiterated for decades, was the improvement of water levels for navigation below St. Paul (Annual Reports, 1881: 1762; 1887:1667). An expected benefit was flood control. Another desired impact was on railroad rates; it was proposed that an efficient water transportation system would help to maintain competition. Other private commercial interests were also served by reservoir construction (Annual Reports, 1906: 1469); Minneapolis flour millers at St. Anthony Falls were among the primary lobbyists for the system. Opposed parties included Minnesota and Wisconsin lumbermen, who feared loss of their control over the flowage in the Headwaters, and farmers, who charged that damaging floods were a by-product of the system. The reservoirs came about as a public undertaking encouraged by private concerns, sometimes with rather blurry demarcations between interests, and a good deal of controversy.

Purpose

The challenge of satisfying divergent demands for water has existed throughout the hundred-year history of the reservoirs. In the most recent phase of development, since the early 1960s, management focus has shifted from the original charge of navigational improvement, to the maintenance of water levels for public recreation and a variety of other needs such as fish and wildlife management, flood control, pollution abatement, water supply, and wild rice production.

In addition to their significance as part of the nation's earliest extensive reservoir system, the reservoir damsites variously incorporate areas and sites representative of prehistoric and historic Indian settlement, the early fur trading network, early steamboat routes, and lumber industry activities. As early public recreation areas, the damsites also played a role in the recreational development of the Headwaters area. In some cases, aspects of these activities have occurred specifically at the damsites. Most often they are a part of the development and background of the surrounding area.

§ 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927. 928. 929. 930. 931. 932. 933. 934. 935. 936. 937. 938. 939. 940. 941. 942. 943. 944. 945. 946. 947. 948. 949. 950. 951. 952. 953. 954. 955. 956. 957. 958. 959. 960. 961. 962. 963. 964. 965. 966. 967. 968. 969. 970. 971. 972. 973. 974. 975. 976. 977. 978. 979. 980. 981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000. 1001. 1002. 1003. 1004. 1005. 1006. 1007. 1008. 1009. 1010. 1011. 1012. 1013. 1014. 1015. 1016. 1017. 1018. 1019. 1020. 1021. 1022. 1023. 1024. 1025. 1026. 1027. 1028. 1029. 1030. 1031. 1032. 1033. 1034. 1035. 1036. 1037. 1038. 1039. 1040. 1041. 1042. 1043. 1044. 1045. 1046. 1047. 1048. 1049. 1050. 1051. 1052. 1053. 1054. 1055. 1056. 1057. 1058. 1059. 1060. 1061. 1062. 1063. 1064. 1065. 1066. 1067. 1068. 1069. 1070. 1071. 1072. 1073. 1074. 1075. 1076. 1077. 1078. 1079. 1080. 1081. 1082. 1083. 1084. 1085. 1086. 1087. 1088. 1089. 1090. 1091. 1092. 1093. 1094. 1095. 1096. 1097. 1098. 1099. 1100. 1101. 1102. 1103. 1104. 1105. 1106. 1107. 1108. 1109. 1110. 1111. 1112. 1113. 1114. 1115. 1116. 1117. 1118. 1119. 1120. 1121. 1122. 1123. 1124. 1125. 1126. 1127. 1128. 1129. 1130. 1131. 1132. 1133. 1134. 1135. 1136. 1137. 1138. 1139. 1140. 1141. 1142. 1143. 1144. 1145. 1146. 1147. 1148. 1149. 1150. 1151. 1152. 1153. 1154. 1155. 1156. 1157. 1158. 1159. 1160. 1161. 1162. 1163. 1164. 1165. 1166. 1167. 1168. 1169. 1170. 1171. 1172. 1173. 1174. 1175. 1176. 1177. 1178. 1179. 1180. 1181. 1182. 1183. 1184. 1185. 1186. 1187. 1188. 1189. 1190. 1191. 1192. 1193. 1194. 1195. 1196. 1197. 1198. 1199. 1200. 1201. 1202. 1203. 1204. 1205. 1206. 1207. 1208. 1209. 1210. 1211. 1212. 1213. 1214. 1215. 1216. 1217. 1218. 1219. 1220. 1221. 1222. 1223. 1224. 1225. 1226. 1227. 1228. 1229. 1230. 1231. 1232. 1233. 1234. 1235. 1236. 1237. 1238. 1239. 1240. 1241. 1242. 1243. 1244. 1245. 1246. 1247. 1248. 1249. 1250. 1251. 1252. 1253. 1254. 1255. 1256. 1257. 1258. 1259. 1260. 1261. 1262. 1263. 1264. 1265. 1266. 1267. 1268. 1269. 1270. 1271. 1272. 1273. 1274. 1275. 1276. 1277. 1278. 1279. 1280. 1281. 1282. 1283. 1284. 1285. 1286. 1287. 1288. 1289. 1290. 1291. 1292. 1293. 1294. 1295. 1296. 1297. 1298. 1299. 1300. 1301. 1302. 1303. 1304. 1305. 1306. 1307. 1308. 1309. 1310. 1311. 1312. 1313. 1314. 1315. 1316. 1317. 1318. 1319. 1320. 1321. 1322. 1323. 1324. 1325. 1326. 1327. 1328. 1329. 1330. 1331. 1332. 1333. 1334. 1335. 1336. 1337. 1338. 1339. 1340. 1341. 1342. 1343. 1344. 1345. 1346. 1347. 1348. 1349. 1350. 1351. 1352. 1353. 1354. 1355. 1356. 1357. 1358. 1359. 1360. 1361. 1362. 1363. 1364. 1365. 1366. 1367. 1368. 1369. 1370. 1371. 1372. 1373. 1374. 1375. 1376. 1377. 1378. 1379. 1380. 1381. 1382. 1383. 1384. 1385. 1386. 1387. 1388. 1389. 1390. 1391. 1392. 1393. 1394. 1395. 1396. 1397. 1398. 1399. 1400. 1401. 1402. 1403. 1404. 1405. 1406. 1407. 1408. 1409. 1410. 1411. 1412. 1413. 1414. 1415. 1416. 1417. 1418. 1419. 1420. 1421. 1422. 1423. 1424. 1425. 1426. 1427. 1428. 1429. 1430. 1431. 1432. 1433. 1434. 1435. 1436. 1437. 1438. 1439. 1440. 1441. 1442. 1443. 1444. 1445. 1446. 1447. 1448. 1449. 1450. 1451. 1452. 1453. 1454. 1455. 1456. 1457. 1458. 1459. 1460. 1461. 1462. 1463. 1464. 1465. 1466. 1467. 1468. 1469. 1470. 1471. 1472. 1473. 1474. 1475. 1476. 1477. 1478. 1479. 1480. 1481. 1482. 1483. 1484. 1485. 1486. 1487. 1488. 1489. 1490. 1491. 1492. 1493. 1494. 1495. 1496. 1497. 1498. 1499. 1500. 1501. 1502. 1503. 1504. 1505. 1506. 1507. 1508. 1509. 1510. 1511. 1512. 1513. 1514. 1515. 1516. 1517. 1518. 1519. 1520. 1521. 1522. 1523. 1524. 1525. 1526. 1527. 1528. 1529. 1530. 1531. 1532. 1533. 1534. 1535. 1536. 1537. 1538. 1539. 1540. 1541. 1542. 1543. 1544. 1545. 1546. 1547. 1548. 1549. 1550. 1551. 1552. 1553. 1554. 1555. 1556. 1557. 1558. 1559. 1560. 1561. 1562. 1563. 1564. 1565. 1566. 1567. 1568. 1569. 1570. 1571. 1572. 1573. 1574. 1575. 1576. 1577. 1578. 1579. 1580. 1581. 1582. 1583. 1584. 1585. 1586. 1587. 1588. 1589. 1590. 1591. 1592. 1593. 1594. 1595. 1596. 1597. 1598. 1599. 1600. 1601. 1602. 1603. 1604. 1605. 1606. 1607. 1608. 1609. 1610. 1611. 1612. 1613. 1614. 1615. 1616. 1617. 1618. 1619. 1620. 1621. 1622. 1623. 1624. 1625. 1626. 1627. 1628. 1629. 1630. 1631. 1632. 1633. 1634. 1635. 1636. 1637. 1638. 1639. 1640. 1641. 1642. 1643. 1644. 1645. 1646. 1647. 1648. 1649. 1650. 1651. 1652. 1653. 1654. 1655. 1656. 1657. 1658. 1659. 1660. 1661. 1662. 1663. 1664. 1665. 1666. 1667. 1668. 1669. 1670. 1671. 1672. 1673. 1674. 1675. 1676. 1677. 1678. 1679. 1680. 1681. 1682. 1683. 1684. 1685. 1686. 1687. 1688. 1689. 1690. 1691. 1692. 1693. 1694. 1695. 1696. 1697. 1698. 1699. 1700. 1701. 1702. 1703. 1704. 1705. 1706. 1707. 1708. 1709. 1710. 1711. 1712. 1713. 1714. 1715. 1716. 1717. 1718. 1719. 1720. 1721. 1722. 1723. 1724. 1725. 1726. 1727. 1728. 1729. 1730. 1731. 1732. 1733. 1734. 1735. 1736. 1737. 1738. 1739. 1740. 1741. 1742. 1743. 1744. 1745. 1746. 1747. 1748. 1749. 1750. 1751. 1752. 1753. 1754. 1755. 1756. 1757. 1758. 1759. 1760. 1761. 1762. 1763. 1764. 1765. 1766. 1767. 1768. 1769. 1770. 1771. 1772. 1773. 1774. 1775. 1776. 1777. 1778. 1779. 1780. 1781. 1782. 1783. 1784. 1785. 1786. 1787. 1788. 1789. 1790. 1791. 1792. 1793. 1794. 1795. 1796. 1797. 1798. 1799. 1800. 1801. 1802. 1803. 1804. 1805. 1806. 1807. 1808. 1809. 1810. 1811. 1812. 1813. 1814. 1815. 1816. 1817. 1818. 1819. 1820. 1821. 1822. 1823. 1824. 1825. 1826. 1827. 1828. 1829. 1830. 1831. 1832. 1833. 1834. 1835. 1836. 1837. 1838. 1839. 1840. 1841. 1842. 1843. 1844. 1845. 1846. 1847. 1848. 1849. 1850. 1851. 1852. 1853. 1854. 1855. 1856. 1857. 1858. 1859. 1860. 1861. 1862. 1863. 1864. 1865. 1866. 1867. 1868. 1869. 1870. 1871. 1872. 1873. 1874. 1875. 1876. 1877. 1878. 1879. 1880. 1881. 1882. 1883. 1884. 1885. 1886. 1887. 1888. 1889. 1890. 1891. 1892. 1893. 1894. 1895. 1896. 1897. 1898. 1899. 1900. 1901. 1902. 1903. 1904. 1905. 1906. 1907. 1908. 1909. 1910. 1911. 1912. 1913. 1914. 1915. 1916. 1917. 1918. 1919. 1920. 1921. 1922. 1923. 1924. 1925. 1926. 1927. 1928. 1929. 1930. 1931. 1932. 1933. 1934. 1935. 1936. 1937. 1938. 1939. 1940. 1941. 1942. 1943. 1944. 1945. 1946. 1947. 1948. 1949. 1950. 1951. 1952. 1953. 1954. 1955. 1956. 1957. 1958. 1959. 1960. 1961. 1962. 1963. 1964. 1965. 1966. 1967. 1968. 1969. 1970. 1971. 1972. 1973. 1974. 1975. 1976. 1977. 1978. 1979. 1980. 1981. 1982. 1983. 1984. 1985. 1986. 1987. 1988. 1989. 1990. 1991. 1992. 1993. 1994. 1995. 1996. 1997. 1998. 1999. 2000. 2001. 2002. 2003. 2004. 2005. 2006. 2007. 2008. 2009. 2010. 2011. 2012. 2013. 2014. 2015. 2016. 2017. 2018. 2019. 2020. 2021. 2022. 2023. 2024. 2025. 2026. 2027. 2028. 2029. 2030. 2031. 2032. 2033. 2034. 2035. 2036. 2037. 2038. 2039. 2040. 2041. 2042. 2043. 2044. 2045. 2046. 2047. 2048. 2049. 2050. 2051. 2052. 2053. 2054. 2055. 2056. 2057. 2058. 2059. 2060. 2061. 2062. 2063. 2064. 2065. 2066. 2067. 2068. 2069. 2070. 2071. 2072. 2073. 2074. 2075. 2076. 2077. 2078. 2079. 2080. 2081. 2082. 2083. 2084. 2085. 2086. 2087. 2088. 2089. 2090. 2091. 2092. 2093. 2094. 2095. 2096. 2097. 2098. 2099. 2100. 2101. 2102. 2103. 2104. 2105. 2106. 2107. 2108. 2109. 2110. 2111. 2112. 2113. 2114. 2115. 2116. 2117. 2118. 2119. 2120. 2121. 2122. 2123. 2124. 2125. 2126. 2127. 2128. 2129. 2130. 2131. 2132. 2133. 2134. 2135. 2136. 2137. 2138. 2139. 2140. 2141. 2142. 2143. 2144. 2145. 2146. 2147. 2148. 2149. 2150. 2151. 2152. 2153. 2154. 2

construction in the Headwaters, and provides a brief overview of contemporaneous plans and improvements at and below Minneapolis and St. Paul. More detailed information about each of the six damsites is provided in Chapter 3.

Peterson (1946), Merritt (1979) and Gjerde (1983) are among studies which provide a periodization and discussion of Mississippi River trade and improvements. Peterson relates the production of various staples to periods of river trade and decline, while Merritt overlays the various stages of channel depths and physical alterations to the river. Gjerde further develops Merritt's approach, particularly with regard to the political context of the river improvements.

Merritt divides the period 1830-1976 as follows: (1979:157-8)

1830-1877	Steamboat Era
1878-1906	Four and One-half Foot Channel
1907-1930	Six-Foot Channel
1930-1939	Nine-Foot Channel
1940-1976	Commercial and Recreational Waterway

This periodization, like Peterson's and Gjerde's, is focused primarily on developments at or below the Twin Cities. However, it also provides a useful organization for studying the Headwaters reservoirs.

The Steamboat Era: 1830-1877

The Mississippi was a direct and logical route to Fort Snelling and later, to the early settlements of Minneapolis and St. Paul. The first steamboat reached Ft. Snelling from St. Louis in 1823 (Kane:1966; 7). Subsequent conveyance of passengers and freight shipments was subject to seasonal fluctuations of water levels, sandbars and other river obstructions, and the yearly freeze-up. Even before the extension of railroad service to the Upper Midwest--a network which emphasized east-west circulation--it became apparent that improvements to the river would be necessary if river transportation was to remain viable and competitive. With the droughts of the mid-1850s and the Panic of 1857, the head of navigation shifted from the Falls of St. Anthony to St. Paul (Gjerde, 1983: 118). Discussion of a two-lock and dam system to improve navigation above St. Paul began in earnest in the 1860s, but the resulting Lock and Dam 1 and 2 were not completed for decades (Gjerde, 1983: 67). Mid-nineteenth century steamboat navigation above St. Anthony Falls was comparatively limited, with the steamboat Governor Ramsey making its first trip to St. Cloud in 1850 (Blegen, 1963: 192).

Government engineers began dredging and snagging the Upper Mississippi below St. Paul in the 1860s. River improvement

efforts during this early period were confined to enhancement of the natural flow, rather than regulation of it (Hartsough, 1934: 262). Government and private interests soon became engaged in debate over appropriate improvements on the waterway below the Twin Cities, and discussion of improvements to the more impassable section from the Falls to the Headwaters was also underway. The need to control floods as well as to improve navigation was apparent, but at mid-century, not yet viewed as interrelated problems (Corps of Engineers, History, 1986:49).

In 1850, Congress hired Pennsylvania civilian engineer Charles S. Ellet Jr. (1810-1862) to study flood control measures on the Ohio and Lower Mississippi Rivers. He recommended a series of storage reservoirs that could control the water levels of the tributaries of the Mississippi during wet and dry seasons (Ellet, 1853; Merritt, 1979: 68-9). His reservoir solution was generally not well-received. In 1861, Captain A.A. Humphreys (1810-1883) and Lieutenant Henry L. Abbot developed a plan for the control of floods and the improvement of navigation that was based solely on levees (Humphreys, 1861; Merritt, 1979: 68-9). This plan, with its dependence on levees alone for the control of floods, greatly influenced river engineering in the U.S. for decades (Corps of Engineers, History, 1986:50).

In the 1860s, debate over the nature of future river improvements was held in private and public arenas. The Minnesota legislature was particularly concerned with improvement of navigation along the Mississippi (Gjerde, 1979: 63). In 1866, the Corps began a fourteen-year series of surveys of the lakes and drainage area in the Headwaters, directed primarily at improving navigation (Annual Reports, 1867: 16, 257; 1892: 1824-6). The 1850s and 1860s studies and debates often resulted in "stop-gap" solutions for river improvement, such as dredging and experimental wing dam construction, but the 1870s saw the beginning of development of more systematic approaches to river management.

Headwaters Studies

Using the results of the studies begun in 1866, the Corps proposed various schemes for the improvement of the Mississippi above Lake Pepin. They were based on a system of reservoirs at the Headwaters. In 1870, Major Gouverneur K. Warren of the St. Paul District recommended the construction of 41 reservoirs on the St. Croix, Chippewa, Wisconsin and Mississippi Rivers to aid in navigation (Annual Reports, 1869: 237; 1870: 1590-1620). In 1875, Major Francis U. Farquhar reported on his plan for the improvement of river navigation, which featured a system of timber and masonry dams at the reservoirs (Annual Reports, 1875: 436). He recommended sites at Pokegama Falls, Leech Lake, Lake

Winnibigoshish, Mud Lake, Vermillion River, Pine River, Gull Lake, and Mille Lacs (Annual Reports, 1892: 1825). The initial plan was revised several times, and the Mud Lake, Vermillion River, and Mille Lacs sites were found to be unnecessary (Annual Reports, 1892: 1826).

The Windom Commission

In 1874, Senator William Windom of Minnesota initiated the Select Committee on Transportation Routes to the Seaboard. This committee called for the construction of waterways to compete with railroads, for uniform channel depths and a comprehensive plan for river improvement. Gjerde notes "although Windom's actions were a watershed in the development of a plan for river improvements, he certainly was not the first individual or agency to recommend river improvement...the Windom Committee's report should be seen as the culmination of initial attempts to force federal improvements of the waterways" (Gjerde, 1983: 62). The Commission recommended a five-foot channel between St. Paul and St. Louis, and a four and one-half foot channel above St. Paul.

Locally, the preservation of the rapidly-eroding Falls of St. Anthony was a major issue between 1866 and 1876 and involved the efforts of Minneapolis city government, private interests including the Minnesota Water Power Company, and the Corps of Engineers (Kane, 1966: 63-67, 73-80; Annual Reports, 1892: 1824). The Corps was successful in creating a three to three and one-half foot channel below the Twin Cities during this period. However, a truly comprehensive plan for river improvements was the product of the next decades (Gjerde, 1983:60).

River Traffic Above the Twin Cities

The prospect of reservoirs gave some hope that Minneapolis could be the seat of navigation above the Falls of St. Anthony (Kane, 1966: 130). Despite improvements, however, navigation above the Falls remained rather limited. The exception was the river route above Brainerd and Aitken, where after about 1870, the growth of agriculture and lumbering encouraged steamboat trade. In peak years, 1300 passengers were carried by steamer from Brainerd to Grand Rapids, a distance of about 190 river miles (Fullerton, 1906:496).

In the 1878-1879 season, boats also ran regularly between St. Anthony Falls and St. Cloud (Hart, 1952: 9). Above this point, numerous rapids interrupted navigation. In 1870, service began in the narrow, winding channel between Aitken and Grand Rapids. At Grand Rapids, Pokegama Falls prevented further travel. The railroad reached Aitken in 1870, but it nevertheless remained an important point for passenger and

freight transportation via steamboat. This traffic ended with the decline of the lumber industry and the domination of the railroad (Annual Reports, 1904: 1465). In his report of 1875, Major F.U. Farquhar provided a detailed description of the river from the Falls of St. Anthony to Pokegama Falls. His survey was made to determine the cost of improving the river above St. Paul to give three- to five-foot navigation at the lowest stages of the river (Annual Reports, 1875:443-453). Corps efforts to dredge the river and remove snags and boulders between Aitken and Grand Rapids began about 1879 and continued until 1910.

The steamboat era above the Twin Cities did not end with 1877, as Merritt's periodization might suggest. A variety of steam-powered craft were operated on the Headwaters until about 1920.

The Four and One-half Foot Channel Period: 1878-1906

The creation of a four and one-half foot channel below St. Paul--a modification of the recommendation of the Windom Committee--was authorized by Congress in 1878 (Gjerde, 1983: 63-4). Portions were completed over the next thirty years by the building of wing dams, dredging, and revetment.

The Mississippi River Commission was created in 1879. The Commission was charged with executing a comprehensive plan for flood control and navigation. The creation of this authority "marked the federal government's growing commitment to the development of a reliable inland waterway system" (Corps of Engineers, History, 1986:49).

Planning for Headwaters Dams

In 1878 Congress requested that Major Charles J. Allen, who succeeded F.U. Farquhar, conduct a study of the impact of a reservoir system on navigation on the Mississippi (Annual Reports, 1879:194). The survey area included 25,000 square miles of the Headwaters region in Minnesota and Wisconsin. Among the criteria of the study were the practicability of establishing reservoirs, the cost of creating and maintaining them, the amount of damage to private property, and the extent to which impounded water could be applied to the improvement of navigation of each stream and the Mississippi (Annual Report, 1879: 1194). Allen's report recommended the construction of an experimental timber dam at the outlet of Lake Winnibigoshish that would raise water levels below St. Paul. Winnibigoshish was well-suited for the experimental project for a number of reasons. The embankment was higher than the other Headwaters lakes, and the engineering difficulties were thought to provide a good test case. In an area without railroads or established roads, Winnibigoshish was also well-located as to timber supplies (Annual Report, 1879: 1216; Pyle, 1884:

620).

Lobbying for the construction of the dam at Lake Winnibigoshish and other Headwaters locations was led by Minneapolis milling interests, notably William D. Washburn, who stood to benefit from the improved flow of water over the Falls of St. Anthony. In 1869, when government engineers Warren and Farquhar were unable to continue their surveys of the Headwaters due to lack of funds, Washburn sent his company engineer, Franklin D. Cook, to survey the area for potential dam sites. Washburn later purchased a tract at Pokegama Falls (Annual Reports, 1869: 278; 1892: 1824-5; Kane; 1966:129). During Washburn's terms in the United States Congress (1880-1885; 1889) he was a zealous supporter of the Headwaters system and earned the title "father of the reservoir system" (Kane, 1966: 129).

Controversy over the construction of the reservoirs was rooted in the stretching of the commerce clause of the U.S. Constitution beyond navigation to the provision of benefits to private milling and manufacturing interests (Minnesota Legislative Reference Bureau, Reservoir Commission, 1961: 10-11). The railroads, lumbermen, and certain St. Paul commercial interests were among the parties opposed. The government's final case in favor of funding for the reservoirs was based on the ultimate goal of improvement of navigation from St. Louis to St. Paul, which could only be accomplished by the securing adequate water in the channel (Merritt, 1979: 74).

Early Dam Construction

In 1880, through the Rivers and Harbor Act, Congress approved \$75,000 for the construction of the experimental dam at Lake Winnibigoshish, as recommended by Charles Allen in 1879 (Annual Report, 1881; 1761; 1892: 1828). Much of the preparatory work involved tracing title to lands liable to overflow, and obtaining the ownership of such lands and releases for any damages. Some of the land purchased or released for the work was owned by the Chippewa:

The damages resulting to lands on the Leech and Winnibigoshish Indian reservations were ascertained by a commission appointed by the Interior department, and an award made by them is supposed to settle all Indian claims for damages that may arise from the building of the Winnibigoshish and Leech Lake Reservoirs.

Charles Wanzer, Assistant Engineer, Annual Reports (1882), p. 1831.

The work began at Winnibigoshish late in 1881. In 1882, the River and Harbors Act appropriated funds for further construction and stated that the improvement of navigation was the specific purpose of the Headwaters, which were not to be used for the

improvement of private property (Bemidji Center for Environmental Studies, 1973:D-XIII-3). Dams at Leech Lake (1882) and Pogeekema Falls (1883) were begun next, followed by Pine River (1884) and Sandy Lake (1891). The dams were built at lake outlets in very remote areas, usually where there were no pre-existing roads or nearby settlement. The sites were in areas of much government-owned land, reducing the acquisition or compensation costs for the land that would be overflowed.

For dam construction at Winnibigoshish, all workmen, tools, and supplies were brought to the site on over 100 miles of Corps-built roads. Nearly two million feet of white and Norway pine were cut from the shores of the lake for construction (Annual Reports, 1882: 1831-3; 1892: 1829). Although dams and control structures constructed of masonry were standard Corps practice by this time, the specifications and budget provided for timber construction, in part due to the difficulty of transporting materials and supplies to the sites (Annual Reports, 1900: 2787). In 1882, Charles Wanzer, the assistant engineer in charge of the project, reported to Allen "the starting of so large a piece of work at such a distance from any of the ordinary business facilities has been necessarily slow and expensive" (Annual Reports, 1882: 1833). Wanzer also reported on an outbreak of small-pox among the Chippewa laborers at the dam, and on the Chippewa's attitudes toward the construction of the reservoir (Annual Reports, 1883: 1461-2).

Costs were controlled by shipping the sawmill and other machinery from one dam site to another (Annual Reports, 1887: 1673). The cost of the expensive first dam at Winnibigoshish was \$214,000, and the total cost of the four that followed was \$467,805 (Annual Reports, 1882: 27-23).

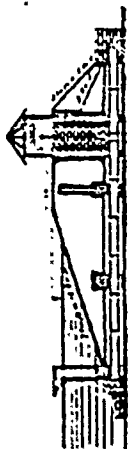
In 1882, the Corps noted that "the Winnibigoshish Dam is the inauguration of the reservoir system for the entire country" (Annual Report, 1882: 1767). There were precedents, however. Under the direction of Captain Allen, studies of existing reservoir dams were compiled (Figure 2). Examples included individual dams in England, Scotland, and Ireland, as well as New York, Massachusetts, and Baltimore. Although there were few notes published with the sections, they all appear to be earth-filled dams (Annual Report, 1882, Sheets 1-3).

The attempt to employ an efficient method of construction for a series of standardized dams appears to be the most comprehensive coordinated work yet performed on an Upper Mississippi River improvement. Annual Reports for this period--ca. 1881 to 1892--show that the experience gained at one site was applied to the next.

When completed, each of the Headwaters dams was comprised

SECTIONS
of
EXISTING
RESERVOIR DAMS
Compiled under the Direction of
Capt. Chas. J. Allen
Chief of Engineers, U.S.A.
Feb. 1881

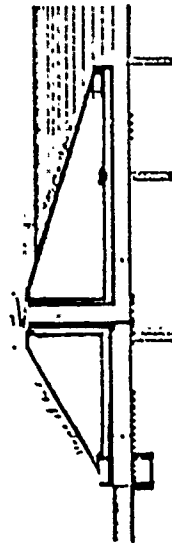
SCALE
1" = 100' Feet
The company's capacity is shown in the Appendix



Woodhull Reservoir Dam
Black River Canal-Porter Co., N.Y.
Report of Canal Commissioner 1871.



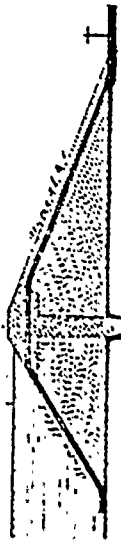
Deruyter Reservoir Dam
Erie Canal-Madison Co., N.Y.



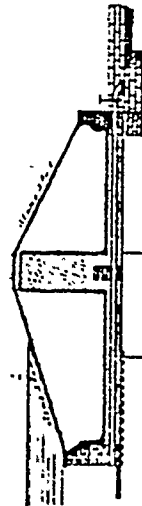
Reservoir Dam
North Branch of the Erie Canal
Report of Canal Commissioner 1870.



Reservoir Dam
Middle Branch of the Erie Canal-Porter Co., N.Y.
Third Annual Report of the Dept. of Public Works, N.Y. City 1873
In 1881, when this map was published, the dam was in the process of being replaced by a new one.



Dams Reservoir Dam
Near Dublin Ireland
Hagen's Handbuch der Wasserbaukunst



South Lake Reservoir Dam
Black River Canal-Herkimer Co., N.Y.
Annual Report of State Engineer



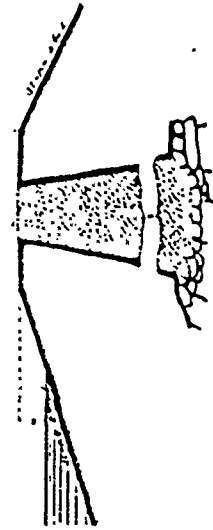
Chestnut Hill Reservoir Dam
Boston Water Works



Reservoir Dam
Darmstadt Water Canal
Hagen's Handbuch der Wasserbaukunst



Inverness Reservoir Dam
Alarcon Water Works, Scotland
Humber Water Supply of Towns



Doud Lake Reservoir Dam
Baltimore Water Works
Van Nostrand's Engineering Vol. 1 p. 100.

2. Reservoir Dam Studies, 1881. Source: Corps of Engineers.

RESERVOIR-DAM LAKE WINNIEGOSEH

MINNESOTA

ENGINEERING
MODIFICATION PLAN

Prepared by the State of Minnesota
to show the location of the proposed dam and the
reservoir to be created thereon.

W. C. Cushman
Chief Engineer, D. C. C.

May 12, 1880
St. Paul, Minn.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

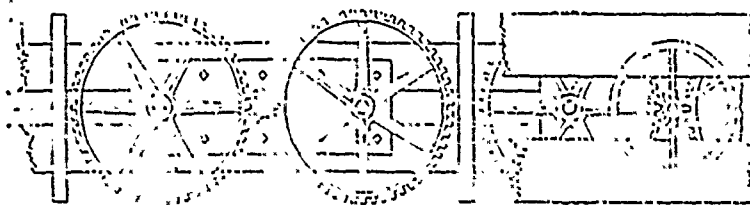
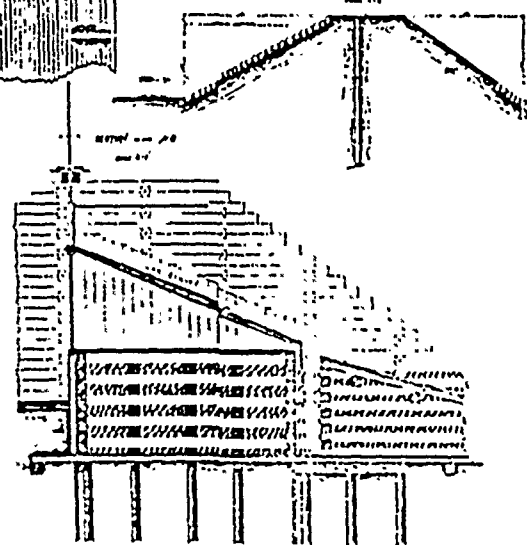
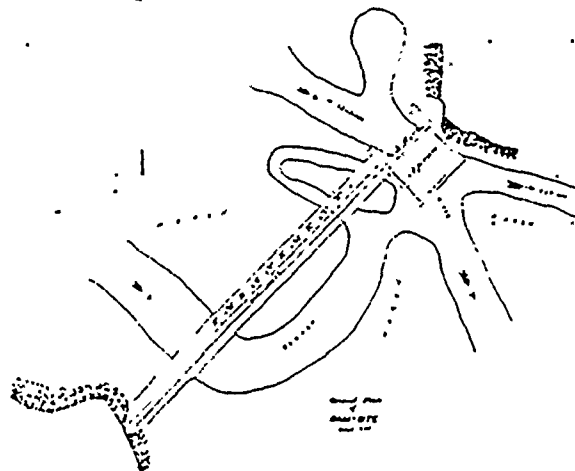
W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.

W. C. Cushman
Chief Engineer, D. C. C.



PIPING PLAN

Sheet 1

PIPING PLAN

Sheet 2



ification Plan. 1880.

there should not be sufficient height of water to allow the leaves to pass, we have the conditions of the old bear trap, and nothing need be done. It may, however, be advisable sometimes to raise the leaves artificially and assist the reversal of the gate thereby.

Table showing cost of subsistence at Sandy Lake Dam, June 1, 1891, to April 30, 1892, inclusive.

Articles.	Total quantity received, July 1, 1891, to May 1, 1892.	Total cost.	Quantity on hand April 30, 1892.	Average cost per pound, gallon, etc.	Value.	Total quantity consumed.	Cost.
Apples, evaporated.....	375	\$51.50	57	\$0.138	\$7.81	318	\$43.69
Apples, ground.....	2	72	21	.24	5.10	19	4.60
Apples, private.....	373	47.51	36	.127	10.53	337	42.91
Beef.....	1,800	67.70	180	.038	6.81	1,620	60.89
Bacon.....	4,829	204.48	483	.042	4.25	4,346	182.23
Bison.....	208	52.85	208	.107	2.54	0	0
Bonnet.....	1,205	40.74	127	.032	4.00	1,078	36.74
Brown.....	44	2.10	44	.048	0.48	0	0
Butter.....	512	14.78	512	.029	2.88	0	0
Butter, private.....	544	24.78	544	.045	5.44	0	0
Butter, private.....	1,963	275.06	9	.141	2.11	1,954	272.95
Butter, private.....	212	2.90	212	.014	0.14	0	0
Butter, private.....	254	24.92	120	.07	8.40	134	16.52
Butter, private.....	529	27.45	151	.052	8.00	378	35.45
Butter, private.....	46	3.17	13	.077	0.77	33	2.40
Butter, private.....	10	2.65	3	.265	7.95	7	1.85
Butter, private.....	292	33.48	15	.114	1.71	277	31.77
Butter, private.....	5	1.57	5	.314	1.57	0	0
Butter, private.....	409	101.36	81	.248	20.41	328	80.95
Butter, private.....	15	1.10	10	.073	0.73	5	0.35
Butter, private.....	45	4.64	45	.103	4.64	0	0
Butter, private.....	2,645	26.45	2645	.01	0.01	0	0
Butter, private.....	348	27.17	12	.071	2.26	336	24.91
Butter, private.....	30	5.70	8	.19	1.14	22	4.56
Butter, private.....	8	12.80	2	1.60	2.40	6	9.40
Butter, private.....	4	4.20	4	1.05	4.20	0	0
Butter, private.....	8,824	212.20	754	.024	18.00	8,070	194.20
Butter, private.....	275	6.60	25	.024	6.60	250	6.00
Butter, private.....	104	13.24	50	.068	3.40	54	7.84
Butter, private.....	7	1.81	2	.26	0.52	5	1.29
Butter, private.....	31	3.15	2	.061	0.20	29	2.95
Butter, private.....	1,404	137.91	50	.104	6.20	1,354	131.71
Butter, private.....	42	1.24	25	.014	0.82	17	0.56
Butter, private.....	24	8.85	4	.37	8.17	20	7.65
Butter, private.....	214	26.80	75	.122	8.77	139	18.03
Butter, private.....	740	57.30	75	.077	6.77	665	50.53
Butter, private.....	28	3.54	4	.126	1.50	24	3.04
Butter, private.....	600	5.20	204	.0087	2.40	396	3.80
Butter, private.....	300	35.75	50	.111	5.82	250	29.93
Butter, private.....	240	4.67	35	.014	0.41	205	4.26
Butter, private.....	175	4.45	25	.025	0.95	150	4.50
Butter, private.....	122	20.50	25	.168	4.20	97	16.30
Butter, private.....	1,250	61.00	10	.049	6.10	1,240	60.90
Butter, private.....	45	16.25	15	.365	6.07	30	12.18
Butter, private.....	11	4.24	21	.400	0.76	14	3.48
Butter, private.....	1	2.55	1	.255	2.55	0	0
Butter, private.....	1,404	17.00	8	.012	1.70	1,396	15.30
Butter, private.....	14,742	231.80	120	.016	2.78	14,622	229.02
Butter, private.....	2,000	200.00	700	.100	42.00	1,300	158.00
Butter, private.....	3,000	300.00	27	.082	3.07	2,973	296.93
Butter, private.....	400	25.63	38	.065	2.69	362	22.94
Butter, private.....	75	1.05	14	.014	1.05	61	0.85
Butter, private.....	49	10.00	8	.204	1.04	41	4.96

Table showing cost of subsistence at Sandy Lake Dam, etc.—Continued.

Articles.	Total quantity received, July 1, 1891, to May 1, 1892.	Total cost.	Quantity on hand April 30, 1892.	Average cost per pound, gallon, etc.	Value.	Total quantity consumed.	Cost.
Peppers.....	204	\$7.08	54	\$0.27	\$14.48	150	\$40.56
Peppers.....	2	70	5	.70	3.50	2	1.40
Peppers.....	125	14.42	64	.116	8.44	61	6.98
Peppers.....	275	19.04	64	.07	4.40	211	14.64
Peppers.....	245	3.50	40	.011	0.44	205	2.04
Peppers.....	24	3.85	4	1.605	0.38	20	1.83
Peppers.....	24	1.67	2	.07	0.14	22	1.83
Peppers.....	3	.90	2	.30	.60	1	.30
Peppers.....	451	22.61	90	.005	0.45	361	18.16
Peppers.....	13	1.85	13	.142	1.85	0	0
Peppers.....	3,070	150.31	602	.019	24.00	2,468	126.31
Peppers.....	1,100	61.13	140	.010	8.44	960	42.69
Peppers.....	74	6.82	7	.778	5.18	67	5.65
Peppers.....	20	10.60	7	.53	3.65	13	8.95
Peppers.....	221	60.65	17	.273	12.44	204	68.09
Peppers.....	576	10.00	21	.033	0.80	555	18.20
Peppers.....	1,752	11.08	210	.001	1.28	1,542	10.40
Peppers.....	35	7.24	7	.207	1.45	28	4.79
Peppers.....	30	1.91	10	.049	0.49	20	1.42
Peppers.....	69	6.00	69	.087	6.00	0	0
Peppers.....	2,810.81	271.95	2,810.81			2,810.81	271.95

Cost of subsistence supplies purchased June 1, 1891, to May 1, 1892, ... \$2,741.24
Freighting 60.60

Total cost, including freighting 2,801.84
Less value of supplies on hand April 30, 1892 271.95

Cost of supplies consumed, June 1, 1891, to May 1, 1892 2,529.89
Number of rations consumed, June 1, 1892, to May 1, 1892 9,315.00
Cost of each ration 0.27

Amount expended during fiscal year ending June 30, 1892, including outstanding liabilities, \$64,192.03.

The beneficial effects resulting in previous years from the operation of the completed reservoirs have been maintained.

The Board of Engineers, in their report dated May 24, 1887, and printed on pp. 1681-1698, Annual Report of the Chief of Engineers, 1887, express this opinion:

As far down as the mouth of the first considerable tributary, the St. Croix, it is therefore not unreasonable to suppose that navigation may be benefited nearly in proportion to the effect upon the St. Paul gauge, i. e., from 1 foot to 18 inches at low-water stages.

My predecessor, in his annual reports for the years 1887, 1888, and 1889, has stated:

From such observations as means admitted in 1885 and 1886, and stated in my reports of December 18, 1885, and November 5, 1886, both of which are here respectfully referred to, it appeared that when the river stood at 2 feet on the U. S. Signal Service gauge at St. Paul, the effect of every 100 cubic feet per second of water added to the river and steadily maintained was equivalent to increasing the depth one-tenth of a foot. As the river rises the depth of each 100 cubic feet of water decreases somewhat. It appears, however, from examinations in 1885 and 1886, that the effect of the liberated water from the four reservoirs was the addition of 1 foot and upwards to the depth at St. Paul, during the dry periods of those years, the additional depth being due to elevation of water surface as well as to additional scour. (See Appendix AA, Annual Report, 1887.)

of an earthen embankment and a timber outlet structure footed on timber piles. (At Pokegama the structure was built on granite outcrop.) The center core of the embankments was filled with puddled clay, and contained a timber diaphragm. The outlet structure was a stone filled crib, supported at each end by stone-filled abutments. From the outset, the timber structure was intended to be replaced by masonry at some later date (Annual Reports, 1881: 1763-4). The number of discharge sluices varied with the length of the dam. The discharge sluices were controlled by timber gates controlled by hoisting machines, or by steel Tainter gates. (Annual Reports 1882: 1828; Figure 3). Log sluices controlled by bear-trap gates or stop logs were built at all of the dams. A navigation lock was built at Sandy, the only lock in the system. The lock was evidence of the steamboat activity, including freight and passenger service, that existed above Aitken.

A complex of buildings that included a dam tender's dwelling and maintenance facilities was completed at each site prior to or during the dam construction. Temporary buildings such as toolhouses, laborers quarters, and stables for draft animals were usually removed after the dam was completed. Canoes and steamboats were used for water transportation during construction. The task of providing for workers over many months of hard work is illustrated in an inventory of a year's rations for the construction crew at Sandy Lake (Figure 4).

As early as 1889 a telephone system was proposed for connecting the four reservoirs then completed. Completion of the system in 1905 allowed daily reporting of water levels, rainfall, and dam operation to St. Paul (Annual Reports, 1887: 1792; 1905: 1670-80). The flow at the dams was managed by the Corps, out of the District office at St. Paul. The civilian dam tender, assisted periodically by Corps engineers, was responsible for day-to-day operation. Watchmen and a variety of other civilian personnel were also employed at the dams. Rules and regulations for the use and administration of the reservoirs were issued periodically (Endicott, 1889; Annual Report, 1896: 1830-1).

No benefits to navigation were expected from the completion of only one reservoir dam. Construction of dams at Leech Lake and Pokegama were approved and started in less than two years (Annual Report, 1879: 1205). The main reservoirs at Winnibigoshish and Leech Lake were first closed to retain water in the spring of 1884 (Annual Reports, 1892: 1830-3). Early reaction to the operation of the dams was favorable, and by 1901 the Corps engineers reported that the dams had demonstrated that they were capable of raising the low water stage of the Mississippi at Saint Paul by 18 inches for 90 days (Annual Reports,

1901: 2309).

There was a regular exchange of information between Minneapolis mill company engineers and government engineers as to the conditions which affected river flow. A particularly prominent spokesman for the mill companies was engineer William de la Barre, who led the development of water power between 1885 and 1930, and was an outspoken advocate of the Headwaters reservoir system (Kane, 1966: 161). With the introduction of advanced steam power and electricity, however, millers and manufacturers were gradually growing less dependent on the river. Kane noted that by 1890, "Minneapolis had ceased to be a city dependent on water power for its existence and growth." (Kane, 1966: 133)

How far downriver the benefits to navigation extended was widely debated. One source reported that below the Twin Cities, "river navigators claim that the benefit of the increased water supply is plainly marked at Lake Pepin," and that Illinois industries were also benefiting from the regulated flow (Fullerton, 1906:495). However, the benefits to navigation were actually the greatest above the Twin Cities, and declined downstream (Annual Reports, 1906: 1466, 1468).

The Headwaters reservoirs were the largest-scale engineering accomplishment yet to be realized on the Upper Mississippi. After the passage of the 1936 Flood Control Act, hundreds of reservoirs were constructed on the lower Mississippi and its tributaries, but primarily for purposes of flood control (History, Corps of Engineers, 1986: 51).

Early Conflicts

It is impossible to so manage the reservoirs as to suit all concerned, because each party minimizes or ignores entirely the interests of all the others.

Annual Reports, 1906: 1440

In 1905, following record floods in the Aitken area, there was a call from some interests for the abandonment of the reservoirs. Local farmers, who raised the issue of flowage rights around the reservoirs and the river, and Duluth newspapers charged the reservoirs with responsibility for the damages. Corps personnel acknowledged that reservoirs were created to serve interests below the dams, rarely those above (Annual Reports, 1906: 1449). They also countered that the Aitken area had benefited, not been injured, through reservoir operation (Annual Reports, 1906: 1458-1464).

From this and other long-running controversies it became apparent that the northern interests viewed the

reservoirs differently than interests in the Twin Cities (Kane, 1966: 160-163). In particular, Duluth businesses and industries wished greater competitiveness with the transportation systems of the Twin Cities. In Minneapolis and St Paul, reservoir supporters were the chief recipients of the competitive railroad routes encouraged by the presence of a navigable waterway, although in fact there was still a limited volume of traffic on the river. The opponents of the system lobbied for the abandonment of the reservoirs. De la Barre led the fight to "save the reservoirs from what he called a 'conspiracy' by an aggregation of men of influence and means notably Duluth business interests who wished to develop the water power potential of the St. Louis River" (Kane, 1966: 161). The Aitken controversy illustrated that measures intended to aid one aspect of river management--primarily navigation--sometimes had a negative impact on others. The Corps of Engineers summarized the opposing interests:

The reservoirs affect seven more or less conflicting interests--steamboat navigation below Minneapolis, steamboat navigation above Minneapolis, logging, mills between Minneapolis and Brainerd, mills above Brainerd, riparian owners below the dams, and riparian owners above the dams. Under the above system every one of these seven different interests is benefitted, except the riparian owners above the dams who have been, or will be, compensated in cash, but of course no one of these interests is benefitted as much as it might be if the reservoirs were operated exclusively for the benefit of that one regardless of the welfare of all the others...(Annual Reports, 1906: 1471).

Unlike lumbering interests, agricultural interests did not decrease in importance over time, and conflicts over water levels between the Corps, farmers, and Indian wild rice growers continued into the 1960s. (Bemidji Center for Environmental Studies, 1973:DXII:15, 16).

The Six-Foot Channel: 1907-1930

A six-foot channel between St. Paul and the mouth of the Missouri River was recommended by the River and Harbors Act of 1905. The objective was to secure a greater river depth to counteract the growing decline of river traffic. The four and one-half foot channel was not yet completed, but the six-foot channel was authorized in 1907 at a cost of \$20 million dollars, part of the largest river and harbor bill yet passed (Gjerde, 1983:70). A variety of transportation issues, including wartime commerce, the Panama Canal, the development of a new fleet of river boats and changing views of the government's role in river management were prominent issues during this period

(Gjerde, 1983:70-102). Despite improvements to the channel, including the construction of Lock and Dam No. 1. (1917), commercial traffic on the Upper Mississippi declined and there was an upsurge in recreational boating (Merritt, 1979: 157).

Twentieth Century Headwaters Improvements

In 1898, the timber outlet structures at Winnibigoshish and Leech Lakes were found to be rotted, unsafe, and inoperable (Annual Reports, 1898: 1812-1816). Between 1899 and 1909 all of the timber outlet structures on the Headwaters reservoirs dams were replaced with concrete, and the reconstruction included a new navigation lock at Sandy Lake. By this time, road construction and new settlement had progressed in the vicinity of the damsites and made concrete construction more feasible. The job was not without hazard. The assistant engineer at the Winnibigoshish reconstruction died in October, 1899 of typhoid fever contracted at the site (Annual Reports, 1900: 2792).

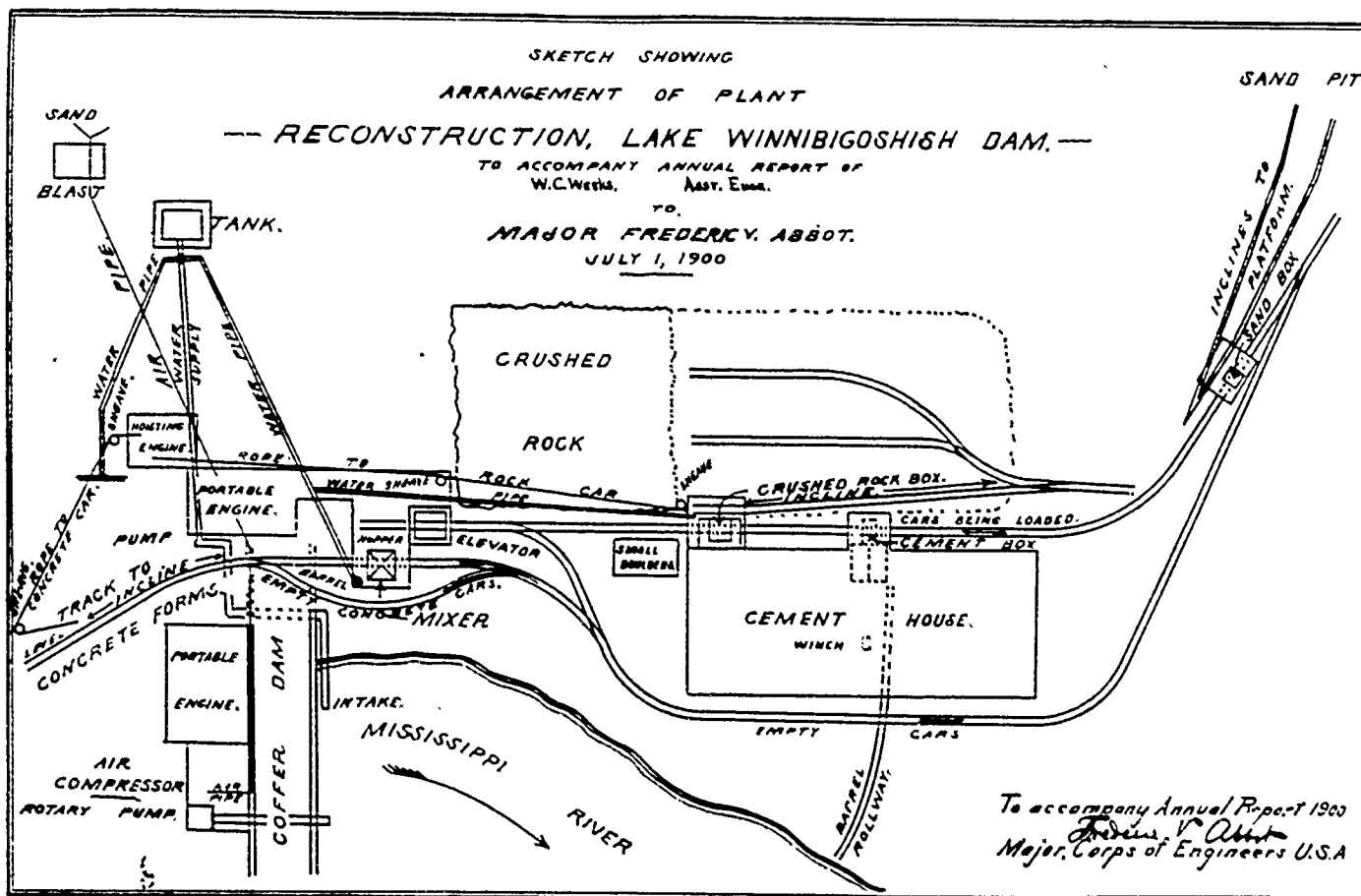
As reconstructed, the dams have earthen dikes with timber diaphragms and slopes protected with sod and stone riprap; at Winnibigoshish, the dike has a concrete slab. The outlet structures are of reinforced concrete resting on timber piles; at Pokegama, the dam is built on quartzite outcrop. The discharge from the rebuilt outlet structures was originally controlled by stop logs or Tainter gates. Equipment was efficiently moved from site to site, as was the practice during the initial construction. The reconstruction was directed much like the original construction, with shared resources and a comprehensive work system (Figures 5-8). While the Corps had initially supplied or contracted all of the labor and materials for the original dams, it appears that a number of outside contractors were used on the reconstruction projects, particularly to supply materials such as sand.

An extensive resurvey and mapping of the reservoirs was completed between 1900 and 1905 (Annual Reports, 1901: 2309). An additional reservoir dam at Gull Lake was authorized in 1907 and completed in 1912. It was made possible in part through the actions of Minneapolis miller John S. Pillsbury of the St. Anthony Falls Water Company, who deeded 995 acres of land at Gull Lake for the purpose (Kane, 1966: 159).

Despite the unique nature of the reservoir system and the controversy surrounding it, the engineering profession outside the Corps seems to have taken little note of the project. A survey of engineering and contracting periodicals between 1900 and 1915 did not locate significant mention of the Headwaters dams. No particular advances in engineering

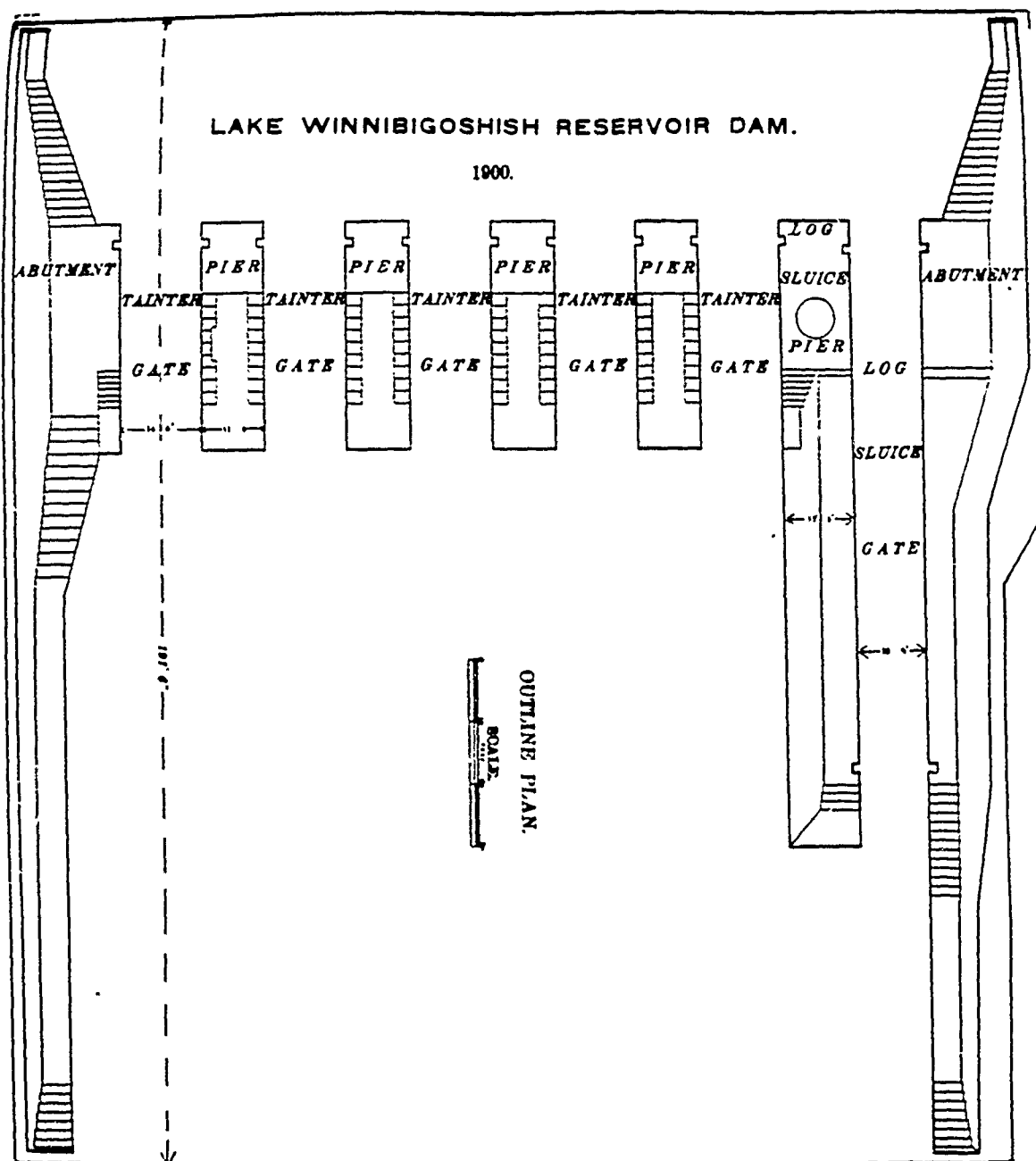


5. Reconstruction of Lake Winnibigoshish Dam, 1900. MHS photo.

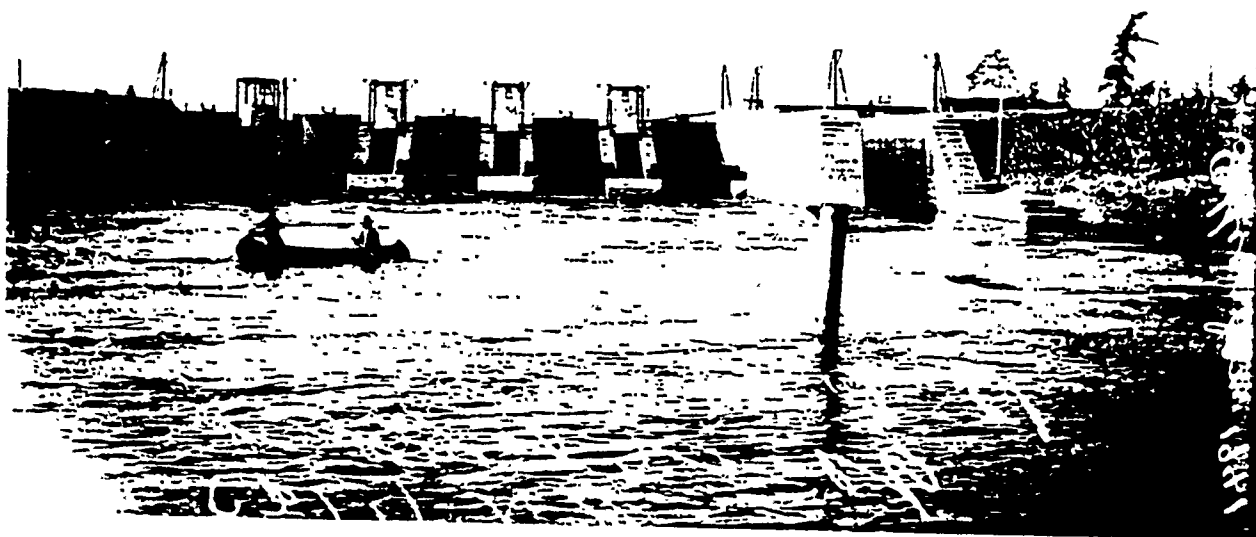


Eng 53 2

6. Sketch Showing Arrangement of Plant, Lake Winnibigoshish Dam, 1900. Source: Corps of Engineers.



7. Plan, Lake Winnibigoshish Dam, 1900. Source: Corps of Engineers.



8. After Reconstruction at Lake Winnibigoshish Dam, 1900. MHS photo.

appear to be represented by the reconstruction projects, or by the Gull Lake Dam of 1912. The integrity of their original design and construction, however, is evident in the relatively few repairs that have been required during the past seventy years or more of operation.

The reconstruction of the dams also included the construction of new dam tender's dwellings and other structures at the damsites. The rough buildings of the original phase of construction were removed from most sites, and more commodious, comfortable houses were erected. Electricity was supplied to the damsites between 1918 and 1925.

Private interests lobbied for additional reservoirs. However, of the 41 originally envisioned by Major Warren in 1870, only that created by the Gull Lake Dam was authorized. This was largely because the existing dams proved adequate. It was also found that many streams in Wisconsin were controlled by lumbermen, who held exclusive rights to the streams and had built fairly extensive log dams (Annual Reports, 1887: 1681).

Lumbering

At the turn of the century, lumber interests played an increasing role in the management of the dam discharge levels. Lumbering became the major economic interest assisted by the Headwaters reservoirs (Bemidji Center for Environmental Studies, 1973:DXII6). Logs sluiced through the dams were officially considered to be a form of navigation. Through deforestation and the loggers' construction of dams on tributaries, floods were greatly aggravated, but as Merritt notes, few citizens complained because of the employment provided by the industry (Merritt, 1979:101).

Lumber was a primary industry in the Headwaters area from about 1880 to 1915. Logging declined sharply after about 1912, but in 1904 over 6,000,000 logs were floated down the Mississippi above St. Paul (Annual Reports, 1906: 1465). In the late 1880s, the Corps reported that "the operations of the reservoirs in the interest of navigation are much impeded by the actions of lumbermen, who build dams at the outlets of lakes or on streams tributary to the Mississippi River in order to gather water for driving their logs" (Annual Reports, 1887: 1669-70). The impact on any single dam was small, but cumulatively, the loggers' dams affected the level of the river, requiring more discharge to keep up the desired level (Annual Report, 1892: 1830). The first operating rules issued in 1889 provided for the sluicing of log drives of less than 3,000,000 board feet if they were accompanied by a work force and did not interfere with other navigation (Endicott, 1889).

of the dam tender has been recognized by the ongoing effort of the St. Paul District to record oral histories of former and current dam tenders. To date, five dam tenders and two spouses of dam tenders have been interviewed. The employment period of this group covers the years 1947-1985. The results of this work will be useful in further study of the dwellings, as well as in evaluating the presence of the Corps in the Headwaters region over the past one-hundred years. As noted in the "Phase II Final Report of the Mississippi Headwaters Reservoirs Oral History Interviews," interview data from former Corps personnel at the damsites provides an opportunity to study the Corps activities in relation to other aspects of Minnesota history. Related developments and themes include fishing and trapping, lumbering, wild rice culture, resort and recreational development, transportation and agriculture (Blatti, 1987, 12-17).

Lake Winnibigoshish Dam

Dam

The Lake Winnibigoshish Dam is located on the Mississippi River at the outlet of Lake Winnibigoshish in southwestern Itasca County. The Winnibigoshish reservoir is the largest in the Mississippi Headwaters system and controls the runoff from a 1442 square-mile drainage area containing 28 lakes. Winnibigoshish is 408 river miles above St. Paul.

In 1880, Congress authorized the construction of the Winnibigoshish Dam as a test project. The first of six in the Mississippi Headwaters region, the dam was begun in 1881 and put into operation in 1884. The design is attributed to Major Charles Allen, and appears to be based on a study of individual reservoirs in Great Britain and the U.S.

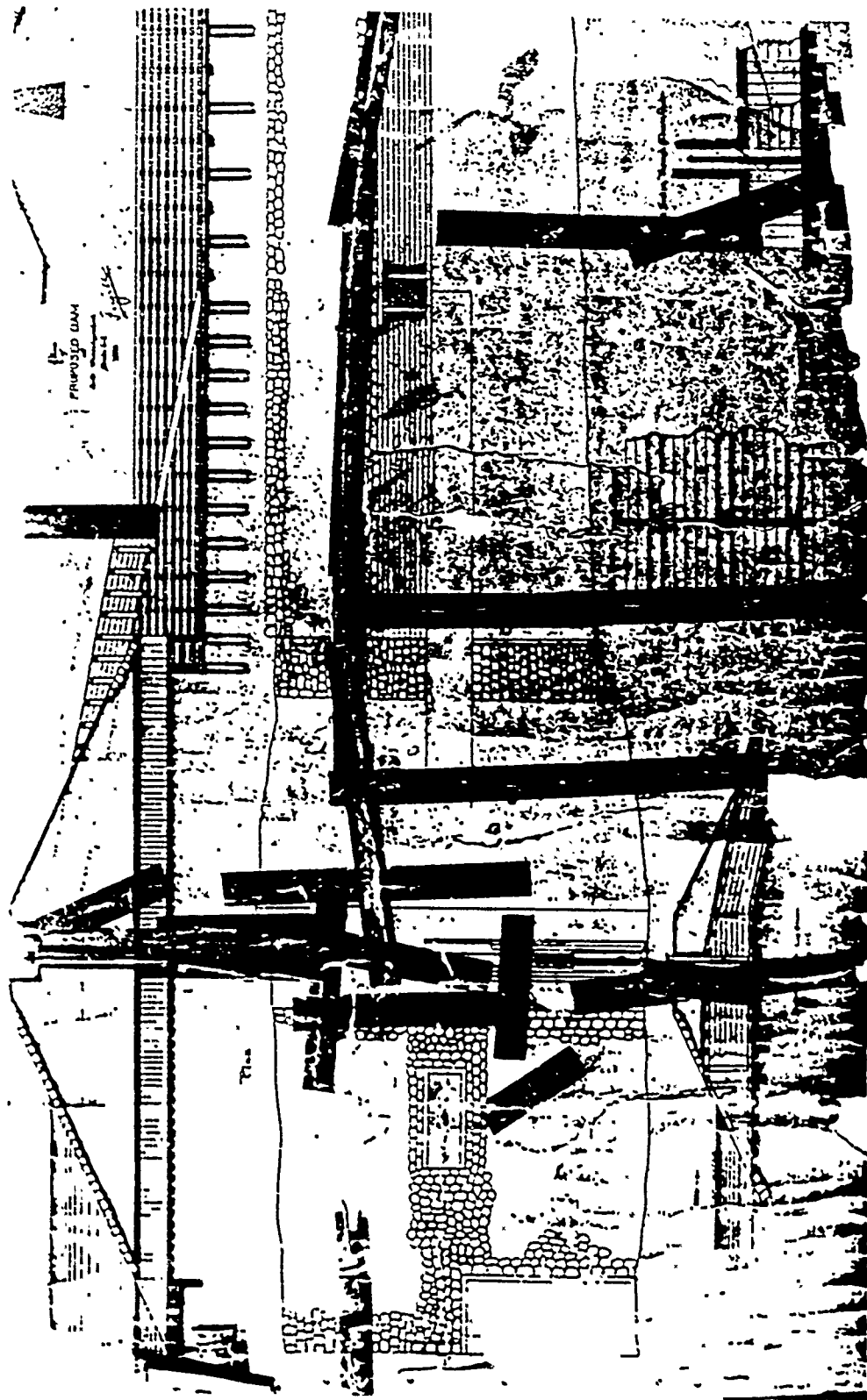
Construction delays at this site, like those at many of the other sites, were caused by logging operations, labor and material shortages, weather problems, and the difficulties of constructing roads and installing machinery in near-wilderness conditions. 300 skilled and unskilled laborers were employed on the project, including local Chippewa.

The original timber dam contained 20 5-foot sluices and one 6-foot log sluice. The sluices were operated by timber gates which worked in grooves and were controlled by hoisting machines (Figure 11).

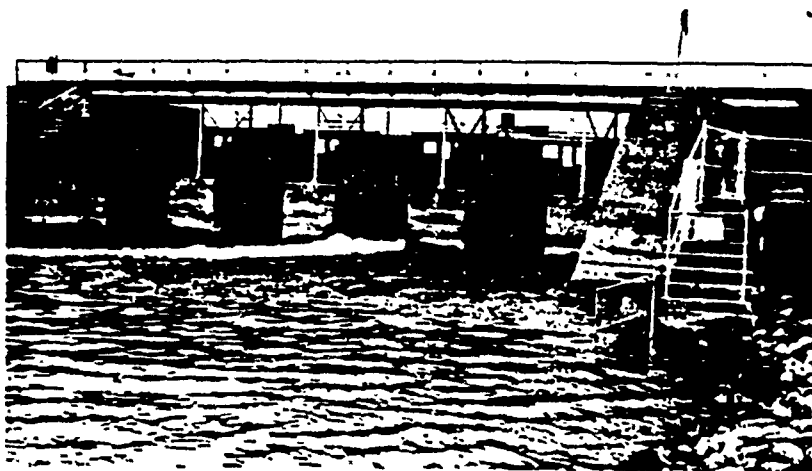
The present structure was constructed between 1899 and 1900 with concrete containing Saylor's Portland Cement. The dam consists of an 800' earthen dike with a timber diaphragm core filled with puddled clay. It is capped with sod, and protected by stone riprap and a concrete slab (Figure 12).

The control structure is constructed of reinforced concrete abutments and piers footed with timber piles set in clay. The total length between abutments is 162 feet. 5 14-foot sluiceways are divided into 3 sections with stop logs. A 12-foot log sluice and a 5-foot fishway were constructed in 1912-14 but are no longer in use. In 1931, the original steel Tainter gates, wooden reversed Parker bear-trap gate in the log sluice, and operating machinery were removed and replaced with stop logs (Figures 13, 14). In 1966, the stop logs in the five 14-foot sluiceways were fitted with slide gates. The timber spillway aprons were replaced with concrete in 1964-66.

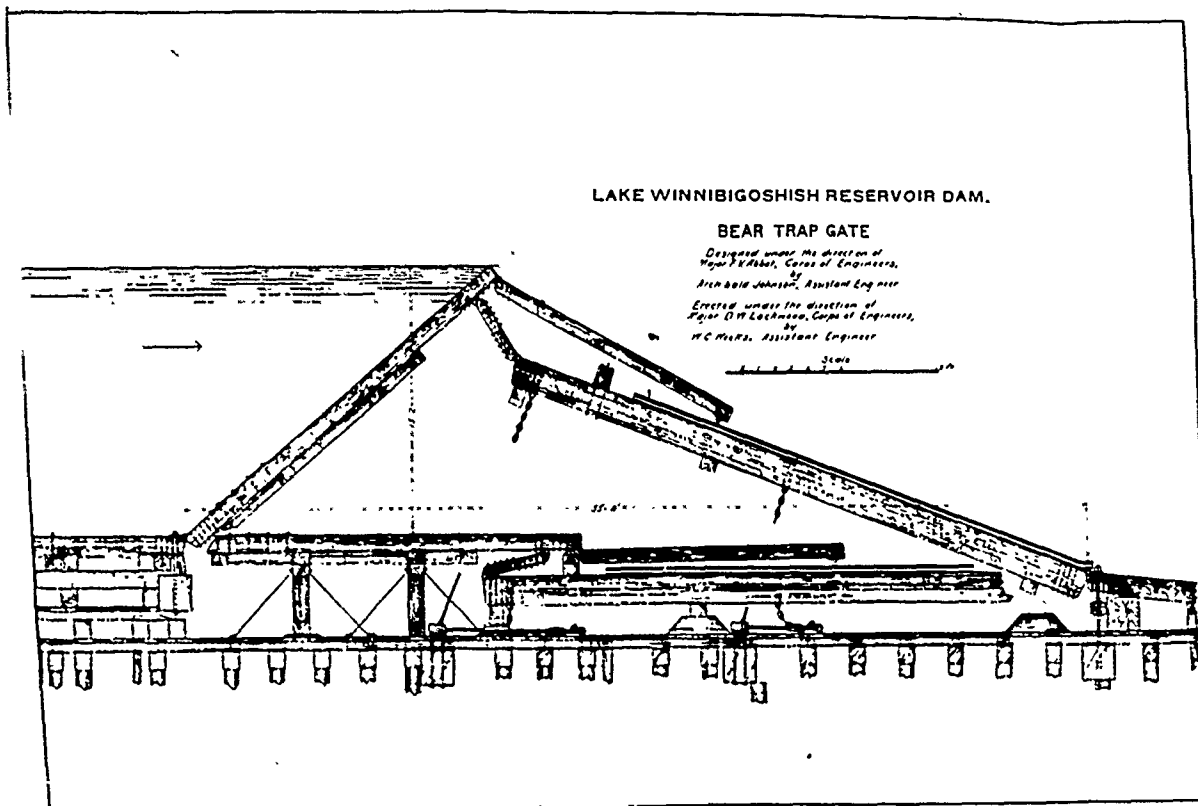
The control structure supports a 20-foot wide highway bridge (County Road 9). This timber-decked bridge was constructed in 1934 and replaced a structure dating from 1909.



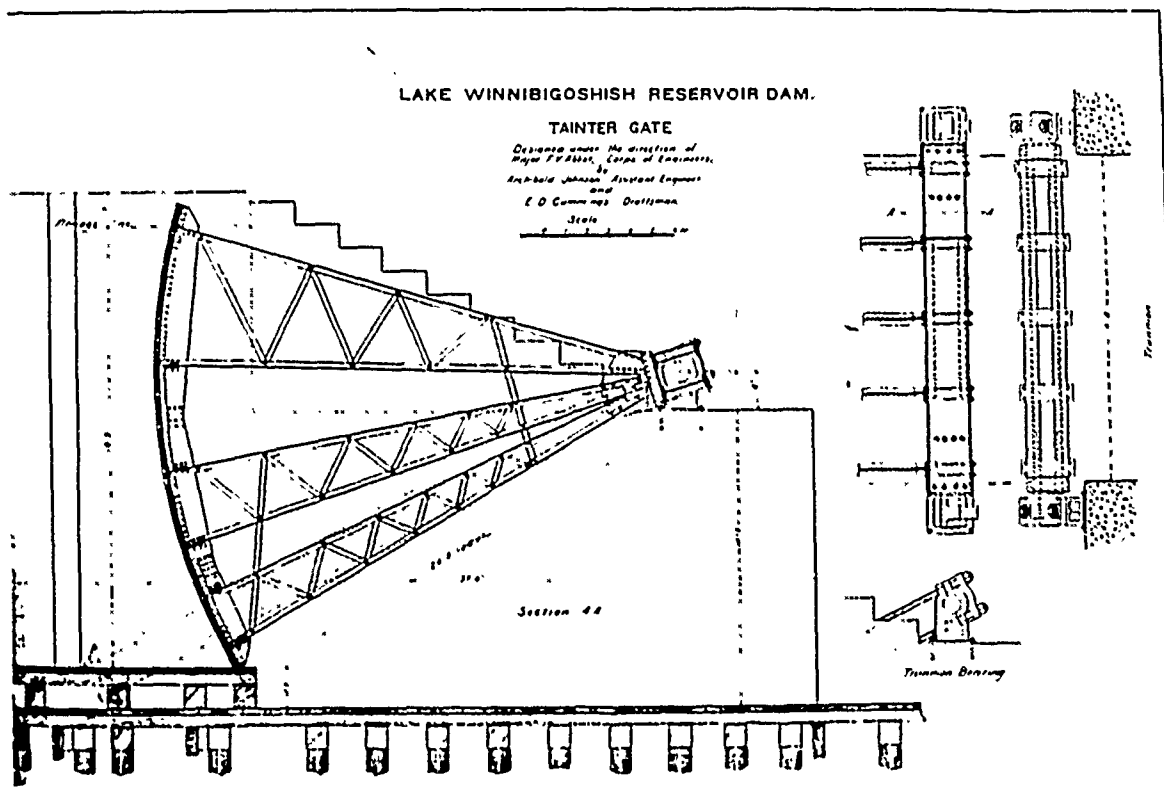
11. Plan for the Timber Dam at Winnibigoshish, 1880. Source: Corps of Engineers.



12. View of Winnibigoshish Dam, north elevation. 1987.



13. Bear Trap Gate at Winnibigoshish Dam, ca. 1881. Source: Corps of Engineers.



14. Tainter Gate at Winnibigoshish Dam, ca. 1881. Source: Corps of Engineers.

Dam Tender's Dwelling

The dam tender's dwelling, dating from 1901, is the only remaining building of a complex of buildings erected on a rise north of the dam between 1901 and 1913 (Figure 15). A modern maintenance building and warehouse and shop occupy the approximate site of a former storehouse.

The one story, eight-room dwelling is of frame construction and is sided with asbestos shingles. A photograph of 1903 shows that the original siding was clapboard (Figure 16). The building rests on a poured concrete foundation above a partial cellar. The materials for the concrete, as noted in the 1901 Annual Report, were left over from the dam construction. A low-pitched hipped roof is covered in asphalt shingles. The roof was originally covered with standing-seam metal.

The small front porch has scalloped trim and simple wooden posts and balusters. The six-over-six, double hung sash of the original windows has been replaced with one-over-one units. There is a glazed transom over the entry.

The dwelling is the simplest of bungalow designs, in exterior and interior treatments. The original plan consisted of the office, kitchen, dining room, large entry hall, and four bedrooms. Plumbing and heating were added sometime after 1910.

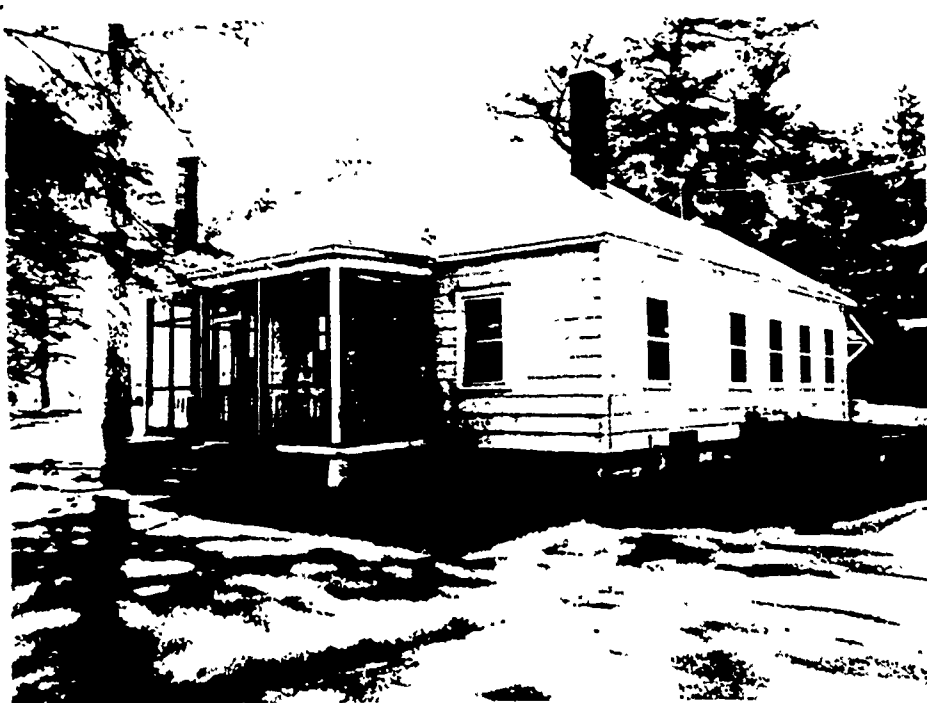
At the interior, there are very simple window surrounds and five-panel doors. A brick fireplace surround was added to a corner of the living room at an unknown date. This room was designated as an office on a remodeling plan of 1910.

That the dam tender's dwellings were constructed with spartan budgets is evident at Winnibigoshish, where an attempt was apparently made to recycle the previous house of 1882 into the structure of 1901. According to the 1901 Annual Report, the materials of an earlier dam tender's house and a kitchen and dining hall were re-used in the construction of the present building. These buildings were located across the channel, on the western shore of the outlet. The 1882 Annual Report listed an 18'x 24' kitchen and a 24' x 40' "eating house" among the original buildings on the west shore Corps site, but indicates that they were of log construction. The plan of 1910 does not suggest how earlier components might have been adapted to the new building (Figure 17).

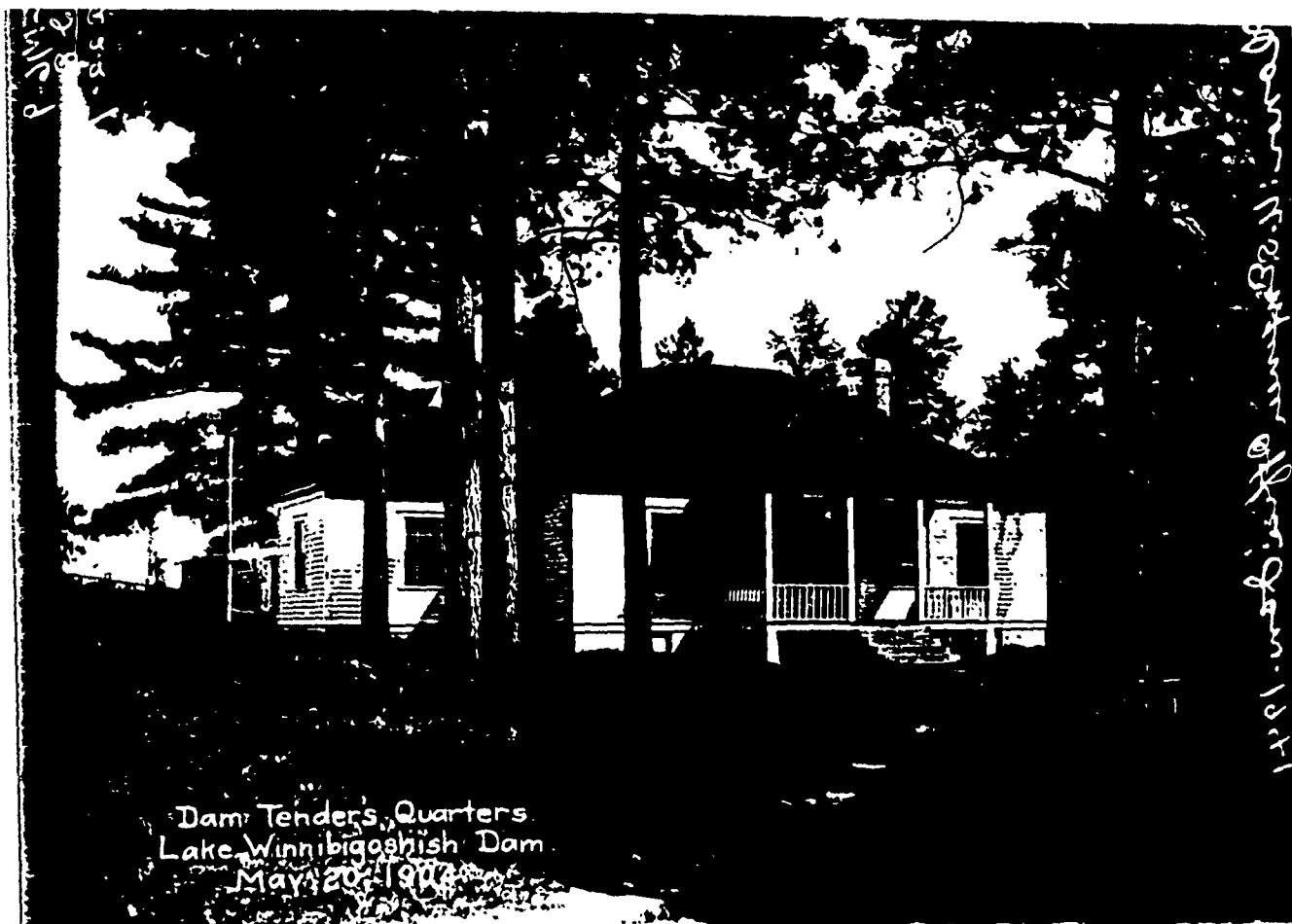
Although in need of maintenance, this house is not seriously deteriorated, and retains much of the original integrity of its sturdy, simple design. As previously noted, the dam tender's house and the Winnibigoshish Dam were listed on the National Register of Historic Places in 1982. The nomination cited the significance of the dam as its association with the first and largest reservoir in the Upper Mississippi Headwaters reservoir system.



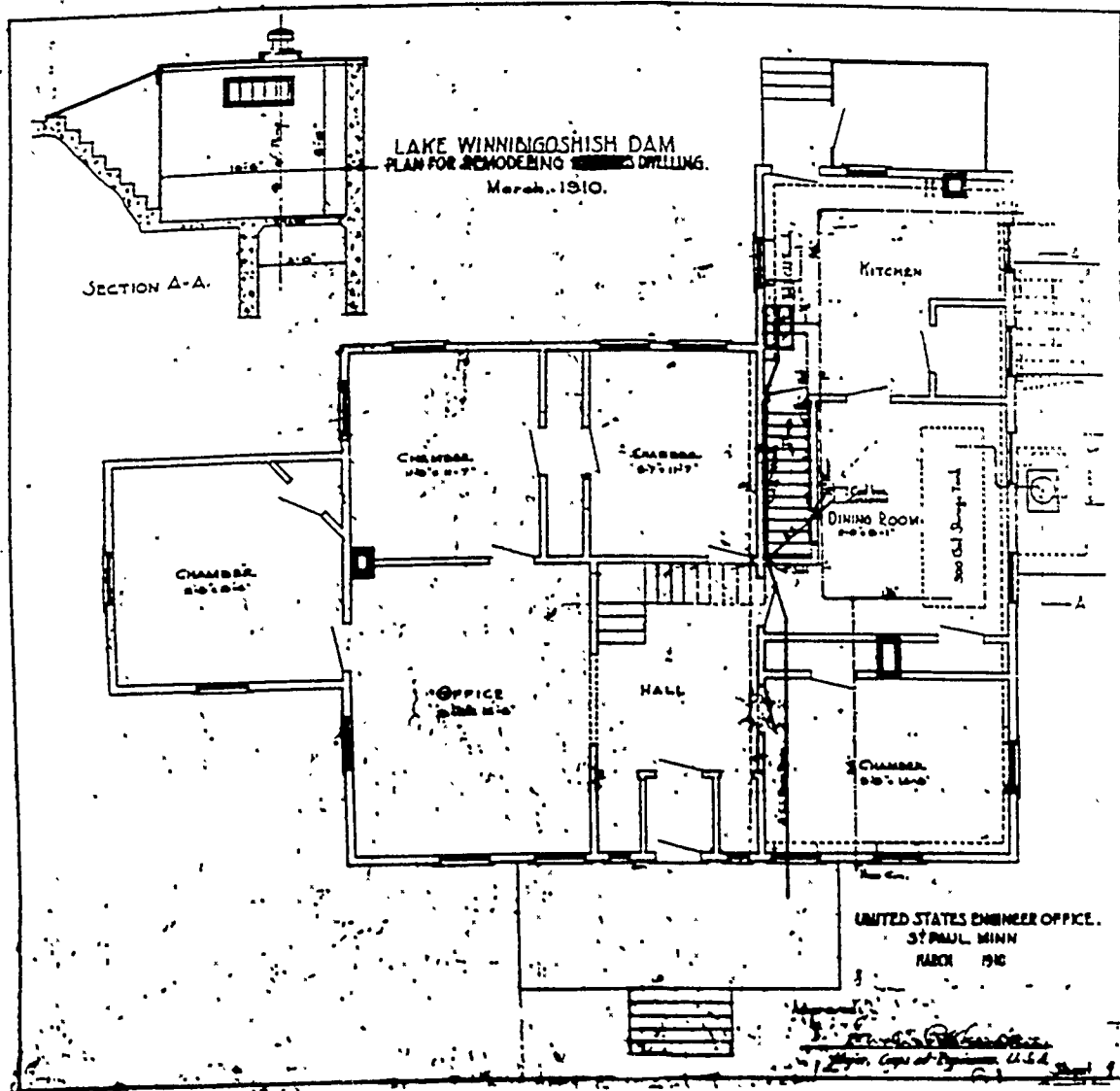
15. Dam Tender's Dwelling at Lake Winnibigoshish Dam.
 South and east elevations, 1987 (top).
 Dam Tender's Dwelling at Lake Winnibigoshish Dam.
 South and west elevations, 1987 (bottom).



15. Dam Tender's Dwelling at Lake Winnibigoshish Dam.
 South and east elevations, 1987 (top).
 Dam Tender's Dwelling at Lake Winnibigoshish Dam.
 South and west elevations, 1987 (bottom).



16. Dam Tender's Dwelling at Lake Winnibigoshish Dam, 1904.
MHS photo.



17. Plan for Remodeling the Dwelling at Lake Winnibigoshish Dam, 1910. Source: Corps of Engineers.

Apart from the concrete dam, the dam tender's dwelling at Winnibigoshish is the only evidence early Corps activity at this site, and is among the oldest dwellings in the area. The 1977 Master Plan for the development of the recreational area across County Road 9 noted that "the dam operator's residence is in physically good condition, but the style and character does not fit the image of a woodsy campground and recreational facility" (Master Plan, 1977:66). This statement ignores the considerable significance of the historic building to the present and future interpretation of the site. To a greater degree than at the other sites, Winnibigoshish represents the early presence of the federal government in a remote area, one where Native Americans constituted the largest population group.

Archaeological Surveys

The Environmental Review of the Headwaters of the Mississippi Projects (1973) noted that an important mound group site was located on the east side of the former, narrow river channel (Dam Bay) immediately adjacent to the dam. This site has been identified as 21 IC 4.

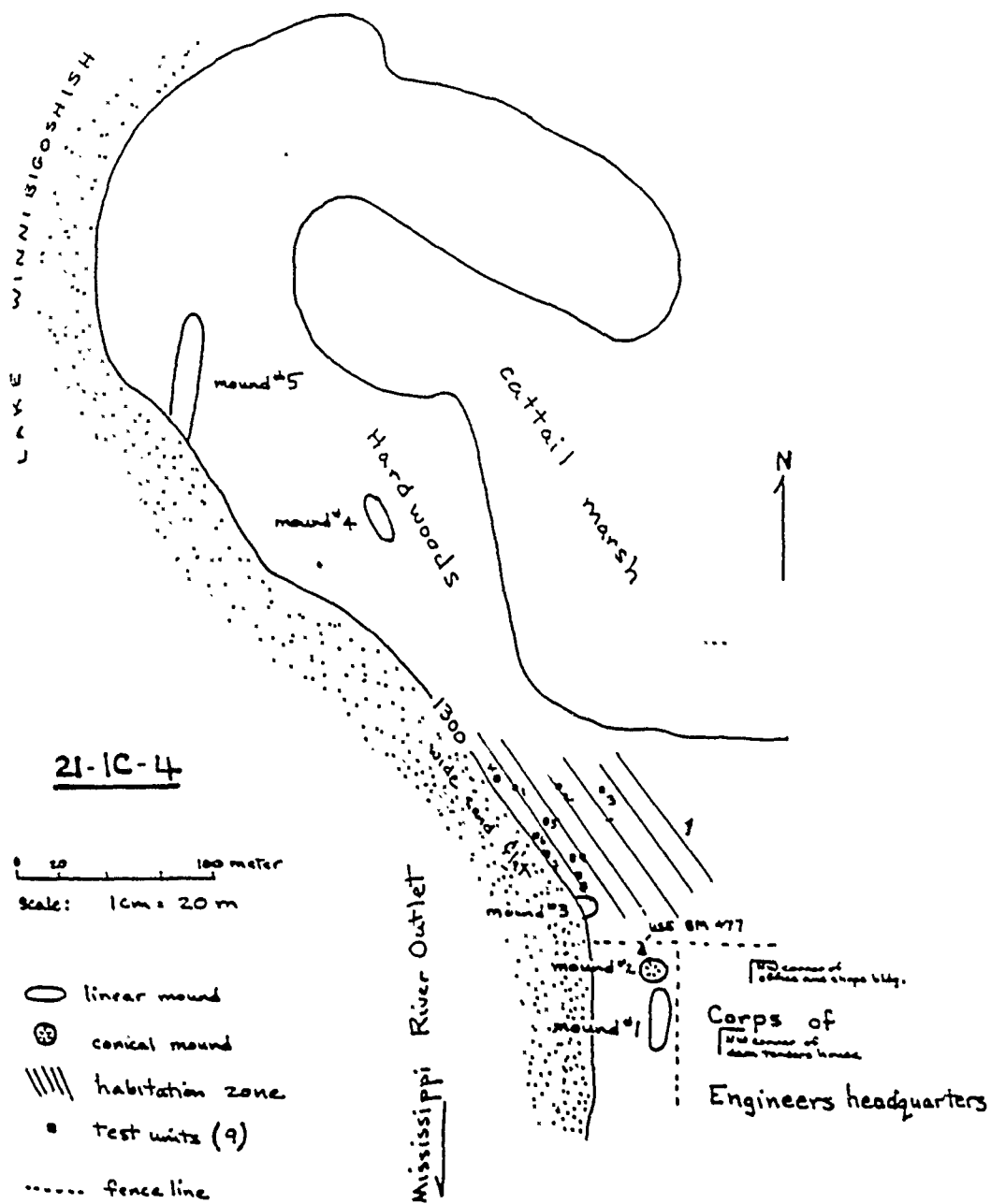
In 1977, an archaeological survey of the shoreline of Winnibigoshish Lake was conducted by Johnson, et. al. Excavations were conducted at the dam site in 1978 by Johnson and Schaaf. In 1985, Brew expanded information about site 21 IC 4.

21 IC 4 is a multicomponent site with prehistoric linear burial mounds, a prehistoric habitation area, and some evidence of historic period fur trade, logging, and dam construction activity. Dam construction destroyed a portion of the site. There are five mounds. Mound 1, a linear mound, and 2, a conical mound, are in a grassy area maintained by Corps personnel (Figure 18).

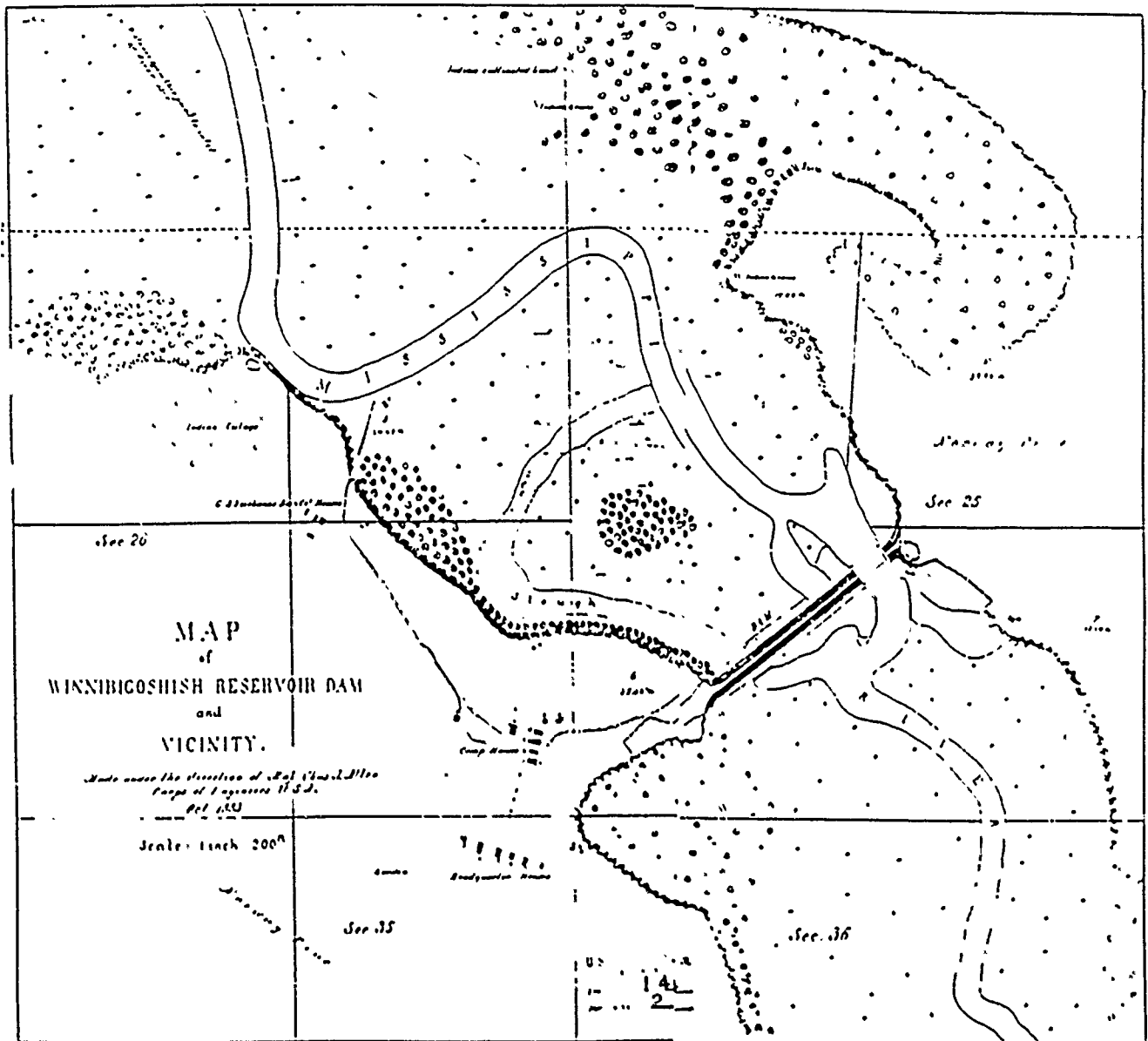
21 IC 4 was determined to be eligible for the National Register (Johnson, 1977: 46-48).

Historic

The Map of Winnibigoshish Reservoir Dam and Vicinity (1883), prepared under the direction of Major Charles J. Allen of the Corps of Engineers, shows the approximate location of 21 IC 4 on the west bank of the river in sections 25 and 35 (Figure 19). Although well-removed from the current study area, the site of a store (the establishment of G.A. Fairbanks) and an Indian village shown near the western bank in section 27 are also of interest. Johnson (1977) and Brew (1985) reported on these west bank sites. The fur trading post (21 IC 41) contains the remains of three or four house foundations, possibly those of the American Fur Company (Johnson, 1977). The



18. Map of 21 IC 4. Mounds 1 and 2 are near the dam tender's dwelling. Source: Johnson, et.al. Cultural Resources Investigation of Lands Adjacent to Lake Winnibigoshish. Minneapolis: Archaeology Laboratory, University of Minnesota, 1977.



19. Map of Winnibigoshish Reservoir Dam and Vicinity, 1883.
Source: Corps of Engineers.

village, in or near the 21 CA 59 locus, could not be located by Brew (1985).

Seventeen buildings constructed during the first phase of dam construction, apparently those enumerated in the 1882 Annual Report, are shown in section 35 on the 1883 map (Annual Reports, 1882:1832). With the exception of an office constructed of rough boards, all the buildings were constructed of log with tarpaper-covered roofs. The office was intended for conversion to a dam tender's quarters. It was described in the 1901 Annual Report as large and well constructed.

The original dam tender's dwelling, on the west bank of the channel, was nearly one-half mile from the dam. The inconvenience of the site apparently contributed to the decision to construct a new dwelling after the dam reconstruction. No debris from the first complex was found by Brew, primarily because the exact location was not excavated (1985:33).

In 1929, the dam site complex included the dwelling (1901), an office (ca. 1913), two shops, various barns and haysheds, an outhouse, ice house and a root house. The root house was apparently built into the linear burial mound (Figure 20). A building constructed as a cement shed for the dam reconstruction and later used as a warehouse was located across County Road 9 to the south. The one-story, three-room office adjacent to the house was finished in stucco. Today there is no visual evidence of any of these buildings, such as foundation marks, remaining on the site.

Sources

Bemidji State College.

1973 Environmental Review of the Headwaters of the Mississippi Reservoir Projects. Bemidji:
Bemidji State College Center for Environmental Studies.

Brew, Alan P.

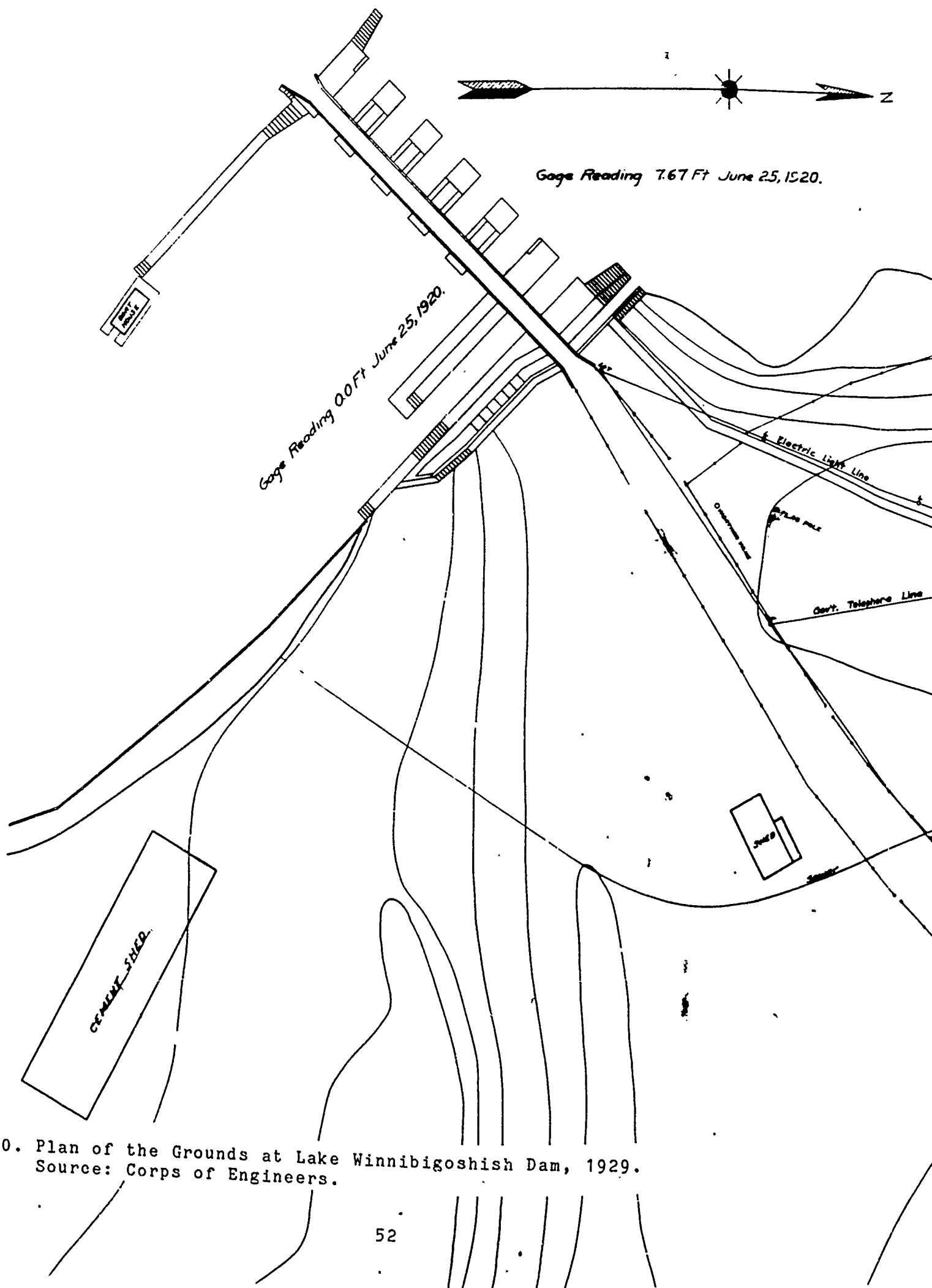
1985 A Cultural Resources Investigation of Archaeological Sites 21CA 59, 21 IC 19, and 21 IC 45 Lake Winnibigoshish, Minnesota. St. Paul District:
Corps of Engineers.

Department of the Army, Corps of Engineers.

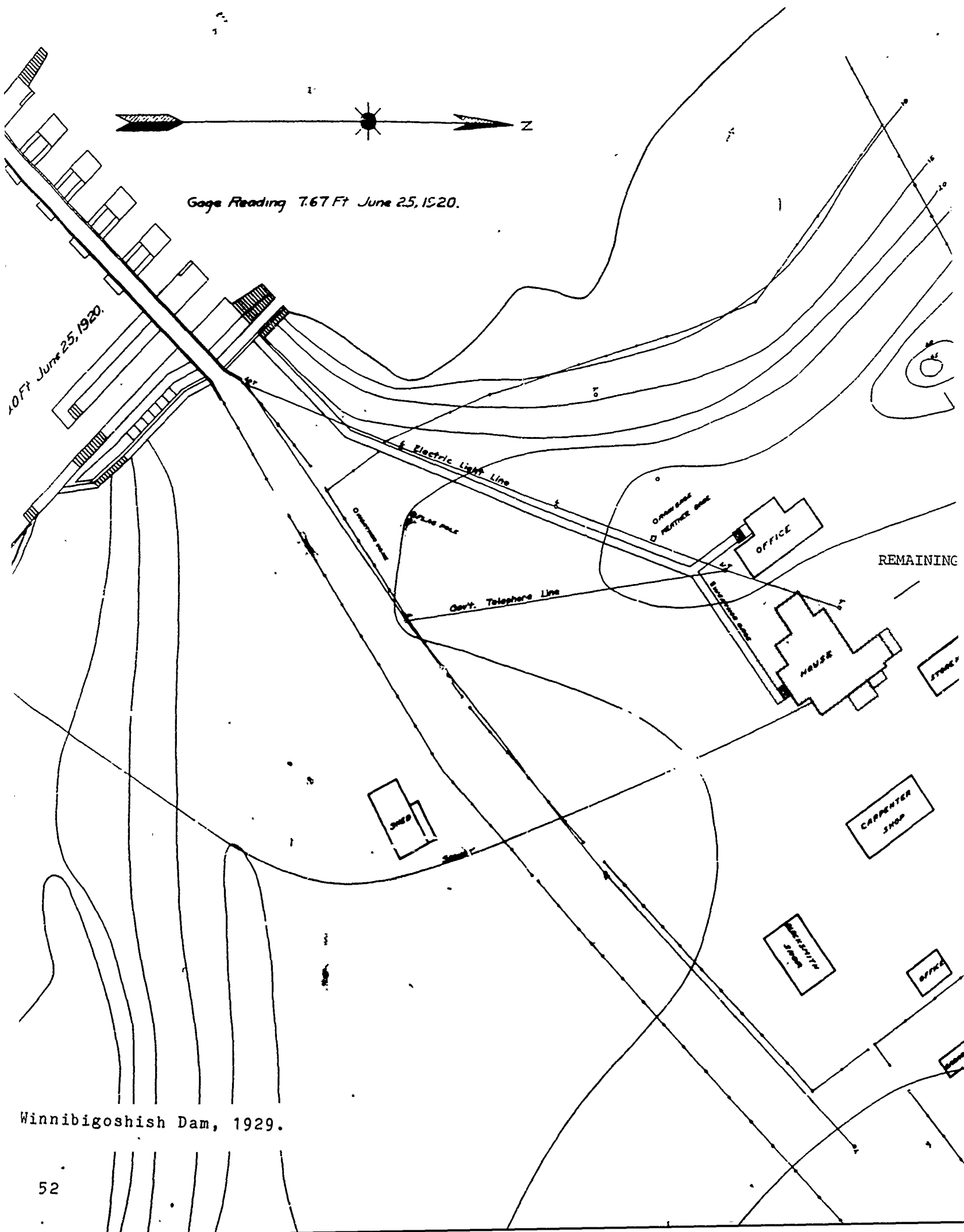
1963 Master Reservoir Regulation Manual for the Mississippi River Headwaters Reservoirs. St. Paul:
St. Paul District.

Johnson, Elden, Christina Harrison and Jeanne Schaaf.

1977 Cultural Resources Investigation of Lands Adjacent



20. Plan of the Grounds at Lake Winnibigoshish Dam, 1929.
Source: Corps of Engineers.



Winnibigoshish Dam, 1929.

Z

To determine elevation of contours referred
to sea level datum add 1290.08 (zero of gage)

BM 477
1320.40
1322.68

REMAINING BUILDING

OFFICE

HOUSE

CARPENTER
SHOP

WRECKED
SHOP

OFFICE

WRECKED
HOUSE

CHICKEN
COOP

WRECKED
HOUSE

WRECKED
HOUSE

WRECKED
HOUSE

BARN

WRECKED
HOUSE

Scale 1 in. = 30 Ft



N

to Lake Winnibigoshish. Minneapolis: Archeology
Laboratory, University of Minnesota.

Johnson, Elden and Jeanne Schaaf.

1978 Cultural Resource Inventory at the Lake
Winnibogoshish Dam Site 21 IC 4 Minneapolis:
Archaeology Laboratory, University of Minnesota.

Merritt, Raymond H.

1979 Creativity, Conflict and Controversy: A History of
the St. Paul District U.S. Army Corps of Engineers.
Washington, D.C.: U.S. Government Printing Office.

Minnesota Historical Society.

1981 National Register of Historic Places, Nomination
form. Winnibigoshish Lake Dam.

St. Paul District, U.S. Army Corps of Engineers.

Annual Reports

1882:1828-1833.
____. 1883:1455, 1461-1465, 1471-1476.
____. 1898:1812-1816.
____. 1900:2786-2806.
____. Winnibigoshish Dam map and plan files.

Photograph Collections

Minnesota Historical Society

St. Paul District, U.S. Army Corps of Engineers

Leech Lake Dam

Dam

The Leech Lake Dam is located on the Leech Lake River at the outlet of Leech Lake. It is 27 miles above the junction of the Leech Lake River and the Mississippi Rivers, and 410 river miles above St. Paul. The drainage area above the dam is 1,163 square miles.

The original dam was begun in 1882. It was completed in 1884 at a cost of \$171,805. The banks of the river are about 3,500 feet apart at the dam site, the largest span in the system. The original timber dam was 3,600 feet, including 2600 feet of embankment and 1,000 feet of timber dam on a pile foundation. The original control structure consisted of 125 sluice bays. The discharge was controlled by stop plank working in grooves. The design of Leech, like the other timber dams, was modelled on the first dam at Winnibigoshish.

By the spring of 1898, the timber structure was rotted, and the dam was not operated again until after reconstruction. Between 1900 and 1903, the timber abutments and bays were replaced by reinforced concrete. Saylor's Portland Cement was used in the project.

The reconstructed dam was originally 3,160 feet in length. The embankment has a timber diaphragm core filled with puddled clay. The 294-foot control structure consists of reinforced concrete abutments and piers supported by timber pilings. The sluiceways were fitted with stop logs closed by hand or by derricks with differential blocks. In 1926, the fishway was extended to provide for the passage of fish at low stages. After the loss of part of the control structure in 1957, the dike was increased to 3,314 feet and the sluiceways reduced to 26. In 1958, the timber apron was replaced with concrete, and in 1970, the slide gates were renewed. The dam carries a 20-foot roadway (Figure 21).

Dam Tender's Dwelling

The Leech Lake Dam tender's house was built between 1902 and 1904. It is currently unoccupied, but appears to be in generally sound condition (Figure 22).

The dwelling is oriented north, with a view of the dam and the wild rice marshes of Leech Lake. It is a ten-room, two-story building of frame construction and rests on a poured concrete foundation. The cellar has a poured concrete floor. Originally, there were three



21. Leech Lake Dam. West elevation, 1987.



22. Dam Tender's Dwelling at Leech Lake Dam. North elevation, 1987 (top).
Dam Tender's Dwelling at Leech Lake Dam. South and west elevations, 1987 (bottom).

brick chimneys, probably connected to stoves. A hot air furnace was installed in 1914. The gable roof is covered with asbestos cement shingles and the exterior walls are clad with conventional asbestos shingles. Early photographs indicate that the building was originally clapboard-sided (Figure 23). Narrow bargeboards at the gable ends have a simple incised design. For years the building was painted white with red trim; now the siding is gold, with brown trim.

Some original six-over-six, double-hung sash remains; the replacement sash is one-over-one (Figure 24). A glazed transom at the entry lights the central hall. Two sets of dormers at the second story and a shed-roofed front porch were part of the original design. The porch has a simple wooden balustrade and wooden posts with chamfered corners.

The design of the exterior of the house is very plain, with a very utilitarian appearance, and makes little reference to a particular style (Figure 25). The interior finishes and details are in some contrast to the exterior.

The first floor contains five rooms organized around a center hall. Three of the four upstairs bedrooms are very large and are evidence of the boarding and lodging facilities that the dam tender was expected to provide to visiting Army Corps personnel. At Leech Lake there was also a separate building for housing visitors.

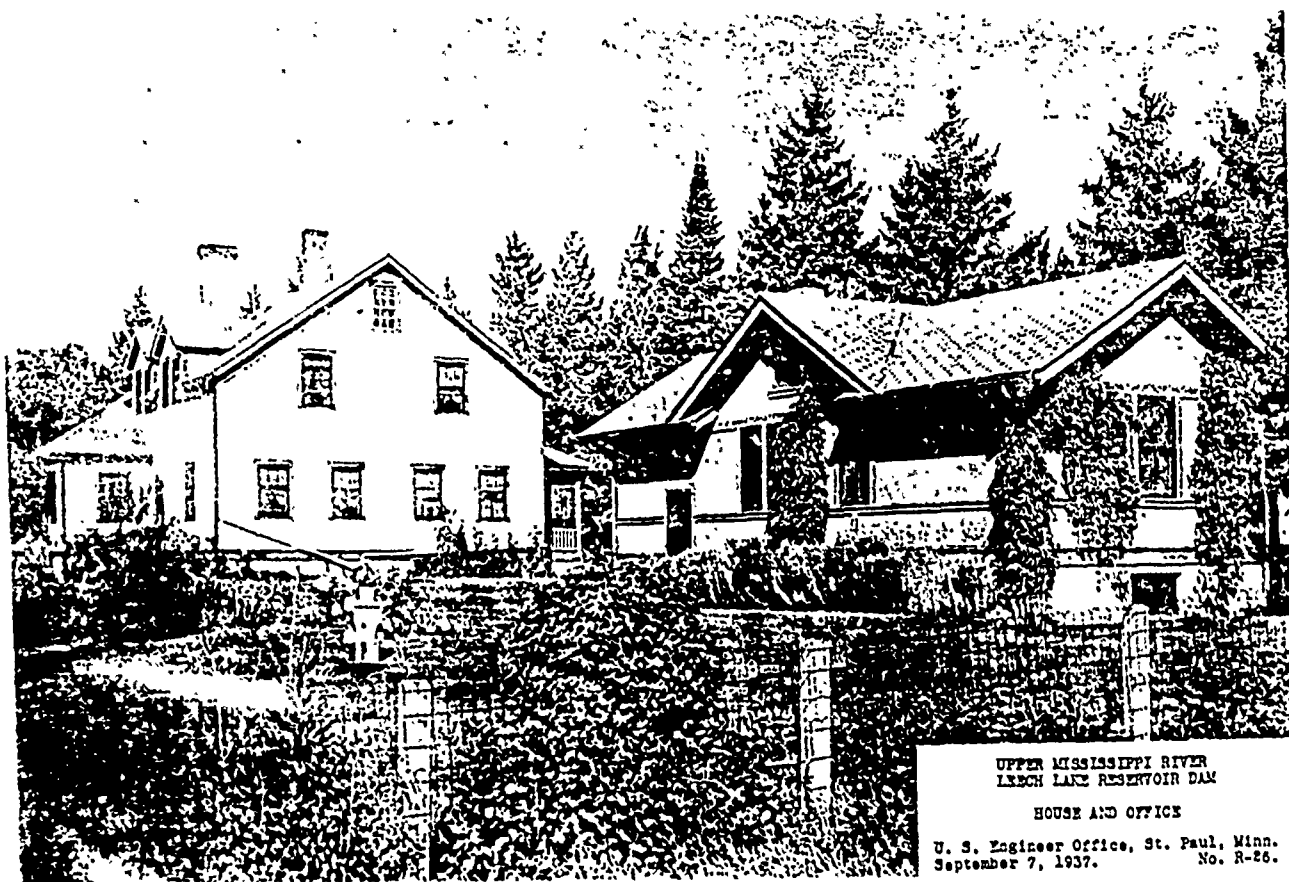
The door and baseboard moldings are of high profile and the door surrounds have rosettes at each corner. Their treatment is of standard character for late nineteenth-century millwork. The doors are four-panel, with simple hardware. Some tongue and groove wainscoting survives in the upstairs bathroom. The central staircase is in good condition, with a hardwood rail and turned balusters. Floors throughout are hardwood.

A searchlight, reportedly installed during World War II, is located at the north side of the dwelling.

Garage

A gable-roofed, frame garage dating from about 1910 is located to the south of the house. It is clad in asbestos shingles and wood. It retains its original wooden ventilator (Figure 26).

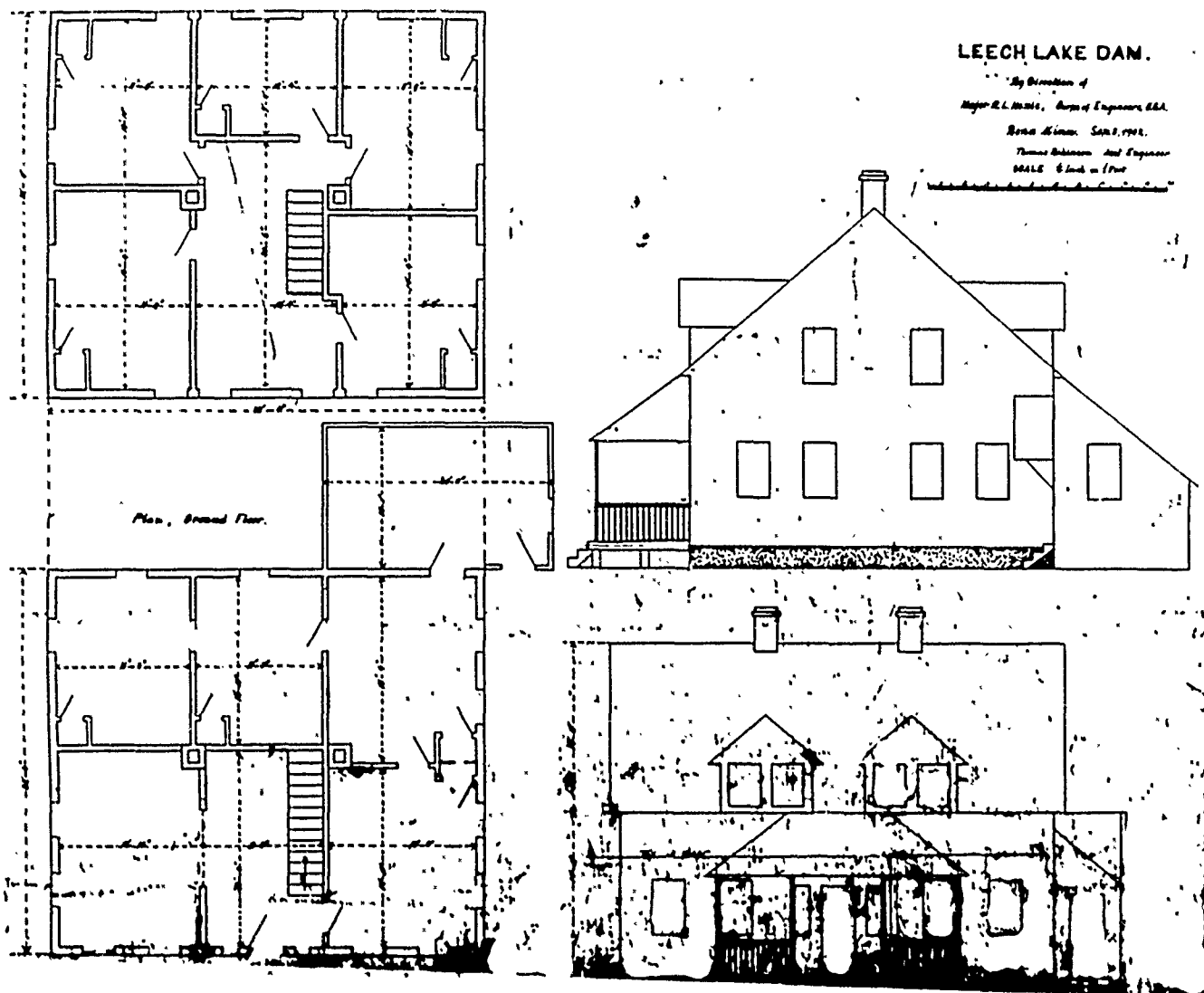
The dwelling and garage are the only surviving structures of the original Corps headquarters complex (Figure 10). A large modern shop building, smaller ancillary structures and a fenced storage area now occupy



23. Dam Tender's Dwelling at Leech Lake Dam, 1904. MHS photo (top).
Dam Tender's Dwelling and Office at Leech Lake Dam, 1937. MHS photo (bottom).



24. Dam Tender's Dwelling at Leech Lake Dam. Original sash with six-over-six lights, north elevation, 1987.



25. Plan of the Dam Tender's House at Leech Lake Dam, 1902.
 Source: Corps of Engineers.



26. South and east elevations of Dam Tender's House and
Garage at Leech Lake Dam, 1987.

a portion of the site.

The flood plain along the south side of the outlet channel above the dam is occupied by seasonal businesses, including fishing boat and bait concessions and a cafe. Much of the remainder of Corps-owned land has been developed into a public recreation area. Although few, if any, of these small buildings appear to be more than fifty years old, they occupy the site of early public facilities that are shown on a Corps site map of 1929 (Figure 27, 28). This area is likely the site of the beginnings of sport fishing and hunting on Leech Lake (Johnson, 1979: 155). The Corps first made this land available for public use about 1909.

Archaeological Surveys

The Environmental Review of the Headwaters of the Mississippi Reservoir Projects (1973) identified twenty-four sites at the Leech Lake Reservoir. None were located within the vicinity of the dam.

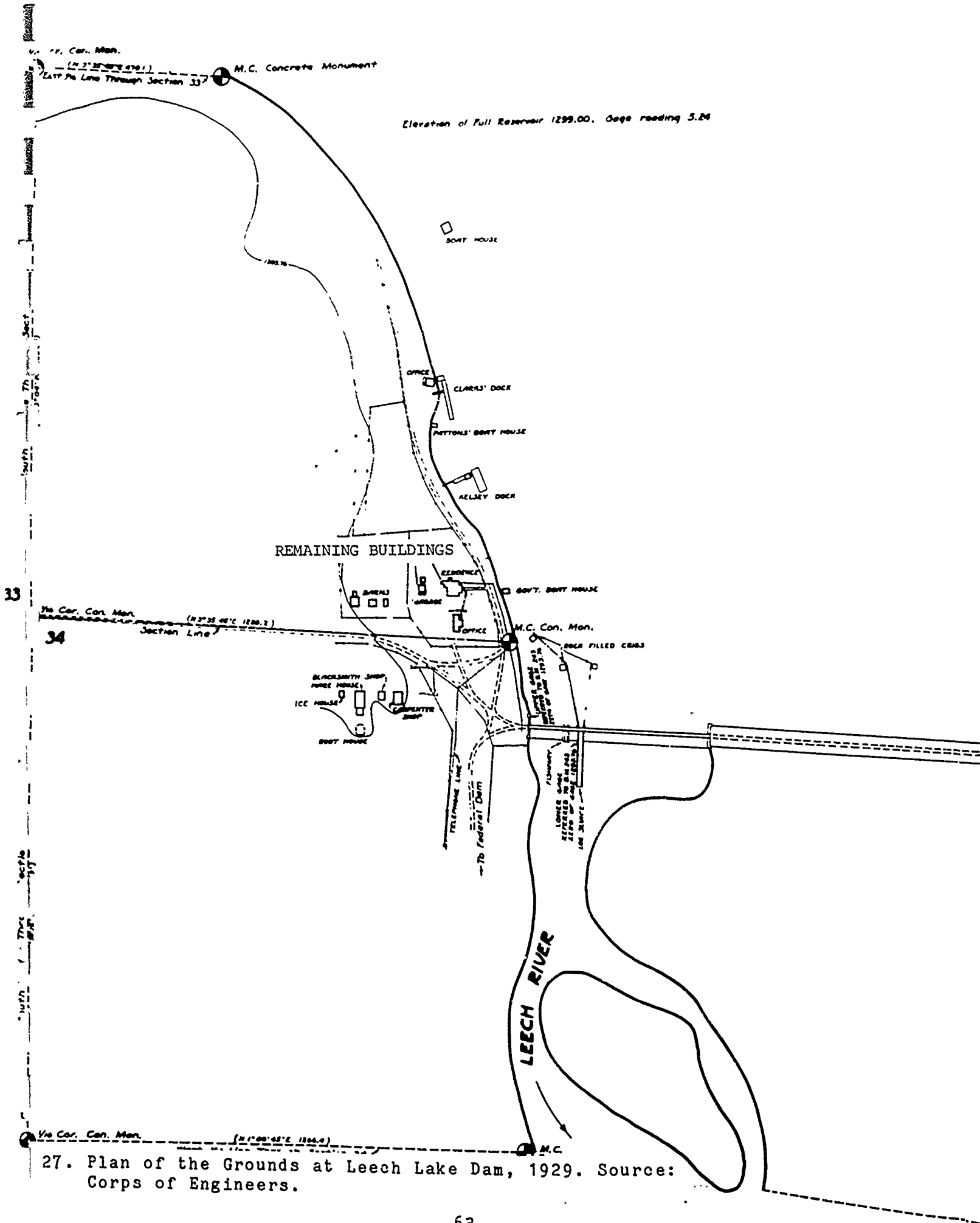
As reported by Johnson et al. in the Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pokegama (1979), there is no evidence of either prehistoric or historic cultural materials in the public recreation area at the dam site, and the report recommended no restriction on any construction activity (Johnson, 1979:155). This report noted that the Survey and Testing at Federal Dam, Leech Lake (1975) had identified a single isolated burial mound within the Corps headquarters area, but a copy of this study has not yet been located.

Historic

Between 1882 and 1883, five buildings were erected at the Leech Lake Dam site. A cookhouse, office, sleeping quarters, storehouse, and blacksmith shop were listed on the original roster. The nature of the accommodations that housed the dam tender until the construction of the present structure (1902-1904) were not reported in the Annual Reports.

By 1929, the site consisted of the present dam tender's dwelling, an office constructed in 1913, a garage, three barns, a blacksmith shop, warehouse, ice house, root house, and carpenter shop (Figures 27, 29). A government boat house was located opposite the dam tender's residence on the outlet channel.

Due to the construction of the public recreational area and new Corps buildings, the soil has been greatly disturbed. Apart from the dam tender's house and garage,



27. Plan of the Grounds at Leech Lake Dam, 1929. Source: Corps of Engineers.

of Full Reservoir 1299.00, Gage reading 5.24

WAT. HOUSE

CLARK'S DOCK

MRS. BENT HOUSE

WILLEY DOCK

GOVT. BENT HOUSE

M.C. Con. Man.

ROCK FILLED CRAB

LEACH RIVER

TO Federal Dam

M.C.

Dam, 1929. Source:

3

33 28

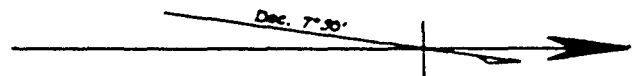
34 27

DIKE

Section Line

To Bridge

300 ft. to Car 3" from Plate



33 28

34 27

DIKE

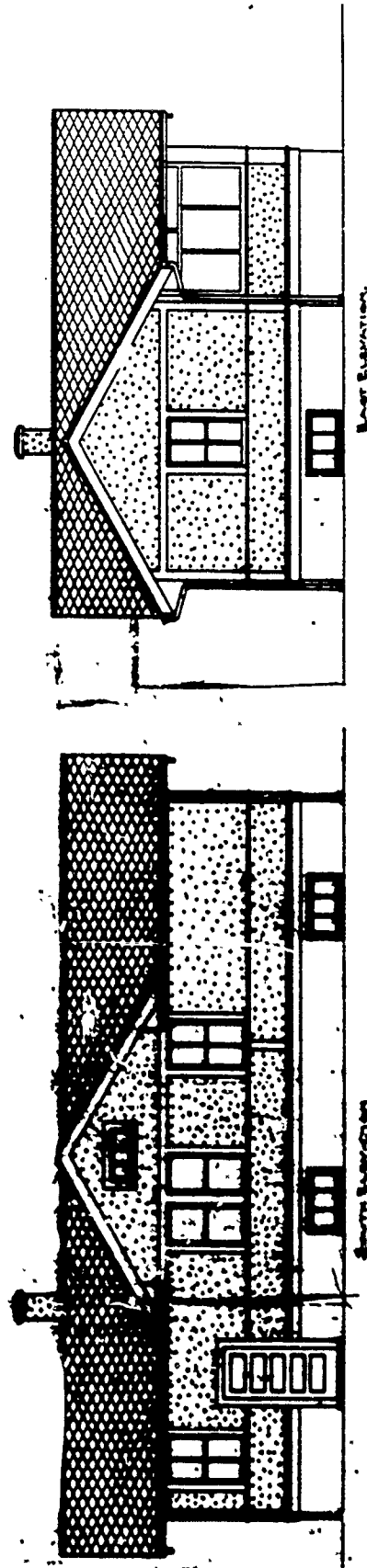
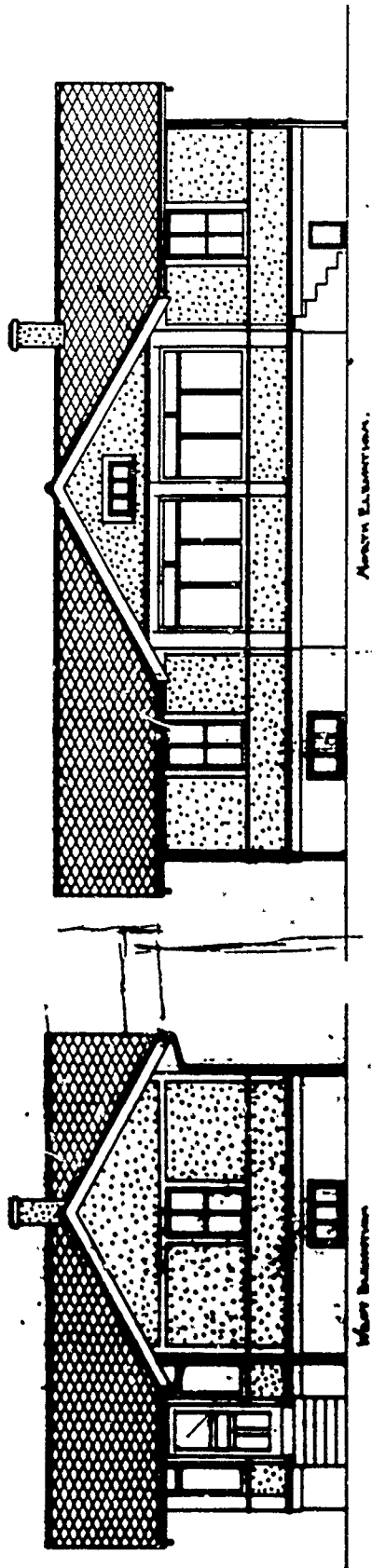
Section Line

M. S. P. & I. M. R. (See Map)

To South



28. Private concession at Leech Lake Dam, 1987.



U.S. ENGINEER OFFICE
ST. PAUL, MINN. APRIL 1913
Approved *W. L. P.*
LIEUT. COL. CORPS ENGINEERS U.S.A.

LAKE WINNIBIGOSHISH DAM
LEECH LAKE DAM
OFFICE BUILDING
1-68

29. Plan of Office Building at Leech Lake Dam, 1913. Source: Corps of Engineers. (This plan was also used at Winnibigoshish.)

there is no evidence of any of the above buildings.

Sources

Bemidji State College.

1973 Environmental Review of the Headwaters of the
Mississippi Reservoir Projects. Bemidji:
Bemidji State College Center for Environmental
Studies.

Department of the Army, Corps of Engineers.

1963 Master Reservoir Regulation Manual for the
Mississippi River Headwaters Reservoirs. St. Paul:
St. Paul District.

Johnson, Elden, Christina Harrison and Jeanne Schaaf.

1979 Cultural Resources Investigation of the Reservoir
Shorelines: Gull Lake, Leech Lake, Pine River and
Lake Pogkegama. Minneapolis: Archaeology
Laboratory, University of Minnesota.

Merritt, Raymond H.

1979 Creativity, Conflict and Controversy: A History of
the St. Paul District U.S. Army Corps of Engineers.
Washington, D. C.: U.S. Government Printing Office.

St. Paul District, U.S. Army Corps of Engineers. Annual
Reports. 1892, pp. 1829-1833.

- ____. 1898, pp. 1812-1816.
- ____. 1900, pp. 2787-2806.
- ____. 1901, pp. 2309-2327.
- ____. 1903, pp. 1528-1540.
- ____. Leech Lake map and plan files.

Photograph Collections

Minnesota Historical Society

Pokegama Lake

Dam

The Pokegama Lake Dam is located on the main stem of the Mississippi River in Itasca County three miles upstream of Grand Rapids, Minnesota, and 344 river miles above St. Paul. The drainage area above the dam is 3,265 square miles and includes areas controlled by the Winnibigoshish and Leech Lake reservoirs. The actual area above the Pokegama Dam is 660 square miles. Pokegama is the distributing reservoir for the two upper reservoirs, which pass through this dam.

The original dam was begun in 1882 and put into operation in 1885, the third on the Mississippi Headwaters. Renovations in concrete, which contained Universal Portland Cement, were completed in 1904 (Figure 30). The general construction features resemble those at the Winnibigoshish and Leech Lake Dams.

The dam consists of two earth-filled dikes with timber diaphragms filled with puddled clay. The east dike is 100 feet long, the west 60 feet in length. The dikes are built on the quartzite outcrop that occurs in this area.

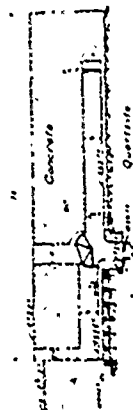
The concrete control structure is 225 feet in length. It contains 13 8-foot sluiceways and one 12-foot log sluice. The original bear trap and Tainter gates have been removed and are controlled by slide gates installed in 1969 (Figure 31).

Other Structures

All early Corps buildings, including the dam tender's house, have been removed from the site. Eleven buildings were first erected at the start of construction of the original timber dam (Figure 31). As shown in a photo of 1904, the house used as the dam tender's was covered with tarpaper and narrow wooden battens (Figure 33). This temporary-appearing building was demolished in 1909 and replaced with a large frame dwelling. The new two-story dwelling was distinguished by a steep hipped roof that contained a full attic lit by dormers (Figures 34-35). The house was provided with plumbing and a hot air furnace, the first dam tender's dwelling to be so equipped at construction. At a later date the building was stuccoed. A one-story office was also constructed in 1909 (Figures 36-37). This small frame building was the most stylish of any yet constructed at the damsites. It featured a flared hip roof and an eyebrow dormer. All of the structures dating from 1883 were replaced (or moved) by 1920. The complex of 1920 consisted of the house and office, one warehouse, carpenter and

GENERAL PLAN.

LOCATION OF LOG SLUICE CHANGED, SEE SHEET 2A



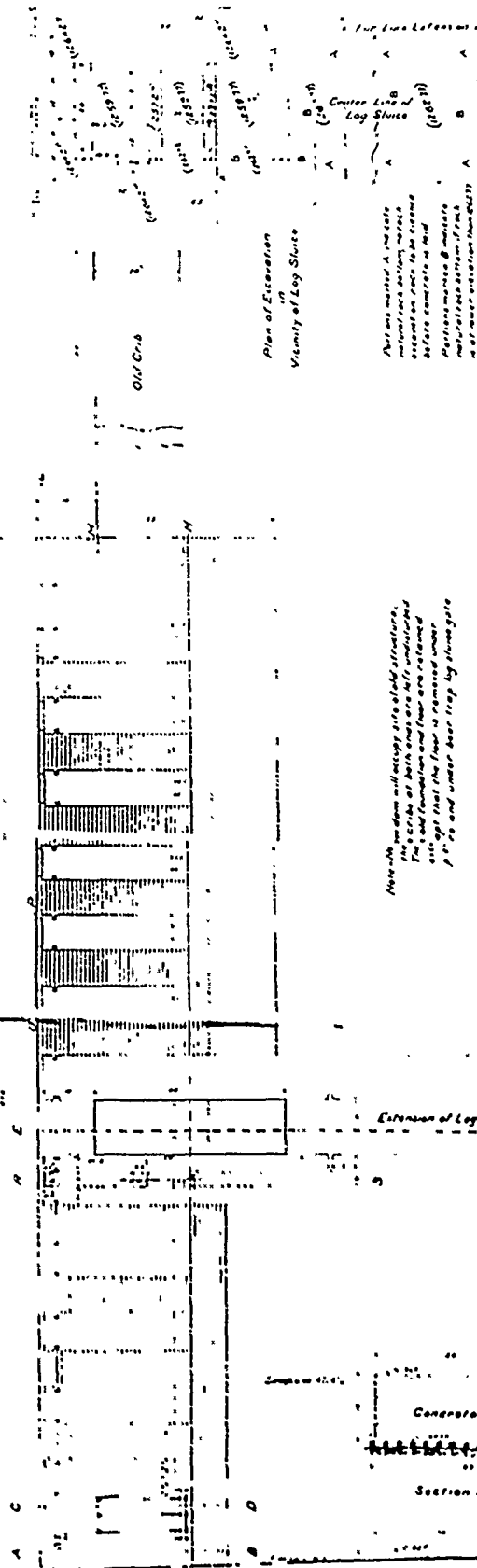
Section E-F

Section A-B

Quarries

Quarries assumed to be the same as at D-14

Section K-L-M-N
Only One Tainter Gate Shown



Note: No foundation will be left at the old sluice. The old sluice at both ends are left undisturbed. The old foundation and floor are removed and the floor is removed under 10 ft. and under bear trap by slings.

Plan of Excavation
in
Vicinity of Log Sluice

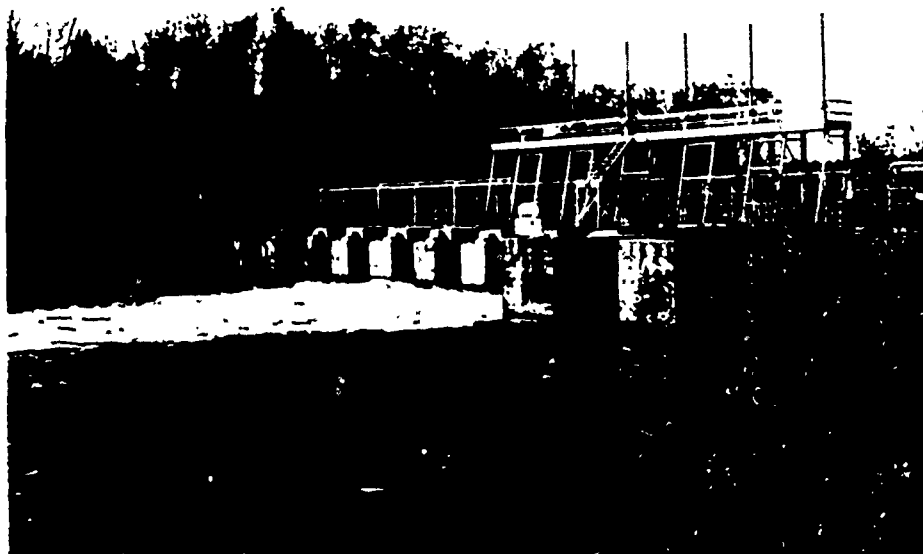
Notes: The old sluice at both ends are left undisturbed. The old foundation and floor are removed and the floor is removed under 10 ft. and under bear trap by slings.

Diagram in United States Engineer Office at Fort Snelling, Minn.
Major R. L. Smith, Chief of Engineers in Charge
A. O. Parks, Assistant Engineer
Thomas R. Robinson, Assistant Engineer in Charge
H. V. Mendenhall, Draftsman

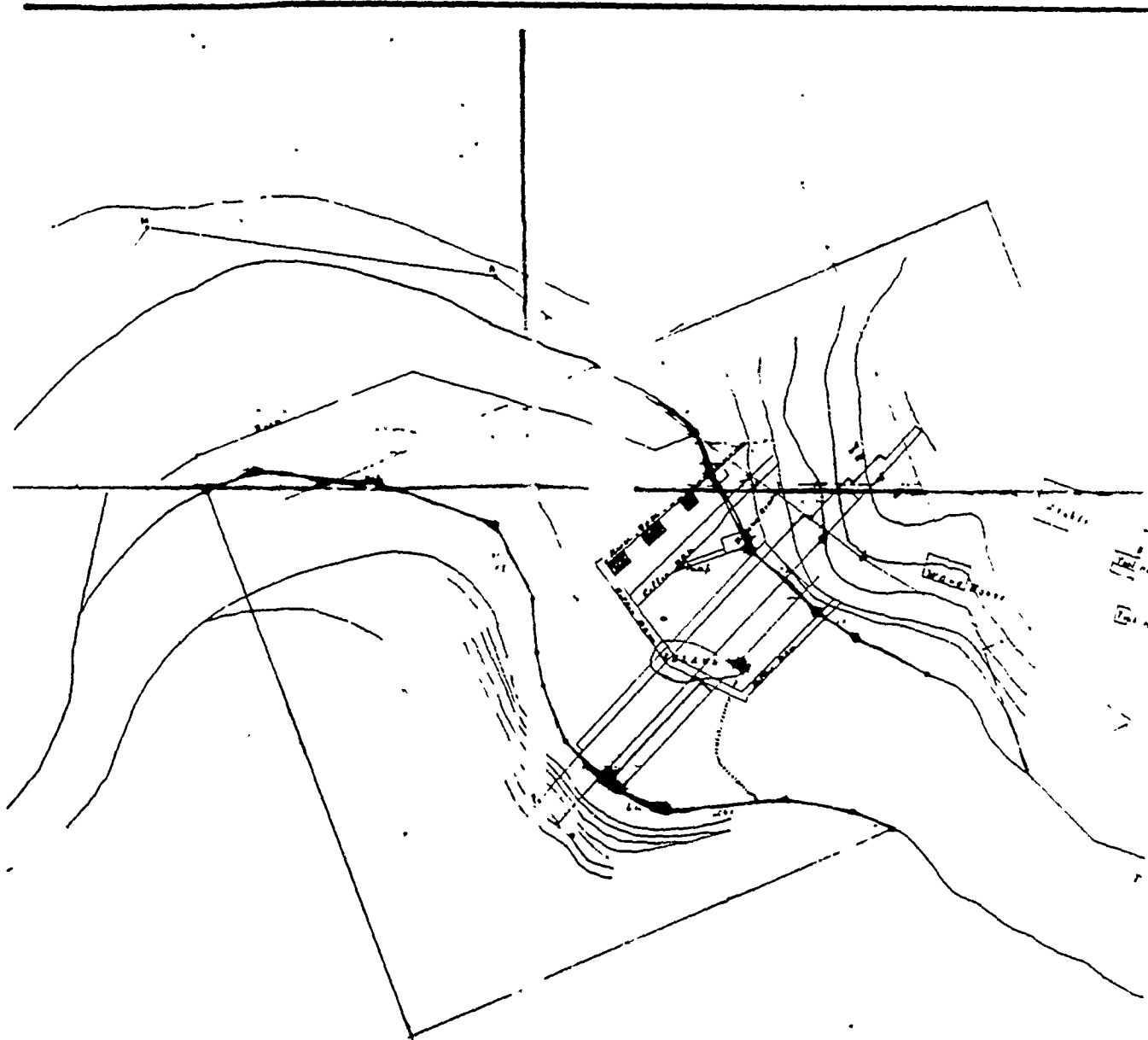
U.S. Engineer Office, St. Paul, Minn. Dec. 15th 1902
To accompany report of this work to the
Chief of Engineers, U.S. Army
Major Corps of Engineers

30X

F



31. Pokegama Dam. South elevation, 1987.



*Realt from A. Johnson,
Jan. 25, 1883.*

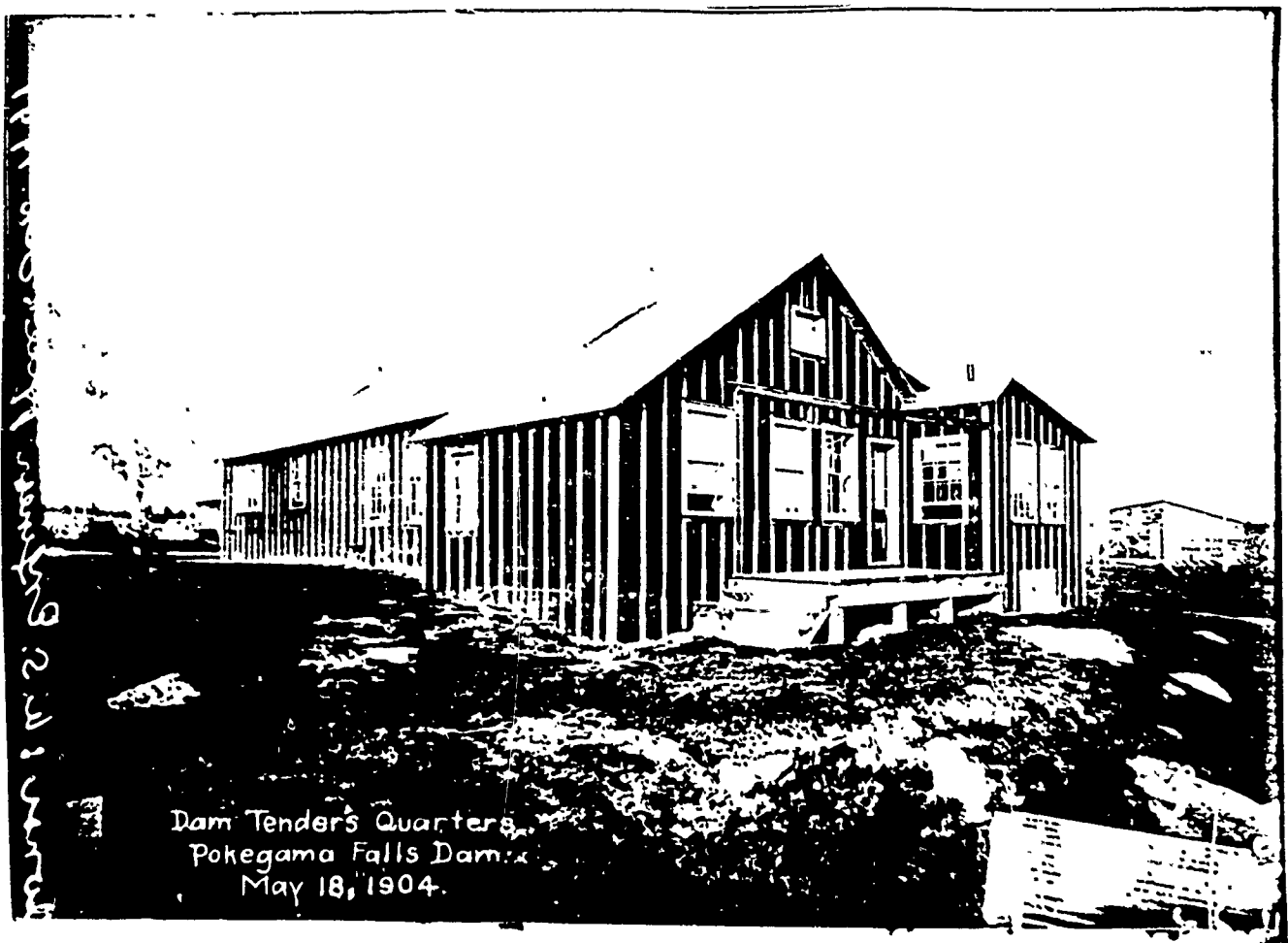
MAP
OF
MISSISSIPPI RIVER
AT
POKEGAMA FALLS

Showing Dam Site
and
Location of Buildings

November 1882
Scale 1:100

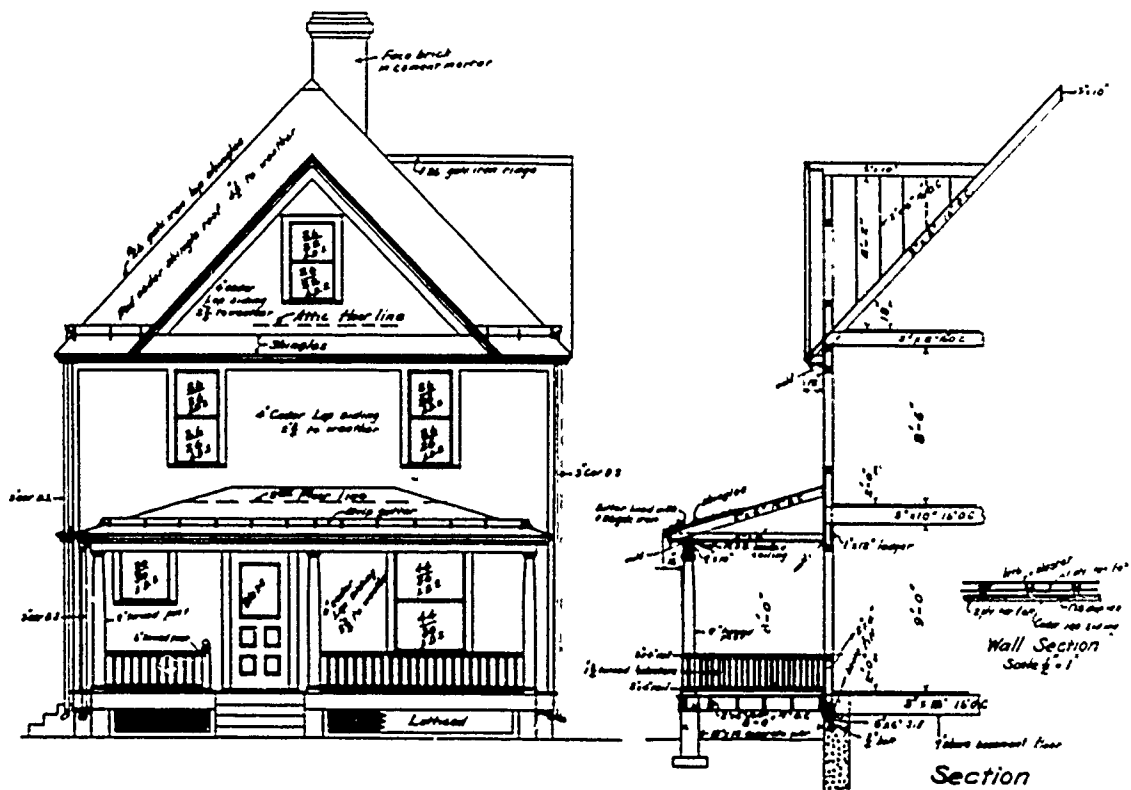
See with map.

32. Map of Mississippi River at Pokegama Falls, 1883. Source: Corps of Engineers.

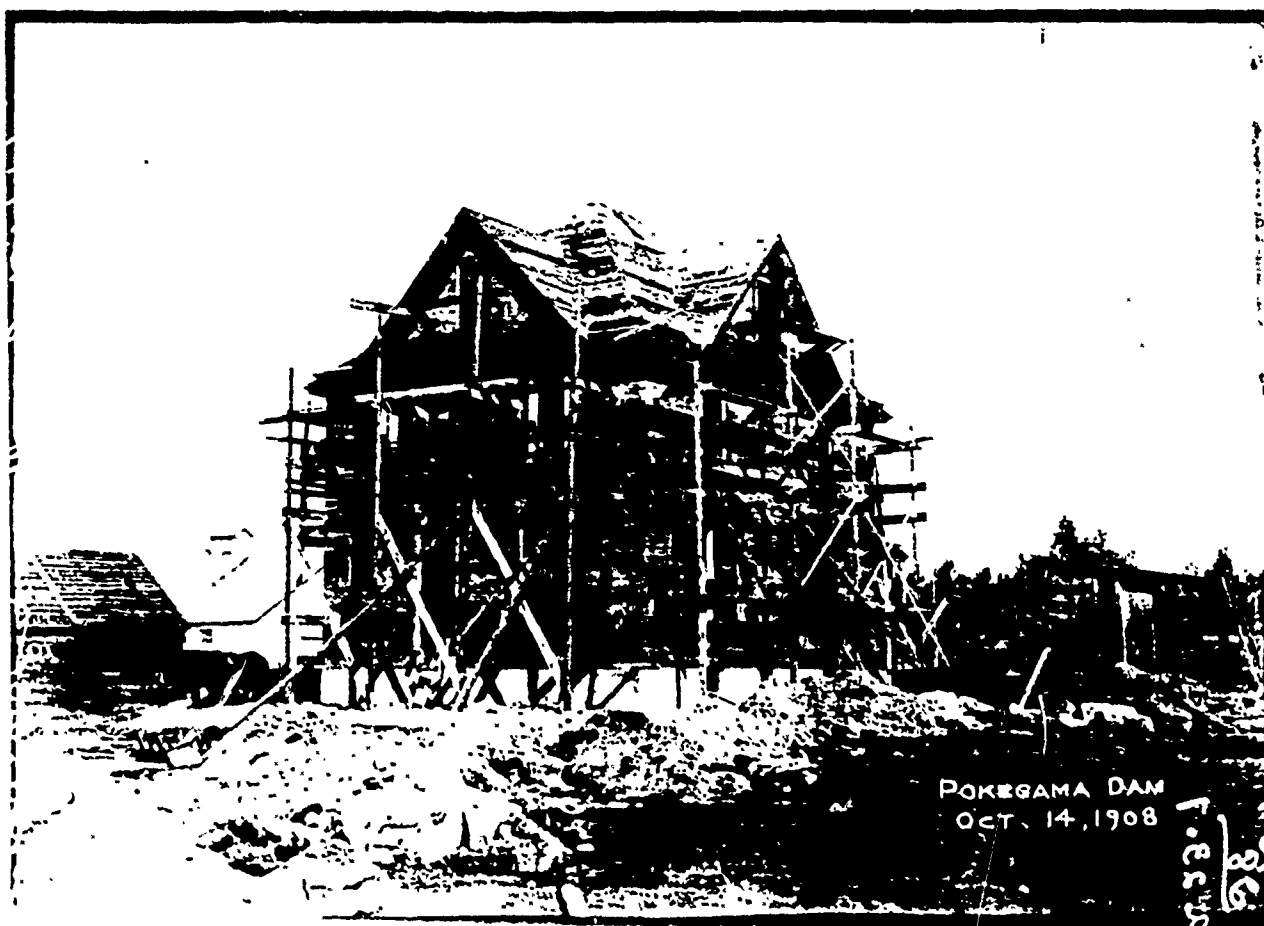


33. Dam Tender's Dwelling at Pokegama Lake Dam, 1904. MHS photo.

POKEGAMA RESERVOIR
PLANS FOR DAM TENDERS HOUSE
APRIL 1908.



34. Plan for Dam Tender's Dwelling at Pokegama Lake Dam, 1908.
Source: Corps of Engineers.

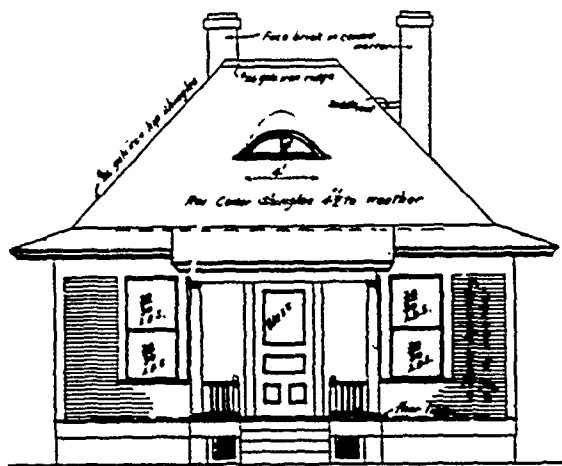


35. New Dwelling at Pokegama Lake Dam, 1908 (under construction). MHS photo.

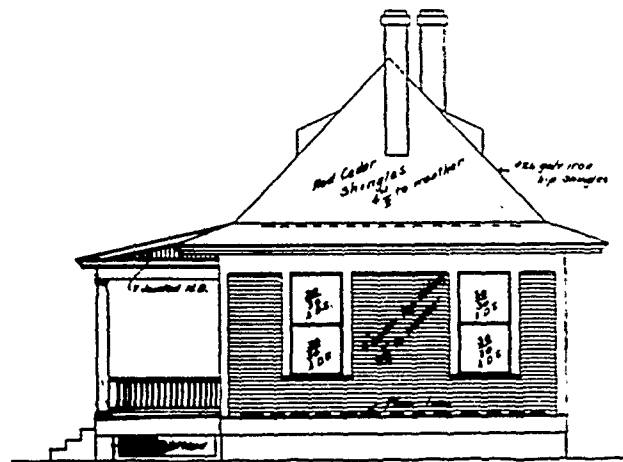


36. New Dwelling and Office at Pokegama Lake Dam, 1909. MHS photo.

POKEGAMA RESERVOIR
PLAN FOR OFFICE BUILDING
 APRIL 1908



Front Elevation
Scale 1/4 in = 1 Ft.



Side Elevation
Scale 1/4 in = 1 Ft.

37. Plan of Office Building at Pokagama Lake Dam, 1908.
 Source: Corps of Engineers.

blacksmith shops, one wood shed and one barn (Figure 38).

Archaeological Surveys

The environmental review report prepared by Bemidji State College (1973) explained that there was a lack of detailed knowledge about the Pokegama reservoir, and recommended a site survey (Bemidji, 1973:D-XI-14). There were no sites noted in the immediate vicinity of the dam. The Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pokegama (1979) recorded completely negative results on Corps of Engineers-owned land. An intensive survey of this area showed no evidence of cultural materials any earlier than the construction of the Corps facilities. The development of the site for recreational use has removed all evidence of the earlier buildings such as foundation outlines.

Sources

Bemidji State College.

- 1973 Environmental Review of the Headwaters of the Mississippi Reservoir Projects. Bemidji: Bemidji State College Center for Environmental Studies.

Department of the Army, Corps of Engineers.

- 1963 Master Reservoir Regulation Manual for the Mississippi River Headwaters Reservoirs. St. Paul: St. Paul District.

Johnson, Elden, Christina Harrison and Jeanne Schaaf.

- 1979 Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pogkegama. Minneapolis: Archaeology Laboratory, University of Minnesota.

Merritt, Raymond H.

- 1979 Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers. Washington, D.C.: U.S. Government Printing Office.

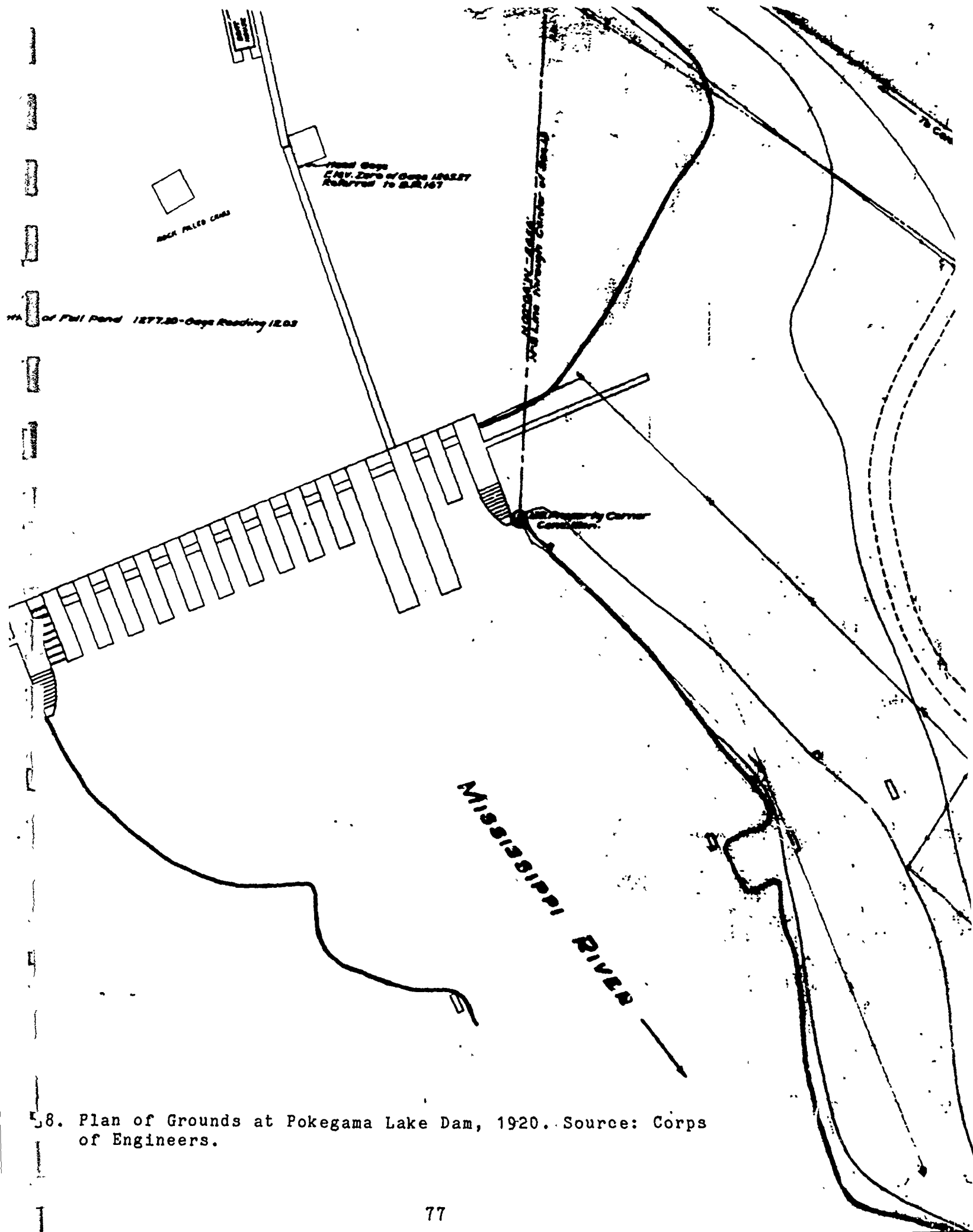
Minnesot Historical Society.

- 1981 National Register of Historic Places, Nomination form. Winnibigoshish Lake Dam.

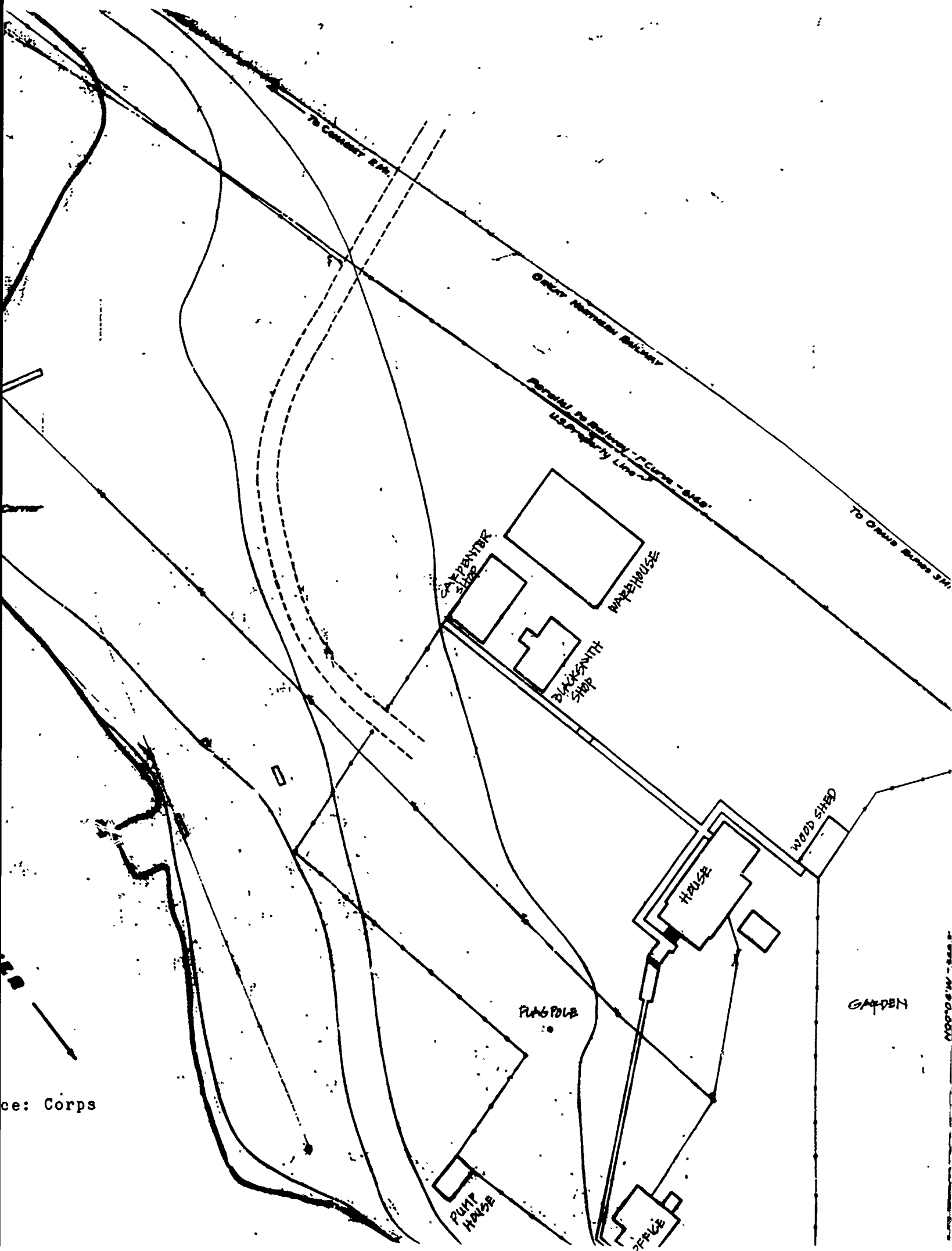
St. Paul District, U.S. Army Corps of Engineers.

Annual Reports

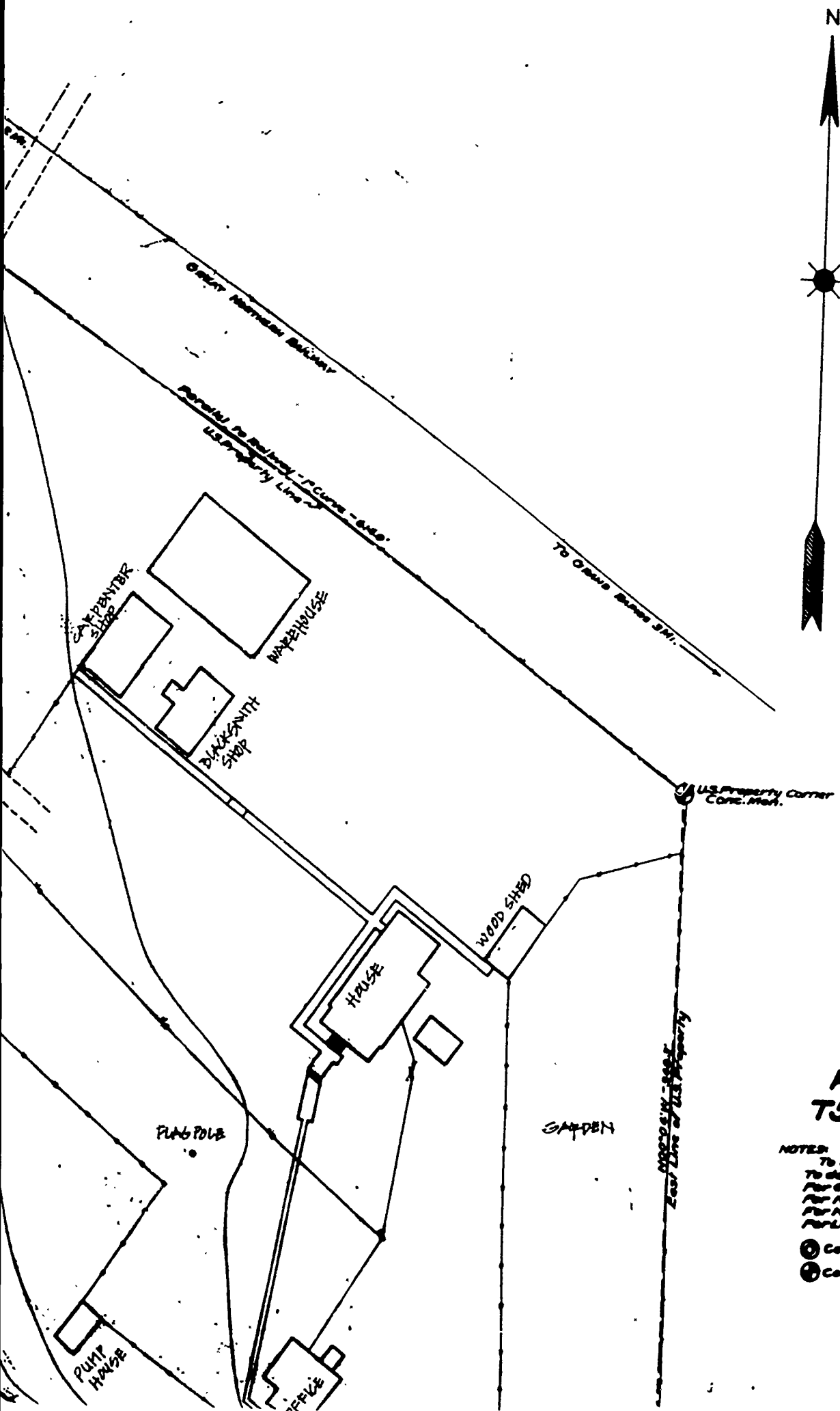
- 1881, pp. 1795-1801
____. 1885, pp. 1747-1749.
____. 1892, pp. 1819-1833.
____. 1903, pp. 1528-1540.
____. 1904, pp. 2235-2245.



8. Plan of Grounds at Pokegama Lake Dam, 1920.. Source: Corps of Engineers.



ce: Corps



PART C T55N - E

NOTES:

To reduce elevations
To determine elevations
For General Land C
For Notes of Topog
For Notes of Topog
For Land Line Note

- ① Corners Found
- ② Corners set by

____. Pokegama Dam plan and map files.

Photograph Collections
Minnesota Historical Society

Pine River

Dam

The Pine River Dam is located on the Pine River at the outlet of Cross Lake in Crow Wing County. It is 15 miles above the junction of the Pine and Mississippi Rivers, and 185 river miles above St. Paul. The total drainage area of the reservoir, known as the Whitefish Chain of Lakes, is 562 square miles and contains 15 natural lakes.

Pine River was the fourth Headwaters reservoir to be constructed. The original timber dam was begun in 1884 and was put into operation in 1886 (Figure 39). The structure consisted of a 1,265-foot embankment and a 235-foot timber crib filled with stone. Thirteen discharge sluices and one log sluice were provided. The timber for the dam consisted of white pine, Norway pine, and a small amount of oak. Machinery and supplies used in the construction of the Winnibigoshish, Leech Lake, and Pokegama dams were reused at Pine River. Dam reconstruction in concrete began in 1905 and was completed in 1907.

The present dam has a 1,265-foot earthen dike with a timber diaphragm core wall filled with puddled clay. The 8-foot roadway that tops the structure is no longer in use. The concrete control structure that replaced the old crib work is 233 feet in length and is supported on timber piles from the original dam. Thirteen 6-foot sluiceways are gated with hand-operated, worm-gear machinery.

In 1912, a fishway was constructed in the sluice adjacent to the log sluice. The log sluice and fishway are no longer in use. A perimeter dike system was completed between 1899 and 1914. The timber apron was replaced by a new concrete and timber apron in 1950. The concrete parapet of the control structure (1907) has not been modified, and its arched openings have a distinctive appearance (Figure 40).

In 1934, representatives of the Portland Cement Association, then meeting in St. Paul, reported that the Pine River Dam was the "finest concrete structure from the point of view of durability" that they were aware of (Old Man River, 1934: 9). This was one of few notices recognizing the engineering or construction of the any dams that could be located.

Other Structures

No structures remain from the seventeen-building complex constructed on this site by the Corps by 1884.



39. Timber Dam at Pine River, 1904. MHS photo.



40. Pine River Dam. South elevations, 1987 (top and bottom).

A dam tender's dwelling, laborers' quarters, engineers' quarters, a dining hall, an office building, an officer's house, a wood shed, a chicken coop, a barn, a warehouse, a sawmill and carpenter and blacksmith shops were included in the original complex. A modern metal maintenance building stands in the vicinity of the original warehouses and shops, and playgrounds and parking lots are located where the dwelling and office stood. }

These structures were all of frame construction, and most were covered with rough boards. The dam tender's house was clad with board and batten siding and roofed with wooden shingles (Figure 41). The cellar was walled with six-inch timber. Two coats of lead and oil were used to paint the inside and outside, and the roof was finished with fire-proof paint. The other buildings were sided, floored, and roofed with inch lumber.

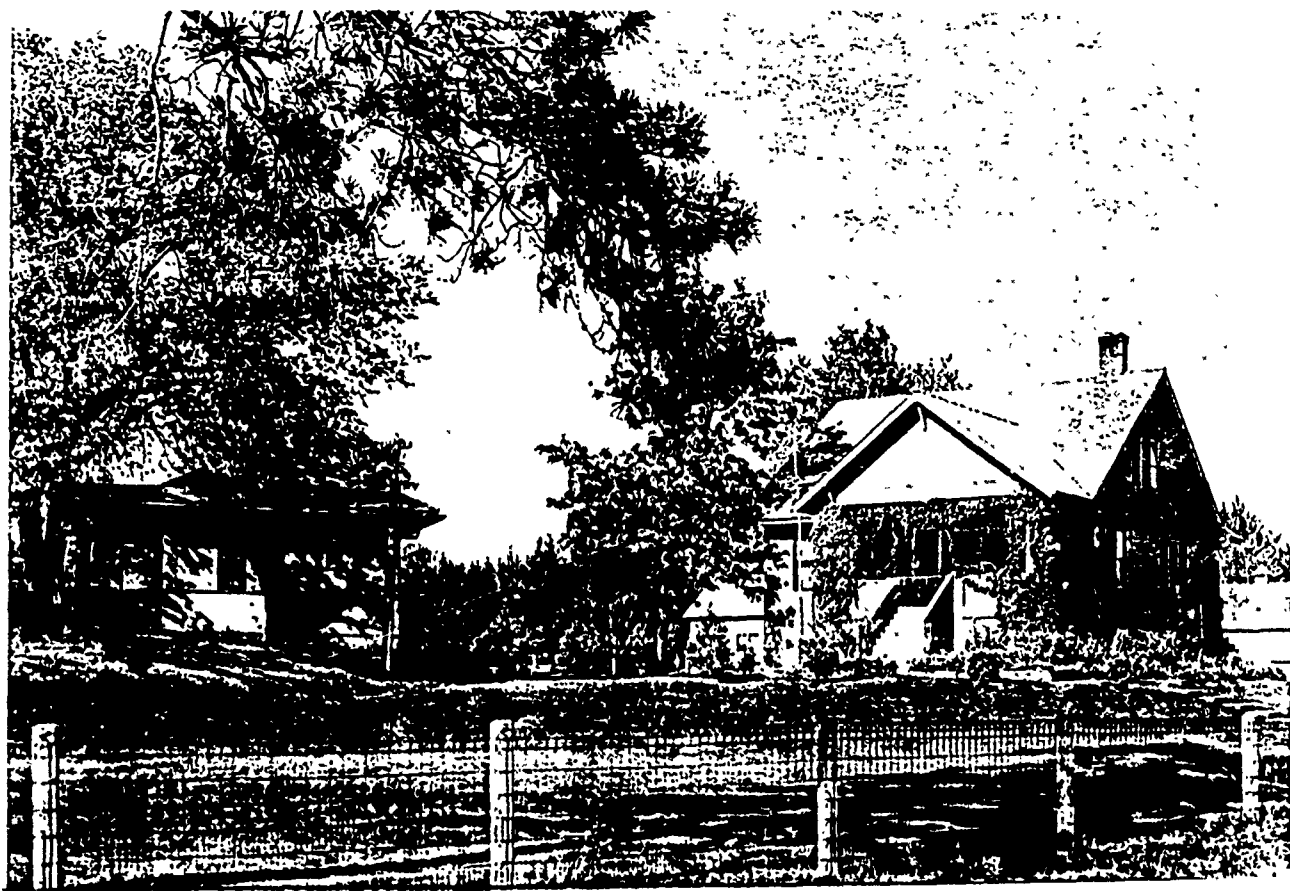
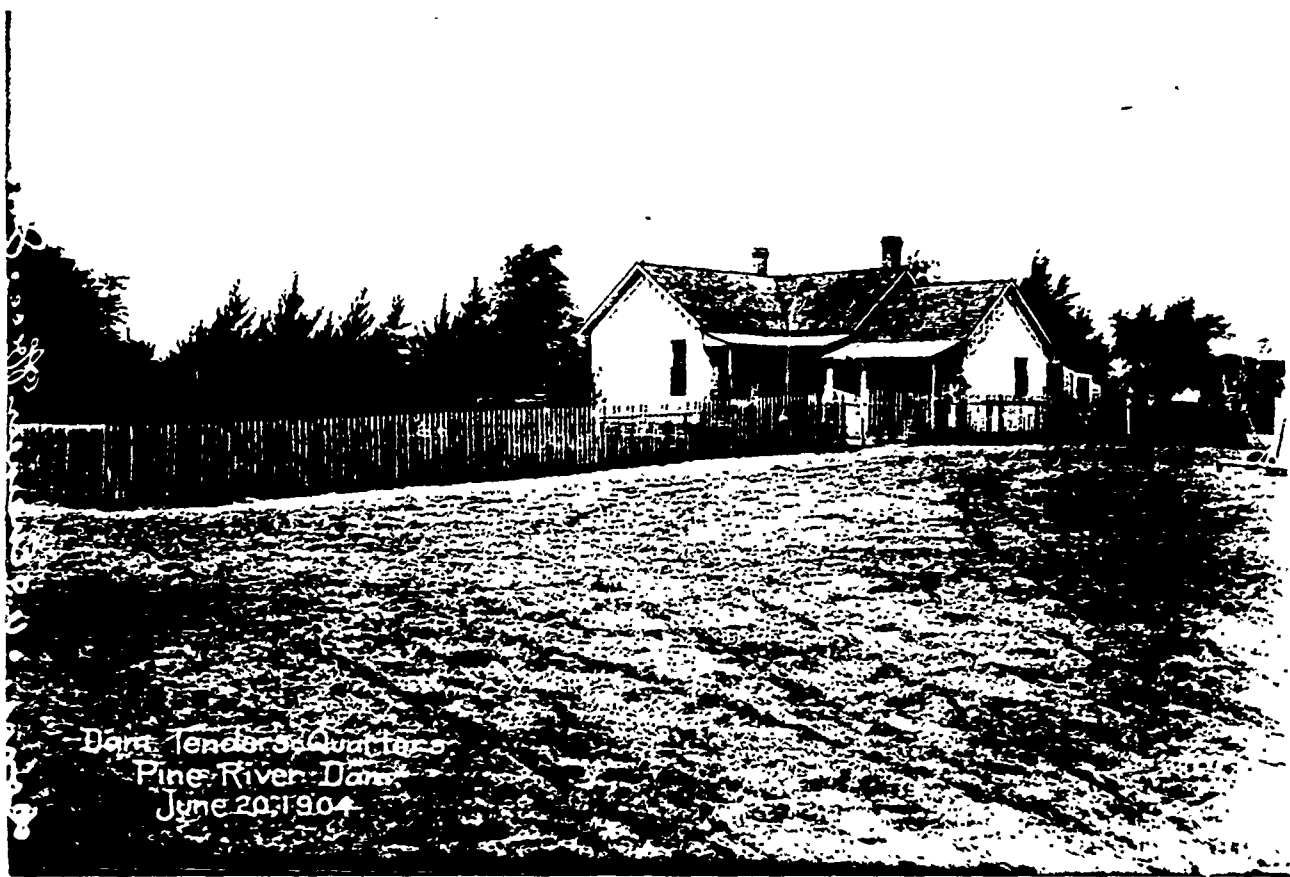
As was the practice at most sites, the buildings that served dam construction purposes were removed when the dam was finished. In 1911, reconstruction of the keeper's dwelling and construction of a new office building and barn was completed. In 1921, the dam tender's dwelling was destroyed by fire. It was replaced in 1922. A 1937 photograph of this building indicates that it had a stucco exterior, asbestos cement shingle roof, and a simple bungalow design (Figure 41). Decorative details consisted of wooden knee braces at the overhanging eaves. The earliest map of the grounds, dating from 1929, shows the location of the new dwelling, the 1911 office, a barn, carpenter and blacksmith shops, two warehouses, a wood shed and a chicken coop (Figure 42). The "new" dwelling was destroyed by another fire in 1959 and was not replaced.

Due to the extensive redevelopment of this site for public recreation, there is no above-grade evidence of any historic structures.

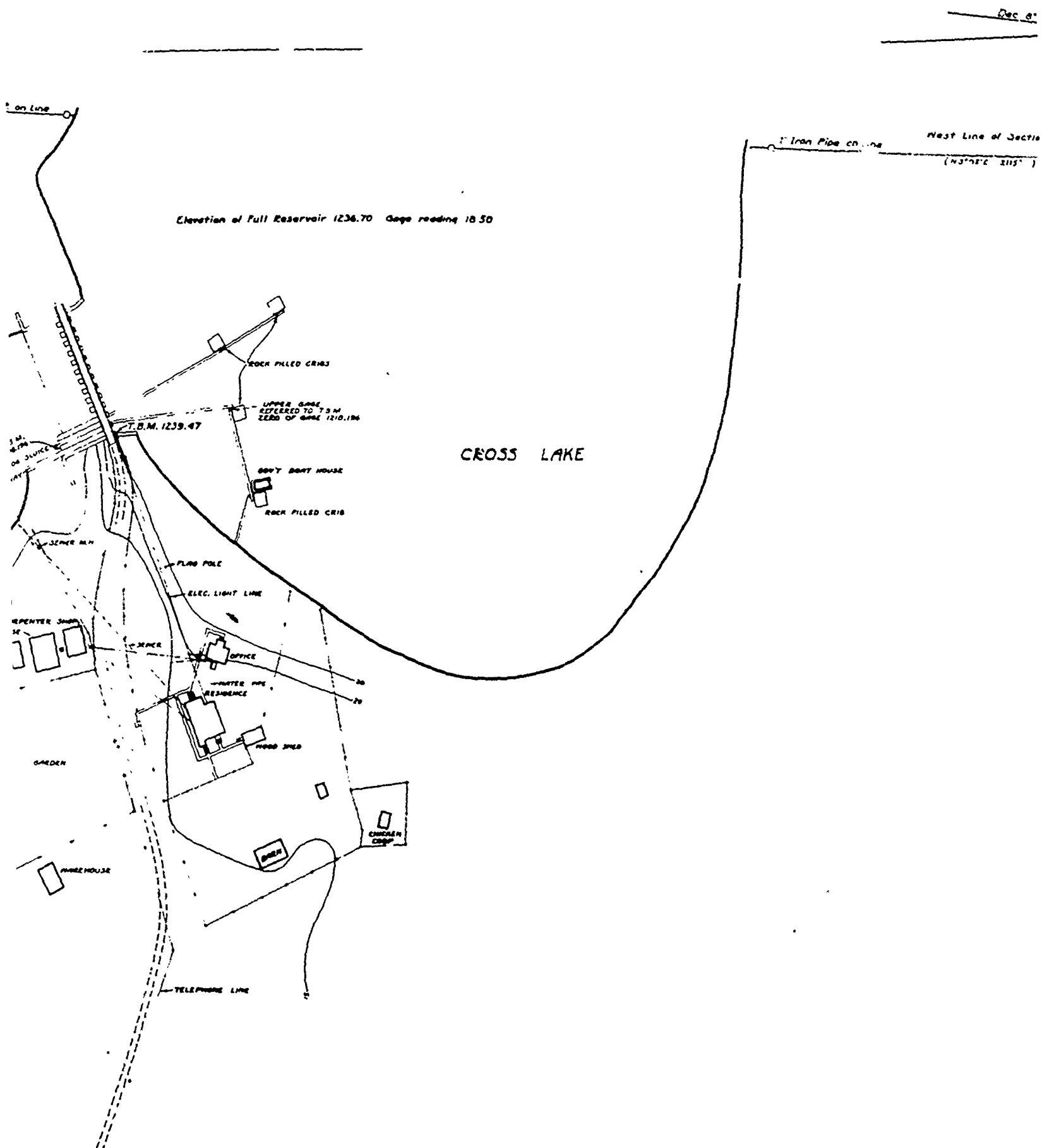
Archaeological Surveys

The Environmental Review of the Headwaters of the Mississippi Reservoir Projects (1973) noted four officially recorded archaeological sites. None were in the vicinity of the damsite. An archaeological survey was recommended by this report but did not state the potential of the area nearest the dam.

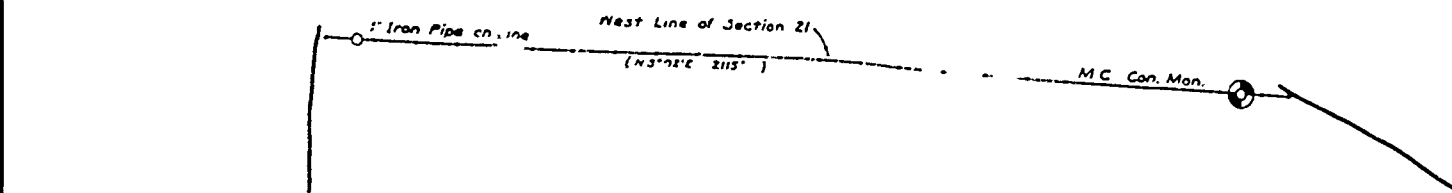
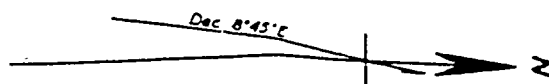
The Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pokegama (1979) surveyed 24 prehistoric/historic archaeological sites. The sites nearest the dam are CW-18 and CW-24. CW-18 is a small island, northwest of the Corps



41. Dam Tender's House at Pine River Dam, 1904. MHS photo (top).
Dam Tender's House at Pine River Dam, 1937. MHS photo
(bottom).



Dam, 1929. Source: Corps of



LAKE

Section 21

(N 0°20' E 2022.7')

of Engineers Gaging Station, that yielded Woodland sherds and other material. CW-24 lies west of the station and contained several Woodland burial mounds.

No sites were identified in the immediate study area. Survey sheets for CW-18 and CW-24 appear as Figures 43 and 44.

Sources

Bemidji State College.

- 1973 Environmental Review of the Headwaters of the Mississippi Reservoir Projects. Bemidji: Bemidji State College Center for Environmental Studies.

Department of the Army, Corps of Engineers.

- 1963 Master Reservoir Regulation Manual for the Mississippi River Headwaters Reservoirs. St. Paul: St. Paul District.

Johnson, Elden, Christina Harrison and Jeanne Schaaf.

- 1979 Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pogkegama. Minneapolis: Archaeology Laboratory, University of Minnesota.

Merritt, Raymond H.

- 1979 Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers. Washington, D.C.: U.S. Government Printing Office.

Minnesota Historical Society.

- 1981 National Register of Historic Places, Nomination form. Winnibigoshish Lake Dam.

St. Paul District, U.S. Army Corps of Engineers.

- 1934 Old Man River. February, Volume 1, Number 1.

St. Paul District, U.S. Army Corps of Engineers. Annual Reports. 1884, pp. 1614-1616.

- ____. 1885, pp. 1747-1749.
- ____. 1886, pp. 1502-1505.
- ____. 1887, pp. 1667-1680.
- ____. 1892, pp. 1829.
- ____. 1906, pp. 1437-1440.

- ____. Pine River Dam map and plan files.

Photograph Collections

Minnesota Historical Society.

Cross Lake Museum, Cross Lake, Minnesota.

St. Paul District, U.S. Army Corps of Engineers.

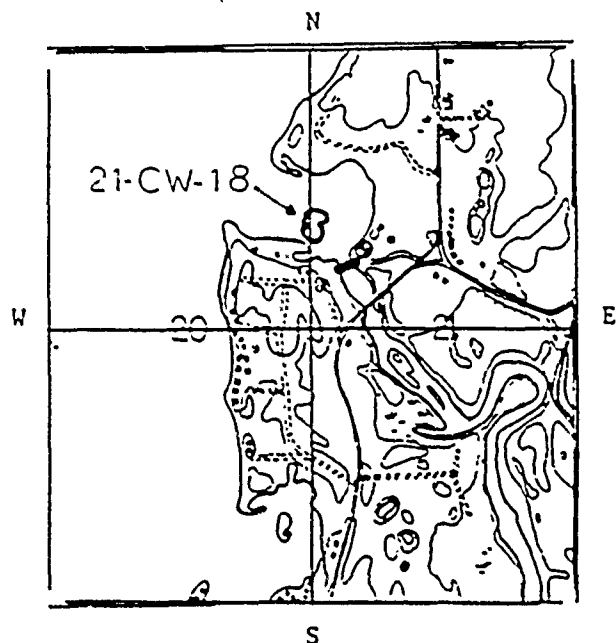
Survey Sheet
Archaeology Laboratory
University of Minnesota

County Crow Wing
Site number CW-18
Site name PR-1

1. Type of site (mound, village, etc.) Prehistoric - Habitation
2. Map reference U.S.G.S. Cross Lake Quad
3. Cultural affiliation Woodland
4. Location: Sec. 21 Twp. 137N R. 27W Verbal description NW 1/4, SW 1/4,
NW 1/4
(at the section line) Section 20 NE 1/4, SE 1/4, NE 1/4
5. Owner and address Corps of Engineers 1135 U.S.P.O. Bldg.
St. Paul, Minnesota 55101
6. Surface collection owners _____
7. Site description

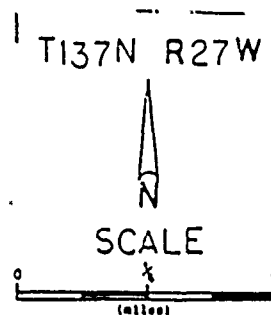
This site is a small island NW of the Corp of Engineers Gaging Station on which there were small trees and scrubs. The island lies in a generally N and S direction and is somewhat protected in a bay area of Cross Lake.

8. Sketch map of location (indicate chief topographical features, houses and roads, section numbers, and outline location of site).



Scale and Comments

- Test pit
- Pedestrian survey
- Can
- Unimproved road
- Light-duty road
- Medium-duty road
- House
- Outbuilding
- Church
- School
- Gaging station



9. Arch Lab photo # R1-16, R-2-19
10. Arch Lab accession # 804-2
11. Recorded by G.J. Hudak
12. Date 4/25/78

43. Survey Sheet, Site CW-18, 1978.

Survey Sheet
Archaeology Laboratory
University of Minnesota

County Crow Wing
Site number CW-24
Site name PR-7

1. Type of site (mound, village, etc.) Prehistoric Mounds
2. Map reference U.S.G.S. Cross Lake Quad
3. Cultural affiliation Woodland (?)
4. Location: Sec. 20 Twp. 137N R. 27W Verbal description SE 1/4 NE 1/4

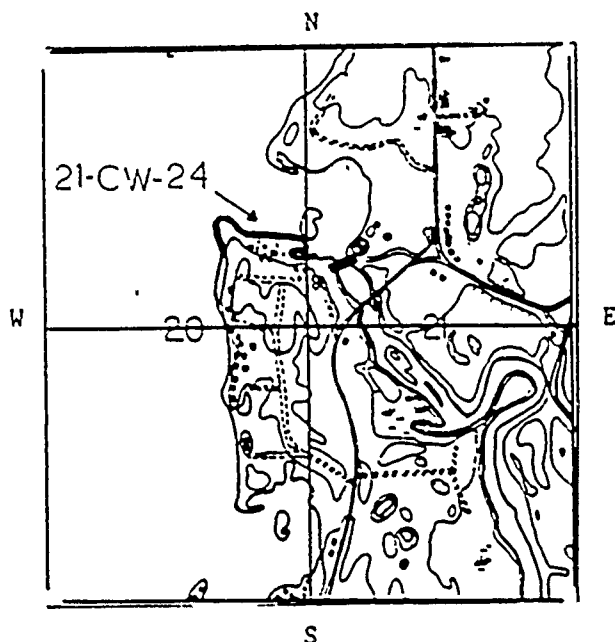
5. Owner and address Walt Goetz Golden Rule Trailer Ct., Cross Lake, Minnesota
56442

6. Surface collection owners _____

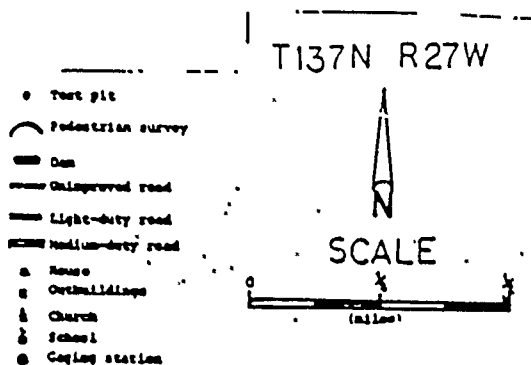
7. Site description

This site is on the southern shore of the bay area at the entrance to Pine River from Cross Lake. The area is west of the Corp of Engineers Gaging Station and has been rather well developed and landscaped and has a trailer court on it.

8. Sketch map of location (indicate chief topographical features, houses and roads, section numbers, and outline location of site).



Scale and Comments



9. Arch Lab photo # R2-20 10. Arch Lab accession # 804-8
11. Recorded by G.J. Hudak 12. Date 5/4/78

44. Survey Sheet, Site CW-24, 1978.

Other Materials

Some dam tender's log books are held by the Crow Wing County Historical Society Museum in Brainerd. Copies of the log books and other material, including insurance records of the 1921 fire and a complete inventory of the contents of the dam tender's dwelling, are on file at the Pine River Dam manager's office. The Cross Lake Museum, near the damsite, holds early photographs.

Sandy Lake Dam

Dam

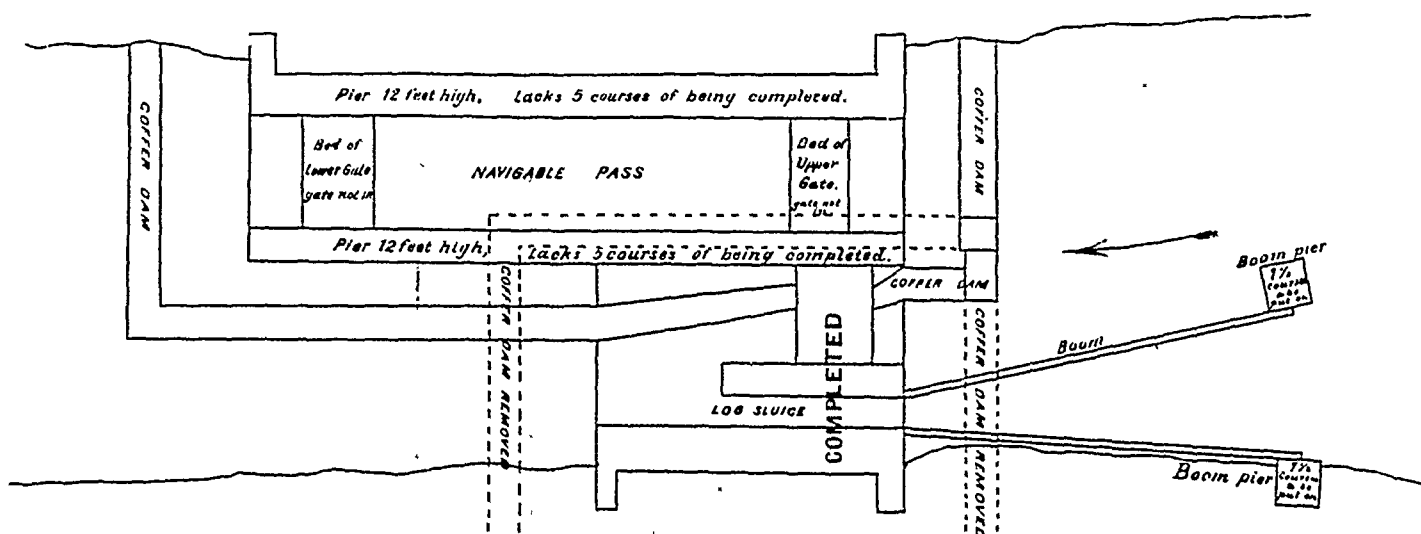
The (Big) Sandy Lake Dam is located in Aitkin County on the Sandy River. It is one mile above the junction of the Sandy and Mississippi Rivers, and 270 river miles above St. Paul. The total drainage area above the dam is 421 square miles. The Sandy Lake reservoir is the most easterly of the damsites and unlike the others, it shares no watershed boundary with another. Eight natural lakes are included in the reservoir.

The original Sandy Lake Dam was begun in 1892 and put into operation in 1895. The original 160-foot dam had 5 timber sluice gates, one log sluiceway, and one lock chamber. A navigation lock was finished in 1896 (Figure 45). The timber structure showed deterioration by 1904, and reconstruction began in 1908. The concrete plant used at the Pine River Dam was shipped by wagon and steamboat to the Sandy Lake site. The new concrete structure was completed in 1909. The lock was reconstructed between 1909 and 1911, and the operating machinery was installed in 1912. The shelter house was built over the lock machinery in 1914 (Figure 46).

The dike is earth-filled, with a timber diaphragm core filled with puddled clay. The right bank is 75 feet long, and the left 30 feet in length. The concrete control structure is supported by its original timber pilings. There are 5 4-foot sluiceways with lift gates, one 5-foot sluiceway (formerly a fishway) controlled with stop logs, and one 11-foot log sluice also controlled by stop logs. The lock chamber is 30 feet wide and 160 feet long, and was converted into a spillway in 1957 with H-beams that provide five additional sluiceways controlled by stop logs. The original timber apron and lock floor were replaced with concrete in 1959 (Figure 47). An 8-foot roadway is supported by the structure.

The construction of the Sandy Lake Dam--the fifth in the system--was viewed as desirable because of its proximity to St. Paul. It was 80 river miles nearer than the main distributing reservoir at Pokegama, and because of its proportionally large drainage area was anticipated to reliably fill up each year (Annual Reports, 1906: 1438). It was originally planned to rebuild it without the navigational lock, but the lock was later approved. The estimated cost of the reconstruction with the lock was \$125,000; the actual cost totalled \$114,000.

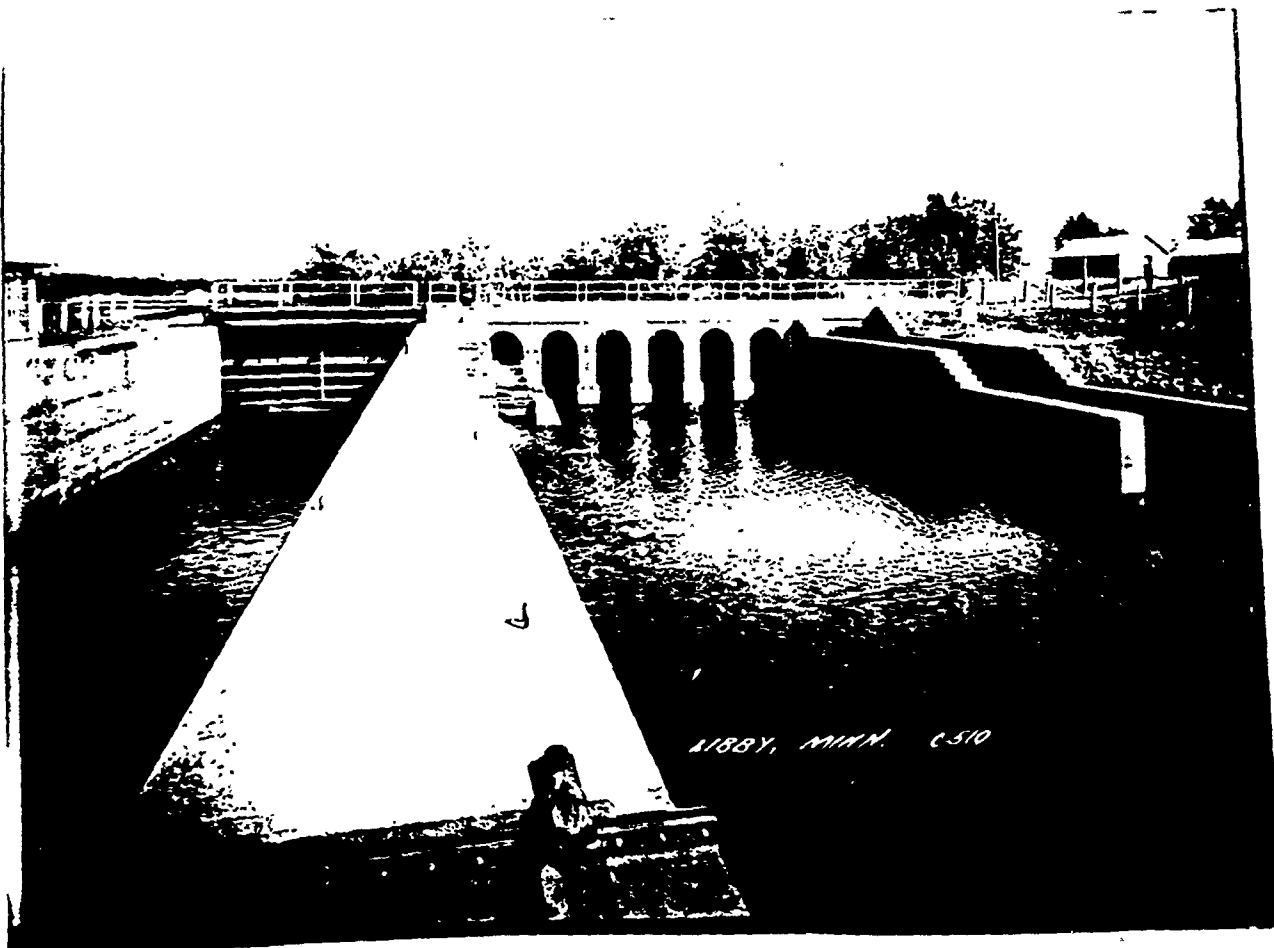
Lock House



Condition of work at Sandy Lake Dam, June 30.1894



45. Condition of Work at Sandy Lake Dam, 1894. Source: Corps of Engineers.



46. Sandy Lake Dam After Reconstruction, 1915. MHS photo.



47. Sandy Lake Dam. South elevation, 1987.

The lock house, dating from 1914, is a small, square metal building which rests on a concrete foundation on the wall of the lock. The low-pitched hipped roof is covered with asbestos cement shingles. The original multi-paned sliding windows, which provide a view of the sluiceways, are intact. The lock operating machinery, installed in 1913, is still in place. The building is now used as a local history center and contains photographs of the original timber dam and other exhibits about the history of the site and area. Many prehistoric artifacts are displayed (Figure 48).

The navigation lock at Sandy was the only one of its kind built on the Upper Mississippi Headwaters. The lock house is in near-original condition and is a significant element of the dam.

Dam Tender's Dwelling

The one-story dam tender's house rests on a concrete foundation and is finished in stucco. The gable roof is covered with asbestos cement shingles. The exterior is very simple, with a plain wooden cornice and window surrounds, and a small screened porch. Most of the windows have two-over-two, double-hung sash (Figure 49).

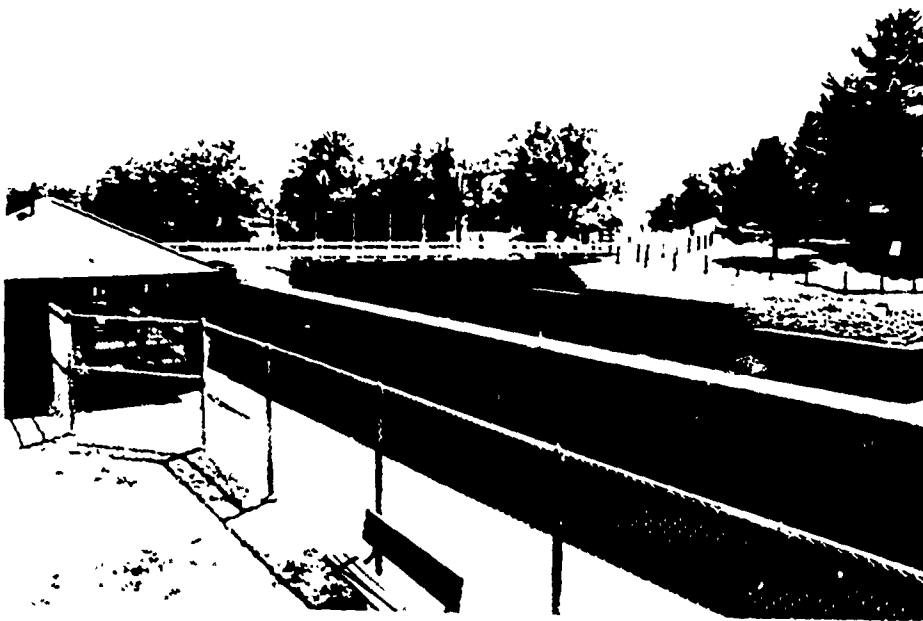
The house appears to have been originally constructed as watchman's quarters sometime between 1891 and 1894 (Figure 50). The building was originally finished with rough boards, and rested on oak blocks over a cellar lined with 6 x 12 inch timber. In 1910, the house was remodeled, and a heating plant and plumbing were installed (Figure 51). There have been a number of subsequent changes, including the addition of a bay window to the dining room at the east elevation. This dwelling has the least architectural significance of the group of four remaining dam tender's dwellings. It is the oldest, however, and is representative of the most earliest and most utilitarian of the dwelling designs.

The dam tender's house and the lock house are the only buildings of the dam-building period that survive.

Archaeological Studies

Sandy Lake was an important cultural center in both prehistoric and historic times. The Environmental Review of the Headwaters of the Mississippi Reservoir Projects (1973) recommended an intensive archaeological survey, in particular focusing on the outlet of the Sandy River.

Five test excavations were conducted at the dam site (21 AK 11) by Johnson in 1975. Artifacts were recovered and further study was recommended. The cultural resources inventory of 1979, conducted by Hudak et. al, made 14

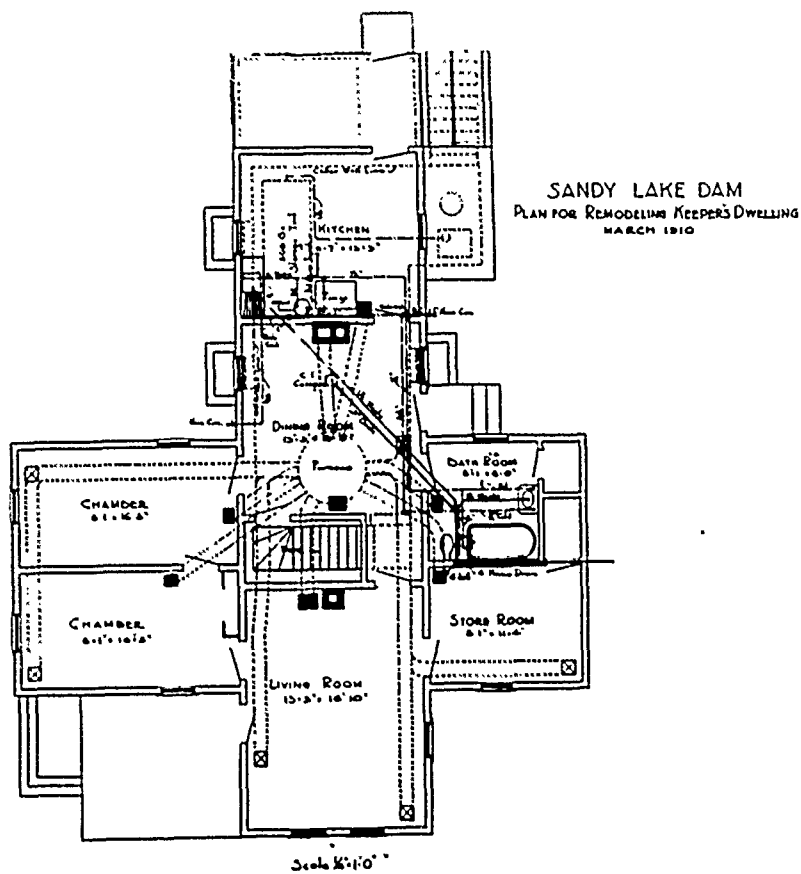


48. Lock House at Sandy Lake Dam, 1987.



49. Sandy Lake Dam Tender's House. West elevation, 1987
(top).
Sandy Lake Dam Tender's House. East elevation, 1987
(bottom).





51. Plan for Remodeling Keeper's Dwelling at Sandy Lake Dam, 1910. Source: Corps of Engineers.

formal and informal excavations at the site and found evidence of prehistoric (Black Duck and Sandy Lake) habitation (Figure 52). The study recommended that further testing of the site be made to determine National Register eligibility (Hudak, 1979:54).

Early History

The dam site is near the terminus of the Savanna Portage, which connected Sandy Lake and the Upper Mississippi with the St. Louis River and Lake Superior. The portage included six miles of rough swamp between the west and east branches of the Savanna River. It was used between 1755 and 1855 by explorers, fur traders and missionaries.

In 1794, a fur trading post was established by the Northwest Company to the south of the dam site at Brown's Point on Big Sandy Lake. According to Grace Nute, this was the most important fur trading station in the Northwest until after the War of 1812 (Nute, 1949:70). In 1830, the Sandy Lake post of the American Fur Company was established at the junction of the Mississippi and Sandy Rivers, to the west of the present dam. William Aitkin, the operator, and missionaries were located here between about 1832 and 1855. A steamboat landing near this site was also in use after about 1870, and possibly earlier.

School Site

A mission was established by Frederick Ayer near the dam site in 1832. A school was built in 1833. A later (?) school building stood to the northwest of the dam, possibly on the location of the first school. It was moved off the site in the 1950s, and was destroyed by a fire at the new location in 1986. A rubble foundation is all that remains. Hudak noted that the foundation was not significant for further study (1979:55; Figure 53).

Cemetery

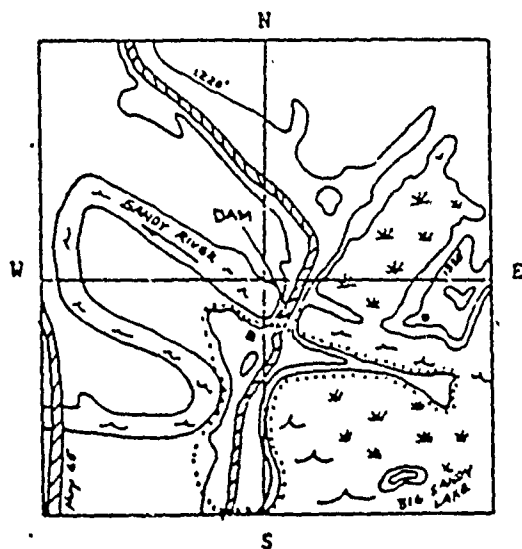
Numerous graves of Indians and early settlers are located on a small hill near the dam tender's house. Although the rise has the appearance of a linear burial mound, it has been shown to be of natural glacial origin (Johnson, 1975; Hudak, 1979). Only a few headstones remain, including two dating from 1891 (Figure 53).

Other Corps Buildings

Eight buildings were constructed at the beginning of the dam construction in 1892. In addition to the watchmen's quarters (now the dam tender's house) there was a dining room and kitchen, a warehouse, carpenter and blacksmith shops, a tool house, a stable, and laborers' quarters. A

COUNTY Aitkin
 SITE NUMBER 21AK11
 SITE NAME Big Sandy Lake Dam Site
 TYPE OF SITE (VILLAGE, etc.) Habitation MAP REFERENCE Libby, MN. U.S.G.S. Quad
 CULTURAL AFFILIATION Prehistoric (Blackduck, Sandy Lake,) historic
 LOCATION NE $\frac{1}{4}$, SE $\frac{1}{4}$, SEC. 25 TWP. 50N R. 24W U.T.M.

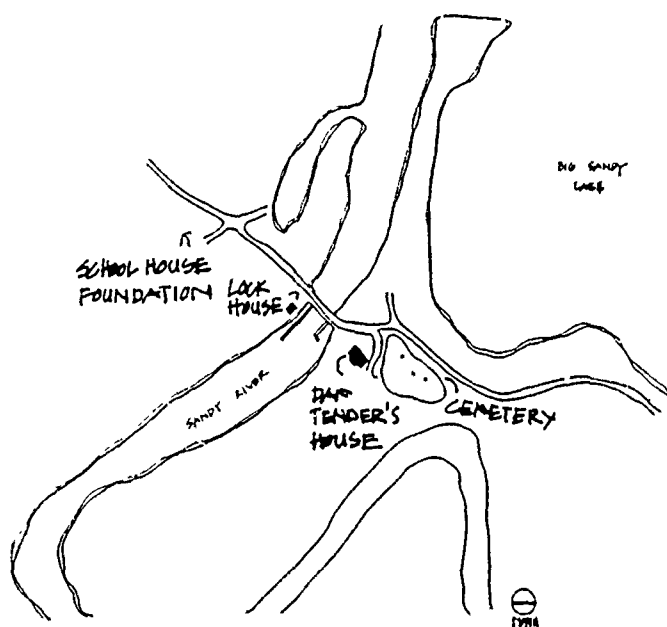
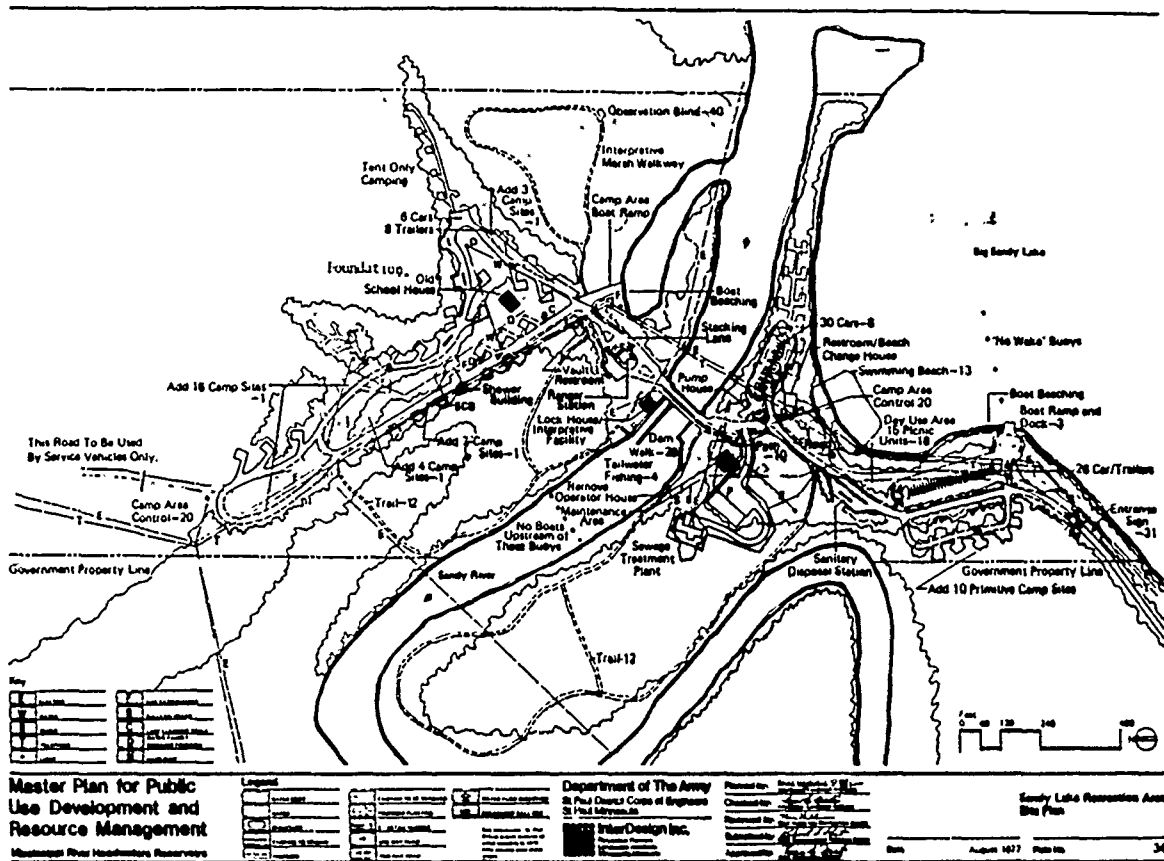
SKETCH MAP OF LOCATION (INDICATE CHIEF TOPOGRAPHICAL FEATURES, HOUSES, ROADS, SEC. NOS., OUTLINE LOCATION OF SITE.)



LEGEND:

- Open Water
- Wild Rice
- Approx. Site Area
- Road
- Structure

SCALE: NOT TO SCALE Roughly 1 cm = 125 m



53. Locations of Historic Buildings and Foundation at Sandy Lake Dam. Shown on the Master Plan, 1977. Source: Corps of Engineers.

one-story office was constructed in 1910 (Figure 54). It was finished in stucco and roofed with asbestos cement shingles. In 1921, plans were prepared for a new dam tender's residence that was apparently never built (Figure 55). The one and one-half story bungalow was to have been finished in stucco, with a lattice porch apron.

A plan of the grounds in 1920 showed the location of the house, office, a wood shed, ice house, barn, chicken coop, warehouse, and carpenter and blacksmith shops (Figure 56). The soil in the vicinity of these buildings has been greatly disturbed due to new road and building construction. Hudak located some early trash pits associated with the dam construction, but did not recommend further investigation (1979:55).

Sources

Bemidji State College.

1973 Environmental Review of the Headwaters of the Mississippi Reservoir Projects. Bemidji: Bemidji State College Center for Environmental Studies.

Boutwell, William T.

"Frederick Ayer, Teacher and Missionary to the Ojibway Indians, 1829 to 1850," Minnesota Historical Collections, Vol. 6, pp. 429-437.

Hart, Irving H.

1926 "The Site of the Northwest Company Post on Sandy Lake," Minnesota History VII, pp. 311-325.

Hudak, G. Joseph and Timothy L. Ready

1979. Cultural Resources Inventory of Lands Adjacent to Big Sandy Lake. St. Paul: Science Museum of Minnesota.

Johnson, Elden.

1975 Excavations at Sandy Lake Dam Site. Minneapolis: Archeology Laboratory, University of Minnesota.

St. Paul District, U.S. Army Corps of Engineers.

Annual Reports. 1892: 1697-1704.

_____. 1896: 1831-1841; 1844

_____. 1909: 1644-1647.

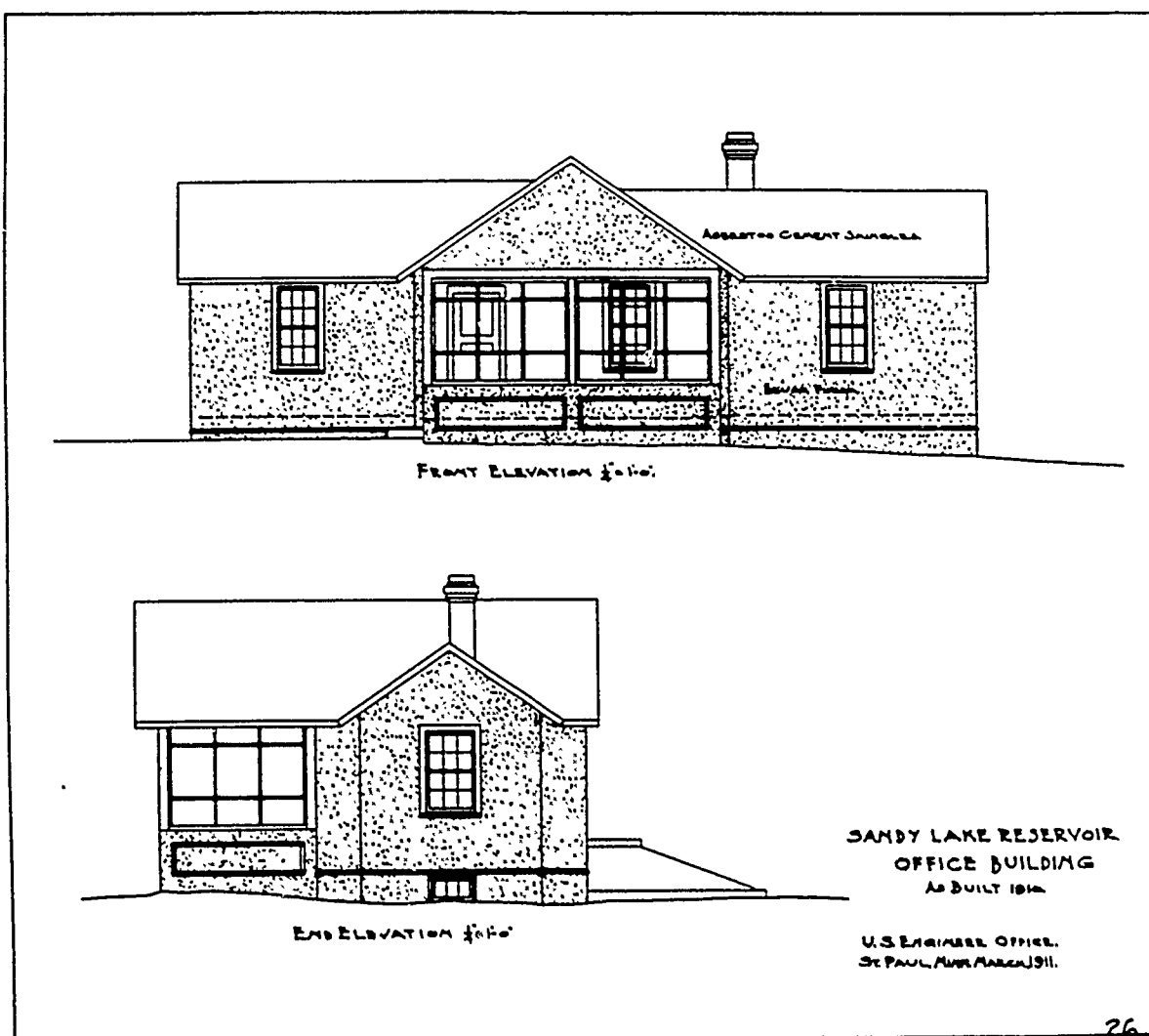
_____. 1910: 1804.

_____. 1911: 1979

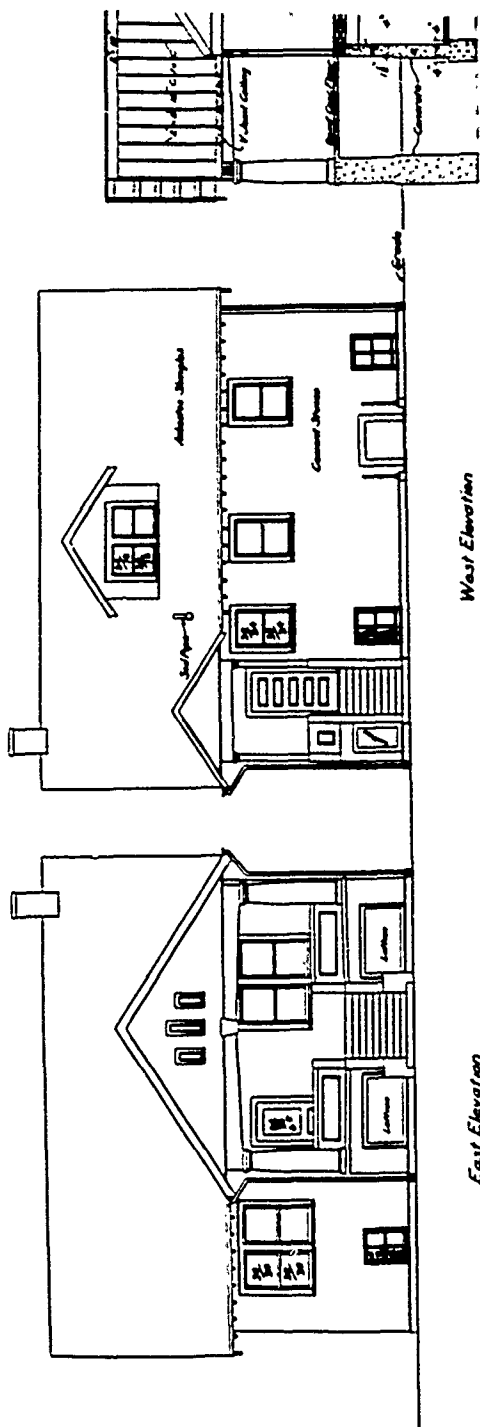
_____. Sandy Lake Dam map and plan files.

Williams, J. Fletcher, N.H. Winchell, Edward D. Neill.

1881 History of the Upper Mississippi River Valley. Minneapolis: Minnesota Historical

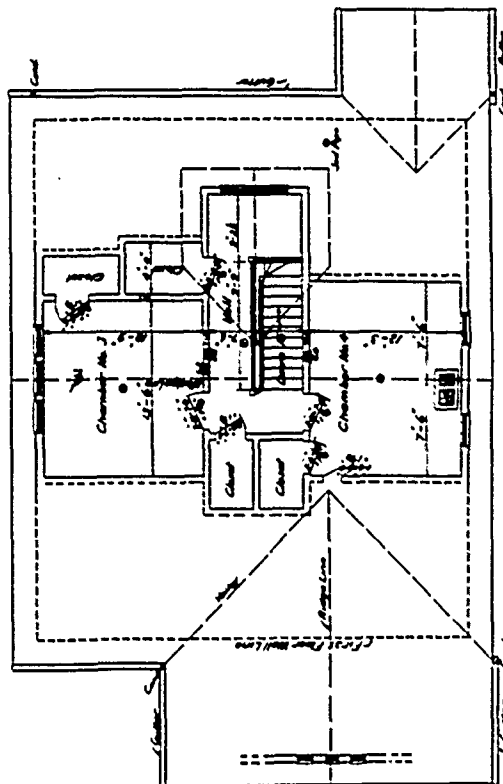


54. Sandy Lake Dam Office Building, 1910. Source: Corps of Engineers.



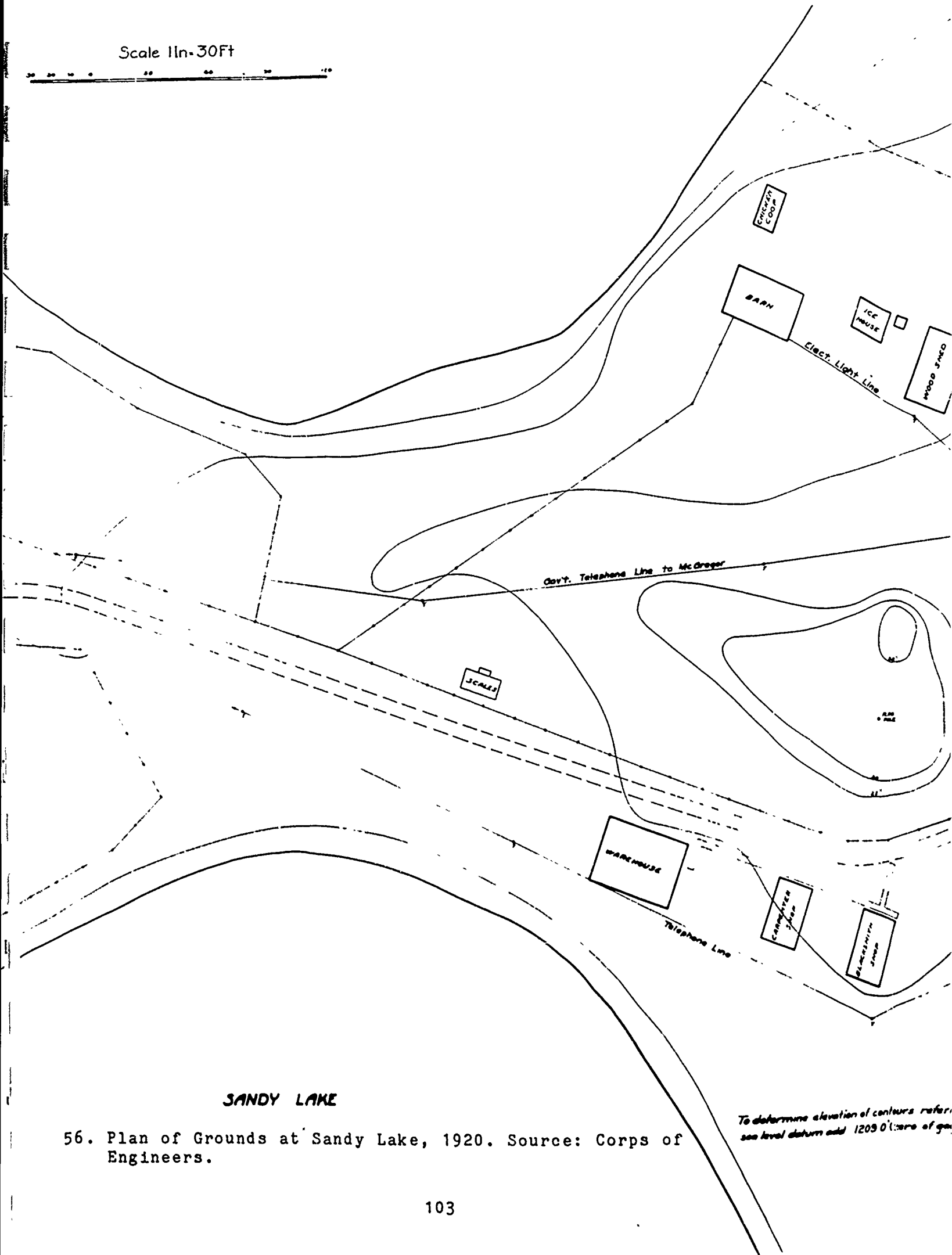
West Elevation

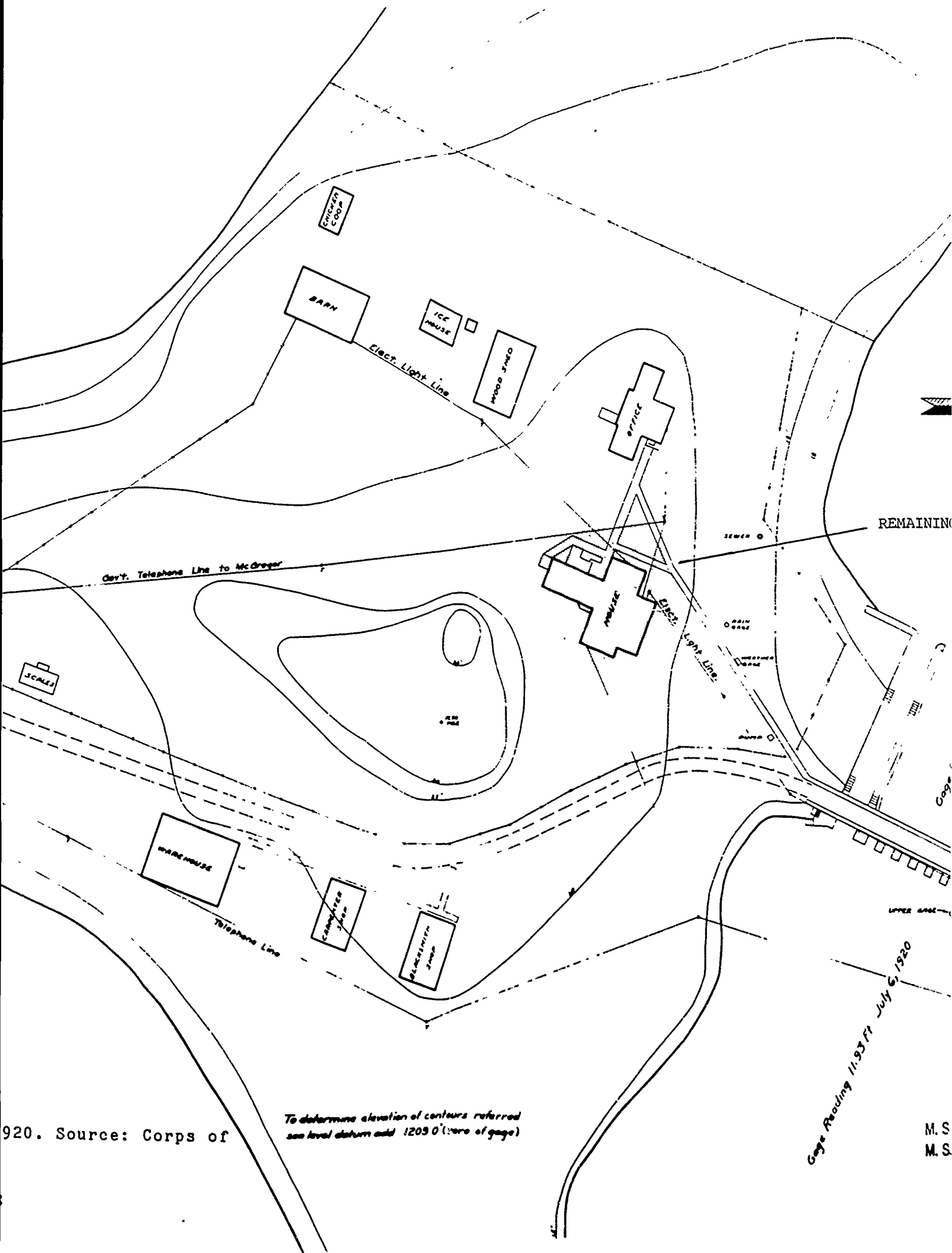
East Elevation



55. Plan and Elevation of Sandy Lake Dam Tender's Dwelling, 1921. (Not constructed.) Source: Corps of Engineers.

Scale 1 in = 30 Ft



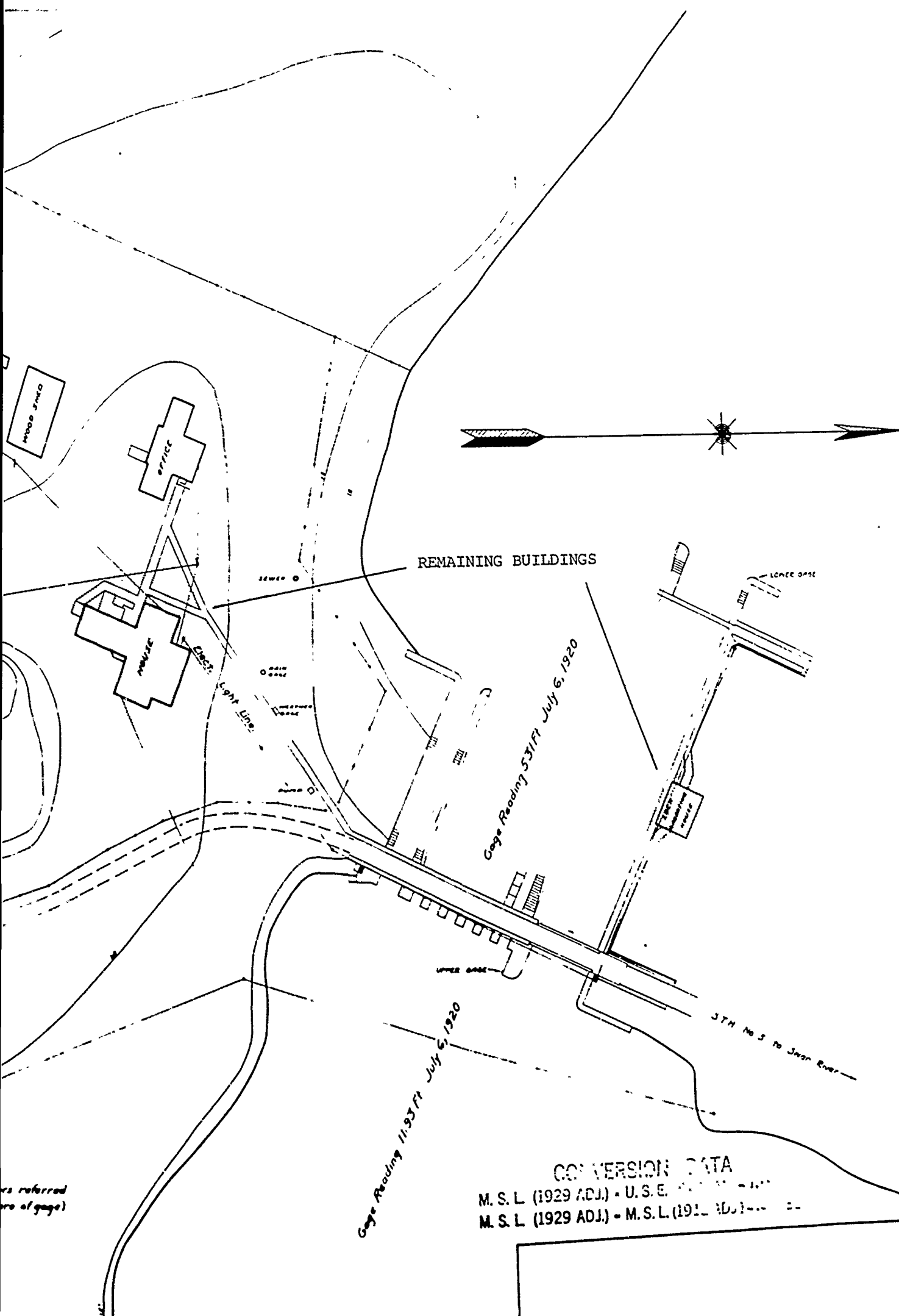


920. Source: Corps of

To determine elevation of contours referred
see level datum add 1209.0' (zero of gage)

Gage Reading 11.93 Ft July 6, 1920

M.S.
M.S.



ers referred
are of page)

CONVERSION DATA
M. S. L. (1929 ADJ.) - U. S. E. (1911 ADJ.) - 1.11'
M. S. L. (1929 ADJ.) - M. S. L. (1911 ADJ.) - 1.11'

Company.

Photograph Collections
Minnesota Historical Society
Sandy Lake Dam, Lock House Exhibit

Gull Lake

Dam

The southernmost of the reservoirs and damsites, the Gull Lake Dam is located on the Gull River about one-half mile below the outlet of Gull Lake in Cass County. It is about 168 river miles above St. Paul. The total drainage area above the dam is 287 square miles.

Gull Lake was proposed as one of the original reservoirs damsites. However, by 1887, it was decided that the cost of damages would be excessive because Gull Lake and the Gull River and its tributaries were encumbered by numerous logging dams and the land was highly valued (Annual Reports, 1887: 1671). Sandy Lake was thought to be an equally effective location for a dam site. Gull Lake, however, was in closest proximity to the Twin Cities. "The greatest difficulty to be contended with at present in seeking efficient management of the reservoir system at the headwaters...is the great distance of the reservoirs from the present head of navigation at St. Paul," noted the Annual Report (1906: 1438). There was a lumber company dam at the outlet of Gull Lake, and initially the Corps investigated only improving this dam (Annual Reports, 1906:1439). In 1907, however, the concrete dam was authorized (Annual Reports, 1907: 409-503). The land and flowage rights were provided by John S. Pillsbury of the St. Anthony Falls Water Power Company (Annual Reports:1910: 1803; Kane, 1966: 159).

Gull Lake was the last of the Headwaters reservoir dams to be constructed. It was begun in 1911 and put into operation in 1912. No timber dam preceded the current structure, as was the case at the earlier dams in the system. It was designed by Colonel Francis R. Shunk and George Freeman, who also designed Lock and Dam No. 1, then under construction on the Mississippi between St. Paul and Minneapolis. Lock and Dam No 1 is the only dam in the St. Paul District that generates hydroelectric power. Shunk and Freeman utilized innovative, prefabricated methods in its design and construction.

The dikes are constructed of concrete curtain wall and earth fill. The left bank dike is 129 feet long with 90 feet of curtain wall. The right bank dike is 72 feet long with 33 feet of curtain wall. An 8-foot public roadway is supported by the dikes and control structure.

The control structure is constructed of reinforced concrete supported on timber piling. Five sluiceways are 5 feet wide, and are controlled by stop logs. There is also an 11-foot log sluice and a 5-foot fishway (Figure 57). In design, Gull Lake does not represent a departure from the other Headwaters dams. However, it has undergone less modification over the years than the others.

Dam Tender's House

The two-story, gable-roofed dam tender's house is of concrete and beam construction (Annual Reports, 1913:2424; Figure 58). Shed-roofed dormers provide additional light to the second story. Asbestos cement shingles were used for roofing, and this material was also used to finish the gable ends and dormers. The windows are one-over-one double hung sash, with a variety of sizes and groupings.

The surface is composed of concrete panels of a large pink, gray and black aggregate surrounded by a smooth concrete margin (Figures 58, 59). Although one plan for this building specifies hollow tile with a stucco finish, the exterior panels appear to be solid concrete (Figure 58). Sections and details seem to indicate that tile was not used. The 1913 Annual Report (2424) noted that this house was of concrete and beam construction and did not mention tile. Painted wooden trim was applied where the forms were joined, and there is a wide wooden sill board.

The house is a good example of the then-popular Craftsman style of architecture. One characteristic of the style is its "honest," straightforward treatment of materials. Brick, stucco, and frame Craftsman style houses were built in many Minnesota cities and towns between about 1905 and 1920. The exposed rafter ends at the eaves, grouped windows, and simple board trim are notable details associated with this style.

The seven-room house is finished with varnished birch trim throughout the interior. The floors appear to be maple. There are many built-in cabinets with intact original hardware. The kitchen cabinets are in good condition, and like the upstairs woodwork, have never been painted. Window and door frames have the flat, squared-off profiles associated with the Craftsman style. The solid-core, four-panel doors have oval eschutcheons and knobs. Picture moldings were applied to the walls of some rooms. Plumbing and a hot-air furnace were provided in the original construction. A plan and elevation are shown in Figures 60 and 61.



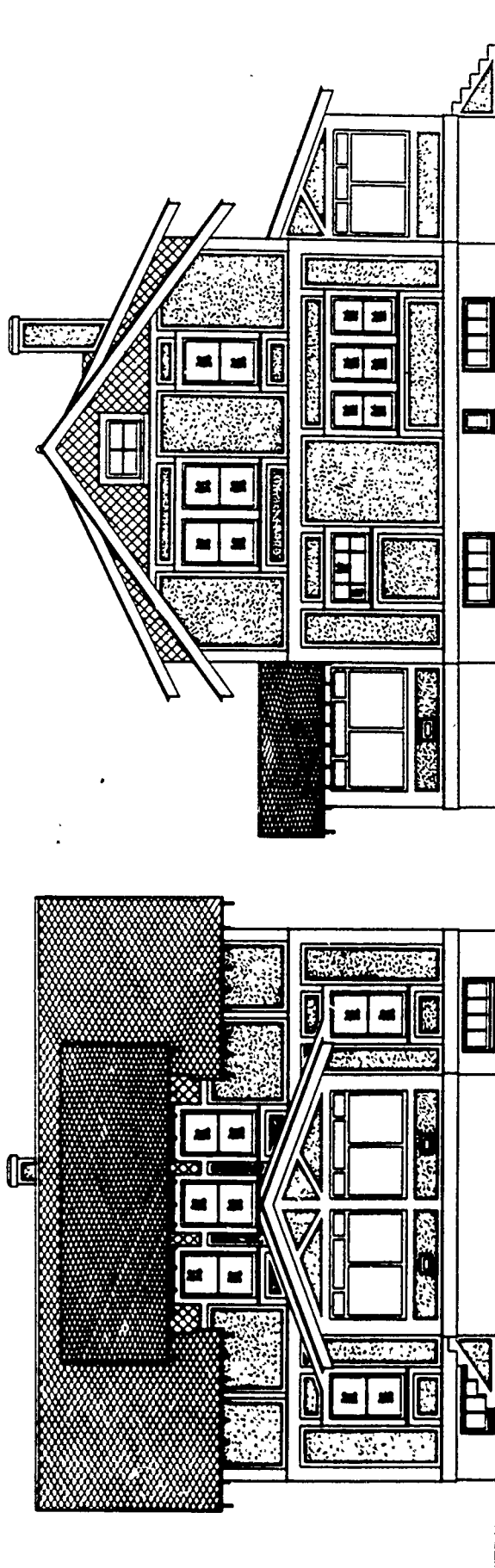
57. Gull Lake Dam. South elevation, 1987.



58. Dam Tender's Dwelling at Gull Lake Dam, 1987. East elevation (top).
 Dam Tender's Dwelling at Gull Lake Dam, 1987. West elevation (bottom).



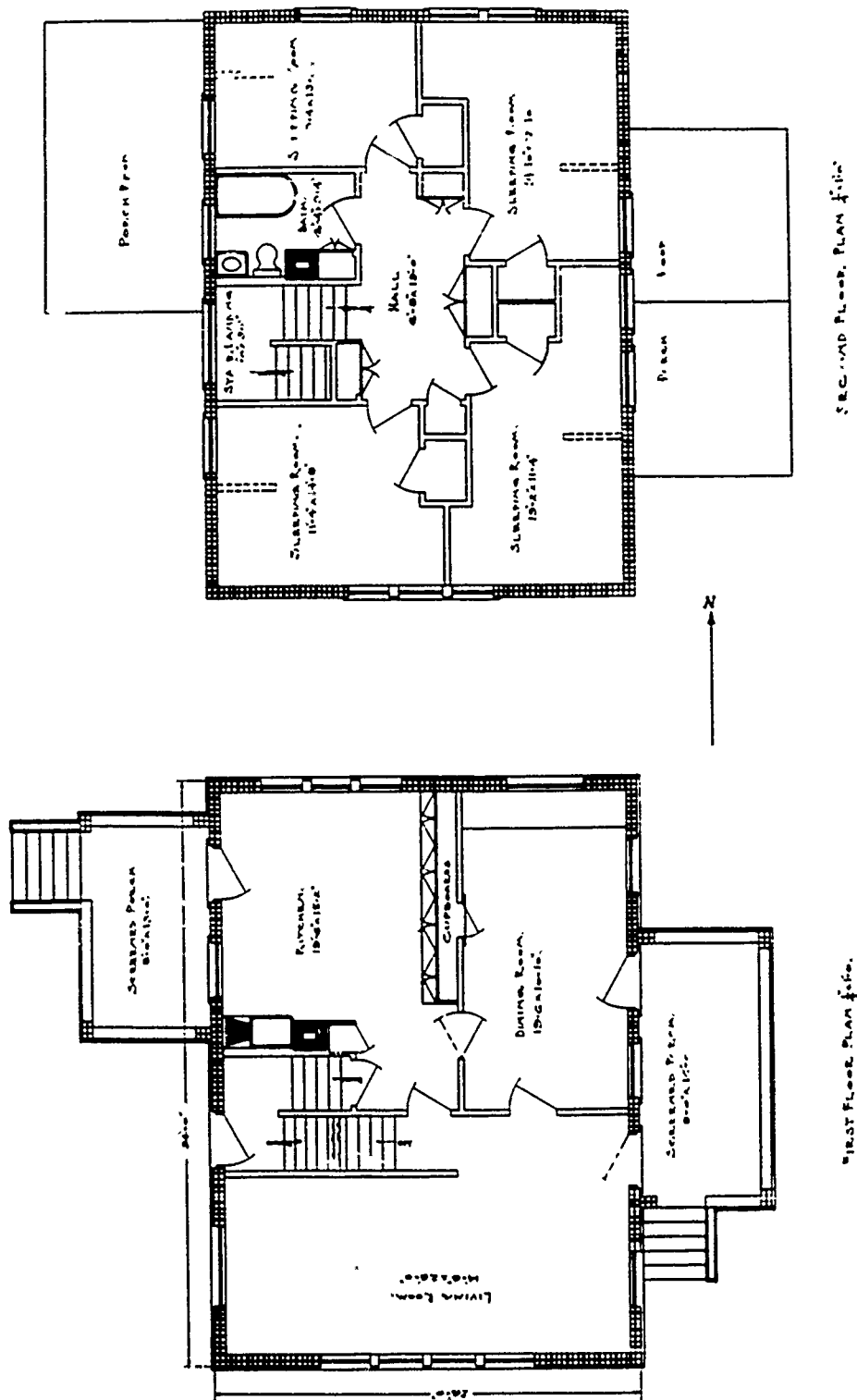
59. Detail of Concrete Construction, Gull Lake Dam Tender's Dwelling, 1987.



East Elevation, $\frac{1}{4}'' = 1'-0''$

North Elevation, $\frac{1}{4}'' = 1'-0''$

60. Elevation of Dam Tender's Dwelling at Gull Lake Dam, 1911. Source: Corps of Engineers.



61. Plan of Dam Tender's Dwelling at Gull Lake Dam, 1911.
Source: Corps of Engineers.

Among the four remaining dam tender's dwellings (at Gull, Leech, Winnibigoshish and Sandy Lakes) the Gull Lake house has the greatest architectural and construction significance. All of the dam tender's dwellings were designed and built by Corps engineers who used readily-available materials. This is evident in the log house erected at Winnibigoshish in 1882-3, and in the use of a poured concrete foundation at Leech Lake at the early date (in such a remote area) of 1902. Poured concrete was readily available during the dam reconstruction. Here, at Gull, the all-concrete house is the logical companion to the new concrete dam one-hundred yards away. Because of the involvement of engineers Shunk and Freeman at Gull Lake--who were involved in innovative pre-cast poured concrete dam construction methods at Lock and Dam No. 1--it is tempting to look for a connection. However, several varieties of poured concrete and beam construction were in common use for the construction of houses for the general public by this date, and what appear to be quite similar houses can be seen in pattern books of the period (Figure 62). Both the houses at Gull Lake, and the now-razed house at Pokegama Lake (1909, razed) represented the Corps attempt to construct dwellings which were quite indistinguishable from middle-class housing built elsewhere.

Archaeological Studies

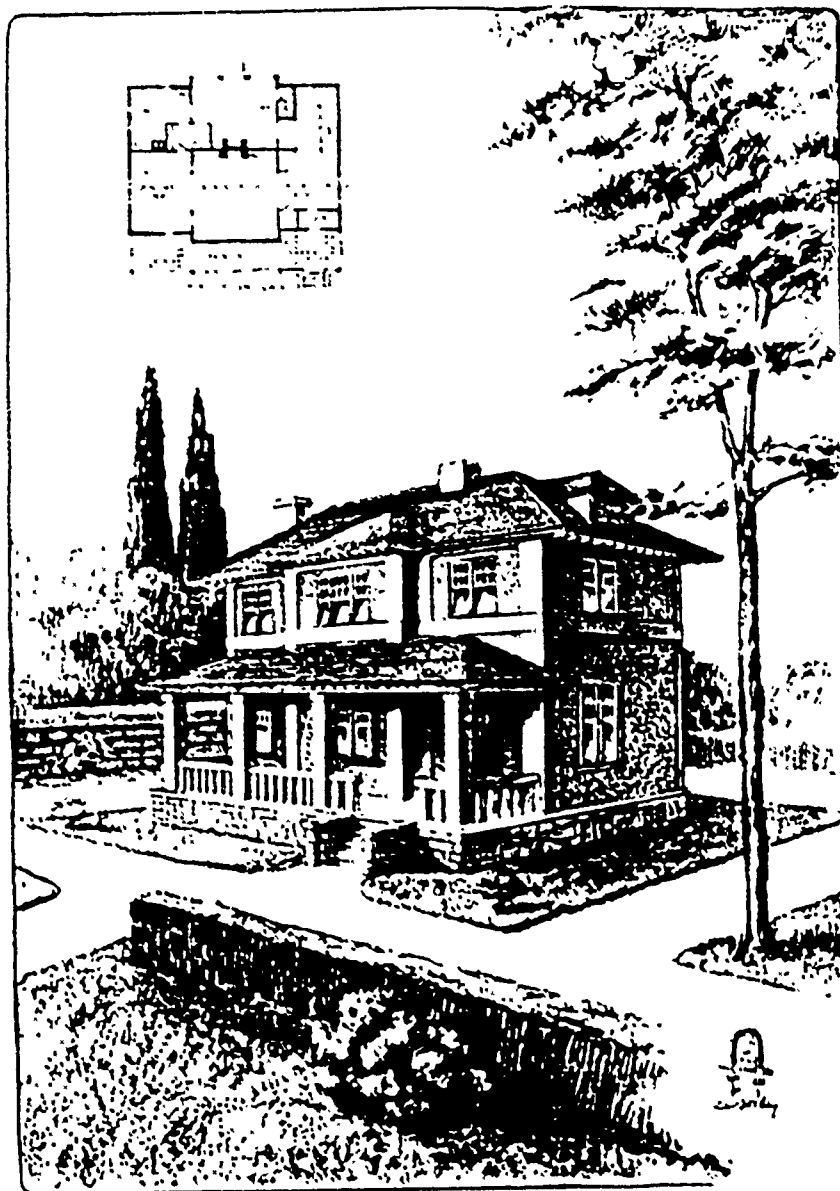
"The Gull Lake damsite stands out as a relatively pristine example of mound village sites in the region," noted the 1973 environmental review report (D-XI-6). Twelve round, elongated and linear mounds (and at least two disturbed by road construction) are located near the eastern end of the dam. The Gull Lake Dam Mound Site is identified as 21 CA 37. The village materials and burial mounds represent two periods of occupation, 800 B.C.-A.D. 200, and A.D. 600 and 900 (Johnson, 1971). An interpretive center is maintained by the Corps of Engineers.

The 1979 Cultural Resources Investigation included an intensive survey of the 82 acres of Corps land adjacent to the damsite. This study recommended that 21 CA 37 and 21 CA 58 (a nearby site on Corps land but outside the immediate study area) be nominated to the National Register.

Historic

None of the previous studies mentioned any historic archaeological remains near the damsite. A 1920 map of the Gull Lake Dam shows fourteen structures on the

A CEMENT HOUSE THAT SHOWS THE DECORATIVE USE OF CONCRETE AS A FRAMEWORK



Published in *The Craftsman*, January, 1907.

EXTERIOR VIEW. NOTE EFFECT OF RAISED FRAMEWORK OF CONCRETE AGAINST ROUGH-CAST PANELS.

ONE or the other of the more massive forms of construction seems to be called for by the design of this house, which was meant to be built either of concrete or of hollow cement blocks, and so is planned especially with a view to the use of one or the other of these materials, although the design would be equally well

suited to stone or brick. Believing that a house built of cement or concrete should be exceedingly simple in design, with plain straight lines and unbroken wall surfaces, we have carried out this idea as consistently as possible.

No timbers are used on the outside of the house, but the form of the framework is

24

62. "A Cement House That Shows the Decorative Use of Concrete as a Framework." Gustav Stickley, *Craftsman Homes*, 1909, p. 24. See Appendix E.

rise above the western bank of the Gull River (Figure 63). Only the dam tender's house described above, the entrance to a root house, which is dug into a hillside to the west of the house, and the boat house survive. The original complex consisted of the dwelling, an office, a boat house, a wood shed, a barn, a warehouse, carpenter and blacksmith shops, an out-house, a corn crib, an ice house, a smoke house, a root house and a chicken coop. The barn, warehouse and shops were clad in corrugated metal (Figure 65). The three-room office, dating from 1912, was finished with cement stucco on metal lath (Figure 64).

Sources

Bemidji State College. Environmental Review of the Headwaters of the Mississippi Reservoir Projects. Bemidji State College Center for Environmental Studies, 1973.

Department of the Army, Corps of Engineers. Master Reservoir Regulation Manual for the Mississippi River Headwaters Reservoirs. St. Paul, April 1963.

Johnson, Elden. "Excavations at Gull Lake Dam (21 CA 37)". The Minnesota Archaeologist, Vol. 31, No. 2, pp. 44-69. Minnesota Archaeological Society, Minneapolis.

Johnson, Elden, Christina Harrison and Jeanne Schaaf. Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pogkegama. Archaeology Laboratory, University of Minnesota, Minneapolis, 1979.

Merritt, Raymond H. Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers. Washington, D.C.: U.S. Government Printing Office, 1979.

St. Paul District, U.S. Army Corps of Engineers. Annual Reports. 1911: 1975-1980.

_____. 1912: 2182-2186.

_____. 1913: 2424-2430

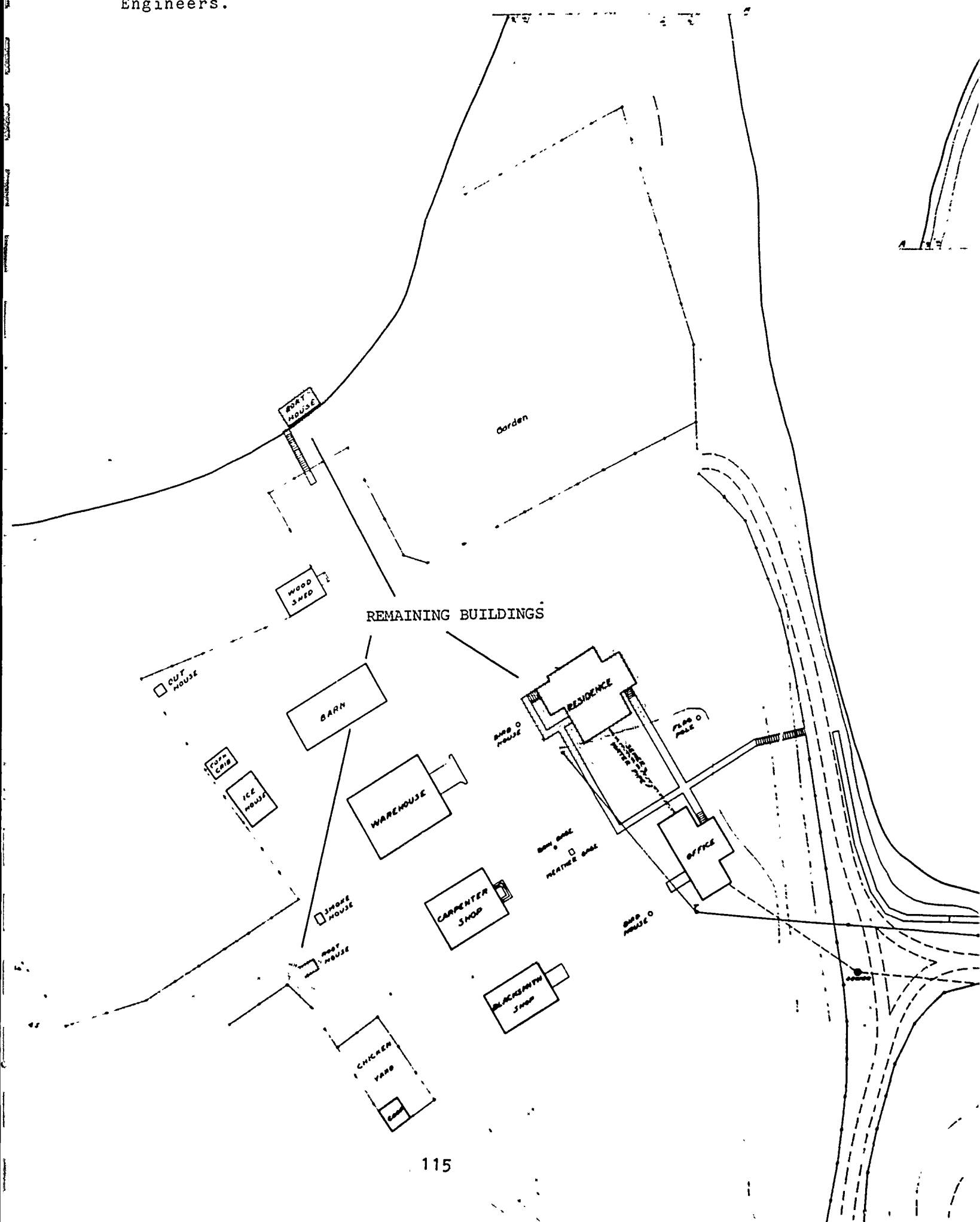
_____. Gull Lake Dam map and plan files.

Photograph Collections

Minnesota Historical Society

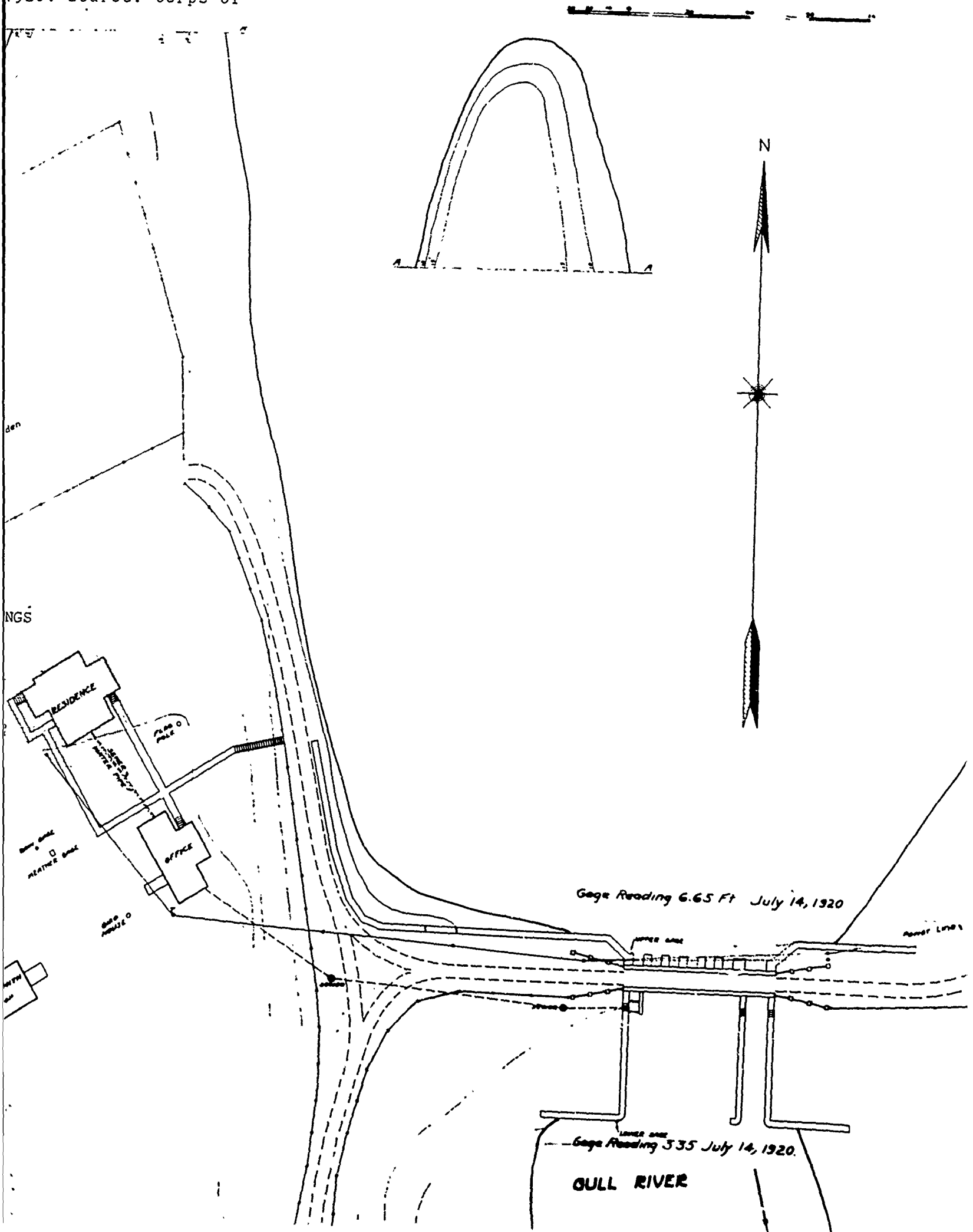
St. Paul District, U.S. Army Corps of Engineers

63. Plan of Grounds at Gull Lake Dam, 1920. Source: Corps of Engineers.

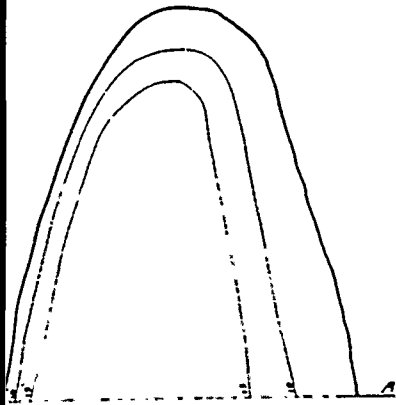


1920. Source: Corps of

Scale 1 in. 30 ft



Scale 1 in. 30 ft



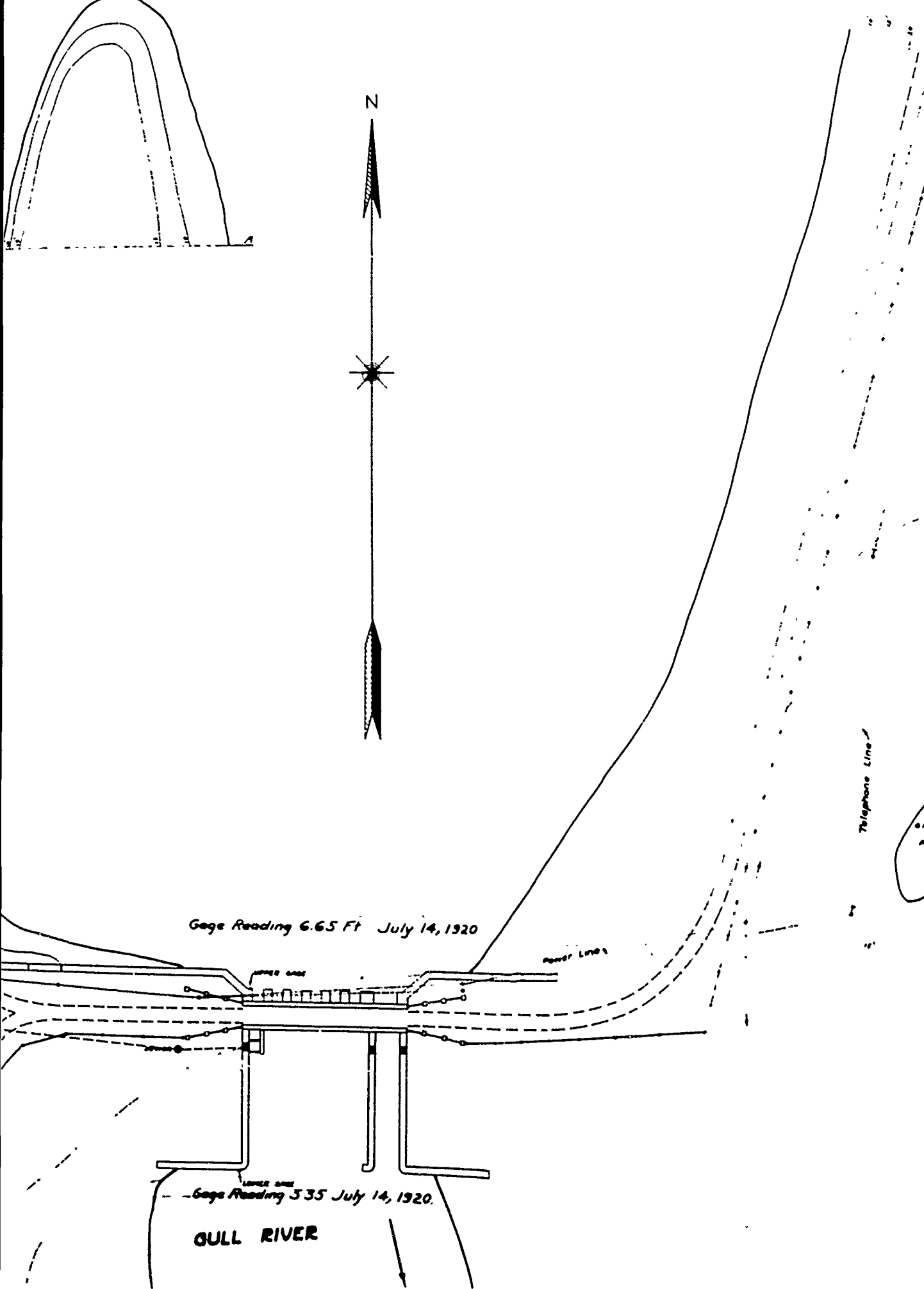
Gage Reading 6.65 Ft July 14, 1920

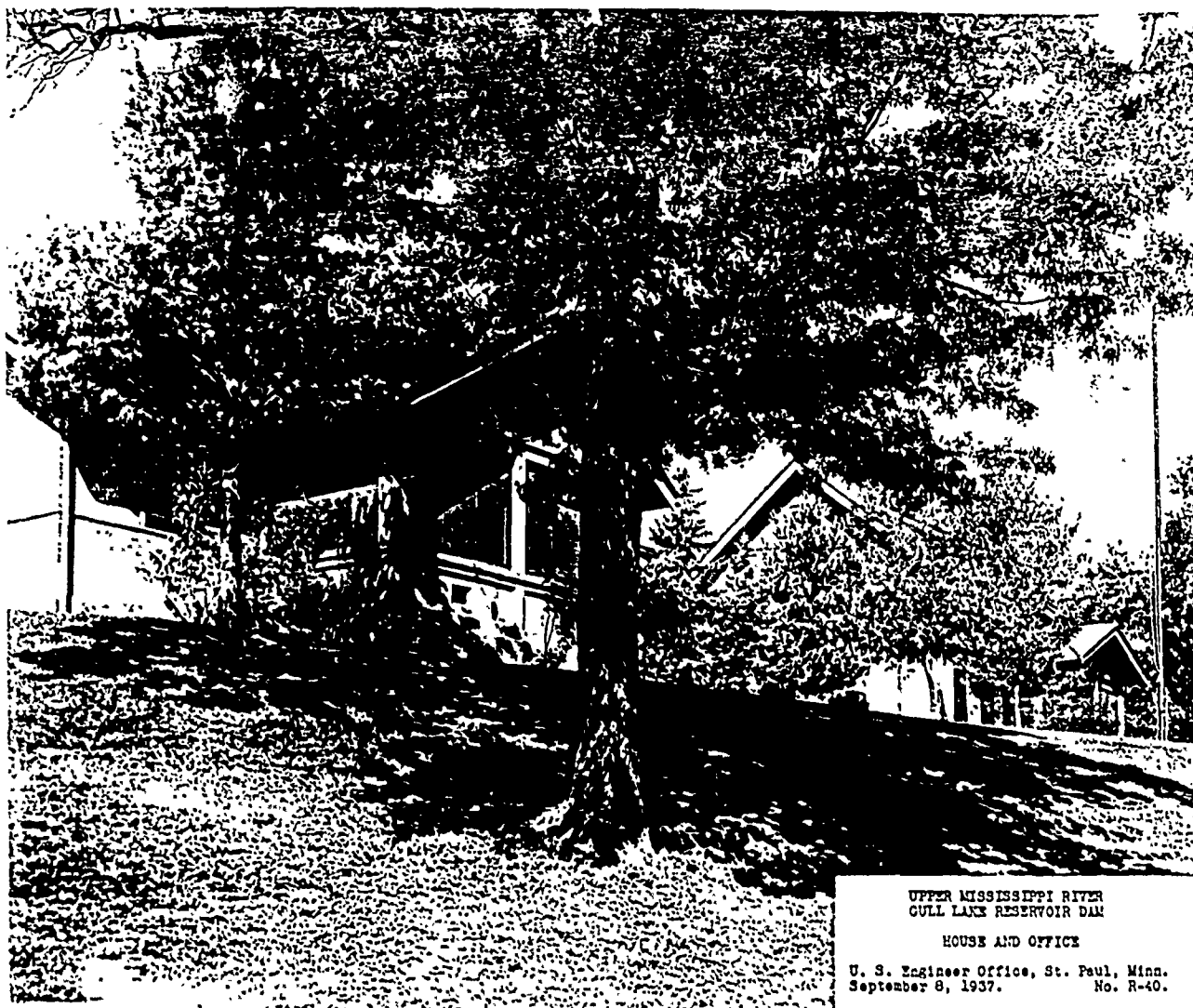
Power Line

Telephone Line

Lower Gage
Gage Reading 5.35 July 14, 1920

GULL RIVER





UPPER MISSISSIPPI RIVER
GULL LAKE RESERVOIR DAM
HOUSE AND OFFICE

U. S. Engineer Office, St. Paul, Minn.
September 8, 1937. No. R-40.

64. Office (left) and Dam Tender's Dwelling at Gull Lake Dam,
1937. Source: Corps of Engineers.



65. Shops at Gull Lake Dam, 1911. MHS photo (top).
Elevation drawing for a carpenter shop, Gull Lake Dam,
n.d. Source: Corps of Engineers (bottom).

Chapter 4

Evaluation and Conclusion

Statement of Significance: Upper Mississippi River Headwaters Reservoirs Dams and Dam Tender's Houses

Headwaters Reservoirs Dams

The Lake Winnibigoshish, Leech Lake, Pine River, Pokegama Lake, Sandy Lake and Gull Lake Dams are associated with the earliest large-scale system of water reservoirs in the United States, and were developed after nearly thirty years of study and debate among government and private interests.

The existing concrete dams date from 1900 to 1913. Each is unique, based on its geographical and geological setting, but the dams share basic construction details and materials. All but Gull Lake have had substantial modifications of equipment and, in some cases, structural modifications. They appear to possess no specific engineering significance, but have proved to be durable and well-constructed. They are among the oldest dam structures in the state and, like the dam tender's houses that still stand at four locations, are evidence of the Corps' presence in remote areas of the state at an early period.

The primary period of significance begins in the early 1880s with the construction of the original earthen dams and timber control structures. Its approximate end is about 1940, in the pre-World War II years. This approximate date marks the beginning of heavy public recreational use of the reservoirs. As discussed in Chapter 2, transportation, public works, commerce, industry and conservation and recreation are the chief areas of significance.

The seasonally low water levels of the Upper Mississippi created obstructions to steamboat trade and also to interests such as milling operations and lumber drives. Periodic floods were also a hazard. Proposals for construction of a series of dams in the Mississippi Headwaters region, designed to stabilize the river's flow and improve navigation below St. Paul, were advanced as early as 1852. For nearly thirty years, additional studies were conducted and a variety of solutions proposed.

In 1878, Congress ordered the examination and survey of the Headwaters region of Minnesota and Wisconsin, an area covering approximately 25,000 square miles. The first experimental dam at Winnibigoshish, which established the design of the succeeding dams, was authorized in 1880. Funds

for dams at Leech Lake and Lake Pokegama, completed in 1884, and Pine River, completed in 1886, were subsequently appropriated. Sandy Lake Dam and a navigation lock were constructed in 1895. Due to the wilderness conditions at the sites, native timber and other materials were employed in the construction of the dams, and equipment was moved from one project to another.

In 1898, Congress authorized replacement of the deteriorated timber dams with concrete. The Winnibigoshish Dam was replaced 1899-1900 and the others were replaced between 1903 and 1909. With the completion of the Gull Lake Dam in 1913, the reservoir system encompassed a watershed of 4,535 square miles and had a storage capacity of 94,834,000,000 cubic feet of water.

Although the federal government's role in the creation of the reservoirs was strictly defined as the improvement of navigation, from the outset, private interests such as Minneapolis millers, northern lumbermen, and water power developers were direct beneficiaries of the improved flow. Other interests have been critical of the reservoirs. Controversy over flowage rights and flooding has involved farmers and wild rice growers, and, since the 1920s, the large number of resort and lakeshore owners on the over 90 lakes included within the Headwaters reservoirs. At the time of their construction, the Headwaters dams had a measurable impact on channel depths at and below St. Paul. However, a series of subsequent river improvements greatly diminished this impact.

In the 1930s, with the completion of the nine-foot channel project and a system of locks and dams on the Upper Mississippi, the operating policies of the reservoirs were modified to reflect the multiple uses of the northern lakes, which increasingly included flood control, recreation, fish and wildlife conservation, and water supply.

The damsites have been witness to the development of the tourist and recreational industry in north central Minnesota. In the 1960s, the first master plans for public recreational access at the damsites formally recognized the pattern of public use which had begun at Leech Lake as early as 1909, with a small public boat launch.

Statement of Significance: Dam Tender's Dwellings

The remaining dwellings are at Lake Winnibigoshish (1901), Leech Lake (1902-1904), Sandy Lake (ca. 1891) and Gull Lake (1913). Because of considerable remodeling, the stucco-clad dwelling at Sandy possesses the least architectural significance. Winnibigoshish (NRHP, 1982) and Leech, both of frame construction, are representative of the functional

design practices of Corps engineers during the dam reconstruction period . Winnibigoshish is a hip-roofed bungalow identical to "civilian" bungalows elsewhere in the state. Leech Lake is a gable-roofed structure distinguished primarily by its front porch, second-story dormers, and excellent orientation toward the marshes at the outlet of Leech Lake. Both are generally unaltered. Although unoccupied, they have been kept sound because of maintenance. Gull Lake is architecturally significant for its all-concrete construction and Craftsman style details. The original integrity of the building's interior and exterior is well-maintained. In appearance, the houses were usually the least utilitarian of the buildings at the damsites. Detailed information on each of the above dwellings is provided in Chapter 3.

Although their appearance and architectural significance varies from dwelling to dwelling, the relationship of these buildings to the history and significance of the Headwaters reservoirs is shared equally among them. They are part of the development and maintenance of the reservoirs from the earliest period, and represent the introduction of a full-time government presence into a remote area of the state. In all cases, they are among the oldest buildings in the immediate area. Winnibigoshish and Leech, in particular, still evoke something of the pioneer conditions which faced the early dam personnel and their families. Today, the dwellings contribute to an understanding of the dam and other buildings as an interdependent unit, and in maintaining the feeling of the original site.

As a building type, specifically a utilitarian dam tender's or lock master's dwelling, these are among only a few remaining in the St. Paul District. None in the study area can be considered exactly representative of other District buildings, because all were somewhat unique. Although the dwelling at Gull possesses particular architectural significance, all appear to be eligible for the National Register of Historic Places according to criteria "a" and possibly "c." (See Appendix A for National Register of Historic Places criteria.)

Finally, the presence of these houses--now at the edge of public recreation areas--greatly assists in interpreting the dam-sites as a century-long human effort. Through the ongoing oral history project, more is being learned about the occupation of dam tender and the significance of the dwellings.

Recommendations and Conclusions

1. Due to recreational development and accompanying road building and regrading, as well as changing lake levels, the damsites are highly disturbed areas. In most

cases, the perimeter of now-razed buildings is not visible. The most "re-organized" sites, where disturbance appears to be at least 80 per cent, are Pine River and Pokegama. Gull Lake, where sidewalks leading to a former office are still visible, represents the least amount of disturbance.

All of the sites have had some level of Corps-sponsored archeological reconnaissance, as noted in Chapter 3. Excavations have focused primarily on prehistoric rather than historic remains, and the results of the studies are summarized in the discussion of individual damsites. Although trash pits, builders' trenches, and building foundations might be located, there does not seem to be important subsurface remains worthy of testing. As this report indicates, there is a generally good published record of the construction of the Corps buildings at each site.

2. As a group of structures with shared significance as established in this report, the dams and dam tender's dwellings described in this report appear to be eligible for the National Register of Historic Places. The Winnibigoshish Dam and dwelling were listed in 1982. It is recommended that a Multiple Property Documentation Form be used to nominate the sites individually, with reference to their shared context.

3. The boundary delineation for National Register purposes varies from site to site. At Pokegama Lake and Pine River, only the dam should be included because there are no other remains of historic, cultural, or archaeological significance. At the other sites the boundary incorporates remaining buildings from the period of significance (1880-1940) as well as the dam structure.

3. The Corps should attempt to find a method of preserving the dam tender's houses at the Winnibigoshish, Gull and Leech Lake sites. These buildings retain much or all of their original integrity, and are essential to the significance and future interpretation of the site. The ongoing oral history project, which focuses on the inhabitants of these dwellings, is very useful in further establishing their significance.

References

Annual Reports of the Chief of Engineers, U.S. Army.
Washington, D.C.: U.S. Government Printing Office,
1874-1986.

Center for Environmental Studies. Environmental Review
of the Headwaters of the Mississippi Reservoir
Projects. Bemidji State College: Bemidji, Minnesota,
1973.

Blatti, Jo. Phase II Final Report, Mississippi
Headwaters Reservoirs Oral History Interviews Pilot
Project. St. Paul: St. Paul District, U.S. Army Corps
of Engineers, 1987.

Blegen, Theodore C. Minnesota: A History of the State.
Minneapolis: 1963.

Brew, Alan P. A Cultural Resources Investigation of
Archaeological Sites 21 CA 59, 21 IC 19, and 21 IC 45
Lake Winnibigoshish, Minnesota. St. Paul: St. Paul
District, U.S. Army Corps of Engineers, 1985.

Decker, Wilbur F. "Clearing for Action on the Upper
Mississippi." Minnesota History, 19 (June 1938):182-189.

Department of the Army, Corps of Engineers. Master
Reservoir Regulation Manual for the Mississippi River
Headwaters Reservoirs. St. Paul: April, 1963.

Ellet, Charles. The Mississippi and Ohio Rivers,
Containing Plans for the Protection of the Delta from
Inundation. Philadelphia: Lippincott, Grambro and Company,
1853.

Endicott, William C. Secretary of War. "Regulations for
the Use and Administration of Reservoirs at Headwaters
of the Mississippi River, February 21, 1889."

Folwell, William Watts. A History of Minnesota,⁴
volumes. St. Paul: Minnesota Historical Society, 1930.

Frank, Arthur DeWitt. The Development of the Federal
Program of Flood Control on the Mississippi River. New
York: Columbia University Press, 1930.

Fullerton, Aubrey. "The Completing of the Mississippi."
World Today, (May, 1906): 494-498.

Gilman, Rhoda R. "Last Days of the Upper Mississippi Fur
Trade." Minnesota History, 42 (Winter 1970): 122-140.

Gjerde, Jon. Historical Resources Evaluation: St. Paul District Locks and Dams on the Mississippi River and Two Structures at St. Anthony Falls. St. Paul: St. Paul District, Corps of Engineers, 1983.

Hartsough, Mildred. "Transportation as a Factor in the development of the Twin Cities." Minnesota History, 7, (September 1926); 218-232.

Hart, Irving H. "The Site of the Northwest Company Post on Sandy Lake." Minnesota History 7 (1926): 311-325.

Hart, Irving H. "Steamboating on Mississippi Headwaters." Minnesota History (Spring, 1952): 7-19.

Hartsough, Mildred. From Canoe to Steel Barge on the Upper Mississippi. Minneapolis: University of Minnesota Press, 1934.

Hudak, G. Joseph and Timothy L. Ready. Cultural Resources Inventory of Lands Adjacent to Big Sandy Lake. St. Paul: Science Museum of Minnesota, 1979.

Humphreys, Andrew A. and H.L. Abbot. Report upon the Physics and Hydraulics of the Mississippi River, Upon the Protection of the Alluvial Region Against Overflow; and Upon the Deepening of Mouths. Washington: 1861.

Interdesign. Master Plan for Public Resource Management. Department of the Army, Corps of Engineers, St. Paul District: 1977.

Interdesign. Mississippi River Headwaters Reservoir Visitor Center Interpretive Prospectus. Department of the Army, Corps of Engineers, St. Paul District: 1979.
1978.

Johnson, Elden. Excavations at Sandy Lake Dam Site. Minneapolis: Archeology Laboratory, University of Minnesota, 1975.

Johnson, Elden and Christina Harrison and Jeanne Schaaf. Cultural Resources Inventory of Lands Adjacent to Lake Winnibigoshish. Minneapolis: Archeology Laboratory, University of Minnesota, 1977.

Johnson, Elden, Jeanne Schaaf. Cultural Resource Inventory, Lake Winnibigoshish Dam Site. Minneapolis: Archeology Laboratory, University of Minnesota, 1978.

Just, Roger. "Annual Reports Citations for Headwaters Reservoir Dam Sites." Unpublished manuscript, n.d.

Kane, Lucille M. "Rivalry for a River: The Twin Cities and the Mississippi." Minnesota History, 37 (December 1961): 309-323.

Kane, Lucille M. The Falls of St. Anthony: The Waterfall That Built Minneapolis. St. Paul: Minnesota Historical Society Press, 1966.

Kleven, Bernhardt. "The Mississippi River Logging Company." Minnesota History 27 (September 1946): 190-202.

Kuhlmann, Charles B. The Development of the Flour-Milling Industry in the United States with Special Reference to the Industry in Minneapolis. Boston: 1929.

Lambert, J.W. and Robert Hoagland. The Economic Impact of Waterborne Transportation on the Upper Mississippi River Basin. St Paul: Upper Mississippi Waterway Association, 1975.

Larson, Agnes. History of the White Pine Industry in Minnesota. Minneapolis: University of Minnesota Press, 1949.

Loehr, Rodney. "Caleb D. Dorr and the Early Minnesota Lumber Industry." Minnesota History, 24 (June, 1943): 125-141.

Mathews, John L. Remaking the Mississippi. Boston: Houghton, Mifflin Co., 1909.

Merritt, Raymond H. Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers. Washington, D.C.: U.S. Government Printing Office, 1979.

Merritt, Raymond H. "The Development of the Lock and Dam System on the Upper Mississippi River. National Waterway Roundtable, (1980): 89-105.

Minnesota Legislative Research Committee. Report of the Upper Mississippi Reservoir and the Minnesota River Valley Development Interim Commission. St. Paul: 1961.

National Register of Historic Places Inventory Form, Winnibigoshish Lake Dam. State Historic Preservation Office, Minnesota Historical Society, 1981.

Nute, Grace Lee. Posts in the Minnesota Fur-Trading Area, 1660-1855. The Minnesota Archaeologist, Vol. 15 (1949) pp. 61-77.

Old Man River. Vol. 1, no. 1 (1936):9-12.

Peterson, William J. "A Century of River Traffic." The Palimpsest 27 (October 1946): 289-1900.

Prosser, R.S. Rails to the North Star. Minneapolis: Dillon Press, 1966.

Pyle, Joseph Gilpin. "The Reservoir System." Harper's Monthly Magazine. 69 (September 1884): 616

U.S. Department of the Interior, Bureau of Outdoor Recreation. The Upper Mississippi: A Wild and Scenic River Study. Ann Arbor: Bureau of Outdoor Recreation, 1975.

U.S. Army Corps of Engineers. The History of the U.S. Army Corps of Engineers. 1986.

U.S. Engineer Department. The Upper Mississippi River Navigation Improvement. St. Louis, U.S. Division Engineer, 1938.

Walker, Platt B. Mississippi Valley Lumberman and Manufacturer. 1876-1900.

Appendix A

National Register Criteria

"The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, material, workmanship, feeling, and association, and

(A) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(B) That are associated with the lives of persons significant in our past; or

(C) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) That have yielded, or may be likely to yield, information important in prehistory or history.

Appendix B

Lake Winnibigoshish National Register Nomination Form

United States Department of the Interior
Heritage Conservation and Recreation Service

National Register of Historic Places
Inventory—Nomination Form

For HCRS use only

received

date entered

See instructions in *How to Complete National Register Forms*

Type all entries—complete applicable sections

1. Name

Historic Winnibigoshish Lake Dam

and or common "Winnie" Dam

2. Location

Street & number Itasca County Highway 9 at Mississippi River not for publication

City, town Deer River vicinity of congressional district 8th

State Minnesota code 22 county Itasca code 061

3. Classification

Category	Ownership	Status	Present Use
☐ district	☒ public	☐ occupied	☐ agriculture ☐ museum
☐ building(s)	☐ private	☐ unoccupied	☐ commercial ☐ park
☒ structure	☐ both	☐ work in progress	☐ educational ☐ private residence
☐ site	Public Acquisition	Accessible	☐ entertainment ☐ religious
☐ object	☐ in process	☐ yes: restricted	☐ government ☐ scientific
	☐ being considered	☐ yes: unrestricted	☐ industrial ☐ transportation
		☐ no	☒ other: dam

4. Owner of Property

Name Department of the Army, St. Paul District Corps of Engineers/
United States Department of Agriculture, Chippewa National Forest

Street & number 1135 United States Post Office & Custom House/none

City, town St. Paul/Cass Lake vicinity of state Minnesota/Minnesota

5. Location of Legal Description

Courthouse, registry of deeds, etc. Itasca County Courthouse/Cass County Courthouse

Street & number

City, town Grand Rapids/Walker state Minnesota

6. Representation in Existing Surveys

Title Statewide Survey of Historic Resources has this property been determined eligible? ☐ yes ☒ no

Date 1980 ☐ federal ☒ state ☐ county ☐ local

Depository for survey records Minnesota Historical Society -- 240 Summit Avenue-Hill House

City, town St. Paul state Minnesota

7. Description

Condition		Check one	Check one
☐ excellent	☐ deteriorated	☐ unaltered	☒ original site
☒ good	☐ ruins	☒ altered	☐ moved date _____
☐ fair	☐ unexposed		

Describe the present and original (if known) physical appearance

The Winnibigoshish Lake Dam is located on the Mississippi River at the outlet of Winnibigoshish Lake approximately fourteen miles northwest of Deer River. The Winnibigoshish Reservoir is the largest in the Upper Mississippi Reservoir System. It has a capacity of 42.5 billion cubic feet of water and controls the runoff from a 1442 square mile drainage area.

The present concrete structure, constructed in 1899-1900 replaced an experimental rock-filled timber crib dam constructed between 1881 to 1884. The dam consists of an 300' earthen dike with a timber diaphragm core filled with puddled clay. Dike slopes are protected either by sod and stone riprap or concrete slab. The control structure consists of reinforced concrete abutments and five piers resting on timber piles set in clay. The distance between abutments is 162'. Seven bays are situated in the structure -- five 14' sluiceways, each of which is divided into three sections of stop logs, for regulating the reservoir discharge; a 12' log sluice; and a 5' fishway constructed landward of the north abutment in 1912-14. The log sluice and the fishway are no longer in use. The control structure supports a 20' wide highway bridge (County Road 9) constructed in 1934 when an earlier 1909 structure was replaced. The bridge's treated timber deck rests on stringers supported between abutments by six steel bents and one concrete pier.

The original steel tainter gates, log sluice reversed Parker bear trap gate, and operating machinery were removed in 1931. The dam was operated solely by stop logs until 1966 when five stop log bays were fitted with slide gates. The timber aprons were replaced with a concrete agron in 1964-66.

A one story frame dam tender's residence, constructed in 1901, is located a short distance north of the dam.

8. Significance

Period	Areas of Significance—Check and justify below			
☐ prehistoric	☐ archeology-prehistoric	☐ community planning	☐ landscape architecture	☐ religion
☐ 1400-1499	☐ archeology-historic	☒ conservation	☐ law	☐ science
☐ 1500-1599	☐ agriculture	☐ economics	☐ literature	☐ sculpture
☐ 1600-1699	☐ architecture	☐ education	☐ military	☐ social/
☐ 1700-1799	☐ art	☒ engineering	☐ music	☐ humanitarian
☒ 1800-1899	☒ commerce	☐ exploration/settlement	☐ philosophy	☐ theater
☒ 1900-	☐ communications	☒ industry	☐ politics/government	☒ transportation
		☐ invention		☒ other (specify)
				Public Works

Specific dates 1899-1900

Builder Architect

Statement of Significance (in one paragraph)

The Winnibigoshish Lake Dam is associated with the first and largest reservoir constructed in the regionally significant Upper Mississippi Reservoir System. Proposals for construction of a series of dams in the Mississippi headwaters region to stabilize the Mississippi's erratic flow were advanced as early as 1852. Between 1866 and 1880 Congress and the United States Army Corps of Engineers seriously considered the concept. Surveys were conducted and proposals formulated. An 1870 Corps report, which influenced future policy decisions, recommended that 41 reservoirs be constructed on the Mississippi, St. Croix, Chippewa, and Wisconsin Rivers. The reservoirs were intended to improve navigation between St. Paul and St. Louis during low water periods and, secondarily, to aid in flood control. Water power advocates, particularly Minneapolis millers, enthusiastically endorsed the concept which would result in a constant water flow. (Prominent Minneapolis miller William D. Washburn ardently sponsored creation of a federally-funded reservoir system while a member of Congress from 1879 to 1885. His efforts earned him the title "father of the reservoir system".) In 1880 Congress authorized construction of an experimental dam at Winnibigoshish Lake on the Upper Mississippi River. Funds for three additional dams (Leech Lake - 1884, Pokegama - 1884, and Pine River - 1886) were appropriated during the ensuing decade. Due to the wilderness state of the region, the dams, including the Sandy Lake Dam completed in 1895, were of timber construction. Plans for additional reservoirs in the system were abandoned in the late 1880s and 1890s. In 1898 the Corps decided to replace the deteriorating timber structures with reinforced concrete dams. The Winnibigoshish Dam was the first to be replaced in 1899-1900; the others were replaced between 1903 and 1909. With completion of an additional dam at Gull Lake in 1913, the reservoir system encompassed a watershed of 4535 square miles and had a storage capacity of 94,834,000,000 cubic feet of water. The system's original objective of improving river navigation diminished in the 1930s with completion of the nine-foot channel project and the system of locks and dams. Since the thirties the reservoirs have been regulated primarily for flood control, recreation, fish and wildlife conservation, and water supply.

¹All dates are completion dates.

9. Major Bibliographical References

See continuation sheet - page 1

10. Geographical Data

Acres of nominated property 6

Quadrangle name Little Kinnibigoshish Lake, Minn.

Quadrangle scale 7.5

UMT References

A

1	5	4	2	0	6	7	0	5	2	5	3	1	6	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Zone Easting Northing

B

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Zone Easting Northing

C

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

D

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

E

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

F

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

G

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

H

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Verbal boundary description and justification

See continuation sheet - page 1

List all states and counties for properties overlapping state or county boundaries

state	code	county	code
-------	------	--------	------

state	code	county	code
-------	------	--------	------

11. Form Prepared By

name/title Mark Haider, Research Historian

organization Minnesota Historical Society

date March 1981

street & number 240 Summit Avenue

telephone 612-296-9075

city or town St. Paul

state Minnesota

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

☐ national ☒ state ☐ local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-565), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the Heritage Conservation and Recreation Service.

State Historic Preservation Officer signature

Russell W. Fridley

title State Historic Preservation Officer

date

For HCRS use only

I hereby certify that this property is included in the National Register

date

Keeper of the National Register

Attest:

date

Chief of Registration

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY

RECEIVED

DATE ENTERED

Winnibigoshish Lake Dam

CONTINUATION SHEET

ITEM NUMBER 9 & 10 PAGE 1

Merritt, Raymond H. Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers. Washington D.C.: U.S. Government Printing Office, 1979. pp. 67-80.

St. Paul District, U.S. Army Corps of Engineers. Annual Reports, 1869-1980.

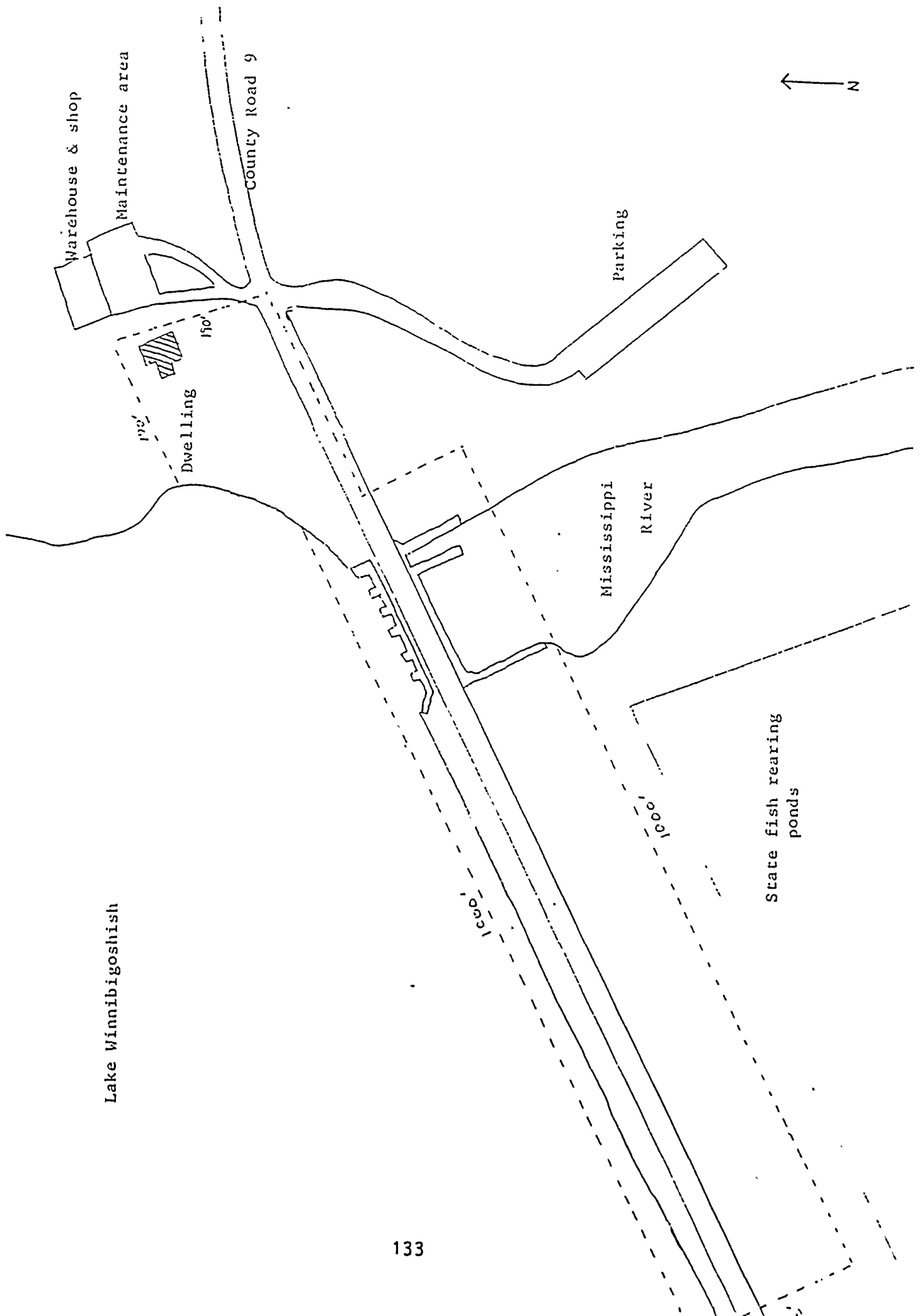
_____. Winnibigoshish Lake Dam files.

_____. Winnibigoshish Lake Dam maps including copies of the original timber dam construction drawings.

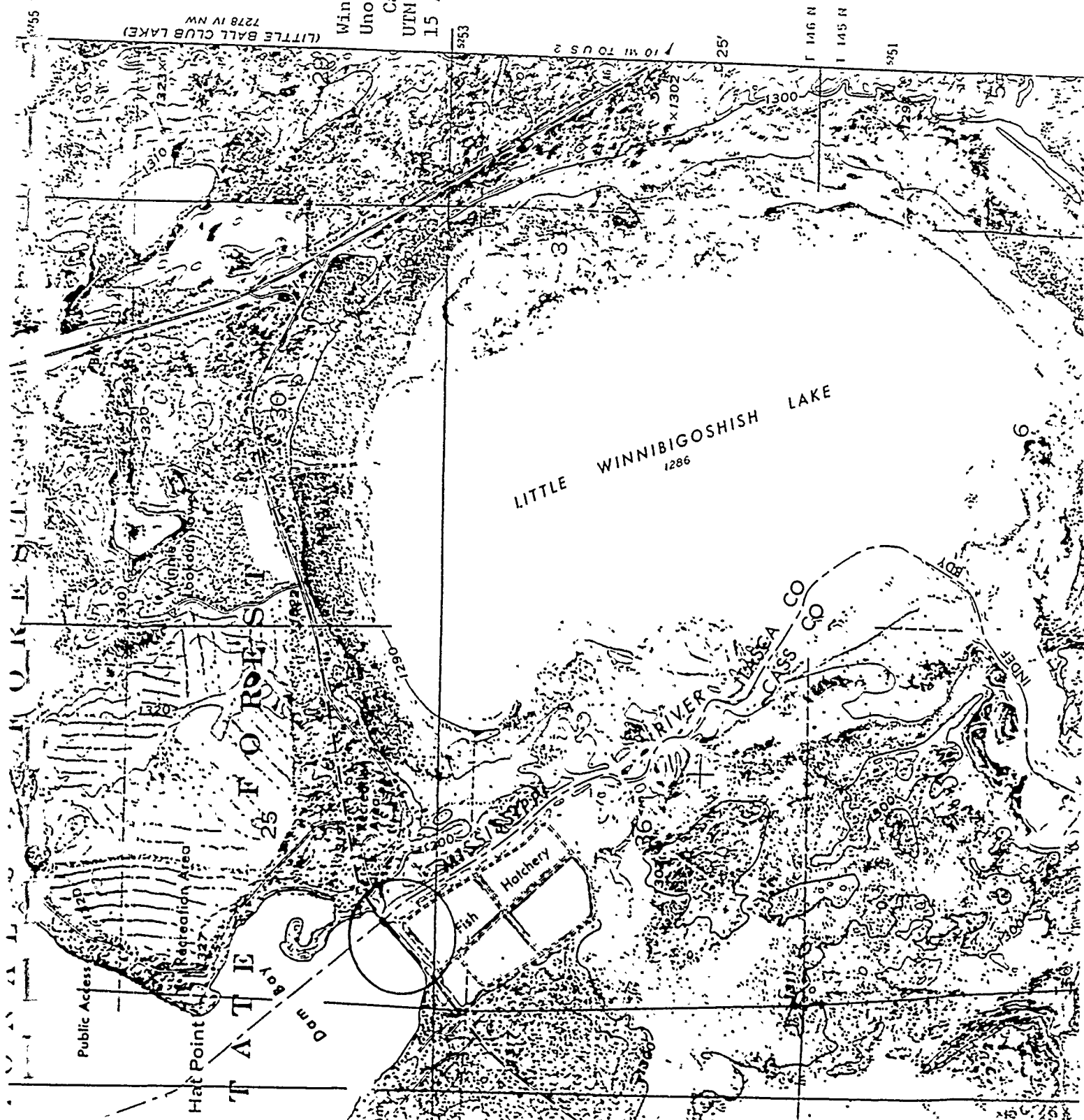
Verbal Boundary Description: (see sketch map)

That part of Section 25 of T146N, R27W described as follows: Beginning at the center of the intersection of County Road 9 and parking-service road northeast of Winnibigoshish Lake Dam, thence northwesterly 190', thence southwesterly approximately 170' to the shoreline of Lake Winnigiboshish, thence southerly along the shoreline to a point 75' northwest of the center line of said County Road, thence southwesterly parallel to said highway 1000', thence southeasterly 215' to a point 140' southeast of the center line of said highway, thence northeasterly parallel to said highway 1000', thence northwesterly 140' to the center line of said highway, thence northeasterly along said center line to point of beginning.

Winnibigoshish Lake Dam Verbal Boundary Description Sketch Map



W U U L



Appendix C

Headwaters Reservoir Data

Source: Annual Report, 1982:27-23

Reservoir	Outlet		Watershed Area (square miles)				Capacity at Maximum Stage (acre-feet)	Previous Projects		Existing Projects		Total Cost
	Minimum Stages (feet) ¹	River	Above St. Paul (miles)	Watershed (square miles)	Original Lake	Reservoir		Com- pleted	Cost	Com- pleted	Cost	
Winnibigoshish	6	Mississippi	408	1,442	117	179.4	967,930	1884	\$214,000	1900	\$173,470	\$387,470
Leech Lake	0	Leech	410	1,163	173	250.9	743,320	1884	171,805	1902	84,380	256,185
Pokegama	6	Mississippi	344	660 ²	24	35.0	120,750	1884	85,000	1904	126,030	211,030
Sandy Lake	7	Sandy	267	421	8	16.6	72,500	1895	114,000	1909	117,020	231,020
Pine River	9	Pine	199	562	18	23.7	177,520	1886	97,000	1907	133,320	230,320
Gull Lake	5	Gull	168	287	20	20.5	70,820	—	—	1913	86,826	86,826
			Surveys and flowage rights				—	—	—	—	160,939	160,939
			Recreational facilities				—	—	—	—	2,834,838	2,834,838
			Total new work				—	—	681,805	—	3,716,823	4,398,628
			Total operating and care				—	—	100,857	—	15,291,436	15,392,293
			Permanent indefinite appropriation for operating and care, Feb. 1, 1895 to end of fiscal year 1936				—	—	—	—	967,197	967,197
			Rehabilitation				—	—	—	—	425,000	425,000
			Total				2,152,840	—	\$782,662	—	\$20,400,456	\$21,183,118

¹Lower operating limits by regulations approved February 4, 1936, as modified December 29, 1944.

²Exclusive of area controlled by Winnibigoshish and Leech Lake Dams.

Appendix D

SCOPE OF WORK MISSISSIPPI RIVER HEADWATERS RESERVOIRS: CULTURAL RESOURCES INVESTIGATION

1.00 INTRODUCTION

1.01 The Contractor will undertake a historic resources investigation of the Mississippi River Headwaters Reservoirs: Lake Winnibigoshish; Leech Lake; Pokegama Lake; Sandy Lake; Pine River; and Gull Lake. All of these reservoirs are in north central Minnesota and are operated by the St. Paul District, Corps of Engineers.

1.02 This investigation partially fulfills the obligations of the Corps of Engineers (Corps) regarding cultural resources, as set forth in the National Historic Preservation Act of 1966 (Public Law [PL] 89-665), as amended; the National Environmental Policy Act of 1969 (PL 91-190); Executive Order (EO) 11593 for the "Protection and Enhancement of the Cultural Environment" (Federal Register, May 13, 1971); the Archeological and Historical Preservation Act of 1974 (PL 93-291); the Advisory Council on Historic Preservation "Regulations for the Protection of Historic and Cultural Properties" (36 CFR, Part 800); the Water Resources Development Act of 1986 (PL 99-662), section 943; and the applicable Corps regulations (ER 1105-2-50).

1.03 The laws listed above establish the importance of Federal leadership, through the various responsible agencies, in locating and preserving cultural resources within project areas. Specific steps to comply with these laws, particularly as directed in PL 93-291 and EO 11593, are being taken by the Corps "... to assure that Federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural, or archeological significance." A part of that responsibility is to locate, inventory, and nominate to the Secretary of the Interior all such sites in the project area that appear to qualify for listing on the National Register of Historic Places.

1.04 EO 11593 and the 1980 amendments to the National Historic Preservation Act further direct Federal agencies "... to assure that any federally owned property that might qualify for nomination is not inadvertently transferred, sold, demolished or substantially altered." In addition, the Corps is directed to administer its policies, plans, and programs so that federally and non-federally owned sites, structures, and objects of historical, architectural, or archeological significance are preserved and maintained for the inspiration and benefit of the people.

1.05 This cultural resources investigation will serve several functions. The report will be a planning tool to aid the Corps in meeting its obligations to preserve and protect our cultural heritage. It will be a comprehensive, scholarly document that not only fulfills federally mandated legal requirements but also serves as a scientific reference for future professional studies. It will identify resources that may require

additional investigations and that may have potential for public-use development. Thus, the report must be analytical, not just descriptive.

2.00 PROJECT DESCRIPTION

2.01 Corps of Engineers Regulation (ER) 1130-2-425 dated September 30, 1980, requires that all Government dwellings covered by this regulation be vacated within 15 years from the date of the regulation. Consequently, the St. Paul District plans to remove its dam tender dwellings in the Headwaters Reservoirs.

2.02 There are six reservoirs in the Mississippi Headwaters region: Gull Lake; Pine River; Big Sandy Lake; Pokegama Lake; Leech Lake, and Lake Winnibigoshish. The Pine River and Pokegama Lake reservoirs do not have dam tender dwellings. The latter two reservoirs are, nevertheless, important to this study as they are part of the headwaters project. The designations and locations of the headwaters reservoirs are as follows:

- (a) Gull Lake Reservoir. Eleven miles northwest of Brainerd.
- (b) Pine River Reservoir. Twenty-three miles north of Brainerd.
- (c) Big Sandy Lake Reservoir. About twelve miles above McGregor, and one mile above the confluence of the Big Sandy and Mississippi Rivers.
- (d) Pokegama Lake Reservoir. Two miles southwest of Grand Rapids.
- (e) Leech Lake Reservoir. Thirty-five miles west of Grand Rapids.

2.03 Before the Corps removes any of the dam tender dwellings, it must first evaluate both the dwellings and the reservoir sites for their National Register of Historic Places (National Register) eligibility. The Lake Winnibigoshish dam and vicinity have already been listed on the National Register.

2.04 For the purposes of this project, the contractor will evaluate the National Register significance of the dams, dwellings, associated structures, and potential historic archeological sites at each of the Headwaters Reservoirs. Thus, each reservoir site will be examined for its own National Register significance. In addition, the contractor will assess the significance of the Headwaters Reservoirs as a thematic group.

2.05 The National Register criteria for evaluation of historic resources are as follows:

"The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, material, workmanship, feeling, and association, and

- (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) That are associated with the lives of persons significant in our past; or

(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) That have yielded, or may yield, information important in prehistory or history." (36 CFR 60.6)

2.06 The following areas of significance should receive special consideration: architecture, commerce, engineering, and transportation.

3.00 DEFINITIONS

3.01 Cultural Resources include any building, site, district, structure, object, data, or other material relating to the history, architecture, archeology, or culture of an area.

3.02 For the purposes of this study, a Cultural Resources Survey is an intensive study of an area sufficient to determine the number and extent of the resources present, their relationships to project features, and their National Register significance. It will also provide recommendations for further studies and detailed time and cost estimates for such studies.

3.03 The project area is defined as the reservoir dam site that the Corps operates and maintains and any adjacent lands that were once associated with the project site.

4.00 SURVEY REQUIREMENTS

4.01 The Contractor will conduct a cultural resources investigation at the Mississippi River Headwaters Reservoirs, in accordance with Sections 2.02 and 3.02 above.

4.02 The Contractor's work will be subject to the supervision, review, and approval of the Contracting Officer's representative.

4.03 The Contractor will employ a systematic, interdisciplinary approach in conducting the study, using techniques and methods that represent the current state of knowledge for the appropriate disciplines. The Contractor will provide specialized knowledge and skills as needed, including expertise in history, particularly Minnesota history.

4.04 The Contractor will provide all materials and equipment necessary to perform the required services expeditiously.

4.05 The Contractor's study will be sufficient to determine the number and extent of any historic resources present, including standing structures as well as historic archeological sites.

4.06 Where historic maps, photographs, or written records indicate there were once standing structures, the Contractor will identify, describe and map these sites. For example, Major Charles Allen's 1883 "Map of Winnibigoshish Reservoir Dam and Vicinity" shows the location of 20 structures west of the dam and 2 east of it.

4.07 The Contractor will recommend any further testing or research required to reveal the extent and significance of historic archeological resources.

4.08 If it becomes necessary in the performance of the work and services, the Contractor will, at no cost to the Government, secure the rights of ingress and egress on properties not owned or controlled by the Government. The Contractor will secure the consent of the owner, or the owner's representative or agent, in writing prior to effecting entry on such property. If requested, a letter of introduction signed by the District Engineer can be provided to explain the project purposes and request the cooperation of landowners. Where a landowner denies permission for survey, the Contractor must immediately notify the Contracting Officer's representative and must describe the extent of the property to be excluded from the survey.

5.00 GENERAL REPORT REQUIREMENTS

5.01 The Contractor will submit the following documents, described in this section and Section 6.00: a draft contract report, a final contract report, and a brochure describing the headwaters reservoirs.

5.02 The draft contract report will detail the approach, methods, and results of the investigation and make recommendations for further work. It will be submitted to the Contracting Officer's representative, who will review it and forward it to other appropriate agencies for review. Comments will be returned to the Contractor, who will make the necessary revisions and submit the final contract report.

5.03 The Contractor's draft and final reports will include the following sections, as appropriate to the study. The length of each section depends on the level of detail required of the study and the amount of information available. The reports should be as concise as possible, yet provide all the information needed for evaluating and managing the project and for future reference.

a. Title page: The title page will provide the following information: the type of study; the types of cultural resources assessed (archeological, historical, and architectural); the project name and location (county and State); the date of the report; the Contractor's name; the contract number; the name of the author(s) and/or Principal Investigator; the signature of the Principal Investigator; and the agency for which the report is being prepared.

b. Management summary: This section will provide a concise summary of the study, containing all the information needed for management of the

project. This information will include the reason the work was undertaken, who the sponsor was, a brief summary of the scope of work and budget, a summary of the field work, the limitations of the study, the results, the significance of the results, and recommendations for further work.

c. Table of contents

d. List of figures

e. List of plates

f. Introduction: This section will identify the sponsors (Corps of Engineers) and their reason for the study and present an overview of the study. It will also define the location and boundaries of the study area (using regional and area-specific maps); define the study area within its regional context; reference the scope of work; identify the institution that did the work and the number of people and person-days/hours involved; give the dates when the various phases of the work were completed; identify the repository of records; and provide a brief outline of the report and an overview of its major goals.

g. Previous historical studies: This section will briefly summarize and evaluate previous historical research in the study area including the researchers, dates, extent, adequacy, and results of past work.

h. Theoretical and methodological overview: This section will state the goals of the sponsor and the researcher, the theoretical and methodological orientation of the study, and the research strategies that were applied to achieve the goals.

i. Results: This section will describe significant historic resources identified during the study. It will minimally include each site's description; its location (USGS quad, legal description, and address if appropriate); its current condition; and the direct and indirect impacts of removing any structures at the site.

j. Evaluation and conclusions: This section will formulate conclusions about the location, condition, and distribution of the historic structures or sites found and their possible importance in terms of local and regional history. It will also relate the results of the study to the stated goals; identify any changes in the goals; assess the reliability of the analysis; and discuss the potential of and goals for future research.

k. Recommendations: This section will recommend any further work deemed necessary. It will determine whether specific resources are eligible for the National Register of Historic Places. It will also describe any areas that were inaccessible and recommend future treatment of them. If the Contractor concludes that no further work is needed at any site, the evidence and reasoning supporting this recommendation will be presented.

l. References: This section will provide bibliographic references in a professionally recognized format for every publication cited in the report. References not cited in the report may be listed in a separate "Additional References" section.

m. Appendix: This section will include the Scope of Work, resumes of project personnel, copies of all correspondence relating to the study, and any other pertinent information referenced in the text. It will also include State site forms for all sites identified during the survey, including find spots and previously recorded sites.

n. Figures: The location of all sites and other features discussed in the text will be shown on a legibly photocopied USGS map bound into the report. Other recommended figures are regional and project maps and photographs of the project area.

5.04 A cover letter submitted with the final contract report will include the project budget.

5.05 The Contractor will submit to the Contracting Officer's representative the negatives for all photographs that appear in the final report.

5.06 The brochure will provide an overview of the history and significance of the study area, and it will also present a summary of each reservoir site. The brochure will be a 12-panel, multiple-fold document. Each panel should be approximately 4 inches wide by 9 inches long. Single spaced type should be used throughout the brochure, and all illustrations should be identified. The brochure will be submitted with the draft contract report, reviewed by the Contracting Officer's representative and, if necessary, revised before resubmission with the final contract report. The writing style should be clear, avoiding the use of technical terms wherever possible; if such terms are used, they should be clearly explained. This brochure should emphasize the general results of the study and its significance in terms of historic cultural development, rather than detailing methods or descriptive information. The use of illustrations is highly recommended. At the Contractor's request, examples of well-written brochures can be supplied by the Contracting Officer's representative. The final brochure will be a "camera-ready" document; the Contractor does not have to provide copies for distribution to the public. The contractor will provide the Contracting Officer's representative with all photographs, negatives, or drawings intended as illustrations in the brochure.

6.00 REPORT FORMATS:

6.01 Formats for both the draft and final contract reports are as follows:

a. The Contractor will present information in whatever textual, tabular, or graphic forms are most effective for communicating it.

b. The draft and final reports will be divided into easily discernible chapters, with appropriate page separations and headings.

c. The report text will be typed, single-spaced (the draft report should be space-and-one-half or double-spaced), on good quality bond paper, 8.5 inches by 11.0 inches, with 1.5-inch binding and bottom margins and 1-inch top and outer margins, and may be printed on both sides of the paper. All pages will be numbered consecutively, including plates, figures, tables, and appendixes.

d. All illustrations must be clear, legible, self-explanatory, and of sufficiently high quality to be reproduced easily by standard xerographic equipment, and will have margins as defined above. All maps must be labeled with a caption/description, a north arrow, map size and dates, and map source (e.g., the USGS quad name or published source). All photographs or drawings should be clear, distinct prints or copies with captions and a bar scale.

6.02 The brochure should follow the basic format requirements specified in Section 5.07.

7.00 MATERIALS PROVIDED

7.01 The Contracting Officer's representative will furnish the Contractor with access to any publications, records, maps, or photographs that are on file at the St. Paul District headquarters.

8.00 SUBMITTALS

8.01 The Contractor will submit reports according to the following schedules:

a. Draft contract report: Seven copies of the draft contract report will be submitted no later than 180 days after awarding of the contract. The draft contract report will be reviewed by the Corps of Engineers, the State Historic Preservation Officer, the State Archeologist, and the National Park Service. The draft contract report will be submitted according to the report and contract specifications outlined in this scope of work.

b. Final contract report: The original and 15 copies of the final report will be submitted 60 days after the Contractor receives the Corps of Engineers comments on the draft report. The final report will incorporate all the comments made on the draft report.

c. Brochure: Three copies of the draft brochure will be submitted for review with the draft contract report. A "camera-ready" copy of the brochure will be submitted with the final contract report, incorporating comments made by the Contracting Officer's representative.

9.00 CONDITIONS

9.01 Failure of the Contractor to fulfill the requirements of this Scope of Work will result in rejection of the Contractor's report and/or termination of the contract.

9.02 Neither the Contractor nor the Contractor's representative shall release any sketch, photograph, report, or other materials of any nature obtained or prepared under the contract without specific written approval of the Contracting Officer's representative prior to the acceptance of the final report by the Government. **Dissemination of research results** through papers at professional meetings and publication in professional journals is encouraged. However, professional discretion should be used in releasing information on site locations where publication could result in damage to cultural resources.

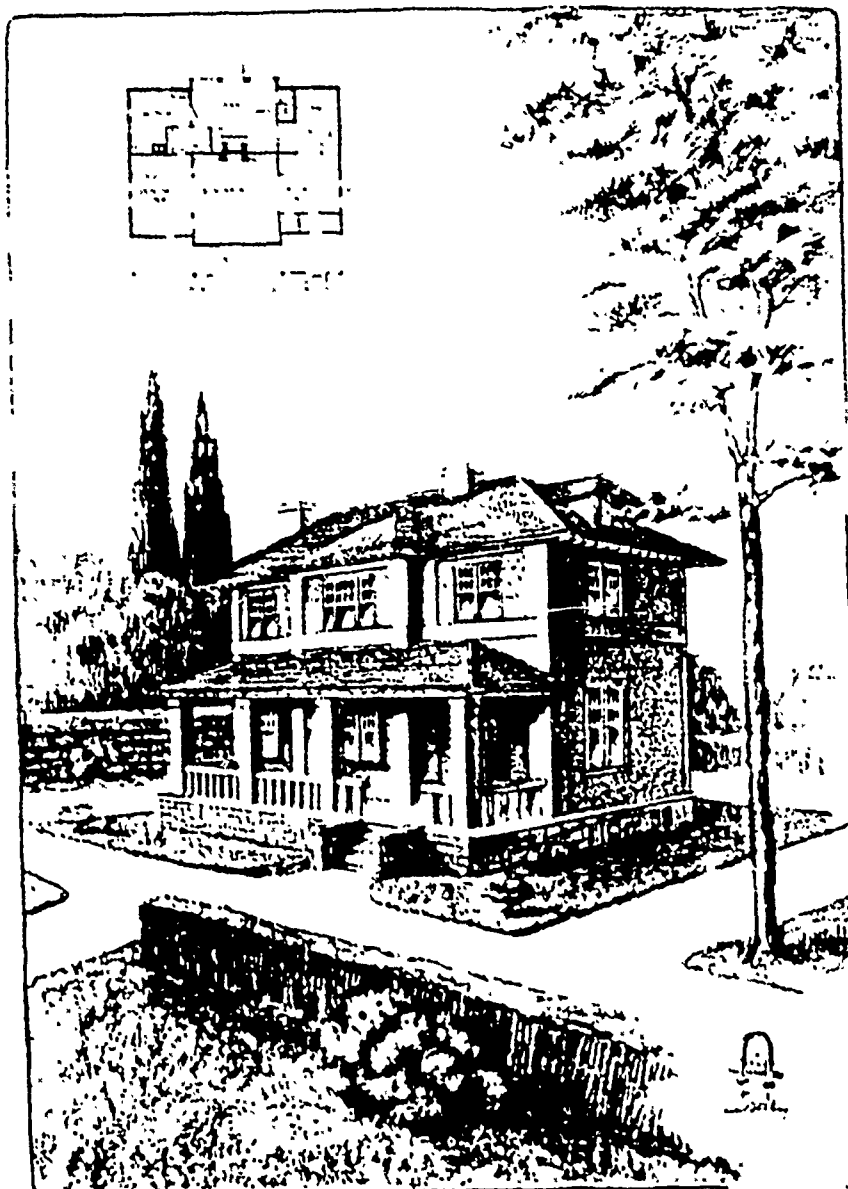
9.03 All materials, documents, collections, notes, forms, maps, etc., that have been produced or acquired in any manner for use in the completion of this contract shall be made available to the Contracting Officer's representative upon request.

9.04 Principal Investigators will be responsible for the **validity of material** presented in their reports. In the event of controversy or court challenge, the Principal Investigator(s) will be placed under separate contract to testify on behalf of the Government in support of the findings presented in their reports.

Appendix E

Gustav Stickley, Craftsman Homes (1909), p. 24-27.

A CEMENT HOUSE THAT SHOWS THE DECORATIVE USE OF CONCRETE AS A FRAMEWORK



Published in The Craftsman, January, 1907.

EXTERIOR VIEW. NOTE EFFECT OF RAISED FRAMEWORK OF CONCRETE AGAINST ROUGH-CAST PANELS.

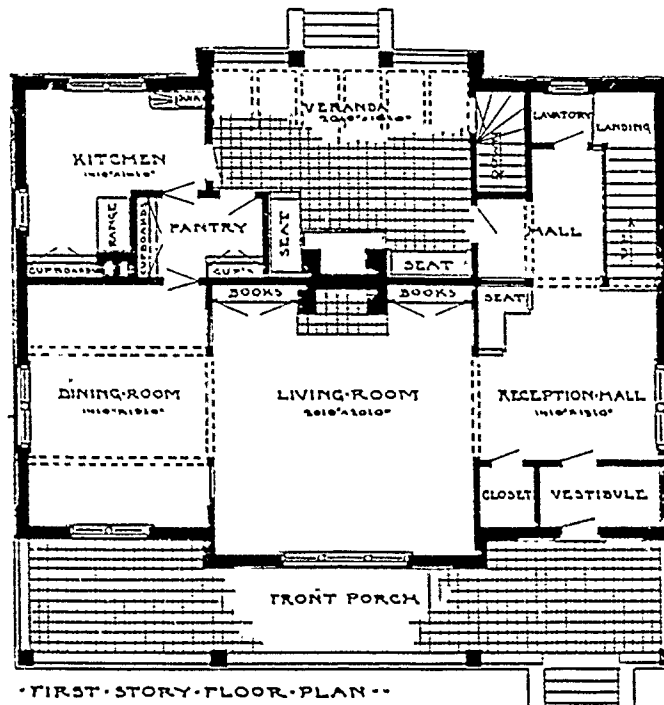
ONE or the other of the more massive forms of construction seems to be called for by the design of this house, which was meant to be built either of concrete or of hollow cement blocks, and so is planned especially with a view to the use of one or the other of these materials, although the design would be equally well

suited to stone or brick. Believing that a house built of cement or concrete should be exceedingly simple in design, with plain straight lines and unbroken wall surfaces, we have carried out this idea as consistently as possible.

No timbers are used on the outside of the house, but the form of the framework is

A CEMENT HOUSE FRAMED IN SMOOTH CONCRETE

revealed in the heavy corner-posts, uprights and horizontal bands of smooth concrete which span the walls and break up the broad plain surfaces. As the walls are given a rough pebble-dash finish, this framework of smooth concrete, which projects slightly from the surface of the wall proper, gives a contrasting effect which adds much to the interest of the design. The concrete may either be left in the natural gray, or the coldness of this tint may be modified by an admixture of coloring which will give it a tone of deeper gray, a suggestion of green, or one of the buff or biscuit shades, according to the color effect that harmonizes best with the surroundings. If the house should be built of stone or brick, the color effect, of course, would be much more decided.



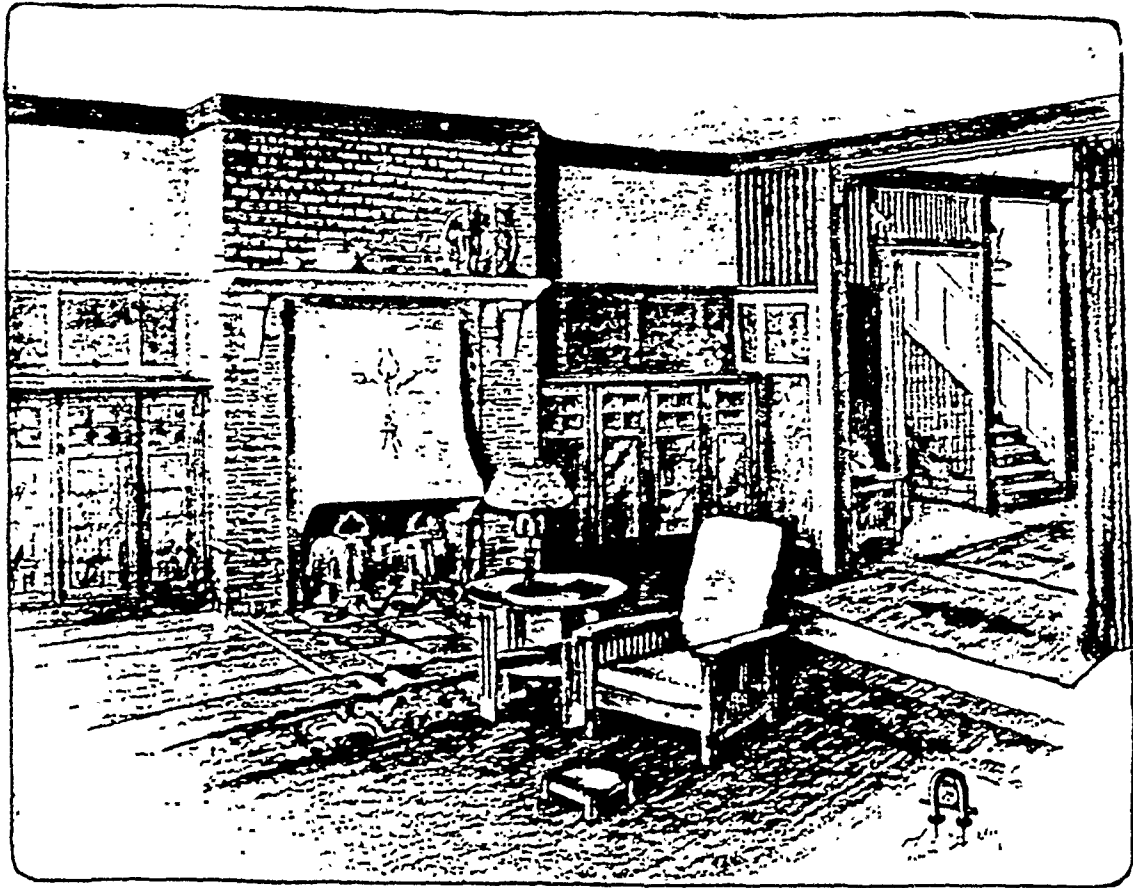
The roof is of slate—not the smooth, thin, lozenge-shaped slates with which we are so familiar, but a much more interesting form of this durable roofing material. The slates we have in mind are large and as rough on surface and edge as split paving-stones. They come in very interesting colors, dull red and slate-color with green and purplish tones which are much like the varied colorings found in stone. If red slate should be chosen for the roof, a pleasant repetition of the color could be obtained by flooring the verandas with square cement blocks of a dull brick red, which give the same effect as the much more expensive Welsh tiles.

Ample provision is made in this house for the healthful outdoor living that is now regarded as so necessary. A wide veranda extends across the entire front and at the back is a large square recessed porch that looks out over the garden at the rear of the house and is used as an outdoor living room where meals can be served if desired. This porch is exposed to the weather on one side only and this can easily be glassed in for the severest days of winter. With a southern exposure, though, it might be open nearly all winter, except on inclement days, for a sun room is pleasant when a room completely walled in is chilly and gloomy and in this case the

warmth of the sun would be supplemented by the comfort of the open fire, for the veranda is provided with an outdoor fireplace big enough to hold a pile of good sized logs. As this veranda has so much the character of a living room, the walls are treated in a way that connects it closely with the interior of the house. A high wainscot of cypress runs around all three sides and built-in fireside seats of the same wood afford a comfortable place for those who are minded to enjoy the fresh air and the warmth of the blazing logs at the same time. A fairly large table placed out here would serve all requirements for both living room and dining room out of doors, and a few comfortable easy chairs would make it a most inviting lounging place. The red cement floor would best be covered by a thick Indian blanket or two, or any rug of sturdy weave and primitive color and design. The wooden ceiling of the porch is heavily beamed and from the beams hang lanterns enough to make the place cheerful by night as well as by day. The color of the floor is repeated in the massive fireplace of hard-burned red brick and the plain mantel-shelf is made of a thick cypress plank.

Just above the sun room is an open-air sleeping room of the same size and general

A CEMENT HOUSE FRAMED IN SMOOTH CONCRETE



LIVING ROOM, SHOWING FIREPLACE AND BUILT-IN BOOKCASES WITH PANELS ABOVE. THE USE OF SPINDLES APPEARS IN THE GRILLES AND BALUSTRADE AND THE IDEA IS FURTHER DEVELOPED IN THE FURNITURE.

arrangement, except that it has no fireplace. On this upper porch the balustrade is replaced by a solid parapet made of the wall of the house. Like the sun room, this sleeping porch can be glassed in when necessary for protection from driving storms. But under ordinary circumstances no protection from the weather is needed even in winter, as nothing is better for the average housed-up human being than sleeping out of doors under plenty of covers.

The plan of the interior is an excellent example of the Craftsman method of arranging the divisions so as to secure at once the greatest possible amount of space, freedom and convenience within a given area and also to keep the construction as inexpensive as possible. The only fireplace is in the living room and is so placed that it may use the same chimney as the veranda fireplace. The ar-

range of the rooms, however, is so open that both dining room and reception hall share the benefit of the fireplace. Draughts from the entrance are cut off by a small vestibule which opens into the reception hall and the space beside it is occupied by a coat closet which receives wraps, overshoes and all those articles which are such a problem to dispose of in a hall that is part of the living room.

Ceiling beams are used only to indicate the divisions into rooms, but around the ceiling angle runs a broad beam and all three rooms are wainscoted to the height of six feet with oak paneling. We have suggested oak for the interior woodwork in this house, as the effect of it is both rich and restful and the color mellows with every passing year. Our idea would be to finish it in a rich nut-brown tone, which has much to do with giving a mellow sunny effect to the whole decorative

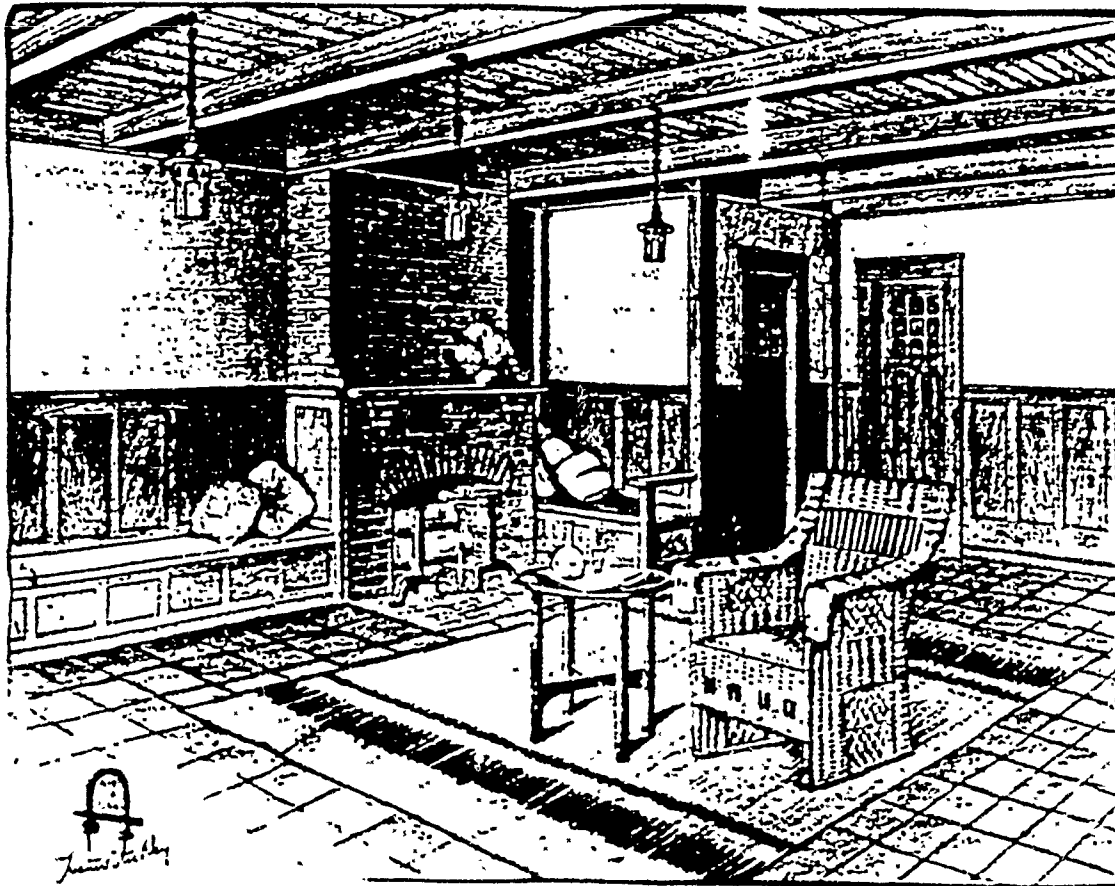
A CEMENT HOUSE FRAMED IN SMOOTH CONCRETE

scheme, for color goes far toward creating the cheery atmosphere that rightly belongs to a home. The rough plaster of the shallow wall spaces above the wainscot might be done in a warm tawny yellow and the whole decorative scheme developed from this foundation of walls and woodwork.

The structural feature that is most prominent in the living room is the fireplace, with the bookcase built in on either side. These bookcases are about four feet in height, so that the upper panels of the wainscot show above them. One decorative structural feature that is seen in all these rooms is the use of spindles wherever they would be effective. They appear in the balustrade of the staircase, in the open spaces above the panels, in the little partitions, in the continuation of these into grilles

above the doors, in the built-in seats and even in the furniture.

On the second story there are three large bedrooms in the front of the house and the open-air bedroom at the back. The staircase with its well occupies the space at one side of the sleeping porch, and the bath room is at the other. The upper hall, though not large, is so designed as to give a feeling of open arrangement and free communication, and the closets are concentrated at the center, where they are easy of access and do not interfere with the space required for the sleeping rooms. The plan of this house, as well as its decoration and interior arrangement, admit of very free interpretation and may be modified greatly to meet personal tastes and requirements.



VERANDA THAT IS FITTED UP AS A LIVING ROOM, SHOWING OUTDOOR FIREPLACE, WAINSCOTING, BUILT-IN SEATS AND USE OF LANTERNS, WITH SUGGESTIONS FOR SUITABLE FURNISHINGS.