



Report of  
**NORTH DAKOTA STATE WATER COMMISSION**  
 State Office Building  
**BISMARCK, NORTH DAKOTA**  
 58501

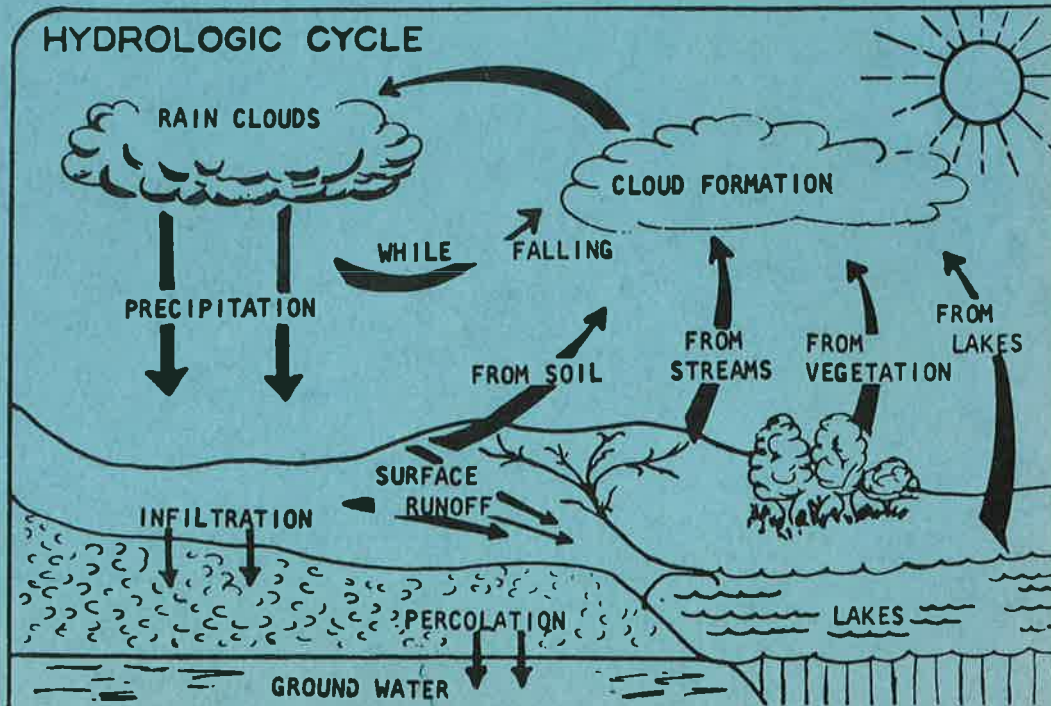
**COTTONWOOD CREEK DAM AND RECREATION COMPLEX**  
**LaMOURE COUNTY**  
 SWC Project #1515 - SORA Project #38-00242

Prepared in Cooperation With

City of LaMoure  
 LaMoure County Water Management District  
 State Game and Fish Department  
 State Outdoor Recreation Agency

September 9, 1971

**HYDROLOGIC CYCLE**



NORTH DAKOTA STATE WATER COMMISSION

OFFICE MEMO

TO: David A. Sprynczynatyk, Director, Engineering Division  
FROM: Dale Frink, Hydrologist-Engineer  
SUBJECT: Cottonwood Dam Flood Releases - SWC Project #1515  
DATE: October 25, 1978

I took a fast look at the hydrology for Cottonwood Dam. The TR20 program was used along with comparisons to Maple River streamgauge statistics. The Maple River watershed is located directly south of the Cottonwood Creek watershed. The two watersheds are similar in regard to channel slope, land use, and soil types. The contributing drainage area at the Maple River streamgauge is approximately 550 square miles. The drainage area at Cottonwood Dam is approximately 240 square miles. Various techniques are available for estimating flood flows between watersheds. Crosby used the general formula of  $Q_n = K(DA)^x S^Y$ . Since the soils of these watersheds are similar and the value of x ranges from 0.55-0.6 (Crosby's Report - James and Red Basins). The formula can be changed to  $Q_n = K(DA)^{.6}$ .

The Log Pearson Peak floods (WRC Adjusted) for the Maple River are:

10 yr. - 2340 cfs  
25 yr. - 4580 cfs  
50 yr. - 6870 cfs  
100 yr. - 9750 cfs

Solving for K and recomputing, gives the following inflows to Cottonwood Dam.

10 yr. - 1400 cfs  
25 yr. - 2770 cfs  
50 yr. - 4125 cfs  
100 yr. - 5850 cfs

Volumes were also reviewed at the Maple River Gage for the five highest peaks.

<u>Year</u>	<u>Peak Q</u>	<u>Estimated Peak Freq.</u>	<u>Volume*</u>
1969	5930	40 yr.	1.6"
1966	2620	15 yr.	0.90"
1972	2200	10 yr.	0.51"
1962 (rain)	2030	8 yr.	0.75"
(snow)	1500	5 yr.	0.31"

\*Volume for snowmelt (15 days); rain (10 days)

The TR20 results for Cottonwood were as follows:

<u>Freq.</u>	<u>Snowmelt</u>			<u>Rainfall</u>		
	<u>Peak Inflow</u>	<u>Peak Discharge</u>	<u>Volume</u>	<u>Peak Inflow</u>	<u>Peak Discharge</u>	<u>Volume</u>
10 yr.	2000	1300	1.03"	1622	750	0.55"
25 yr.	2780	2100	1.32"	2500	1675	0.79"
100 yr.	5450	5000	2.44"	4600	4000	1.35"

In comparing TR20 results with the streamgage estimates, it appears that the snowmelt TR20 flows are fairly close. However, the 10 year snowmelt volume may be somewhat high and therefore, the 1300 cfs discharge probably should be adjusted downward. My best estimate of the discharges from Cottonwood Dam are:

	<u>Discharge</u>	<u>Depth through Emergency Spillway</u>
10 year	1000 cfs	1.5 feet
25 year	2100 cfs	3.0 feet
50 year	3500 cfs	4.0 feet
100 year	5000 cfs	5.5 feet

From this information, it appears that Cottonwood Dam may be somewhat underdesigned. There are a few refinements to the TR20 input data that should be made if this information is used for dam safety or modification design.

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Dale Frink  
Hydrologist-Engineer

DF:ad

NORTH DAKOTA STATE WATER COMMISSION

PROJECT PROPOSAL

NAME: Cottonwood Creek Dam and Recreation Complex, LaMoure County  
PROJECT: SMC #1515 - SORA #3800242  
SPONSOR: City of LaMoure  
DATE: September 7, 1971

TABLE OF CONTENTS

1. Bureau of Outdoor Recreation Project Proposal, BOR Form 8-163
2. Cost Acquisition Analysis, BOR Form 8-164
3. Development Cost Analysis, BOR Form 8-165
4. Supplement to BOR Form 8-165
5. Land and Water Conservation Fund Project Agreement, BOR Form 8-92
6. Project Assurances, SORA Form 2E
7. Civil Rights Act Assurances, DI Form 1350
8. A-95 Clearinghouse Review
9. Land Descriptions
10. Accord With State Plan
11. Hydrology
12. Design
13. Cost Estimate for Dam Construction
14. Cost Estimate for Recreation Facilities
15. Cost Participation Agreement
16. Water Permit 1790, SWC Form #108
17. Permit to Construct Dam, SWC Form #110
18. Maps and Plans



UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF OUTDOOR RECREATION LAND AND WATER CONSERVATION FUND PROJECT PROPOSAL	FOR BOR USE ONLY	
	State or Territory	Project Number
	Geographic Code	Congressional District
	Latitude ____° ____' ____" Longitude ____° ____' ____"	
<input type="checkbox"/> Acquisition	<input type="checkbox"/> Development	Date Received
<input type="checkbox"/> Planning	<input checked="" type="checkbox"/> Combination	

## PART I

1. Project Title	COTTONWOOD CREEK DAM	2. County	LaMOURE
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## 3. Brief description of project

The City of LaMoure will acquire 1758 acres of land for the construction of a dam and development of a recreation area. Recreation developments will include facilities for picnicking, playgrounds, beach area, boating, access roads, parking areas, tree and shrub planting, landscaping, fencing, and signs.

The City of LaMoure will be responsible for operation and maintenance of the project.

4. Applicant's name, address and phone number George Kaftan Mayor City of LaMoure LaMoure, North Dakota 58458	5. a. Total project costs <u>\$ 676,400</u> Federal assistance requested <u>50 %</u> <u>\$ 338,200</u> b. Source(s) of remainder of funds:  See attached participation agreement
6. Other Federal Grant? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If "Yes," attach an explanation of nature of the	7. Previous L&WCF Grant? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Project Number
	8. <input checked="" type="checkbox"/> New

**UNITED STATES DEPARTMENT OF THE INTERIOR  
BUREAU OF OUTDOOR RECREATION**

Land and Water Conservation Fund  
Project Application  
PART II

BOR Project Number	Stage
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Initial     Revised     Final

Date 7-20-71

Acquisition Cost Analysis

Activity or Facility		Acres	Estimated Cost	Activity or Facility		Acres	Estimated Cost
<b>A</b>	Family Campground			<b>I</b>	Trails		
<b>B</b>	Group Campground			<b>J</b>	Winter Sports		
<b>C</b>	Picnic Ground	100	10,000	<b>K</b>	Hunting		
<b>D</b>	Sports and Playfields			<b>L</b>	Fishing		
<b>E</b>	Golf Course			<b>M</b>	Impoundments	1,653	165,300
<b>F</b>	Swimming Pool			<b>N</b>	Other		
<b>G</b>	Beach	5	500	<b>Y</b>	Project Administration		
<b>H</b>	Boating				<b>TOTAL</b>	<b>1,758</b>	<b>175,800</b>

Acquisition Schedule

Code*	Parcel Number	Acreage	Estimated Date of Acquisition	Estimated Value Of Land to be Acquired	Estimated Value of Improvements to be Acquired	Total Estimated Cost
1	1	420	10-31-71	42,000		42,000
1	2	200	10-31-71	20,000		20,000
1	3	160	10-31-71	16,000		16,000
1	4	160	10-31-71	16,000		16,000
1	5	160	10-31-71	16,000		16,000
1	6	160	10-31-71	16,000		16,000
1	7	160	10-31-71	16,000		16,000
1	8	338	10-31-71	33,800		33,800



PROJECT NUMBER 38-00242

COTTONWOOD CREEK DAM

PART III BOR FORM 8-165

1. ESTIMATES

- A. Voided
- B. Voided

2. AGREEMENTS

- A. See the attached participation agreement. The City of LaMoure shall be responsible for operation and maintenance of the project.
- B. No other future agreements are contemplated concerning this project.

3. MAPS

- A. See attached state location map.
- B. See attached site plan.
- C. See attached preliminary design plans.

4. GENERAL

- A. This project shall be carried out in such a manner as to preserve and enhance the natural beauty and environmental quality of the area.
- B. The City of LaMoure shall work in close cooperation with the State Water Commission and the State Game and Fish Department to insure that the best water, fish, and wildlife practices are followed in the operation of this project.

UNITED STATES DEPARTMENT OF THE INTERIOR  
 Bureau of Outdoor Recreation  
 Land and Water Conservation Fund Project Agreement

State NORTH DAKOTA	Project Number 38-00242
Project Title COTTONWOOD CREEK DAM	
Period Covered by this Agreement	Date of Approval to 9-30-73
Project Period	Date of Approval to 9-30-73
Project Scope (Description of Project)	

The City of LaMoure will acquire 1758 acres of land for the construction of a dam and development of a recreation area. Recreation developments will include facilities for picnicking, playgrounds, beach area, boating, access roads, parking areas, tree and shrub planting, landscaping, fencing, and signs.

The City of LaMoure will be responsible for operation and maintenance of the project.

LaMoure is located in Southeastern North Dakota.

Project Stage Covered by this Agreement

Entire Project

<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">Project Cost</td> </tr> <tr> <td>Total Cost</td> <td style="text-align: right;">\$ 676,400.00</td> </tr> <tr> <td>Fund Support</td> <td style="text-align: right;">50 %</td> </tr> <tr> <td>Fund Amount</td> <td style="text-align: right;">\$ 338,200.00</td> </tr> <tr> <td>Cost of this Stage</td> <td style="text-align: right;">\$ 676,400.00</td> </tr> <tr> <td>Assistance this Stage</td> <td style="text-align: right;">\$ 338,200.00</td> </tr> </table>	Project Cost		Total Cost	\$ 676,400.00	Fund Support	50 %	Fund Amount	\$ 338,200.00	Cost of this Stage	\$ 676,400.00	Assistance this Stage	\$ 338,200.00	<p>The following attachments are hereby incorporated into this agreement:</p> <ol style="list-style-type: none"> <li>1. General Provisions Dated Dec. 1965</li> <li>2. Project Proposal 38-00242</li> <li>3. _____</li> <li>4. _____</li> </ol>
Project Cost													
Total Cost	\$ 676,400.00												
Fund Support	50 %												
Fund Amount	\$ 338,200.00												
Cost of this Stage	\$ 676,400.00												
Assistance this Stage	\$ 338,200.00												



The United States of America, represented by the Director, Bureau of Outdoor Recreation, United States Department of the Interior, and the State named above (hereinafter referred to as the State), mutually agree to perform this agreement in accordance with the Land and Water Conservation Fund Act of 1965, 78 Stat. 897 (1964), and with the terms, promises, conditions, plans, specifications, estimates, procedures, project proposals, maps, and assurances attached hereto and hereby made a part hereof.

The United States hereby promises, in consideration of the promises made by the State herein, to obligate to the State the amount of money referred to above, and to tender to the State that portion of the obligation which is required to pay the United States' share of the costs of the above project stage, based upon the above percentage of assistance. The State hereby promises, in consideration of the promises made by the United States herein, to execute the project described above in accordance with the terms of this agreement.

The following special project terms and conditions were added to this agreement before it was signed by the parties hereto:

The State of North Dakota shall transfer all funds granted hereunder to the project participants as per the signed cost sharing agreement.

By mutual consent, Section B.2(d) of the General Provisions is hereby voided.

In witness whereof, the parties hereto have executed this agreement as of the date entered below.

THE UNITED STATES OF AMERICA

STATE

By \_\_\_\_\_  
(Signature)

\_\_\_\_\_ NORTH DAKOTA  
(State)

\_\_\_\_\_  
(Title)

By John Greenslit  
(Signature)

Bureau of Outdoor Recreation  
United States Department of  
the Interior

\_\_\_\_\_ JOHN GREENSLIT  
(Name)

Date \_\_\_\_\_

\_\_\_\_\_ STATE LIAISON OFFICER  
(Title)

PROJECT ASSURANCES

(for use of SORA office only)

NORTH DAKOTA STATE OUTDOOR RECREATION AGENCY  
STATE CAPITOL  
BISMARCK, NORTH DAKOTA

SORA PROJECT NO. \_\_\_\_\_  
DATE RECEIVED \_\_\_\_\_  
PRIORITY \_\_\_\_\_

1. APPLICANT City of LaMoure c/o George Kaftan, Mayor AGENCY  
LaMoure, North Dakota ADDRESS  
PROJECT IS LOCATED IN LaMoure COUNTY

2. PROJECT IDENTIFICATION: TITLE Cottonwood Creek Dam & Recreation Complex SORA NO. \_\_\_\_\_  
LEGAL DESCRIPTION: SE 1/4 SEC. 30 TWP 133N RGE 60W  
SCOPE OF PROJECT: Acquire 1758 acres of land in fee; construct a dam creating a 8076 acre-foot reservoir with a 494 acre surface area and 40 feet maximum depth; and install facilities for fishing, swimming, boating, picnicing and playing outdoor games.  
TO BE STARTED project approval 19 72 TO BE COMPLETED September 19 73

IN SUBMITTING THIS PROJECT PROPOSAL \_\_\_\_\_  
(Name of Applying Agency)

HEREBY CERTIFIES THAT:

- A. No financial assistance has been given or promised under any other Federal program or activity with regard to this proposed project.
- B. The Applicant responsible for the proposed project has the ability and the intention to finance its share of the project.
- C. The Applicant accepts the obligation to comply with applicable laws, rules and regulations in effect at the time of the award and to the further terms and conditions of the Bureau of Outdoor Recreation Manual in effect at the time of the award.
- D. Property acquired under this program will be placed in use as an outdoor recreation facility and will be retained for such use in perpetuity or otherwise as provided and agreed to in the project agreement. Prior approval of the North Dakota State Outdoor Recreation Agency will be obtained before any other disposal is made of such property.
- E. The Applicant has the intent and ability to finance the operation and maintenance of the facility being developed for so long as is required.
- F. No foreign uses of such property, other than those described in the proposal will be permitted unless approved in advance by the North Dakota State Outdoor Recreation Agency. In the event foreign use is made of such project the Applicant shall, within one year of such foreign use, reimburse the North Dakota State Outdoor Recreation Agency the cost of the project, less the amount of such cost paid by the Applicant.
- G. If for any reason it shall become necessary for any department or agency of the State of North Dakota to expend State funds in order to fulfill any obligations which the Applicant has agreed to perform in the construction and maintenance of this project, the Applicant shall, within a one year period, reimburse the State department or agency the amount of funds expended for such maintenance or operation.
- H. The Applicant understands that qualification of this project proposal by the North Dakota State Outdoor Recreation Agency does not in itself constitute an obligation or award of requested funds and does not guarantee that funds will necessarily be made available for the project.
- I. The Applicant will supply development specifications and detailed plans to the North Dakota State Outdoor Recreation Agency as requested to do so by the Executive Officer of the Agency.
- J. The Applicant shall, within thirty days after completion of the project, submit to the North Dakota State Outdoor Recreation Agency a certified and itemized statement of its expenditures made in connection with the project, and shall, upon request, make all financial records available to the North Dakota State Outdoor Recreation Agency at any time.

SUBMITTED BY \_\_\_\_\_ City of LaMoure APPLICANT  
(Name of Applying Agency)  
George Kaftan TITLE Mayor DATE \_\_\_\_\_  
(Authorized Representative)  
\_\_\_\_\_  
(Authorized Representative) TITLE \_\_\_\_\_ DATE \_\_\_\_\_  
\_\_\_\_\_  
(Authorized Representative) TITLE \_\_\_\_\_ DATE \_\_\_\_\_

U.S. Department of The Interior  
ASSURANCE OF COMPLIANCE  
(Title VI, Civil Rights Act of 1964)

City of LaMoure (hereinafter called "Applicant Recipient")  
(Name of Applicant-Recipient)

HEREBY AGREES THAT IT will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and all requirements imposed by or pursuant to the Department of the Interior Regulation (43 CFR 17) issued pursuant to that title, to the end that, in accordance with Title VI of that Act and the Regulation, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant-Recipient receives financial assistance from Bureau of Outdoor Recreation and Bureau or Office

Hereby Gives Assurance That It will immediately take any measures to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant-Recipient by Bureau of Outdoor Recreation, Bureau or Office

This assurance obligates the Applicant-Recipient, or in the case of any transfer of such property, any transferee for the period during which the real property or structure is used for a purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance obligates the Applicant-Recipient for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Applicant-Recipient for the period during which the Federal financial assistance is extended to it by Bureau of Outdoor Recreation. Bureau or Office

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts or other Federal financial assistance extended after the date hereof to the Applicant-Recipient by the bureau or office, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Applicant-Recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall reserve the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant-Recipient, its successors, transferees, and assignees, and the person or persons whose signature appear below are authorized to sign this assurance on behalf of the Applicant-Recipient.

July 27, 1971  
Dated

City of LaMoure  
Applicant-Recipient

LaMoure, North Dakota  
Applicant-Recipient's Mailing Address

By George Kattau  
~~President, Chairman of Board of~~  
Comparable authorized Official)  
Mayor

# NORTH DAKOTA STATE PLANNING DIVISION

STATE CAPITOL—FOURTH FLOOR—BISMARCK, NORTH DAKOTA 58501  
701 224-2818

September 8, 1971

STATE INTERGOVERNMENTAL CLEARINGHOUSE "LETTER OF CLEARANCE"  
ON PROJECT REVIEW IN CONFORMANCE WITH OMB CIRCULAR NO. A-95

TO: State Outdoor Recreation Agency

Mr. John Greenslit, Liason Officer  
State Outdoor Recreation Agency  
State Office Building  
Bismarck, North Dakota 58501

Dear Mr. Greenslit:

Subject: Application by the City of LaMoure through the State Outdoor Recreation Agency to the Bureau of Outdoor Recreation for a grant-in-aid to acquire 1758 acres of land for the construction of a dam and the development of an outdoor recreation complex. This project was designated as:

38-00242 Cottonwood Creek Dam

This application was received in our office on September 8, 1971.

In compliance with Executive Order No. 48 and OMB Circular No. A-95, our office has reviewed this application and hereby gives clearance to it without comment.

Sincerely yours,



Arthur Leno  
Associate Planner

AL/b

NORTH DAKOTA STATE WATER COMMISSION

Office Memo


TO : Milo W. Hoisveen, Chief Engineer  
 FROM : Delton D. Schulz, Office Engineer  
 SUBJECT: Cottonwood Creek Dam, SWC Project #1515  
 DATE : July 19, 1971

Following are descriptions of lands for which options have been obtained for the Cottonwood Creek Dam project.

<u>Landowner</u>	<u>Description</u>	<u>Acreage</u>
Ed Steffes	N $\frac{1}{2}$ NE $\frac{1}{4}$ 25-133-61	80
Ed Steffes	SW $\frac{1}{4}$ NE $\frac{1}{4}$ 25-133-61	40
Ed Steffes	N $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ 25-133-61	20
Ed Steffes	SW $\frac{1}{4}$ 25-133-61	160
Ed Steffes	W $\frac{1}{2}$ SE $\frac{1}{4}$ 25-133-61	80
Ed Steffes	SE $\frac{1}{4}$ SE $\frac{1}{4}$ 25-133-61	40
		Subtotal 420 acres
Steffes	NW $\frac{1}{4}$ NE $\frac{1}{4}$ 31-133-60	40
Steffes	NW $\frac{1}{4}$ 31-133-60	160
		Subtotal 200 acres
Harold & Mary Gleesing	NW $\frac{1}{4}$ 25-133-61	160
		Subtotal 160 acres
Harold & Mary Gleesing	S $\frac{1}{2}$ S $\frac{1}{2}$ 24-133-61	160
		Subtotal 160 acres
James Valleyhand Inc.	NW $\frac{1}{4}$ 36-133-61	160
		Subtotal 160 acres
Arthur & Gladys Arndt	NE $\frac{1}{4}$ 36-133-61	160
		Subtotal 160 acres
George & Nellie Fenno	N $\frac{1}{2}$ S $\frac{1}{2}$ 24-133-61	160
		Subtotal 160 acres



<u>Landowner</u>	<u>Description</u>	<u>Acreage</u>
M.H. & Mary Steffes	S $\frac{1}{2}$ and 18 acres along south side of North half (148.5' x 5,280') 30-133-60	338
		Subtotal 338 acres
		TOTAL 1758 acres

  
\_\_\_\_\_  
Delton D. Schulz  
Office Engineer

DDS:eh

DIST:  
DDS  
ALG  
MWH  
ME

**LANDOWNER**

**DESCRIPTION**

**ACREAGE**

ED STEFFES  
 ED STEFFES  
 ED STEFFES  
 ED STEFFES  
 ED STEFFES  
 ED STEFFES  
 STEFFES  
 STEFFES  
 HAROLD & MARY GLEESING  
 HAROLD & MARY GLEESING  
 JAMES VALLEYHAND INC.  
 ARTHUR & GLADYS ARNDT  
 GEORGE & NELLIE FENNO  
 MH & MARY STEFFES

NI/2 NE 1/4 25-133-61  
 SW 1/4 NE 1/4 25-133-61  
 NI/2 SE 1/4 NE 1/4 25-133-61  
 SW 1/4 25-133-61  
 W 1/2 SE 1/4 25-133-61  
 SE 1/4 SE 1/4 25-133-61  
 NW 1/4 NE 1/4 31-133-60  
 NW 1/4 31-133-60 18  
 NW 1/4 25-133-61  
 S 1/2 S 1/2 24-133-61  
 NW 1/4 36-133-61  
 NE 1/4 36-133-61  
 NI/2 S 1/2 24-133-61  
 S 1/2 AND 18 ACRES ALONG  
 SOUTH SIDE OF NORTH HALF  
 (1485' X 5280') 30-133-60

80  
 40  
 20  
 160  
 80  
 40  
 40  
 160  
 160  
 160  
 160  
 160  
 160

Y A N  
**TOTAL: 1758**

**COTTONWOOD CREEK DAM LAND ACQUISITION**

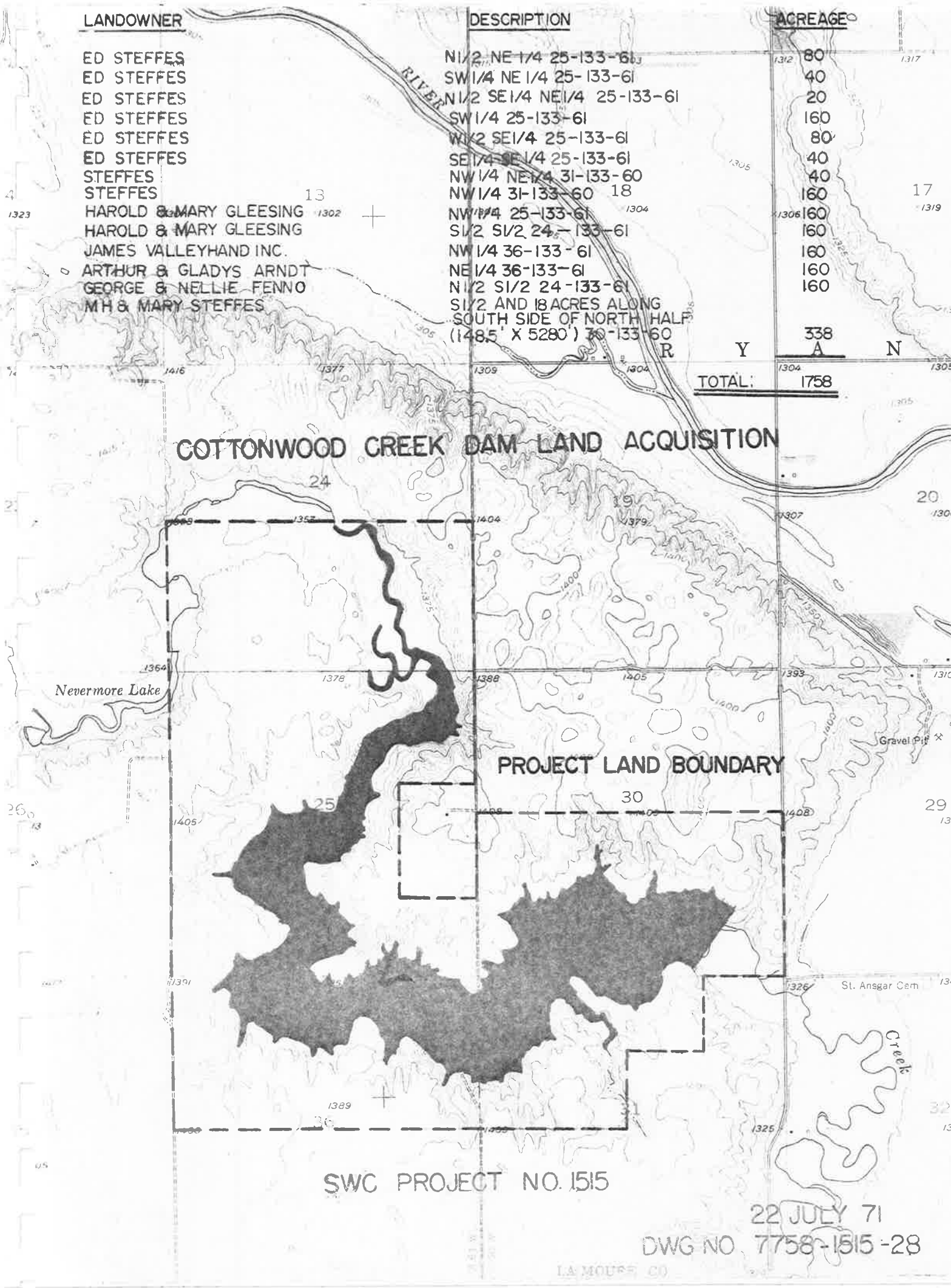
**PROJECT LAND BOUNDARY**

SWC PROJECT NO. 1515

22 JULY 71

DWG NO. 7758-1515-28

LA MOURE, CO



NAME OF PROJECT: Cottonwood Creek Dam

PROJECT NUMBER: 38-00242

PROJECT SPONSOR: City of LaMoure

BOR FORM 8-153

ITEM 12

ACCORD WITH STATE PLAN

The City of LaMoure will acquire 1758 acres of land for the construction of a dam and development of a recreation area. Recreation developments will include facilities for picnicking, playgrounds, beach area, boating, access roads, parking areas, tree and shrub planting, landscaping, fencing, and signs.

The estimated cost of the land acquisition is \$175,000.00 and the estimated cost of development is \$500,600.00. Total estimated project costs are \$676,400.00 with \$338,200.00 federal assistance requested.

Paragraph 2 under the Boating and Water Skiing section on page 94 of SCORP states, "Studies should be initiated to determine possible sites for future water retarding structures. When such structures are constructed, facilities for boating and water skiing should be included."

Paragraphs 3 and 4 of the same section state, "Facilities at existing water areas such as marinas, boat ramps, boat trailer parking areas, and access roads are badly needed. Developments should be aimed at providing these areas and facilities at all areas receiving adequate boating and water skiing use."

"Other facilities that should be constructed include comfort stations, picnic facilities, camping areas, water supplies, change stations, and similar related facilities."

Paragraph 4 under the Swimming Beaches section on page 95 of SCORP states, "Swimming beaches should be made integral components of recreation complexes developed adjacent to high quality water areas which would provide enjoyable swimming experiences the year round and which could replace those swimming areas of marginal quality. These opportunities may be limited and none should be lost."

Paragraph 5 under the Picnicking section on page 96 of SCORP states, "Consideration should also be given to providing picnicking facilities at lakes and reservoirs where a significant amount of picnicking occurs in conjunction with water-based activities."

Playgrounds are not specifically covered in SCORP, but it is felt that the addition of such equipment would greatly enhance the recreation area and increase the quality of the area.

This project is judged to be in full accord with SCORP and should receive high priority for federal cost sharing assistance along with other North Dakota projects.



Curt Seibel  
Recreation Planner

NORTH DAKOTA STATE WATER COMMISSION

OFFICE MEMO

MEMO TO: Milo W. Hoisveen, Chief Engineer  
FROM: Delton D. Schulz, Office Engineer  
SUBJECT: Cottonwood Creek Dam - SWC Project #1515  
Design, Hydrology, Dam Construction and Recreation Area  
and Facilities Development Cost Estimate Report  
DATE: September 18, 1970

H Y D R O L O G Y

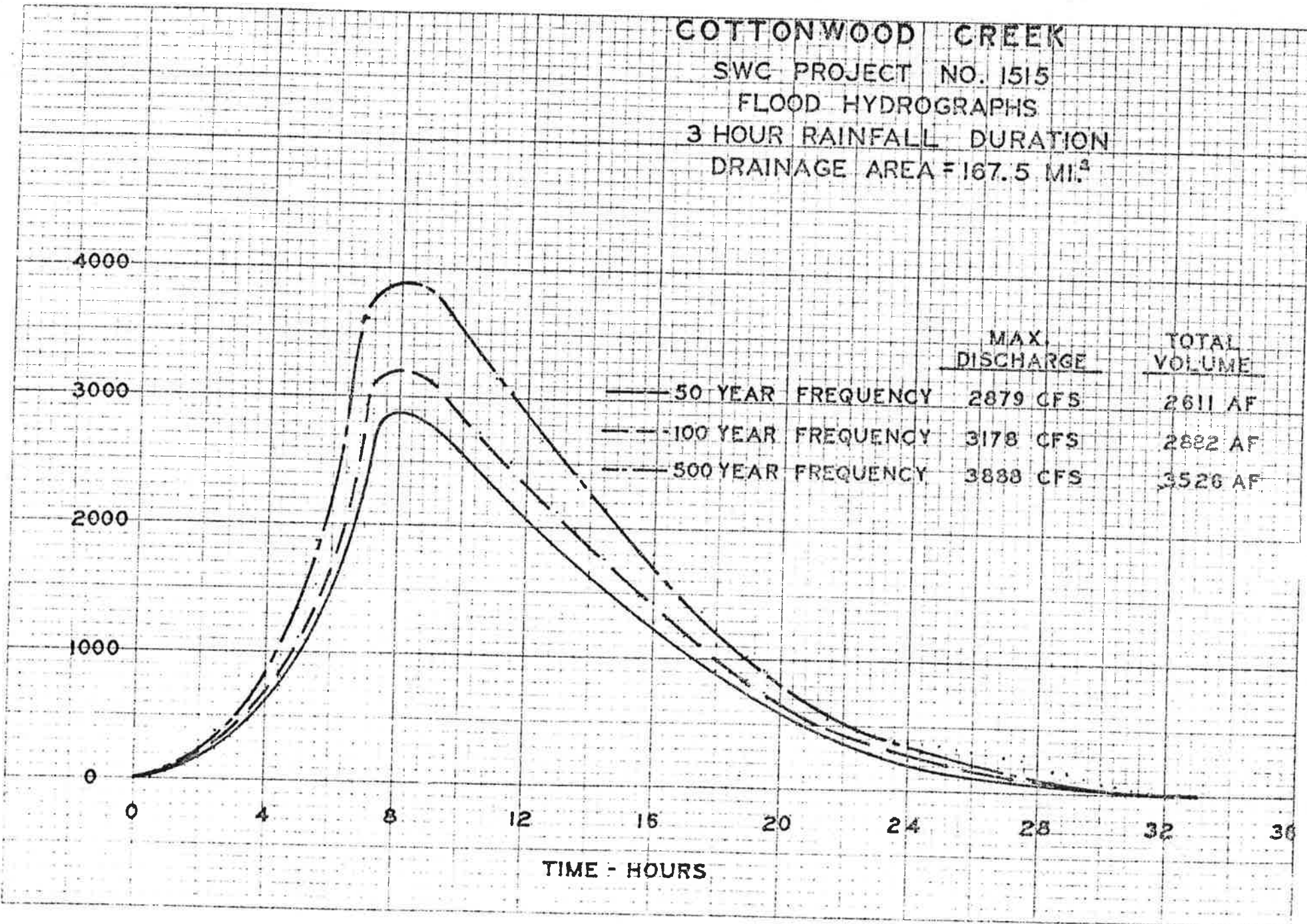
Cottonwood Creek Dam is proposed to be located in Section 30, Township 133 North, Range 60 West on Cottonwood Creek in LaMoure County. Cottonwood Creek is tributary to the James River. The drainage area above the dam is 167.5 square miles which is more than adequate to sustain the reservoir water surface level after it is filled. The length of the stream channel from its headwaters to the dam site is 75.0 miles. The total fall within this distance is 594.5 feet.

The spillway facilities designed in the dam provide for flows in excess of a 100 year flood frequency. The total head buildup on the spillway crest from a 100 year frequency storm is 4.4 feet.

A rainfall of 100 year frequency on the area would approximate 3.4 inches falling in a 3.0 hour period. The computed design inflow hydrograph has a peak discharge of 3,178 cubic feet per second and a total volume of 2,882 acre-feet. Computations developed for maximum flows and a graphical presentation of a hydrograph are attached. Also attached is a reservoir area-capacity curve.

Average annual water yield of the drainage basin approximates 40 acre-feet per square mile. The total drainage area of 167.5 square miles would, therefore, yield approximately 6,700 acre-feet to the reservoir. Reservoir water losses are estimated to be approximately 1,210 acre-feet per year.

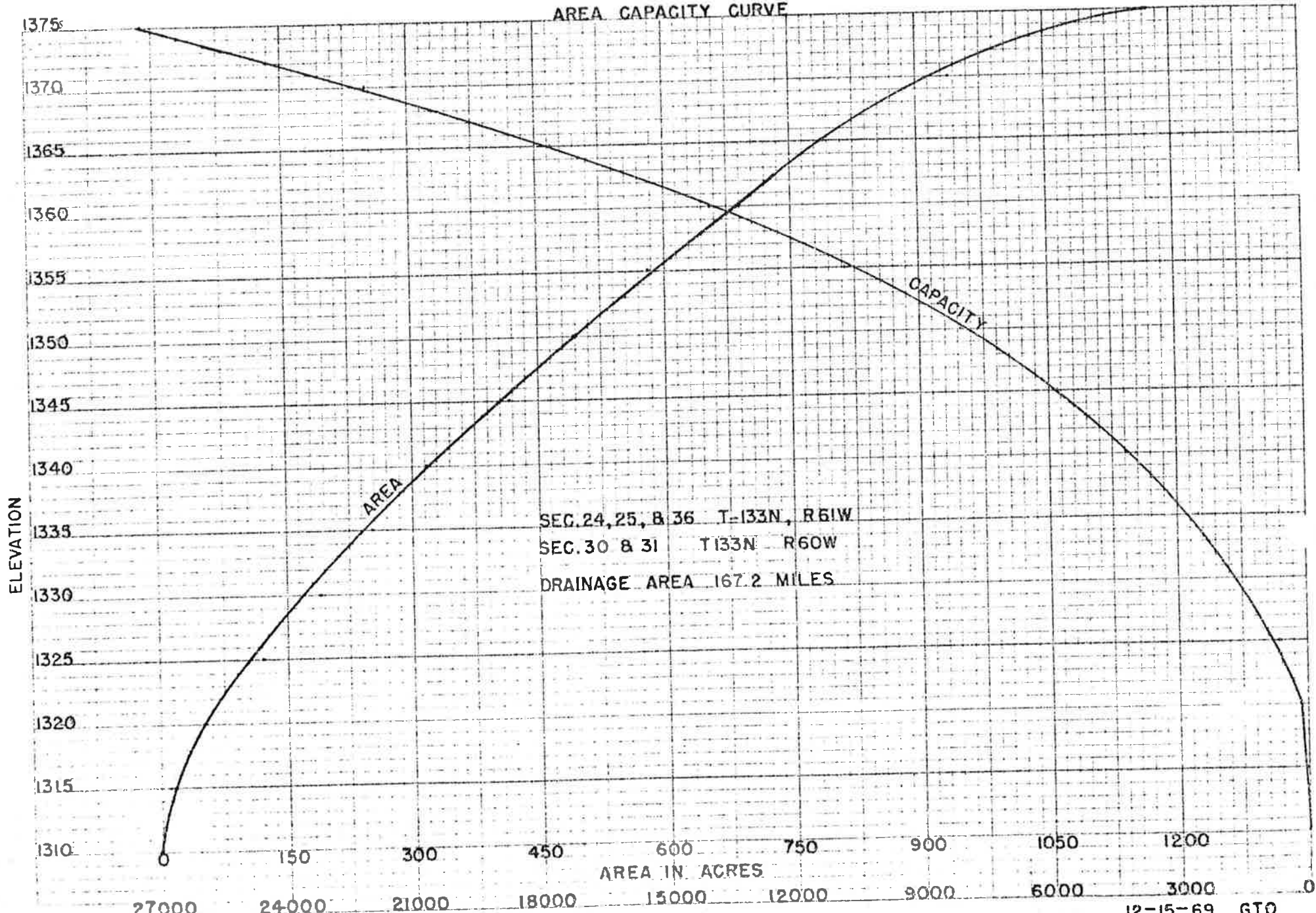
**COTTONWOOD CREEK**  
 SWC PROJECT NO. 1515  
 FLOOD HYDROGRAPHS  
 3 HOUR RAINFALL DURATION  
 DRAINAGE AREA = 167.5 MI.<sup>2</sup>







# COTTONWOOD CREEK PROJECT NO. 1515 AREA CAPACITY CURVE



## STATE WATER COMMISSION

## RESERVOIR FLOOD ROUTING

## MODIFIED PULS METHOD

## PROJECT 1515

LOCATION CUTTONWOOD CREEK

DRAINAGE AREA 167.5 SQ. MI.

W.S.ELEV	HT	VEL	Q	
1350.00	0.00		0.00	WEIR CONTROL
1350.20	0.20		1.98	WEIR CONTROL
1350.40	0.40		5.89	WEIR CONTROL
1350.60	0.60		11.33	WEIR CONTROL
1350.80	0.80		18.25	WEIR CONTROL
1351.00	1.00		26.62	WEIR CONTROL
1351.20	1.20		36.46	WEIR CONTROL
1351.40	1.40		47.79	WEIR CONTROL
1351.60	1.60		60.65	WEIR CONTROL
1351.80	1.80		75.06	WEIR CONTROL
1352.00	2.00		91.07	WEIR CONTROL
1352.20	2.20		108.71	WEIR CONTROL
1352.40	2.40		128.01	WEIR CONTROL
1352.60	2.60		149.02	WEIR CONTROL
1352.80	2.80		173.32	WEIR CONTROL
1353.00	3.00		199.87	WEIR CONTROL
1353.20	3.20		227.76	WEIR CONTROL
1353.40	3.40		256.93	WEIR CONTROL
1353.60	3.60		287.31	WEIR CONTROL
1353.80	3.80		318.87	WEIR CONTROL
1354.00	4.00		351.56	WEIR CONTROL
1354.20	4.20		385.34	WEIR CONTROL
1354.40	4.40		420.17	WEIR CONTROL

STATE WATER COMMISSION  
RESERVOIR FLOOD ROUTING  
MODIFIED PULS METHOD  
PROJECT 1515

LOCATION COTTONWOOD CREEK DRAINAGE AREA 167.5 SQ. MI.

W.S. ELEV	HT	VEL	Q	
1354.60	41.20	34.43	432.77	PIPE CONTROL
1354.80	41.40	34.51	433.82	PIPE CONTROL
1355.00	41.60	34.60	434.86	PIPE CONTROL
1355.20	41.80	34.68	435.91	PIPE CONTROL
1355.40	42.00	34.76	436.95	PIPE CONTROL
1355.60	42.20	34.84	437.99	PIPE CONTROL
1355.80	42.40	34.93	439.03	PIPE CONTROL
1356.00	42.60	35.01	440.06	PIPE CONTROL

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 RESERVOIR FLOOD ROUTING  
 MODIFIED PULS METHOD  
 PROJECT 1515

LOCATION COTTONWOOD CREEK

DRAINAGE AREA 167.5 SQ. MI.

ELEVATION MSL	RATED OUTFLOW CFS	STORAGE AC-FT	S + D/2 CFS	DAY	HR	INFLOW CFS	OUTFLOW CFS	ELEVATION MSL
1350.00	0.00	8076.0	195435.94	1	0.0	0.0	0.00	1350.00
1350.50	8.61	8238.0	199360.50	1	0.5	14.0	0.02	1350.00
1351.00	26.62	8400.0	203299.88	1	1.0	65.0	0.10	1350.01
1351.50	54.22	8650.0	209353.56	1	1.5	104.0	0.29	1350.02
1352.00	91.07	8900.0	215421.94	1	2.0	203.0	0.62	1350.04
1352.50	138.52	9150.0	221495.56	1	2.5	312.0	1.19	1350.07
1353.00	199.87	9400.0	227576.06	1	3.0	373.0	1.94	1350.11
1353.50	272.12	9650.0	233662.13	1	3.5	511.0	2.90	1350.17
1354.00	351.56	9900.0	239751.75	1	4.0	690.0	4.21	1350.24
1354.50	426.47	10332.0	250243.44	1	4.5	806.0	5.84	1350.34
1355.00	434.86	10767.0	260774.44	1	5.0	1108.0	7.93	1350.46
1355.50	437.47	10933.0	264792.88	1	5.5	1535.0	13.21	1350.63
1356.00	440.06	11100.0	268835.50	1	6.0	1806.0	20.81	1350.84
				1	6.5	2444.0	30.42	1351.07
				1	7.0	2944.0	42.55	1351.29
				1	7.5	3093.0	56.72	1351.53
				1	8.0	3220.0	75.54	1351.79
				1	8.5	3193.0	95.55	1352.05
				1	9.0	3134.0	119.52	1352.30
				1	9.5	2979.0	143.61	1352.54

STATE WATER COMMISSION  
 RESERVOIR FLOOD ROUTING  
 MODIFIED PULS METHOD  
 PROJECT 1515

LOCATION COTTONWOOD CREEK

DRAINAGE AREA 167.5 SQ. MI.

ELEVATION MSL	RATED OUTFLOW CFS	STORAGE AC-FT	S + D/2 CFS	DAY	HOUR	INFLOW CFS	OUTFLOW CFS	ELEVATION MSL
				1	10.0	2819.0	171.41	1352.77
				1	10.5	2739.0	197.73	1352.98
				1	11.0	2582.0	226.58	1353.18
				1	11.5	2504.0	254.08	1353.38
				1	12.0	2351.0	280.65	1353.55
				1	12.5	2200.0	306.63	1353.72
				1	13.0	2125.0	330.89	1353.87
				1	13.5	1979.0	352.53	1354.01
				1	14.0	1836.0	363.64	1354.08
				1	14.5	1765.0	373.89	1354.15
				1	15.0	1628.0	383.34	1354.21
				1	15.5	1495.0	391.75	1354.27
				1	16.0	1430.0	399.39	1354.32
				1	16.5	1303.0	406.30	1354.37
				1	17.0	1181.0	412.26	1354.41
				1	17.5	1122.0	417.54	1354.44
				1	18.0	1008.0	422.16	1354.47
				1	18.5	900.0	425.96	1354.50
				1	19.0	848.0	426.77	1354.52
				1	19.5	748.0	427.07	1354.54



STATE WATER COMMISSION  
 RESERVOIR FLOOD ROUTING  
 MODIFIED PULS METHOD  
 PROJECT 1515

LOCATION COTTONWOOD CREEK

DRAINAGE AREA 167.5 SQ. MI.

ELEVATION MSL	RATED OUTFLOW CFS	STORAGE AC-FT	S + D/2 CFS	DAY	HOUR	INFLOW CFS	OUTFLOW CFS	ELEVATION MSL
				1	20.0	655.0	427.28	1354.55
				1	20.5	611.0	427.45	1354.56
				1	21.0	527.0	427.56	1354.56
				1	21.5	453.0	427.61	1354.57
				1	22.0	422.0	427.62	1354.57
				1	22.5	377.0	427.60	1354.57
				1	23.0	361.0	427.55	1354.56
				1	23.5	337.0	427.49	1354.56
				1	24.0	319.0	427.41	1354.56
				2	24.5	311.0	427.32	1354.55
				2	25.0	295.0	427.22	1354.54
				2	25.5	276.0	427.11	1354.54
				2	26.0	267.0	426.98	1354.53
				2	26.5	246.0	426.85	1354.52
				2	27.0	223.0	426.69	1354.51
				2	27.5	211.0	426.53	1354.50
				2	28.0	185.0	425.34	1354.49
				2	28.5	158.0	423.53	1354.48
				2	29.0	143.0	421.58	1354.47
				2	29.5	113.0	419.48	1354.45

## D E S I G N

A compacted earthfill embankment with a 3:1 upstream slope,  $2\frac{1}{2}$ :1 downstream slope with a 10-foot berm at elevation 1342.0 and a 20 foot top width is proposed. The crest of the embankment is to be established at elevation 1362.0 with a 6-inch center crown and a 2-foot overfill through the creek section to elevation 1364.0 to allow for settlement. The embankment will also incorporate a core trench at the base to limit seepage. Also, included will be a trench type toe drain to preclude sluffing of the downstream toe of the embankment. The upstream face of the embankment is to be covered with a 6-inch gravel filter blanket and 18 inches of rock riprap from elevation 1340.0 to elevation 1358.0. Rock riprap will also be placed downstream from the outlet structure and in such other areas where erosion may take place.

The service spillway consists of a 10-foot by 12-foot reinforced concrete box drop inlet and a 54-inch reinforced concrete pipe extending laterally through the embankment and containing 6 reinforced concrete anti-seep collars. The reinforced concrete pipe will be placed in a concrete cradle. The outlet structure consists of a modified reinforced concrete box-type outlet. The crest of the weir is to be established at 1350.0. The base of the outlet structure is to be established at elevation 1308.0.

The drawdown pipe consists of a 12-inch welded steel pipe with gate valve for the purpose of reservoir renovation. The inlet elevation of the drawdown pipe is 1325.0. The outlet will discharge into the service spillway outlet structure. Cathodic protection is provided to restrain corrosion of the pipe.

An emergency spillway with 100-foot bottom width and 4:1 side slopes is to be incorporated as an added safety feature. The emergency spillway is to be vegetated and the crest is to be set at mean sea level elevation 1536.0.

Computation of the storm routing through the reservoir indicates a maximum water surface buildup within a 100 year storm frequency to be 1354.57. Computations showing the reservoir flood routing are attached. Following are physical features of the dam:

- A. Drainage Area - 167.5 square miles
- B. Controlled Water Surface Elevation - 1350.0 msl
- C. Reservoir Capacity at Controlled Elevation - 8,076 acre-feet
- D. Reservoir Area at Controlled Elevation - 494 acres
- E. Maximum Depth - 40' - 0"
- F. Height of Dam - 50' - 0"
- G. Average Depth - 16.35 feet
- H. Earthfill Embankment - 330,000 cubic yards

  
\_\_\_\_\_  
Delton D. Schulz  
Office Engineer

DDS:rk

Distribution:

MWH  
AKG  
DDS

C O S T E S T I M A T E  
F O R  
D A M C O N S T R U C T I O N

Based on costs for construction of previous projects by the State Water Commission, it is estimated that costs for construction of the dam solely are as follows:

		SWC Project #1515 Cottonwood Creek		Quantities 9/9/70	
<u>Item</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	Elev. 1350	
				<u>Cost</u>	
1. Embankment and Outlet Channel Stripping	C.Y.	.90	13,000	\$ 11,700.00	
2. Emergency Spillway and Borrow Area Stripping	C.Y.	.30	10,000	3,000.00	
3. Core Trench Excavation (includes outlet channel)	C.Y.	.90	63,000	56,700.00	
4. Earthfill Embankment	C.Y.	.45	330,000	148,500.00	
5. Trench Drain Excavation	C.Y.	1.00	1,220	1,220.00	
6. Gravel for Trench Filter Drain	Tons	3.00	1,647	4,941.00	
7. 10" Dia. 16 gage perforated and unperforated C.M.P.-765 L.F. (Complete with Fittings, cap, etc.)	Lump Sum	L.S.	L.S.	2,000.00	
8. Concrete (Inlet and Outlet structures, Manhole slab, 54" R.C.P. Cradle, 12" W.S.P. Apron and Anti-seep collars, and 54" R.C.P. Anti-seep collars.)	C.Y.	150.00	194	29,100.00	
9. Reinforcing Steel	Lb.	.25	19,230	4,807.50	
10. 54" (Deep Joint) Interpace specification AWWA C-301 SP-18 Lock Joint prestressed concrete subaqueous embedded cylinder pipe with rubber and steel joint plus lugs and bolts. (or equal) 173 L.F. + Length of Hood	Lump Sum	150.00	173	25,950.00	

				Elev. 1350	
<u>Item</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Cost</u>	
11. Trash Rack	Lump Sum	500.00	1	\$	500.00
12. 274 L.F. of 12" W.S.P. Drawdown pipe (Complete with Cathodic protection, Manhole, gate valve, trash rack etc.)	L.F.	20.00	274		5,480.00
13. 8 BP 36 H-Beam Bearing Piling	L.F.	10.00	147		1,470.00
14. Gravel for Riprap Bed	Ton	2.50	2,000		5,000.00
15. Riprap	Ton	6.50	5,000		32,500.00
16. Seeding	Acre	100.00	10		1,000.00
				Subtotal	\$333,868.50
				Contingencies	26,131.50
				Construction Insp.	18,000.00
				Contract Admin.	37,800.00
				TOTAL	\$415,800.00

C O S T   E S T I M A T E  
F O R  
C O T T O N W O O D   C R E E K   D A M  
R E C R E A T I O N   F A C I L I T I E S   &  
A R E A   D E V E L O P M E N T

<u>Item</u>	<u>Number</u>	<u>Estimated Unit Cost</u>	<u>Estimated Total Cost</u>
1. Picnic Area			
a. table	20	\$ 200	\$ 4,000
b. fireplace	10	125	1,250
c. trash receptacles	10	175	1,750
d. shelter	2	2,000	4,000
e. comfort station (double)	1	4,500	4,500
f. well & hand pump	2	2,000	4,000
2. Playground			
a. swing set	1	250	250
b. slide	1	400	400
c. seesaw	1	150	150
d. sandbox	1	50	50
3. Beach Area (wading only)			
a. sand blanket	2,000 ton	4.50/ton	9,000
b. dressing room & restroom (combination)	1	6,500	6,500
c. float line	1	100	100
4. Boating Area			
a. dock	1	900	900
b. launch ramp	1	1,500	1,500
5. Access Road & Parking Areas			
a. excavating	5,000 cy	.50/cy	2,500
b. 18"X40" C.M.P.	2	4/ft.	320
c. motor grader	24 hrs.	15/hr.	360
d. road gravel	500 cy	5/ton	2,500
e. barrier posts	100	8	800
6. General Area Development			
a. trees, shrubs, & landscaping		Lump Sum	2,000
b. fencing	9 mi.	1,848/mi	16,632
c. signs			<u>2,000</u>
		Subtotal	65,462
		Engineering	8,088
		Indirect Costs	8,750
		Contingencies	<u>2,500</u>
		Total	\$84,800



Dist. \_\_\_\_\_  
SWC Proj. No. 1515  
RVC Acct. \_\_\_\_\_  
ca. Proj. Participant \_\_\_\_\_

# A G R E E M E N T CONSTRUCTION OF WORKS

THIS AGREEMENT is entered into by and between:

(1) The North Dakota State Water Commission, hereinafter referred to as the Commission, acting by and through Milo W. Hoisveen, Secretary and Chief Engineer;

(2) The State Game and Fish Department, hereinafter referred to as the Department acting by and through Russell Stuart, Commissioner;

(3) The City of LaMoure, hereinafter referred to as the City acting by and through \_\_\_\_\_;

(4) The \_\_\_\_\_, hereinafter referred to as the \_\_\_\_\_ acting by and through \_\_\_\_\_;

## I. PROJECT, LOCATION AND PURPOSE

WHEREAS, the parties to this Agreement propose to construct the following: Dam to impound waters for recreation purposes

hereinafter referred to as the Project, located Section 30, Township 133 North, Range 60 West, LaMoure County, North Dakota, the purpose of which is Recreation

NOW, THEREFORE, IT IS AGREED:

## II. DRAWINGS AND SPECIFICATIONS

That the Project will be constructed in accordance with drawings and specifications of the North Dakota State Water Commission, approved by City and Department, and with drawings and specifications, Cottonwood Creek Dam Plans - SWC Project #155

\_\_\_\_\_ are by this reference made a part of this Agreement to the same force and effect as if they were incorporated into the body of this Agreement

## III. COSTS AND ALLOCATIONS

That the estimated cost of the various Project elements and their allocation to the Project participants shall be as follows:

A. Preliminary Engineering and Investigations - - - - - Total Estimate \$ \_\_\_\_\_

1. North Dakota State Water Commission	-	-	-	-	-	\$	_____	or	_____	%
2. _____						\$	_____	or	_____	%
3. _____						\$	_____	or	_____	%
4. _____						\$	_____	or	_____	%
5. _____						\$	_____	or	_____	%
B. Land and/or Easement Acquisition - - - - -										- Total Estimate \$ 175,800
1. North Dakota State Water Commission	-	-	-	-	-	\$	_____	or	_____	%
2. Bureau of Outdoor Recreation						\$	87,900	or	50	%
3. Game and Fish Department						\$	87,900	or	50	%
4. _____						\$	_____	or	_____	%
5. _____						\$	_____	or	_____	%
C. Construction of Main Works - - - - -										- Total Estimate \$ 415,800
1. North Dakota State Water Commission	-	-	-	-	-	\$	105,000	or	25	%
2. Bureau of Outdoor Recreation						\$	207,900	or	50	%
3. Game and Fish Department						\$	17,100	or	4	%
4. City of LaMoure						\$	85,800	or	21	%
5. _____						\$	_____	or	_____	%
D. Construction of Appurtenant Works Recreation Area & Facilities- Total Estimate \$ 84,800										
1. North Dakota State Water Commission	-	-	-	-	-	\$	42,400	or	50	%
2. City of LaMoure						\$	42,400	or	50	%
3. _____						\$	_____	or	_____	%
4. _____						\$	_____	or	_____	%
5. _____						\$	_____	or	_____	%
E. Other Items - - - - -										- Total Estimate \$ _____
1. North Dakota State Water Commission	-	-	-	-	-	\$	_____	or	_____	%
2. _____						\$	_____	or	_____	%
3. _____						\$	_____	or	_____	%
4. _____						\$	_____	or	_____	%
5. _____						\$	_____	or	_____	%
F. Total Project Costs and Allocations - - - - -										\$ 676,400
1. North Dakota State Water Commission	-	-	-	-	-	\$	105,000	or	15.5	%

- 2. Bureau of Outdoor Recreation \$ 338,200 or 50 %
- 3. Game and Fish Department \$ 105,000 or 15.5 %
- 4. City of LaMoure \$ 128,200 or 19 %
- 5. \_\_\_\_\_ \$ \_\_\_\_\_ or \_\_\_\_\_ %

That all parties shall provide the others with cost statements within 30 days after the Project's completion and settlements shall be made within 30 days of receipt of said statements.

**IV. TITLE TO LANDS AND/OR EASEMENTS**

That title to all lands and/or easements for the Project shall be purchased in the name of State Game and Fish Department by the Department and recorded in the County Register of Deeds office wherein the Project is situated.

**V. OPERATION AND MAINTENANCE**

That the City shall operate and maintain the Project in accordance with rules and regulations prescribed by the Commission and the Department

**VI. INDEMNIFICATION**

That the City does hereby accept responsibility for and holds the Commission and the Department harmless from, all claims and damages to public or private properties, rights, or persons arising out of the construction, operation, and maintenance of the Project. In the event a suit is initiated or judgment entered against the Commission or Department the City shall indemnify them for any settlement arrived at or judgment satisfied.

**VII. CHANGES IN RESPONSIBILITIES**

That changes in any responsibilities of the parties hereto or conditions herein stated will not be effective or binding unless such changes or conditions are made in writing, signed by the parties concerned and attached hereto.

**VIII. OTHER STIPULATIONS**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

IN WITNESS WHEREOF, the parties hereto have signed this Agreement the day and year indicated below.

WITNESS: <u>Matt Emerson</u>	DATE: <u>9-2-71</u>	NORTH DAKOTA STATE WATER COMMISSION By: <u>Milo W. Horsween</u> Secretary and Chief Engineer
<u>[Signature]</u>	<u>7/20/71</u>	By: <u>George Koptew</u>
<u>[Signature]</u>	<u>7/20/71</u>	By: <u>[Signature]</u>
<u>[Signature]</u>		By: _____

Permit No. 1790

Application for a Permit to Divert and Appropriate the Water of the State of North Dakota



Date received and filed in State Engineer's office... City of LaMoure, whose post office (Name of Applicant)

address is LaMoure, State of North Dakota 58458, hereby applies for a permit to divert and appropriate water of the State of North Dakota as stated herein, subject to existing rights.

- 1. Source of proposed appropriation Cottonwood Creek which is tributary to James River
2. A. Amount of water requested 8076 Acre-feet storage plus 1482 acre-feet annually
B. Proposed rate of withdrawal of water N.A. cubic feet per second or gallons per minute.
3. Points of Diversion:
A. (1) 1/4 1/4 Sec Twp Rge
(2) 1/4 1/4 Sec Twp Rge
(3) 1/4 1/4 Sec Twp Rge
B. If water is to be delivered from storage reservoir complete the following: and file NDSWC Form 110:
Location of dam 1/4 SE 1/4 Sec 30 Twp 133N Rge 60W
Height embankment above stream 50 Ft.
Capacity of Reservoir 8076 acre-feet. Area of water surface 494 acres.
C. If water is to be obtained from well complete the following
Proposed depth well Depth to top of Aquifer
Proposed size well or well casing Depth to Bottom of Aquifer
Has pump test been performed, if so, by whom
Computed capacity of well
4. Purpose Recreation
A. If purpose is irrigation:
Type of irrigation system Dates of use
Estimate of time required for completion of system
5. Has the quality of water analysis been made? Class water C S
Date Sample taken
6. Description of land to be irrigated (show lot numbers where applicable):

Table with columns for Sec., Twp., Rge., NE 1/4, NW 1/4, SW 1/4, SE 1/4, and Total. The table is mostly empty with a 'Total number of acres to be irrigated' label at the bottom right.

Located in LaMoure County, North Dakota.
Estimated quantity of water that will be returned to the approximate source from which diverted:
CITY OF LAMOURE
George Kattou Mayor
(Applicant's Signature)

NOTE: Above application is merely a declaration of intention to create a water right, approval does not create such right. Water right will be created only if and when water is beneficially used, pursuant to conditions and stipulations specified by the State Engineer.

CONDITIONAL PERMIT

All water appropriations are subject to prior water permits and in all cases where the use of water for different purposes conflicts such uses shall conform to the following order of priority as are set forth in the North Dakota Century Code:

1. Municipal and Domestic Use
2. Livestock Use
3. Irrigation and Industrial Use
4. Fish, Wildlife and Outdoor Recreation Use.

When the source of appropriation is from surface waters such as a lake, river, stream or reservoirs the rate of withdrawal shall not exceed \_\_\_\_\_ gallons per minute and the withdrawals are subject to the natural flows in or entering such lakes, rivers, streams or reservoirs unless otherwise modified by the State Engineer.

When the water is from an underground source, the State Engineer may, in order to determine the allowable quantity of water, the rate of withdrawal and the well spacing, require the applicant to provide acceptable pump test data and other pertinent information for that specific aquifer prior to approval of such application.

When the source of appropriation is from a river or stream for storage in a dam or reservoir, the rate of withdrawal shall not exceed the natural flows less the amount of flow needed for downstream domestic and livestock uses.

Prior to the granting of a Perfected Water Permit the rate of withdrawal and the acre-feet for any Conditional Permit are subject to modification by the State Engineer and failure to comply with any order of the State Engineer may result in forfeiture of this permit.

This is to certify that I have examined the foregoing application and hereby approve the same. subject to prior water permits. Failure to comply with any order of the State Engineer may result in forfeiture of water permit.

The amount of water to be appropriated shall be limited to the amount that can be used beneficially, not to exceed 8076.0 acre feet each year. storage plus 1482.0 acre-feet annual use.

1. Date of priority July 28, 1971
2. Date of hearing on application September 7, 1971
3. Date of approval by State Water Commission September 7, 1971
4. Water shall be beneficially used on or before December 31, 1973

WITNESS my hand and seal this 7th day of September, 1971.

Milo W. Hoisween  
State Engineer  
Secretary, State Water Commission

Permit No. 1790

APPLICATION FOR PERMIT TO CONSTRUCT OR ENLARGE A DAM OR RESERVOIR

TO: Chief Engineer AND LaMoure County Water Management District
North Dakota State Water Commission
Bismarck, North Dakota 58501
LaMoure North Dakota 58458

I, the undersigned, do hereby apply for a permit to construct or enlarge a dam as indicated below and according to specifications shown on this and attached sheets:

- 1. Location: County LaMoure
Legal description to nearest forty acre tract: Sec. SE 1/4 Twp. 133 N., Rge. 60 W.
2. Purpose: Recreation
3. Data
Drainage Area Above Dam 167.5 Square Miles
Type of Dam Earth Fill
Type and Size of Spillway Double drop inlet - 54" Reinforced concrete pipe
Type and Size of Emergency Spillway Grassed, compacted earthfill - 100 feet wide
Type and Size of Gate Reservoir Control Structure
Invert Height above Stream Bed of Control Structure
Height of Spillway above Stream Bed 40 feet feet
Surface Area of Reservoir at Spillway Crest 494 acres
Computed Reservoir Capacity at Spillway Crest Elevation 8076 acre feet
4. Water course on which dam is to be located is a tributary to: James River

5. Will flows presently available to downstream riparian land owners be depleted? No If so, to what extent?

6. Downstream landowners who might be deprived of use of water by construction of the dam are None
12" riparian outlet

7. Is the dam and impounded water on the owners land or does sponsoring entity have landowner's permission to construct Dam and Flood Land? Options signed for land acquisition (Copies of all easements must be filed with application.)

8. For an enlargement of an existing dam, answer the following:
Why is enlargement necessary? N.A.

Year dam was constructed N.A. By what agency
Total yardage in existing dam N.A.

9. The dam will be built under the supervision of State Water Commission and will conform to data and specifications given above and on the following attached sheets

(Name or Number of attached data sheet)

10. This dam will be operated in conformance to all state water laws and rules and regulations of the North Dakota State Water Commission.

11. Construction will begin on or before 19 and will be completed on or before 19

Date Submitted:

Signed City of LaMoure
(Owner of land on which dam is located or legal Entity sponsoring project)
George Kaftan Mayor
LaMoure, North Dakota 58458

STATE OF NORTH DAKOTA )
COUNTY OF LaMoure ) ss

On this 27th day of July 1971, before me a Notary Public personally appeared

George Kaftan, known to me to be the same person who executed the foregoing application for a permit to construct or enlarge a dam or reservoir and acknowledged to me that he executed the same.

Distribution:

SWC Prj. No. 1515
WMD
Co. Reg. of Deeds

Theodore F. Kessel
Notary Public, LaMoure County, N. D.
My Commission Expires December 8, 1974

The filing of this application and its approval in no way relieves the landowner from any responsibility or liability for damages from the construction, operation or failure of this structure. Concurrence by Water Management district not applicable where not established.

AFFIDAVIT OF DESIGNING AGENCY

The dam and reservoir described in this application and on attached sheets has been designed and approved by the State Water Commission and, if the construction thereof is supervised by this agency, it will be built according to the specifications and data shown in this application and data sheets attached hereto.

Dated this 16 day of July, 1971

State Water Commission
(Name of Agency)
Bismarck, North Dakota 58501
(Address of Agency)

Signed State Water Commission
By: Milo W Hoisveen
Title Chief Engineer

For use of North Dakota State Water Commission & Water Management District

APPROVAL AND PERMIT

This is to certify that I have examined the foregoing application and hereby approve the same subject to the rules and regulations of the North Dakota State Water Commission and the laws of the State of North Dakota subject to the following conditions:

WITNESS my hand and seal this 27th day of July, 1971

Signed Milo W Hoisveen
Chief Engineer
North Dakota State Water Commission
X Signed: Bruce G. Thomsen
Chairman

WMD

DISAPPROVAL

This is to certify that I have examined the foregoing application and hereby reject and disapprove the same for the following reasons:

WITNESS my hand and seal this day of , 19

Signed:
Chief Engineer
North Dakota State Water Commission
Signed:
Chairman

WMD



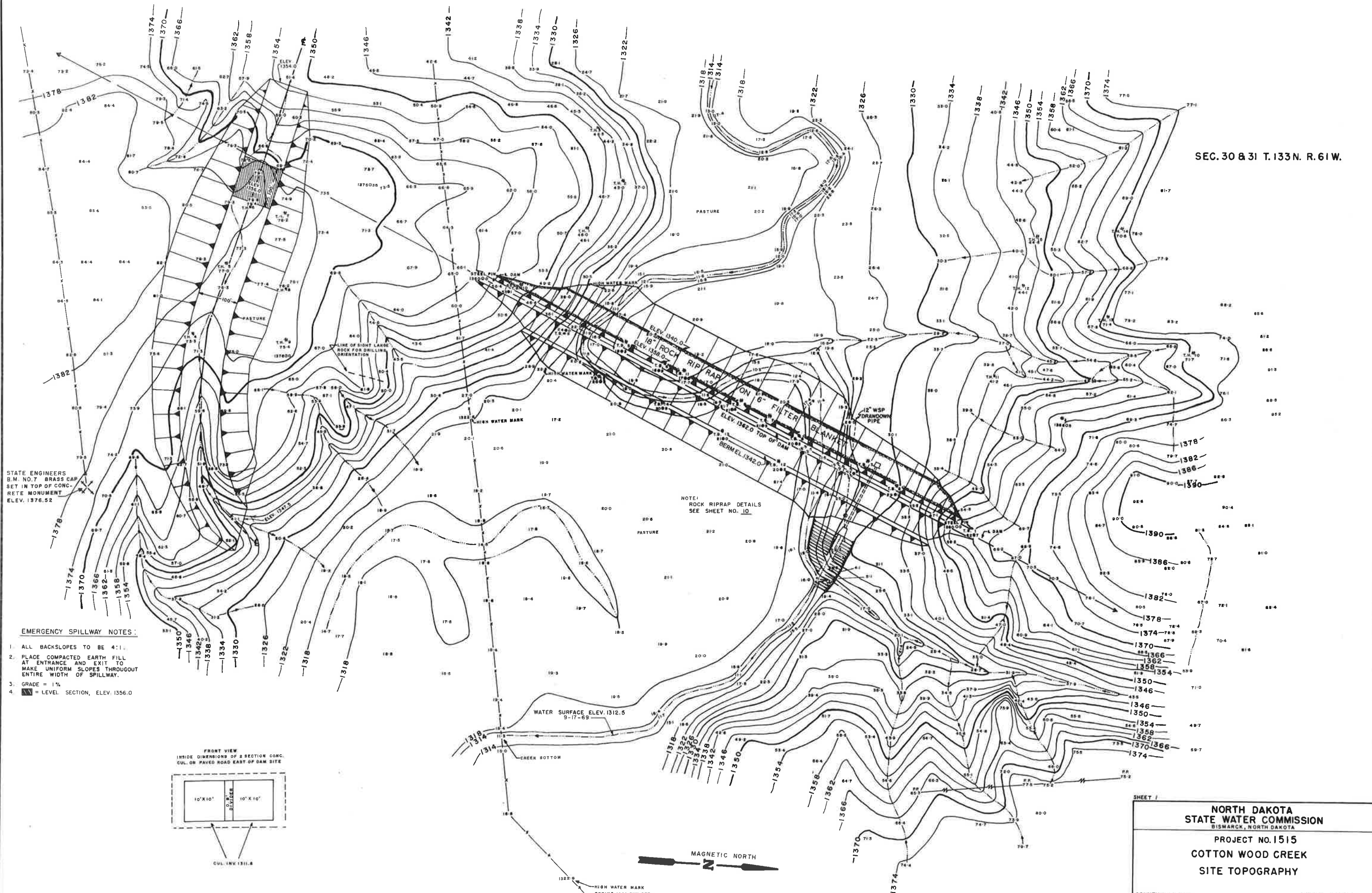


Cottonwood  
Creek  
Dam



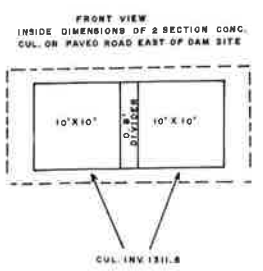
TO ABERDEEN FROM CRAVEN 16 17 18 19 20 21 22. 23 24 25  
FROM GROTON FROM LANGFORD FROM WATERTOWN FROM ORTONVILLE

SEC. 30 & 31 T. 133 N. R. 61 W.



STATE ENGINEERS  
S.M. NO. 7 BRASS CAP  
SET IN TOP OF CONCRETE MONUMENT  
ELEV. 1376.52

- EMERGENCY SPILLWAY NOTES:**
1. ALL BACKSLOPES TO BE 4:1.
  2. PLACE COMPACTED EARTH FILL AT ENTRANCE AND EXIT TO MAKE UNIFORM SLOPES THROUGHOUT ENTIRE WIDTH OF SPILLWAY.
  3. GRADE = 1%.
  4. ▭ = LEVEL SECTION, ELEV. 1356.0



NOTE:  
ROCK RIPRAP DETAILS  
SEE SHEET NO. 10

SHEET 1

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515  
COTTON WOOD CREEK  
SITE TOPOGRAPHY**

COUNTY LAMOURE      DATE 8-20-69  
 SURVEYED: EDS      CHECKED BY: DDS      SUBMITTED: *D. J. Schuch*  
 DRAWN: G.A.S.      DESIGNED BY: K.L.S.      APPROVED: *D. J. Schuch*  
 DRAWING NO. 7244-1515-1      SCALE 1"=100'



SEC'S 25,30,31,36  
T.133N. R.60W.



MATCH TO DRAWING  
NO. 7302-1515-3

L. DAM  
1362  
1356

30  
29

32

L. OF PAVED ROAD IS CENTER  
OF STYRENE DUMPS  
BARREL BOX VALVE WITH  
TWO 10" DIAM. OPENINGS  
INVERT EL. 1341.8

STATE ENG. BRASS CAP SET IN  
TOP OF CONCRETE MONUMENT  
ELEV. 1376.52

SHEET 2

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515**

**COTTONWOOD CREEK**

RESERVOIR TOPOGRAPHY

COUNTY LAMOURE DATE 10-24-69  
SURVEYED BY: EDS CHECKED BY: DDS SUBMITTED: 3/2/70  
DRAWN BY: G.A.S. DESIGNED BY: K.L.S. APPROVED: *Philip W. Hansen*  
DRAWING NO. 7301-1515-2 SCALE 1" = 200'

UNDER CULTIVATION

UNDER PASTURE

UNDER CROPPING

UNDER WOODS

UNDER WATER

UNDER SWAMP

UNDER SAND

UNDER GRAVEL

UNDER ROCK

UNDER CLAY

UNDER SILT

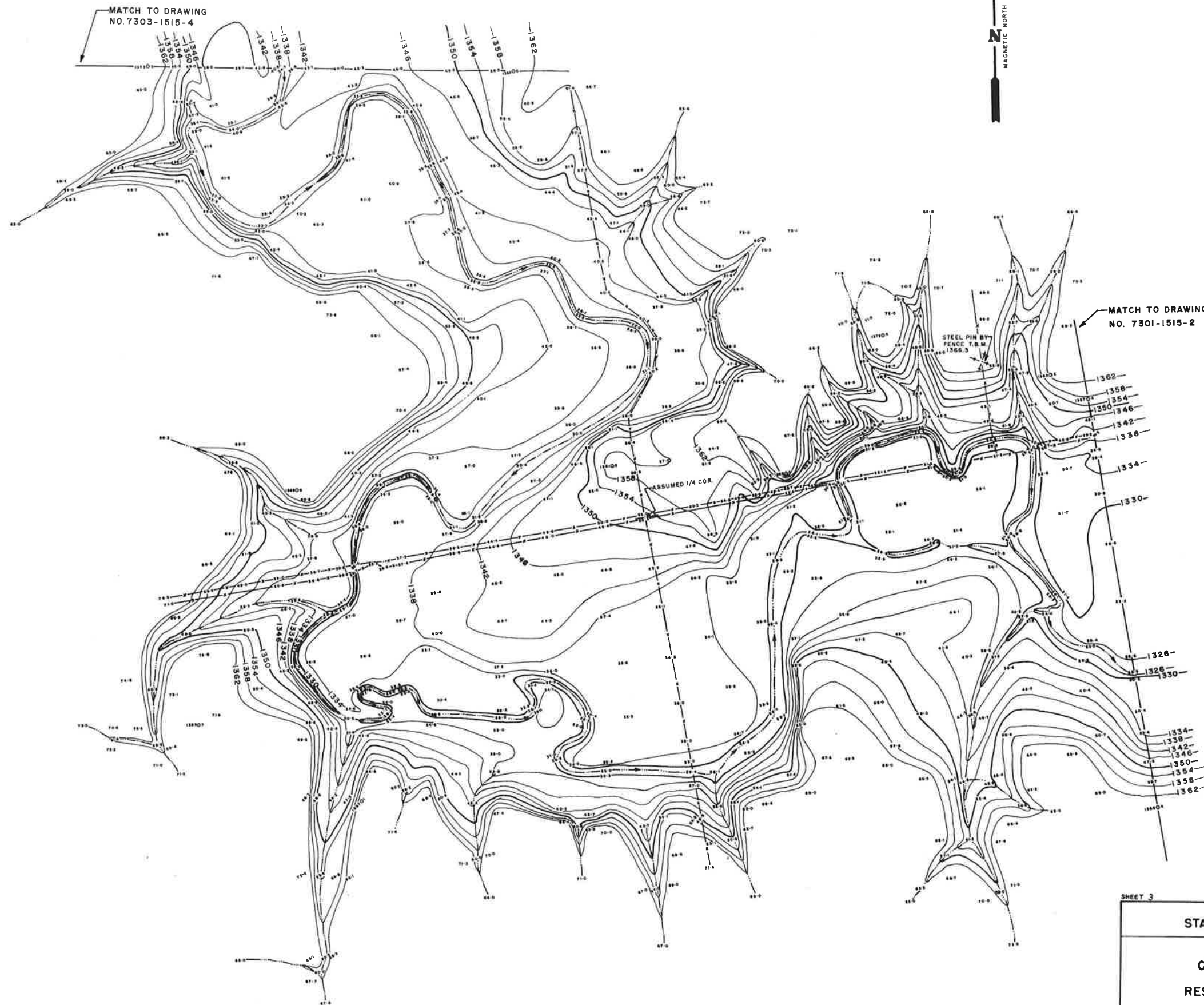
UNDER MUD

UNDER SLUDGE

UNDER DEBRIS

UNDER OTHER

SEC'S. 25 & 36 T.133N. R.61W.



SHEET 3

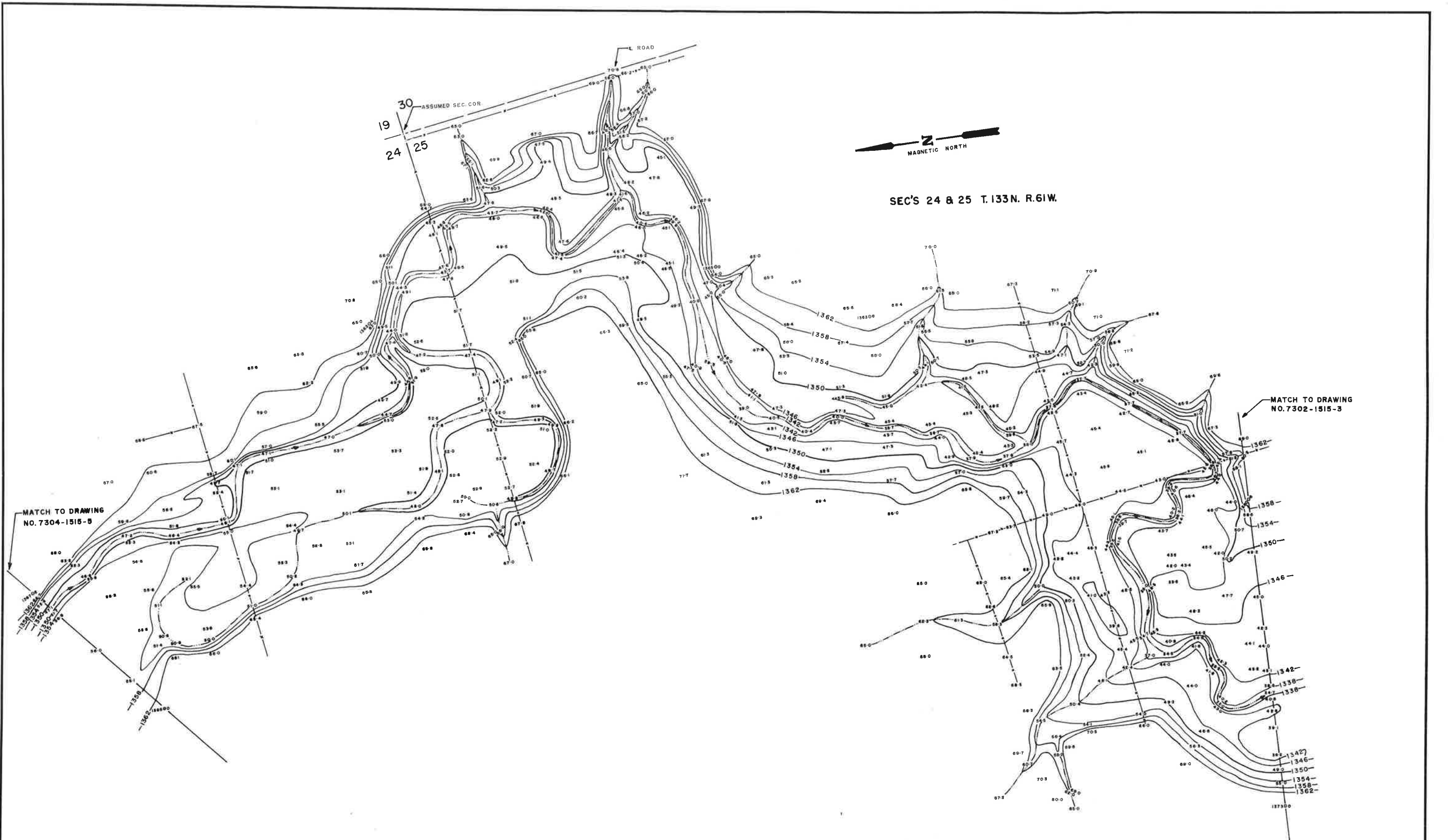
**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

PROJECT NO. 1515  
**COTTONWOOD CREEK**  
RESERVOIR TOPOGRAPHY

COUNTY LAMOUR	DATE 10-24-69	
SURVEYED: E D S	CHECKED BY: D D S	SUBMITTED: <i>[Signature]</i>
DRAWN: G A S	DESIGNED BY: K L S	APPROVED: <i>[Signature]</i>

DRAWING NO. 7302-1515-3

SCALE 1" = 200'



SEC'S 24 & 25 T.133N. R.61W.



MATCH TO DRAWING  
NO. 7304-1515-B

MATCH TO DRAWING  
NO. 7302-1515-3

SHEET 4

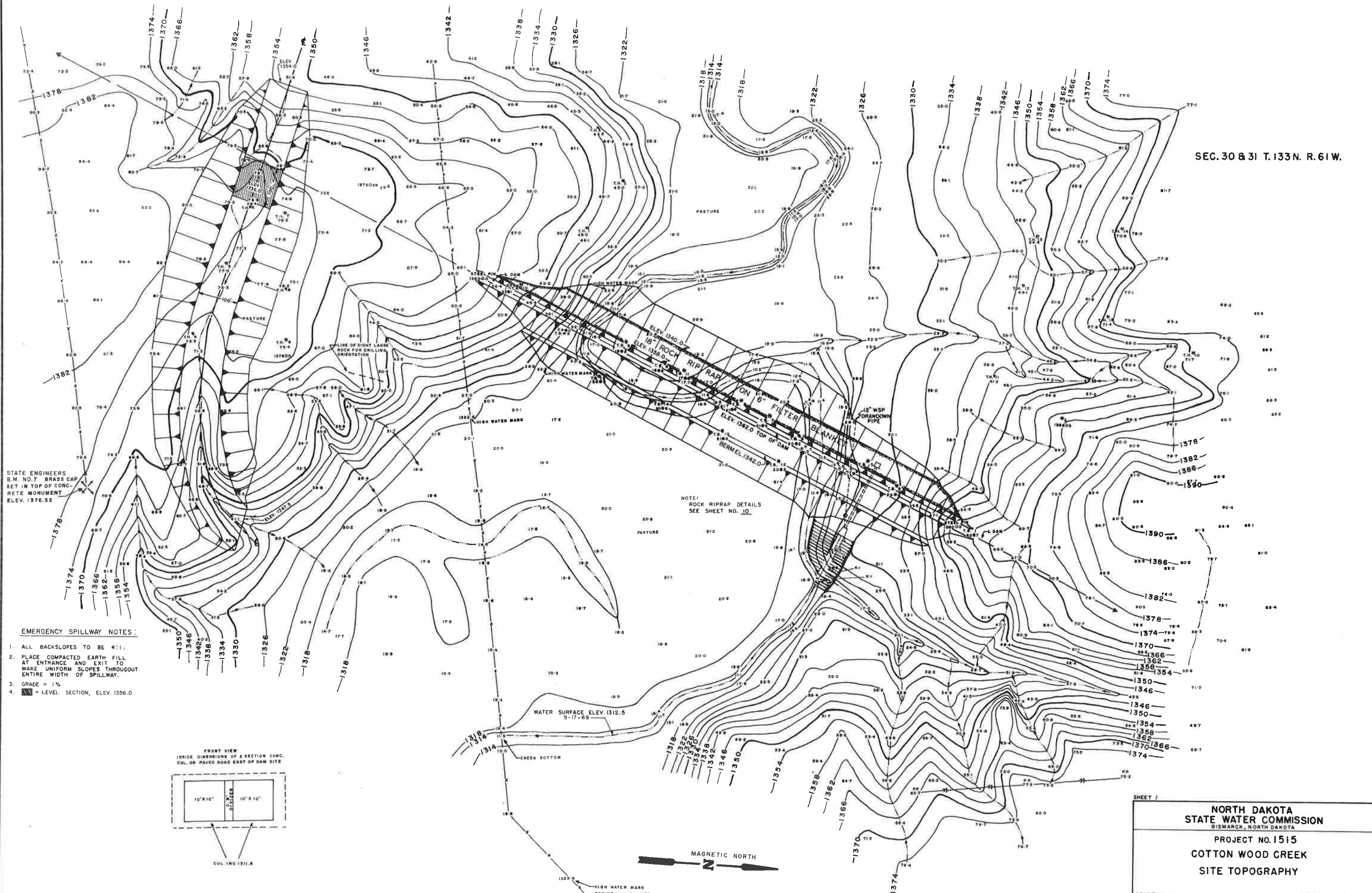
**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515  
COTTONWOOD CREEK  
RESERVOIR TOPOGRAPHY**

COUNTY LAMOURE DATE 10-24-68  
 SURVEYED BY: E.D.S. CHECKED BY: D.D.S. SUBMITTED BY: *[Signature]*  
 DRAWN BY: G.A.E. DESIGNED BY: K.L.S. APPROVED BY: *[Signature]*  
 DRAWING NO. 7303-1515-4 SCALE 1"=200'

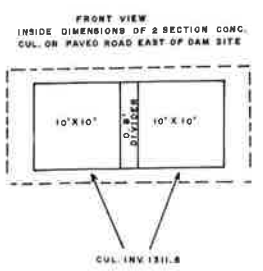


SEC. 30 & 31 T. 133 N. R. 61 W.



STATE ENGINEERS  
S.M. NO. 7 BRASS CAP  
SET IN TOP OF CONCRETE MONUMENT  
ELEV. 1376.52

- EMERGENCY SPILLWAY NOTES:**
1. ALL BACKSLOPES TO BE 4:1.
  2. PLACE COMPACTED EARTH FILL AT ENTRANCE AND EXIT TO MAKE UNIFORM SLOPES THROUGHOUT ENTIRE WIDTH OF SPILLWAY.
  3. GRADE = 1%.
  4. = LEVEL SECTION, ELEV. 1356.0



NOTE:  
ROCK RIPRAP DETAILS  
SEE SHEET NO. 10



SHEET 1

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515  
COTTON WOOD CREEK  
SITE TOPOGRAPHY**

COUNTY LAMOURE      DATE 8-20-69  
 SURVEYED: E.D.S.      CHECKED BY: O.D.S.      SUBMITTED: *D. J. Schuch*  
 DRAWN: G.A.S.      DESIGNED BY: K.L.S.      APPROVED: *D. J. Schuch*  
 DRAWING NO. 7244-1515-1      SCALE 1"=100'

SEC'S 25,30,31,36  
T.13N. R.60W.



MATCH TO DRAWING  
NO. 7302-1515-3

DAM  
1362  
1356

DINER 1 1/2" X 1/4"  
DEC. 1925  
HARRISON 1924  
CROSS 1914

STATE ENG. BRASS CAP SET IN  
TOP OF CONCRETE MONUMENT  
ELEV. 1376.52

1322  
1330  
1326  
1336  
1334  
1346  
1342  
1354  
1350  
1358

L OF PAVED ROAD IS CENTER  
OF STOWAWAY DOUBLE  
BARREL BOX VALVE WITH  
TWO 10" DIA. OPENINGS  
INVERT EL. 1361.2

SHEET 2

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515**

**COTTONWOOD CREEK**

RESERVOIR TOPOGRAPHY

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COUNTY LAMOURE DATE 10-24-69

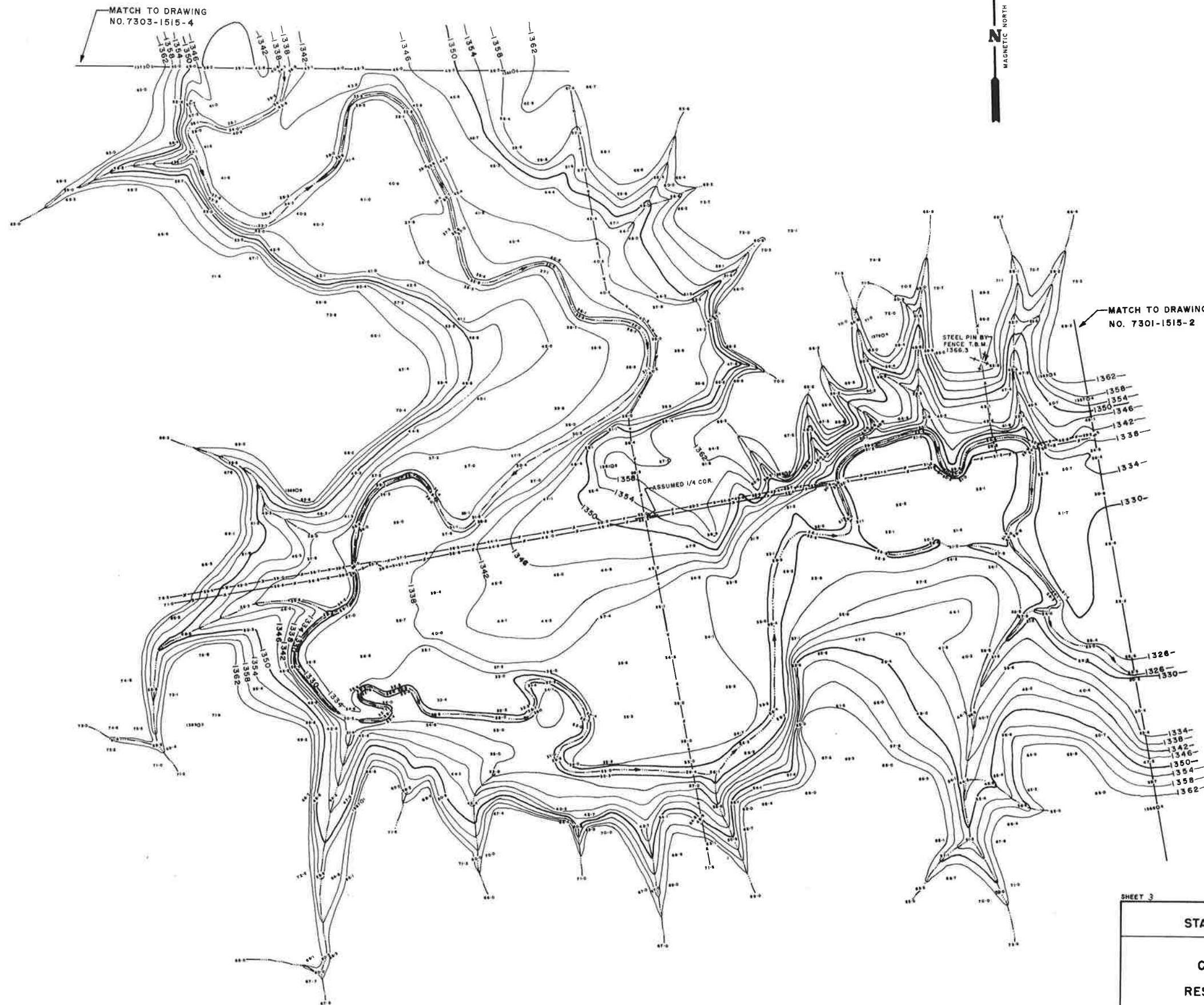
SURVEYED: EDS CHECKED BY: DDS SUBMITTED: 3/2

DRAWN: G.A.S. DESIGNED BY: K.L.S. APPROVED: *John W. Harrison*

DRAWING NO. 7301-1515-2 SCALE 1" = 200'



SEC'S. 25 & 36 T.133N. R.61W.



SHEET 3

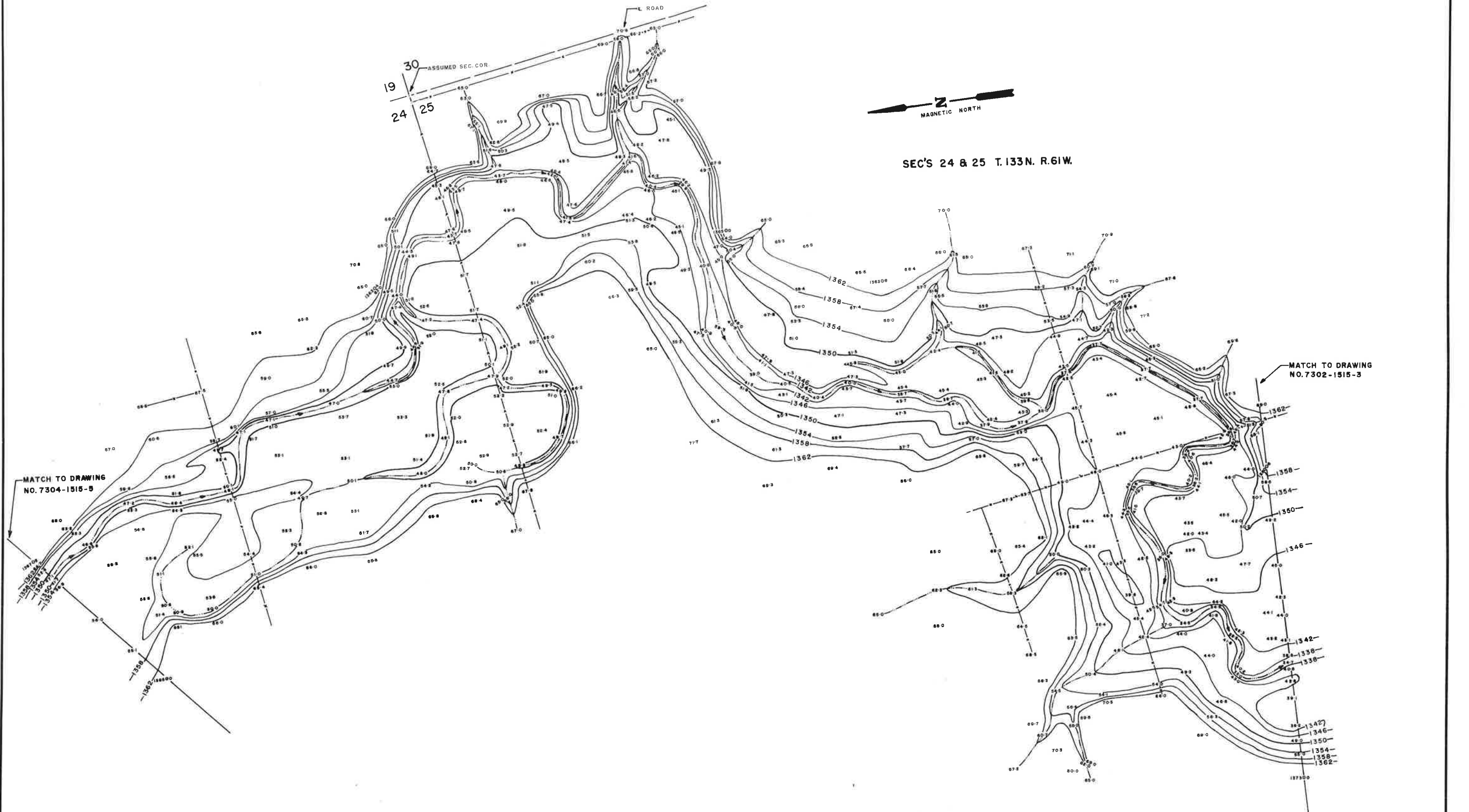
**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

PROJECT NO. 1515  
**COTTONWOOD CREEK**  
RESERVOIR TOPOGRAPHY

COUNTY LAMOURE	DATE 10-24-69	
SURVEYED: E D S	CHECKED BY: D D S	SUBMITTED: <i>[Signature]</i>
DRAWN: G A S	DESIGNED BY: K L S	APPROVED: <i>[Signature]</i>

DRAWING NO. 7302-1515-3

SCALE 1" = 200'



MATCH TO DRAWING  
NO. 7304-1515-5

MATCH TO DRAWING  
NO. 7302-1515-3

SEC'S 24 & 25 T. 133N. R. 61W.



SHEET 4

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515  
COTTONWOOD CREEK  
RESERVOIR TOPOGRAPHY**

COUNTY LAMOURE DATE 10-24-68  
SURVEYED BY: E.D.S. CHECKED BY: D.D.S. SUBMITTED BY: *[Signature]*  
DRAWN BY: G.A.E. DESIGNED BY: K.L.S. APPROVED BY: *[Signature]*  
DRAWING NO. 7303-1515-4 SCALE 1"=200'



MATCH TO DRAWING  
NO. 7303-1515-4

SEC'S 23 & 24 T.133N. R.61W.



SHEET 5

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

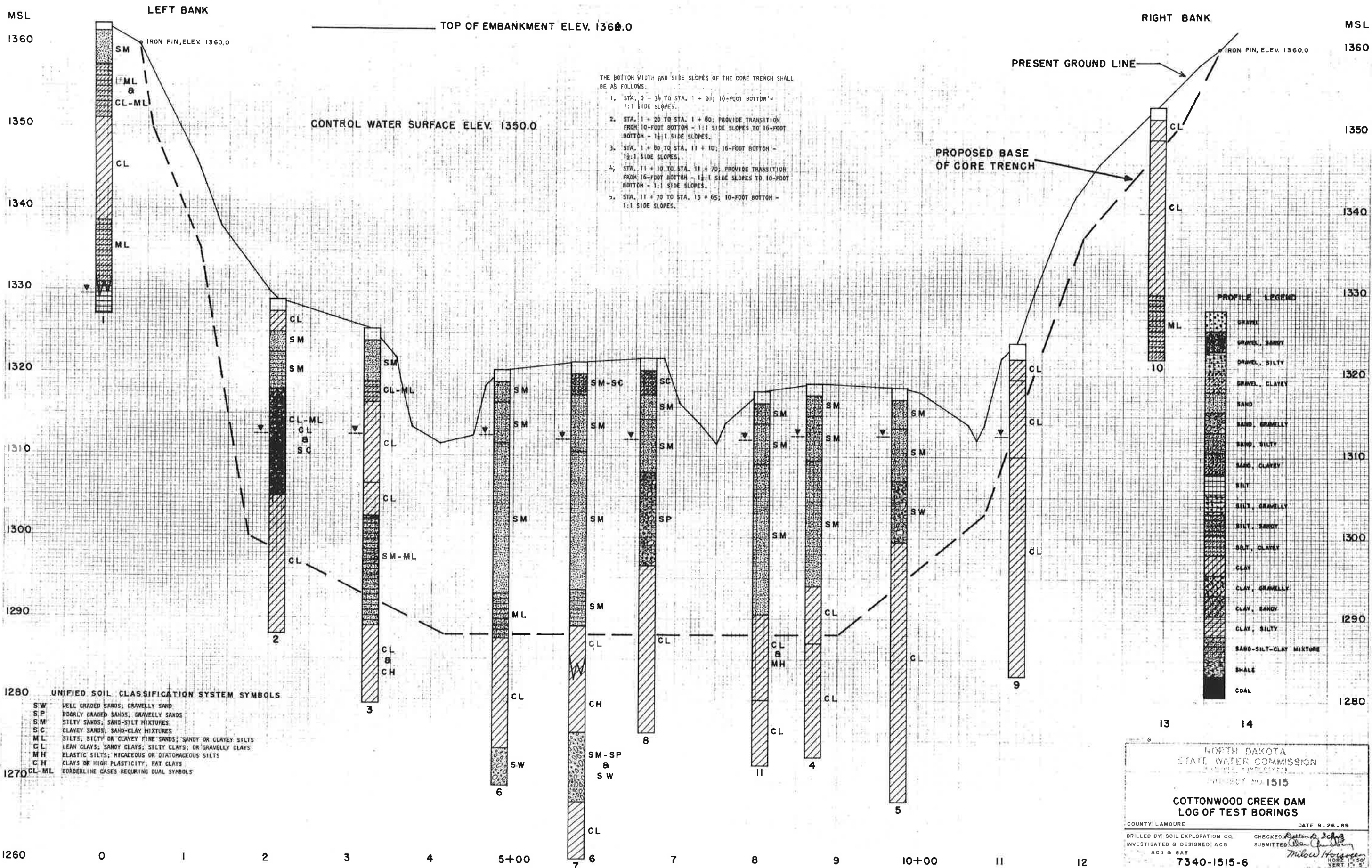
**PROJECT NO. 1515  
COTTONWOOD CREEK  
RESERVOIR TOPOGRAPHY**

COUNTY LAUREL	DATE 10-24-69
SURVEYED: E.D.S.	CHECKED BY: DDS
DRAWN: G.A.S.	DESIGNED BY: K.L.S.
	APPROVED: <i>M.E. W. Holsen</i>

DRAWING NO. 7304-1515-5

SCALE 1" = 200'





THE BOTTOM WIDTH AND SIDE SLOPES OF THE CORE TRENCH SHALL BE AS FOLLOWS:

1. STA. 0 + 34 TO STA. 1 + 20; 10-FOOT BOTTOM - 1:1 SIDE SLOPES.
2. STA. 1 + 20 TO STA. 1 + 80; PROVIDE TRANSITION FROM 10-FOOT BOTTOM - 1:1 SIDE SLOPES TO 16-FOOT BOTTOM - 1 1/2:1 SIDE SLOPES.
3. STA. 1 + 80 TO STA. 11 + 10; 16-FOOT BOTTOM - 1 1/2:1 SIDE SLOPES.
4. STA. 11 + 10 TO STA. 11 + 70; PROVIDE TRANSITION FROM 16-FOOT BOTTOM - 1 1/2:1 SIDE SLOPES TO 10-FOOT BOTTOM - 1:1 SIDE SLOPES.
5. STA. 11 + 70 TO STA. 13 + 65; 10-FOOT BOTTOM - 1:1 SIDE SLOPES.

1280 UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

SW	WELL GRADED SANDS; GRAVELLY SAND
SP	POORLY GRADED SANDS; GRAVELLY SANDS
SM	SILTY SANDS; SAND-SILT MIXTURES
SC	CLAYEY SANDS; SAND-CLAY MIXTURES
ML	SILTS; SILTY OR CLAYEY FINE SANDS; SANDY OR CLAYEY SILTS
CL	LEAN CLAYS; SANDY CLAYS; SILTY CLAYS; OR GRAVELLY CLAYS
MH	ELASTIC SILTS; MICACEOUS OR DIATOMACEOUS SILTS
CH	CLAYS OF HIGH PLASTICITY; FAT CLAYS
1270 CL-ML	BORDERLINE CASES REQUIRING DUAL SYMBOLS

NORTH DAKOTA  
STATE WATER COMMISSION  
PROJECT NO. 1515

**COTTONWOOD CREEK DAM  
LOG OF TEST BORINGS**

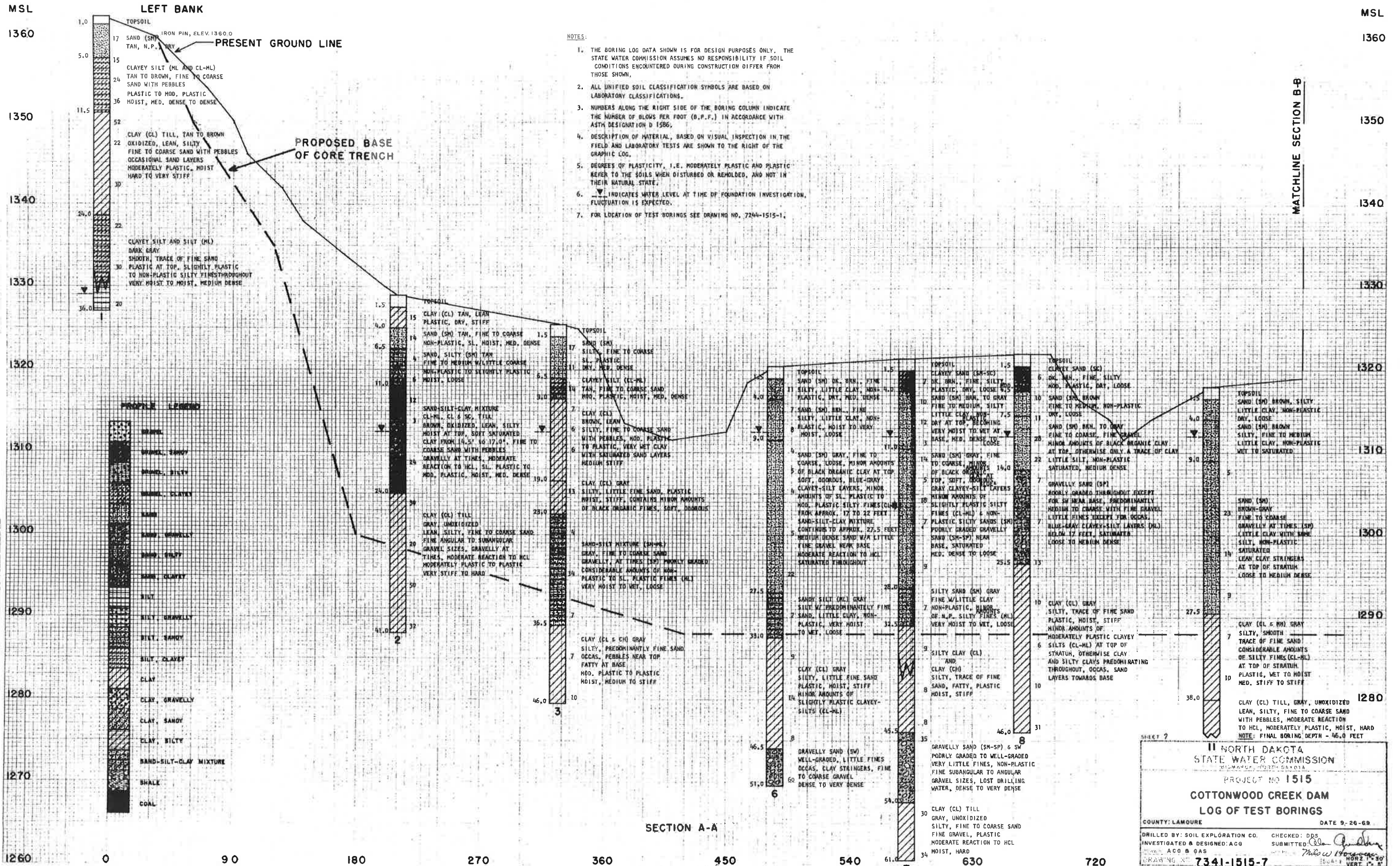
COUNTY: LAMOUR      DATE: 9-26-69

DRILLED BY: SOIL EXPLORATION CO.      CHECKED: *Arthur Schlegel*  
 INVESTIGATED & DESIGNED: AGC      SUBMITTED: *Walter Johnson*  
 AGC & GAS      *Milou Harrison*

7340-1515-6

VERT. 1:50





- NOTES:
1. THE BORING LOG DATA SHOWN IS FOR DESIGN PURPOSES ONLY. THE STATE WATER COMMISSION ASSUMES NO RESPONSIBILITY IF SOIL CONDITIONS ENCOUNTERED DURING CONSTRUCTION DIFFER FROM THOSE SHOWN.
  2. ALL UNIFIED SOIL CLASSIFICATION SYMBOLS ARE BASED ON LABORATORY CLASSIFICATIONS.
  3. NUMBERS ALONG THE RIGHT SIDE OF THE BORING COLUMN INDICATE THE NUMBER OF BLOWS PER FOOT (B.P.F.) IN ACCORDANCE WITH ASTM DESIGNATION D 1586.
  4. DESCRIPTION OF MATERIAL, BASED ON VISUAL INSPECTION IN THE FIELD AND LABORATORY TESTS ARE SHOWN TO THE RIGHT OF THE GRAPHIC LOG.
  5. DEGREES OF PLASTICITY, I.E. MODERATELY PLASTIC AND PLASTIC REFER TO THE SOILS WHEN DISTURBED OR REMOLDED, AND NOT IN THEIR NATURAL STATE.
  6. ▽ INDICATES WATER LEVEL AT TIME OF FOUNDATION INVESTIGATION. FLUCTUATION IS EXPECTED.
  7. FOR LOCATION OF TEST BORINGS SEE DRAWING NO. 7244-1515-1.

FINAL SURVEY  
DATE: 10/1/68  
BY: [Signature]

ORIGINAL SURVEY  
DATE: 10/1/68  
BY: [Signature]

SHEET 2

**NORTH DAKOTA**  
STATE WATER COMMISSION  
BISMARCK, NORTH DAKOTA

PROJECT NO 1515

**COTTONWOOD CREEK DAM**  
LOG OF TEST BORINGS

COUNTY: LAMOUR      DATE: 9-26-68

DRILLED BY: SOIL EXPLORATION CO.      CHECKED: DRS  
INVESTIGATED & DESIGNED: AGG      SUBMITTED: [Signature]

SCALE: ACC @ 8AS      DATE: 10/1/68  
DRAWING NO. 7341-1515-7      HORIZ. SCALE 1" = 30'

SECTION A-A

MATCHLINE SECTION B-B



MSL

1360

RIGHT BANK

MSL

1360

1350

1350

1340

1340

1330

1330

1320

1320

1310

1310

1300

1300

1290

1290

1280

1280

1270

MATCHLINE SECTION A-A

PRESENT GROUND LINE

IRON PIN, ELEV. 1360.0

PROPOSED BASE OF CORE TRENCH

PROFILE LEGEND



SECTION B-B

1260

900

990

1080

1170

1260

1350

1440

NORTH DAKOTA  
STATE WATER COMMISSION  
Project No. 1515  
**COTTONWOOD CREEK DAM**  
**LOG OF TEST BORINGS**

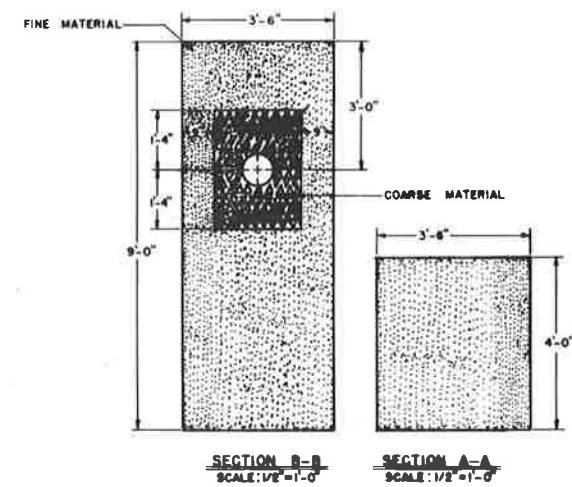
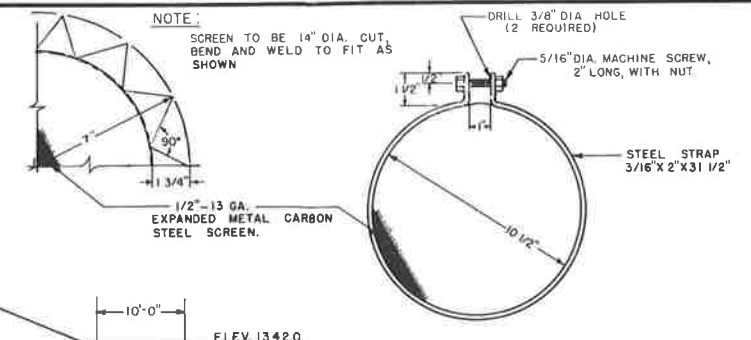
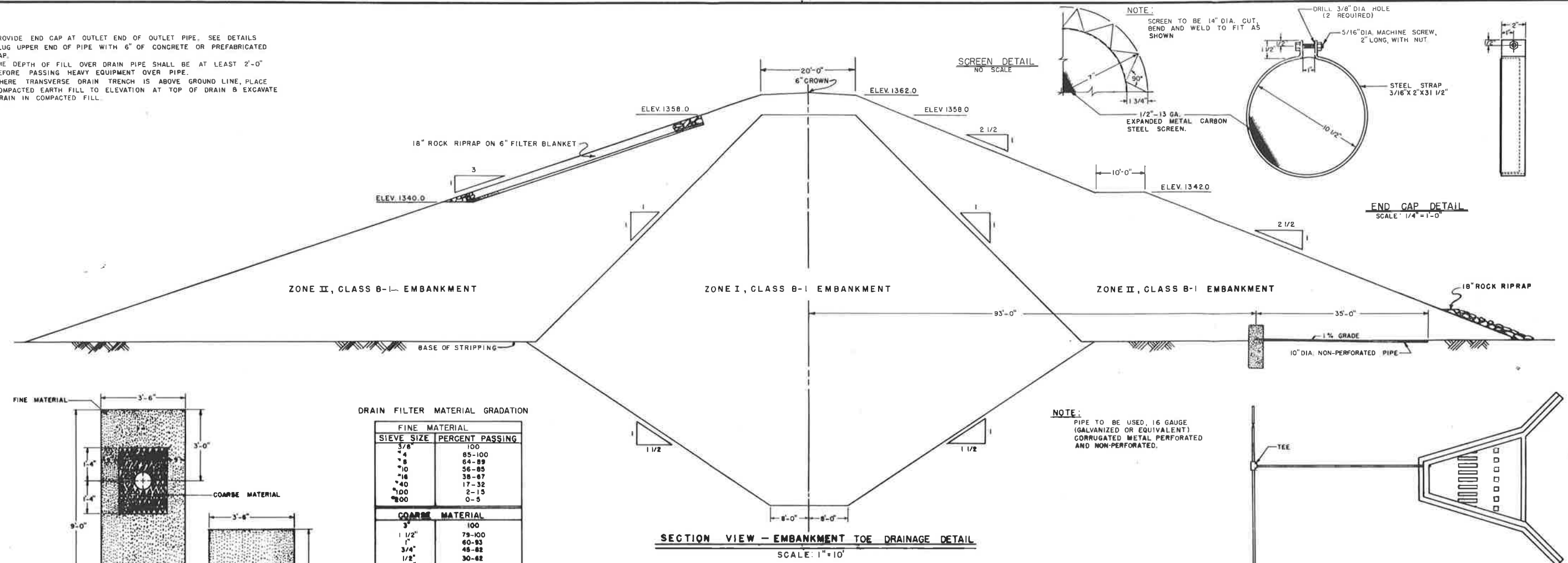
COUNTY: LAMOUR      DATE: 9-26-69

DRILLED BY: SOIL EXPLORATION CO.      CHECKED: DGS  
INVESTIGATED & DESIGNED: ACG      SUBMITTED: *[Signature]*  
ACG & GAS      *Milo W. Hansen*  
NO. 1515-30  
VERT. 1" = 5'

**7342-1515-8**

**NOTES**

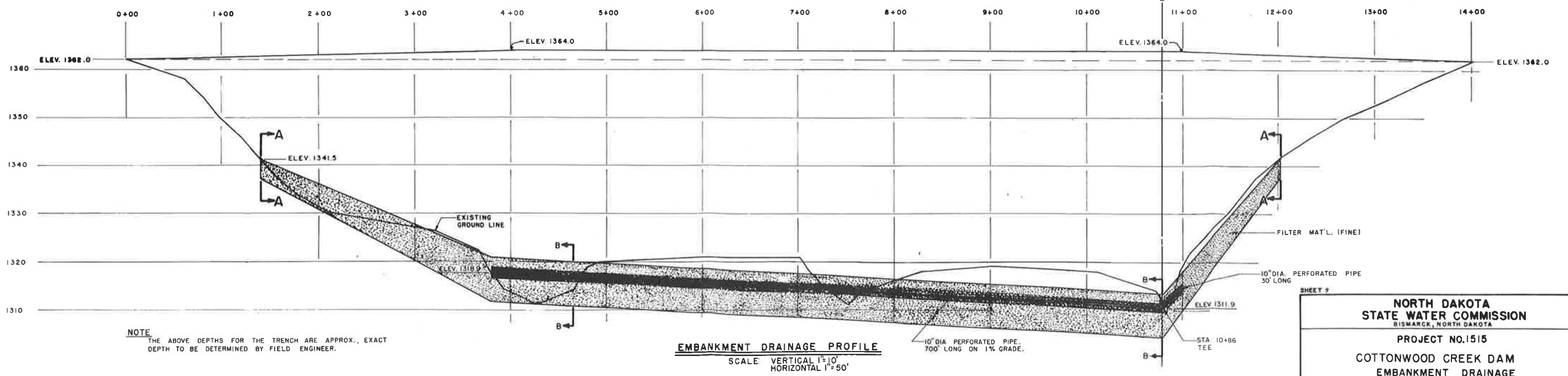
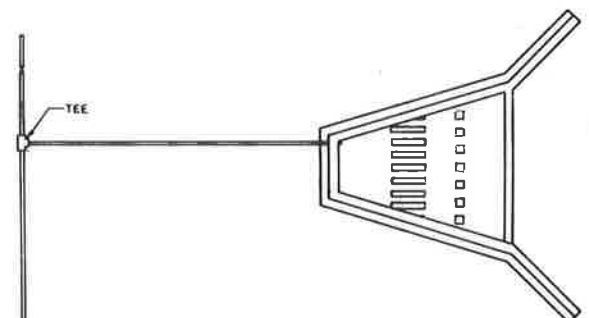
1. PROVIDE END CAP AT OUTLET END OF OUTLET PIPE. SEE DETAILS.
2. PLUG UPPER END OF PIPE WITH 6" OF CONCRETE OR PREFABRICATED CAP.
3. THE DEPTH OF FILL OVER DRAIN PIPE SHALL BE AT LEAST 2'-0" BEFORE PASSING HEAVY EQUIPMENT OVER PIPE.
4. WHERE TRANSVERSE DRAIN TRENCH IS ABOVE GROUND LINE, PLACE COMPACTED EARTH FILL TO ELEVATION AT TOP OF DRAIN & EXCAVATE DRAIN IN COMPACTED FILL.



**DRAIN FILTER MATERIAL GRADATION**

FINE MATERIAL	
SIEVE SIZE	PERCENT PASSING
3/8"	100
#4	85-100
#8	64-89
#10	56-85
#18	38-67
#40	17-32
#100	2-15
#200	0-5
COARSE MATERIAL	
3"	100
1 1/2"	79-100
1"	60-93
3/4"	48-82
1/2"	30-62
3/8"	24-49
#4	11-31
#10	0-16

**NOTE:**  
PIPE TO BE USED, 16 GAUGE (GALVANIZED OR EQUIVALENT) CORRUGATED METAL PERFORATED AND NON-PERFORATED.



**NOTE:**  
THE ABOVE DEPTHS FOR THE TRENCH ARE APPROX., EXACT DEPTH TO BE DETERMINED BY FIELD ENGINEER.

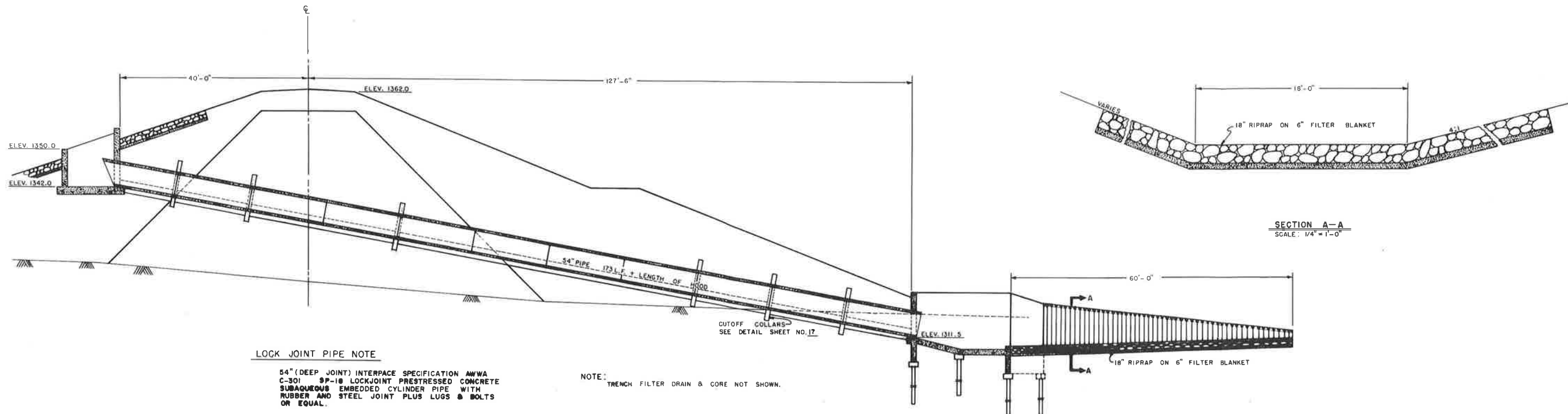
**EMBANKMENT DRAINAGE PROFILE**  
SCALE: VERTICAL 1"=10'  
HORIZONTAL 1"=50'

**NORTH DAKOTA STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515**  
**COTTONWOOD CREEK DAM**  
**EMBANKMENT DRAINAGE**

COUNTY: LAMOUR  
DATE: 4-9-20  
SURVEYED: [Signature] CHECKED BY: DCS SUBMITTED: [Signature]  
DRAWN: WAH DESIGNED BY: MRH, KLS APPROVED: [Signature]  
DRAWING NO. 7431-1515-11 SCALE AS SHOWN



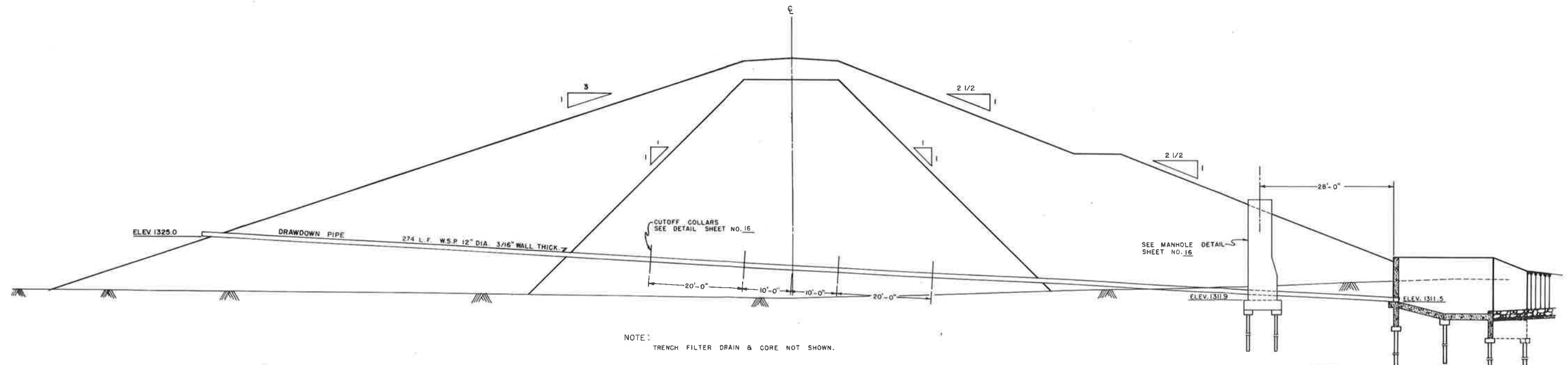


**LOCK JOINT PIPE NOTE**

54" (DEEP JOINT) INTERPACE SPECIFICATION ANWA C-301 SP-18 LOCKJOINT PRESTRESSED CONCRETE SUBAQUEOUS EMBEDDED CYLINDER PIPE WITH RUBBER AND STEEL JOINT PLUS LUGS & BOLTS OR EQUAL.

NOTE: TRENCH FILTER DRAIN & CORE NOT SHOWN.

**SECTION THROUGH PRINCIPAL SPILLWAY**  
SCALE: 1" = 10'-0"



NOTE: TRENCH FILTER DRAIN & CORE NOT SHOWN.

**SECTION THROUGH DRAWDOWN PIPE**  
SCALE: 1" = 10'-0"

SHEET 10

**NORTH DAKOTA STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515**  
COTTONWOOD CREEK DAM

PRINCIPAL SPILLWAY & DRAWDOWN PIPE SECTIONS

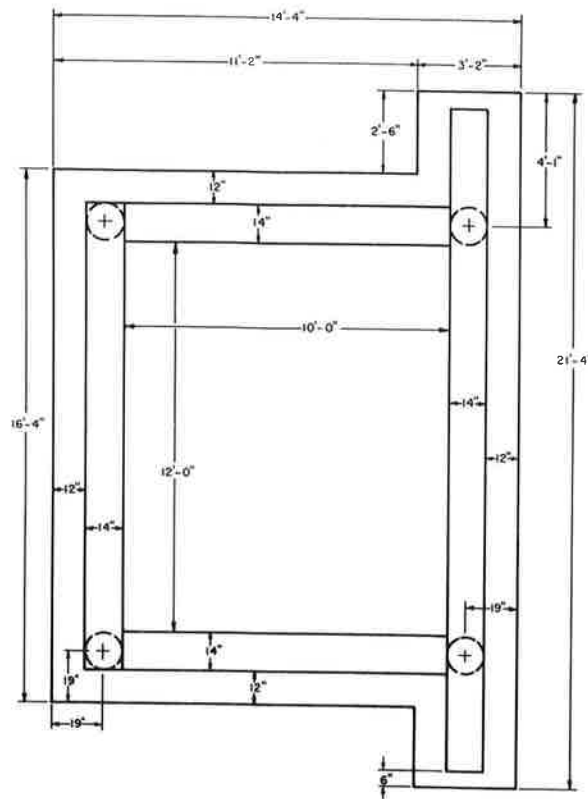
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COUNTY: LAMOURE DATE: MAY 27, 1970

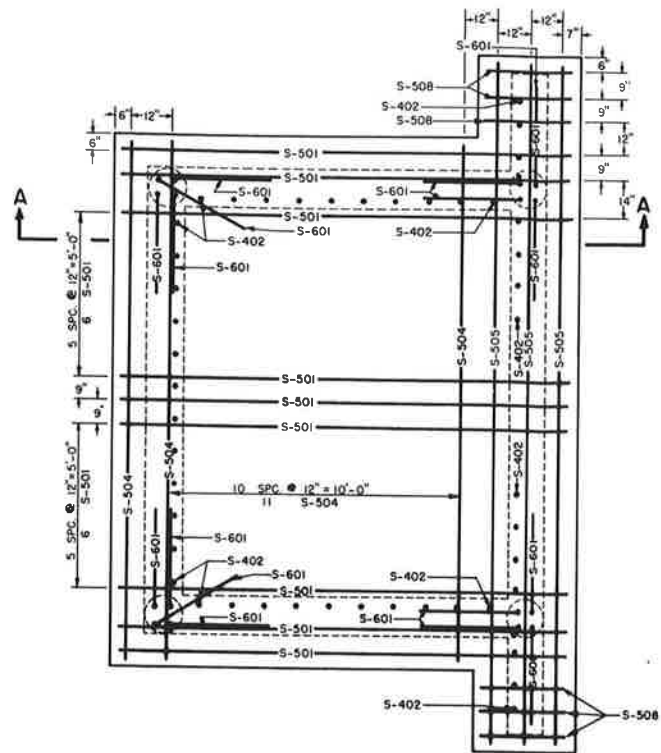
SURVEYED: \_\_\_\_\_ CHECKED BY: D.D.S. SUBMITTED: \_\_\_\_\_

DRAWN: G.T.O. DESIGNED BY: K.L.S. APPROVED: \_\_\_\_\_

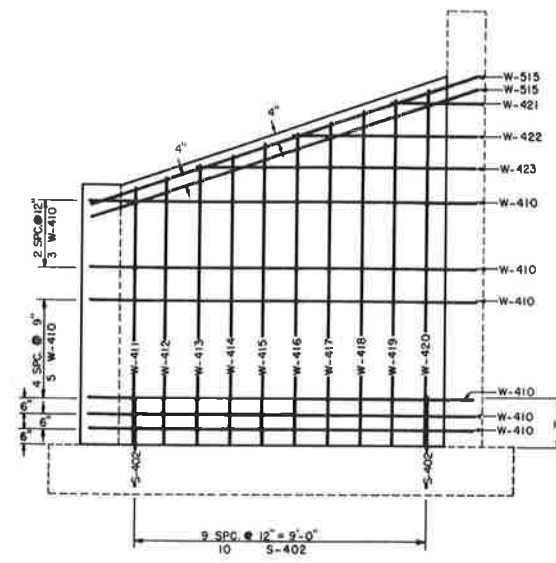
DRAWING NO. 7541-1515-18 SCALE AS SHOWN



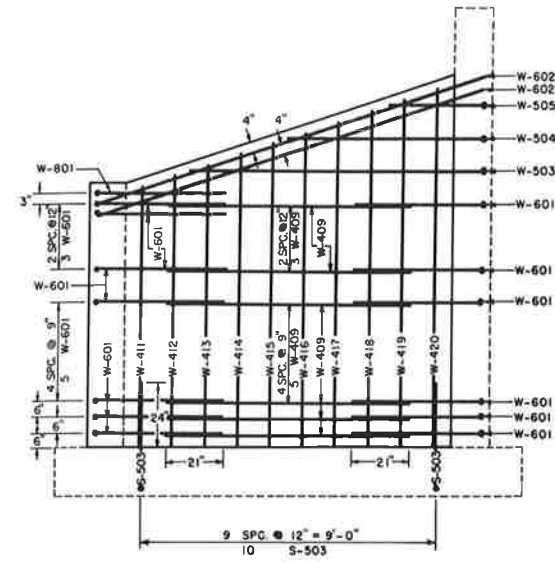
**INLET STRUCTURE - PLAN VIEW**  
SCALE: 3/8" = 1'-0"



**UPPER STEEL**

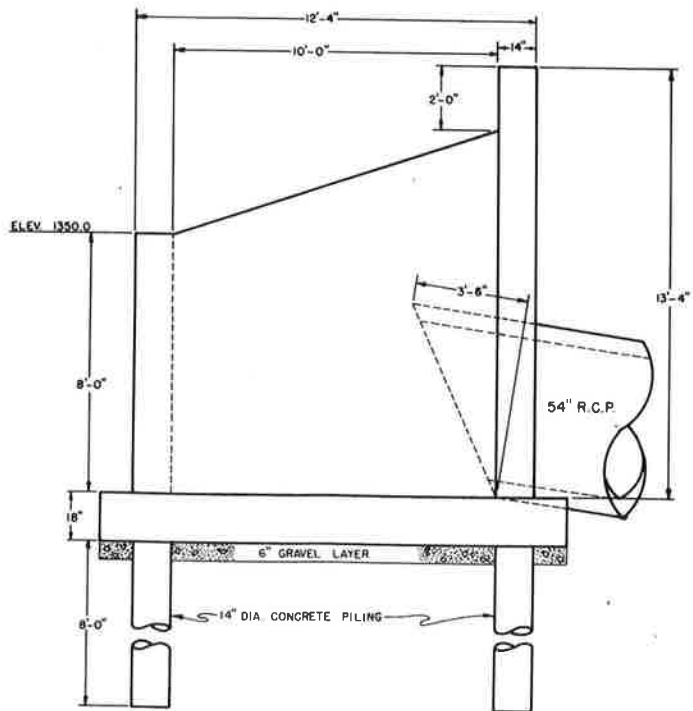


**INSIDE STEEL**

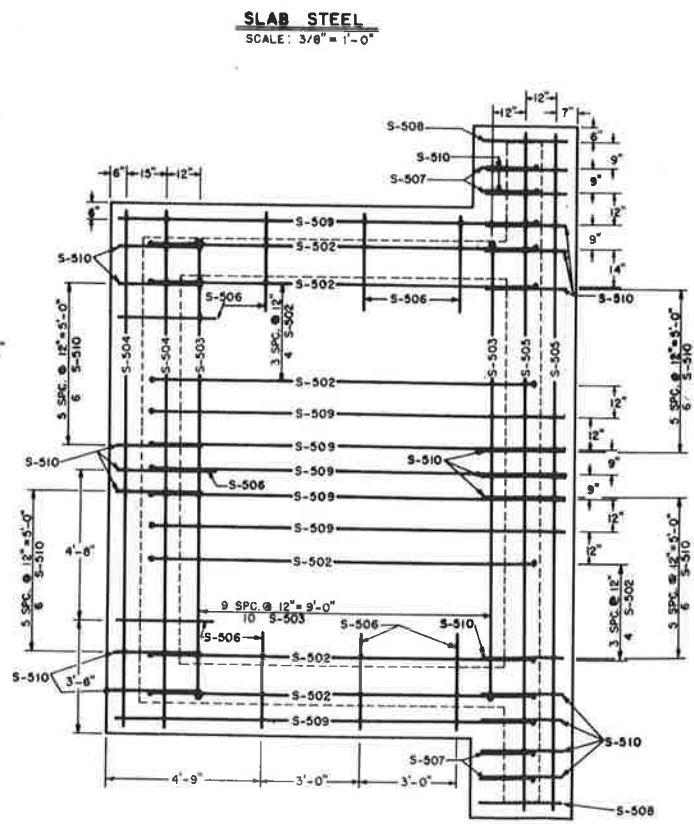


**OUTSIDE STEEL**

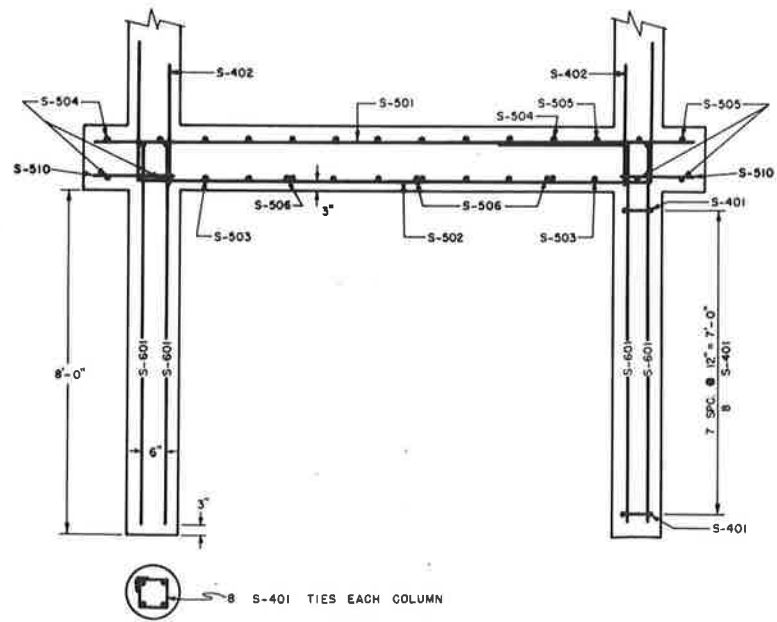
**SIDEWALL STEEL**  
SCALE: 3/8" = 1'-0"



**INLET STRUCTURE - ELEVATION VIEW**  
SCALE: 3/8" = 1'-0"



**LOWER STEEL**



**SECTION A-A**  
SCALE: 1/2" = 1'-0"

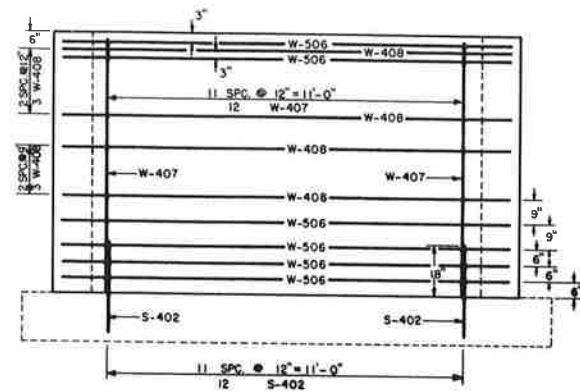
- NOTES:**
- MINIMUM COVER OF 3" ON ALL REINFORCING STEEL WHERE CONCRETE IS IN CONTACT WITH SOIL; 2" IN ALL OTHER CASES.
  - ALL BARS PLACED 12" O.-C. UNLESS OTHERWISE INDICATED.

SHEET 11

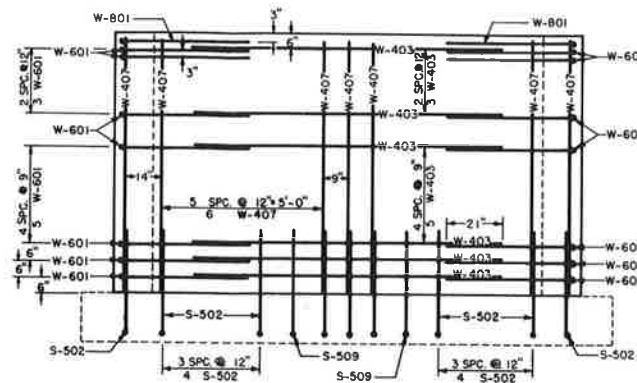
**NORTH DAKOTA STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515**  
**COTTONWOOD CREEK DAM**  
**INLET STRUCTURE**

COUNTY LA MOURE DATE 4-20-70  
 SURVEYED: \_\_\_\_\_ CHECKED BY: D O S SUBMITTED: \_\_\_\_\_  
 DRAWN: G T O DESIGNED BY: K L S APPROVED: \_\_\_\_\_  
 DRAWING NO. 7537-1515-14 SCALE AS SHOWN

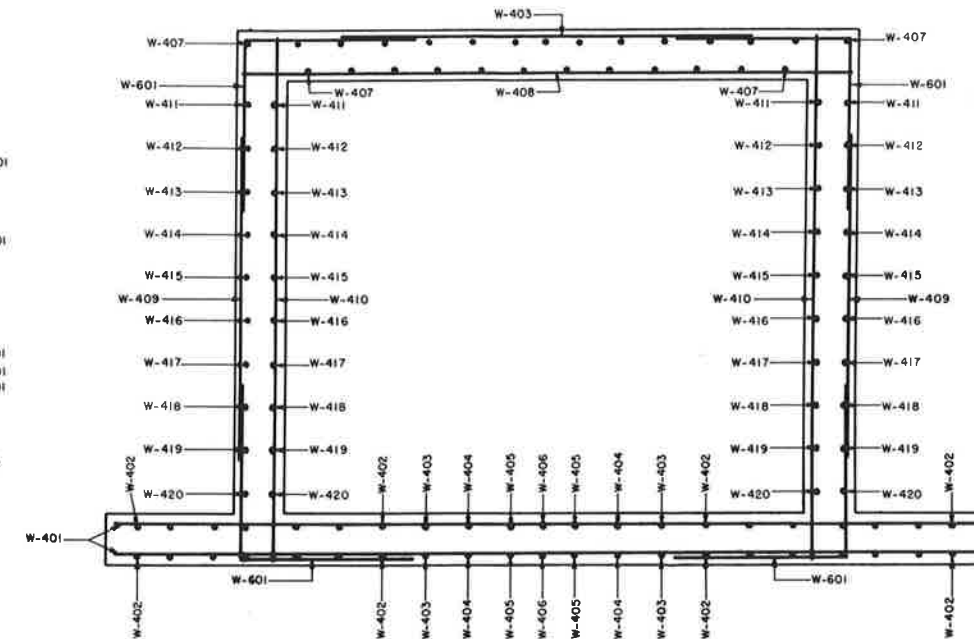


INSIDE STEEL

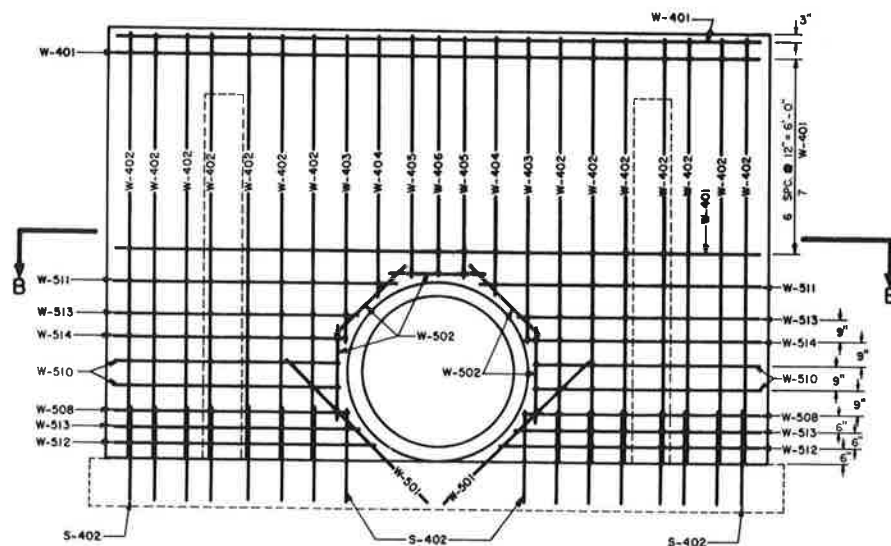


OUTSIDE STEEL

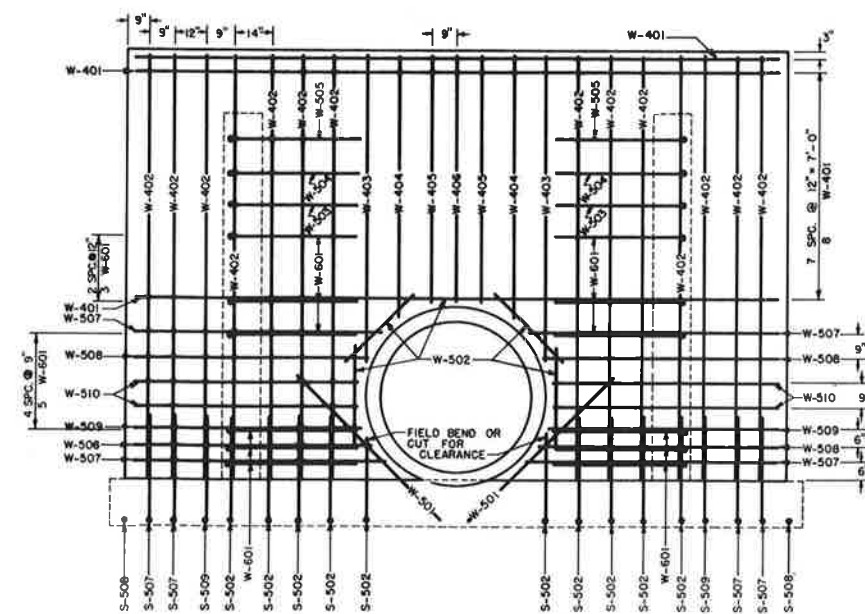
UPSTREAM WALL STEEL  
SCALE: 3/8" = 1'-0"



SECTION B-B  
SCALE: 1/2" = 1'-0"



INSIDE STEEL



OUTSIDE STEEL

DOWNSTREAM WALL STEEL  
SCALE: 3/8" = 1'-0"

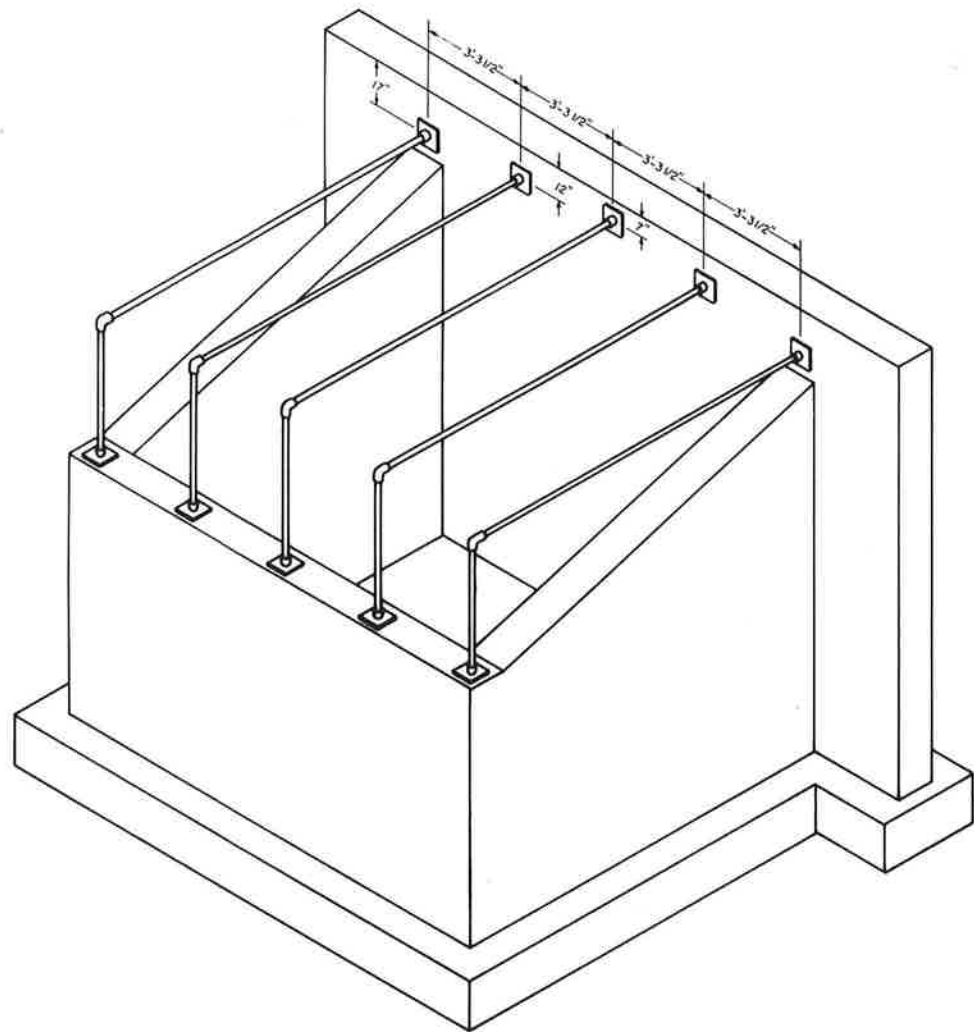
SHEET 12

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

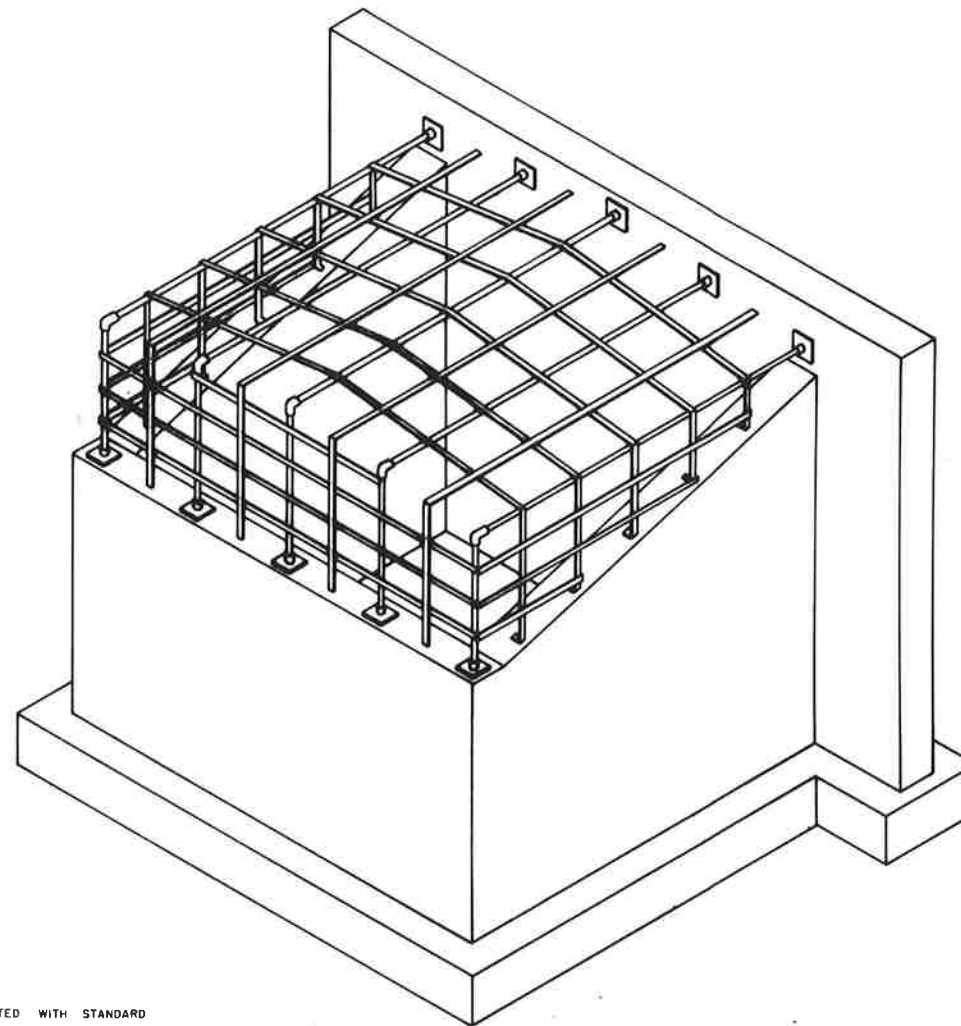
PROJECT NO. 1515  
COTTONWOOD CREEK DAM  
INLET STRUCTURE

COUNTY: LAMOUR      DATE: 4-22-70  
 SURVEYED:      CHECKED BY: D.N.S.      SUBMITTED:      APPROVED: *[Signature]*  
 DRAWN: G.T.O.      DESIGNED BY: K.L.S.      APPROVED: *[Signature]*

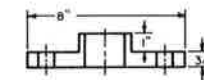
DRAWING NO. 7538-1515-15      SCALE AS SHOWN



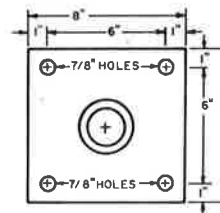
**PIPE FRAME**  
SCALE: 3/8" = 1'-0"



**TRASH RACK - FINISHED VIEW**  
SCALE: 3/8" = 1'-0"



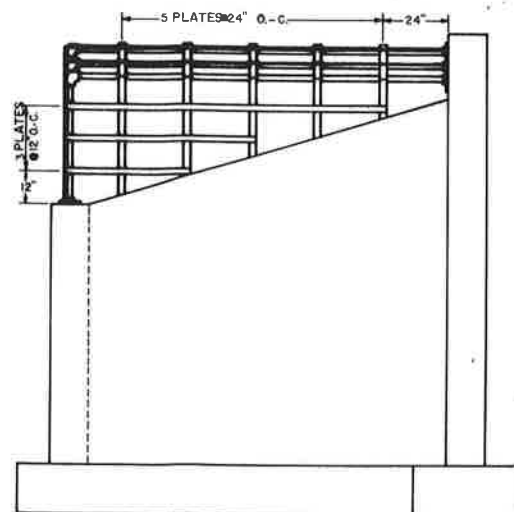
**SECTION VIEW**



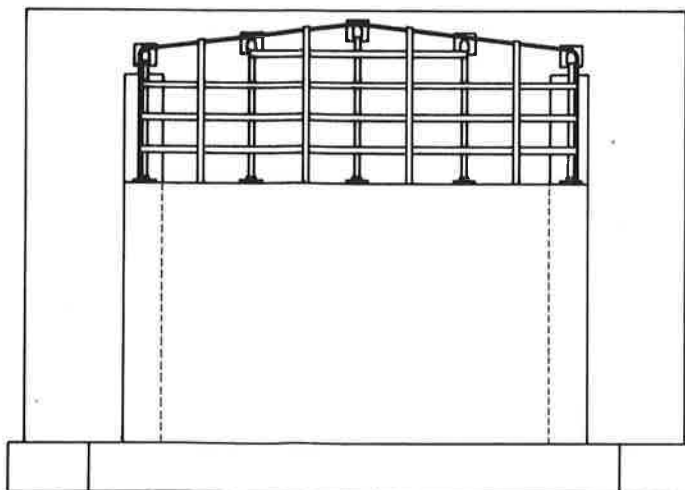
**PLAN VIEW**

**BASE PLATE DETAILS**  
NO SCALE

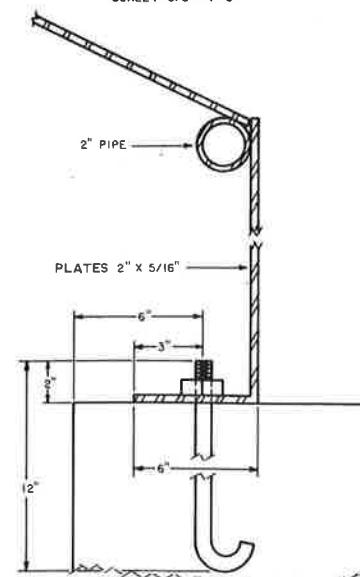
- NOTES:**
1. TRASH RACK FRAME TO BE CONSTRUCTED WITH STANDARD 2" BLACK PIPE.
  2. JOINTS ON 2" PIPE MAY BE THREADED, WELDED OR CLAMPED.
  3. PLATES 2"x5/16" TO BE WELDED ON TRASH RACK AS SHOWN.
  4. TRASH RACK TO BE GIVEN ONE COAT OF LEAD PRIMER AND TWO COATS OF ALUMINUM PAINT.



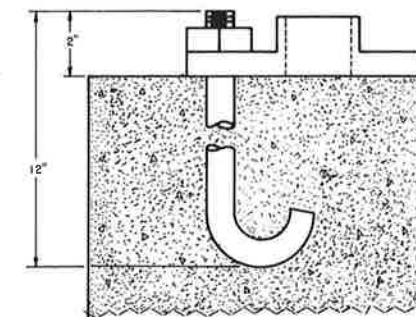
**SIDE VIEW**  
SCALE: 3/8" = 1'-0"



**FRONT VIEW**  
SCALE: 3/8" = 1'-0"



**BAR MOUNTING DETAIL**  
NO SCALE



**BOLT DETAIL**  
SCALE: 3/8" = 1"

SHEET 13

**NORTH DAKOTA STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

**PROJECT NO. 1515**

**COTTONWOOD CREEK DAM**

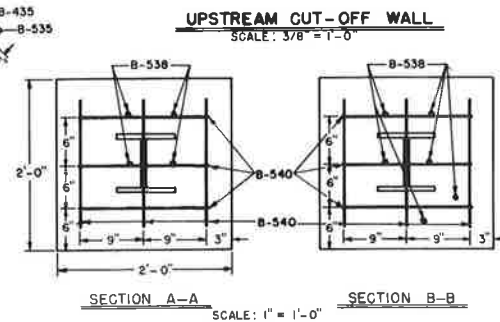
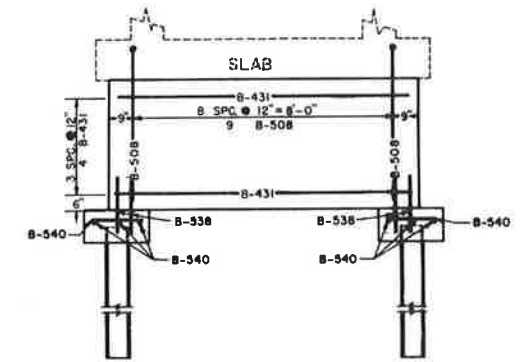
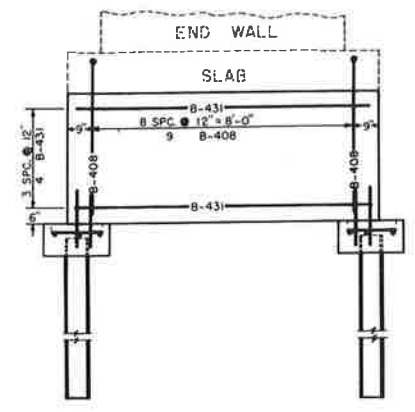
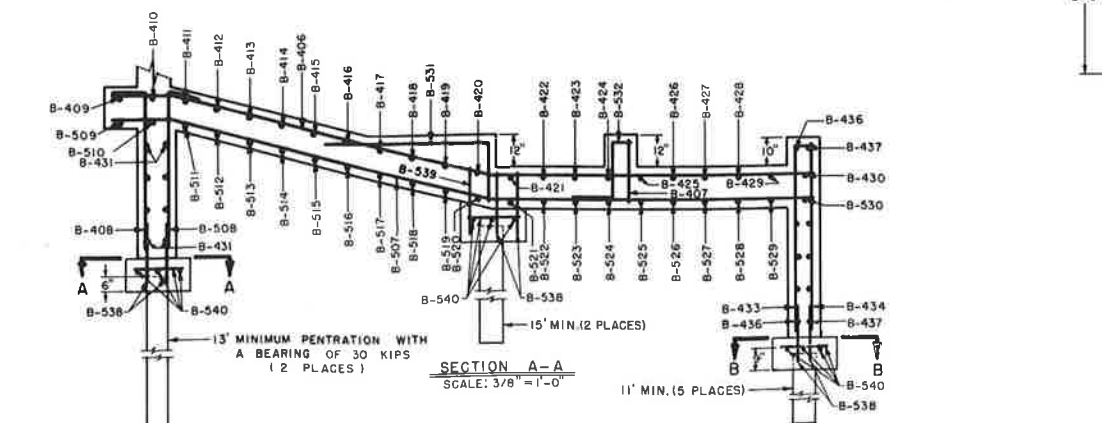
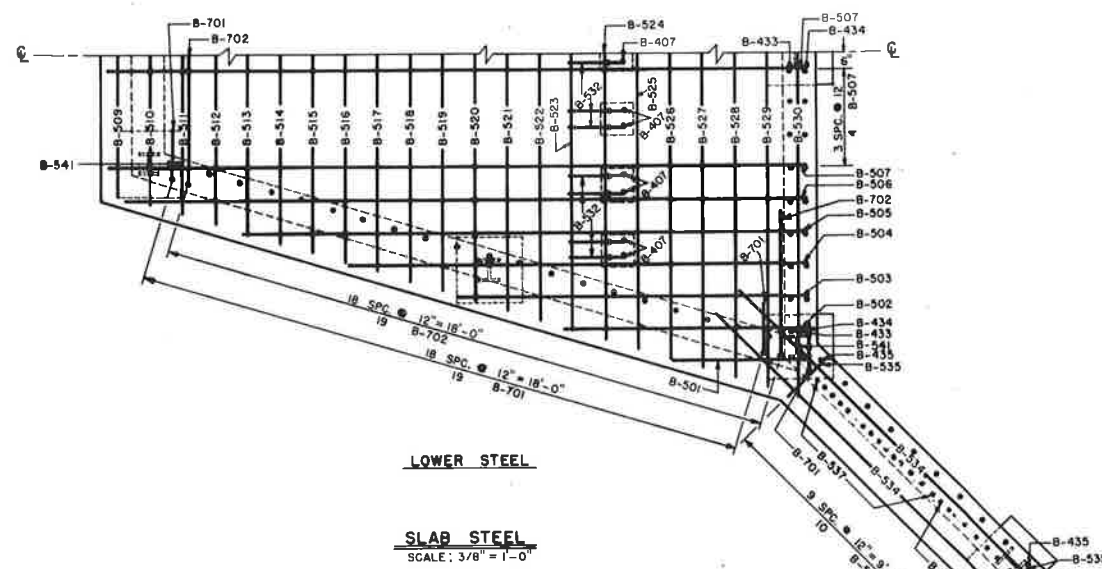
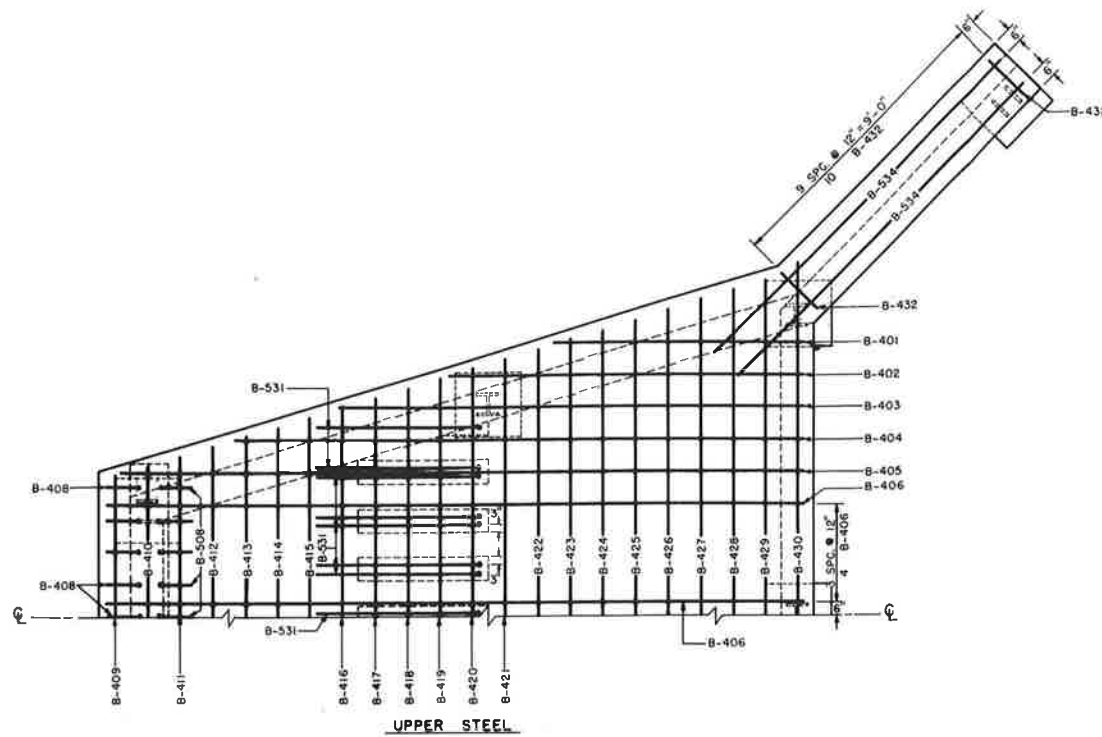
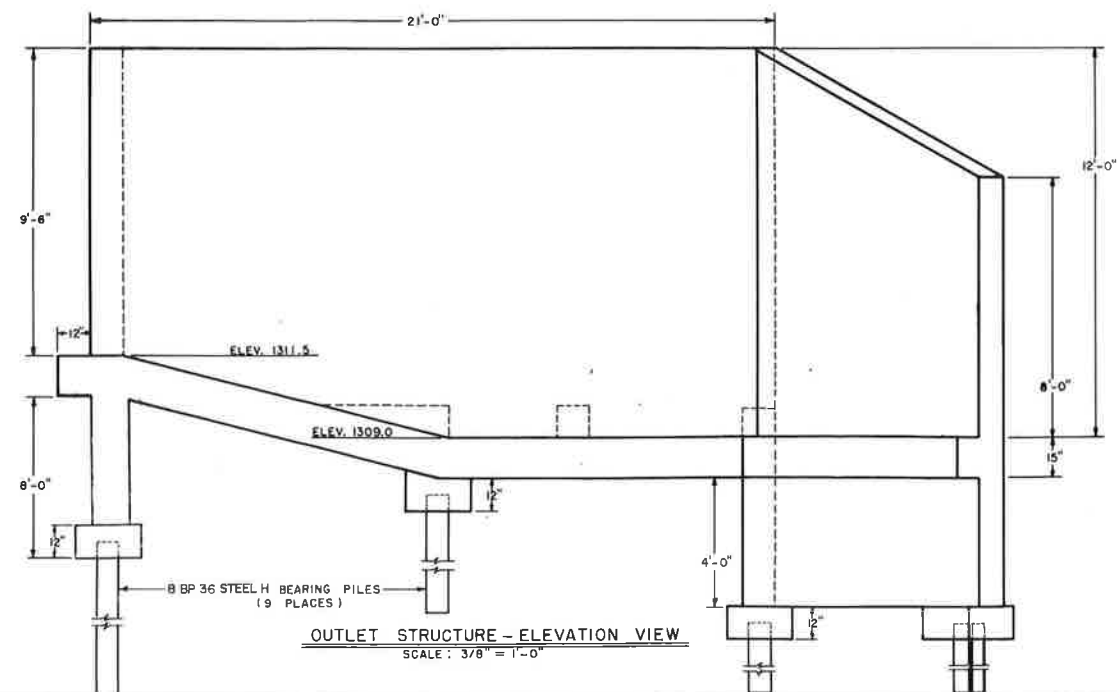
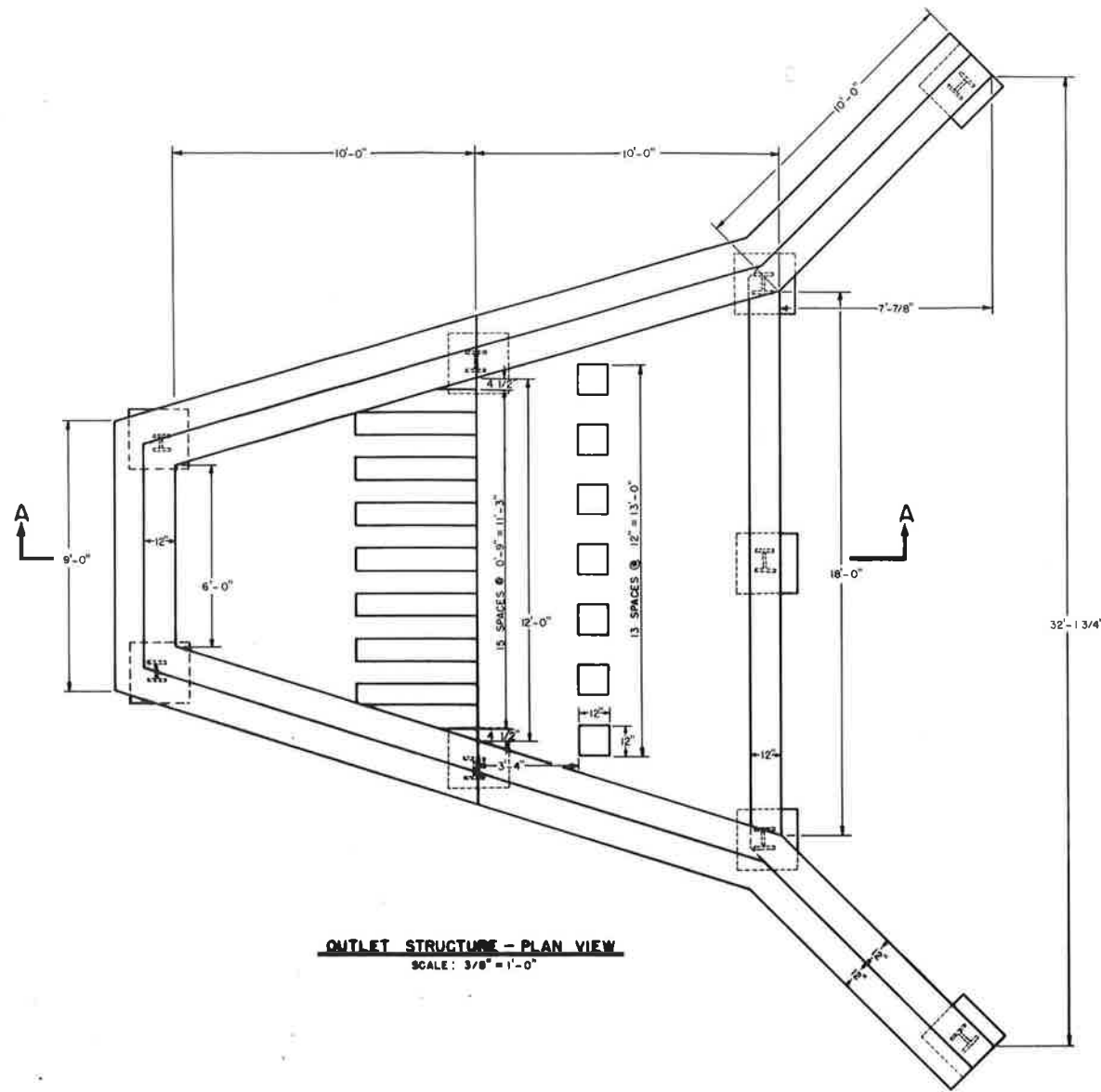
**TRASH RACK**

---

COUNTY LAMOURE DATE MAY 8, 1970

SURVEYED: G.T.O. CHECKED BY: D.D.S. SUBMITTED: [Signature] DESIGNED BY: K.L.S. APPROVED: [Signature]

DRAWING NO. 7536-1515-13 SCALE AS SHOWN



SHEET 14

**NORTH DAKOTA**  
STATE WATER COMMISSION  
BISMARCK, NORTH DAKOTA

PROJECT NO. 1515  
COTTONWOOD CREEK DAM  
OUTLET STRUCTURE

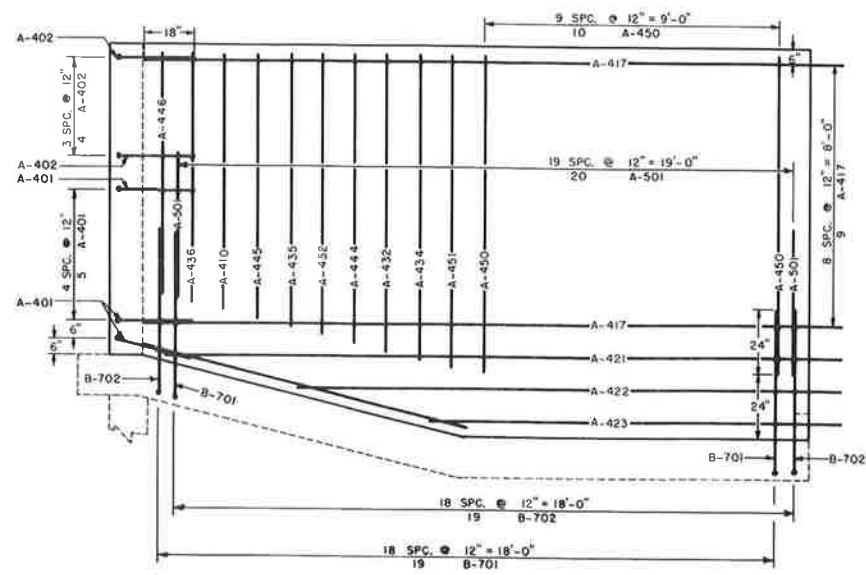
COUNTY LAMOUR DATE MAY 19, 1970

SURVEYED BY: G T O CHECKED BY: D D S SUBMITTED BY: [Signature]

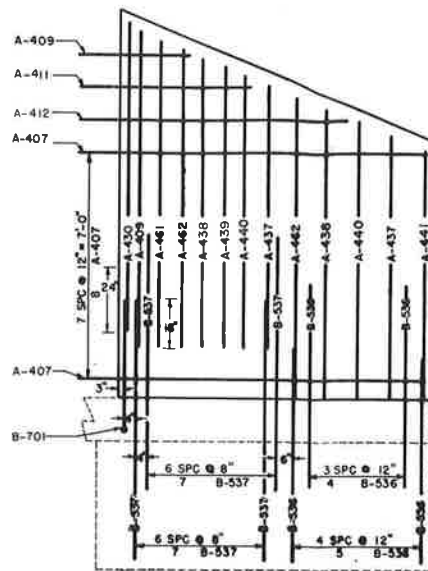
DRAWN BY: K L S DESIGNED BY: K L S APPROVED BY: [Signature]

DRAWING NO. 7542-1515-19 SCALE AS SHOWN

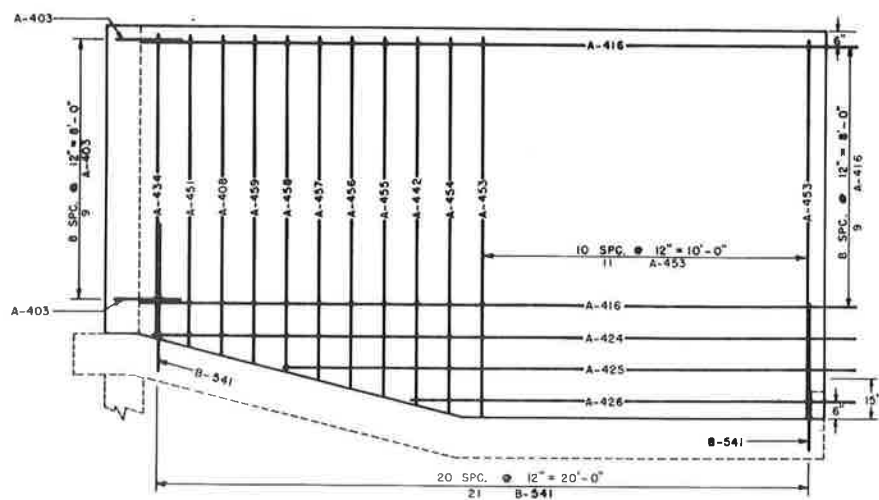




SOILSIDE STEEL

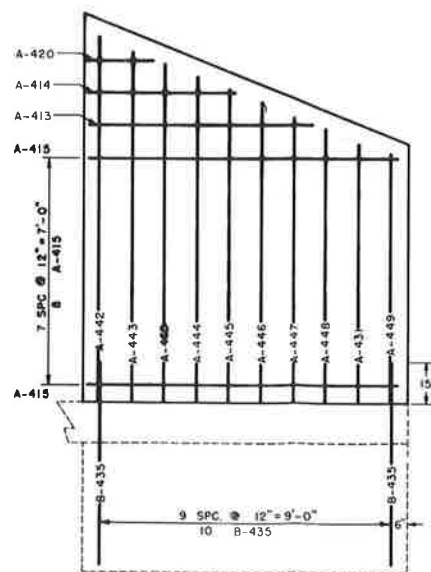


SOILSIDE STEEL



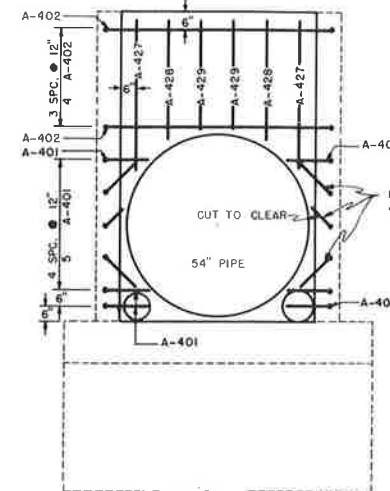
STREAMSIDE STEEL

TRAINING WALL  
SCALE: 3/8" = 1'-0"

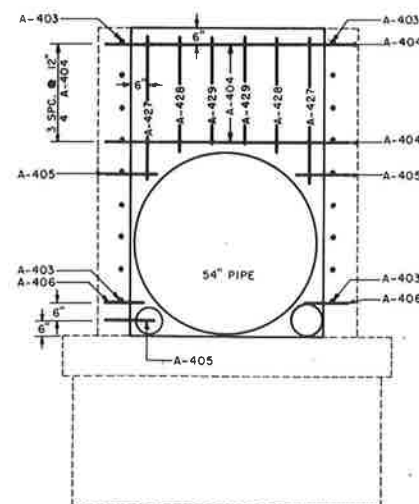


STREAMSIDE STEEL

WING WALL  
SCALE: 3/8" = 1'-0"



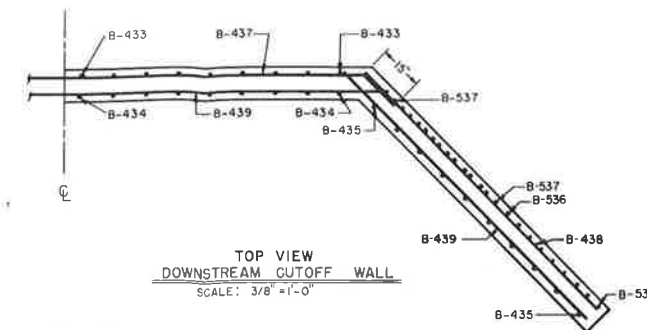
UPSTREAM STEEL



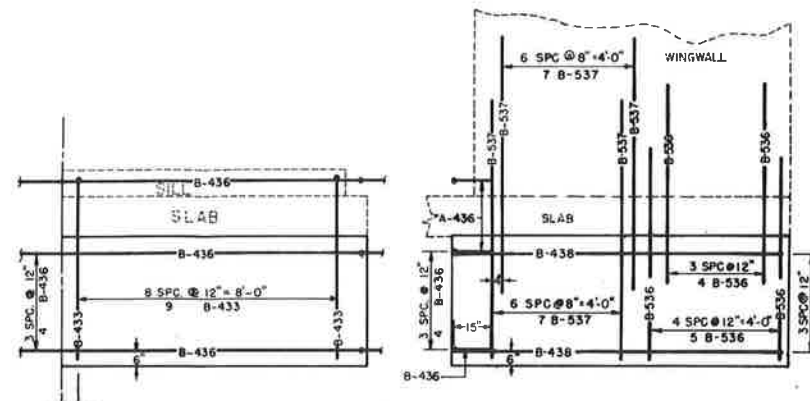
DOWNSTREAM STEEL

NOTE: CUT OR BEND BARS TO CLEAR 12" PIPE AND 10" PIPE.

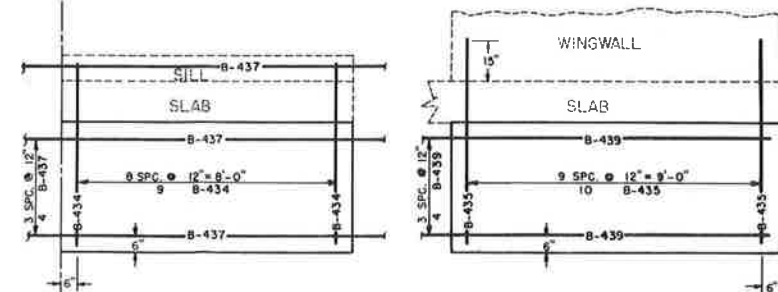
END WALL  
SCALE: 3/8" = 1'-0"



TOP VIEW  
DOWNSTREAM CUTOFF WALL  
SCALE: 3/8" = 1'-0"



UPSTREAM STEEL

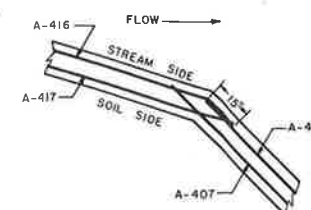


DOWNSTREAM STEEL

DOWNSTREAM CUTOFF WALL STEEL  
SCALE: 3/8" = 1'-0"

NOTES:

1. MINIMUM COVER OF 3" ON ALL REINFORCING STEEL WHERE CONCRETE IS IN CONTACT WITH SOIL; 2" IN ALL OTHER CASES.
2. ALL BARS PLACED 12" O.-C., UNLESS OTHERWISE INDICATED.



WING & TRAINING WALL JUNCTION  
SCALE: 3/8" = 1'-0"

SHEET 15

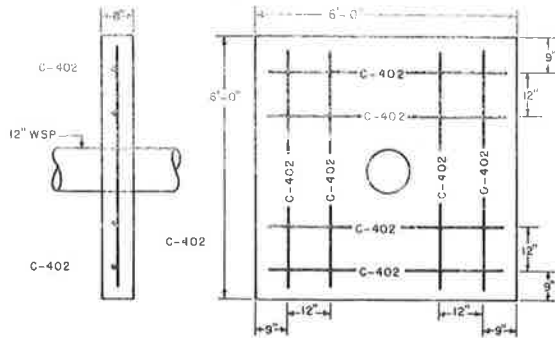
NORTH DAKOTA  
STATE WATER COMMISSION  
BISMARCK, NORTH DAKOTA

PROJECT NO. 1515

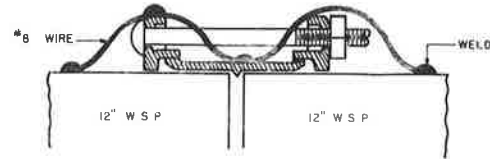
COTTONWOOD CREEK DAM

OUTLET STRUCTURE

COUNTY LAMOURE DATE MAY 19 1970  
SURVEYED: CHECKED BY: D O S SUBMITTED: [Signature]  
DRAWN: G T O DESIGNED BY: K L S APPROVED: [Signature]  
DRAWING NO. 7540-1515-17 SCALE AS SHOWN



**CONCRETE ANTI-SEEP COLLAR 12" WSP**  
SCALE: 1/2" = 1'-0"

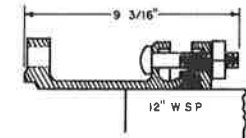


**DRESSER BONDING PROCEDURE**  
NO SCALE

- NOTE:**
1. USE BONDING PROCEDURE SHOWN ACROSS ALL JOINTS.
  2. DRESSER BOND MADE BY WELDING USING #8 STRANDED WIRE.
  3. APPLY TO COLDFRIME OR EQUAL TO COUPLINGS AND WELDED AREA AND COVER WITH TAPECOAT CT OR EQUIVALENT.

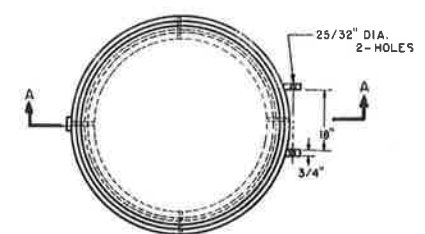


STYLE 128 STEEL FLANGED ADAPTER  
AS MANUFACTURED BY DRESSER MANUFACTURING OR EQUAL.

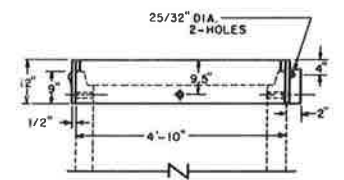


**STEEL FLANGED ADAPTERS**  
NO SCALE

- NOTES:**
1. HOLE IN RCP FOR FASTENING COVER FRAME TO BE CAST IN PIPE.
  2. HOLES IN COVER FRAME TO BE FIELD DRILLED.
  3. ALL RCP ON MANHOLE TO BE CLASS III RCP MEETING ASTM SPECIFICATION C-478.
  4. THREE COATS OF PAINT (RUST-OLEUM OR EQUAL) ARE TO BE APPLIED TO THE COVER AND FRAME.  
1ST. COAT: 673 QUICK-DRYING RED PRIMER (SHOP COAT)  
2ND. COAT: 950 ZINC CHROMATE PRIMER (FIELD PRIMER)  
3RD. COAT: 850 FLAT GRAY TOP COAT.
  5. BOLTS USED IN COVER ASSY.  
FRAME — 1" X 8", 4 NEEDED  
HINGE — 3/4" X 2 1/2", 2 NEEDED



**COVER FRAME DETAIL**  
SCALE: 1/2" = 1'-0"

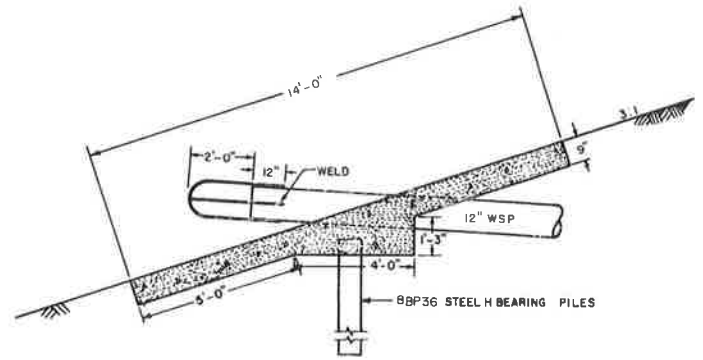


**SECTION A-A**  
SCALE: 1/2" = 1'-0"

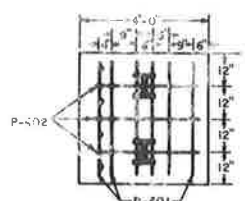


**HYPALON GASKET**  
NO SCALE

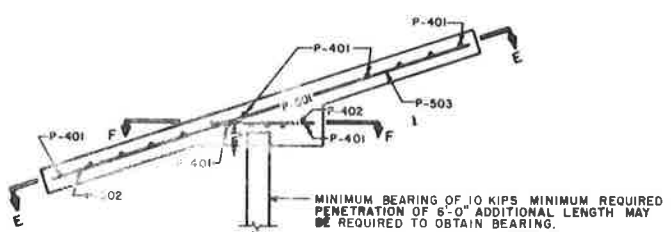
- NOTE:**  
1/8" - HYPALON GASKET OF 60 DURO. BY CLARK. (OR EQUIVALENT)



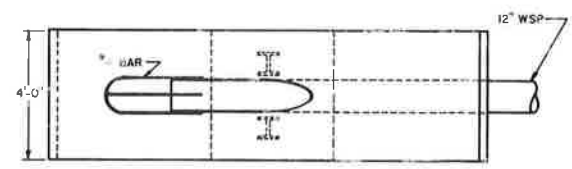
**CONCRETE APRON - ELEVATION VIEW**  
SCALE: 3/8" = 1'-0"



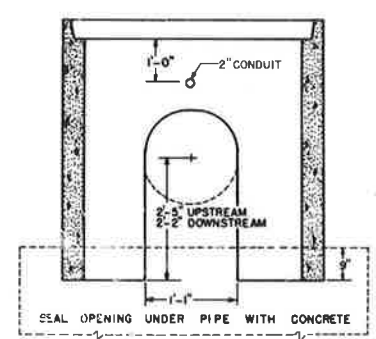
**SECTION F-F**  
SCALE: 3/8" = 1'-0"



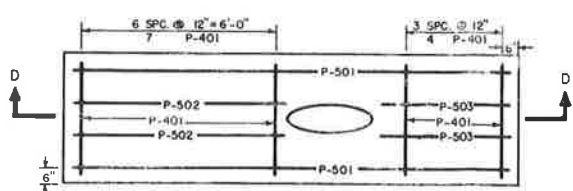
**SECTION D-D**  
SCALE: 3/8" = 1'-0"



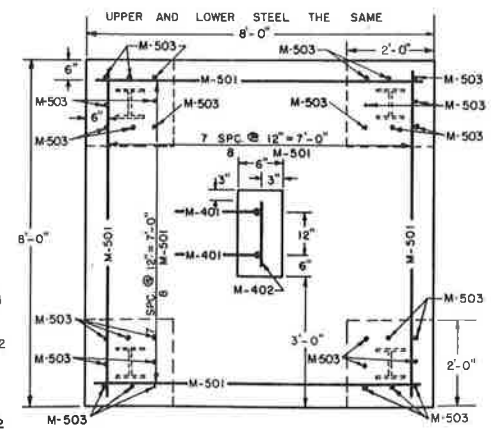
**CONCRETE APRON - PLAN VIEW**  
SCALE: 3/8" = 1'-0"



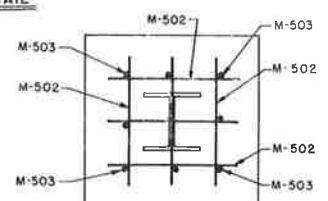
**SECTION C-C**  
NO SCALE



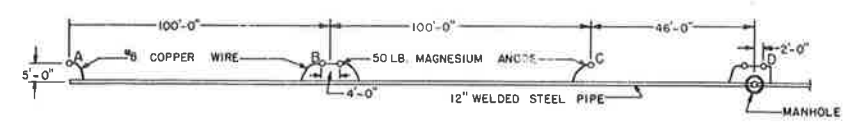
**SECTION E-E - STEEL DETAIL**  
SCALE: 3/8" = 1'-0"



**SLAB STEEL MANHOLE**  
NO SCALE

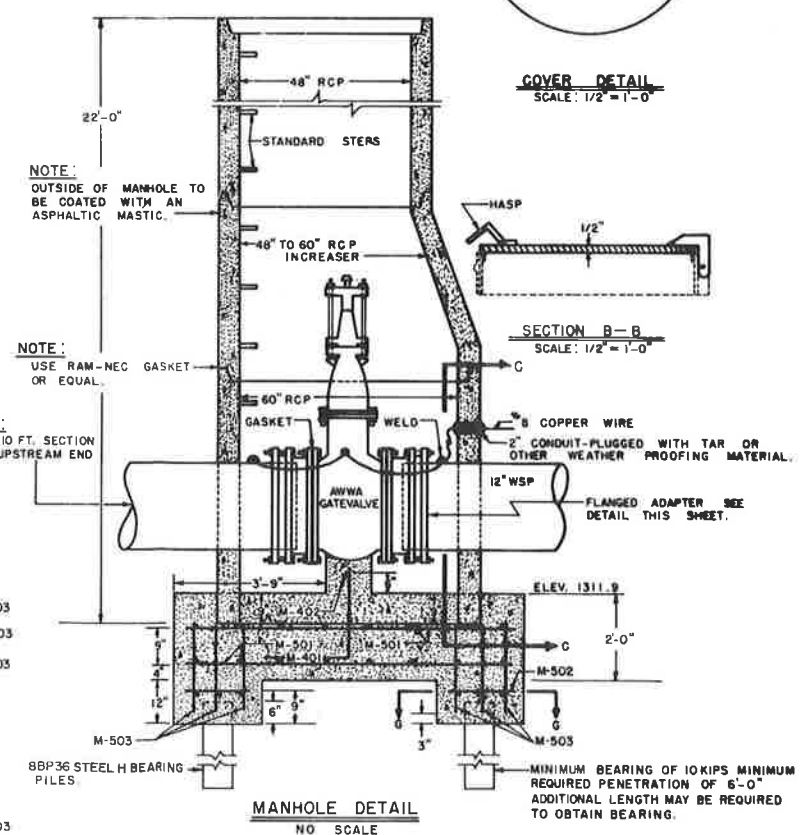


**TYPICAL FOUR PLACES**  
**SECTION G-G OF MANHOLE**  
SCALE: 1" = 1'-0"



**CATHODIC PROTECTION DETAILS**  
NO SCALE

- NOTE:**  
SEE ALSO DRESSER BONDING PROCEDURE ABOVE



**MANHOLE DETAIL**  
NO SCALE

- NOTE:**  
OUTSIDE OF MANHOLE TO BE COATED WITH AN ASPHALTIC MASTIC.

- NOTE:**  
USE RAM-NEC GASKET OR EQUAL.

- NOTE:**  
USE 10 FT. SECTION ON UPSTREAM END

**COVER DETAIL**  
SCALE: 1/2" = 1'-0"

**SECTION B-B**  
SCALE: 1/2" = 1'-0"

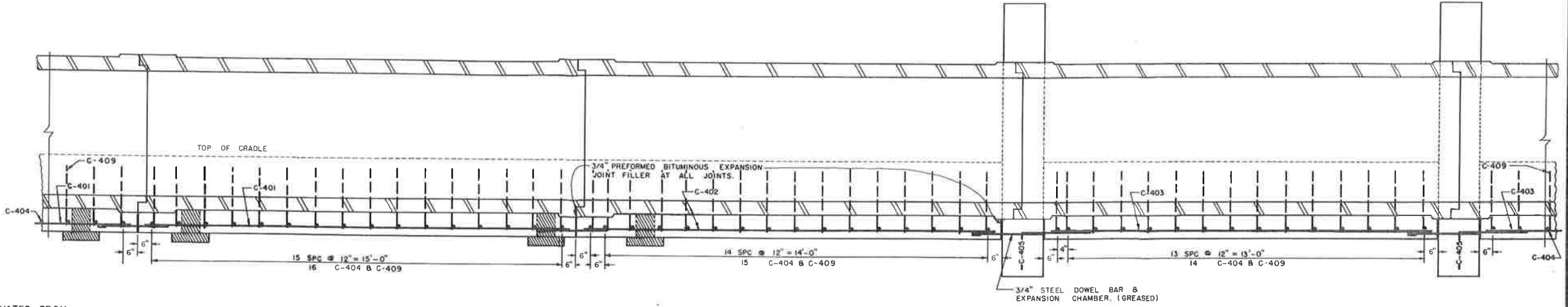
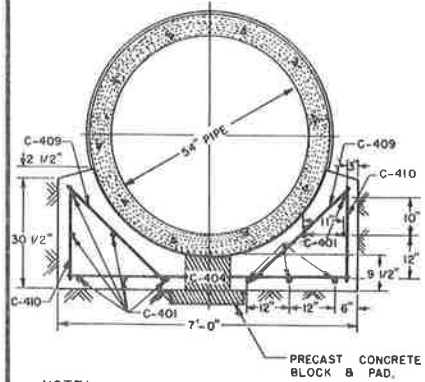
**SHEET 16**

**NORTH DAKOTA STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

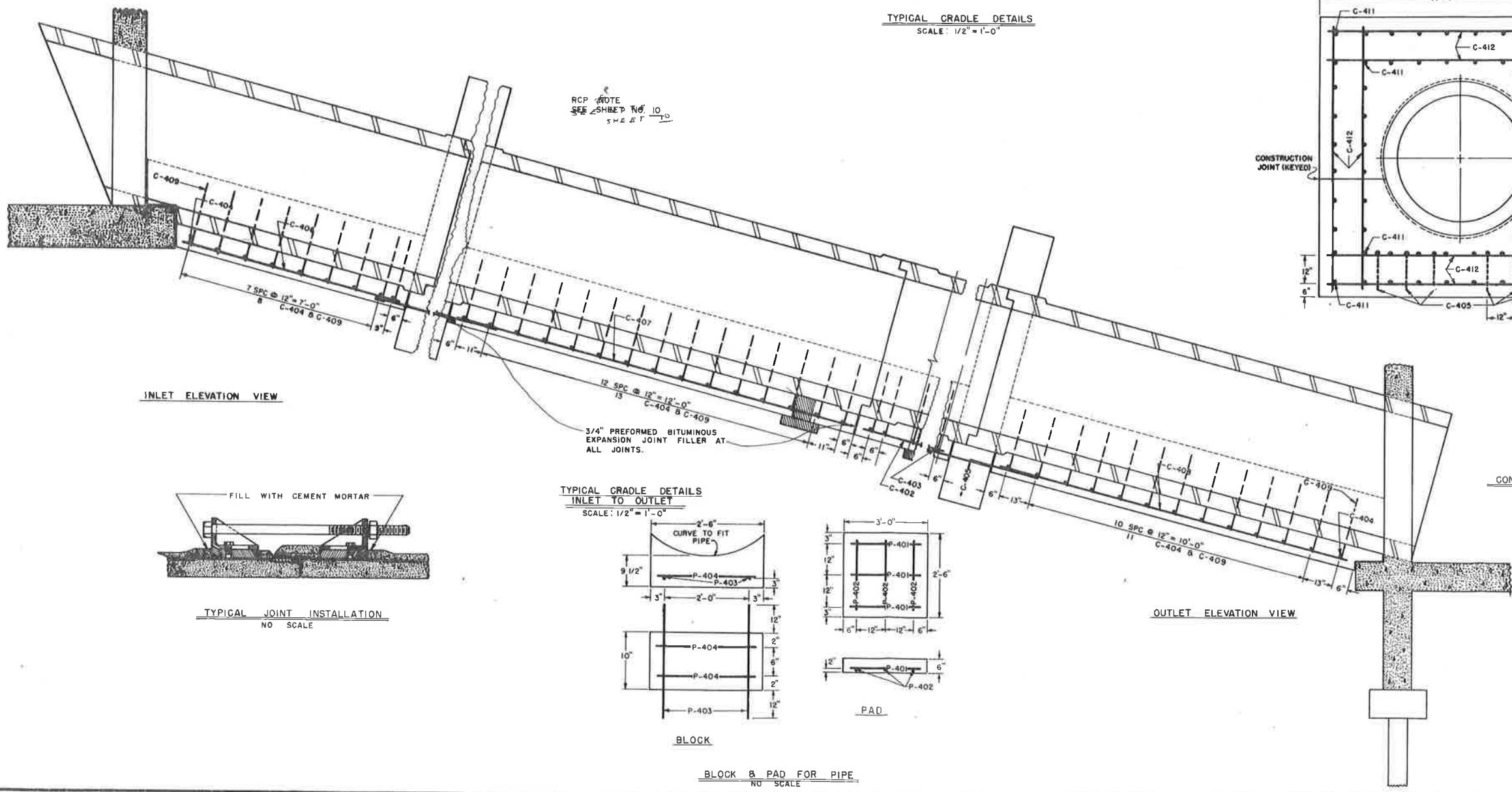
**PROJECT NO. 1515**  
COTTONWOOD CREEK DAM  
MISCELLANEOUS DETAILS

COUNTY: LAMOURE  
SURVEYED: \_\_\_\_\_ CHECKED BY: D D S  
DRAWN: G T O DESIGNED BY: M L S  
DATE: JULY 6, 1970  
SUBMITTED: \_\_\_\_\_ APPROVED: \_\_\_\_\_

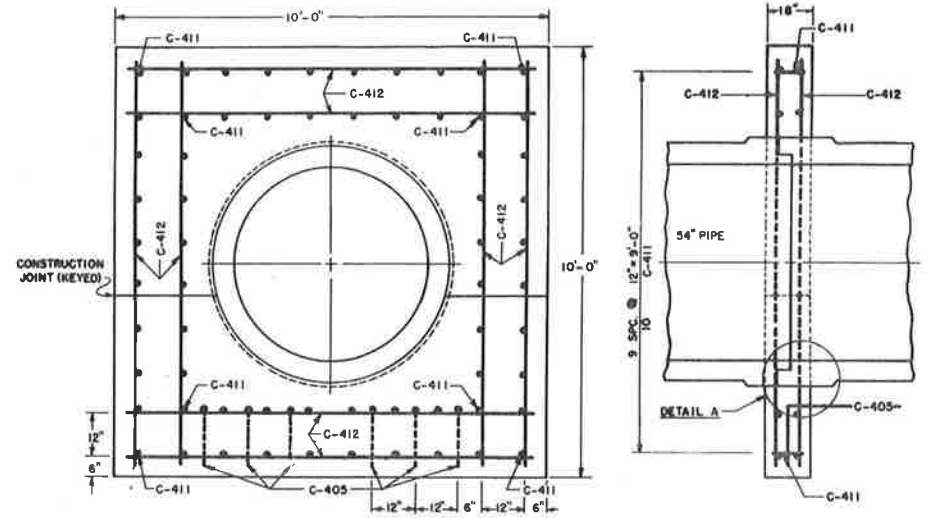
DRAWING NO. 7539-1515-16  
SCALE AS SHOWN



NOTE:  
CONCRETE SHALL BE PLACED IN A TRENCH EXCAVATED FROM OVERFILLED PIPE BED. NO FORMING WILL BE ALLOWED FOR CRADLE.

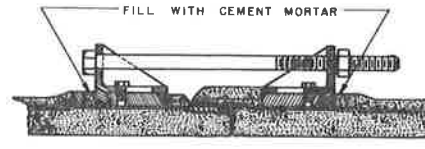


TYPICAL CRADLE DETAILS  
SCALE: 1/2" = 1'-0"

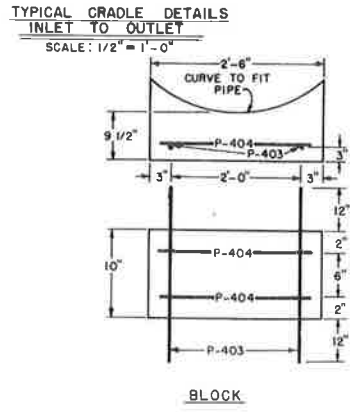


PAINT WITH 1/8" P.R.G. (OR EQUAL) HEAVY TYPE.  
3/4" PREFORMED BITUMINOUS JOINT FILLER.

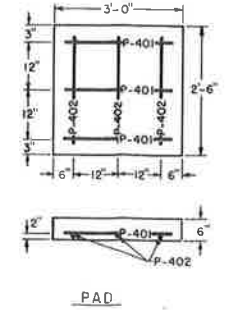
CONCRETE CUTOFF & REINFORCING COLLAR  
SCALE: 1/2" = 1'-0"



TYPICAL JOINT INSTALLATION  
NO SCALE



BLOCK & PAD FOR PIPE  
NO SCALE



PAD

SHEET 17

**NORTH DAKOTA STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

PROJECT NO.  
COTTONWOOD CREEK DAM  
CRADLE & COLLAR DETAILS

COUNTY: LAMOUR      DATE: AUG. 4, 1970  
SURVEYED:      CHECKED BY: D D S      SUBMITTED:      DATE:      1970  
DRAWN: G T O      DESIGNED BY: K L S      APPROVED: *[Signature]*  
DRAWING NO. 7550-1515-22      SCALE AS SHOWN






SEC'S 25,30,31,36  
T.133N. R.60W.

LEGEND

- Access Road
- Foot Trail
- Area
- Bath House and Comfort
- Comfort Station
- Picnic Shelter
- Picnic Table
- Fireplace
- Trash Receptacle
- Dining Rm
- Water Slide
- Swing
- Slide
- Well and Pump House
- Well
- Drinking Fountain
- Water Line
- Power Line
- Boat Dock
- Boat Launch
- Ski Slope
- Ski Tow
- Life Guard Tower
- Lights
- Flag Pole
- Sand Box
- Parking Lot Barriers
- Fleet Line
- Game Whirl
- Play House
- Spring Animals (Fiberglass)
- See-Saw

MATCH TO DRAWING  
NO. 7302-1515-3

-  NORMAL POOL ELEV. 1350.0
-  FLOOD POOL ELEV. 1355.0
-  SWIMMING BEACH

STATE ENG. BRASS CAP SET IN  
TOP OF CONCRETE MONUMENT  
ELEV. 1376.52

SHEET 18 OF

**NORTH DAKOTA**  
**STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

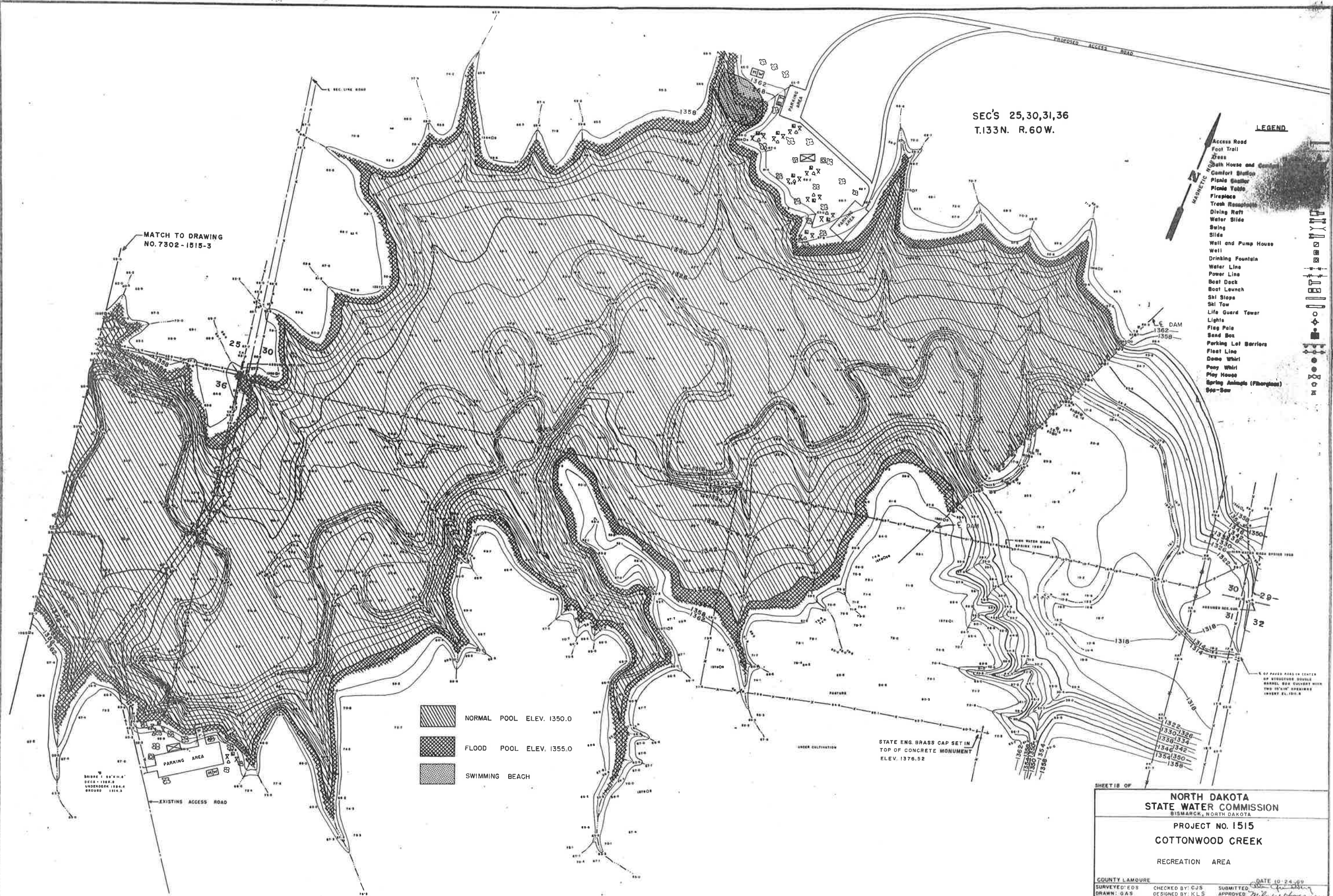
**PROJECT NO. 1515**  
**COTTONWOOD CREEK**

RECREATION AREA

COUNTY LA MOURE

SURVEYED BY: G.A.S. CHECKED BY: C.J.S. SUBMITTED: DATE 10-24-69  
DRAWN: G.A.S. DESIGNED BY: K.L.S. APPROVED: [Signature]

DRAWING NO. 7544-1515-21 SCALE 1"=200'



**FIELD AND LABORATORY INFORMATION ON TYPICAL BORROW MATERIALS**

TEST HOLE NO.	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4
DEPTH (FEET)	2.0-7.0	7.0-14.0	14.0-19.0	19.0-23.0	2.0-6.0	12.0-19.0	19.0-24.0	2.0-7.0	7.0-12.0	12.0-17.0	17.0-22.0	22.0-29.0	1.0-9.0	9.0-16.0	16.0-25.0
REFERENCE TEST METHOD	METHOD A ASTM D 698														
MAXIMUM DRY DENSITY	100	104	97	102	97	97	97	102	99	106	111	103			
OPTIMUM MOISTURE	20	20	22	20	22	22	21	19	22	17	15	18			
UNIFIED SOIL CLASSIFICATION SYST.	CL #	CL #	CL #	CL #	ML #	ML #	ML #	CL #	ML #	ML #	SC #	ML #	SW	SM-SC	CL
PLASTICITY INDEX (%) OR DEGREE	17	17	20	13	10	7	7	13	11	9	10	7	NON-PLASTIC	SLIGHTLY PLASTIC	PLASTIC
DESCRIPTION	BRN. CLAY	BRN. LEAN CLAY	BRN. CLAY	BRN.-GRAY SILTY CLAY	BRN. CLAYEY SILT	BRN. CLAYEY SILT	BRN. GRAY CLAYEY SILT	BRN. LEAN CLAY	BRN. CLAYEY SILT	BRN. CLAYEY SILT	BRN. GRAY CLAYEY SAND	BRN. GRAY CLAYEY SILT	GRAVELLY SAND	SAND & CLAYEY SAND	BRN. CLAY
LOCATION	UPSTREAM AND SOUTHWEST OF CENTERLINE OF DAM, SEE DWG. NO. 7244-1515-1														

TEST HOLE NO.	5	6	6	7	7	8	8	9	9	10	10	10	10	11	11
DEPTH (FEET)	1.0-10.0	1.0-20.0	20.0-25.0	1.0-20.0	20.0-20.5	1.0-19.0	19.0-25.0	1.0-17.0	17.0-25.0	2.0-7.0	7.0-13.0	13.0-17.0	17.0-25.0	2.0-7.0	9.0-17.0
REFERENCE TEST METHOD	METHOD A ASTM D 698														
MAXIMUM DRY DENSITY										112	112	106	104	113	107
OPTIMUM MOISTURE										16	15	18	18	15	18
UNIFIED SOIL CLASSIFICATION SYST.	GW	SW #	CL	SW #	CL	SW	CL	GW #	CL	SC #	SC #	CL #	CL #	CL #	CL #
PLASTICITY INDEX (%) OR DEGREE	NON-PLASTIC	NON-PLASTIC	PLASTIC	NON-PLASTIC	PLASTIC	NON-PLASTIC	PLASTIC	NON-PLASTIC	PLASTIC	12	9	17	15	12	16
DESCRIPTION	GRAVEL-SAND MIXTURE	GRAVELLY SAND	BRN. CLAY		BRN. CLAY	GRAVELLY SAND	BRN. CLAY	GRAVEL-SAND MIXTURE	BRN. CLAY	BRN. CLAYEY SAND	BRN. CLAYEY SAND	BRN. LEAN CLAY	GRAY LEAN CLAY	BRN. LEAN CLAY	BRN. CLAY
LOCATION	PROPOSED EMERGENCY SPILLWAY, SEE DWG. NO. 7244-1515-1														

TEST HOLE NO.	11	12	12	12	13	13	13	14	14	15	15	15	15
DEPTH (FEET)	17.0-25.0	2.0-9.0	9.0-17.0	17.0-23.0	2.0-7.0	7.0-14.0	14.0-19.0	1.0-6.0	6.0-25.0	2.0-7.0	7.0-14.0	14.0-18.0	18.0-25.0
REFERENCE TEST METHOD	METHOD A ASTM D 698												
MAXIMUM DRY DENSITY		125		102	111	109		111		110	102	102	
OPTIMUM MOISTURE		10		19	14	17		15		16	19	18	
UNIFIED SOIL CLASSIFICATION SYST.	CL	SM #	CL	ML #	CL #	CL #	CL	CL #	SM	CL #	CL #	CL #	CL
PLASTICITY INDEX (%) OR DEGREE	PLASTIC	5	PLASTIC	9	17	16	PLASTIC	16	NON-PLASTIC	17	17	17	PLASTIC
DESCRIPTION	GRAY LEAN CLAY	BRN. SAND	BRN. CLAY	BRN. CLAYEY SILT	BRN. CLAY	BRN. CLAY	BRN. CLAY	TAN LEAN CLAY	BRN. SAND	BRN. LEAN CLAY	BRN. LEAN CLAY	BRN. LEAN CLAY	GRAY LEAN CLAY
LOCATION	UPSTREAM AND WEST OF CENTERLINE OF DAM, SEE DWG. NO. 7244-1515-1												

NOTE: THE UNIFIED SOIL CLASSIFICATION SYMBOLS FOLLOWED BY AN ASTERISK (\*) ARE BASED ON LABORATORY CLASSIFICATIONS THOSE SYMBOLS WITHOUT AN ASTERISK ARE BASED ON FIELD CLASSIFICATION

PI INDEX  
LESS THAN 0  
0 TO 5  
6 TO 15  
16 TO 40  
GREATER THAN 40

DEGREE OF PLASTICITY  
NON PLASTIC  
SLIGHTLY PLASTIC  
MODERATELY PLASTIC  
PLASTIC  
HIGHLY PLASTIC

SHEET 77

**NORTH DAKOTA  
STATE WATER COMMISSION**  
BISMARCK, NORTH DAKOTA

PROJECT NO. 1515

COTTONWOOD CREEK DAM  
BORROW AREA SOILS DATA

COUNTY LAMOURE DATE 7-22-1970  
 SURVEYED BY: \_\_\_\_\_ CHECKED BY: ACG SUBMITTED BY: \_\_\_\_\_  
 DRAWN BY: ACG & GAS DESIGNED BY: \_\_\_\_\_ APPROVED BY: *Milo W. Howman*  
 DRAWING NO. 7535-1515-12 SCALE