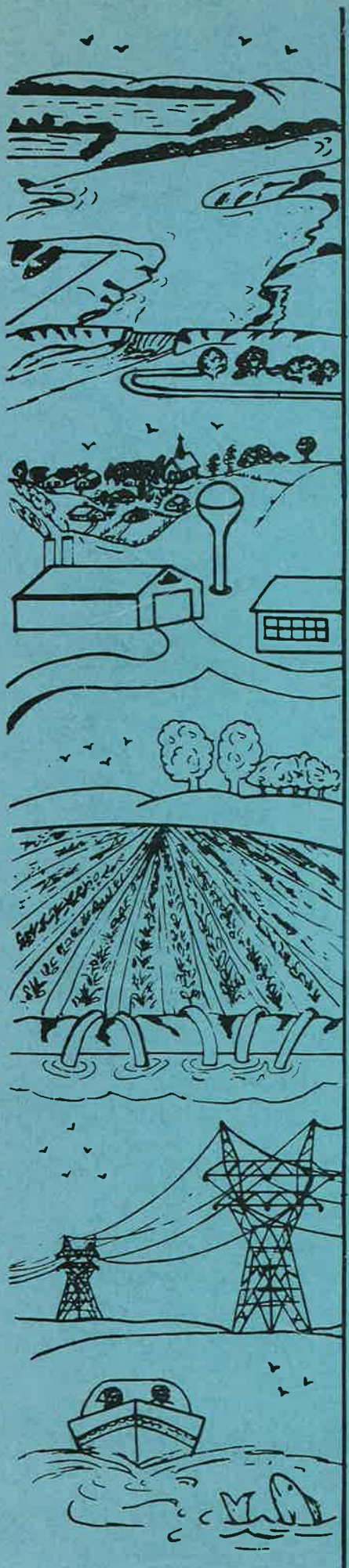


"BUY NORTH DAKOTA PRODUCTS"

Report of

NORTH DAKOTA STATE WATER CONSERVATION COMMISSION

1301 State Capitol

BISMARCK, NORTH DAKOTA

NORTHGATE DAM AND RECREATION COMPLEX

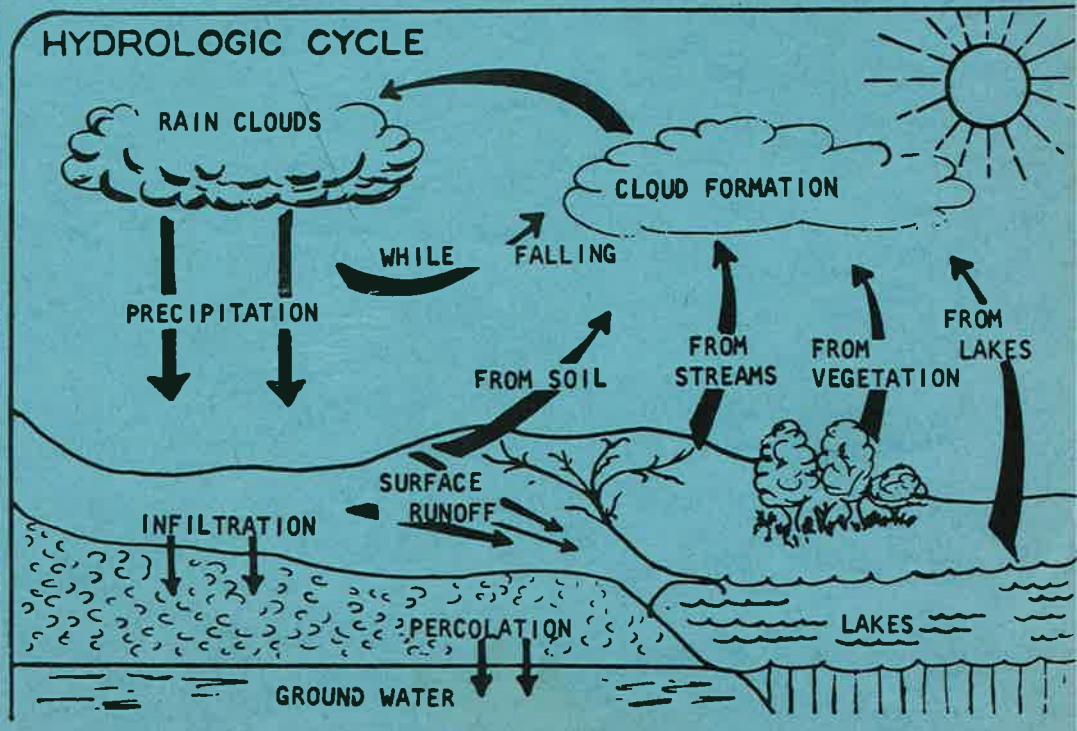
BURKE COUNTY

SWC Project #667 - SORA Project #7-17

Prepared in cooperation with

Burke County Water Management District
North Dakota State Game and Fish Department
North Dakota State Outdoor Recreation Agency
North Dakota State Water Commission

January 31, 1968



DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION

PROJECT PROPOSAL – DEVELOPMENT

Use this form for submission of individual projects which will develop lands and waters to facilitate their use by the public for outdoor recreation. If concurrent Acquisition is being undertaken, check here [X]

LEAVE BLANK FOR BOR USE ONLY

Date Received	Priority	Project Number

Project Officer

SECTION 1

1. State or Territory
North Dakota

2. Name and address of agency responsible for project
Burke County Water Management District - c/o O. J. Fisher, Chairman - Bowbells, North Dakota 58721

3. Project Title
Northgate Dam and Recreation Complex, Burke County, SORA Project #7-17

4. Brief description of project

Located 4½ miles south of Northgate and about ½ mile west of paved highway #8, the project includes acquiring about 442 acres of land, constructing a dam creating a 152 acre reservoir with a 1300 acre-foot capacity, and installing outdoor recreation facilities for such activities as boating, fishing, picnicking, swimming, and playing outdoor games. The project is designed to meet local unmet needs and projected 1980 requirements in Region II. Plans include general area development to enhance the area's natural beauty.

SWC Project #667

5. Duration of project	6. Federal assistance requested	7. Recommended priority
from 3-1-68 to 12-31-70	$42,000	A

8. Name, Organization, and Title of individual having day-to-day responsibility for direction of project
O. J. Fisher, Chairman
Burke County Water Management District
Bowbells, North Dakota 58721

9. Name and Address to appear on check
Milo W. Hoisveen, State Fiscal Officer
1301 State Capitol
Bismarck, North Dakota 58501

10. TERMS AND CONDITIONS: In submitting this Project Proposal, the State hereby accepts the Terms and Conditions set forth in the BOR Grants-in-Aid Manual, which will be a part of the Project Agreement for any grant awarded under this proposal.

11. CERTIFICATION: As the official designated to represent the State and act for the State for purposes of the Land and Water Conservation Fund Act, I recommend that assistance be made available from the Fund, when monies are available, in accordance with the recommended priority. No financial assistance has been given or promised under any other Federal program or activity with regard to the proposed project. The State or public agency to be responsible for the proposed project has the ability and intention to finance its share of the costs of this project. The Applicant will not discriminate against any person on the basis of race, color, or national origin in the use of any property or facility acquired or developed pursuant to this proposal, and shall comply with the terms and intent of Title VI of the Civil Rights Act of 1964, P. L. 88–354 (1964), and of the regulations promulgated pursuant to such Act by the Secretary of the Interior and contained in 43 CFR 17.

(Signature)

John Greenslit
(Name)

(Date)

State Liaison Officer
(Title)

12. For State use
SORA (7)
Burke Co. WMD (1)
Game & Fish (1)
Comm. Steinberger (1)
SWC (10)

January 31, 1968
Sargent County Teller, Milnor

BOR 8–91

NORTH DAKOTA STATE WATER COMMISSION

Acquisition and Development Project Justification Report

Northgate Dam and Recreation Complex, Burke County
SWC Project #667
SORA Project #7-17

January 31, 1968

A-D:660-1. PROJECT PLAN AND JUSTIFICATION:

A. State Plan Accord

The Northgate Dam project will provide outdoor recreation opportunities for boating, fishing, picnicking, swimming and playing outdoor games and sports.

"OUTDOOR RECREATION IN NORTH DAKOTA" (page 39, paragraph 5-7) states: "PLANNING REGION II has generally adequate areas and facilities for hunting, swimming beaches, and for playing or attending outdoor sports events to meet the needs of the residents as projected to 1980. There may be instances of local unmet needs for these activities. The supply of fishing areas is adequate to meet 1970 needs, however, an additional 1,800 acres of fishing lakes will be needed by 1980. Many potential dam and reservoir sites are available.

"Acquisition and development programs should generally be directed towards providing additional areas and facilities for boating, water skiing, swimming pools, camping, bicycle trails, horseback riding trails, picnicking, walking and hiking trails, scenic drives, cultural events, ice skating, sledding, tobagganing, and snow skiing.

"Action by all levels of government, and by the private sector must be expanded if the growing future needs of the region are to be met."

Paragraph 12 states: "Well coordinated and adequately planned action programs by all levels of government, and by the private sector can assure that the future needs of the people will be met."

The Northgate Dam will help to meet state and regional needs for fishing, boating, and picnicking. It will also help to satisfy local unmet needs for playing outdoor games and sports and for swimming beaches.

The project is in accord with the state comprehensive outdoor recreation plan and is accorded Bureau of Outdoor Recreation priority designation "A".

B. Summary of Area

Northgate Dam and Recreation Complex is located $4\frac{1}{2}$ miles south of Northgate near the Canadian border in Burke County, North Dakota. Paved highway #8 is about $\frac{1}{2}$ mile east of the proposed project which is in Economic Region II, Souris River Basin.

The area is rolling to hilly covered primarily with natural grass and brush. The topography is ideal for installation of a structure to retain a 152 surface acre reservoir for water-related outdoor recreation purposes. General layout of the project features are planned so as to enhance the area's appearance and add to its natural beauty.

C. Outline of Project Features

A $66,000 dam is planned which will create a 152 acre reservoir with a 102 square mile drainage area and 1300 acre-feet capacity. Maximum depth of the reservoir would be 25 feet. A final cost estimate and design and hydrology report are included with this proposal. The final estimate is $3,000 above the preliminary estimate upon which the construction agreements were based. The

added $3,000 cost is proposed to be shared equally by the State Water Commission and the Bureau of Outdoor Recreation.Agency

About 442.6 acres of land are to be acquired for the reservoir and public recreation areas adjacent thereto. The estimated land cost is $36,000.

Engineering costs estimated at $3,000 are to be provided by the State Water Commission.

Recreation facilities are to be installed by the Burke County Water Management District for public use activities such as boating, fishing, picnicking, swimming, camping and playing outdoor games. A detailed cost estimate is included with this proposal.

In summary, the various project phases, their costs and allocations are as follows:

	Engr.	Land	Dam	Facil.	Total
SWC	$1,500	-	12,000	-	13,500
G & F Dept.	-	7,500	10,500	-	18,000
SORA (WC Alloc.)	-	-	-	3,750	3,750
Burke Co. WMD	-	10,500	10,500	3,750	24,750
BOR	1,500	18,000	33,000	7,500	60,000
TOTALS	$3,000	$36,000	$66,000	$15,000	$120,000

D. Organizations and Coordination

Numerous formal and informal conferences have been held among the participating agencies. Coordination of each project phase will be continued as activities proceed. Primary agencies and their responsibilities include:

1. Administration - State Outdoor Recreation Agency
2. Engineering - State Water Commission
3. Land Acquisition - Burke County Water Management District and State Game and Fish Department
4. Dam Construction - State Water Commission with Contract Forces
5. Recreation Facilities - Burke County Water Management District
6. Financing - Bureau of Outdoor Recreation, State Outdoor Recreation Agency, State Water Commission, State Game and Fish Department, and Burke County Water Management District

E. Economic Feasibility

The project will serve a 30 mile radius area with a population of 19,200. Anticipated annual visitation is 16,000 with an assumed value of $1.25 per visitation. Annual operation and maintenance costs are estimated at $1,200 and depreciation at $4,000 for total annual costs of $5,200. With estimated annual benefits of $20,000 less $5,200 annual costs, the average annual net benefits are $14,800.

Assuming the $120,000 total costs allocated to outdoor recreation were invested and compounded at 4% for 30 years, we would have a product of $389,208. With net annual benefits of $14,800 over the project's 30 year life, we would receive $444,000 in benefits indicating a benefit-cost ratio of 1.14 to 1.

A project economic feasibility report is included with this project proposal (SORA Form 28).

F. Operation and Maintenance

The Burke County Water Management District will operate and maintain the project with technical assistance from the State Game and Fish Department and State Water Commission. The area will be open to the public at all times. Operation and maintenance funds are obtained from ad valorem taxes levied by the Burke County Water Management District.

A-D:660-2. MAPS AND CHARTS

A. Included with this project proposal are the following maps and supporting data:

1. State map showing project #7-17 location
2. SWC Map #5703-667-2A "Ownership Map Showing Purchase Line and Topography"
3. SWC Map #5704-667-3 "Damsite Topography"
4. SWC Map #5718-667-4 "Log of Test Borings"
5. Design and Hydrology Report
6. Area Capacity Curve
7. Soil Investigation Report
8. Water Permit #1478 and Form #110 "Application for Dam Construction"

A-D:660-3. AGREEMENTS

A. The following are included with this proposal:

1. Burke County Board of Commissioners Approval - Resolution
2. Burke County Water Management District project assurances

3. Construction agreement between Burke County Water Management District, State Game and Fish Department, State Outdoor Recreation Agency and State Water Commission.

A-D:660-4. PLANS

A. Construction plans for the project are included with this proposal as follows:

1. SWC #6948-667-7 "Recreation Area and Facilities"
2. SWC #6951-667-9 "Outlet Structure Steel Details"
3. SWC #6952-667-10 "Box Inlet and Steel Details"
4. SWC #6953-667-11 "Outlet Structure Details - Guard Rail, Trashrack and Valve Details"

Prepared by:

Jim Schulz, Assistant Secretary
North Dakota State Water Commission

JS:ka

Distribution:
SORA (7)
Burke Co. WMD (1)
Game & Fish (1)
Comm. Steinberger (1)
SWC (10)

NORTH DAKOTA STATE WATER COMMISSION

OFFICE MEMO

MEMO TO: Milo W. Hoisveen, Chief Engineer
FROM: Delton D. Schulz, Office Engineer
SUBJECT: Northgate Dam - SWC Project #667
DATE: January 5, 1968

Following is the final cost estimate for construction of Northgate Dam:

Stripping, 10,000 cy @$0.25	$ 2,500.00
Core Excavation, 8,000 cy @$0.80	6,400.00
Earth Embankment, 52,000 cy @$0.40	20,800.00
Concrete, 42 cy @$120.00	5,040.00
Reinforcing Steel, 4,000 lbs. @$0.20	800.00
72" Corrugated Metal Pipe, 108 lineal feet @$40.00	4,320.00
12" Welded Steel Pipe, 180 L.F., with gate valve and valve box --- Lump Sum	4,000.00
Rock Riprap (embankment and outlet channel) 1,700 cy @$5.00	8,500.00
Gravel Bedding (embankment and outlet channel) 700 cy @$3.00	2,100.00
* Placing topsoil and seeding, 4 acres @$250.00	1,000.00
* Guard Rail	400.00
TOTAL CONTRACT COST	$ 55,860.00
ENGINEERING	2,140.00
CONTINGENCIES	2,000.00
SUB-TOTAL	$ 60,000.00
INDIRECT COSTS 10% OF TOTAL	6,000.00
TOTAL PROJECT COSTS	$ 66,000.00

DDS:sl

Delton D. Schulz
Office Engineer

NORTH DAKOTA STATE WATER COMMISSION

PRELIMINARY COST ESTIMATE

NORTHGATE DAM AND RECREATION AREA
SWC PROJECT #667

OCTOBER 4, 1967

Item	Number	Estimated Unit Cost	Estimated Total Cost
1. Picnic Area			
a. Table	10	40	400
b. Shelter	2	1200	2400
c. Fire Place	5	40	200
d. Trash Receptacle	5	15	75
e. Comfort Station (double)	1	1700	1700
f. Well and Pump	1	1000	1000
2. Play Ground			
a. Slide	1	400	400
b. Swing (3 unit)	1	300	300
c. Sand Box	1	20	20
3. Boating Area			
a. Dock	1	500	500
b. Launch Ramp	1	1000	1000
4. Parking Area			
a. Motor Grader	40 hrs.	15	600
b. Crushed Gravel	500 cy	2	1000
c. Barriers	150	3	450
5. Beach Area (wading only)			
a. Sand Blanket	1000 cy	1	1000
6. General Area Development			
a. Trees, shrubs, & landscaping		Lump Sum	1400
b. Signs		Lump Sum	300
c. Lights		Lump Sum	200

Sub Total	12,945
Engineering	1,290
Indirect Costs	765
Total	$ 15,000

KS:jd

January 31, 1968

NORTH DAKOTA STATE OUTDOOR RECREATION AGENCY
Project Economic Feasibility Report
Benefit-Cost Ratio

PROJECT NAME Northgate Dam and Recreation Complex

LOCATION-COUNTY Burke County *SORA #* 7-17

I. BASIC DATA

A.	*Radius of Anticipated Use*	30 *miles*
B.	*Population Within Use Area*	19,200
C.	*Anticipated Annual Visitations*	16,000
D.	*Investment (include land)*	$ 120,000
E.	*Estimated Life of Facilities*	30 *years*

II. ANNUAL COSTS

F.	*Operation and Maintenance*	$ 1,200
G.	*Depreciation (D ÷ E)*	$ 4,000
H.	*Total Annual Costs (F + G)*	$ 5,200

III. ANNUAL BENEFITS

J.	*Assumed Value Per Visitation*	$ 1.25
K.	*Estimated Annual Benefits (J x C)*	$ 20,000
L.	*Average Net Benefits (K - H)*	$ 14,800

IV. BENEFIT-COST RATIO

M.	*Factor for value of 1 compounded at* 30 *years @* 4 *% = (factor)*	3.24339751
	(Standard factor for 30 years @ 4% = 3.24339751)	
N.	*Product of Investment (D x M factor)*	$ 389,208
P.	*Total Benefits (L x E)*	$ 444,000
Q.	*Benefit-Cost Ratio (P ÷ N)*	1 : 14:1

To support D-660-1E Economic Feasibility

SORA Form 28
500/10-4-66

NORTH DAKOTA STATE WATER COMMISSION

OFFICE MEMO

MEMO TO: Milo W. Hoisveen, Chief Engineer
FROM: Delton D. Schulz, Office Engineer
Dale H. Glover, Hydrologist
SUBJECT: Northgate Dam - SWC Project #667 - Design and Hydrology Report
DATE: January 4, 1968

Northgate Dam is proposed to be located on Stony Run Creek in Section 19, Township 163 North, Range 89 West in Burke County.

The drainage area above the proposed dam site is 102 square miles. The length of the river channel from its headwaters to the proposed dam site approximates 30 miles. The total fall within this distance is 240 feet.

A rainfall of 100-year frequency on the area would approximate 3.5 inches falling in a 6.0 hours period. The computed design inflow hydrograph has a peak of 3,665 cubic feet per second and a total volume of 2,250 acre-feet, which is equal to a runoff depth of 0.41 inches from the contributing drainage area of 102 square miles.

The service spillway for Northgate Dam will consist of a 8.0 feet by 10.0 feet reinforced concrete box drop inlet and a 72 inch corrugated metal pipe extending laterally through the earth embankment. The crest of the service spillway is to be set at mean sea level elevation 1899.0 feet.

The emergency spillway is to be vegetated, 150 feet wide with 3:1 side slopes. The crest of the spillway will be set at mean sea level elevation 1901.0 feet.

The embankment will consist of a rolled earth fill. The crest of the embankment is to be set at mean sea level elevation 1908.0 feet. The crown width will be 12.0 feet.

It was assumed that the reservoir water surface was at service spillway crest elevation at the time of arrival of a 100-year frequency rainfall. Runoff waters

were routed through the spillways and the following facts established:

(a) The maximum reservoir water surface level reached would be mean sea level elevation 1904.0 feet.

(b) The maximum discharge of the service spillway would be 678 cubic feet per second.

(c) The maximum discharge of the emergency spillway would be 2,400 cubic feet per second.

The factors of safety regarding the proposed structure are more than adequate. Attached are computations showing the capacities of the spillways, a 100-year rainfall frequency, as well as a hydrograph showing reservoir inflow and spillway discharge.

Delton D. Schulz
Office Engineer

Dale H. Glover
Hydrologist

DDS:DHG:sl

Distribution:
MWH
Al G
DDS
DHG

NORTHGATE DAM

19-163-89

SWC PROJECT #667

Stoney Run Creek

Drainage Area 102 Square Miles

Length of Channel, 30 mi.±

Total Fall, 240 ft.±

$$T_c = \frac{2.47\ L^{1.15}}{H^{0.385}} = \frac{2.47 \times 30^{1.15}}{240^{0.385}} = \frac{2.47 \times 50}{8.25} = 15 \text{ Hrs.}$$

$$\text{Runoff Factor} = C = \frac{0.25}{T_c^{0.284}} = \frac{0.25}{2.16} = 0.116 = 11.6\%$$

$$\frac{P}{T_c} = \text{Exact percent} = \frac{P}{15} = 8\% = .08 \qquad P = .08 \times 15 = 1.20 \text{ Hrs.}$$

Use 5 periods. Duration = 5 x 1.20 = 6.0 Hours Use P = 8% T_c Model

100-Year 6-Hour Rainfall = 3.50 Inches

R.O. = 3.50 x C = 3.50 x 0.116 = 0.41 Inches

$$M = \frac{D.A.}{T_c} = \frac{102}{15} = 6.8$$

D = Discharge Factor = M x R.O. = 2.79

Period	1	2	3	4	5	Total
% Dist. R.F.	28	33	19	14	6	100
D	0.78	0.92	0.53	0.39	0.17	2.79

100-YEAR RAINFALL	3.50 Inches
100-YEAR PEAK INFLOW	3,665 cfs
100-YEAR VOLUME	2,250 Acre-Feet

D.H.G. 3-15-67

NORTHGATE DAM

SWC PROJECT #667

HOUR	TIME %T_c	1st PER. D=.78	2nd PER. D=.92	3rd PER. D=.53	4th PER. D=.39	5th PER. 0.17	TOTAL DISCH. c.f.s.
0	0	0	(0= 8%)	(0=16%)	(0=24%)	(0=32%)	0
.75	5	55	(2=10%)	(4=20%)	(1=25%)	(3=35%)	55
1.50	10	185	12				197
2.25	15	394	118				512
3.00	20	884	294	25			1203
3.75	25	1388	640	106	1		2135
4.50	30	1345	1342	229	38		2954
5.25	35	1172	1694	511	108	5	3490
6.00	40	1002	1505	900	230	28	3665*
6.75	45	842	1301	939	509	63	3654
7.50	50	690	1105	819	712	139	3465
8.25	55	549	919	704	655	270	3097
9.00	60	423	745	593	569	309	2639
9.75	65	312	586	489	485	270	2142
10.50	70	218	443	392	405	233	1691
11.25	75	158	321	304	330	197	1310
12.00	80	137	222	226	262	163	1010
12.75	85	118	173	160	200	132	783
13.50	90	94	154	113	146	103	610
14.25	95	65	128	95	101	77	466
15.00	100	30	98	83	76	55	342
15.75	105	5	61	67	67	38	238
16.50	110		20	48	57	31	156
17.25	115		1	25	44	27	97
18.00	120			5	29	23	57
18.75	125				12	17	29
19.50	130				1	10	11
20.25	135					3	3
21.00	140					0	0

TOTAL - 36,011

* Maximum Inflow 3,665 c.f.s.

Time Intervals, 5% x T_c = .05 x 15 - 0.75 Hrs.

36,011 x 0.75 Hr. = 27,008 Hr. Sec. Ft. = 2,251 Acre-Feet

102 Sq. Mi. x 53.33 x 0.41" R.O. = 2,230 Acre-Feet

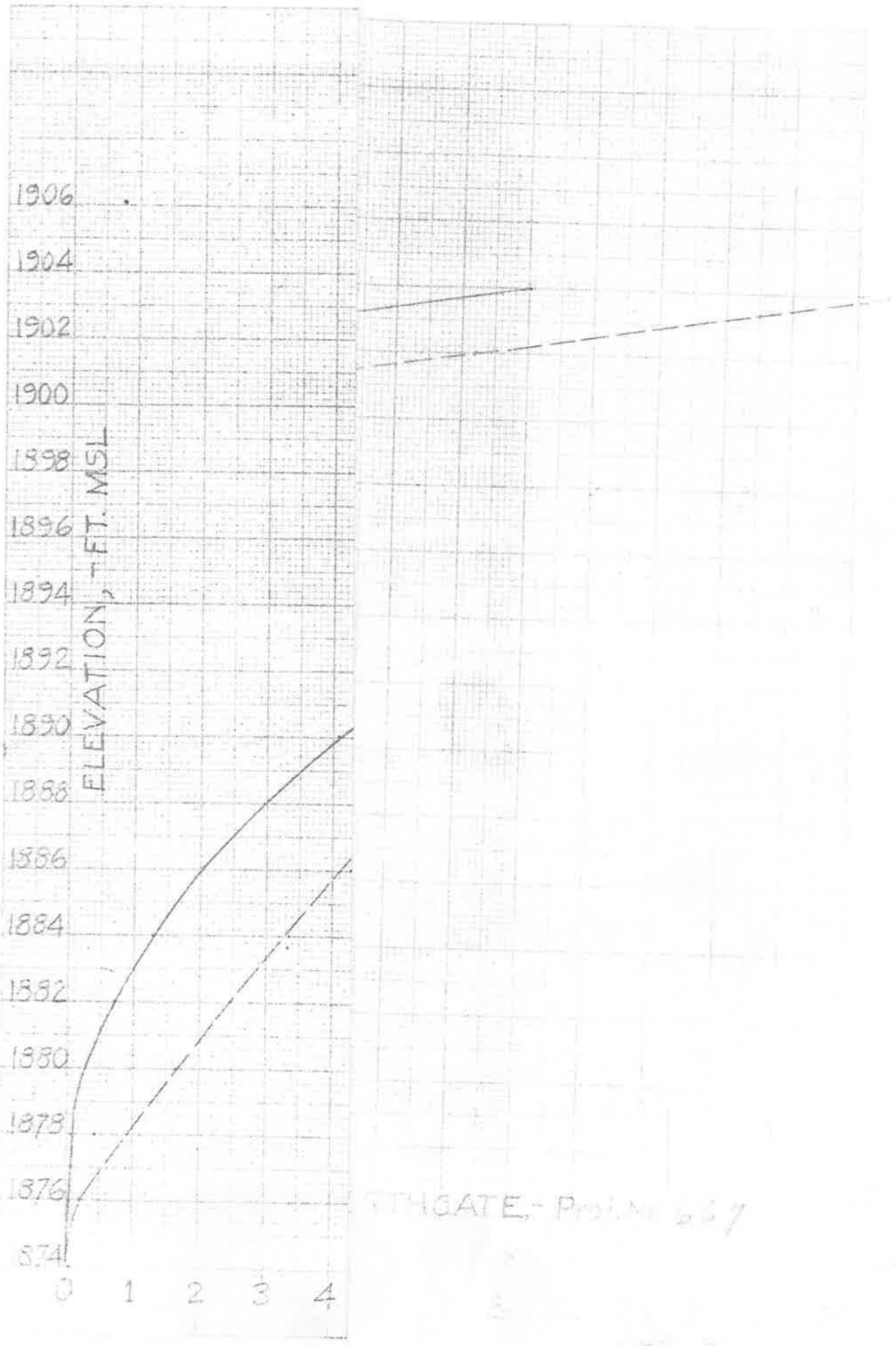
D.H.G. 3-15-67

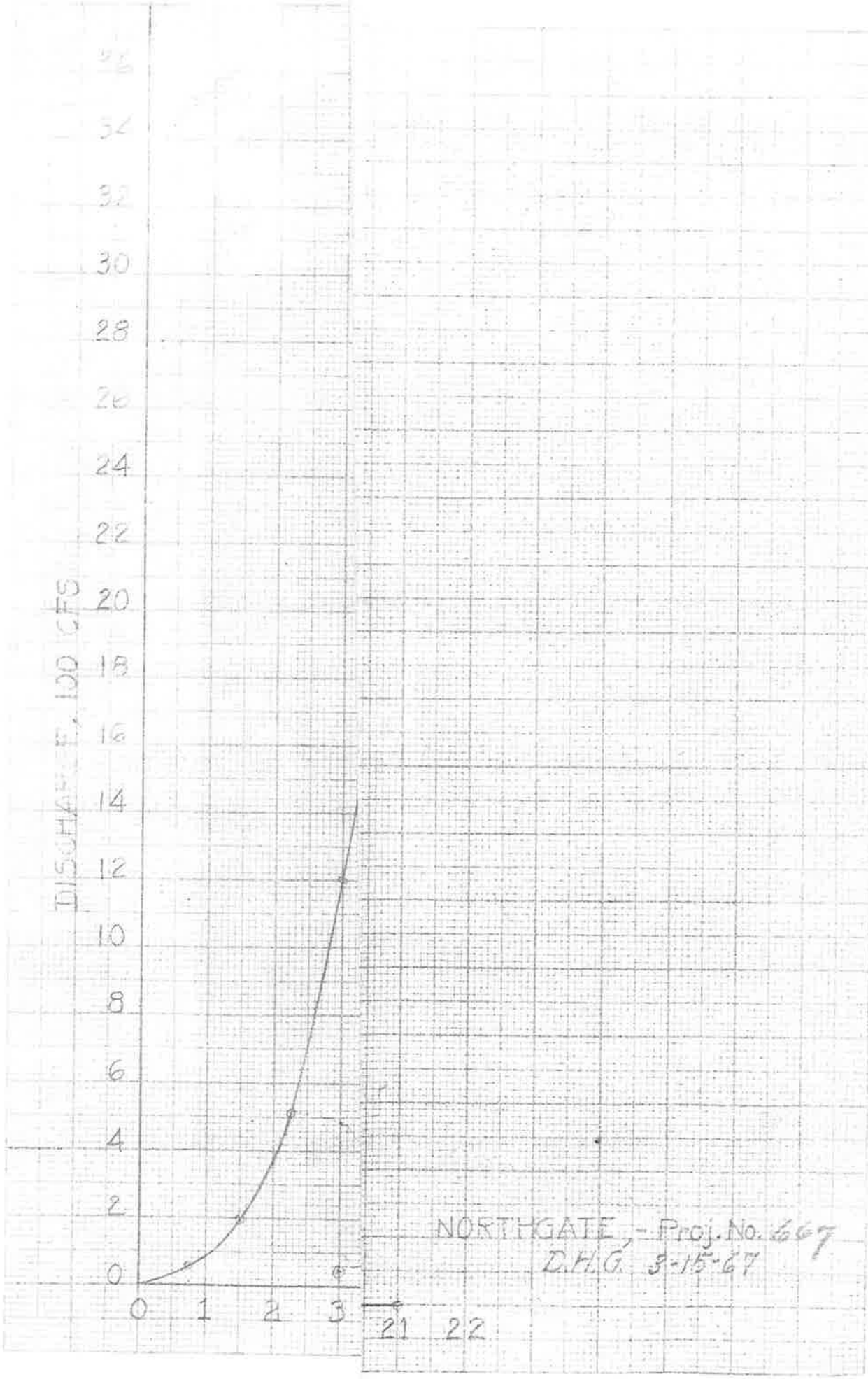
NORTHGATE DAM

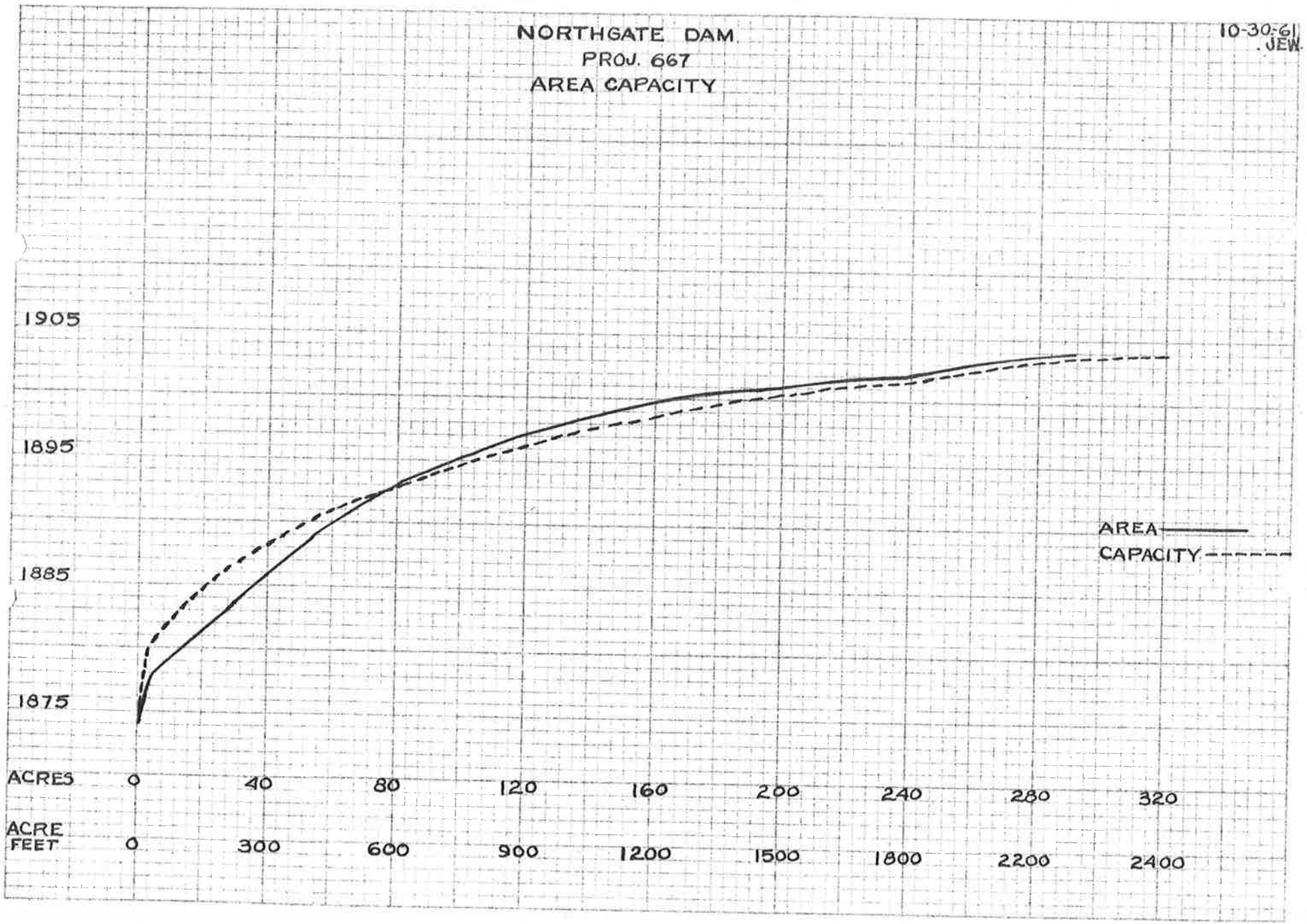
SWC PROJECT #667

	POOL ELEV FT., MSL	STORAGE AC.-FT.	SERVICE SPILLWAY HEAD-FT.	SERVICE SPILLWAY DISCH-CFS	EMERGENCY SPILLWAY HEAD-FT.	EMERGENCY SPILLWAY DISCH-CFS	TOTAL DISCH. CFS
Service Spillway	1899.0	1300	0.0	0			0
	1900.0	1465	1.0	87			87
Emergency Spillway	1901.0	1640	2.0	245	0	0	245
	1902.0	1835	3.0	451	1	464	915
	1903.0	2090	4.0	673	2	1310	1983
Maximum W.S. Elev.	1904.0	2400	5.0	678	3	2400	3080
Top of Dam	1908.0						

D.H.G. 3-15-67


1906
1904
1902
1900
1898
1896
1894
1892
1890
1888
1886
1884
1882
1880
1878
1876
1874
ELEVATION, FT. MSL
0
1
2
3
4


DISCHARGE, 100 CFS
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0
1
2
3
21
22
NORTHGATE, - Proj. No. 667
D.H.G. 3-15-67


NORTHGATE DAM.
PROJ. 667
AREA CAPACITY
10-30-61
JEW.
1905
1895
1885
1875
AREA
CAPACITY
ACRES 0 40 80 120 160 200 240 280 320
ACRE FEET 0 300 600 900 1200 1500 1800 2200 2400

SOIL INVESTIGATION

Project No. 667 County: Burke

Project Name: Northgate Dam

INTRODUCTION:

A preliminary investigation was initiated by the State Water Commission to determine the feasibility of an earthfill dam at the proposed site on Stony Run Creek south of Northgate, North Dakota. A total of seven foundation test borings and four test holes for borrow exploration were drilled and tested by Lake Agassiz Testing Laboratories, Moorhead, Minnesota, on November 7, 8, and 9, 1967. The test borings were drilled on or about the centerline of the proposed earthen embankment, whereas the test holes were drilled adjacent to the dam site for purposes of borrow exploration. The locations of the test borings and test holes are shown on Drawing No. 5704-667-3.

Descriptive logs of the geologic deposits penetrated in each of the test borings were made by the chief driller and samples taken at prescribed depths. The samples were examined later by the writer and composite logs were compiled which included information provided by the driller and also the writer's interpretations.

Laboratory and office work on the soil investigation were performed by the writer and Mr. Ray Christensen, Soils Technician. It included the following: (1) visual examination and analysis of the cores from the test borings, (2) sieve and hydrometer analysis, (3) atterberg limits, (4) compilation of test boring and other data, (5) preparing soil profiles, illustrations, and writing this report on the investigation.

GEOLOGY AND PHYSIOGRAPHY:

The Northgate Dam site, as described in this report, is situated in Section 19, Township 163 North, Range 89 West, in Burke County, in northwestern North Dakota. The surficial geology is primarily of glacial origin being situated in the Central Lowland Physiographic Province of North Dakota.

The dam site and adjacent land surface is a gently rolling upland, mantled by glacial drift, consisting predominantly of till. Till is a heterogeneous mixture of clay, silt, sand, pebbles, cobbles and boulders deposited directly by glacier with little or no transportation by water. When till occurs above the water table, it is characterized by yellow or red oxidation stains. Till below the water table is gray in color and locally termed "blue clay." Glacial till is relatively impermeable; however, lenticular or discontinuous sand and gravel deposits interbedded in the till are generally fair to good sources of water.

TESTS:

The following tests or criteria were employed in this investigation:

a. Penetration. The penetration (n) resistance of the soil was measured by driving a two inch O.D. split tube sampler a distance of one foot into previous undisturbed soils with a 140 pound hammer and a 30 inch drop. The test is in accordance with ASTM (American Society for Testing and Materials) D 1586-64 T. This standard test gives an indication of the consistency of cohesive soils or the relative density of cohesionless soils. The results are tabulated for each of the borings. This test is not conclusive in itself, but it does afford an indication of the relative strength of the soils; and can usually be correlated in a general way with the unconfined compressive strength of clays.

b. Unconfined Compression. The unconfined compression test of a soil is a uniaxial compression test in which the test specimen is provided with no lateral support while undergoing vertical compression. The test measures the unconfined compressive strength of a cylinder of cohesive or semi-cohesive soil and, indirectly, the shearing strength. One-half the unconfined compressive strength is reported as "cohesion." The test is performed upon an undisturbed sample of soil at its natural moisture content. The samples are taken at various depths with a two inch I.D. shelby tube sampler. The samples averaged 2.0 inches in diameter and 4.0 inches in length, and were tested in a spring-type compression machine. This conforms to ASTM Designation D 2166-63 T.

SOIL CONDITIONS:

As explained in the introductory section, seven test borings were drilled along the proposed centerline of dam. Since different soil conditions exist along the coulee floor as compared to the coulee walls, the soil conditions will herein be discussed under two separate subheadings.

a. Coulee Walls:

The textural quality of the soils along the slopes appear to be relatively uniform; consisting of tan lean clays, silty sands, and clayey sands in the upper ten feet, and brown to gray clays (till) in the lower levels. The deposits within the top ten feet ranges from the nonplastic to the slightly plastic SM and SC soil groups to the moderately plastic clays of the CL soil group.

Below the depth of ten feet, the soil is a lean textured clay (glacial till) with a relatively high silt content and occasional sand lenses. It is basically a cohesive-frictional type soil.

Based on the unconfined compression tests, the unconfined compressive strength (q_u) ranges from 1.43 to 5.36 tons per square foot. The consistency of the soil ranges from very stiff to hard.

b. Coulee Floor:

Test borings drilled on or near the coulee floor indicate near uniform soil conditions; consisting of deposits of silt, clay and sand in the upper portion, sand and gravel in the middle portion, and gray clay (till) in the lower portion.

The most critical soil layer in the soil foundation is the middle portion. It consists essentially of permeable and water-bearing gravelly sands, with very little fines. It ranges in thickness from approximately $2\frac{1}{2}$ feet in test boring 2, to 9 feet in test boring 4. Its maximum thickness probably occurs between test borings 2 and 4, and pinches out rapidly to the north and south. The coefficient of permeability (k) based on grain-size analysis ranges from 1.2×10^{-1} to 2.5×10^{-1} cm per second.

EMBANKMENT MATERIALS:

As previously mentioned, four test holes were drilled adjacent to the dam site for possible embankment material. Test holes 1, 2, and 3 are in the vicinity of the proposed emergency spillway on the north bank, while test hole 4 is located on the south bank of the dam. The proposed borrow areas and locations of test holes are shown on Drawing No. 5704-667-3.

The soil encountered in the borrow areas is predominantly sandy clays and lean clays of the SC and CL soil group respectively. Of the coarse and fine-grained soils, both groups offer good stability and are best

adapted for embankment construction. Proctor densities range from 110 to 118 pounds per cubic foot and optimum moistures from 13 to 16 percent. Information concerning previous data is attached on Form 179B.

Therefore, it is the opinion of the writer that the sandy clays and clays will readily lend themselves to the compaction required for an earthen embankment, and that this soil investigation is sufficient to classify this as an economically feasible site for the construction of a reservoir.

RECOMMENDATIONS:

In view of the soils data encountered in the preliminary investigation and based on laboratory test results, the site is acceptable for a fill embankment with the following recommendations:

1. The top several feet of the soil foundation, which lacks the density of the underlying soil due to frost action, surface runoff or other causes, should be penetrated by the core trench.
2. The core trench should be excavated to the proposed depth as shown on Drawing No. 5718-667-4 and in accordance with design specifications.
3. The ends of the core trench should be well keyed into the firm and impervious clay (CL) on the abutments. Recommend the core trench be excavated to a minimum depth of three (3) feet at elevation 1901.0. (Water surface control elevation is 1899.0.)
4. One area should be carefully checked when the core trench is opened to be sure that the trench bottoms in brown to gray glacial till (CL). This is the area between test borings 3 and 5 where saturated and waterbearing sand and gravel deposits predominate.

Dist.
SWC Proj.# 667
SWC Acct.
1 ea. Proj. Participant

SWC Proj. # 667

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 North Dakota State Game & Fish Department, hereinafter referred to as the Department, acting by and through Russ Stuart (name), Commissioner (title);

(3) The North Dakota State Outdoor Recreation Agency, hereinafter referred to as the Agency, acting by and through Milo W. Hoisveen (name), Executive Officer (title);

(4) The Burke County Water Management District, hereinafter referred to as the District, acting by and through O. J. Fisher (name), Chairman (title).

I. Project, Location and Purpose

WHEREAS, the parties to this Agreement propose to construct the following:

Northgate Dam and Recreation Complex (SORA Project #7-17),

hereinafter referred to as the Project, located in Section 19, Township 163 North, Range 89 West, Burke County, North Dakota, the purpose of which is to provide a water-based outdoor recreation area and facilities.

NOW, THEREFORE, IT IS AGREED:

II. Drawings and Specifications

That the Project shall be constructed in accordance with drawings

V. Operation and Maintenance

That the District shall operate and maintain the Project in accordance with rules and regulations prescribed by the Commission, Department and Agency.

VI. Indemnification

That the District does hereby accept responsibility for, and holds the Commission and the Department and Agency 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 and Agency the District shall indemnify them for any settlement arrived at or judgment satisfied.

VI. 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

1. Bureau of Outdoor Recreation cost allocations assume approval and funding through the Land and Water Conservation Fund Act.
2. State Outdoor Recreation Agency commitments are subject to full Agency approval.
3. State Game and Fish Department participation is contingent upon completion of land acquisition prior to initiating construction and cost participation is limited to $18,000.

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

WITNESS:	DATE:	
Jim Schuff	9/29/67	NORTH DAKOTA STATE WATER COMMISSION By: Milo W Hoisveen Secretary and Chief Engineer
	11/9/67	NORTH DAKOTA STATE GAME & FISH DEPARTMENT By: Russell McStuart Commissioner
Jim Schuff	9/29/67	NORTH DAKOTA STATE OUTDOOR RECREATION AGENCY By: Milo W Hoisveen Executive Officer
Burt L Wilson	11-16-67	BURKE COUNTY WATER MANAGEMENT DIST. By: O J Fisher Chairman

PART E - PROJECT ASSURANCES

NORTH DAKOTA STATE OUTDOOR RECREATION AGENCY
1301 STATE CAPITOL
BISMARCK, NORTH DAKOTA

(for use of SORA office only)

SORA PROJECT NO. _____

DATE RECEIVED _____

PRIORITY _____

1. APPLICANT Burke County Water Management District AGENCY

c/o O. J. Fisher, Chairman, Bowbells, North Dakota 58721 ADDRESS

PROJECT IS LOCATED IN Burke COUNTY

2. PROJECT IDENTIFICATION: TITLE Northgate Dam & Recreation Complex SORA NO. 7-17

LEGAL DESCRIPTION: _____ SEC. 19 TWP 163 RGE 89

SCOPE OF PROJECT: Construct $63,000 dam on 400 acre tract estimated to cost $30,000 and provide recreation facilities estimated at $15,000.

TO BE STARTED January 1 19 68 . TO BE COMPLETED December 31 19 70 .

IN SUBMITTING THIS PROJECT PROPOSAL Burke County Water Management District
(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 Burke County Water Management District APPLICANT
(Name of Applying Agency)

O J Fisher TITLE Chairman DATE 9/29/67
(Authorized Representative)

_____ TITLE _____ DATE _____
(Authorized Representative)

_____ TITLE _____ DATE _____
(Authorized Representative)

SORA FORM #2-E

Dist.: District, SORA, SWC Proj. #667

"BUY NORTH DAKOTA PRODUCTS"

Permit No. 1478

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 .....

Burke County Water Management District (Northgate Dam), whose post office
(Name of Applicant)
address is Bowbells, State of North Dakota, 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 Stoney Run Creek
   which is tributary to Des Lacs River
2. A. Amount of water requested 1300 acre-feet plus 459 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) ..... ¼ ..... ¼ Sec. ..... Twp. ..... Rge. .....
   (2) ..... ¼ ..... ¼ Sec. ..... Twp. ..... Rge. .....
   (3) ..... ¼ ..... ¼ Sec. ..... Twp. ..... Rge. .....
   B. If water is to be delivered from storage reservoir complete the following: and file NDSWCC Form 110 or 111:
   Location of dam SW ¼ SE ¼ Sec. 19 Twp. 163 Rge. 89
   Height embankment above stream bed 34 Ft.
   Capacity of Reservoir 1310 acre-feet. Area of water surface 153 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 2 years
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):

Sec.	Twp.	Rge.	NE ¼				NW ¼				SW ¼				SE ¼				Total
			NE ¼	NW ¼	SW ¼	SE ¼	NE ¼	NW ¼	SW ¼	SE ¼	NE ¼	NW ¼	SW ¼	SE ¼	NE ¼	NW ¼	SW ¼	SE ¼	
Total number of acres to be irrigated																			

Located in Burke County, North Dakota.
Estimated quantity of water that will be returned to the approximate source from which diverted: .....

Burke County Water Management District

O J Tesker
(Applicant's Signature) Chairman

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.

DO NOT COMPLETE THIS SIDE OF FORM — THIS SIDE FOR USE OF STATE ENGINEER

CONDITIONAL PERMIT

This is to certify that I have examined the foregoing application and hereby approve the same subject to prior water rights. The rate of withdrawal is not to exceed natural flow. Acre-feet and rate of withdrawal are subject to modification by the State Engineer.
(If denied state reason, if approved state condition, if any, to approval)
Failure to comply with any order of the State Engineer may result in forfeiture of water right.

The amount of water to be appropriated shall be limited to the amount that can be used beneficially, not to exceed 1300 acre-feet storage/~~xxxxxxxxxxxxxxxx~~ plus 459 acre-feet annual use.

1. Date of priority September 12, 1967
2. Date of hearing on application October 2, 1967
3. Date of approval by State Water Conservation Commission November 2, 1967
4. Construction to be initiated on or before -
5. Construction to be completed on or before -
6. Water shall be beneficially used on or before December 31, 1972

WITNESS my hand and seal this 6th day of November, 19 67.

Nels W Horsley
State Engineer
Secretary, State Water Conservation Commission

W.R.# 1478
SWC Proj.#

Permit No.

APPLICATION FOR PERMIT TO CONSTRUCT OR ENLARGE A DAM OR RESERVOIR

TO: Chief Engineer
North Dakota State Water Commission
Bismarck, North Dakota

(Northgate Dam)

I, O.J.Fisher,Chairman,Burke County WMD, 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 Burke

Legal description to nearest forty acre tract: SW¼SE¼ Sec. 19 Twp. 163 N., Rge. 89 W.

2. Purpose: Recreation

3. Data

Drainage Area Above Dam 102 Square Miles

Type of Dam Earth Fill

Type and Size of Spillway 72" CMP

Type and Size of Emergency Spillway 150' Vegetated

Type and Size of Gate Reservoir Control Structure

Invert Height above Stream Bed of Control Structure

Height of Spillway above Stream Bed 25 feet

Surface Area of Reservoir at Spillway Crest 153 acres

Computed Reservoir Capacity at Spillway Crest Elevation 1300 acre feet

4. Water course on which dam is to be located is a tributary to: Stoney Run Creek

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

12" drawdown WSP to be installed

6. Downstream landowners who might be deprived of use of water by construction of the dam are

7. Is the dam and impounded water on the owners land? Yes
(If the answer is no, proof of easement from other owner must be filed with application.)

8. For an enlargement of an existing dam, answer the following:

Why is enlargement necessary?

Year dam was constructed By what agency

Total yardage in existing dam

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 plans on file

(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 December 31, 19 68

and will be completed on or before December 31, 19 72

Date Submitted:

Burke County Water Management District

Signed O J Fisher, Chairman
(Owner of land on which dam is located)

Address

TE OF NORTH DAKOTA)
NTY OF Burke) ss (NOTARIZING NOT NECESSARY)

On this 11th day of September 19 67, before me a Notary Public personally appeared O. J. Fisher, known to me to be the same person who executed the foregoing application for a water right permit and acknowledged to me that he executed the same.

Bert L. Wilson Jr.

Notary Public, Burke County, N. D.

My Commission Expires January 11, 1969

It should be recognized that 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.

AFFIDAVIT OF DESIGNING AGENCY

The dam and reservoir described in this application and on attached sheets has been designed and approved by the North Dakota State Water Commission (Name of Agency) 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 12th day of September, 19 67.

North Dakota State Water Commission
(Name of Agency)

Bismarck, North Dakota
(Address of Agency)

Designing Agency
Signed North Dakota State Water Commission

By: _____

Title State Engineer

For use of North Dakota State Water Commission

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 6th day of November, 1967.

Signed: Michael Haverkamp

Chief Engineer
North Dakota State Water Commission

DISAPPROVAL

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

NESS my hand and seal this _____ day of _____, 19_____.

Signed: _____

Chief Engineer
North Dakota State Water Commission