

LAKE IBSEN OUTLET WORKS

SWC PROJECT #503

BENSON COUNTY

PREPARED BY

NORTH DAKOTA STATE WATER COMMISSION

APRIL 18, 1974

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Lake Ibsen is located in Benson County one mile southeast of Leeds, North Dakota. The Lake is located toward the lower end of the Hurricane Lake Watershed. Numerous south flowing streams empty into Lake Ibsen with 87 percent of the water generated within the basin passing through Lake Ibsen. Lake Ibsen discharges through a small channel into Silver Lake then into Mauvais Coulee and Devils Lake.

The watershed's principal features are the gently rolling ground moraine in the headwater to the near level ground surrounding the Lake. The entire area is dotted with numerous potholes which receive and retain local runoff.

The principal problem at Lake Ibsen is flooding with resultant damage to crops and pasture. The primary cause of flooding around the Lake is that the existing outlet channel is not large enough to carry the normal runoff. This channel is crossed by graded roads that have, in many instances, inadequate bridges and culverts.

The primary purpose of the project is to provide adequate outlet for the Lake. This will provide the landowners and operators around the Lake and upstream from the Lake with the opportunity to continue their agricultural pursuits and provide a reasonable degree of economic stability in the area.

Improvement Works to be Installed

Ultimate structural and channel design are based on the 10-year peak frequency curve for the area. These curves were developed by the Soil Conservation Service for this area. Peak flow from this event will be contained within the banks of the completed channel improvement. The duration of flooding by larger, less frequent events, will be significantly reduced by channel improve-

ments. In the initial stage of construction, the capacity of the structure and channel will be built to 43 percent of ultimate design. Enough right-of-way will be secured at the time of initial construction to provide for the ultimate channel capacity.

Control Structure:

The outlet control structure at Lake Ibsen is a structural steel sheet piling weir (see appendix page). The weir is constructed in a manner to allow increase capacity at a minimal cost. For the pilot channel the weir length will be thirty (30) feet. When the downstream channel is increased to its maximum capacity, the weir length will be fifty (50) feet. A "Texas" crossing will be provided immediately down to allow passage of farm equipment during periods of low flow.

Outlet Channel:

The channel improvement (pilot channel) will be designed to convey 43 percent of 10-year frequency peak runoff within its banks. Channel locations are shown on the plan and profile sheet in the appendix. The pilot channel slope is 0.0003, with a twenty (20) foot bottom and 4:1 side slopes. The shallow side slopes will provide better protection from bank sloughing, slope erosion and blockage from snow. The roughness coefficient (n) used for the aged channel is $n=0.035$. The pilot channel will be 2.53 miles long. There will be four channel changes incorporated in the channel. The major channel change will be provided as a wildlife mitigation measure.

Field inlets will be provided on the channel. These inlets will be the vegetative type or constructed using corrugated metal pipe. The exact number, size and location of these inlets will be determined at the time of construction.

Road crossings between Section 14 and 15, 14 and 23, 23 and 24 will need to be upgraded. Under the present phase of construction, one 48 inch CMP will

be installed at Station 98+37 between Sections 23 and 14.

Mitigation Measures:

Included in this project are measures for mitigating damages to the wildlife population of the watershed from channel improvement. The principle mitigation measure will be the grade stabilization of Lake Ibsen. This feature will allow the Lake level to be set at a given control elevation. An oxbow will be cut off in Section 14, Township 155 North, Range 68 West to be developed as wildlife habitat. This phase of construction will be coordinated with the North Dakota Game and Fish Department and the Federal Bureau of Sport Fisheries and Wildlife. All structural features associated with mitigation areas, fencing, dike, diversion, etc., will be maintained to insure their continued function for wildlife benefit.

The Benson County Water Management District will obtain all land rights needed for the structure and channel improvements. Upon completion of the project, the District will be responsible for the operation and maintenance of the outlet structure, outlet channel and associated mitigation features.

Prepared by:

Stephen M. Hoetzer
Design Engineer
April 18, 1974

LAKE IBSEN OUTLET WORKS
ESTIMATED CONSTRUCTION COSTS

Control Structure:

1.	Site Preparation - L. S.	\$ 2,000.00
2.	Structural Steel Sheet Piling P.SA - 23 526.5 L.F. @ \$10.00/L.F.	5,265.00
3.	Structural Steel 582 lb. @ .50/lb.	291.00
4.	Rock Riprap 275 cu. yds. = 413 tons @ \$10/ton	4,130.00
5.	Gravel 20 cu yd ³ = 28 tons @ \$7.50/ton	<u>210.00</u>
	Total	<u>\$11,896.00</u>

Outlet Channel:

1.	Channel Excavation 40,000 yd ³ @ .50/yd ³	\$20,000.00
2.	Field Inlets 4 @ 350/inlet (18" CMP w/flap gates)	1,400.00
3.	48" CMP Road Crossing - L.S.	<u>1,200.00</u>
	Total	<u>\$22,600.00</u>

Total Project Costs \$34,496.00

Contingencies	\$ 3,504.00
Construction Inspection	3,000.00
Contract Administration	<u>3,000.00</u>

TOTAL COST \$44,000.00