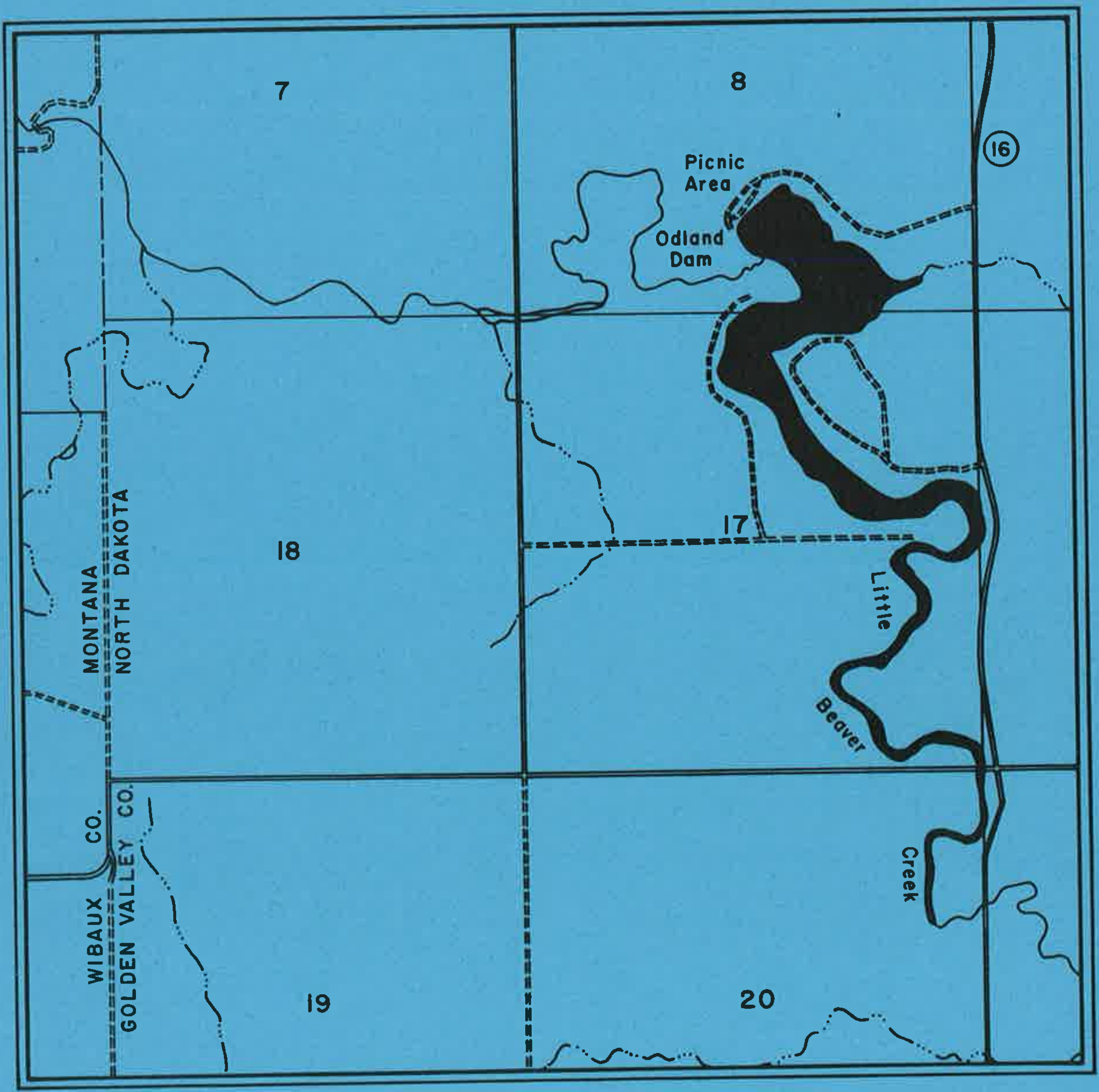
PRELIMINARY ENGINEERING REPORT

ODLAND DAM RESTORATION

GOLDEN VALLEY CO., NORTH DAKOTA

SWC PROJECT NO. 394



NORTH DAKOTA
STATE WATER COMMISSION
APRIL, 1987

PRELIMINARY ENGINEERING REPORT
ODLAND DAM

SWC Project #394
North Dakota State Water Commission
900 East Boulevard
Bismarck, ND 58505-0187

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Prepared for the
Golden Valley County
Water Resource Board

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PURPOSE AND SCOPE

Since the construction of Odland Dam in 1936, the Odland Reservoir has accumulated sediment and organic material which, in recent years, has essentially eliminated the use of the reservoir as a recreation area. In June, 1985, the Golden Valley County Water Resource Board entered into an agreement (Appendix A) with the State Water Commission to study the feasibility of increasing the depth of the Odland Reservoir to provide for improved boating conditions. The proposal, as requested by the Board and examined in this report, includes the excavation of the reservoir area behind Odland Dam such that any area presently more than 4 feet deep would be at least 8 feet deep, as measured from the control elevation of the reservoir. The project would consist of breaching the embankment, draining the reservoir, allowing the reservoir area to dry out, excavating areas between 4 and 8 feet deep, repairing the breached embankment, and allowing the reservoir to re-fill.

This report contains a history of activity related to Odland Dam, a description of the study area, a description of the method proposed to increase the depth of the Odland Reservoir, a cost estimate considering several alternatives, and an environmental assessment.

BACKGROUND

Odland Dam was constructed in 1936 by the Works Progress Administration and the Federal Emergency Relief Administration to provide fish habitat and recreation. Since its construction, the principle spillway has required periodic repair work consisting mainly of guniting concrete on the spillway. Repairs and modifications to the principle spillway occurred in 1937, 1938, 1949, 1951, 1953, 1956, 1963, and 1983. Currently, the principle spillway is in fair condition.

The first recorded interest in modifying the Odland Reservoir was a petition, dated April 1956, from local landowners requesting the level of the reservoir be raised. Since then, there has been continued interest in improving the recreational value of the reservoir. In 1970, the State Water Commission investigated the feasibility of raising the dam for the Golden Valley Park Board. The feasibility of raising the control elevation of the dam was again studied by the State Water Commission in 1982 for the Golden Valley County Water Resource Board. At that time, the cost to raise the control elevation 4 feet was estimated at $750,000. Various other options have been proposed including, the construction of a new dam immediately downstream, dredging out the accumulated sediment from the reservoir, and, as considered in this report, the excavation of sediment from the bottom of a drained reservoir.

DESCRIPTION OF AREA

Location and Basin Description:

Odland Dam is located in the SE 1/4 of Section 8, Township 141 North, Range 105 West. The site is about 8 miles north and 1/2 mile west of Beach in Golden Valley County (Figure 1). The embankment lies across Little Beaver Creek approximately nine miles above its confluence with the main stem of Beaver Creek in Montana. Beaver Creek flows into the Little Missouri River and then into Lake Sakakawea.

The drainage area above Odland Dam is 79 square miles. The Little Beaver Creek valley flattens and widens upstream of the reservoir. The bluffs rise to elevation 2800 mean sea level (msl). Most of the upstream drainage area is under cultivation with the exception of the steep slopes of the buttes and their tops.

Climate:

Precipitation for crop production is adequate during normal years although occasionally the area suffers from periods of drought. The average annual precipitation is 15.5 inches, most of which occurs during the period of April through September. The annual mean temperature is approximately 42°F.

Geology:

Odland Dam and its drainage area lie within the unglaciated Missouri Plateau Section of the Great Plains Province. The surfacial materials are basically bedrock and consist primarily of the Bullion Creek Formation with

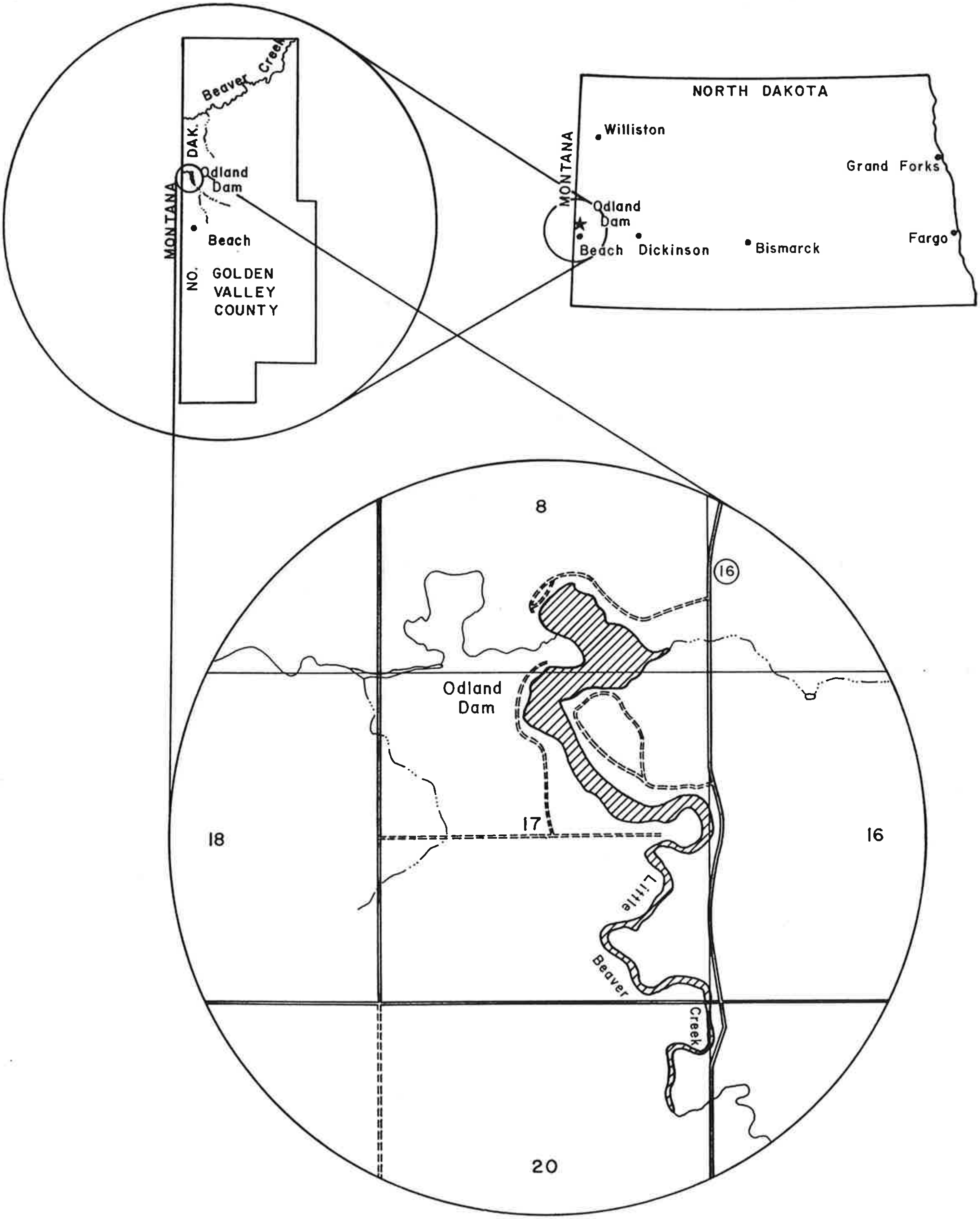


Figure I. LOCATION MAP

erosional remnants of the Sentinel Butte Formation. Both the Bullion Creek and Sentinel Butte Formations are of the Paleocene age.

Dam Description:

The Odland Dam embankment is a rolled earth-fill type whose top elevation is 2645 msl. The 28-foot high embankment has a 3H:1V (3 horizontal to 1 vertical) upstream slope with no berms. The downstream face has a slope of 2.5H:1V with a 10-foot wide berm at elevation 2632 msl. The top of the embankment is 690 feet long and 10 feet wide. A clay core is shown on the original plans. A low level drawdown pipe is not included as part of the structure.

Seepage occurs near the center of the embankment. The exact location where water seeps from the embankment is hidden below the riprap on the downstream face. The average rate of the seepage flow is estimated at 5 to 10 gallons per minute (gpm).

The principal spillway consists of an approach channel, rubble masonry weir with a chute structure, and a plunge pool. The approach channel consists of a flat curved channel approximately 150 feet long at the same elevation as the principal spillway. The principal spillway is 100 feet wide with a 1H:1V side slope and vertical side walls. The side walls were originally at a slope of 1H:1V in 1936 and reconstructed in approximately 1938. The stilling basin consists of the original 11-foot long flat rubble masonry apron, 12 feet of riprap, and a scour hole. The crest elevation of the principal spillway is 2638 msl. At this elevation the reservoir covers 132 acres and the capacity is 722 acre-feet. The average depth is 5.5 feet and the maximum depth is 17 feet. A contour map showing the main portion of the reservoir is shown in Figure 2. The area bound by the 2630 contour is the portion of the reservoir currently deeper than 8 feet, as measured from the control elevation.

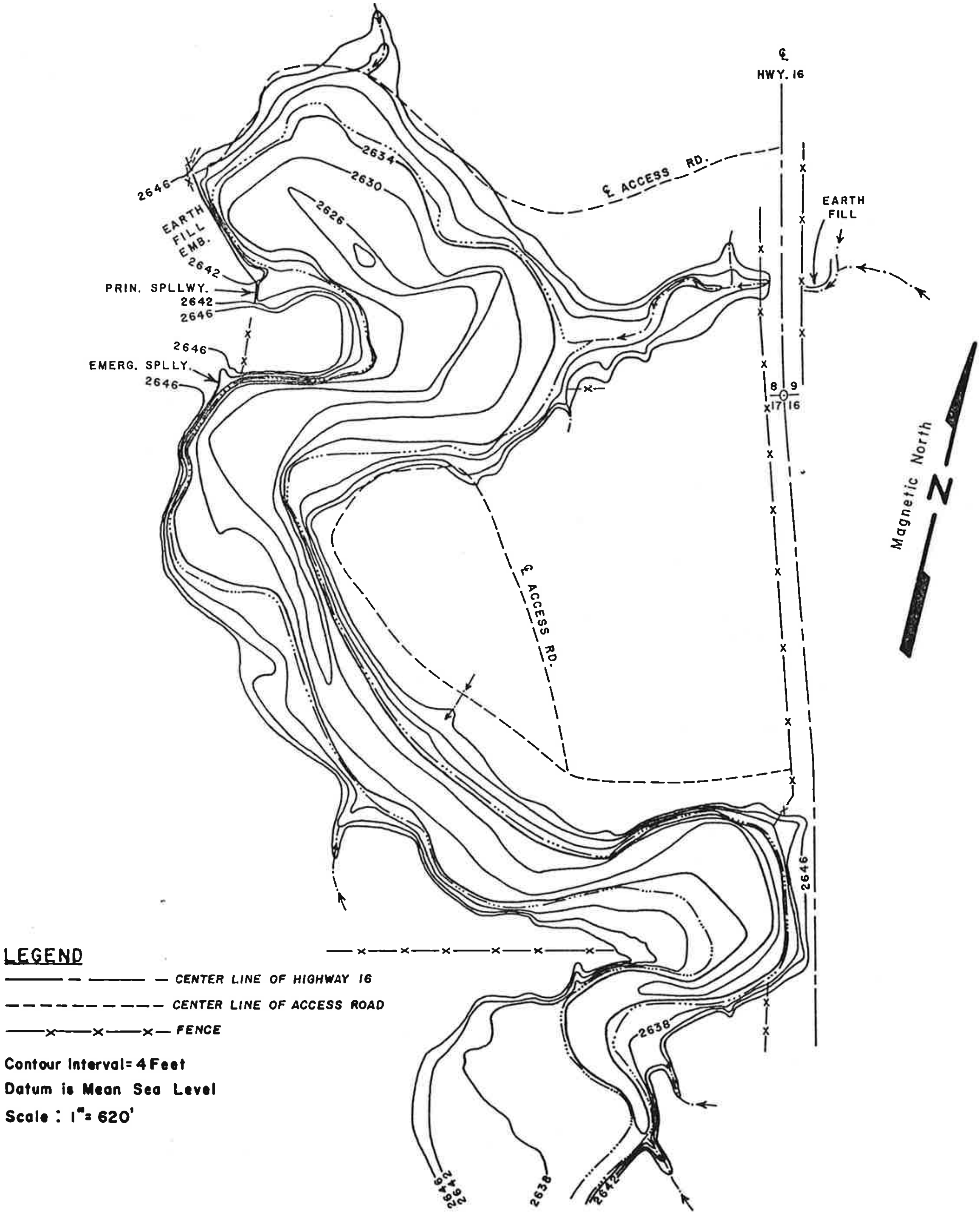
Seepage out of the south abutment of the principal spillway from two PVC pipes is estimated at 20 to 25 gpm. The PVC pipes were installed in 1963 to bleed off water from a coal vein located about 4 feet below the crest elevation of the spillway in the south abutment. Seepage through this coal vein is believed to be the cause for much of the damage to the principal spillway over the years.

The grassed emergency spillway lies in a natural low area between two hills about 400 feet south of the principal spillway. The 148-foot wide emergency spillway has 2H:1V sides. At the emergency spillway crest elevation of 2641.6 msl, the reservoir covers 178 acres and the capacity is 1280 acre-feet.

There are several abandoned cabins adjacent to the reservoir. The cabins have not been in use for quite some time. There is no developed beach area along the reservoir. Two boat ramps are located in the northwest portion of the reservoir adjacent to the embankment. The boat ramps would not be affected by the proposed project.

<u>Dam Design Classification</u>:

Dams are classified according to their potential hazard to property and potential for loss of life, if the dam should suddenly fail. Odland Dam is located in a rural area where there is little probability of future residential development downstream of the dam site. Failure of this dam could result in



SITE TOPOGRAPHY MAP
Figure 2

damage to agricultural land and township roads, however, no loss of life would be expected. Therefore, Odland Dam is considered a low hazard dam. The embankment height is 28 feet, classifying Odland Dam as classification III, according to the North Dakota Dam Design Handbook.

Sedimentation:

The rate of sedimentation in reservoirs is dependent upon the amount of soil eroded from the watershed and transported into the reservoir. There are several factors which determine the amount of sediment that is carried by surface runoff. Among them are soil type, amount of runoff, slope of land, land use and conservation practices used. Also contributing to the sediment accumulation is the organic material that is generated within the reservoir itself.

Sedimentation in the Odland Reservoir could be reduced by examining the watershed to determine land treatment measures which could reduce the erosion rate. Treatment practices include conservation cropping systems, crop residue use, stubble mulching, strip cropping, contour plowing, grassed waterways, windbreaks and buffers, and sediment catching ponds.

There is limited data available on the total sediment accumulation in the Odland Reservoir. An original topographic map of the reservoir area is not available and no sedimentation surveys of the reservoir have been completed. Locals have indicated that over the years sediment accumulations have been substantial.

Water Quality:

Water quality data for Odland Reservoir is limited. State Health Department water samples taken in February of 1985, and March of 1986, show high nutrient concentrations. Phosphorus concentrations are especially high. These high concentrations are attributed to three sources: releases from the existing sediment due to wave action, agricultural non-point source runoff, and the City of Beach's wastewater treatment facility.

Odland Reservoir is currently hypereutrophic. Draining the lake and excavating sediment, as proposed in this report, would tend to decrease phosphorus concentrations and improve the current oxygen depletion in the lake. Implementation of agricultural best management practices throughout the Odland Dam watershed would further improve overall water quality. A substantial upgrading of Beach's wastewater treatment plant to include nutrient removal or total containment would be desirable. Any methods used to improve the water quality would improve the recreational value of the reservoir.

Fish Life:

The existing condition of Odland Reservoir prohibits the sustainment of fish life. Winter kill resulting from shallow water depths and low dissolved oxygen levels due to the oxygen demand of the lake sediment make sustainment of fish life impossible. The enhancement of the reservoir, as proposed in this report, would not produce habitat capable of sustaining fish life.

Groundwater:

When the reservoir is drained, the water table in the reservoir area would be lowered to a level where it would reach an equilibrium with the lower natural water table of adjacent areas. The natural groundwater conditions in the area adjacent to the reservoir will determine the complexity of the excavation work required. Groundwater inflow to the reservoir, either directly or from springs discharging into the upstream channel, could significantly increase the amount of dewatering required to allow for excavation of the reservoir bottom.

There are no wells in the immediate reservoir area that would give information on groundwater levels. The absence of standing water in low areas above and below the dam site would seem to indicate a low groundwater table. A low water table would reduce the time required to dry out the reservoir bottom and could reduce costs associated with excavating wet material. Using available information, it is difficult to predict the amount of time which will be required to adequately dry out the reservoir bottom to allow for excavation. The time required to adequately dry out the reservoir before excavation can begin is estimated at several months to several years.

DESCRIPTION OF PROJECT

Breaching The Embankment:

The first phase of the project would consist of breaching the embankment and allowing the reservoir area to drain and dry out. This could be done immediately following the spring runoff. Depending on the level of the reservoir, it may be necessary to siphon or pump the level of the reservoir down a few feet prior to breaching the embankment. Lowering the reservoir level prior to breaching the embankment would reduce the risk of damaging downstream areas.

An alternative to siphoning or pumping would be to excavate a notch in the downstream half of the embankment, install a gated culvert, back fill around the culvert, and excavate the upstream side of the embankment allowing the reservoir to drain through the culvert at an orderly rate. The controlled releases through the culvert would help prevent downstream erosion and decrease the sediment load of the released flows. Simply breaching the embankment would provide less control over the releases and could result in downstream flooding, erosion, and sedimentation problems. After the reservoir is drained, the culvert would be removed and the embankment would remain breached while the reservoir bed is drying out. Riprap would be required to provide erosion protection to the breached section of the embankment.

Regardless of the method of breaching the embankment, a slow initial drawdown rate is necessary to prevent slope failure of the embankment. Removing water from the reservoir faster than the pore water pressures in the embankment can dissipate, could cause slope failure. Drawdown should be less than .3 feet per day while the water surface is between the maximum water level and mid-height of the dam.

The current embankment is in good structural condition. However, there is a seep located near the middle of the embankment. Seepage has occurred in this area for many years. The exact location of the seep is not known because it is hidden beneath the rock riprap spread on the downstream slope of the embankment. Before breaching the embankment, the riprap should be cleared away to better pinpoint the location of the seep. The embankment should be breached at the seep location. After the excavation is completed, the repair of the breached embankment should eliminate the seepage in this area.

A channel, with a maximum depth of approximately 4 feet, would be required upstream and downstream of the embankment to provide adequate drainage of the reservoir through the breach. The channel would need to extend approximately 100 feet both on the upstream and downstream side of the embankment.

After the reservoir is drained and dried, the bottom sediment can be expected to consolidate 20 to 30 percent. Depending on the depth of sediment, areas within the reservoir could be lowered as much as 2 feet due to consolidation alone. Before excavation begins, the reservoir bottom should be re-surveyed and excavation quantities determined.

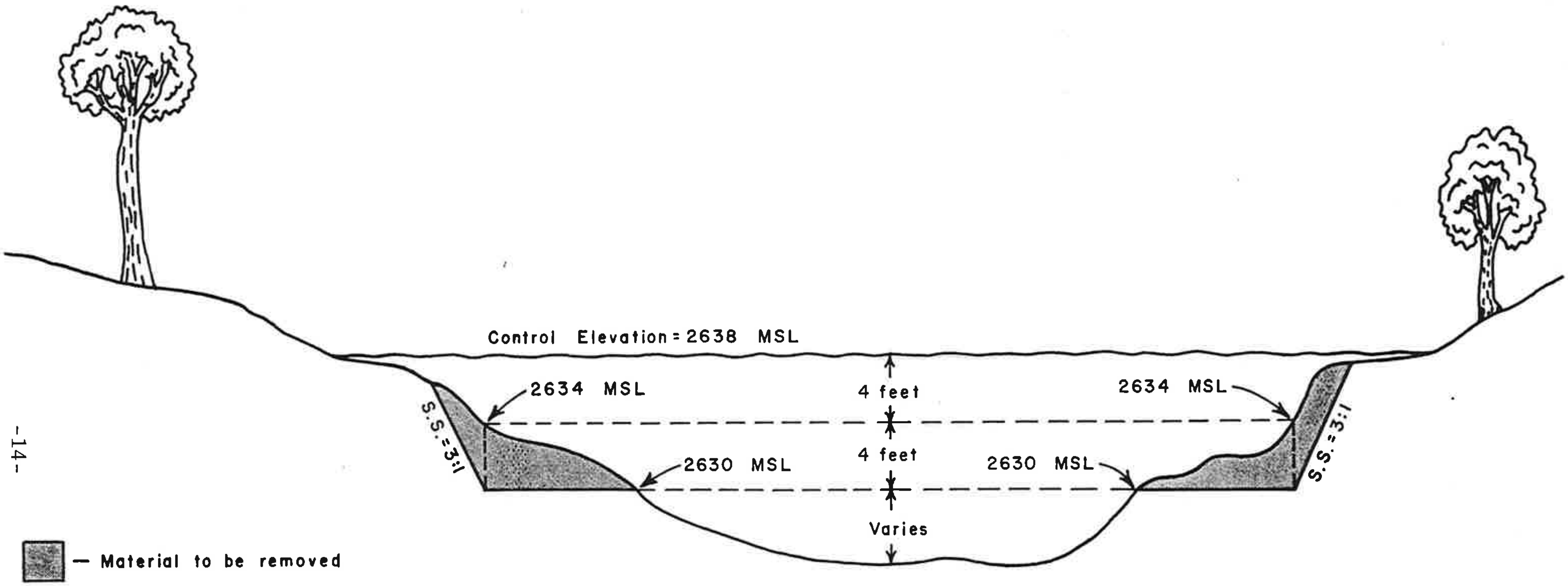
<u>Excavation</u>:

The excavation would involve the operation of earth moving equipment directly on the dewatered reservoir bottom. If the reservoir is drained in the spring of the year, sediment could be excavated in the fall, if it has dried out enough. If the reservoir bottom is still in a saturated condition, the sediment could be excavated after it freezes or the reservoir bed could be allowed to dry out another year. Some water may be retained within lower areas of the reservoir during the period that excavation is taking place.

Figure 3 shows a typical cross-section of the reservoir bottom and the material which would be removed. As Figure 3 illustrates, all material between elevations 2630 and 2634 msl will be excavated from the reservoir bottom. All areas currently 4 feet deep will be 8 feet deep, as measured from the control elevation of 2638 msl. The slope adjacent to the excavated reservoir bottom will be constructed at a slope of 3H:1V.

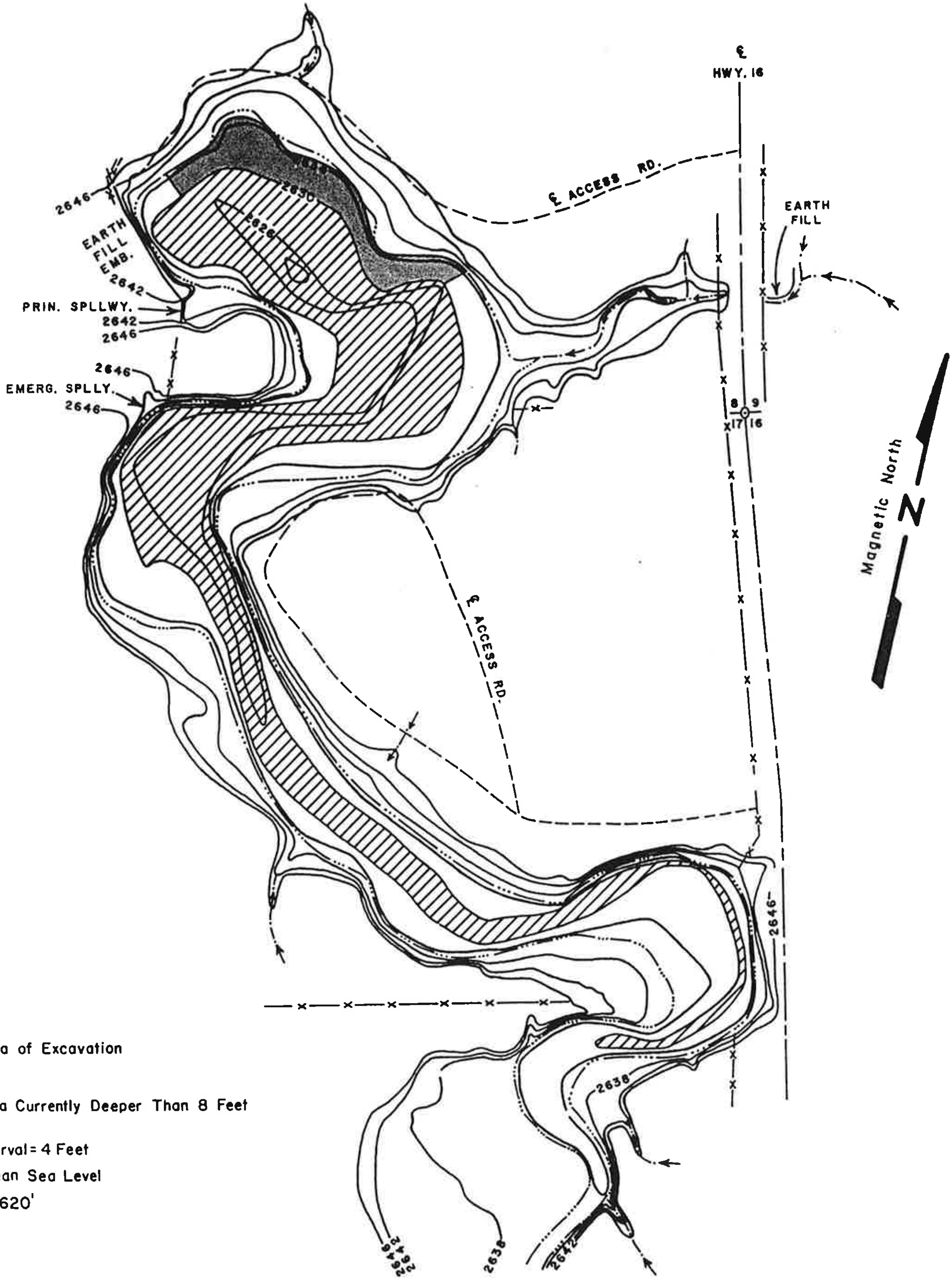
Four alternative plans for restoring the lake have been studied. The four alternatives consider excavation of different portions of the reservoir bottom. Figures 4, 5, 6, and 7, show those areas of the reservoir which would be deepened for Alternatives 1, 2, 3, and 4, respectively. As the figures show, there will be no excavation in the immediate area around the embankment and the principal spillway. There currently are seepage problems in these areas and excavation in the immediate vicinity may worsen the existing problem.

Alternative 1 involves the removal of sediment beginning adjacent to the boat ramps near the north embankment and extending approximately 1,700 feet along the northern portion of the reservoir (Figure 4). The amount of material removed would be 18,000 cubic yards. The reservoir capacity would be increased 11.2 acre-feet. The average depth of the reservoir would be increased 2 percent from 5.5 feet to 5.6 feet. The portion of the reservoir at least 8 feet deep



TYPICAL CROSS-SECTION

Figure 3



LEGEND

— Area of Excavation

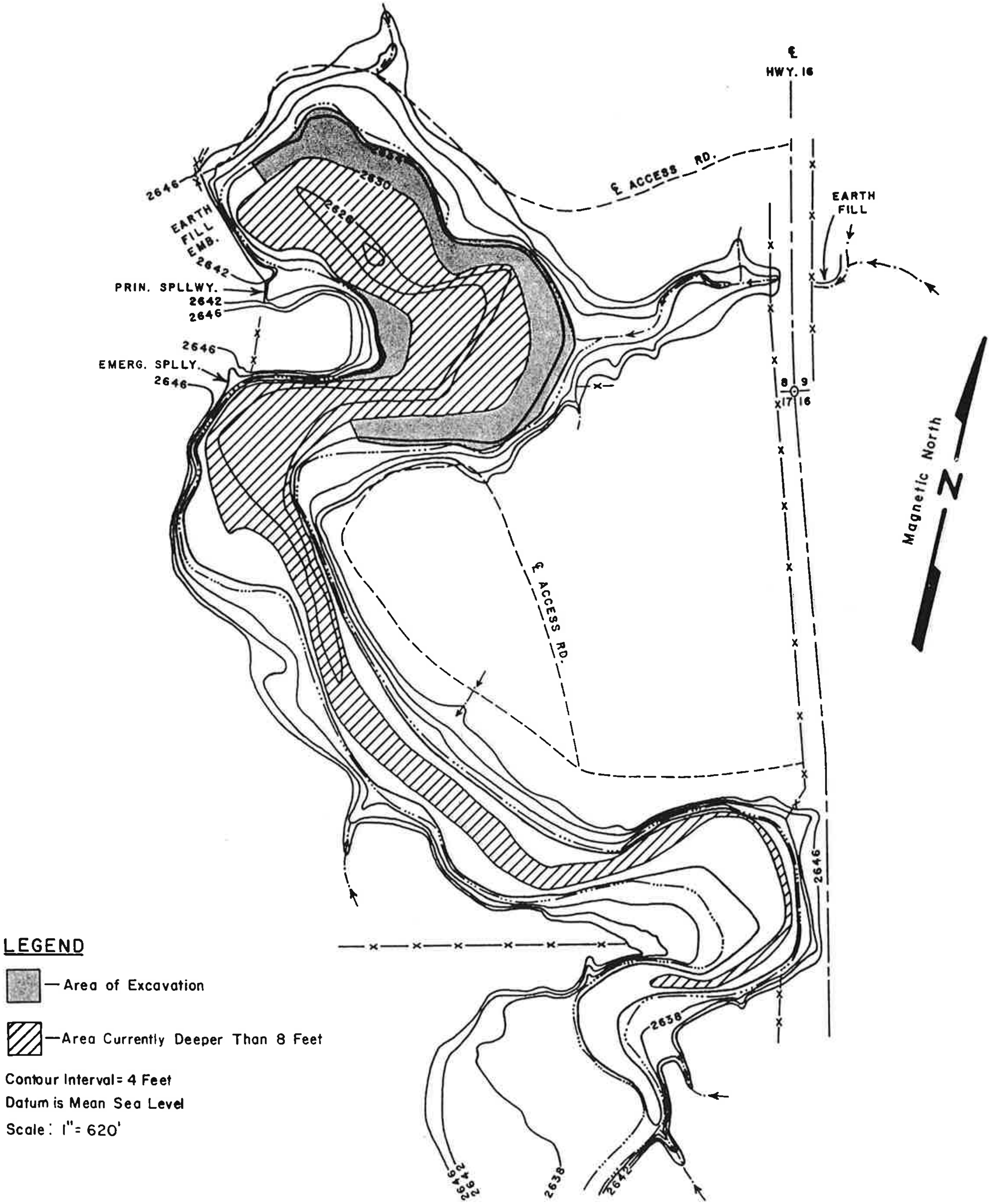
—Area Currently Deeper Than 8 Feet

Contour Interval = 4 Feet

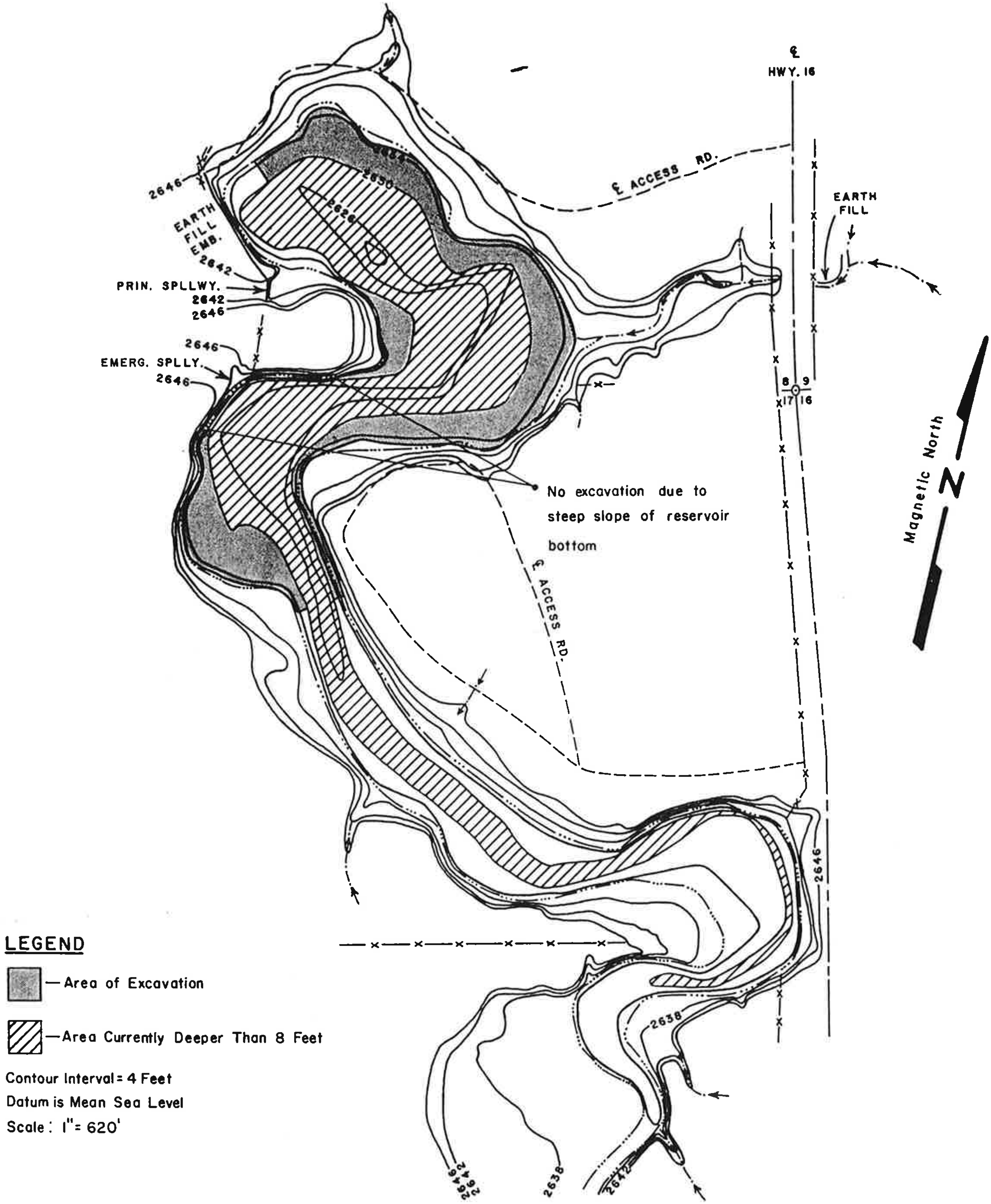
Datum is Mean Sea Level

Scale: 1" = 620'

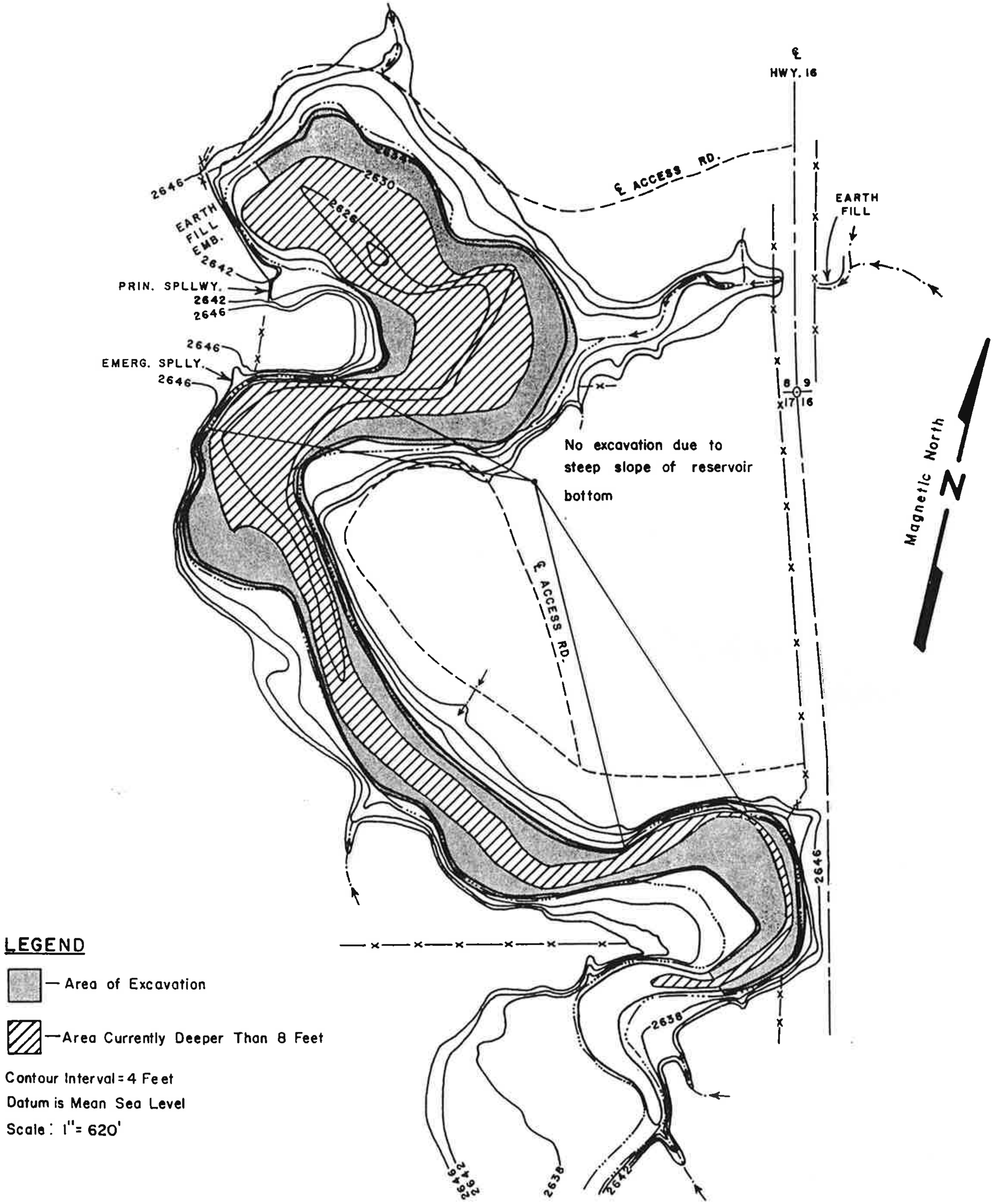
ALTERNATIVE I
Figure 4



ALTERNATIVE 2
Figure 5



ALTERNATIVE 3
Figure 6



ALTERNATIVE 4
Figure 7

would be increased by 13 percent from 36.8 acres (existing conditions) to 41.4 acres.

Alternative 2 would include the removal of sediment from the same area as Alternative 1 and an additional 1,650-foot strip along the eastern edge and an 850-foot strip along the western portion of the reservoir (Figure 5). A total of 41,900 cubic yards of material would be removed adding 25.9 acre-feet to the capacity of the reservoir. The average depth of the reservoir would be increased 4 percent to 5.7 feet. The area of the reservoir at least 8 feet deep would be increased 29 percent to 47.5 acres.

Alternative 3 includes removing sediment from the area covered in Alternative 2 and an additional 1000 feet on the east side and 1,800 feet on the west side of the reservoir (Figure 6). A total of 68,900 cubic yards of material would be removed. Alternative 3 would add 42.7 acre-feet (6 percent increase) to the capacity of the Odland Reservoir. The average depth of the reservoir would be increased from 5.5 feet to 5.8 feet. The reservoir area at least 8 feet deep would be increased by 41 percent to 51.8 acres.

The final alternative considered, Alternative 4, includes the removal of sediment from the area mentioned in Alternative 3 and an additional 3,860 feet along the southwest side and two strips of 1,253 feet and 2,080 feet along the northeast side of the reservoir (Figure 7). A total of 124,900 cubic yards of material would be removed adding 77.4 acre-feet to the capacity of the reservoir. The average depth of the reservoir would be increased by 11 percent from 5.5 to 6.1 feet. The area of the reservoir at least 8 feet deep would be increased 76 percent from 36.8 acres to 64.8 acres.

The increase in capacity values given above do not represent any increases attributable to sediment consolidation. An increase in depth of 20 to 30 percent of the sediment depth can be expected. Since sediment depths in the reservoir are not known and no sedimentation data exists, an estimation of capacity increase due to sediment consolidation can not be made.

As shown on Figures 6 and 7, portions of the reservoir bottom between elevations 2634 and 2630 msl will not be excavated due to the steep slope of the reservoir bottom in these areas. Excavation of the steeply sloped areas would be difficult and there would be little gain in 8 feet deep reservoir area at the locations shown.

The excavated sediment material would be deposited in areas adjacent to the reservoir. The exact locations of the disposal sites will have to be determined through negotiations with area landowners if the project is pursued. The closer the disposal sites are to the reservoir the less expensive it will be to transport the sediment material. Haul distances to the disposal sites should be less than 10,000 feet.

Cost Estimate:

The construction contract for the project should be broken up into two separate contracts: 1. draining the reservoir and 2. excavation of the reservoir material, which would including the repair of the embankment. The draining of the reservoir should be completed prior to advertising for bids for the excavation contract. This would allow contractors to view the reservoir bottom before submitting their bids.

Table 1 is a cost estimate for "draining the reservoir" and "restoring embankment". Table 2 includes cost estimates for each of the four alternatives.

TABLE 1 - COST ESTIMATE

Draining the Reservoir

Item	Quantity	Unit	Unit Cost	Cost
Site Preparation		LS	$	$ 500
Reservoir Drawdown*		LS		5,000
Embankment Excavation	1700	CY	1.50	2,600
Channel Excavation	200	CY	1.50	300
Rock Riprap	80	CY	27.00	2,200
			TOTAL	$10,600

*May not be necessary.

Restoring Embankment

Item	Quantity	Unit	Unit Cost	Cost
Site Preparation		LS	$	$1,000
Restore Embankment (Fill)	2870	CY	1.50	4,300
Channel Fill	100	CY	1.50	200
			TOTAL	$5,500

TABLE 2 - COST ESTIMATE

Alternative 1

Item	Quantity	Unit	Unit Cost	Cost
Draining the Reservoir		LS	$	$10,600
Restoring Embankment		LS		5,500
Reservoir Excavation	18,000	CY	1.20	21,600
Disposal Area Seeding	3	Ac	200.00	600
	Subtotal			$38,300
	20% Engineering and Contingencies			7,700
	TOTAL			$46,000

TABLE 2 - COST ESTIMATE (CONT.)

Alternative 2

Item	Quantity	Unit	Unit Cost	Cost
Draining the Reservoir		LS	$	$10,600
Restoring Embankment		LS		5,500
Reservoir Excavation	42,000	CY	1.20	50,400
Disposal Area Seeding	6	Ac	200.00	1,200
		Subtotal		$67,700
		20% Engineering and Contingencies		13,500
		TOTAL		$81,200

Alternative 3

Item	Quantity	Unit	Unit Cost	Cost
Draining the Reservoir		LS	$	$ 10,600
Restoring Embankment		LS		5,500
Reservoir Excavation	68,900	CY	1.20	82,700
Disposal Area Seeding	10	Ac	200.00	2,000
		Subtotal		$100,800
		20% Engineering and Contingencies		20,200
		TOTAL		$121,000

Alternative 4

Item	Quantity	Unit	Unit Cost	Cost
Draining the Reservoir		LS	$	$ 10,600
Restoring Embankment		LS		5,500
Reservoir Excavation	124,900	CY	1.20	149,900
Disposal Area Seeding	18	Ac	200.00	3,600
		Subtotal		$169,600
		20% Engineering and Contingencies		33,900
		TOTAL		$203,500

The cost estimate for draining the reservoir and restoring the embankment is the same for each of the four alternatives and is estimated at $10,600 and

$5,500, respectively. The estimated cost for Alternative 1 is $46,000, Alternative 2 is $81,200, Alternative 3 is $121,000, and Alternative 4 is $203,500. The cost estimate does not include any cost associated with acquiring land used for disposal sites.

The cost of the project is largely dependent upon fuel costs at the time the contractors submit their bids. Any sharp changes in fuel prices between the date of this report and the time bids are submitted could cause a significant difference between the cost estimate and actual bid prices.

Funding alternatives for a project of this nature are limited. One alternative is to apply for a lake restoration grant from the Environmental Protection Agency (EPA). Funding through the EPA is possible under a program known as "Restoration of Publicly Owned Freshwater Lakes," as authorized by Section 314 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500). This program could provide up to 50 percent of eligible costs. The program has strict requirements which include a comprehensive watershed restoration plan and extensive water quality data for Odland Reservoir for a minimum of one year. Pursuing funding under this program would require assistance from the North Dakota State Health Department.

The Golden Valley County Water Resource Board may request the State Water Commission to cost participate in the project. The State Water Commission may cost particpate if it is found the increase in recreational value resulting from the project outweighs the cost. Other possible sources of funding include the North Dakota State Parks and Recreation Department, the North Dakota Game and Fish Department or the Land and Water Conservation Fund.

ENVIRONMENTAL ASSESSMENT

The project would have minimal environmental impacts. The areas impacted would include the reservoir area and the disposal sites. The placement of sediment in the disposal areas may convert non-productive farmland into productive agricultural areas. There should be an increase in recreational activity and there may be an increase in residential development near the reservoir.

There would be less downstream flood protection provided while the dam is breached. The proposed project would have no affect on downstream flood flows when it is completed. The exposure of the reservoir to overland runoff should not create a problem with erosion and subsequent sediment deposition downstream. Local changes in air quality and noise levels would be noticeable during the construction phase of the project. The project would not increase the wildlife value of the reservoir.

If the project is pursued, the State Historical Society should be contacted concerning any historical, archaeological or cultural resources that may be affected.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In recent years there has been a continued interest in increasing the recreational value of the Odland Reservoir. In its present condition, the Odland Reservoir offers limited recreational value due to shallow water depths. To improve boating conditions, the Golden Valley County Water Resource Board requested the State Water Commission to investigate the feasibility of excavating the Odland Reservoir area, such that, any area presently more than 4 feet deep would be at least 8 feet deep.

The Odland Reservoir has a surface area of 132 acres and a capacity of 722 acre-feet. The maximum depth is 17 feet and the average depth is 5.5 feet. The embankment is 28 feet high and 690 feet long. The 100-foot wide principal spillway consists of an approach channel, rubble masonry weir with a chute structure, and a plunge pool. Since its construction in 1936, the spillway has required extensive repairs. Seepage occurs near the center of the embankment and on the south abutment of the principal spillway. The grassed emergency spillway lies about 400 feet to the south of the principal spillway.

Little data exists on sediment accumulations in the Odland Reservoir. Sediment depths probably range from 0 to 6 feet. The reservoir sediment can be expected to consolidate 20 to 30 percent when dried. The poor water quality of the reservoir would improve slightly as a result of the proposed project, however, additional steps could be taken to further improve overall water quality. Under both existing and proposed conditions, the reservoir would be unable to support fish life. Groundwater levels surrounding the reservoir appear to be low, therefore, after the reservoir is drained the bottom should dry sufficiently to allow for excavation.

The first phase of the project would consist of breaching the embankment and allowing the reservoir to drain. Several different methods of breaching the embankment are acceptable depending on the level of the reservoir at the time of drawdown. Regardless of the method used, a slow initial drawdown rate is necessary to prevent slope failure. The embankment should be breached at the seep location. When the embankment is restored the seepage should be eliminated.

Excavation may begin once the reservoir bottom has dried sufficiently to allow for the operation of earth moving equipment. Four excavation alternatives have been considered. The area of the reservoir, at least 8 feet deep, would be increased from 36.8 acres under existing conditions to 41.4 acres, 47.5 acres, 51.8 acres, and 64.8 acres for Alternatives 1, 2, 3, and 4, respectively. Disposal areas should be located as close to the reservoir as possible. The cost estimate for Alternatives 1, 2, 3, and 4, are $46,000, $81,200, $121,000 and $203,500, respectively. Funding assistance may be possible through the Environmental Protection Agency, the State Water Commission, the State Parks and Recreation Department, the State Game and Fish Department or the Land and Water Conservation Fund. The project would have minimal environmental impacts.

The project is feasible from a technical standpoint and would provide a improved recreational reservoir in Golden Valley County. Justification for the project is questionable when comparing project costs to the limited increase in recreational value of the reservoir. The decision to proceed with the project must be made by the Golden Valley County Water Resource Board.

APPENDIX A

Investigation Agreement

SWC Project #394
June, 1985

A G R E E M E N T

Investigation of Odland Dam

I. Parties

This agreement is between the North Dakota State Water Commission, hereinafter referred to as the Commission, acting through the State Engineer, Vernon Fahy; and the Golden Valley County Water Resource Board, acting through its Chairman, Orville Moe.

II. Project, Location, and Purpose

The Board wishes to increase the depth of Odland Dam, located in Section 8, Township 141 North, Range 105 West, in Golden Valley County, North Dakota. In order to improve conditions for boating, the Board wishes to excavate the reservoir behind Odland Dam such that any area presently more than four feet deep will be at least eight feet deep (measured from the control elevation of the reservoir).

III. Preliminary Investigation

The parties agree that further information is necessary concerning the quantity of material to be excavated, the cost of excavation, and alternative ways of increasing the depth. Therefore, the Commission shall do the following:

1. conduct field surveys, including reservoir soundings, to determine the quantity of material to be excavated;
2. develop a preliminary cost estimate for the project;
3. consider alternative methods of increasing the reservoir depth;
4. prepare a preliminary engineering report containing the results of this study.

IV. Deposit - Refund

The Board shall deposit a total of $1500 with the Commission to partially defray the costs of the investigation. Upon receipt of a request from the Board to not proceed farther with the preliminary investigation or upon a breach of this agreement by any of the parties, the Commission shall provide the Board with a statement of all expenses incurred in the investigation and shall refund to the Board any unexpended funds.

V. Rights-of-Entry

The Board agrees to obtain written permission from any affected landowners for field investigations by the Commission which are required for the preliminary investigation.

VI. Indemnification

The Board hereby accepts responsibility for and holds the Commission free from all claims and damages to all public and private properties, rights on persons arising out of this investigation. In the event a suit is initiated or judgement rendered against the Commission, the Board shall indemnify it for any judgement arrived at or judgement satisfied.

VII. Changes to the Agreement

Changes to any contractual provisions herein will not be effective or binding unless such changes are made in writing, signed by both parties, and attached hereto.

NORTH DAKOTA STATE WATER COMMISSION By:	GOLDEN VALLEY COUNTY WATER RESOURCE BOARD By:
Vernon Fahy VERNON FAHY State Engineer	Orville R. Moe ORVILLE MOE Chairman
DATE: July 9, 1985	DATE: 7-22-85
WITNESS: Sharon Locken	WITNESS: Allen Kunick