

No. 1470-3

Water Division No. 3 MINNESOTA RIVER DISTRICT
(Blanks to be filled by the Engineer for the W. B. C.)

DEC 11 1967

STATE WATER RESOURCES COMMISSION
SOUTH DAKOTAVESTED RIGHT
APPLICATION FOR PERMIT

To appropriate Water within the State of South Dakota

(NOTE--Draw a line through items not applicable.)

1. Name of applicant South Dakota Department of Game, Fish and Parks
 Postoffice address Pierre, County Hughes, State South Dakota

II. If a corporation

- (a) Name of same _____
 (b) Date and place of incorporation _____
 (c) Amount of capital stock _____
 (d) Amount paid in _____
 (e) Names and addresses of directors _____

(NOTE--A certified copy of articles of incorporation must accompany the application.)

III. Method of accomplishing the work and financial resources of the applicant:

- (a) Method of accomplishing work (Whether by contract, employment of others, or by direct labor) _____

- (b) Cash on hand, \$ _____ (c) Treasury stock, \$ _____
 (d) Bonds to be issued, \$ _____ (e) Other resources, \$ _____

2. Name of diversion work LAKE OLIVER - DEUEL COUNTY
As required to fill lake to outlet level - approximately 300'
 3. Amount of water claimed acre feet per year cubic feet per second _____
 4. Source of water supply Dry draw _____
 5. Location of point of diversion NE 1/4 SEC 32, T 115 N, R 47 W
No visible sign _____ on _____ bank DEUEL County.

6. Annual period or periods during which water is to be used continuously _____
 7. To be used for:

I. Irrigation or domestic use: Gravity, overhead sprinkling or combination system? _____

- (a) Number of acres to be irrigated _____ acres.

(b) Legal subdivisions to be irrigated _____

(NOTE--A list of lands to be irrigated, giving each subdivision and fraction with acreage thereof, should be written here, or may be appended as a part of this application. Same must also be shown on accompanying map.)

- (c) Statement as to domestic use (giving location, etc.) To the ordinary high water mark of the inundated portion of Sec. 33, T 114, R 47

II. Stockwatering, mining, milling, power, fish culture, fire protection and public recreation:

- (a) Nature of use public recreational purposes
 Name any of the above uses claimed _____
 (b) Amount of power to be generated _____ horse power.
 Amount claimed for engine cooling _____
 (c) Location of plant _____
 (d) Method of developing power _____
 (e) Point where water will be returned to stream _____

8. Estimated cost of work:

(a) Head Gates, \$ (b) Pumping plant, \$
 (c) Fluming, \$ (d) Canal-earth, \$ Rock, \$
 (e) Other structures \$ Total, \$

9. Description of diversion works:

I. Nature of works: (Reservoir, dam, ditch, flume, pumping plant, etc.)

II. Dimensions of works. m Information requested not applicable. Lake Oliver is a
 (a) Dam: Height feet; length at bottom feet; length at top feet; thickness at bottom feet; thickness at top feet; slope at front water face; slope at back face
 material used in construction

(b) Reservoir: Capacity when filled 440 acres feet. Surface area at highwater mark 100 acres.

DEPTH AT OUTLET-Feet	SURFACE AREA AT EACH DEPTH AT OUTLET--ACRES	ACRE-Feet CAPACITY

(c)* Head gate: Width feet; height feet;
 Material

(d) Canal: Total length miles.

LOCATION BELOW HEADGATE	DEPTH	BOTTOM WIDTH	WIDTH AT WATER-LINE	GRADE PER MILE
At Mile	 feet	 feet	 feet	 feet
At Mile	 feet	 feet	 feet	 feet
At Mile	 feet	 feet	 feet	 feet
At Mile	 feet	 feet	 feet	 feet
At Mile	 feet	 feet	 feet	 feet
At Mile	 feet	 feet	 feet	 feet

(Give dimensions where reductions in size are made.)

10. Time required for completion of work years.

11. Time required for complete application of water to the proposed beneficial use years.

12. Choice of newspaper for publication of notice of intention to appropriate

STATE OF SOUTH DAKOTA }
 County of Hughes ss.

I, ~~XXXXXX~~ B. A. Hodgins, being first duly sworn on my oath depose and say: That my relation to the above described undertaking is that of owner, that I have read the above foregoing statement, examined the map accompanying the same, and that I know of my own personal knowledge that the matters therein stated and shown are true.

Signed *B. A. Hodgins*

Subscribed and sworn to before me this 8th day of December 1967..

Notary Public
 Notary Public (or other qualified officer.)

*Each diversion must have a headgate or measuring device.

H. E. Bowers, Notary Public
 My Commission Expires

Remarks by State Water Resources Commission:

"VESTED RIGHT" CLAIMED

STATE OF SOUTH DAKOTA
County of HUGHES

Pierre, South Dakota, FEBRUARY 7, 1968

This is to certify that the foregoing application was received by the Commission at 10:15 o'clock
a.m. upon the 11TH day of DECEMBER, 1967

State Water Resources Commission

By:

Auston Jones
Chief Engineer, Executive Officer

Number of permit 1470-3

Date of first receipt of application DECEMBER 11, 1967

Date of return to applicant for correction, amendments or changes required as follows: _____, 19____

Date of receipt of corrected application _____, 19____

Date from which applicant may claim right 1889, 19____

Approved JANUARY 10 1968, Recorded in Book 10 Page 7676

This is to certify that we have examined the foregoing application for a permit to appropriate water of the State of South Dakota, and we hereby grant the same as stated herein, subject, however, to the following limitations and conditions:

1st. The equivalent of at least one-fifth of the work above specified is ~~to be~~ completed ~~on or before~~ _____

2nd. The whole of said work is ~~to be~~ completed ~~on or before~~ _____

3rd. The limit of time for proof of beneficial use of water appropriated in accordance herewith is

COMPLETED

4th. The water appropriated shall be used for the purpose of PUBLIC RECREATION

5th. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be injuriously affected by this appropriation.

6th. The amount of the appropriation herein granted shall not exceed 300 ACRES FEET ANNUALLY
~~on the first day of the year; neither shall it exceed the capacity of the above described system of diversion works, nor the least amount of water that experience may hereafter indicate as necessary for the production of crops, nor the amount of the best husbandry, and further, said appropriation shall be limited to not more than one acre-foot (1,000,000) of water per second of time for each acre of land to which water is actually~~
USED FOR PUBLIC RECREATION was

and beneficially ~~used for irrigation~~ on or before JUNE 30, 1965, said water to be used during the following described annual period:

CONTINUOUSLY

Witness my hand this 7TH day of FEBRUARY, 1968

State Water Resources Commission

By:

Auston Jones
Chief Engineer, Executive Officer

Certificate of Construction issued FEBRUARY 7, 1968

Water License issued FEBRUARY 7, 1968

Permit No. 1470-3

Water Division No. 3 MINNESOTA RIVER Water District

Certificate of Completion of Works

TO ALL WHOM IT MAY CONCERN:

This is to Certify, That the Department of Game, Fish and Parks

of Pierre, County of Hughes, and State of South Dakota, the holder Vested Right of Permit No. 1470-3 issued upon Application

No. 1470-3, bearing date of priority of 1889, authorizing the diversion of 300 acre feet annually out of the waters of dry draws

County of Deuel, State of South Dakota, at a point in the NE 1/4, Section 32, T115N, R47W

for public recreation

purposes, has fully complied with the provisions of the laws of the State of South Dakota relating to proof of ~~completion~~ recognized as of the works of diversion set out and described in said Permit; that said works are ~~found in~~ 300 acre feet annually satisfactory condition for diverting and conveying to the place of intended use ~~with~~ for

per second of water; and that the ~~works proposed to be installed by the~~ use of said water are described as follows, to-wit: to be used in place for public recreation

Witness my hand this 7th day of February, A. D. 1966.

State Water Resources Commission

By:

J.W. GRIMES
Chief Engineer, Executive Officer

STATE OF SOUTH DAKOTA

WATER LICENSE No. 1470-3

WHEREAS, On the 11th day of December A. D. 1967
 the Department of Game, Fish and Parks
 of Pierre County of Hughes and State of
South Dakota duly made application (No. 1470-3) to us for a Vested Right permit to use 300 acre feet
annually of the waters of dry draws
 County of Deuel, State of South Dakota, for public recreation
 purposes; and

WHEREAS, On the 7th day of February A. D. 1968
Vested Right
 Permit No. 1470-3 was issued to said applicant for the diversion of said water, recognizing
 completion of the works of diversion therein described XXXXXX
XXXXXX and for the application to beneficial use of said
 water XXXXXX
 and, XXXXXX

WHEREAS, On the 11th day of December A. D. 1967
 the holder of said permit duly made proof of the completion of adequate works for the diversion of 300 acre
feet annually of said waters, as evidenced by our Certificate No. 1470-3
 dated February 7, 1968 confirming the completion of works of sufficient capacity for
 diverting and conveying to the place of intended use 300 acre feet annually
 priority of 1889 and,

WHEREAS, On the 11th day of December A. D. 1967
 proof was duly made of the application to beneficial use of 300 acre feet annually
to be used in place for public recreation purposes of said water;

NOW, THEREFORE, By the virtue of the authority vested in us by the laws of the State of South Dakota,
We hereby grant and confirm to the Department of Game, Fish and Parks
of Pierre the holder and owner of said Vested Right permit No. 1470-3
a water right, dating from 1889 to the use of 300 acre feet annually
~~water~~ of the waters of dry draws
in the County of Deuel and State of South Dakota, or so much thereof as may be
necessary for the purposes hereinbelow mentioned, to be diverted at a point in the NE 1/4
Section 32, T115N, R47W
and ~~water~~ stored in place

for the purpose of public recreation, subject to any limitations listed in
the Permit to Appropriate Water, and

subject, however, to the laws of the State of South Dakota applicable to a license for the use of the waters of the State, and subject, also to the local or community customs, rules and regulations which have been or may be adopted from time to time by a majority of the users from a common source of supply, canal or lateral from which such water may be taken, when such rules and regulations have for their object the economical use of such water.

WITNESS, My hand and seal of our office at Pierre, South Dakota,
this 7th day of February A. D. Nineteen
Hundred and Sixty-eight

State Water Resources Commission

By:

J. W. GRIMES
Chief Engineer, Executive Officer

Location No.

Water Division No. Water District

Proof of Application of Water to Beneficial Use

PETITION OF HOLDER

Ques. 1. State your name, residence, occupation and postoffice address.

Ans. South Dakota Department of Game, Fish and Parks, Pierre, S. Dak.

Ques. 2. If acting in behalf of a corporation, state its name, principal place of business (if a foreign corporation, give name and postoffice of statutory agent,) your position with reference to same, and your authority for appearing in its behalf.

Ans.

Ques. 3. State date of posting and date of recording notice of appropriation.

Ans.

Ques. 4. State source of water supply and give exact location of point of diversion.

Ans. Dry draw - no visable sign

Ques. 5. Describe your works of diversion giving length and height of each dam and state amount of water they are capable of conveyin; from point of diversion to place of use, and give name of canal or ditch or other works by which water is conducted to such place of use, and date of completion of same.

Ans. A meandered lake - depth 11 feet - 100 acres

Ques. 6. State for what purpose water is used and describe place of use. (If for irrigation, name each subdivision in which used, and number of acres in each subdivision that have ACTUALLY been irrigated with said water.)

Ans. Fish and wildlife propagation, conservation and recreation

Ques. 7. If for other than irrigation purpose, state how applied, amount of horse power generated, etc.

Ans. Used in place in lake or reservoir

Ques. 8. What is the minimum amount of water required for the use specified above?

Ans. As required to fill lake to outlet level - approximately 300 acre feet per year

Ques. 9. If you are not the person or representative of the corporation to whom above mentioned permit was originally issued, please state how ownership was acquired by present holder.

Ans.

Ques. 10. State when, how, in what amount and to what extent, the water diverted under above mentioned permit has been used.

A 13. A meandered lake. Used by the public for uses specified except for
that amount lost by evaporation and seepage

(Sign)

R. A. Hodgins

I hereby certify that the foregoing testimony was read to the above subscriber before its signing, that I believe him to be the person he represents himself to be, and that said testimony was subscribed and sworn to before me, at my office in Pierre, County of Hughes

State of South Dakota, on this 8th day of December A. D. 19 67

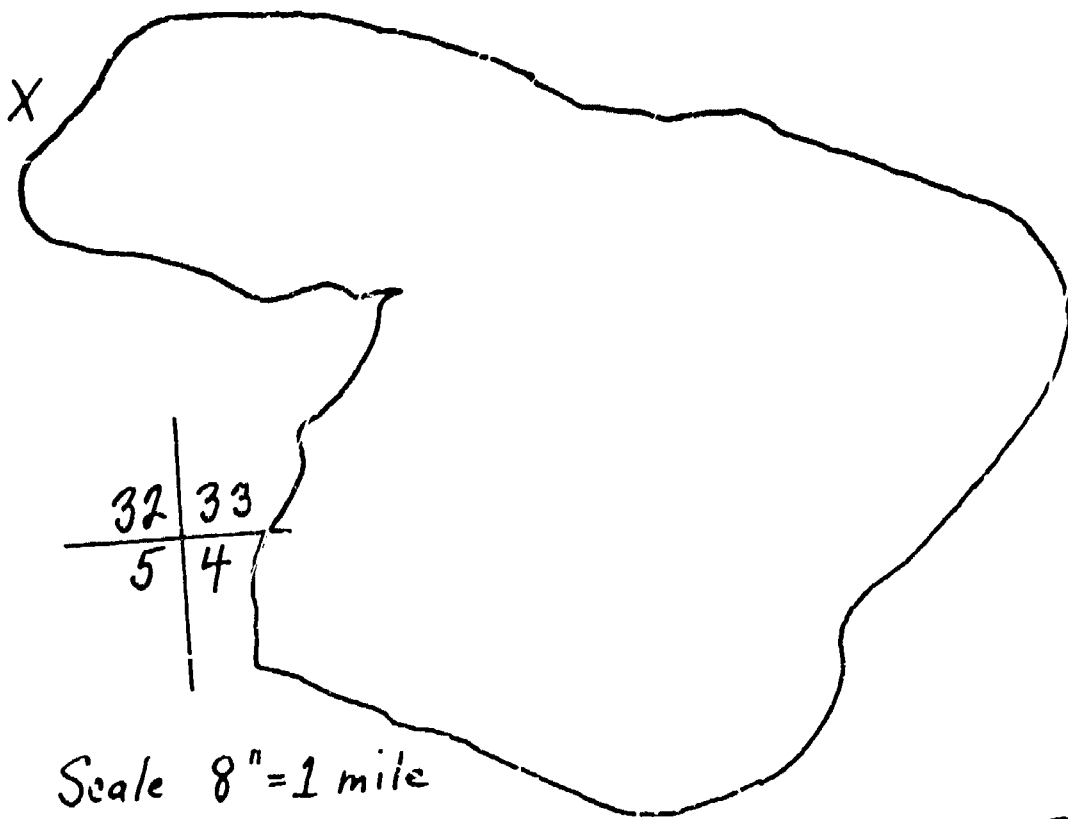
Witnesses.

H. E. Bowers
H. E. Bowers, Notary Public

My Commission Expires July 25, 1970

I, the undersigned, do hereby certify that I am a duly qualified elector residing in the immediate vicinity of the diversion works designated in the foregoing testimony, that I have no interest in the works, water or land above described, that I have read the foregoing testimony and that I know of my own personal knowledge that the matters therein stated are true.

Lake Oliver
Deuel Co.
4,33-114-47



Scale 8"=1 mile

John Popowski
Feb. 2, 1959

Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

September 21, 1988

Richard Beringson, Secretary
Department of Game, Fish and Parks
Anderson Building
445 E Capitol
Pierre SD 57501

Dear Mr. Beringson:

I am writing to notify you that pursuant to the Notice of Intent to Validate Vested Water Right Claims dated June 20, 1988 that I intend to oppose validation of all Department of Game, Fish and Parks Vested Water Right Claims for lakes for the following reasons:

1. Until the outlet elevation for each lake is surveyed and the outlet elevation is set by the Water Management Board.
2. To allow the Vested Water Right Claim to be amended, if necessary, as follows:
 - a) Include the outlet elevation;
 - b) To correct the amount of water claimed;
 - c) To add the qualification that a vested claim is subject where necessary to installation of a concrete outlet structure to assure retention of the outlet as the established elevation; and
 - d) To add any amendments and qualifications necessary to clarify a Vested Right Claim.

Also, that I intend to oppose validation of all Department of Game, Fish and Parks Vested Water Right Claims for dams to allow the Vested Water Right Claim to be amended, if necessary, as follows:

1. To include the spillway elevation;
2. To correct the amount of water claimed; and
3. To add any amendments and qualifications necessary to clarify a Vested Right Claim.

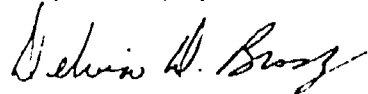


September 21, 1938
Richard Beringson, Secretary
Page 2

We will be working with your staff on these validations. We have already discussed setting outlet elevations before validating claims for lakes. Although the work necessary to complete the validation process will take several years to complete, the results should be of benefit to the public and to your Department. As the work is completed to validate each claim, the claim will be presented to the Water Management Board for validation.

Please advise if you have any questions.

Very truly yours,

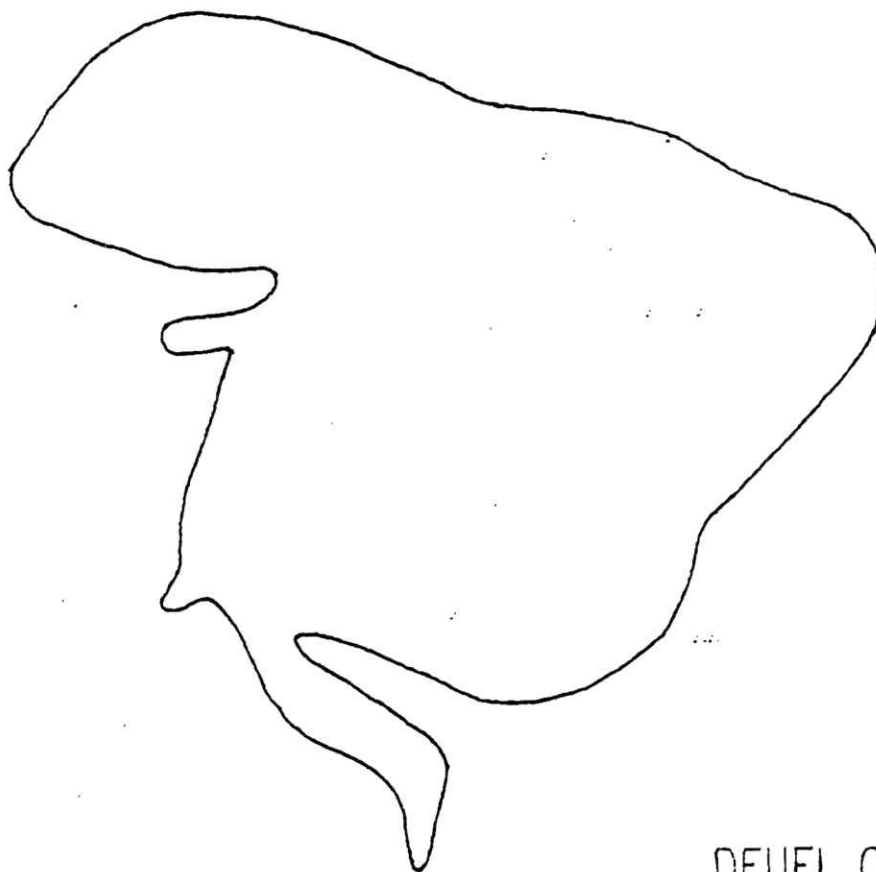


for JOHN HATCH, Chief Engineer
Water Rights Division
605 773-3352

cc: Ron Koth, Department of Game, Fish and Parks

ORDINARY HIGH WATER MARK INVESTIGATION LAKE OLIVER

NOVEMBER 1988



DEUEL COUNTY

DIVISION OF WATER RIGHTS



**Department of
Water & Natural Resources**

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

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ABSTRACT

This report contains the results of an Ordinary High Water Mark (OHWM) investigation on Lake Oliver, Deuel County, as requested by the South Dakota Department of Game, Fish, and Parks. The primary physical evidence involved in determining this OHWM elevation were erosion lines, slope changes, trees found at the upper water level of the lake, and boulder lines.

Based upon the findings of this investigation, the recommended OHWM elevation for Lake Oliver is 1684.3 feet above mean sea level (fmsl) and the recommended outlet elevation is 1683.6 fmsl. The present outlet elevation is 1687.2 fmsl. Establishing the outlet elevation at 1683.6 fmsl. does not authorize the drainage of water from Lake Oliver into Lake Cochrane.

INTRODUCTION

An investigation was conducted to establish the Ordinary High Water Mark (OHWM) on Lake Oliver, Deuel County, at the request of the South Dakota Department of Game, Fish, & Parks. The request was made as a result of Flood Control Permit Application No. 8 submitted by the Deuel County Commission which proposed to partially drain Lake Oliver to alleviate problems associated with high water levels in Lake Oliver. The Water Management Board deferred the application for further investigation at the September 9, 1987 Board Meeting. The OHWM for Lake Oliver needed to be established before any drainage occurred to prevent lowering the lake to abnormal levels and adversely affecting the use of the lake.

When requested, the Water Management Board is required by SDCL 43-17-21 to establish the OHWM on public lakes in South Dakota which are used for public purposes including, but not limited to boating, fishing, swimming, hunting, skating, picnicking and similar recreation pursuits. The OHWM, according to SDCL 43-17-20 (2), is defined in decisions rendered by the courts of this state.

In the case of Anderson v. Ray, 37 S.D. 17, 156 N.W. 591 (1916) the Court wrote:

In the case of freshwater rivers, and lakes in which there is no ebb and flow of the tide, but which are subject to irregular and occasional changes of height, without fixed quantity or time, except that they are periodical, recurring with the wet or dry seasons of the year-high water mark, as a line between the riparian owner and the public, is to be determined by examining the beds and banks, and ascertaining where the presence and action of the water are so common and usual, and so long-continued in all ordinary years, as to mark upon the soil of the bed a character distinct from that of the banks, in respect to vegetation, as well as respects the nature of the soil itself.

In the case of Flisrand v. Madson, 35 S.D. 457, 152 N.W. 796, 800-801 (1915) the court wrote:

Neither high or low water mark means the highest or lowest point reached by the waters of a lake during periods of extreme and continued freshets, or periods of extreme and continued drought, but does mean the high and low points of variation of such waters under ordinary conditions, unaffected by either extreme.

The South Dakota Supreme Court further defined "Ordinary High Water Mark" in the Waubay Lake Case by stating that:

...under ordinary circumstances, the OHWM will be set at the level where there is a distinct mark which evidences erosion and changes in the character of the soil, and destruction of terrestrial vegetation, which have occurred under the

ordinary and continuous conditions of the lake, disregarding periods of extreme and periodic freshets, and disregarding the highest water mark which does not evidence soil and soil changes and destruction of vegetation occasioned under ordinary conditions. If a single distinct mark, occasioned under ordinary circumstances and evidencing all of the factors delineated above does not exist, i.e., there is conflicting evidence of the role of the OHWM, it is the level where significant major, and substantial terrestrial vegetation ends, that the OHWM is to be set. (cites omitted)

INVESTIGATION DATES

Field investigations for the OHWM determination on Lake Oliver were conducted on October 28 & 29, 1987; February 2 & 3, 1988; June 22 & 23, 1988; and September 12, 1988.

ELEVATION REFERENCES

Elevations in this report are referenced to a Department of Water and Natural Resources benchmark. The bench mark is located in the State Park on the north side of Lake Cochrane approximately 1900 feet south and 250 feet east of the northwest corner of Section 4 - T114N - R47W. It is a standard OHWM disc and is set at an elevation of 1686.81 feet above mean sea level (fmsl).

GENERAL INFORMATION

Lake Oliver is located in eastern Deuel County 10 miles east and 2 miles south of the town of Clear Lake. The lake is located in Sections 32 and 33 - T115N - R47W and Section 4 - T114N - R47W. The lake is used for fishing, hunting, and wildlife habitat. At an elevation of 1684 fmsl, the surface area of the lake is 172 acres, the storage capacity is approximately 1500 acre feet, and the maximum depth is 12.5 feet. The present outlet elevation is 1687.2 fmsl and is located on the southern part of the lake in the NW1/4 of the SW1/4 of the SE1/4 of Section 4 - T114N - R47W (See Figure 2). The watershed directly contributing to Lake Oliver is 322 acres (See Figure 2). The drainage basin has a total relief of 86 feet. Figure 3 is a contour map of the bottom of the lake.

MEANDER LINE

A meander line was established on Lake Oliver in 1872 (See Figure 4). The elevation of the meander line varies between 1678 fmsl and 1710 fmsl. It should be noted that the meander line is not a boundary line, but a traverse roughly following the bank or shore of a lake for the purpose of locating the approximate water boundaries. The meander line defines neither the boundaries of the lake nor the extent of the area of land which is owned by the abutting landowner, but is a means of determining the number of acres of land subject to sale.

WATER RIGHTS

Vested Water Right No. 1470-3 authorizes S.D. Department of Game, Fish and Parks to fill Lake Oliver to the outlet elevation annually. Water License No. 1470-3 states Game, Fish, & Parks has the right to the beneficial use of 300 acre feet annually to be stored in place (Lake Oliver) and used for public recreation purposes. The priority date of this vested right claim is 1889.

GEOLOGY

Lake Oliver is a kettle lake which formed during the glaciation periods (Beissel, 1987). As a glacier retreats, thick deposits of sediment are deposited alongside and in front of the glacier. Blocks of stagnant ice may become buried by the sediment. After the ice block melts, a depression or kettle is formed. (Plummer, 1982) Water may then accumulate in the depression forming a lake or slough.

The surficial deposits found within the watershed of Lake Oliver consist mainly of Pleistocene glacial deposits of Late Wisconsin Age. These deposits consist of a heterogeneous mixture of boulders, sand, silt, and clay. The glacial deposits reach a thickness of approximately 600 feet in this area. (Beissel, 1987)

There are two surficial aquifers which exists approximately 1.5 miles north and two miles west of Lake Oliver (Kume, 1985). Neither aquifer extends into the watershed of Lake Oliver. USGS test holes located 1/4 mile to the north of Lake Oliver and one mile southwest of Lake Oliver indicate no surficial aquifer exists within Lake Oliver watershed (Division Well Logs). These factors would indicate the possibility of a hydrologic connection between any aquifer and Lake Oliver is unlikely. Figure 5 shows the location of these aquifers and test holes in comparison to the watershed of Lake Oliver.

Lake Cochrane is also a kettle lake which is located south of Lake Oliver. During the OHWM investigation of Lake Oliver, the water level of Lake Cochrane was lower than the water level of Lake Oliver. Both lakes are also underlain by impermeable glacial deposits. These two factors, differing water levels and being underlain by impermeable glacial deposits, indicate there is not an underground hydrological connection between the two lakes.

HYDROLOGIC FACTORS AFFECTING LAKE OLIVER

There are several factors which might influence the water level of eastern South Dakota lakes and create water level fluctuations on an annual basis. These factors include precipitation, runoff, evaporation, surface water outflow, and groundwater inflow and outflow. All of these factors contribute to the hydrologic budget of a lake. The hydrologic budget of a lake is simply the

difference between inflows and outflows from a lake which will result in increases and decreases in water levels annually.

Precipitation falling directly on the lake is a major source of water for Lake Oliver. The annual average precipitation for this area is 24 inches (Spuhler, 1971). Table 1 and Figure 9 show precipitation amounts over the last 49 years collected at Clear Lake, South Dakota. The amount of annual precipitation will be the largest contributor to Lake Oliver's hydrologic budget.

Another source of water for Lake Oliver is runoff from the lake's 322 acre watershed. The size of Lake Oliver's watershed as compared to the lake's surface area, 172 acres, is small. The drainage area of Lake Oliver will provide limited amount of runoff during normal years and will be a minimal contributor to the hydrologic budget of the lake.

The main source of water outflow from Lake Oliver occurs in the form of evaporation. The average annual lake evaporation for this area is 34 inches (Spuhler, 1971).

Surface water outflows would occur when the lake's water level exceeds the outlet elevation. The current outlet elevation for Lake Oliver is 1687.2 fmsl. There were no indications during the field investigations that the water level of Lake Oliver ever exceeded the outlet elevation of 1687.2 fmsl. Surface water outflow has not occurred at Lake Oliver with the outlet at its current elevation.

Groundwater inflow to a lake and outflow from a lake to an aquifer are other sources of water input and output. Due to the impermeable glacial deposits which underlie Lake Oliver and the absence of a surficial aquifer near the lake, ground water inflow/outflow is assumed to be minimal or nonexistent.

MAN MADE CHANGES

Lake Oliver has experienced abnormally high water levels throughout the 1980's. In an attempt to lower the water level, Deuel County Commission proposed installing a tile drain which would drain water from Lake Oliver to Lake Cochrane. Flood Control Permit Application No. 8, if approved by the Water Management Board, would authorize the construction of this drainage system. This application was deferred by the Water Management Board for further investigation.

One point brought forward by Deuel County Commission was that a natural drainage once connected Lake Oliver and Lake Cochrane. This natural drainage mentioned by the Commission is also the current outlet area for Lake Oliver. They contend the natural drainage was filled when Lake Cochrane shore property was developed. They now want to restore this natural drainage.

There have been two affidavits submitted to the Division of Water Rights in regard to this natural drainage (see Figures 6 and 7). Inez Leshner states she has witnessed water flowing from Lake Cochrane into Lake Oliver. In the early 1950's the drainage was filled and since that time no flow occurred between the lakes. The second affidavit signed by Leslie Bostic states a dam was constructed in the early 1940's on the north side of Lake Cochrane to prevent flooding of hayland north of Lake Cochrane. Before this dam was constructed, Lake Cochrane and Lake Oliver were hydrologically connected.

This added fill in the natural drainage between Lake Oliver and Lake Cochrane has disrupted the historical hydrology of Lake Oliver. The lake will now be more susceptible to abnormally low water levels and abnormally high water levels. The current outlet elevation is 1687.2 fmsl. This higher outlet has prevented an exchange of water between the two lakes during high water levels. This exchange would have allowed high water levels to stabilize at a lower elevation.

Not only has it disrupted Lake Oliver's hydrology but it has also disrupted Lake Cochrane's hydrology. In the Spring of 1973 a outlet structure had to be constructed in the southeast corner of Lake Cochrane. Several lake shore residents were complaining the lake was experiencing abnormal shore erosion due to abnormally high lake water levels. At the time it was thought the Lake Cochrane natural outlet had been artificially increased by the road on the east side of Lake Cochrane. If the natural drainage had not been filled which had existed between the lakes, Lake Cochrane would have drained into Lake Oliver and both lakes would have stabilized at a lower level.

An OHWM was established on Lake Cochrane at an elevation of 1684.3 fmsl at the October 6 and 7, 1981 Water Management Board Meeting. At the same meeting, the Department of Game, Fish, and Parks Water Right No. 1468-3 was clarified to allow the water level at Lake Cochrane to be maintained at an elevation no higher than 1683.6 fmsl. The current outlet elevation for Lake Cochrane is 1682.5 fmsl.

WATER QUALITY

A water quality sample was taken from Lake Oliver on July 8, 1987 by the Department of Water and Natural Resources (See Figure 8). This sample indicates the lake is high in total dissolved solids. Lakes of internal drainage, water bodies that receive insufficient inflow to cause outflow, and lakes that receive little or no groundwater inflow or outflow will be high in total dissolved solids (Kume, 1985).

OHWM INDICATORS

During the field investigations, the primary physical evidence used to determine the OHWM for Lake Oliver were trees found at the upper level of the lake, erosion lines, slope changes, and boulder lines.

Trees, which are the largest and most permanent expression of upland growth, can be used to approximate the maximum water levels of the lake's recent past. Cottonwood, ash, and willow are the predominant trees found along the shores of South Dakota lakes. Most trees do not normally survive inundation of their root systems for an extended period of time.

A majority of the trees around Lake Oliver have been inundated for several years due to the recent high water levels and have since died. Several trees were cored in an attempt to approximate their age. Due to the deteriorated condition of these trees their age could not be determined.

There is a well defined fringe of established trees along the shoreline of Lake Oliver. The elevation of the base of the tree trunk facing toward the water ranges between 1684.2 to 1685.0 fmsl (See Photos 1 through 3). The diameter of these trees range from 1.7 feet to 3.0 feet.

There are several trees below the 1684.2 fmsl elevation, although these trees do not show a definite pattern around the lake. As mentioned before, the lake is now more susceptible to water level fluctuations due to the outlet being raised. These trees have established themselves during a period when Lake Oliver water level was lower. During the recent high water levels all of these trees have been destroyed.

Several slope changes are evident around the lake. The elevation of these changes range from 1684.2 to 1685.2 (see photos 4 through 6). Elevations of erosion lines around the lake vary from 1684.2 to 1686. The higher erosion lines are probably due to the recent high water levels. A slope change will occur where there has been continued wave erosion and soil stratification.

A concentration of boulders can be found in several places around Lake Oliver. The elevation of these boulders range from below 1683 fmsl to 1686.0 fmsl (See Photos 7 and 8). These boulders are probably a result of a combination of ice action and wave erosion.

One form of ice action that can produce a feature such as boulder lines is called ice push. In the spring, lake shorelines can be acted upon by ice sheets/wind action which form ice pushed ridges. The lake ice melts first near the shores because of the

relatively rapid heating of the earthy material of the shore and the shallow bottom. An open lane of water is formed which is further widened by a rise in lake level from the water added by the melting snow of the surrounding slopes. If strong winds develop before the ice becomes rotten, the ice is blown about from side to side by the winds and pushed on the shores with almost irresistible force. The direction of shove is related to that of the winds and may vary along any shore even during a jam, if the winds shift considerably. The force of the push depends on the firmness and momentum of the ice, the latter being determined by the velocity and duration of the wind, the weight of the ice and to some extent the distance through which the ice is free to move. (Dionne, 1979)

A second process which could produce this feature is erosion due to wave action. High water levels erodes material from the banks and boulders are left in place. A likely explanation for these boulder lines around Lake Oliver is these two processes, ice push and wave erosion, are working simultaneously.

Based upon previous OHWM investigations, the physical evidence of the OHWM around Lake Oliver, and the historical hydrological connection between Lake Oliver and Lake Cochrane, the recommended OHWM elevation for Lake Oliver is 1684.3 fmsl.

OUTLET

It has been the practice of the Division of Water Rights during previous OHWM investigations where the OHWM was related to the outlet elevation, to define the outlet elevation along with the OHWM elevation. The Ordinary High Water Level (OHWL) is defined as the calm water level generally equal to the outlet structure elevation. The OHWL elevation is the water level needed to establish the OHWM. The OHWL is generally one half to one foot below the OHWM (Division Files, OHWM Investigation on Lake Cochrane, Deuel County).

In the investigation to determine the OHWM on Lake Cochrane, the OHWL was found to be 1683.6 fmsl. This elevation is the maximum level at which that Game, Fish & Parks can maintain Lake Cochrane water level.

The current outlet elevation for Lake Oliver is 1687.2 fmsl. Historical evidence presented earlier in this report and physical evidence found at Lake Oliver both suggest that this is not the historical outlet elevation for Lake Oliver. Based upon previous OHWM investigations and the physical evidence used to establish the OHWM elevation, the recommended outlet elevation for Lake Oliver is 1683.6 fmsl. The present outlet is 3.6 feet higher than the recommended outlet elevation. Establishing the outlet at 1683.6 fmsl should not authorize drainage of poorer quality water from Lake Oliver into Lake Cochrane.

CONCLUSIONS

OHWM indicators used during the Lake Oliver investigation were trees found at the upper level of the lake, erosion lines, slope changes, and boulder lines. Established trees were found at an elevation starting at 1684.2 fmsl and upward. This elevation coincides with slope changes and erosion lines also starting at 1684.2 fmsl. Boulder lines extend from below 1683 fmsl to 1686 fmsl.

The present outlet elevation of Lake Oliver is 1687.2 fmsl. The outlet area had been filled during the 1950's which has disrupted the historical hydrology of Lake Oliver. Lake Cochrane and Lake Oliver had been hydrologically connected before this area had been filled.

Based upon previous OHWM investigations, and OHWM elevations and outlet elevations established by the Water Management Board, the physical evidence suggests that the OHWM and the outlet elevation for Lake Oliver are 1684.3 fmsl and 1683.6 fmsl, respectively. Establishing the outlet at this elevation should not authorize drainage of poorer quality water from Lake Oliver into Lake Cochrane.



Tim Tollefsrud
Natural Resources Engineer
DWNr, Division of Water Rights

RECOMMENDATIONS OF THE CHIEF ENGINEER

1. That the OHWM for Lake Oliver be established at an elevation of 1684.3 feet mean sea level (fmsl);
2. That the outlet elevation for Lake Oliver be established at 1683.6 fmsl subject to approval of a Flood Control Permit Application by the Water Management Board to lower the Lake Oliver outlet elevation from the present 1687.2 fmsl elevation to 1683.6 fmsl; (The 1683.6 fmsl elevation is the original outlet elevation for Lake Oliver. This original outlet was filled during lake shore development around Lake Cochrane approximately 35 to 45 years ago to the present elevation of 1687.2 fmsl. Before any change in the present outlet elevation of 1687.2 fmsl may be made, a Flood Control Permit Application must be approved by the Water Management Board. Approval of a Flood Control Permit would not authorize lowering the Lake Oliver outlet elevation below 1683.6 fmsl.)
3. That Vested Right Claim No. 1470-3 be amended to establish the outlet elevation at 1683.6 fmsl, subject to approval of a Flood Control Permit Application by the Water Management Board to lower the Lake Oliver outlet elevation from the present 1687.2 fmsl elevation to 1683.6 fmsl; and
4. That Vested Water Right Claim No. 1470-3 be amended to correct the amount of water claimed from 300 acre feet annually to "sufficient water to fill Lake Oliver annually to the original Lake Oliver outlet elevation of 1683.6 fmsl".



John Hatch, Chief Engineer
DWNR, Division of Water Rights

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FIGURE 1

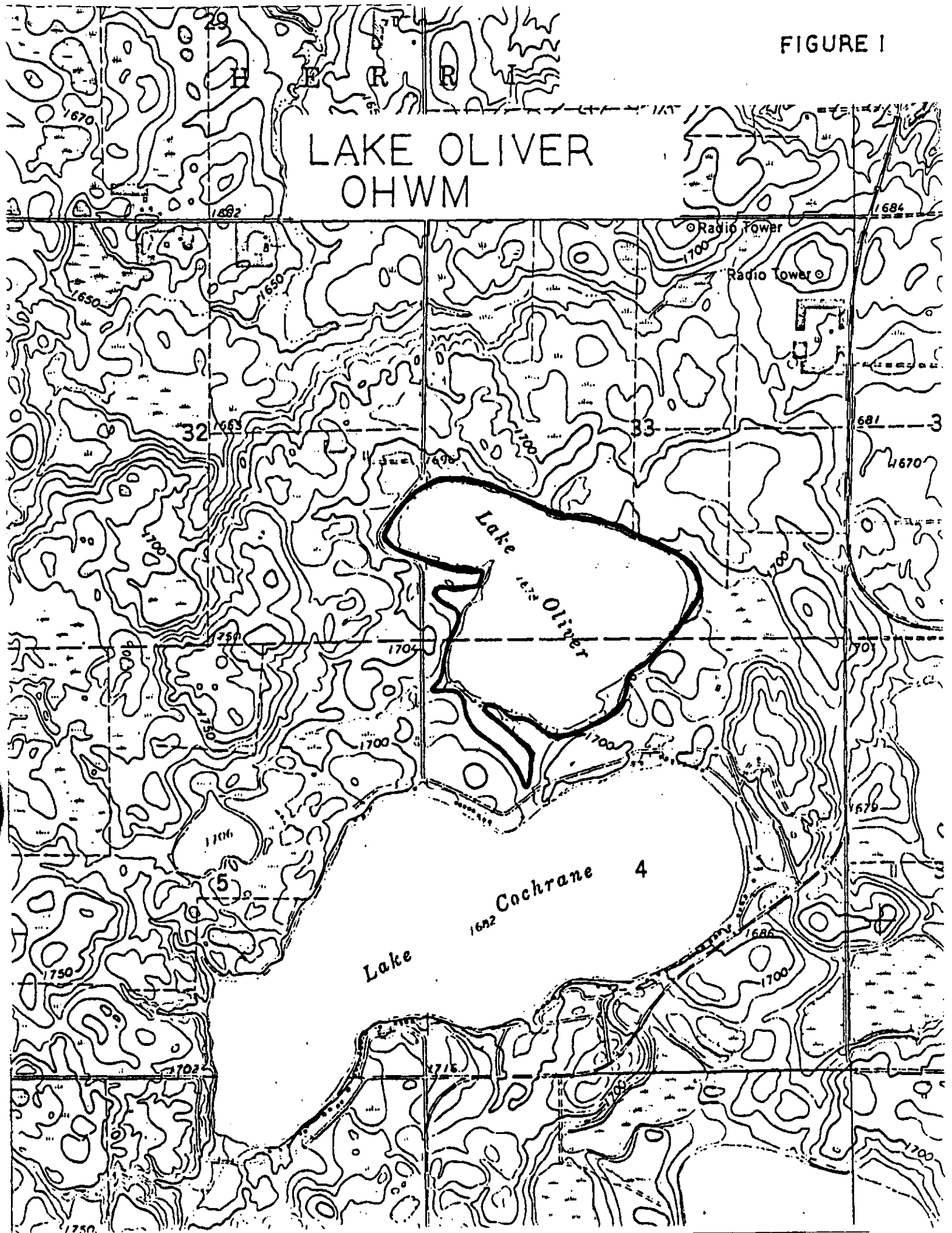
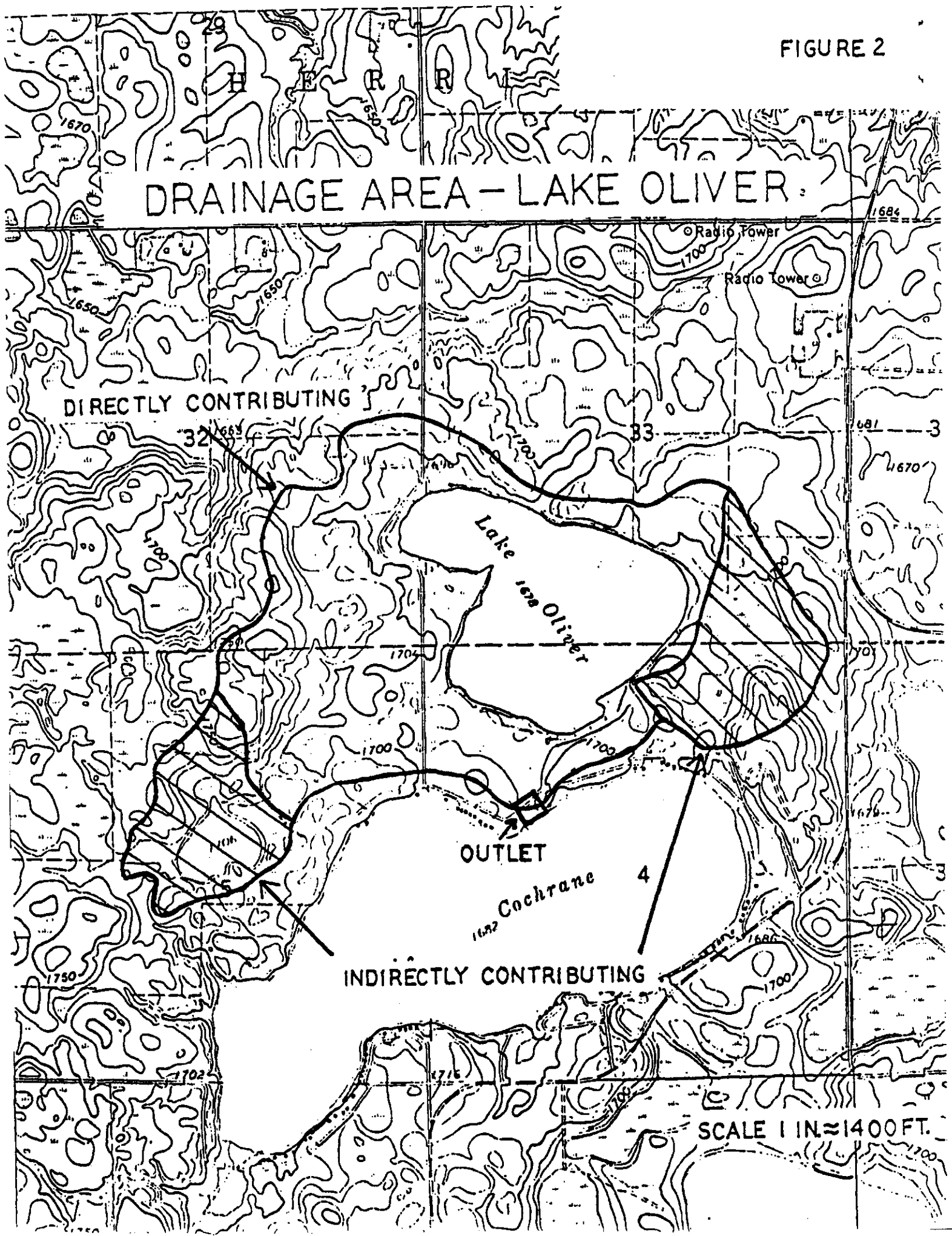


FIGURE 2

DRAINAGE AREA - LAKE OLIVER



LAKE OLIVER CONTOUR MAP

FIGURE 3

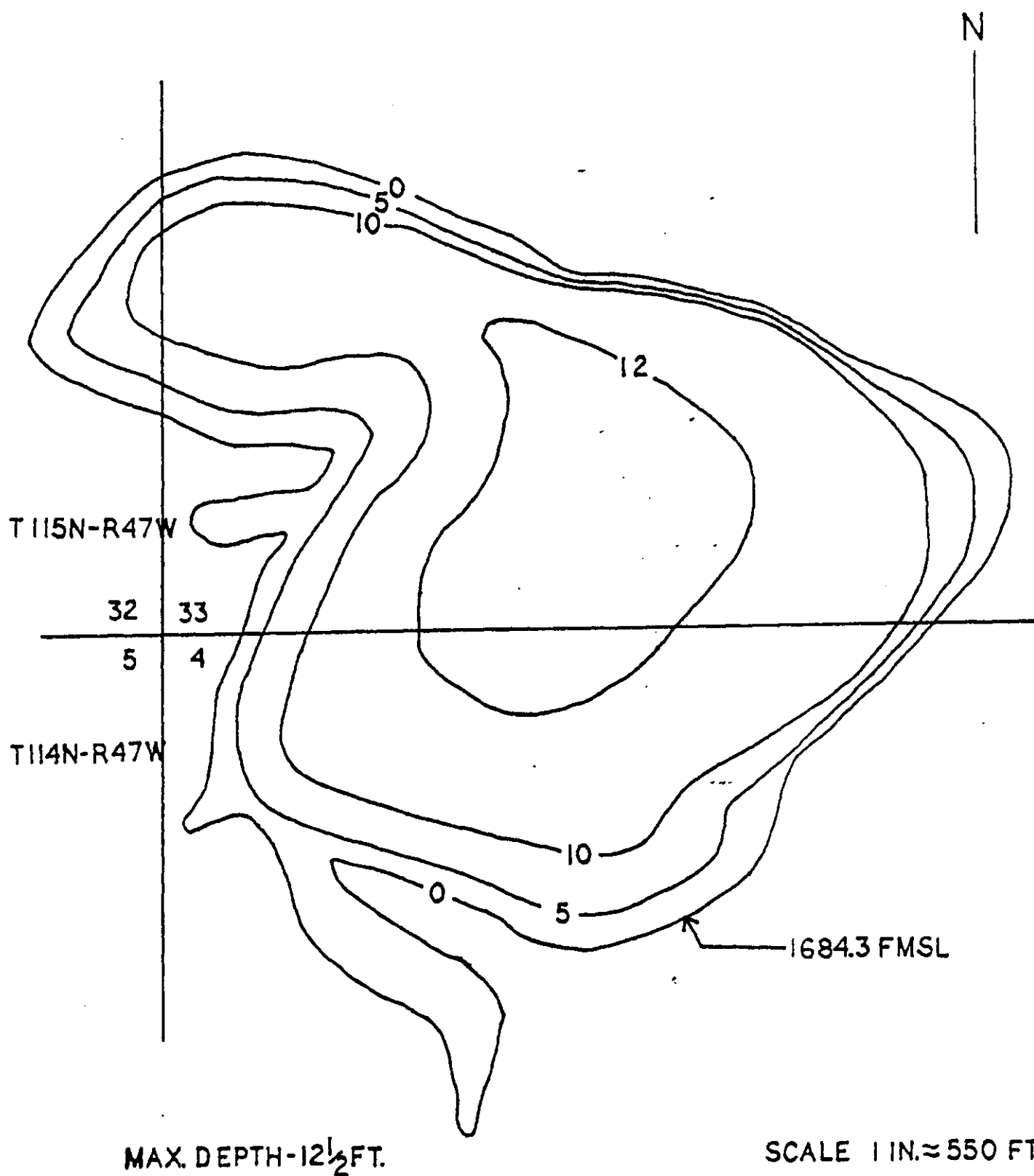
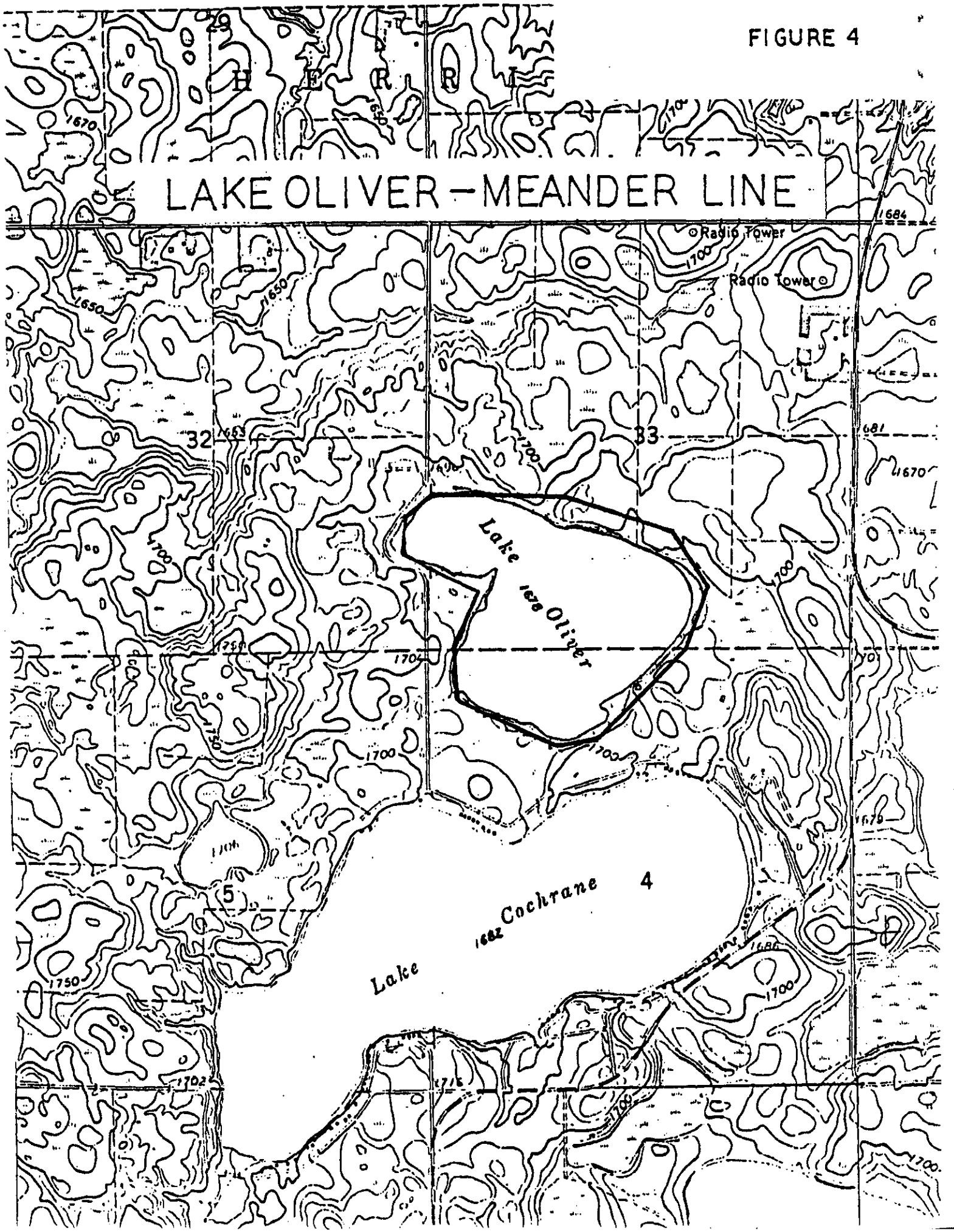


FIGURE 4

LAKE OLIVER - MEANDER LINE



WELL 1

COUNTY: DEUEL
 LEGAL LOCATION: SW SW NW SW SEC. 05, T. 114 N., R. 47 W.
 LATITUDE: 44.4227
 LAND OWNER:
 PROJECT: DEUEL COUNTY STUDY
 DRILLING COMPANY: SDGS
 DRILLER: S. JORGENSEN
 GEOLOGIST:
 DATE DRILLED: 07-01-1974
 GROUND SURFACE ELEVATION: 1763.00 T
 TOTAL DRILL HOLE DEPTH: 29.0
 USGS HYDROLOGICAL UNIT CODE: 0701003
 ELECTRIC LOG INFORMATION:
 SPONTANEOUS POTENTIAL:
 NATURAL GAMMA:
 SAMPLES:

LOCATION: 114N-47W-05CBCC
 LONGITUDE: 96.3001

DRILLER'S LOG:
 GEOLOGIST'S LOG:
 DRILLING METHOD: AUGER

TEST HOLE NUMBER: DA-74-78

SINGLE POINT RESISTIVITY:
 EXTRA:

0 - 1.0 TOPSOIL
 1.0 - 7.0 CLAY, LIGHT-TAN; OXIDIZED, ROCKS
 7.0 - 29.0 CLAY, LIGHT-BROWN, SANDY; PEBBLES

WELL 2

LEGAL LOCATION: SE SE NE SEC. 32, T. 115 N., R. 47 W.
 LATITUDE: 44.4332
 LONGITUDE: 96.2949
 LAND OWNER:
 PROJECT: DEUEL COUNTY STUDY
 DRILLING COMPANY: SDGS
 DRILLER: G. WALLACE
 GEOLOGIST: M. SCHWEDER
 DATE DRILLED: 07-16-1973
 GROUND SURFACE ELEVATION: 1712.00 T
 TOTAL DRILL HOLE DEPTH: 25.0
 USGS HYDROLOGICAL UNIT CODE: 0702003
 ELECTRIC LOG INFORMATION:
 SPONTANEOUS POTENTIAL:
 NATURAL GAMMA:
 SAMPLES:

DRILLER'S LOG:
 GEOLOGIST'S LOG:
 DRILLING METHOD: AUGER
 TEST HOLE NUMBER: DA-73-136

SINGLE POINT RESISTIVITY:
 EXTRA:

0 - 2.0 TOPSOIL, BLACK
 2.0 - 17.0 CLAY, OXIDIZED, MOIST (STILL)
 17.0 - 25.0 CLAY, UNOXIDIZED, WOOD, FINE (STILL)

FIGURE 5

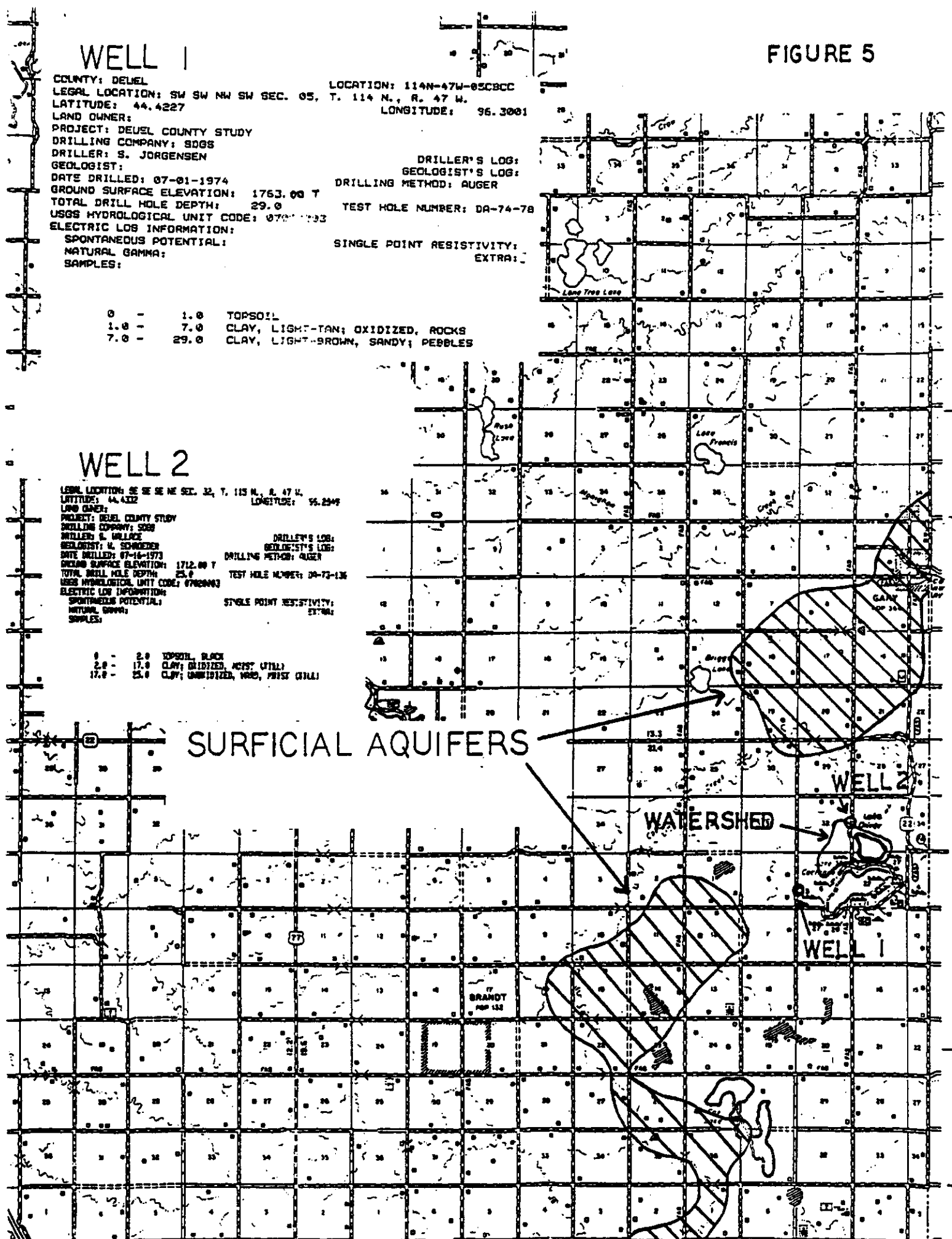
SURFICIAL AQUIFERS

WATERSHED

WELL 2

WELL 1

BRANDT
 POP 133



AGENDA

WATER MANAGEMENT BOARD MEETING DECEMBER 7 & 8, 1988

Place: Room Dakota A, Howard Johnsons, 3300 W Russell, Sioux Falls SD
 Scheduled Hearing Times are Estimates and May be Delayed due to Prior Agenda Items

December 7, 1988

- 8:00 am Call to Order
 Approval of October 5 & 6 1988 Board minutes
 Set May 10 & 11, 1989 meeting location (Pierre Suggested)
 Status and review of water rights litigation -- Harold Deering and John Guhin
 Request to Advertise Proposed Revisions to:
 1) General Rules Chapter 74:02:01 -- Del Brosz
 2) Safety of Dams Rules Chapter 74:02:08 -- Tim Schanl
 Discussion on Superfund Report -- Susan Bowar
 Administer Oath to the Water Rights Staff
- * 8:15 am Consider Establishing the Ordinary High Water Mark and Setting the Outlet Elevation for Lake Oliver in Deuel County -- Tim Tollefsrud
 Reconsider Flood Control Permit Application No. FC-8, Deuel County - Deferred from September 1987 Board meeting -- Tim Tollefsrud
- 9:00 am Cancellation Considerations
- 9:15 am Consider Establishing the Ordinary High Water Mark and Setting the Outlet Elevation for:
 1) Cottonwood Lake in Sully County -- David Brown
 2) Fish Lake in Aurora County - Deferred from October 1988 Board meeting --- David Brown
- 9:30 am Consider Request for Variance from Spillway Requirements for Opal Dam, Department of Game, Fish & Parks -- Tim Schaal
- 9:45 am Break
- 10:00 am Introduction of Water Rights Staff, Board and Legislative Oversight Committee
 Consider New Permit Applications and Vested Right Validations
- 10:30 am Consider Water Permit Application No. 5208-3 and Future Use Permit Application No. 5209-3, Kingbrook Rural Water System - Automatic Delay from the October 1988 Board meeting -- Jim Goodman
- 11:00 am Consider an Intercounty Drainage Dispute in Roberts and Grant Counties - Automatic Delay from the October 1988 Board meeting -- Tim Tollefsrud
- 12:00 Lunch
- 1:00 pm Consideration of Findings of Fact, Conclusions of Law and Final Decision on Denial of Extension of Time to Construct Works specified on Permit Nos. 40-2A and 1812-2, Robert and Mark Tubbs
- 1:15 pm Reconsider Water Permit No. 5189-3, Isabelle Fryer - Deferred from the October 1988 Board meeting -- Ron Duvall
 Reconsider Cancellation of Water Permit No. 4780-3, Vincent and Isabelle Fryer -- Ron Duvall

Mr. Hatch stated the 1989 meeting dates have been scheduled for March 1 & 2, May 10 & 11, in Pierre, July 26 & 27, September 27 & 28 and December 6 & 7.

Litigation

John Guhin stated the Red Lake OHWM case is scheduled to be heard December 8, 1988. The ETSI case is scheduled to be heard December 13, 1988.

General Rules Chapter 74:02:01

Mr. Lloyd MOVED, SECONDED by Mr. Brink to direct the staff to ADVERTISE proposed changes to the General Rules Chapter 74:02:01 for public hearing at the March 1 & 2, 1989 board meeting. MOTION CARRIED.

Safety of Dams Rules Chapter 74:02:08

Mrs. Loucks MOVED, SECONDED by Mr. Brink to direct the staff to ADVERTISE proposed changes to the Safety of Dams Rules Chapter 74:02:08 for public hearing at the March 1 & 2, 1989 board meeting. MOTION CARRIED.

Superfund Report

Susan Bowar presented a report on the Superfund (copy on file).

John Hatch stated that John Smith, Secretary, DWNR was meeting with the Governor to discuss what legislation was necessary and how to proceed on the environmental bond issue. Mr. Hatch stated he will keep the board members informed of what action is being requested by the Governor.

Chairman Gunderson read a letter that had been received from the US Department of Interior requesting a special Water Management Board meeting to be held before the regular March, 1989 meeting (letter on file). A decision on a special board meeting was delayed until later in the meeting.

Chairman Gunderson administered the oath to the staff.

Ordinary High Water Mark and Outlet Elevation for Lake Oliver in Deuel County

Tim Tollefsrud presented the report prepared on the Ordinary High Water Mark and Outlet Elevation for Lake Oliver (copy on file).

Mr. Tollefsrud stated Lake Oliver and Lake Cochrane were once connected. The recommended Ordinary High Water Mark for Lake Oliver is consistent with the established OHWM for Lake Cochrane established in 1981. Mr. Tollefsrud stated the recommended OHWM at elevation 1683.6 disregards the man-made changes, the filled outlet. It would be the historical OHWM. The recommended OHWM for Lake Oliver will not affect the OHWM for Lake Cochrane.

Chairman Gunderson administered the oath to Eddie Smith.

Mr. Smith stated he is representing people that do not want Lake Oliver water drained into Lake Cochrane. Lake Cochrane is a very clean lake with a sanitary sewer system presently being established.

Chairman Gunderson administered the oath to Chuck Staudenmaier.

Mr. Staudenmaier stated he was an association board member. The report states there will be water testing to judge the water qualities in the two lakes. They have just formed a Lake Association rural sewer system to purify Lake Cochrane. If water of lesser quality is brought into a lake which they are purifying, it would be contradictory. There is an alternate way to drain Lake Oliver below Lake Cochrane rather than directly into Lake Cochrane.

Chairman Gunderson administered the oath to Ken Skorseth.

Mr. Skorseth stated he was Deuel County Highway Superintendent but was present on behalf of the Board of Commissioners. Mr. Skorseth stated they applied for the flood control permit. They would like the OHWM established as recommended by Mr. Tollefsrud. Mr. Skorseth stated that one of the options of getting the water out of Lake Oliver without draining into Lake Cochrane would be an underground tile system. This option would be very expensive. They are also concerned with possible liability action. Presently, the outlet for Lake Oliver is through a lake lot. There is no ditch, just a low point. The water would go over a road.

Mr. Brink MOVED, SECONDED by Mr. Rollag:

1. That the OHWM for Lake Oliver be established at an elevation of 1684.3 feet mean sea level (fmsl);
2. That the outlet elevation for Lake Oliver be established at 1683.6 fmsl subject to approval of a Flood Control Permit Application by the Water Management Board to lower the Lake Oliver outlet elevation from the present 1687.2 fmsl elevation to 1683.6 fmsl;
3. That Vested Right Claim No. 1470-3 be amended to establish the outlet elevation at 1683.6 fmsl, subject to approval of a Flood Control Permit Application by the Water Management Board to lower the Lake Oliver outlet elevation from the present 1687.2 fmsl elevation to 1683.6 fmsl; and
4. That Vested Water Right Claim No. 1470-3 be amended to correct the amount of water claimed from 300 acre feet annually to "sufficient water to fill Lake Oliver annually to the original Lake Oliver outlet elevation of 1683.6 fmsl".

MOTION CARRIED.

Flood Control Permit Application No. FC-8, Deuel County
Tim Tollefsrud presented the report on the permit application (report on file). Mr. Tollefsrud stated the staff recommendation is for continued deferral of Application No. FC-8 until the Applicant conducts a water quality study to compare the water quality of Lake Oliver with that of Lake Cochrane and determine if the discharge of water from Lake Oliver into Lake Cochrane would degrade Lake Cochrane water quality. Or, in lieu of the water quality study, a plan to amend Application No. FC-8 may be submitted for lowering the outlet elevation and routing Lake Oliver overflow into the drainage downstream of Lake Cochrane.

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and Final Decision with the 2 changes.

Meeting recessed at 1:27 p.m.

Meeting reconvened at 1:37 p.m.

Introductions were made of the Water Rights Division staff, board members and Legislative Oversight Committee.

Consideration of Withdrawal of Flood Control Application No. FC-8, Deuel County Commission and Consideration of Establishment of an Outlet Elevation for Lake Oliver, Deuel County

The South Dakota Department of Game, Fish and Parks (GF&P) and the South Dakota Department of Environment and Natural Resources (DENR) requested that the Water Management Board establish an outlet elevation for Lake Oliver in Deuel County. The board has previously established Ordinary High Water Marks (OHWM) for Lake Oliver and Lake Cochrane at 1684.3 feet mean sea level (fmsl). The board also previously established an outlet elevation for Lake Cochrane at 1683.6 fmsl with the present pipe outlet at an elevation of 1682.5 fmsl. A permanent outlet at the established outlet elevation of 1683.6 fmsl will be constructed at the Lake Cochrane outlet.

The present elevation at which Lake Oliver spills water to Lake Cochrane is 1687.2 fmsl. Water is currently above the OHWM for Lake Oliver.

A permanent outlet for Lake Oliver will be constructed upon establishment of an outlet elevation. The proposed outlets for Lake Oliver and Lake Cochrane will be designed to prevent the water level in the lakes from exceeding the established OHWM during a 100-year, 24-hour storm event. The establishment of an outlet elevation for Lake Oliver and construction of permanent outlet structures is intended to resolve the recurring high water problems for these lakes.

The Chief Engineer's recommendation is that the outlet elevation for Lake Oliver, Deuel County be established at 1683.6 fmsl. The outlet structure is to be located in the S 1/2 NW 1/4 of Section 4-T114N-R47W. The reasons for the Chief Engineer's recommendation are based upon the evidence presented in the report (on file).

Diane Best, staff attorney for DENR and Gary Richter, attorney for GF&P, will jointly present their cases. Mr. Richter will offer testimony with respect to their proposal to develop structures on Lake Oliver, Deuel County. Ms. Best will offer testimony in respect to Lake Cochrane issues.

Mr. Richter gave an overview of why GF&P and DENR joined together to present their cases on the application.

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Mike McCann, attorney representing the Lake Cochrane Improvement Association (Association), stated the position of the Association is they do not believe it is in the best interest of the public or themselves for Lake Oliver water to flow through Lake Cochrane. The Association believes that the quality of the water in Lake Oliver is not as good as the quality of water in Lake Cochrane. The Association also believes that the natural outlet for Lake Oliver is the "eastern" outlet, and would like the water to flow directly from Lake Oliver to Culver Lake.

If the board would decide to drain the water from Lake Oliver through Lake Cochrane, the Association would suggest that they do so by using an enclosed waterway to avoid picking up contaminants from the grassland and marshlands between Lake Oliver and Lake Cochrane.

Allen Van Meveren, landowner along Culver Lake, stated he was against water being dumped into Culver Lake from Lake Oliver.

Proponents

Chairman Rollag administered the oath to John Cooper.

In answer to questions from Mr. Richter, Mr. Cooper stated he was the Secretary for GF&P and provided his address and educational background. Mr. Cooper, as part of a 1995 flood response team, was called upon to investigate flooding on Lake Cochrane and Lake Oliver. The Lake Cochrane Recreation Area, which is situated between Lake Cochrane and Lake Oliver, had reports of flooding problems. Some of the residents in the cabins surrounding Lake Cochrane were concerned of the rising water in the lake. The flood response team took a look at what was causing the flooding and started working on a solution.

Mr. Cooper stated that he and Nettie Myers, Secretary of DENR, talked with the governor and the governor's position was to 1) take a look at the issue, 2) stay within legal restraints under state water law, 3) do what can be done to take care of the rising water and flood potential, and 4) come up with a plan.

Mr. Cooper stated he asked for some help from DENR and GF&P staff to try to come up with a solution that would be best for all the parties concerned. Mr. Cooper looked into several issues and concerns, and reviewed files to come up with a solution.

A temporary relief measure was pursued. Since Lake Cochrane's outlet was partially blocked, a temporary culvert was installed to drain water out of Lake Cochrane, on its natural water course down to Culver Lake. The control structure was used to make sure the water level in Lake Cochrane was dropped to relieve the flooding, but at the same time, trying not to add a large head of water into Culver Lake.

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Mr. Richter referred to State's Exhibit No. 1A (a topographical map of the area of Lake Cochrane and Lake Oliver), State's Exhibit No. 1B (GF&P map of the Lake Cochrane Recreation Area, which shows the roadways and camping pads, and which lies between Lake Oliver and Lake Cochrane), and State's Exhibit No. 1C (GF&P map of the Lake Cochrane Recreation Area, which shows a cross-hatched section where the flood waters set during the end of April and first part of May). State's Exhibit Nos. 1A, 1B & 1C were admitted into the record (on file). Mr. Cooper used overlays on an overhead projector to describe the three exhibits. State's Exhibit No. 1C shows the water standing in the recreation area, coming across from Lake Oliver and flowing into Lake Cochrane. This lasted for approximately 30 days. The water could not flow through the culverts that drain from Lake Oliver into Lake Cochrane because the culverts were plugged.

Mr. Cooper stated the Association wants the water from Lake Oliver to flow from the east end of the lake directly to Culver Lake. The historical drainage pattern runs from Lake Oliver to Lake Cochrane, through a series of wetlands, into Culver Lake. From a legal standpoint, the Lake Oliver outlet needs to reflect natural conditions prior to human intrusion in the area.

Mr. Richter referred to State's Exhibit No. 1D (signed plan of action established by the Secretaries of the DENR and GF&P). State's Exhibit No. 1D was admitted into the record (on file).

Ms. Best presented to the board a DENR Position Description Form on Gale Selken, engineer with the Water Rights Program (State's Exhibit No. 3). State's Exhibit No. 3 was admitted into the record (on file).

In answer to questions from Ms. Best, Mr. Selken stated that he had been involved in the cooperative effort between DENR and GF&P to alleviate the flooding concerns at Lake Cochrane and Lake Oliver. Mr. Selken had investigated and videotaped the area.

Mr. Selken referred to State's Exhibit Nos. 2 and 2A (geological survey maps) to show the board the area that was covered on the videotape (State's Exhibit No. 7). Mr. Selken stated the area shown in the videotape will start approximately 2 miles east of Lake Cochrane, in Minnesota, in an area called the Lowell Hunt dam. When GF&P installed a 36-inch culvert at Lake Cochrane, the Lowell Hunt dam overtopped. The videotape will continue approximately 1/2 mile to the west from the hilltop in between the Hunt dam, Lake Oliver and Lake Cochrane. The videotape will go west another mile to the slough area that Lake Cochrane flows into before it goes into Culver Lake. From this area, the videotape will travel back up through the drainage area to the outlet on Lake Cochrane. The videotape will also show the cabin area around Lake Cochrane and the temporary culvert that Deuel County constructed in 1993, the park area, the general flooding around Lake Oliver, and finally, the proposed outlet area in question.

State's Exhibit Nos. 2 (dated 1970) and 2A (dated 1967) were admitted into evidence (on file).

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Mr. Selken gave a brief narration of the videotape while it was being shown to the board and to the audience.

Meeting recessed at 3:08 p.m.

Meeting reconvened at 3:28 p.m.

Ms. Best questioned Mr. Cooper about an issue he raised on the ice action on the old outlet for Lake Cochrane. Mr. Cooper had indicated that the ice had caused the lowering of the outlet. Ms. Best asked Mr. Cooper to clarify this issue. Mr. Cooper stated that the elevation of the outlet had been lowered as a result of the pipe tipping over. What had actually happened was the pipe had been raised and flattened somewhat. The pipe was under water. After some investigation, it was determined that the pipe may have had a kink in it or that it was flattened. The pipe elevation was raised somewhat as a result of the ice action. Staff was looking for ways to relieve the flooding and the current outlet was not doing the job.

Ms. Best submitted State's Exhibit No. 7 (videotape shot on May 15, 1995) for the record (on file).

Copies of State's Exhibit No. 6 (Report prepared by Gale Selken w/attachments) were handed out to the board. Mr. Selken summarized his report for the board. Mr. Selken also referred to (State's Exhibit Nos. 4, 4A, 5 and 5A) cross-sections that were prepared by the engineering division of GF&P.

Mr. Selken stated the joint request of DENR and GF&P is to solve the issue of the outlet elevation for Lake Oliver.

Mr. Selken addressed Flood Control Application No. FC-8. Mr. Selken explained the difference between a flood control permit and an outlet elevation. When an outlet elevation or the OHWM is not established on a lake and people want to change the natural conditions, a flood control permit is required. GF&P requested that DENR establish an OHWM and outlet elevation for Lake Oliver after Flood Control Application No. FC-8 was submitted. It was decided that the flood control application, OHWM and the outlet elevation all be done at the same time so the work would not be duplicated.

State's Exhibit Nos. 4, 4A, 5, 5A and 6 were admitted into the record.

In answer to questions from Mr. McCann, Mr. Selken stated the preliminary structure they planned to install from Lake Oliver to Lake Cochrane was a 36-inch culvert with protection at both ends. The outlet from Lake Cochrane will be designed by GF&P. A concrete weir was proposed.

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Mr. Selken stated that he had no knowledge prior to 1988 of any flooding problems on Lake Oliver.

Chairman Rollag administered the oath to Lawrence Severson.

Mr. Severson stated he has lived in Deuel County all of his life and has fished and hunted around Lake Cochrane and Lake Oliver throughout his life.

In answer to a question from Ms. Best, Mr. Severson stated that sometime in the mid-1940's he had seen water flowing from Lake Oliver to Lake Cochrane. There was a small stream running between the lakes. This stream would stay open in the cold weather and a person could trap in that stream.

In answer to a question from Mr. Brink, Mr. Severson stated that he does not know if the water had flowed from Lake Oliver to Lake Cochrane since 1949. He had left the area in 1949 to go to school and then he went into the Army. He did not return to the area for a number of years after 1949.

Chairman Rollag administered the oath to Cleo Christensen.

Mr. Christensen stated that he had a Bachelor's and Master's degree in geology from the University of South Dakota. He has worked for the South Dakota Geological Survey for 35 years; the last 3 1/2 years as the state geologist. For 19 years, he has done some part-time teaching in geology for the University of South Dakota. He is also a member of several associations. Mr. Christensen has over 30+ publications on geology and groundwater resources in South Dakota.

In answer to questions from Ms. Best, Mr. Christensen stated that to find out where a natural outlet is located on a lake, he first referred to aerial photography. In Mr. Christensen's opinion, an aerial photograph is the most reliable source of seeing what the landscape was like in past years. Stereo pair photographs give a 3-dimensional view of the landscape.

Mr. Christensen referred to State's Exhibit No. 8, two stereo pair aerial photographs that he used while doing his investigation on the lakes in the area. The scale of the photographs are a little less than 1 inch to the mile and were taken from approximately 20,000 feet. These photographs were taken September 4, 1952.

Mr. Christensen stated that he used State's Exhibit No. 8 to develop his analysis with respect to where the outlet elevation would be for Lake Oliver. He also did an on-site investigation. Mr. Christensen referred to State's Exhibit No. 4 and 5A to show the area where he did his

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investigation. Mr. Christensen remarked that he looked specifically for any geologic evidence of any water that would have flowed through the area between Lake Oliver and Culver Lake. He found none. He did find a connection between Lake Oliver and Lake Cochrane.

State's Exhibit No. 8 (2 stereo pair photographs) were admitted into the record (on file).

Mr. McCann referred to Exhibit Nos. A-C (photographs taken July 6, 1995). The photographs were taken in the area along State's Exhibit No. 5A. (Photographs were not admitted into the record at this time).

Meeting recessed at 5:15 p.m.

Meeting reconvened at 5:29 p.m.

Mr. McCann requested that the board hear Gordon Gunderson, opponent, who will not be present for the hearing on July 7, 1995.

Chairman Rollag administered the oath to Gordon Gunderson.

Mr. Gunderson stated he built a cabin on the north side of Lake Cochrane in 1960 and has been familiar with the area for 20 years prior to that time. Mr. Gunderson handed out to the board his written "Objection to Request to Establish an Outlet Elevation for Lake Oliver, Deuel County, South Dakota" attached with Exhibit Nos. 1 and 2 (two aerial photo maps), and a precipitation chart with data from 1911 to 1994 (on file).

Gunderson believed it would be a mistake to establish a high water mark for Lake Oliver as high or higher than Lake Cochrane. Mr. Gunderson does not believe that the water from Lake Oliver should run into Lake Cochrane.

In his written testimony, Mr. Gunderson stated he represented Mr. Bostic, who was the owner of some land on the north side of Lake Cochrane at the time the county commissioners had condemned some land for a road. At that time, Mr. Gunderson became familiar with that portion on the north side of Lake Cochrane between Lake Oliver and Lake Cochrane. Mr. Bostic and Mr. Gunderson have walked over that property many times. There was no water in that area either going from Lake Oliver to Lake Cochrane, or Lake Cochrane to Lake Oliver. One spring, Mr. Gunderson did see some water that could have gone either way. This water could have come from snow cover.

An examination of the area around Lake Oliver will show what the boundaries of Lake Oliver were. There were trees on the north side and west side that died and they have been removed. There are trees on the south side that are dead, but they haven't been removed. These dead trees

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show what the boundaries of Lake Oliver were.

Mr. Gunderson believes the only reason why Lake Oliver invaded the recreation area is, it was a means by which excessive moisture could get out the east end of Lake Oliver. There is a tile area located on the east side of Lake Oliver from at least 40 years ago. Tile was put in from Lake Oliver in a southeasterly direction.

Mr. Gunderson stated that on July 4, 1995, he and Lyle Tobin spent time investigating the eastern opening from Lake Oliver. Mr. Tobin was able to find where the tile had deteriorated and is now gone. Mr. Gunderson believed that as long as the tile was there, Lake Oliver did not overflow into the recreation area or to the west because the excess moisture flowed out the east end of the lake.

GF&P built a Quonset, for storage purposes, on their property and the Quonset is now situated in approximately three to four feet of water. Mr. Gunderson believed that GF&P would not have built the Quonset in that area if they knew this was the waterway.

Mr. Gunderson believed the old history of the release of water from Lake Oliver can be proven another way. Mr. Gunderson referred to his precipitation chart, which he believed showed that in times when there was a lot of moisture, Lake Oliver did not overflow. After the tile deteriorated and could not take any water, Lake Oliver flowed elsewhere.

In answer to a question from Mr. Freeman, Mr. Gunderson stated that he did not know when the tile was installed.

In answer to a question from Ms. Best, Mr. Gunderson stated that the precipitation chart came from the Clear Lake weather station.

Luanne Napton submitted her written testimony to the board (testimony on file). There were no objections by any of the parties.

Meeting recessed at 5:50 p.m.

Meeting reconvened at 8:32 a.m., July 7, 1995.

Chairman Rollag administered the oath to Willis Beecher.

Mr. Beecher stated he lives at Canby, Minnesota, which is approximately nine miles east of Lake Cochrane, and has worked with soil and water conservation since 1954. Mr. Beecher supports the proposal by DENR. The natural drainage runs between Lake Oliver and Lake Cochrane and the water should flow between these two lakes. DENR's proposal is the most practical and

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economical way to solve the drainage in the area.

Mr. Beecher presented State's Exhibit No. 18 (photographs A - E) to the board. These photographs were taken on May 16, 1995, one day after the videotape (State's Exhibit No. 7) was taken. The photographs were taken from the air and show Lake Cochrane, Lazareth and Canby creeks. Mr. Beecher described the photographs to the board (photographs admitted into the record) (on file).

Chairman Rollag administered the oath to David German.

In answer to questions from Ms. Best, Mr. German stated he lives at Brookings and has a B.S. and M.S. degree from South Dakota State University in Biology with course work in civil engineering, wildlife and fisheries, biology and chemistry; all relating to limnology, the study of lakes. Mr. German has been employed with South Dakota State University since 1986, working on lake projects. Mr. German is currently involved in lake assessment; interpretation of lake data to determine whether there are changes occurring in some of the lakes in the area. Previously, he worked on the Oakwood Lake study; which is a limnological study of all of the aspects of the Oakwood Lake system related to nutrient enrichment within the lake system.

Mr. German stated he has tested the water quality at Lake Cochrane and Lake Oliver as part of a small nonpoint source pollution project that was done at Lake Cochrane. A portion of that study was to evaluate the effectiveness of three sediment dams that had been installed in approximately 1975 or 1976. This study was also to look at the water quality of Lake Oliver as it is related to Lake Cochrane; primarily to look at the water quality as it flows into Lake Cochrane. This testing was done in 1993 and 1994.

Mr. German used an overhead projector as he gave his presentation to the board.

Mr. German referred to State's Exhibit No. 9 (copy of a USGS topographic map). Mr. German used this map to show the sampling sites where he tested for water quality on Lake Oliver and Lake Cochrane. Prior to the water flow in 1993, water was collected from Oliver Slough. This area would be the flooded portion of Lake Oliver as it approached the access road to the cabins to the north side of the Wengler property. In 1993, an outlet was installed by the county on the Wengler property. Water samples were taken at that time of the water flowing from the Wengler Outlet. The Peterson Outlet is the area where the water flows from Lake Oliver, through a culvert in the road, and across the Peterson property into Lake Cochrane.

Mr. German stated that Jerry Siegel requested additional data be collected in 1994. This data included a limited number of samples from Culver Lake. In 1994, Jerry Siegel was the manager of the East Dakota Water Development District and was also acting as coordinator of the

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nonpoint source project on Lake Cochrane.

Mr. German next referred to the water samples on Lake Cochrane. Mr. German stated another component of the monitoring he was involved in as part of the Lake Cochrane Protection Project was the assessment of the water quality differences above and below three sediment dams. These dams were built in 1976 (see 1A, 2A and 3A on State's Exhibit No. 9). Data was collected from these three dams to determine whether there was any treatment was occurring.

As a result of the 1993 and 1994 study, charts were developed to show the results of the water quality in the area. Mr. German referred to State Exhibit Nos. 10, 11, 11A, 12 and 13 (charts showing Total Phosphorus, Suspended Solids and Total Nitrogen results) and went over each chart with the board.

Mr. German stated that Total Phosphorus (State's Exhibit No. 11A) is a nutrient necessary for Melba growth in lakes. Phosphorus is not available from the atmosphere. Therefore the algae must derive this from the water or from sediments that may replenish the water with phosphorus. Phosphorus is an insoluble nutrient and prefers to be attached to flow particles.

A limited number of samples were taken from Lake Oliver in 1993, primarily because the water was flowing. The purpose of the monitoring was to determine what effect the flow of Lake Oliver water had on the water quality of Lake Cochrane.

The data indicates that Lake Cochrane varies from mesotrophic to eutrophic, which is a measure of the enrichment of a lake body. Oligotrophic lakes are poorly nourished, eutrophic lakes are well nourished and mesotrophic lakes are in between. Lake Cochrane varies between eutrophic and mesotrophic and is fairly stable. With the limited data available, Lake Oliver appears to be more eutrophic than Lake Cochrane and Culver Lake is more eutrophic than either Lake Oliver or Lake Cochrane.

Ms. Best requested that State's Exhibit Nos. 9, 10, 11, 11A, 12 and 13 be admitted into the record (on file).

Mr. German stated that State's Exhibit No. 11 shows the data from the two points which water flows from Lake Oliver into Lake Cochrane. This would be the Wengler Outlet and the Peterson Outlet. Water is picking up phosphorus in the Peterson Outlet as it moves from Lake Oliver to Lake Cochrane. The water is picking up less nutrients flowing from the Wengler Outlet than through the Peterson Outlet.

In reference to State's Exhibit No. 12, Mr. German stated there is substantially no difference in terms of suspended solids.

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In reference to State's Exhibit No. 10, Mr. German stated that the water from Lake Oliver has less total nitrogen in it than does Lake Cochrane. The difference being, the nitrogen in the Peterson Outlet is in the form of nitrate, as opposed to an organic form which is in Lake Cochrane.

The final chart, State's Exhibit No. 13, shows a plot of data from 1991-1994. This was data collected as part of the Lake Cochrane Protection Project. The chart shows all of the deepest, high quality lakes (19) over 100 acres in size in South Dakota, with the exception of the Missouri River system, and tells where the lakes tend to be in terms of their phosphorus concentration. Mr. German stated that Lake Cochrane is a rare resource in terms of its water quality. If the data in 1993 and 1994 for Lake Oliver were on the chart, it would be located between approximately 0.05 - 0.06 mg/l. Mr. German drew a line on the chart to show where Lake Oliver would have been located, if it would have been included as one of the lakes in the study, and initialed it. Lake Oliver would be above some of the other deeper natural lakes and reservoirs in terms of total phosphorus, but that is not unusual for shallower lakes. Shallower lakes generally tend to be more enriched than the deeper lakes.

In answer to a question from Mr. McCann, Mr. German explained that any limiting nutrient that is depleted beyond the level of the algae population's ability to extract it from the water, is when growth stops. Not all algae are the same physiologically. For that reason, phosphorus tends to be a more important limiting nutrient than nitrogen. When nitrogen becomes limiting, some algae can fix nitrogen and are able to draw it from the atmosphere or dissolve nitrogen from the water, fix it and utilize that as a nitrogen source, so they are in a position of being able to grow, reproduce and often feed other forms of algae. From the stand point of a lake, phosphorus tends to be the more important limiting nutrient. It is not always nutrients that limit the growth of algae. Many lakes are not limited by nutrients, but by other factors.

Mr. McCann questioned that if water was going to be routed from Lake Oliver through Lake Cochrane, when the water exceeds the OHWM over a long period of time, will this degrade the quality of the water because of the phosphorus element in Lake Cochrane? Mr. German stated that any time you put water into a lake that is higher in concentration than that which is in the lake and that which exits the lake, phosphorus is being accumulated. That will have an effect of degradation, but how much degradation will occur is unknown. All lakes tend to accumulate phosphorus.

Mr. McCann questioned that if the board were to determine that water needs to be drained from Lake Oliver through Lake Cochrane, would it be better to put the water through an enclosed waterway to avoid some of the phosphorus from coming into the lake? Mr. German stated that if the present conditions in the wetlands persist, that would be a preferred option to draining the water into the wetlands.

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In answer to a question from Clayton P. Holt, Mr. German stated that the fact that Lake Oliver is shallow and becoming "putrid" probably has no relationship to the accumulation of phosphorus. Phosphorus accumulation would be a function of the concentration of phosphorus that is entering Lake Oliver from its watershed and that which is flowing out. More phosphorus is entering the watershed than is transported out. Mr. German commented that this was a normal situation for all the lakes he has studied.

Mr. German stated that it has been his experience that watersheds that have a higher percentage of farmed land, have a higher export of phosphorus than areas that are grassy. Phosphorus is attached to soil particles. The soils in the area of Lake Oliver and Lake Cochrane are rich in phosphorus. When soil moves, phosphorus moves with it.

In answer to a question from Mr. Richter, Mr. German stated there were no state standards in South Dakota for phosphorus.

In answer to a question from Clayton B. Holt, Mr. German stated he did not have any data on when the area around Lake Oliver has been farmed. There is data, but he did not obtain it.

In answer to a question from Francis Brink regarding phosphorus in the wetland area between Lake Oliver and Lake Cochrane, Mr. German clarified from previous testimony that phosphorus has an affinity for soil, but it also has an affinity for organic matter. Wetlands are high in organic matter; both living and dead. The suspended solids data shows that there is some removal of suspended material as it goes through the wetland, but an increase in phosphorus. Without doing fractionation of total phosphorus in Lake Oliver, you can not tell what form it was in. The wetlands are not contributing soil from an erosion standpoint, but are very rich and very productive.

Chairman Rollag questioned, if an artificial wetland could be designed to remove phosphorus between the two lakes? Mr. German stated that considerable work has been done on artificial wetlands in the United States. This has been successful in areas where the vegetation has been living year around. In South Dakota, the vegetation was killed by the winter temperatures.

Phil von Fischer questioned, with the excess water coming in and the erosion of the properties around Lake Cochrane, would you feel that the phosphate level will be higher in Lake Cochrane in 1995 and in the future? Mr. German stated that high water on the lake, above its naturally protected shoreline, can cause an increase in phosphorus due to soil erosion around the lake shore. If the water is sufficiently removed from the lake as it enters, and the lake levels do not rise above that protected shoreline, then that would not happen. If the outlet was plugged and more water was held in the lake than what is normally there, erosion would occur and there would be an increase in phosphorus levels.

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Meeting recessed at 10:08 a.m.

Meeting reconvened at 10:23 a.m.

Chairman Rollag administered the oath to Bill Stewart.

Mr. Stewart, Environmental Senior Scientist for DENR, stated he is the supervisor in charge of the assessment section for the Clean Lakes and Nonpoint Source Programs. This consists of doing diagnostic feasibility studies on lakes and watersheds to present alternatives for restoration of water quality.

Mr. Stewart has a B.S. degree in biology from Dakota State College; 18 graduate hours in biology from the University of South Dakota in Vermillion; 3 graduate hours in environmental engineering; and, a short course in design of the water quality monitoring networks from Colorado State University. Mr. Stewart taught junior high science for 8 years in Sisseton; worked on the Big Stone Lake Project as a water quality analyst in 1987; and in 1989, he transferred to Pierre and started working for the department as a Natural Resources Scientist where he was in charge of several diagnostic feasibility studies. In 1991, he was promoted to Natural Resources Program Scientist, where he was the South Dakota Clean Lakes coordinator.

Mr. Stewart has written numerous diagnostic feasibility study reports for the state of South Dakota and has been an author on various reports.

Mr. Stewart stated he was asked by the Water Rights Division to give an opinion on the water quality differences between Lake Cochrane and Lake Oliver, and impacts of Lake Oliver water flowing into Lake Cochrane. In order to give that opinion, a trip was made to the area to sample the lakes and the flow between the two lakes.

A Sampling Plan for Lake Cochrane and Lake Oliver was put together and submitted to the Water Rights Division for approval (State's Exhibit No. 14). State's Exhibit No. 14 was admitted into the record (on file). The purpose of this sample was to determine water quality for both lakes and to compare the results. Mr. Stewart referred to State's Exhibit No. 2A (topographic map) to show where the various water samples were collected on the lakes (marked as black dots on lakes on map). Samples were also collected from the discharge point of the East Culvert and the West Culvert where water passes through the road. After the samples were collected, they were sealed in a bag of ice, and kept in a cooler until they were sent to the South Dakota State Health Lab for analysis. Additional samples were collected at each subsite and brought to the Floyd Matthew Training Center laboratory for chlorophyll analysis, algae identification and cell count.

In answer to a question from Ms. Best, Mr. Stewart stated they also did field measurements (see State's Exhibit No. 14). The following field measurements were collected: dissolved oxygen,

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water temperature, air temperature, pH, turbidity, Secchi disk, conductivity, and field observations. A Secchi disk is used to compare transparencies between lakes.

The results came back from the state health laboratory and slides were prepared on the results. Mr. Stewart presented the slides to the board, explaining the results from the lab. State's Exhibit No. 15 (6 bar charts) show Lake Cochrane and Oliver Comparisons.

Mr. Stewart stated that the bars on the charts (State's Exhibit No. 15) represent samples taken from: Cochrane Surface, Cochrane Bottom, Oliver Surface, Oliver Bottom, East Culvert and West Culvert. Key nutrient parameters were taken and the charts show the results that came back from the state health lab.

Slide 1 - Tests taken for ammonia and nitrate. Cochrane Surface was the only sample that detected ammonia. The other samples were below the detection level for ammonia. All the samples contained a Nitrate detection level of 0.10 mg/L. According to the South Dakota Water Quality Standards, the standard for nitrates in Lake Cochrane and Lake Oliver is 50 mg/L.

Slide 2 - Tests taken for fecal coliform bacteria. Fecal coliform bacteria is bacteria that inhabits the digestive track of warm blooded animals. No detection of fecal coliform bacteria was detected in either lake. The bacteria was detected in both the East Culvert and West Culvert. The level of fecal bacteria was lower in the East Culvert than the West Culvert. The West Culvert showed 90 colonies per 100 mL of water. The standard for these water bodies is 200 colonies per 100 mL of water.

Slide 3 - Tests taken for total suspended solids and dissolved oxygen. The level of suspended solids in the lakes was well below the standard of 90 mg/L. The level of dissolved oxygen should not be below the standard 5.0 mg/L. The levels of the chart show the samples taken to be at or above the 5.0 mg/L level.

Slide 4 - Tests taken for total phosphate and total dissolved phosphate. The total phosphate measured for the surface and bottom of Lake Cochrane is 0.026 mg/L. The total phosphate measured in Lake Oliver was 0.026 for the surface and 0.030 for the bottom. The East Culvert was higher in phosphate and total dissolved phosphate than the West Culvert.

In answer to a question from Ms. Best, Mr. Stewart stated the state's proposed project would be located at the West Culvert.

Slide 5 - Tests taken for kjeldahl nitrogen. Kjeldahl nitrogen is a measure of organic nitrogen. The chart shows that all the tests were normal.

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In answer to a question from Ms. Best, Mr. Stewart stated there are no standards for kjeldahl nitrogen.

Slide 6 - Comparison of Carlson's Trophic State Index. When comparisons between lakes are done, there needs to be a way to simplify all the numbers. This index is a series of equations produced by a scientist by the name of Robert Carlson from Penn State University. Three parameters are taken. From the three parameters, a trophic state index is calculated. This index is between 0 (totally distilled, pure water) and 100 (extreme hyper-eutrophic). The results of the Secchi disk measurements, total phosphorus concentration and the chlorophyll concentrations of the surface water of the two lakes were calculated. As of June 14, 1995, the two lakes by trophic state index are almost the same.

Ms. Best requested that State's Exhibit No. 15 and State's Exhibit No. 17 (state health lab results) be admitted into the record (on file).

Ms. Best questioned whether Mr. Stewart had an opinion on the water quality of Lake Cochrane and Lake Oliver as of June 14, 1995. Mr. Stewart stated that the water quality between Lake Cochrane and Lake Oliver were very similar.

In answer to a question from Clayton P. Holt, Mr. Stewart stated the reason for the high phosphorus level in Lake Cochrane in 1989 could be due to the lack of water flowing into the lake.

In answer to a question from Shirly Holt, Mr. Stewart stated that the quality of water flowing into Lake Cochrane after heavy rains could improve, if the watershed is in good condition.

Chairman Rollag administered the oath to Lee Cleveland.

Mr. Cleveland stated he lived on the east side of Lake Cochrane. Mr. Cleveland has water problems in the spring, if there is overflow. The water comes into his pasture behind his house and his neighbor also has land that gets flooded. Mr. Cleveland stated that he did not want the water flowing directly from Lake Oliver into Culver Lake. Mr. Cleveland also owns land on the northeast side of Lake Oliver and commented that there was a great amount of damage done to the shoreline there because of the plugging of the culverts. He believed this problem should be addressed.

Chairman Rollag administered the oath to Harold Westphal.

Mr. Westphal stated he lived on the east side of Culver Lake in Canby, Minnesota. He has water problems on his land, which has affected his crop production.

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Chairman Rollag administered the oath to Allen Van Meveren.

Mr. Van Meveren stated he lived in Colman and that his property was located adjacent to Mr. Westphal's property on Culver Lake. Mr. Van Meveren stated that since the 36-inch culvert was put in, approximately 15 acres of his land is now under water. Mr. Van Meveren believed a solution to the problem would be to put a dam between Lake Oliver and Lake Cochrane. That way, Lake Oliver could keep their water, Lake Cochrane would not have the excess water coming in, and he and Mr. Westphal would not be the recipient of the water coming out of both lakes.

Mr. Van Meveren also commented that a rural water system would be taking water out of the aquifer underneath the lakes. A person should be looking at conserving the water in both Lake Oliver and Lake Cochrane.

Opponents

Chairman Rollag administered the oath to Lyle Tobin.

In answer to questions from Mr. McCann, Mr. Tobin stated he had a home located at the southwest corner of Lake Cochrane and his address was in Gary. Mr. Tobin is a member of the Association and serves on the board. Mr. Tobin has examined the eastern outlet of Lake Oliver. The first time he had been out to the outlet was May 25, 1994, to investigate the information that there was tile laid on the eastern outlet of Lake Oliver. An intake was discovered at a point close to the meandering land to the southeast of Lake Oliver. Mr. Tobin and personnel from the ASCS office in Clear Lake, probed from the intake to the southeasterly direction, approximately 500 to 600 feet, and then lost the tile. Mr. Tobin stated they did not visually see the tile laid. The information he received from a contractor that did the tiling in the late 40's or early 50's, indicated that the concrete tile was 12 inches long by 6 inches in diameter. The probe indicated a tile depth of approximately 35 to 40 inches.

The following are photographs Mr. Tobin took on July 6, 1995, in the area of the tile.

Photograph (Exhibit No. A) - shows the land to the water and the mouth of what is the eastern outlet. The water is approximately 300 to 400 feet from the road.

Photograph (Exhibit No. B) - looking east toward Lake Oliver. This photograph shows cattails growing on high ground. The bottom of the draw is to the right in this photograph.

Photograph (Exhibit No. C) - looking northeast over end of Lake Oliver. The low dark spot in the center of the photograph shows where the tile intake is located.

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Photograph (Exhibit No. D) - looking east. Draw is in the foreground and runs southeasterly.

Photograph (Exhibit No. E) - looking northeast over draw in foreground.

Photograph (Exhibit No. F) - looking northwest in the draw where the tile exists. This photograph was taken from the base of draw next to road.

Photograph (Exhibit No. G) - looking west toward Lake Oliver. Photograph shows a natural crevice and the beginning of southeast waterway.

Photograph (Exhibit No. H) - looking southeast, down to where the tile exists.

Mr. Tobin stated reference had been made to the tree line. The water in Lake Oliver has slowly risen over the past 8 to 10 years and this has caused the tile to deteriorate. When that 6-inch tile ceased to operate, the reservoir capability of Lake Oliver also ceased.

Mr. Tobin stated that Exhibit No. I was a USGS map prepared in 1967, showing Lake Oliver, Lake Cochrane, Culver Lake and South Slough.

Mr. McCann requested that Exhibit Nos. A-H (photographs) and Exhibit No. I (map) be admitted into the record (on file).

Mr. McCann requested that Exhibit Nos. J-N (aerial photographs) be admitted into the record (on file). The aerial photographs show the Lake Oliver, Lake Cochrane, Culver Lake and South Slough area.

Meeting recessed at 11:45 a.m.

Meeting reconvened at 1:00 p.m.

Chairman Rollag stated that a neutral representative from Minnesota was present to give a report on a plan to restore the Minnesota River.

Chairman Rollag administered the oath to Kerry Netzke.

Ms. Netzke stated she was at the meeting on behalf of a group known as Area II Minnesota River Basin Project. Ms. Netzke provided the board with a handout on "Working Together: A Plan to Restore the Minnesota River" and presented a brief report (on file).

Ms. Best asked Mr. Tobin to show the board the area where he and Mr. Hatch were looking at the tile drain that runs from Lake Oliver. Mr. Tobin referred to State's Exhibit 5A and used a pink

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highlighter and marked with an X the area of the intake to the tile drain. Mr. Tobin stated that there is tile leading from the intake in the direction of Lake Oliver and Culver Lake.

In answer to a question from Ms. Best, Mr. Tobin did not know if the elevation of the intake had been surveyed.

Mr. Tobin also used the pink highlighter to make a line on State's Exhibit 5A where he believed the crossing would be located on the east side of Lake Oliver.

In answer to a question from Clayton P. Holt, Mr. Tobin stated that in approximately 1985, Legislation let it be known that if the tile was not registered with the state, it would not be recognized in the future. The state does not have to restore the tile.

In answer to a question from John Lair, Mr. Tobin estimated that the tile fell approximately less than 5 feet from the point where the water would flow away from the intake in an easterly direction. No outlet was discovered.

In answer to a question from Mr. Brink, Mr. Tobin stated that in approximately 1948 to 1950, the tile was built to drain the wetland area.

Chairman Rollag administered the oath to Mike Wengler.

In answer to questions from Mr. McCann, Mr. Wengler stated he lived in Brookings and owned a cabin on Lake Cochrane. Mr. Wengler referred to State's Exhibit No. 4. A black tube flows from the slough area, adjacent to Oliver, and joins through the ditch, through Mr. Wengler's property into Lake Cochrane. The black tube that goes into the lake, comes through the culverts on both sides of the county road on Mr. Wengler's property, and goes out into the lake about 15 feet. The tube is a 12-inch tube.

Mr. Wengler stated that there is a lot of green vegetation and it is very "scummy and slimy" and the water is very murky at the point where the tube discharges into the lake. The water has been this way since the tube was put in 2 years ago. Directly across, on the other side of the lake, the water is clear. The water has been flowing through the tube off and on over the past 2 years. The only time the water quits flowing is when the tube drains the slough area.

In answer to a question from Mr. Brink, Mr. Wengler stated that he signed an easement 2 years ago for temporary modification, so the flooding in the area would ease.

Chairman Rollag administered the oath to Clayton P. Holt.

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Clayton P. Holt requested that Holt Exhibit No. 1 (agenda and list of attendees for October 7 & 8, 1981, Water Management Board meeting in Brookings) be admitted into the record (on file).

Clayton P. Holt requested that Holt Exhibit No. 2 (a portion of the Minutes of the November 8 & 9, 1972, Water Resources Commission meeting) be admitted into the record (on file).

Clayton P. Holt requested that Holt Exhibit No. 3 (Speech Made by Clayton P. Holt to the Senate Agriculture Committee on 2-16-95) and Holt Exhibit No. 4 (Lincoln Pipestone Rural Water Project and the Project Area of the Well Site 1-28-95) be admitted into the record (on file). Ms. Best objected to Holt Exhibit Nos. 3 & 4 being admitted into the record on the basis of relevancy. Chairman Rollag overruled Ms. Best's objections. Ms. Best requested a standing objection on Holt Exhibit No. 4.

Clayton P. Holt requested that Holt Exhibit No. 6 (East Dakota Water Development District [draft minutes]) be admitted into the record (on file). On page 4 of this exhibit it states "The overflow of Lake Oliver water into Lake Cochrane including the 12" tube installed was discussed. The consensus of the Board was that Lake Oliver overflow needs to be re-routed into Lake Culver, if possible, to keep the nutrient enriched water in the wetland areas between Lake Oliver and Lake Cochrane out of Lake Cochrane. The manager agreed to try to facilitate discussion to resolve this issue."

Clayton P. Holt stated he grew up near Clear Lake on a farm three miles south of Clear Lake. Lake Cochrane was where they went for their recreational activities.

Clayton P. Holt presented the board with Holt Exhibit No. 5 (Information for the Water Management Board). This exhibit was not admitted into evidence by Mr. Holt. Mr. Holt read his testimony from this exhibit (see exhibit on file).

Clayton P. Holt requested that Holt Exhibit No. 7 (map and aerial photograph) be admitted into the record (on file). The map in this exhibit shows the wetland areas. The photograph shows Lake Oliver, Lake Cochrane, Culver Lake, and part of South Slough. Ms. Best stated she would like a standing objection to the reference of the "Well Site" on the aerial photograph.

Chairman Rollag administered the oath to Bob Lee.

Mr. Lee stated he has had a cabin on the north side of Lake Cochrane for 22 years. The cabin is located approximately 2 blocks east of Mr. Wengler's, where the black tube goes into the lake. This lake is a unique, spring fed lake. For many years this lake did not have an outlet or an inlet. Lake Cochrane has nice, sandy beaches with many homes surrounding it. The lake is also a recreational lake. Mr. Lee stated Lake Oliver does not have any of these attributes.

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Mr. Lee commented that he could see the slime and the algae draining into Lake Cochrane from Lake Oliver. In the summer when the weather is warm an odor comes from Lake Oliver. These should be reasons for not letting Lake Oliver water flow into Lake Cochrane.

Chairman Rollag administered the oath to Shirley Holt.

Mrs. Holt, Lake Cochrane resident, stated the water should be drained directly into Culver Lake from Lake Oliver.

Chairman Rollag administered the oath to Judy McCann.

Mrs. McCann stated she has been a resident on Lake Cochrane for approximately 21 years. Mrs. McCann has a degree in geography from South Dakota State University. Mrs. McCann believes that the residents of Lake Cochrane have done a wonderful job of taking care of the lake. The people of Lake Cochrane are very concerned about the lake and do not want the lake ruined. Mrs. McCann also believes that her dog has gotten sick recently from the water and she is concerned about what the water could do to the children who swim in the lake.

Chairman Rollag administered the oath to Clayton B. Holt.

Clayton B. Holt has been living in the Lake Cochrane area for approximately 20 years. When he was younger, he would fish in Lake Oliver and that lake would be real weedy. The water in Lake Oliver was so cloudy from the algae he could not see his lure until it was up near his rod. Testimony was heard that if you farm around the lake, the phosphorus and nitrogen levels will increase. Mr. Holt was concerned with the amount of water that would be flowing into Lake Cochrane from Lake Oliver.

Clayton B. Holt stated he had talked to some people who live on Lake Cochrane and they commented that they bought property on the lake because of its reputation of being a clear, clean lake. Mr. Holt talked to neighbors recently and they commented on how the water is greener than its ever been. His neighbor pumps water out of the lake to water his lawn and the neighbor has been thinking about putting a filter on his pump because its getting plugged up.

Rebuttal

In answer to questions from Ms. Best, Mr. Hatch stated that his recommendations remain the same after hearing testimony the past couple of days with respect to the Lake Oliver and Lake Cochrane issues. The issue before the board is where to set the outlet elevation for Lake Oliver. There has been testimony in support of moving water east from Lake Oliver, directly towards Culver Lake and towards the point where the end of the tile is approximately 1/3 mile from the

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Lake Oliver OHW. For water to move into that tile line from Lake Oliver, the water would have to rise approximately 2.7 feet above the OHW before it would flow east through the tile line.

Under the flow design for the outlet for Lake Oliver and for Lake Cochrane, the Cochrane outlet is at 1683.6 fmsl. Under the 100-year, 24-hour storm design, the water would drain out within 5 days and would not go above the OHW. People have concerns about flooding, but under the flow design, this should not occur. Mr. Hatch referred to Figure 1 of the report and noted that the OHW for Lake Oliver extends down almost to the roadway, which is located just north of Lake Cochrane.

Mr. Hatch stated that the issue before the board is establishing the outlet elevation for Lake Oliver. Mr. Hatch realizes the concerns the people expressed regarding the water quality, but the issue is the outlet elevation.

In answer to a question from Mrs. Loucks, Mr. Hatch stated that in years past, Lake Cochrane has been higher in elevation than Lake Oliver, but now, Lake Oliver is higher in elevation than Lake Cochrane.

Mr. McCann questioned what kind of structure was being considered for the outlet? Mr. Hatch stated that GF&P would be doing the design on the outlet structure. Mr. Hatch stated the outlet structure would remove water within a 5-day period and handle a 100-year, 24-hour storm.

Clayton P. Holt questioned why the culverts were originally installed in the area between Lake Oliver and the park? Mr. Hatch answered that they were installed for local drainage in the area.

Mr. Richter questioned at what level would the outlet elevation have to be constructed? Mr. Hatch stated the outlet would have to be constructed at an elevation of 1683.6 fmsl.

Closing statements

Mr. Richter stated the issue before the board is to set the outlet elevation for Lake Oliver. If the water is released in an area that is not the ordinary water course, a flood control permit would be needed. The state is trying to accomplish what they can within South Dakota law. The outlet elevation recommended is 1683.6 fmsl. The established OHW for Lake Oliver is 1684.3 fmsl.

Mr. Richter stated that if the outlet elevation would be at the east end of Lake Cochrane, it would be set approximately 4 feet higher than the OHW. If the outlet elevation would be constructed at 1688.0 fmsl, there would be water all over the place.

Minutes of the 86th Meeting of the Water Management Board
July 6 & 7, 1995

There has been testimony given by several people that state the natural water flow is into Lake Cochrane from Lake Oliver.

Mr. McCann stated the Association believes that the department is not taking enough interest in the water quality issue. Mr. German reported that phosphorus was a limiting nutriment for algae. The Association is very concerned about the future of Lake Cochrane. The lake has steadily seen deterioration in the past and is not as clean as it has been.

The Association believes the state is going in the wrong direction. They would like to work together with the state and come up with a better solution to the problem. The Association does not believe the problem is going to be solved by putting in the large structures, running water out of Lake Oliver periodically, into a slough, overflowing that slough and flushing out the nutriments into Lake Cochrane.

The Association would like the board to consider the presentation given by Mr. German regarding phosphorus being a limiting factor. The Association believes that once the phosphorus gets into the lake, there will be no way of getting it out.

The drain tile should be reinstalled and with time, this drain tile should resolve the problem. The Association believes this drain tile was leading water out of the system down into Culver Lake.

Clayton P. Holt stated in his testimony the water could flow out of the east end of Lake Oliver. The tile located 3 feet below the high point would be at an elevation of 0.6 of a foot above the elevation of 1683.6 fmsl. This is what the figures show. Mr. Holt also stated that with great expense, a sewer system has been installed around Lake Cochrane to keep phosphorus from building up in the lake. The residents around the lake do not want to see this effort come undone.

Mr. Lair, owner of property on the north end of Lake Oliver, is concerned with the level Lake Oliver has reached and the damage it has done to the north shore line of the lake. As a property owner, Mr. Lair believes they are entitled to as much consideration as any other property owner at the meeting.

Mrs. Gunderson clarified for the people in attendance, that the board is required to fulfill the rules of law of the State of South Dakota. The board gives ample time and due respect to each individual who wishes to give testimony. Mrs. Gunderson stressed that the board cares about the condition of all of the people of the state. What decision the board makes on this lake will be based on testimony brought before the board and prior experience from other lakes they have had to make equally difficult decisions on. The board does not favor any side; they attempt in every way possible to abide by the statutes and rules of the state.

Minutes of the 86th Meeting of the Water Management Board
July 6 & 7, 1995

Mr. Freeman MOVED, SECONDED by Mr. Brink to APPROVE the withdrawal of Flood Control Application No. FC-8, Deuel County Commission. MOTION CARRIED.

Mr. Brink commented that the OHWM had already been established at 1684.3 fmsl at the December 7, 1988, Water Management Board meeting.

Mr. Brink MOVED, SECONDED by Mrs. Gunderson to establish the outlet elevation for Lake Oliver in Deuel County at 1683.6 fmsl. MOTION CARRIED.

Mr. Brink MOVED, SECONDED by Mrs. Gunderson to establish the location of the outlet structure at the S 1/2 NW 1/4 Section 4-T114N-R47W. MOTION CARRIED.

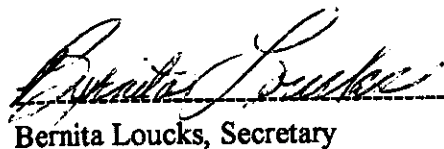
Chairman Rollag directed that Findings of Fact, Conclusions of Law and a Final Decision be prepared.

A transcript of the proceedings may be obtained by contacting George Heller, Heller Reporting Service, PO Box 367-0367, 5th Street Plaza, Watertown, SD 57201 telephone number (605)886-5280.

The hearing was also tape recorded and a duplicate set of tapes may be obtained by contacting the Water Rights Program, Department of Environment and Natural Resources, 523 East Capitol, Pierre, SD 57501, telephone number (605)773-3352.

Meeting adjourned at 3:35 p.m., July 7, 1995.


Dwayne Rollag, Chairman


Bernita Loucks, Secretary

**REQUEST TO ESTABLISH AN OUTLET ELEVATION FOR
LAKE OLIVER DEUEL COUNTY, SOUTH DAKOTA
JUNE 6, 1995**

The Department of Game, Fish and Parks and the Department of Environment and Natural Resources have requested that the outlet elevation for Lake Oliver be set. The purpose for the request is to allow an outlet structure between Lake Oliver and Lake Cochrane to alleviate flooding to the Lake Cochrane Recreation Area.

The issue before the Water Management Board is the establishment of the outlet elevation for Lake Oliver, although other issues will also have to be addressed. Lake Oliver is part of a drainage system that consists of Lake Oliver, Lake Cochrane, Lake Culver, and several wetlands. During the period from the early 1950's until 1993, Lake Oliver did not spill water. In the intervening years, manmade modifications have interfered with the natural drainage between the lakes. The location and design of the Lake Oliver outlet and the Lake Oliver water quality, the Lake Cochrane outlet and the affects on downstream landowners are all related.

LAKE OLIVER

In 1986 - 1987, an investigation was conducted to establish the Ordinary High Water Mark on Lake Oliver, Deuel County at the request of the Department of Game, Fish and Parks (attachment 3). The ordinary high water mark request was made as a result of Flood Control Permit Application No. 8 submitted by the Deuel County Commission. Application No. FC-8 proposed to partially drain Lake Oliver to alleviate problems associated with the high water levels. At the December 7, 1988 Water Management Board meeting, the Board accepted the recommendations of the Chief Engineer and established the Ordinary High Water Mark for Lake Oliver at 1684.3 feet mean sea level (fmsl). The Board also established the outlet elevation at 1683.6 fmsl subject to the approval of Flood Control Permit No. FC-8.

Flood Control Permit Application No. FC-8 proposed to construct a flood control project to drain water from Lake Oliver into Lake Cochrane. The project consisted of an eight inch tile drain approximately 1000 feet long located in the NW1/4 of section 4 T114N R47W. The purpose of the project was to alleviate flooding due to high water levels in Lake Oliver. After hearing testimony on Flood Control Application No. FC-8 the Board deferred action until a water quality study was completed to determine the affects of routing Lake Oliver water into Lake Cochrane. The Board held that, in lieu of the water quality study a plan to amend application No. FC-8 could be submitted for lowering the current outlet elevation and routing Lake Oliver overflow into the drainage downstream of Lake Cochrane.

LAKE COCHRANE

Lake Cochrane is located in Deuel County, Sections 4, 5 and 8 of T114N R47W. Lake Cochrane is located directly south of Lake Oliver. October 7, 1981, the Water Management Board established the Ordinary High Water Mark on Lake Cochrane at 1684.3 feet msl (attachment 4). In addition, the Board established the outlet elevation for Lake Cochrane at 1683.6 feet msl. This action was taken even though a pipe outlet from Lake Cochrane had been constructed in 1972 by the Department of Game, Fish and Parks at an elevation of 1682.5 feet msl. Excess precipitation and the

fact that the pipe outlet has been raised by ice action has resulted in water levels in Lake Cochrane which have exceeded the outlet elevation. The Lake Cochrane outlet should be redesigned and rebuilt to elevation 1683.6 feet msl.

Discharge from Lake Cochrane flows downstream for approximately one half mile into Lake Culver. Lake Culver is partially in South Dakota and partially in Minnesota.

ISSUES CONCERNING LAKE OLIVER OUTLET LOCATION AND ELEVATION:

1. The location of the outlet for Lake Oliver needs to be established. One proposal for the Lake Oliver outlet is in the NE1/4 section 4 T114N R47W. This would drain water from the southeast corner of Lake Oliver directly to Lake Culver therefore bypassing Lake Cochrane.
2. Flood Control Application No. FC-8, submitted by the Deuel County Commission proposed to drain Lake Oliver through a tile in the NW1/4 section 4 T114N R47W (attachment 5). Action on No. FC-8 was deferred until the water quality issue between Lake Oliver and Lake Cochrane was resolved or until another outlet was defined.
3. An emergency culvert was installed in 1993, through an area that historic information indicates is the natural drainage from Lake Oliver to Lake Cochrane.
4. The outlet elevation needs to be set for Lake Oliver.

Location of the Lake Oliver Outlet

The report for the Ordinary High Water Mark Investigation Lake Oliver November 1988 (attachment 3) determined that the location for the Lake Oliver outlet is in the NW1/4 SW1/4 NW1/4 Section 4 T114N R47W. Division investigation shows that water has flowed between Lake Oliver and Lake Cochrane. The area between the lakes has been filled in preventing water from flowing between the lakes.

Statements that the natural outlet for Lake Oliver is in the southeast portion of the lake in section 33 T115N R47W through the northeast portion of section 4 T114N R47W then into Lake Culver have been investigated. This area was surveyed by Department of Game, Fish and Parks engineering staff. The survey profile (attachments 7, 8, 9, 10) indicates that for the outlet to be located in this area several conditions would have to be met. The water would have to exceed the ordinary high water mark of 1684.3 fmsl for Lake Oliver, reach a high point of 1688.0 fmsl between Lake Oliver and Lake Culver and then drop within a quarter of a mile to elevation 1653.3 fmsl (Lake Culver's water elevation).

A field inspection of this area does not indicate any form of a natural channel or of erosional features. It is not physically possible for water to drop 34.7 feet in elevation and not erode a natural channel. This location is not a reasonable location for the natural outlet from Lake Oliver.

Action on deferred Flood Control Application No. FC-8.

Flood Control Application No. FC-8 was received by the Water Rights Division on July 31, 1987. FC-8 proposed to construct an 8 inch tile drain from Lake Oliver to Lake Cochrane on the west side of the Lake Cochrane Recreational area in the NW1/4 section 4 T114N R47W. The Water Management Board deferred action on No. FC-8 at the September 1987 meeting. At the December 1988 meeting of the Water Management Board the board continued deferment of No. FC-8 to allow a water quality study.

The Deuel County Commission has submitted a letter stating that they no longer wish to construct the proposed drain and have requested that Flood Control Application No. FC-8 be withdrawn (attachment 5).

Lake Oliver outlet elevation.

The Water Management Board established the outlet elevation of Lake Oliver at elevation 1683.6 fmsl pending approval of Flood Control Application No. FC-8. Elevation 1683.6 fmsl is the elevation necessary to maintain the Ordinary High Water Mark of 1684.3 fmsl established by the Board. A review of the data from the previous investigations continues to support elevation 1683.6 fmsl as the correct outlet elevation.

Since the deferral of Flood Control Application FC-8, the situation at Lake Oliver and Lake Cochrane has changed. The area has received above normal precipitation for the last three years. Lake Oliver presently has a water level at 1687.08 fmsl, this is 2.78 feet above the OHWM and 3.48 feet above the recommended outlet elevation. Water has overtopped the paved roads between the lakes and caused damage to the Lake Cochrane Recreational Area, private property and shorelines. In 1993 Deuel County installed a 12 inch plastic culvert through the natural outlet area from Lake Oliver to Lake Cochrane to help alleviate the flooding. This pipe is still functional.

Design of Lake Oliver outlet and redesign of Lake Cochrane outlet.

To maintain the ordinary high water marks and to alleviate flooding around both lakes, the outlets for both lakes must be adequately designed and constructed. To show that the outlets for both lakes can be designed to alleviate flooding a design storm of 100 year 24 hour return interval was selected. This storm would result in 5.5 inches of precipitation falling on the lakes and drainage areas in a 24 hour period. This design storm would have a one percent chance of occurrence in any given year.

The outlets were designed using the 100 year 24 hour design storm, to meet the requirement that the water level would not exceed the established ordinary high water marks and that the water levels would return to the outlet elevations in 5 days.

Using the above parameters, the outlet from Lake Oliver to Lake Cochrane would be a culvert that would handle 18 cubic feet per second of water (cfs). The 18 cfs in addition to the water from the Lake Cochrane drainage area would require that the outlet for Lake Cochrane handle 44 cfs. The Department of Game, Fish and Parks engineering division has

verified that an outlet structure from Lake Oliver to Lake Cochrane and from Lake Cochrane downstream can be designed and built to meet these parameters.

DOWNSTREAM ISSUES:

Lake Cochrane discharge flows into a wetland then into Lake Culver. Lake Culver is a natural lake that is on the border of South Dakota and Minnesota. Downstream of Lake Culver in the NE1/4 section 5 T114N R46W there is a dam owned by Lowell Hunt. Mr. Hunt's dam was overtopped by the precipitation and the additional flow from the installation of the 36 inch culvert on the Lake Cochrane outlet. Mr. Hunt has completed some work on his dam but the design and construction is not known.

WATER QUALITY ISSUES:

There have been many references to the water quality of Lake Oliver water. Information concerning the water quality will be presented to the Water Management Board at the July 6, 1995 hearing.

CONCLUSIONS:

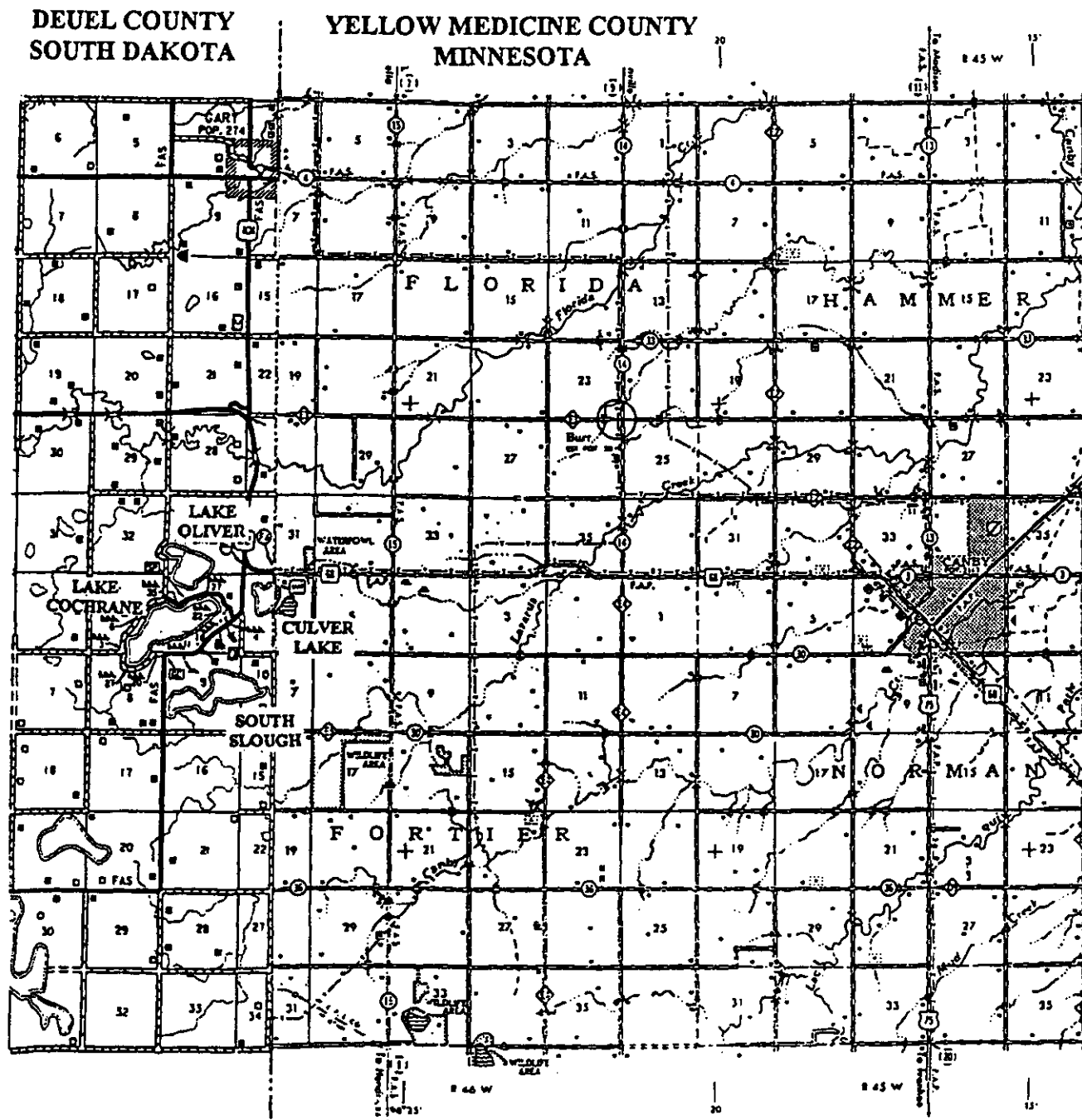
1. The Ordinary High Water Marks for Lake Oliver and Lake Cochrane have been previously established at 1684.3 feet mean sea level. In addition, the outlet elevation for Lake Cochrane has been established at 1683.6 feet mean sea level. The outlet for Lake Oliver was established at 1683.6 feet mean sea level pending approval of Flood Control Application No. FC-8.
2. Flood Control Application No. FC-8 should be withdrawn because the Deuel County Commission does not intend to construct the project.
3. The natural drainage is from Lake Oliver to Lake Cochrane.
4. The outlet from Lake Oliver to Lake Cochrane is located at the NW1/4 SW1/4 SE1/4 NW1/4 Section 4, T114N R47W near Fire Location Number 162.
5. The outlet elevation from Lake Oliver to Lake Cochrane is at 1683.6 feet mean sea level.
6. The outlets for Lake Oliver and Lake Cochrane can be designed for a 100 year 24 hour design storm and the waters discharged in a 5 day period without exceeding the ordinary high water marks of either lake.



Gale N. Selken P.E.
Natural Resources Engineer IV

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WATER RIGHTS

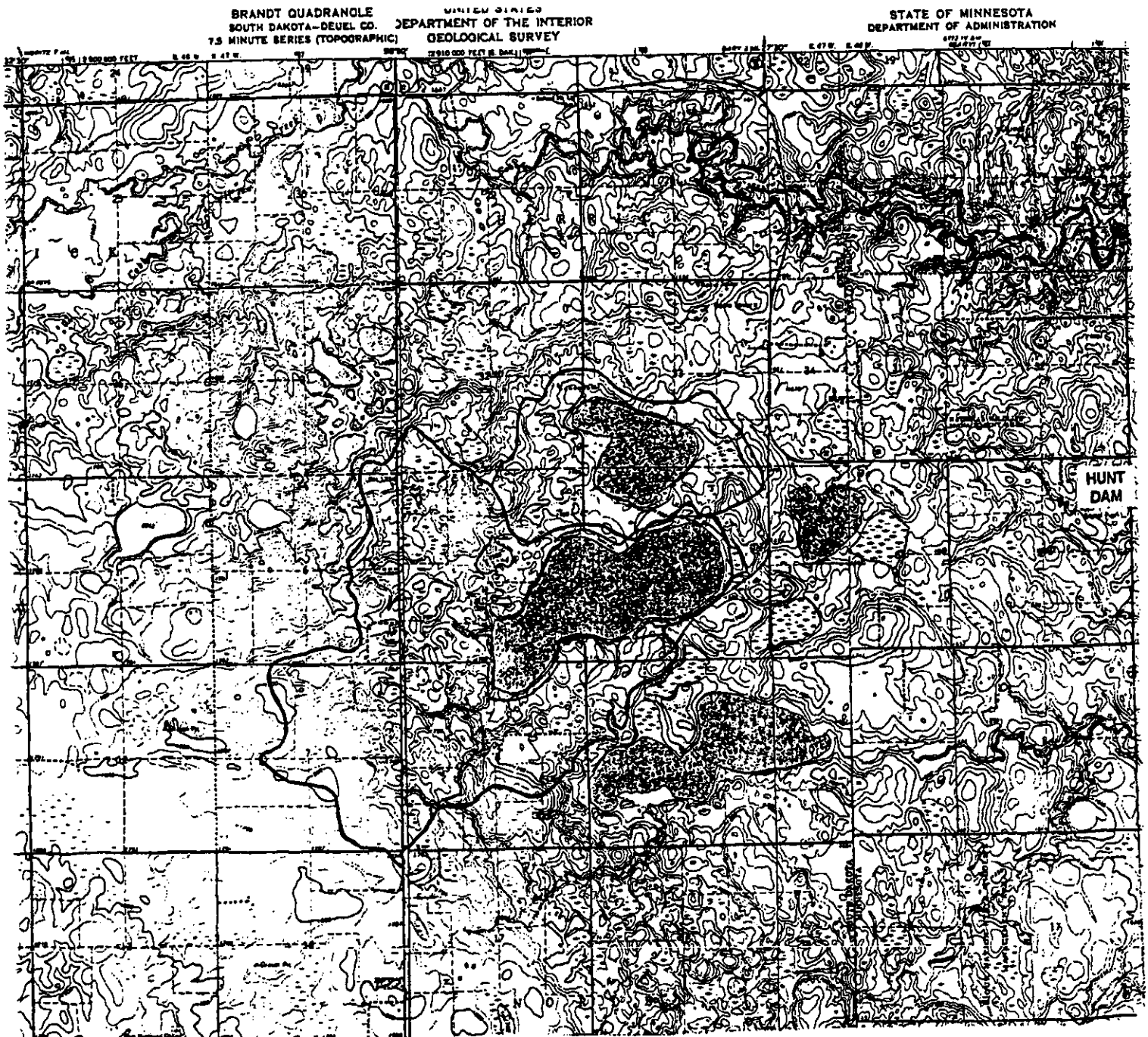
REQUEST TO ESTABLISH AN OUTLET ELEVATION
FOR LAKE OLIVER
DEUEL COUNTY, SOUTH DAKOTA



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WATER RIGHTS

REQUEST TO ESTABLISH AN OUTLET ELEVATION
FOR LAKE OLIVER
DEUEL COUNTY, SOUTH DAKOTA

WATERSHED MAP





DENR
SOUTH DAKOTA

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

Memo to File

Lake Oliver in Deuel County

VWR No. 1470-3

The OHWM was set by the Water Management Board on December 7, 1988.

OHWM elevation 1684.3 fmsl NGVD29

The outlet elevation was set by the Water Management Board on July 6, 1995

Outlet elevation 1683.6 fmsl NGVD29