

WATER PERMIT NO. 6314-3

Name of Applicant: Wild Oak Golf Club

Address: 117 S Lawler, Mitchell SD 57301

Phone: 605 996-2084

Amount of Water Claimed: 0.17 add'l cfs

Total Acres: 80

Source of Water Supply: Firesteel Creek

Water to be used for: irrigation

County: Davison

Type of Waste Disposal System:

Location: Mitchell

PRIORITY Date Received: 2-26-2002

Fee: \$225

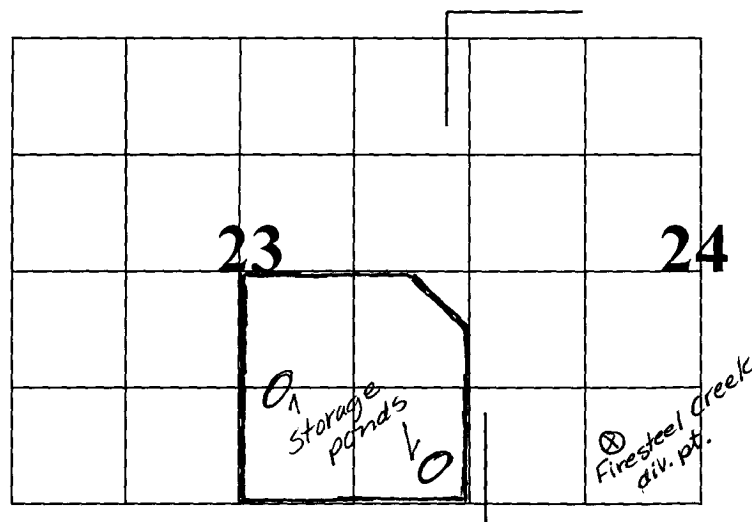
Corrected Application Received: 3-20-2002

Period of Annual Use: May 1 – September 31

Remarks: add'l nine holes to existing golf course authorized by Water Right No. 1371-3

Diversion Point: SE ¼ SW ¼ Sec 24-T103N-R60W

Land to be Irrigated: SE ¼ Sec 23-T103N-R60W



Depth of Well: NA

Well Driller: : NA

Remarks:

Type of Map: aerial

Prepared by: Dorothy Heitzman, FSA

Reviewed and the Number Assigned on: 3-20-2002

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

**SOUTH DAKOTA
WATER PERMIT NO. 6314-3**

Date of first receipt of application February 26, 2002.

Date of return to applicant for corrections, amendments or changes February 27, 2002.

Date of receipt of corrected application March 20, 2002.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 6314-3 to Wild Oak Golf Club, 117 S Lawler, Mitchell SD 57301 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 6314-3 appropriates an additional 0.17 cubic feet of water per second (cfs), changes the location of the diversion point and changes the acres from what is currently authorized by Water Right No. 1371-3. Water Right No. 1371-3 appropriates 0.50 cfs from Firesteel Creek located in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ to irrigate 83.13 acres located in the SW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 24; all in T103N-R60W. This permit authorizes diversion of an additional 0.17 cfs from the diversion point on Firesteel Creek which is now located in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ Section 24, T103N, R60W. This permit also changes the acres irrigated to the new nine hole golf course addition located in the SE $\frac{1}{4}$ Section 23, T103N, R60W. Water will be diverted from the Firesteel Creek diversion point at a maximum rate of 0.67 cfs to two holding ponds prior to application to the land. The ponds will be located in the W $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 23-T103N-R60W. The original nine hole golf course will continue to be irrigated from a well as authorized by Water Right No. 1747-3.
2. The amount of the appropriation may not exceed 2 acre feet annually for each acre of land to which water is actually and beneficially applied for irrigation. The water is to be used during the following described annual period: April 1 – November 1.
3. The date from which applicant may claim right is February 26, 2002.
4. The date of approval of Permit No. 6314-3 is May 28, 2002.
5. One-fifth of the construction is to be completed on or before November 28, 2005.
6. All construction is to be completed on or before May 28, 2007.
7. Water is to be put to beneficial use on or before May 28, 2011.
8. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

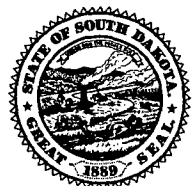
1. The City of Mitchell has priority right to Firesteel Creek water under a future use withdrawal permit. Water Permit No. 6314-3 is subject to their prior rights if or when the city develops the reserved water supply.
2. Water Permit No. 6314-3 is subject to written shut-off orders from the Chief Engineer if necessary to protect downstream senior water rights on the James River.
3. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

WATER MANAGEMENT BOARD

By: Garland Erbele
Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

JUN 13 2002

date



Mail to: Water Rights Program Joe Foss Building 523 E. Capitol Pierre, SD 57501-3181 (605) 773-3352	No. <u>6314-3</u> (office use only)
	Hydrologic Unit <u>10160011</u>
	Basin <u>James River</u>
Newspaper <u>Daily Republic, Mitchell SD</u>	

RECEIVED
FEB 26 2002
WATER RIGHTS
PROGRAM

Application For Permit To Appropriate Water For Irrigation

Type of Application: New Vested Right X Amendment/Correction to Permit No. 1371-3
(Use predates Mar 2, 1955)

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.) change use to allow for additional acres under irrigation.
New 9 holes on golf course

1. Name of Applicant Dave Backlund - Wild Oak Golf Phone 605-996-2084
(check one) X Owner Tenant/lessee

Mailing Address 117 S Lawler Mitchell SD 57301
(Street, RR, or Box and City) (Zip Code)

2. Amount of water claimed 0.17 add'l *CFS or 250-300 **GPM 245 ***AF Total Acreage 80
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)

3. Source of water supply Firesteel Creek

4. Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) Grid in (SE1/4 SW1/4)
Sec 24 - T 103N - R60W County DAVISON

5. County or counties where water will be used DAVISON

6. Annual period during which water is to be used MAY - SEPT April 1 - November 1

7. List below each forty acre division, or lot, or fraction thereof and show number of acres to be irrigated in each.
(Attach sheet if more space is needed)

Land Description	Acres	Land Description	Acres
<u>see attached</u>	<u>40</u>		
<u>portions of SE1/4 Sec 23-T103N-R60W</u>	<u>40</u>		

8. Give a description of the project. (Attach sheet if more space is needed)

pumping water from firesteel creek into holding ponds.
Irrigating golf course from ponds. Creek water will
supplement development drainage in ponds

STATE OF SOUTH DAKOTA) SS
County of DAVISON

Attachments: Attach Form 2A if diversion is from a well or dugout, or if storage of water is proposed. Attach map and any other technical information. (see instructions)

I, David Backlund, the applicant, certify that I have read this application, have examined the attached map and that the matters stated are true and that I intend, and am able to complete the necessary construction.

Applicant's signature David Backlund

Subscribed and sworn to before me this 21st day of February 2002

Notary Public signature Burt G...

Supplemental Information

(type or print in ink)

1. Well Information - Proposed Construction

- a) Drill Hole Diameter _____ Depth _____
- b) Casing Type _____ Diameter _____ Thickness _____
- c) Screen Type _____ Diameter _____ Thickness _____
- d) Gravel Pack _____ Length of Gravel Pack _____
- e) Depth to Top of Water Bearing Material _____
- f) Depth to Water (ground surface to water level) _____
- g) Distance to nearest existing domestic well:
On applicants property _____ On property owned by others _____

2. Wastewater Disposal System Information

- a) Type of System (i.e. septic tank, drain field) _____
- b) System Capacity (gallons) _____ Year Constructed _____
- c) Connected to the City of _____ Sanitary System _____

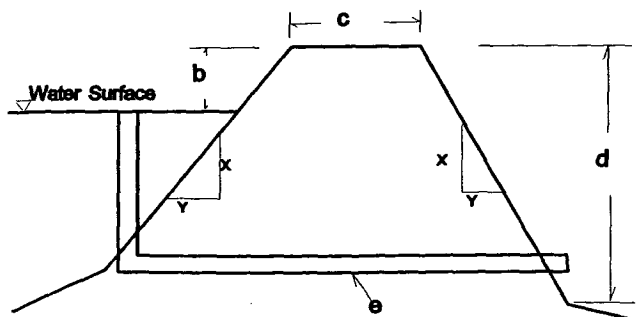
3. Dugout Information

- a) Surface Dimensions 5 Acres Depth 40'
- b) Depth to water (ground surface to water level) 160' well water @ 160'
@ 5 GPM

4. Water Storage Dams

If the proposed water use system contains one or more storage dams, please furnish the information requested below for each dam. The locations of the dams need to be shown on the map submitted with the application.

- a) If a private engineering firm or government agency was involved in the design of this dam, please give their name and address:



- b) Freeboard _____
- c) Crest Width _____
Crest Length _____
- d) Height _____
- e) Primary Outlet Capacity _____
If pipe, diameter _____
- f) Secondary Spillway Capacity _____
Spillway Width _____
- g) X & Y Slope _____
Upstream _____
Downstream _____
- h) Surface Area of Impoundment _____
- i) Storage _____ Acre Feet
- j) Drainage Area Above Dam _____ Acres

Southeast Quarter (SE1/4) of Section Twenty-three (23), Township One Hundred Three (103) North, Range Sixty (60), Davison County, South Dakota, except a strip of land two (2) rods wide along the North side, and except Lots H-1 and H-2 in the Southeast Quarter (SE1/4), and except Lot H-3 in the West Half of the Southeast Quarter (W1/4SE1/4); and subject to an easement for pipeline 53 feet from and parallel to the South boundary, and the right of reversion of all Lots deeded for Highway purposes; and except Lot H-4 in the S1/2SE1/4 of Section 23, Township 103 North, Range 60, West of the 5th P.M., Davison County, South Dakota, consisting of 142.27 acres, more or less, including all of the real property that reverted to the Sellers property under the Executive Order dated the 11th day of May, 1983 and the recorded the 19th day of May, 1983.

Will Oak Golf Club
(Water Permit Application No. 6314-3)

Top of Dam Elev. - 105
2nd Spillway Elev. - 103
P. Spillway Elev. - 102
Dis Top Elev. - 88

Cat. 3 - Low Hazard Dam

H. = 17 ft.

Normal Storage Capacity - 52.92 Ac.-ft
Int. Storage Capacity - 58.48
Max. Storage Capacity - 70.16

Int. Capacity x Eff. H. = $58.48 \times 13 = 760 < 3000$ ∴ 25 yr
Minimum Spillway Design

From USGS WRI 80-80 "Tech. for Est. Flood Peaks ... in 50"

$$DA = 95 \text{ Ac} = 0.148 \text{ mi}^2$$

$$\text{Slope} = 40 \text{ ft/mile}$$

$$SI = 3.33 \quad CN = 69$$

$$\begin{aligned} Q_{25} &= 83.4 A^{.60} S^{.44} S_i^{-.72} \\ &= 83.4 (0.148)^{.60} (40)^{.44} (3.33)^{-.72} \\ &= 83.4 (0.3178) (5.0688) (0.4206) \\ &= \underline{57 \text{ cfs}} \end{aligned}$$

$$\begin{aligned} Q_{100} &= 132 A^{.65} S^{.46} S_i^{-.67} \\ &= 132 (0.148)^{.65} (40)^{.46} (3.33)^{-.67} \\ &= 132 (0.2888) (5.4269) (0.4466) \\ &= \underline{93 \text{ cfs}} \end{aligned}$$

Secondary Spillway Flow

$$\begin{aligned} Q &= CLH^{3/2} \quad C = 2.6 \\ &= 2.6 (20) (2)^{1.5} \quad L = 20 \\ &= \underline{147 \text{ cfs}} \quad H = 2 \end{aligned}$$

SPN routes a Q_{25} peak of 50 cfs thru the primary spillway with a reservoir peak elevation of 102.81 and peak outflow of 7.8 cfs and Q_{100} peak of 118 cfs thru the secondary spillway with a reservoir peak elevation of 103.62 and peak outflow of 26.5 cfs.

Section 74:02:08:09

NRCS Annual Yield

$$CN = 69, DA = 95, ISO = 3$$

1. Topo Map - OK (Section line closed)
2. Dam axis Profile - OK
3. Dam Max X-Sec. - OK
4. Area - Capacity - OK
5. Outlet Details - OK
6. Spillway Rating - OK
7. Spillway Details - OK
8. Specs - OK
9. EPP - N/A Cat. 3 - OK

$$\begin{aligned} 80\% \text{ chance} &= 0.1 \\ 0.1 \times 95^{1/2} &= 0.8 \text{ Ac.-ft} \\ 50\% \text{ chance} &= 0.3 \\ 0.3 \times 95^{1/2} &= 2.5 \text{ Ac.-ft} \\ 10\% \text{ chance} &= 1.8 \\ 1.8 \times 95^{1/2} &= 14 \text{ Ac.-ft} \end{aligned}$$

NEW
SPECTRACEF
cefditoren pivoxil
200-mg tablets

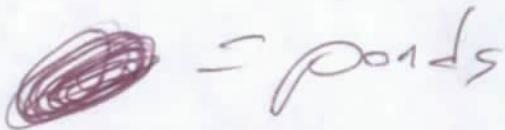


= Diversion
point



TAP PHARMACEUTICALS INC.
Lake Forest, IL 60045

NEW
SPECTRACEF
cefditoren pivoxil
200-mg tablets



TAP PHARMACEUTICALS INC.
Lake Forest, IL 60045

2001-050-01855 11/01

6314-3

Form Service Agency

RECEIVED
MAR 13 2002
DAVISON HANSON FSA

MAP NOT TO SCALE
THIS IS NOT AN OFFICIAL WETLAND MAP

Dorothy Heitzman FT.

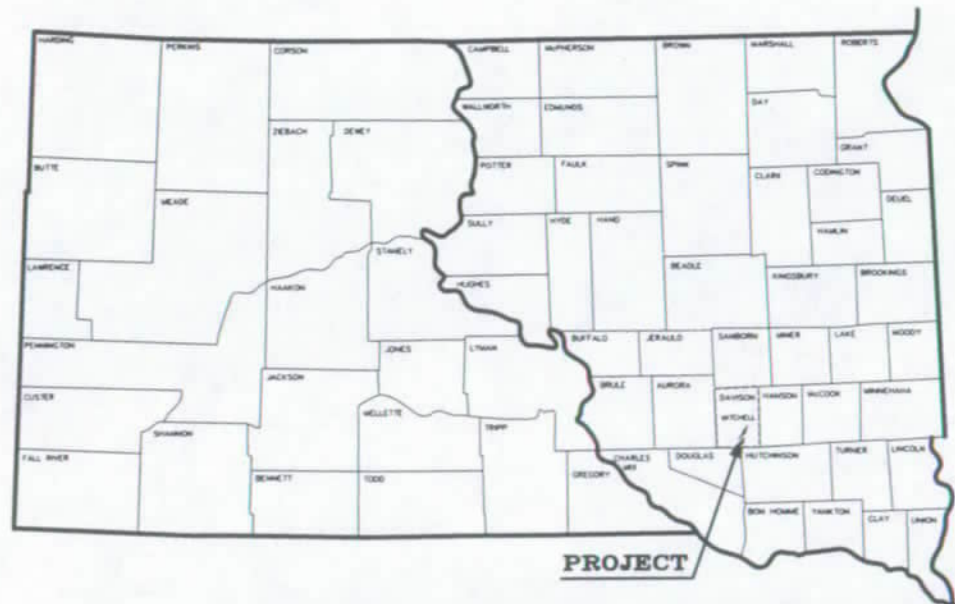
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Sec. 23

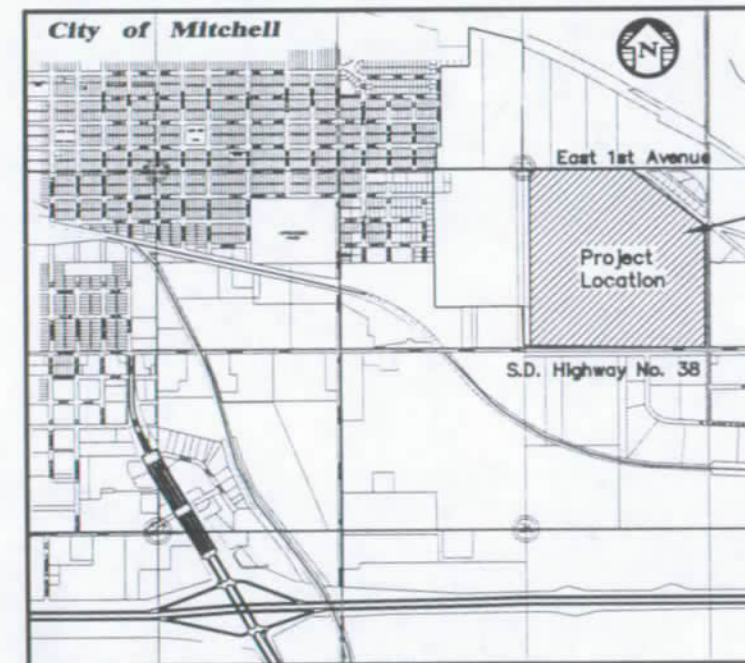


WILD OAK GOLF COURSE ADDITION PROPOSED DAM STRUCTURE MITCHELL, SOUTH DAKOTA

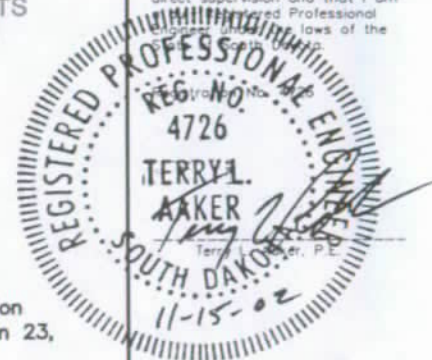
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WATER RIGHTS
PROGRAM



LOCATION MAP



Area of Construction
S.E. 1/4 of Section 23,
T 103 N, R 60 W



INDEX OF SHEETS

- | | |
|---|---|
| 1 | Cover Sheet |
| 2 | Overall Layout Plan |
| 3 | Plan and Profile Sheet |
| 4 | Principal Spillway Cross Sections and Typical Section |
| 5 | Trash Rack and Baffle Detail Sheet |
| 6 | Seepage Collar Detail |

**OWNER: DAVE BACKLUND
WILD OAK GOLF COURSE**

**Schmucker,
Paul, Nohr &
Associates**

Engineers - Planners - Surveyors

**SPN
ASSOCIATES**

620 North Lawler - P.O. Box 398
Mitchell, South Dakota
Zip 57301
Phone: (605) 996-7761
Fax: (605) 996-0015

Certificate

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of South Dakota.

REG. NO. 4726
TERRY L. AAKER
REGISTERED PROFESSIONAL ENGINEER
SOUTH DAKOTA
11-15-02

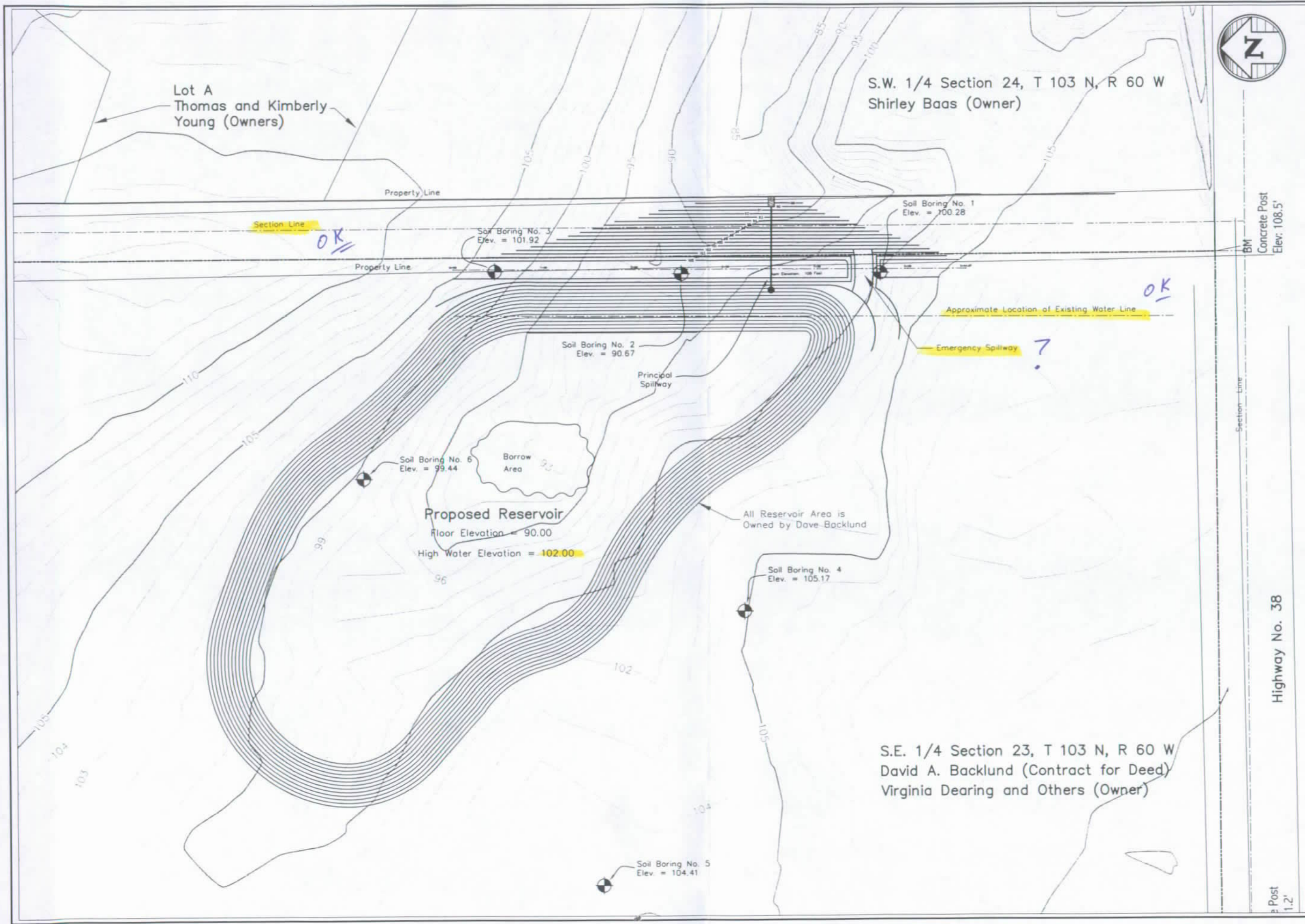
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Vert. Scale: NTS
Drawn By: ****
Checked By: ****
Date: 10/2002
Project No.: 11263
Computer Name: Server
File Name: Wild Oak
Cover - Dam

Project Name:
**Wild Oak
Golf Course
Addition**

Located in:
**Mitchell,
South Dakota**

Sheet Name:
**Cover
Sheet**

Sheet Number:	Total Sheets:
1	6



SPN
ASSOCIATES

Engineers - Planners - Surveyors

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Horiz. Scale: 1" = 50' (22" x 34" Size)
Horiz. Scale: 1" = 100' (11" x 17" Size)
Vert. Scale: none
Vert. Scale: none
Drawn By: TAJ
Checked By: ****
Date: ****
Project No: 11263
Computer Name: Server
File Name: Wild Oak dam reservoir

Project Name:

Wild Oak
Golf Course
Addition

Located in:

Mitchell,
South Dakota

Sheet Name:

Dam Structure
Overall Plan

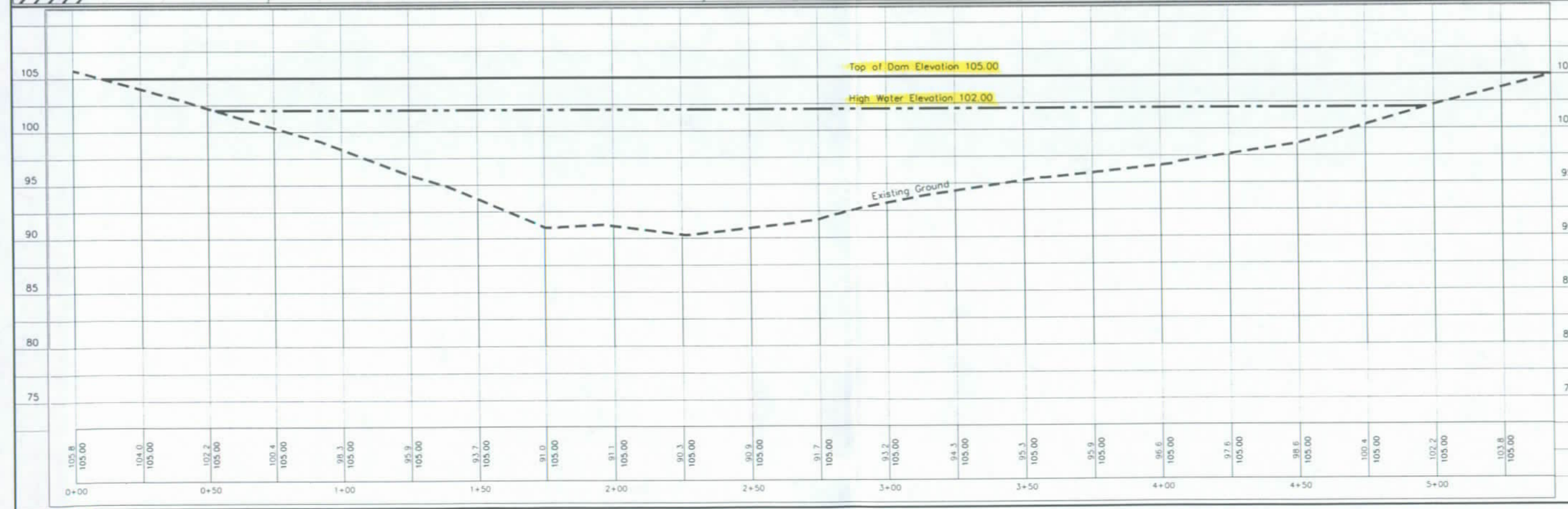
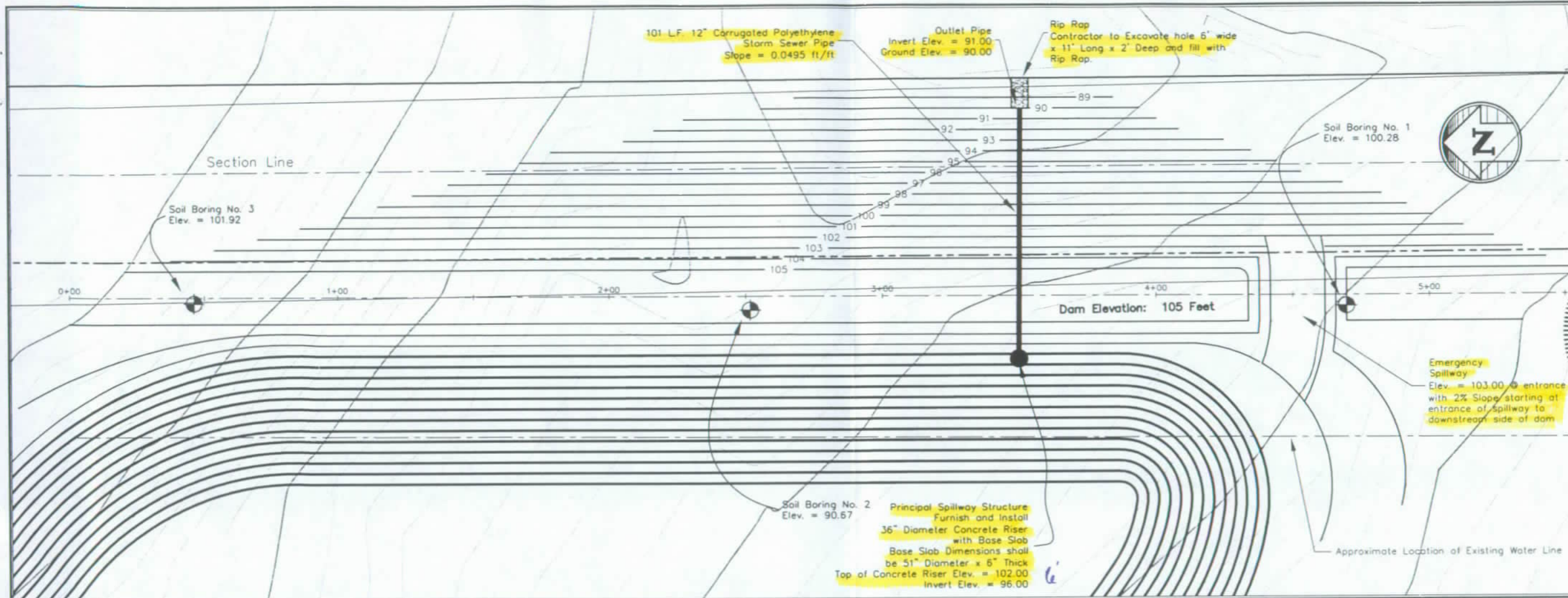
Sheet Number: Total Sheets:

2 6

Concrete Post
Elev. 108.5'

Highway No. 38

Post
1.2'



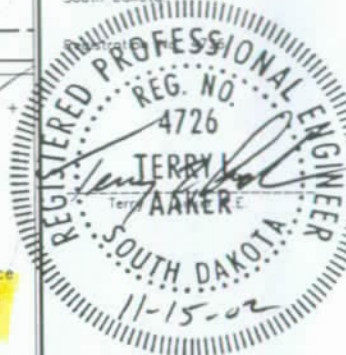
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ASSOCIATES

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Mitchell, South Dakota 57301
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Horiz. Scale: 1" = 40' (11" x 17" Size)
Vert. Scale: 1" = 5' (22" x 34" Size)
Vert. Scale: 1" = 10' (11" x 17" Size)
Drawn By: TAJ
Checked By: ****
Date: ****
Project No.: 11263
Computer Name: Server
File Name: Wild Oak dam reservoir

Project Name:

Wild Oak
Golf Course
Addition

Located in:

Mitchell,
South Dakota

Sheet Name:

Dam Structure
Plan and Profile

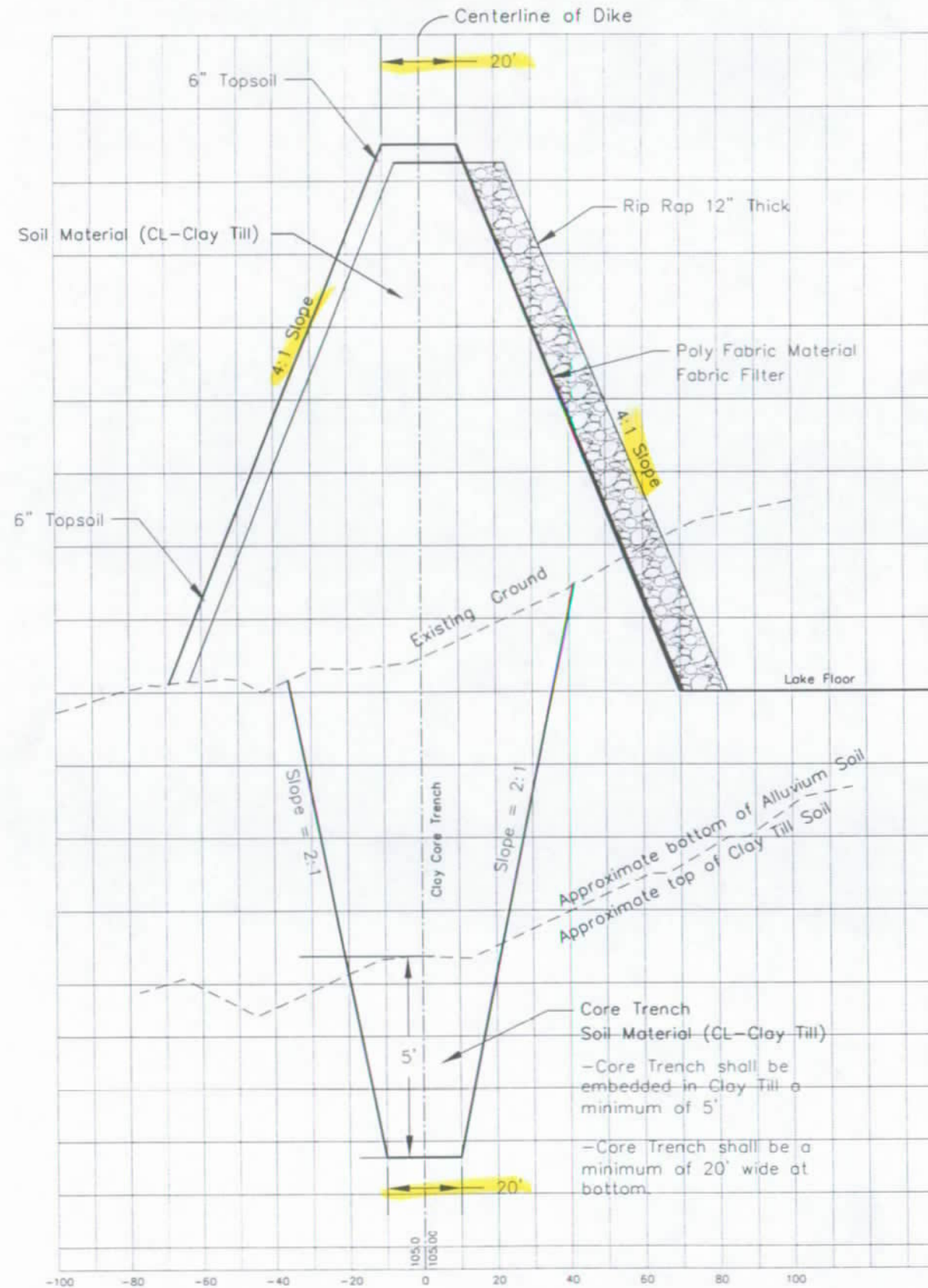
Sheet Number:

3

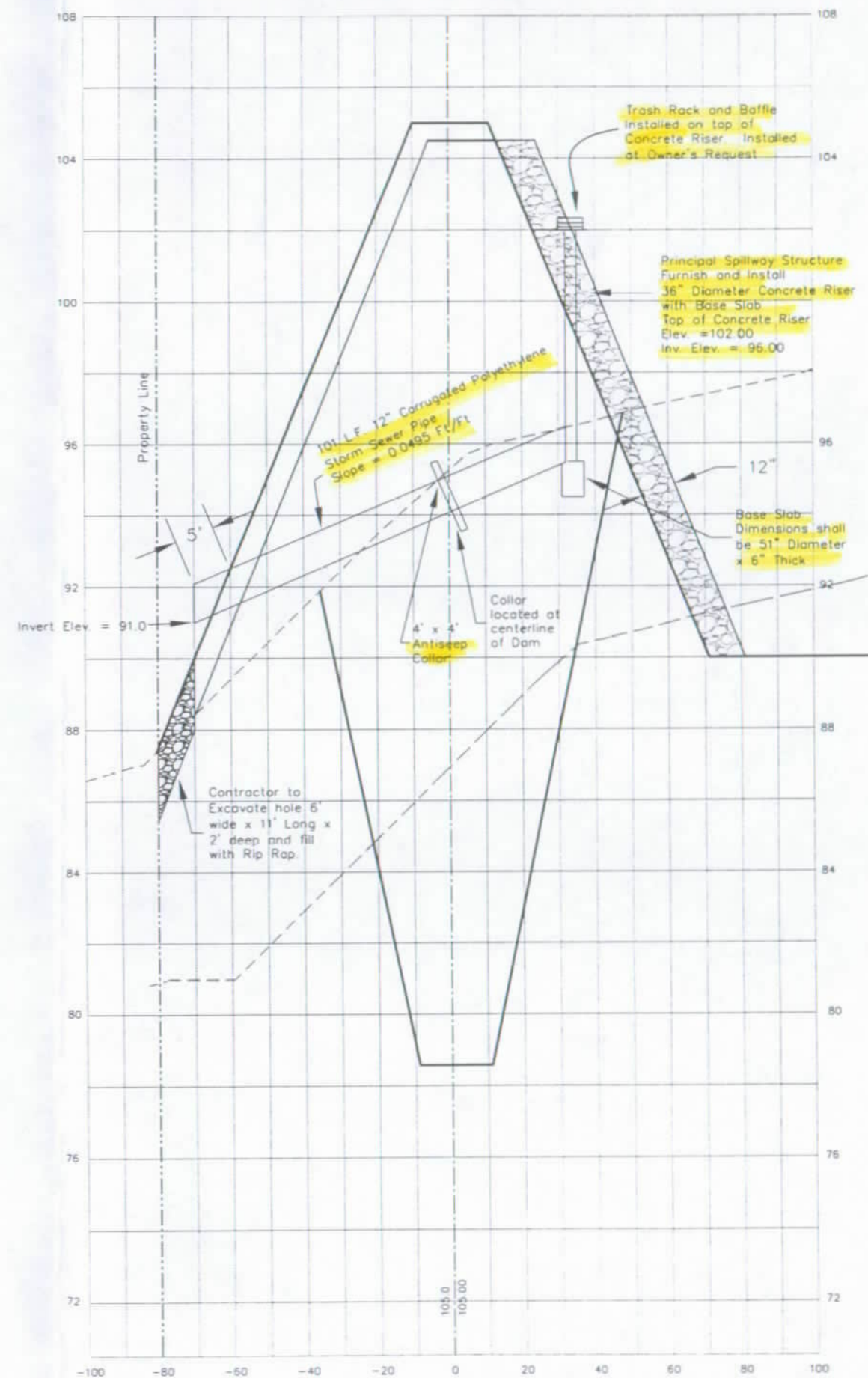
Total Sheets:

6

Typical Dam Cross Section



Principal Spillway Detail, 3+50



SPN
ASSOCIATES

Engineers - Planners - Surveyors

620 North Lawler - P.O. Box 398
Mitchell, South Dakota 57301
Phone: (605) 996-7761 - Fax: (605) 996-0015

Certificate

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Horiz. Scale: 1" = 20' (22" x 34" Size)
Horiz. Scale: 1" = 40' (11" x 17" Size)
Vert. Scale: 1" = 2' (22" x 34" Size)
Vert. Scale: 1" = 4' (11" x 17" Size)
Drawn By: TAJ
Checked By: ****
Date: 10/2002
Project No.: 11263
Computer Name: Server
File Name: Wild Oak dam reservoir

Project Name:

Wild Oak
Golf Course
Addition

Located in:

Mitchell,
South Dakota

Sheet Name:

Dam and Principal Spillway
Cross Sections and Details

Sheet Number:

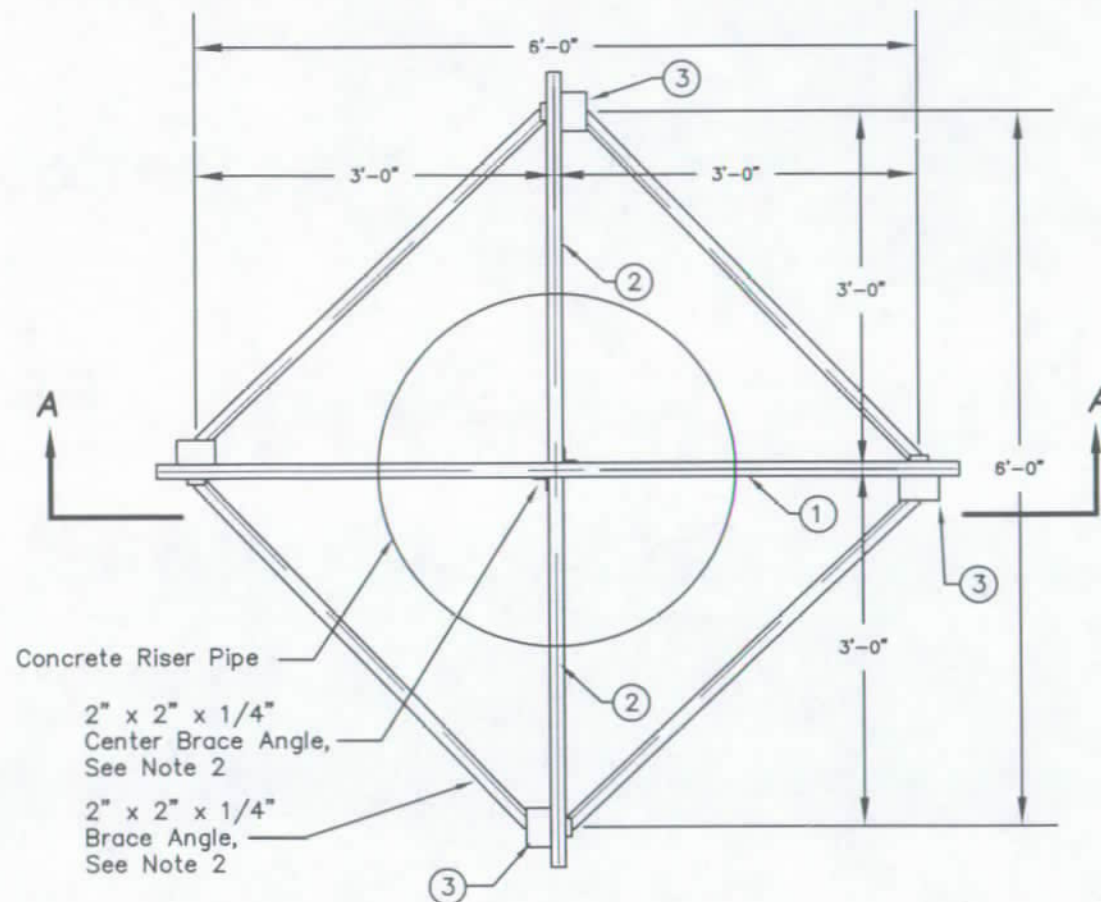
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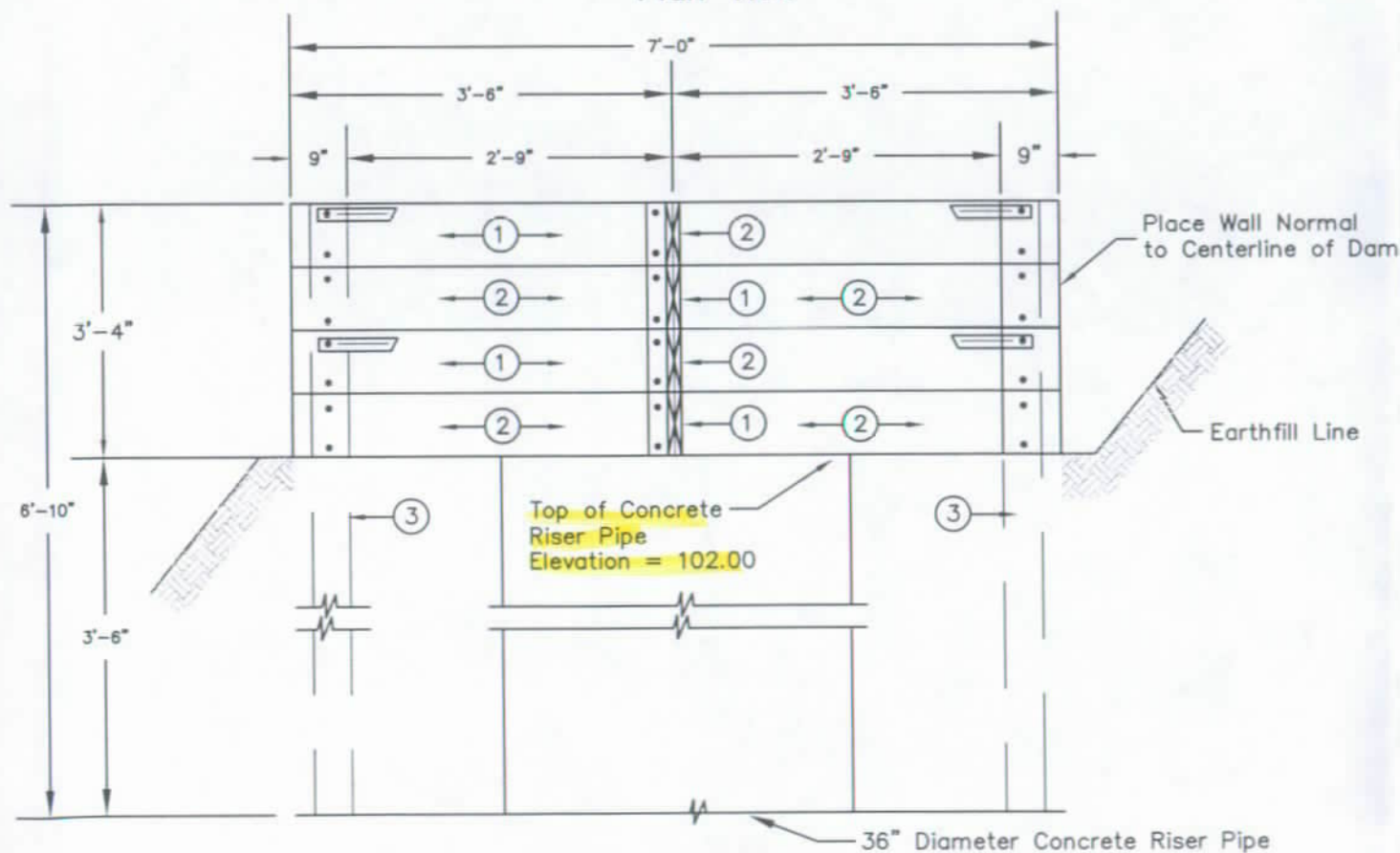
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Certificate

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Plan View



Sectional Elevation A-A

Plan View of Brace Angle

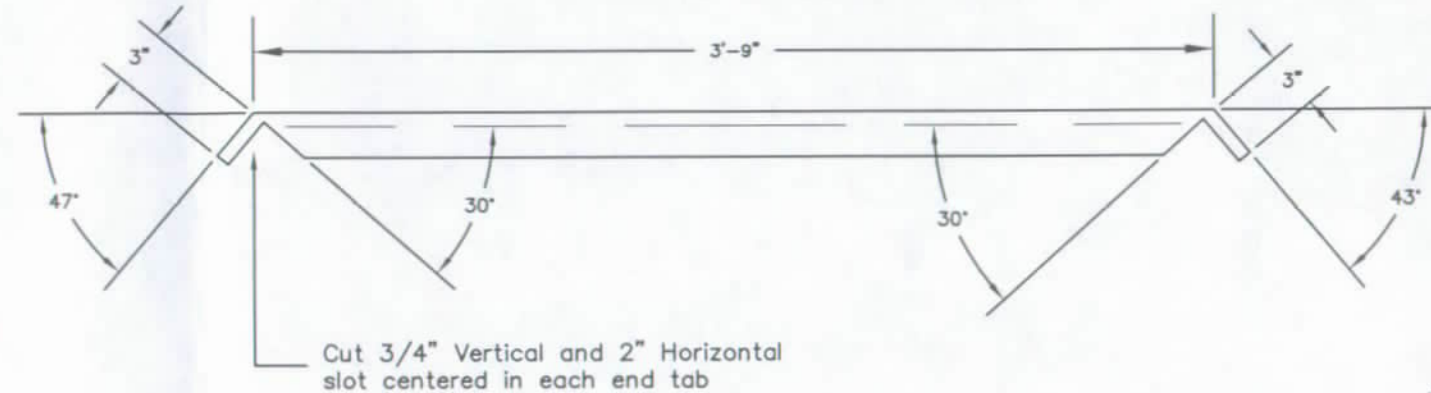


Table of Quantities

Item	Mark	No. Required
2" x 10" x 7' Pressure Treated Lumber	1	4
2" x 10" x 3'-5" Pressure Treated Lumber	2	8
4" x 6" x 6'-10" Pressure Treated Post	3	4
2" x 2" x 1/4" x 4'-3" Steel Angle	*	8
2" x 2" x 1/4" x 3'-2" Steel Angle	*	2
5/8" x 8" Steel Bolts, Nuts, 2 Washers	*	32
1/2" x 3" Steel Bolts, Nuts, 2 Washers	*	32

General Notes

- To 4" x 6" Posts (4 Required) Bolt 2" x 10" Boards using two 5/8" x 8" Bolts per 2" x 10" Board. Do not place Bolts Closer than 1-1/2" from edge of board.
- For center brace angles drill 8 - 5/16" holes 5/8" from outer edge of each leg of each angle and centered 5-1/4" apart along the leg.
- Attach Brace Angles to top bolt on top 2" x 10" board and to top bolt on next to bottom board.

Trash Rack and Baffle Specifications

- An anti-vortex baffle shall be installed at the elevations and locations as shown on the plans.
- The anti-vortex baffle shall be installed to be capable of restricting water from forming a vortex, "circular swirling", condition upon entering the concrete riser, but allow water to flow freely into the riser without major disruption.
- The anti-vortex baffle shall be manufactured to meet the dimensions of the concrete riser and surrounding areas as specified on the plans.
- The anti-vortex baffle shall be manufactured to withstand long period, harsh environmental conditions such as high wind, heavy rain, hail, freezing, heat, harsh water waves, etc..
- The anti-vortex baffle shall be securely mounted with the mounting devices located on the outside of the riser pipe.
- The anti-vortex baffle shall be made of pretreated lumber and galvanized steel.

Horiz. Scale: 1" = 10' (22' x 34" Size)
 Horiz. Scale: 1" = 20' (11' x 17" Size)
 Vert. Scale: 1" = 5' (22' x 34" Size)
 Vert. Scale: 1" = 10' (11' x 17" Size)
 Drawn By: TAJ
 Checked By:
 Date:
 Project No.: 11263
 Computer Name: Server
 File Name: Wild Oak dam reservoir

Project Name:

Wild Oak
Golf Course
Addition

Located In:

Mitchell,
South Dakota

Sheet Name:

Trash Rack and Baffle
for 36" Concrete Riser

Sheet Number:

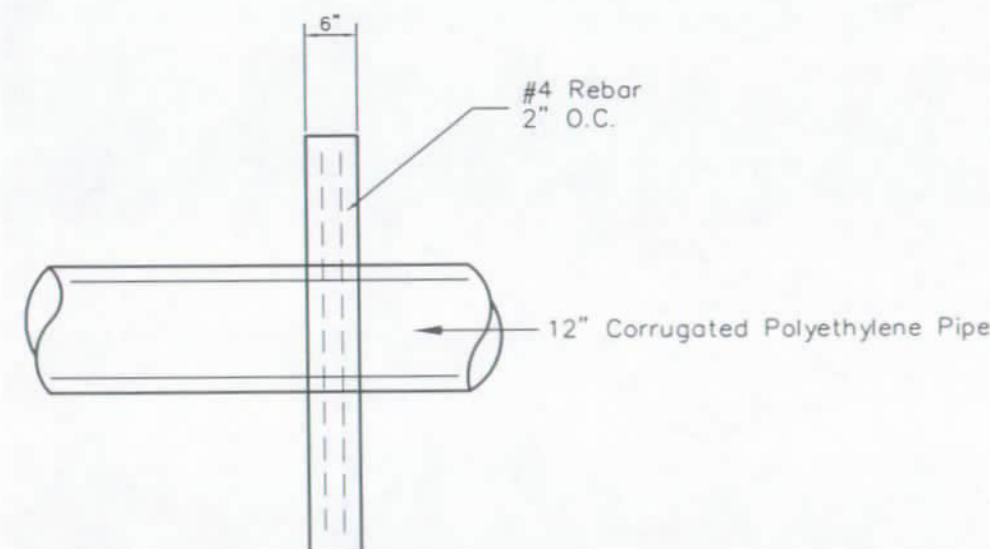
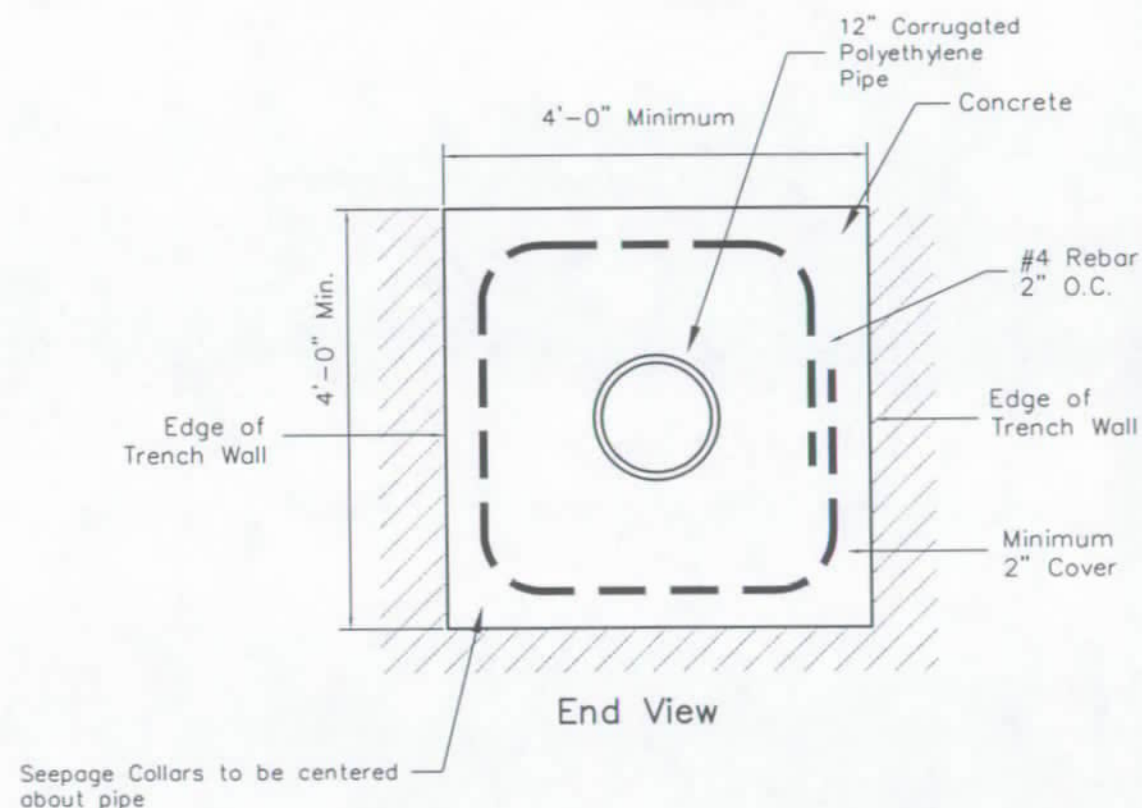
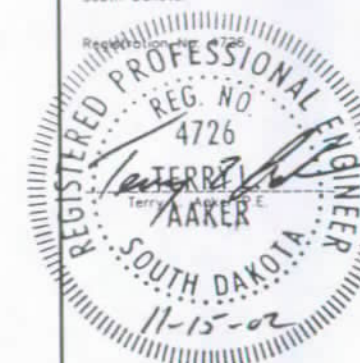
5

Total Sheets:

6

Certificate

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.



Section

TYPICAL CONCRETE SEEPAGE COLLAR DETAILS

NO SCALE

Horiz. Scale: 1" = 100' (22" x 34" Size)
Horiz. Scale: 1" = 200' (11" x 17" Size)
Vert. Scale: 1" = 5' (22" x 34" Size)
Vert. Scale: 1" = 10' (11" x 17" Size)
Drawn By: TAJ
Checked By: ****
Date: ****
Project No.: 11263
Computer Name: Server
File Name: Wild Oak dam reservoir

Project Name:

Wild Oak
Golf Course
Addition

Located in:

Mitchell,
South Dakota

Sheet Name:

Seepage Collars

Sheet Number:

6

Total Sheets:

6

RECEIPT

Water Rights Program

South Dakota Department of Environment and Natural Resources

112 417127

Pierre, March 20, 20 02

RECEIVED OF Wild Oak Golf Club, 117 S Lawler St., Mitchell, SD 57301
the following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct
and to put water to beneficial use _____

75 00

Fee for Application for Permit No. _____ to Appropriate Water, for Future
Use _____

Fee to retain Future Use Permit No. _____ after period of seven years.

Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water
License No. _____

Fee for Filing Transfer Form _____

Fee for Filing Extension Request _____

Fee for _____

(Any Other Work Provided by Law)

Total

75 00

By

Darlan E. Erbe

Chief Engineer

gm

RECEIPT

Water Rights Program

South Dakota Department of Environment and Natural Resources



417102

Pierre, February 26, 20 02

RECEIVED OF Wild1Oak Golf Club, 117 S Lawler St., Mitchell, SD 57301
the following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use _____	150	00
Fee for Application for Permit No. _____ to Appropriate Water, for Future Use _____		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____	50	00
Fee for Filing Transfer Form _____		
Fee for Filing Extension Request _____		
Fee for _____		

(Any Other Work Provided by Law)	Total	200 00

By

Darla L. Ebel
Chief Engineer

REAL ESTATE TAX NOTICE
Javison County Treasurer, 200 East 4th
Mitchell, SD 57301

Legal Description of Property (For tax purposes only)

SE 1/4 EX HWY LOTS, RIVERVIEW SUB,
& NE NE NE OF SE 1/4

23-103-60

PARCEL# 6000-10360-234-10

MITCHELL TWP
MITCHELL 17-2
ACRES 142.27
TAXBILL# 1378

FIRST CLASS
PRESORT
US POSTAGE
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SIOUX FALLS
SOUTH DAKOTA



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

February 27, 2002

David Backlund
Wild Oak Golf Club
117 S Lawler
Mitchell SD 57301

Dear Mr. Backlund:

Thank you for submitting the *Application for a Permit to Appropriate Water* for irrigation of Wild Oak Golf Club. There are several items that need to be addressed prior to proceeding with this application.

Water Right No. 1371-3 authorizes 0.50 cubic feet of water per second (225 gallons per minute) from Firesteel Creek to irrigate 83.13 acres located in portions of the SW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$ Section 24-T103N-R60W (copy enclosed). The aerial photo submitted with the application indicates the irrigated lands for a new 9 hole golf course are located in the SE $\frac{1}{4}$ Section 23-T103N-R60W. It would appear that the 80 acres requested on this application would be in addition to the 83.13 acres of the original golf course authorized by Water Right No. 1371-3. Is this correct? If so, an additional filing fee may be required. Are you proposing to use the same diversion point authorized by No. 1371-3? *yes*

The golf club also held Water Right No. 1747-3 authorizing 1.18 cubic feet of water per second (530 gallons per minute) from a well located in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ Section 24 (copy enclosed). Will water from the well be used in conjunction with the irrigation of Section 23? *Maybe if needed*

The new application requests 300 gallons per minute (gpm) which is greater than the 225 gpm diversion rate authorized by Water Right No. 1371-3. Is 300 gpm the diversion rate from Firesteel Creek or the diversion rate from the holding ponds? What is the diversion rate from each? Where are the holding ponds located? Please mark the location of the holding ponds on the aerial photo. If they are located in Section 24, then include an aerial photo of that section with the holding ponds and Firesteel Creek diversion point marked.

The aerial photo for Section 23 is being returned because it must be signed by one of the following: Registered Land Surveyor, Registered Professional Engineer or by any other government employee who normally prepares maps as a part of his assigned duties (i.e. local NRCS office).

If you have any questions, please contact Eric Gronlund or me.

Sincerely,

Karen Schlaak

Karen Schlaak
Water Rights Program
605 773-3352

RECEIVED
MAR 20 2002
WATER RIGHTS
PROGRAM

enclosures

Water Rights Program - File Documentation

NAME: John Doescher, Wild Oak Golf Club

ADDRESS: Mitchell

DATE: 3-18-02 **COUNTY:** DN **TELEPHONE:** 996-2084

RE: Pending Application

COMMENTS:

Mr. Doescher called to answer the questions asked in my letter dated February 27, 2002.

The 80 acres requested on the application are in addition to the 83.13 acres on Water Right No. 1371-3. An additional \$75 fee will be required. They will be using the same diversion point as No. 1371-3.

Water Right No. 1747-2 authorizes diversion from a well. Mr. Doescher stated water from the well will be used in conjunction with the water from Firesteel Creek for irrigation of the new area. The amount will be based on rainfall.

The diversion rate from the holding ponds to the golf course will be 300 gpm. They were not certain what the diversion rate would be from the creek to the ponds, but they are requesting 300 gpm. They were proposing to fill the ponds in the spring. Additional water would be based on rainfall.

The holding ponds will be located in the new area in Section 23. He will be submitting aerial photos for both Sections 23 and 24, with the proposed locations of the holding ponds and Firesteel diversion point locations marked.



Karen Schlaak
Environmental Scientist

Water Rights Division - DENR

Conversation or File Documentation

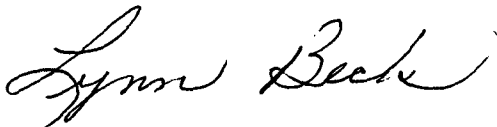
Name of Person: **John Doescher** File No. **6314-3**
Address: **Wild Oak Golf Club, 117 S Lawler, Mitchell, SD 57301** County: **Davison**
Date: **4-5-02** Telephone: **(605) 996-2084**
RE: **Water Permit Application No. 6314-3**

Comments:

I telephoned Mr. Doescher to clarify some aspects of the application. They do not plan to use WR 1371-3 (0.50 cfs from Firesteel Creek) to irrigate the original 83.13 acres located in the SW¼ and NW¼ SE¼ Section 24, T103N-R60W. These acres are irrigated solely from a well authorized by WR 1747-3.

This application will use 0.17 cfs and the 0.50 cfs from WR 1371-3 to irrigate a new 80 acres of golf course located in the SE¼ Section 23, T103N-R60W. The water from Firesteel Creek will fill two ponds (apprx. 5 acres each) with a combined storage of 70-80 million gallons (245 acre-feet). Water will be pumped from the ponds to the new nine-hole course at a rate of 300 gpm or 0.67 cfs. In this conversation Mr. Doescher thought they might use the well to supplement pumping to the ponds. In a conversation on 4-8-02 Mr. Doescher said that they would not pump water from the well to the ponds. If they decide to it will be down the road and they will make application to do so.

I told Mr. Doescher that to store 245 acre-feet the ponds would be fairly deep, he said they would be.

A handwritten signature in cursive script, reading "Lynn Beck".

Lynn Beck
Natural Resources Engineer



Cooperator Access
Water Resources skip navigation

Data Category:

Surface Water

Geographic Area:

United States

GO

Monthly Streamflow Statistics for the Nation

USGS 06477500 FIRESTEEL CR NEAR MOUNT VERNON SD

Available data for this site

Surface-water: Monthly streamflow statistics

GO

Davison County, South Dakota
Hydrologic Unit Code 10160011
Latitude 43°46'30", Longitude 98°14'33" NAD27
Drainage area 521.00 square miles
Gage datum 1,297.22 feet above sea level NGVD29

Output formats

HTML table of all data

Tab-separated data

Reselect output format

YEAR	Monthly mean streamflow, in ft ³ /s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1955									.000	.006	.007	.000
1956	.000	.000	1.70	8.48	.66	.010	.006	53.9	1.26	.052	.24	.14
1957	.055	.28	8.75	4.26	97.9	17.6	95.7	1.89	.34	.032	.16	.14
1958	.11	.52	58.2	52.5	2.93	.97	.19	.000	.000	.000	.13	.006
1959	.000	.064	.46	.14	.071	.007	.000	.000	.000	.000	.000	.016
1960	.023	.052	455	326	5.46	1.47	.045	.000	.000	.000	.000	.000
1961	.000	.29	.52	.083	1.58	28.9	1.39	.17	.000	.019	.030	.029
1962	.010	.014	84.4	536	514	1,097	123	77.0	6.76	2.40	1.34	2.40
1963	.62	1.81	11.8	6.39	9.41	3.26	1.06	.16	.063	.006	.12	.094
1964	.30	.19	.49	1.88	23.3	.047	.016	.000	.000	.000	.000	.000
1965	.000	.12	.000	.42	.077	.53	.039	.006	.057	.022	.021	.13
1966	.004	.27	112	3.02	1.33	.015	.005	4.65	.44	.089	.046	.021
1967	.019	.12	2.73	.43	.025	169	9.97	.17	.039	.005	.005	.026
1968	.001	.026	.11	5.10	6.20	.001	20.0	12.1	.32	.027	.001	.007
1969	.000	.000	.084	623	10.9	2.36	.21	.072	.008	.11	.12	.039
1970	.081	.61	21.6	77.3	5.86	1.71	.002	.007	.000	.021	.096	.033
1971	.000	.80	110	6.21	2.30	.25	.81	.000	.000	.000	.012	.085
1972	.030	.23	148	3.79	319	34.2	3.59	4.32	.028	.16	.36	.26
1973	23.3	75.1	161	12.2	4.35	4.56	.28	.004	.061	.18	.17	.34
1974	6.57	10.7	12.1	4.32	3.48	36.0	.11	.004	.015	.023	.049	.096

1975	.10	.070	.36	1.07	.063	.027	.000	.000	.000	.000	.029	.064
1976	.005	.29	.21	.14	.19	.003	.000	.000	.000	.000	.000	.000
1977	.000	.000	78.3	11.6	1.38	.21	.000	2.22	.064	.028	.33	.022
1978	.000	.000	276	26.9	17.4	17.7	.25	.000	.008	.015	.028	.024
1979	.004	.000	1.89	1.03	.69	.084	.061	.082	.000	.008	.056	.063
1980	.022	.000	.065	.049	.004	.014	.000	.11	.005	.005	.031	.036
1981	.038	.15	.24	.27	.064	.023	.000	.27	.031	.077	.060	.062
1982	.000	25.6	40.8	10.0	20.7	39.0	.53	.061	.069	39.2	5.01	1.14
1983	.66	.52	9.61	70.5	21.1	2.32	8.33	.14	.033	.082	.19	.22
1984	.31	38.7	184	293	19.2	792	46.0	5.16	.73	2.75	2.01	1.41
1985	1.00	1.86	268	24.1	4.43	6.80	.17	.35	.89	.33	.63	.68
1986	1.14	2.90	391	370	466	170	12.7	1.02	3.48	12.9	3.46	2.08
1987	1.33	2.22	424	136	7.90	2.55	.39	.032	.030	.066	.39	.25
1988	.30	.75	12.8	5.69	54.5	10.1	.083	.002	.080	.053	.12	.065
1989	.026	.002	50.6	7.56	.47	.013	.000	.000	.013	.010	.030	.018
1990	.050	.072	.11	.064	.088	18.7	9.73	.015	.006	.014	.025	.020
1991	.023	.079	.12	.15	28.7	125	.63	.024	.015	.15	.11	.019
1992	.024	3.00	7.14	1.10	.18	.18	1.11	124	13.8	1.54	2.16	1.00
1993	.65	1.16	104	62.6	188	161	623	30.1	7.15	2.79	4.38	4.15
1994	1.68	52.4	165	12.6	23.1	39.7	3.94	.51	.36	.12	.24	.51
1995	.55	4.36	15.9	497	1,135	205	13.1	2.89	1.26	6.05	13.4	5.56
1996	1.87	175	83.1	29.9	94.6	147	3.59	.65	.48	2.89	16.3	5.00
1997	2.64	1.96	759	290	276	37.2	2.76	1.05	.42	.52	.43	.63
1998	.28	1.12	1.82	26.2	55.5	128	119	21.6	.76	10.7	119	22.7
1999	5.23	16.5	27.5	276	461	48.8	102	4.67	10.3	1.40	1.21	1.08
2000	.96	1.45	1.21	1.20	1.87	1.13	.13	.59	.039			
Mean of monthly streamflows	1.11	9.36	90.9	85.0	86.4	74.5	26.8	7.78	1.07	1.89	3.83	1.13
				May	June	July	Aug.	Sept.				

Avg.

84.5 72.8 26.2 7.6 1.0

Questions about data h2oteam@usgs.gov
 Feedback on this website gs-w_support_nwisweb@usgs.gov
 Surface Water data for USA: Monthly Streamflow Statistics
<http://water.usgs.gov/nwis/monthly/>

[Return to top of page](#)

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REPORT ON WATER PERMIT APPLICATION NO. 6314-3

Wild Oak Golf Club

April 11, 2002

Wild Oak Golf Club has filed a water permit application to appropriate an additional 0.17 cubic feet of water per second (cfs), change the location of the diversion point, and to change the location of the acres irrigated from what is currently authorized by Water Right No. 1371-3. Water Right No. 1371-3 appropriates 0.50 cfs from Firesteel Creek located in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ to irrigate 83.13 acres located in the SW $\frac{1}{4}$ and NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 24; all in T103N-R60W.

PROPOSED PROJECT:

Water Permit Application No. 6314-3 is one mile east of Mitchell in Davison County. Lake Mitchell is approximately 6.5 river miles upstream of the diversion point on this application. The James River is approximately one river mile downstream of the diversion point.

This project proposes to divert an additional 0.17 cfs from a diversion point on Firesteel Creek which is now located in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ Section 24, T103N-R60W. This is a change in location of the diversion point from Water Right No. 1371-3. SDCL 46-5-13.1 allows for a change in location of a diversion point if the change does not increase the potential for interference with existing diversions.

The 80 acres to be irrigated are for a new nine-hole addition to the golf course located in the SE $\frac{1}{4}$ Section 23, T103N-R60W. Irrigated acres authorized by Water Right No. 1371-3 are located in the SW $\frac{1}{4}$ and NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 24, T103N-R60W. SDCL 46-5-34 allows for a change in the location of the acres irrigated if doing so allows beneficial and economical use of water for irrigation.

Water will be diverted from Firesteel Creek at a maximum rate of 0.67 cfs to two holding ponds located in the W $\frac{1}{2}$ SE $\frac{1}{4}$ and SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 23, T103N-R60W. The combined storage capacity of the holding ponds will be approximately 245 acre-feet. Water will also be applied to the lands at a maximum rate of 0.67 cfs. The 83.13 acres of the original nine-hole golf course, located in the SW $\frac{1}{4}$ and NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 24, T103N-R60W, will continue to be irrigated from a well authorized by Water Right No. 1747-3.

Water availability for the proposed project is subject to overflow from the Lake Mitchell Dam. Firesteel Creek may be an unreliable source of water during dryer climatic periods.

EXISTING WATER RIGHTS:

There are no water rights on Firesteel Creek downstream of the proposed project. Firesteel Creek flows into the James River a mile downstream of the proposed diversion point. Upstream of the application the City of Mitchell holds two water rights for water from Firesteel Creek for municipal use. Vested Right No. 426-3 claims 15 cfs from Firesteel Creek, stored in Lake Mitchell and Future Use Permit No. 427-3 reserves the right to apply for and appropriate 23.2 cfs up to 5,756 acre-feet annually for municipal use. The City of Mitchell water rights mentioned above are senior to the 0.50 cfs authorized by Water Right No. 1371-3.

The James River has water rights downstream of the confluence with Firesteel Creek. During times when water is available in Firesteel Creek there should be enough flow to satisfy senior water rights on the James River. Under certain circumstances there may be instances where this permit is shutoff due to downstream senior water rights on the James River.

Water Permit Application No. 6314-3, if approved, and Water Right No. 1371-3 should be incorporated with a priority date of February 17, 1967 for the 0.50 cfs and February 26, 2002 for the applied for 0.17 cfs when licensed. SDCL 46-5-30.4 allows the 0.50 cfs portion of the combined 0.67 cfs to retain the February 17, 1967 priority date under Water Right No. 1371-3.

CONCLUSIONS:

1. Water Permit Application No. 6314-3 proposes to appropriate an additional 0.17 cubic feet of water per second (cfs), change the location of the diversion point, and to change the location of the acres irrigated from what is currently authorized by Water Right No. 1371-3.
2. SDCL 46-5-13.1 allows for a change in location of a diversion point if the change does not increase the potential for interference with existing diversions. There are no water rights on Firesteel Creek downstream of the proposed project.
3. SDCL 46-5-34 allows for a change in the location of the acres irrigated if doing so allows beneficial and economical use of water for irrigation. The golf course expansion is a beneficial and economical use of water for irrigation .
4. Water Permit Application No. 6314-3, if approved, and Water Right No. 1371-3 should be incorporated with a priority date of February 17, 1967 for the 0.50 cfs and February 26, 2002 for the applied for 0.17 cfs when licensed.
5. SDCL 46-5-30.4 allows the 0.50 cfs portion of the combined 0.67 cfs to retain the February 17, 1967 priority date under Water Right No. 1371-3.
6. Water availability for the proposed project is subject to overflow from the Lake Mitchell Dam. Firesteel Creek may be an unreliable source of water during dryer climatic periods.
7. The City of Mitchell has priority right to water from Firesteel Creek under future use withdrawal permits, and this application is subject to their prior rights if or when the city develops the reserved water supply.
8. Under certain circumstances there may be instances where this permit is shutoff due to downstream senior water rights on the James River.



Lynn Beck
Natural Resources Engineer Specialist

MAP FOR REPORT ON APPLICATION NO. 6314-3



0.5 0 SCALE 0.5 1 Miles



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 6314-3, Wild Oak Golf Club**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 6314-3, Wild Oak Golf Club, c/o David Backlund, 117 S. Lawler, Mitchell SD 57301.

The Chief Engineer is recommending APPROVAL of Application No. 6314-3 because 1) there is a reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. The City of Mitchell has priority right to Firesteel Creek water under a future use withdrawal permit. Water Permit No. 6314-3 is subject to their prior rights if or when the city develops the reserved water supply.
2. Water Permit No. 6314-3 is subject to written shut-off orders from the Chief Engineer if necessary to protect downstream senior water rights on the James River.
3. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

See report on application for additional information.

Garland Erbele, Chief Engineer
May 2, 2002



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

May 2, 2002

Alan Sherman, Water Superintendent
City of Mitchell
612 N. Main Street
Mitchell SD 57301-0278

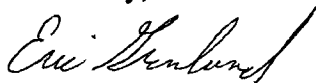
Dear Mr. Sherman:

I am writing to make you aware of Water Permit Application No. 6314-3 filed by Wild Oak Golf Club to appropriate water from Firesteel Creek. This application proposes to divert additional water from Firesteel Creek and amend Wild Oak's existing water right to irrigate a nine hole addition to the course.

Enclosed is a copy of the recommendation, report and notice of hearing on this application. The notice is to be published in the Daily Republic on May 9 and 16, 2002. Any petition to intervene must be submitted by May 28, 2002 as set forth in the notice.

The proposed diversion point is below Lake Mitchell but I wanted to provide you this information because of the city's interest in Firesteel Creek. If you have any questions on this application, please contact Lynn Beck or myself at (605) 773-3352.

Sincerely,


Eric Gronlund
Water Rights Program
(605) 773-3352

enclosure



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.

May 2, 2002

Dave Backlund
Wild Oak Golf
117 S Lawler
Mitchell, SD 57301

Dear Mr. Backlund:

Water Permit Application No. 6314-3 for irrigation use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of hearing has been sent to the Publisher of the Daily Republic printed at Mitchell, SD (Ph # 605-996-5514). You will need to contact the newspaper and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Chief Engineer and a report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper to authorize publication of your Notice of Hearing and to arrange for payment. Early contact with the paper can eliminate delays. Upon receiving authorization, the publisher has been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur twenty days before the board meeting. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

enclosures

NOTE: If you plan to contest any part of the Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

May 2, 2002

Daily Republic
PO Box 1288
Mitchell, SD 57301-1288

ATTENTION: Legal Public Notice

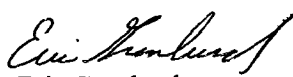
Enclosed is a Notice of Hearing on Application No. 6314-3 to Appropriate Water to be published twice. Please publish the first notice on May 9, 2002 with the second publication 7 days later.

The applicant must verify to you that the notice is to be published, before you make the first publication **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is David Backlund, Wild Oak Golf, 117 S. Lawler, Mitchell, SD (Ph # 605-996-2084).

Please send the Water Rights Program the first publication immediately. The publication is checked for accuracy so any corrections can be made in the second publication. You may use the form below or fax a copy of the first publication. Any fax should be sent to the attention of Karen Schlaak at (605) 773-4068. Publication errors can invalidate the public notice.

After the second publication, **please send us an affidavit or use the enclosed Proof of Publication form.** The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----

No. 6314-3

TO: Eric Gronlund
Water Rights Program
Joe Foss Building
Pierre SD 57501-3181

Date _____

We are in receipt of your letter of May 2, 2002 enclosing Notice of Hearing to Appropriate Water by Application No. 6314-3 which was first published in our issue of _____. **ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.**

Name

Newspaper

Instruction to Newspaper - Publish first Notice on May 9, 2002 with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF APPLICATION NO. 6314-3 to Appropriate Water
and to Amend Water Right No. 1371-3

Notice is given that Wild Oak Golf Club, 117 S Lawler, Mitchell SD 57301 has filed an application for a water permit to appropriate an additional 0.17 cubic feet of water per second (cfs), change the location of the diversion point and to change the acres from what is currently authorized by Water Right No. 1371-3. Water Right No. 1371-3 appropriates 0.50 cfs from Firesteel Creek located in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ to irrigate 83.13 acres located in the SW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 24; all in T103N-R60W. This application proposes to divert an additional 0.17 cfs from the diversion point on Firesteel Creek which is now located in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ Section 24, T103N, R60W. This application also proposes to change the acres to irrigate the new nine hole golf course addition located in the SE $\frac{1}{4}$ Section 23, T103N, R60W. Water will be diverted from the Firesteel Creek diversion point at a maximum rate of 0.67 cfs to two holding ponds prior to application to the land. The ponds will be located in the W $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 23-T103N-R60W. The original nine hole golf course will continue to be irrigated from a well as authorized by Water Right No. 1747-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 6314-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by May 28, 2002.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Program address to request copies of information pertaining to this application. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

Affidavit of Publication

**NOTICE OF APPLICATION
NO. 6314-3 to
Appropriate Water and
to Amend Water Right
No. 1371-3**

Notice is given that Wild Oak Golf Club, 117 S. Lawler, Mitchell SD 57301 has filed an application for a water permit to appropriate an additional 0.17 cubic feet of water per second (cfs), change the location of the diversion point and to change the acres from what is currently authorized by Water Right No. 1371-3. Water Right No. 1371-3 appropriates 0.50 cfs from Firesteel Creek located in the NE 1/4 SW 1/4 to irrigate 83.13 acres located in the SW 1/4, NW 1/4 SE 1/4 Section 24; all in T103N-R60W. This application proposes to divert an additional 0.17 cfs from the diversion point on Firesteel Creek which is now located in the SE 1/4 SW 1/4 Section 24, T103N, R60W. This application also proposes to change the acres to irrigate the new nine hole golf course addition located in the SE 1/4 Section 23, T103N, R60W. Water will be diverted from the Firesteel Creek diversion point at a maximum rate of 0.67 cfs to two holding ponds prior to application to the land. The ponds will be located in the W 1/2 SE 1/4, SE 1/4 SE 1/4 Section 23-T103N-R60W. The original nine hole golf course will continue to be irrigated from a well as authorized by Water Right No. 1747-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 6314-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

AFFIDAVIT OF PUBLICATION

STATE OF)
SOUTH DAKOTA)
COUNTY OF DAVISON)

Noel Hamiel of said county being first duly sworn, on oath says that he is the publisher of The Daily Republic, and that The Daily Republic is, and during all the times hereinafter mentioned was, a daily legal newspaper as defined in SDCL 17-2-2, as amended, published at Mitchell, Davison County, South Dakota; that affiant is and during all of said times was, an employee of such newspaper and has personal knowledge of the facts stated in this affidavit; that the notice, order or advertisement, a printed copy of which is attached, was published in said newspaper for 2 successive issues, bearing the following dates:

May 9	20	02		20
May 16	20	02		20
	20			20

that the full amount of the fee charged for publishing the same, to-wit, the sum of \$ 135.00, insures solely to the benefit of the publisher of said newspaper; that no agreement or understanding for the division of the fee has been made with any person, and that no part of the fee has been agreed to be paid to any other person.

Subscribed and sworn to before me this
28 day of May A.B., 20 02

Kathy Hoffman
Notary Public
County of Hanson, S.D. OCT 8 2003
My Commission Expires: _____

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WATER RIGHTS
PROGRAM



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

JUN 13 2002

Wild Oak Golf Club
%Dave Backlund
117 S Lawler
Mitchell SD 57301

Dear Mr. Backlund:

Enclosed is Water Permit No. 6314-3 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

Form 10, *Notice of Completion of Works and Application of Water to Beneficial Use*, is enclosed. Please return this completed form after you have finished the system and have put the water to beneficial use. An investigation can then be scheduled so the water license may be issued, thus completing the acquisition of a water right.

An informational sheet *Common Water Right Questions?* is also enclosed. This sheet is intended to answer some of the questions associated with obtaining and keeping a water right.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

**SPECIFICATIONS
AND
DESIGN INFORMATION
FOR**

**WILD OAK GOLF COURSE ADDITION
PROPOSED DAM STRUCTURE**

Mitchell, South Dakota

SPN #02-11263

NOVEMBER 2002

SCHMUCKER, PAUL, NOHR & ASSOCIATES

ENGINEERS-PLANNERS- SURVEYORS

620 NORTH LAWLER P.O. BOX 398

MITCHELL, SOUTH DAKOTA, zip 57301

PHONE 605-996-7761

FAX 605-996-0015



WILD OAK GOLF COURSE ADDITION
PROPOSED DAM STRUCTURE

MITCHELL, SOUTH DAKOTA

SPN #02-11263

02-225
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WATER RIGHTS
PROGRAM

I hereby certify that this plan, specification
or report was prepared by me or under my direct
supervision and that I am a duly Registered
Professional Engineer under the laws of the
State of South Dakota.

By Terry L. Aaker
Registration Number 4726
Date 11-15-02



SCHMUCKER, PAUL, NOHR & ASSOCIATES
CONSULTING ENGINEERS - SURVEYORS
620 NORTH LAWLER, PO BOX 398
MITCHELL, SOUTH DAKOTA 57301

TABLE OF CONTENTS
FOR
WILD OAK GOLF COURSE ADDITION
PROPOSED DAM STRUCTURE
MITCHELL, SOUTH DAKOTA

- SECTION 1: Site Layout. A topographic map of the dam site specifying the legal description of the proposed dam and the location of the spillway and outlet works, and all test borings, test pits, and borrow pits. The map shows all property contiguous to the dam site and contiguous to the flood zone behind the dam and the owners of the contiguous property.
- SECTION 2: Soil Data. A profile along the dam axis showing the location, elevations, and depth of borings or test pits, including logs of bore holes or test pits.
- SECTION 3: Dam Cross-Section. A maximum cross-section of the dam showing the elevation and width of the crest; slopes of upstream and downstream faces; thickness of riprap; zoning of earth embankment; location of cutoff and bonding trenches; and elevations, size, and type of outlet conduit, valves, and operating mechanism.
- SECTION 4: Area-capacity Curves. Area-capacity curves of the proposed reservoir.
- SECTION 5: Piping Details. Detailed drawings showing plans, cross and longitudinal sections of the outlet conduits, valves and controls for operating the outlet, and trash racks.
- SECTION 6: Spillway Capacity. The discharge capacity in cubic feet per second of the spillway for each foot in water depth above the spillway crest up to the maximum high-water level and the formula used in making the calculations.
- SECTION 7: Spillway Details. Detailed plans of spillway structures, cross-section of the channel heading to and from the spillway, spillway profile, and procedures for operation of the spillway structures.
- SECTION 8: Downstream Analysis. An analysis conducted on the downstream conditions and flow capacities.
- SECTION 9: Specifications. Specifications including provisions during the period of construction for supervision by an engineer.

SECTION 1

SITE LAYOUT

(See Plans, Sheet 2)

SECTION 2

SOIL DATA

(See Section 9, Section 02010)

SECTION 3

DAM CROSS-SECTION

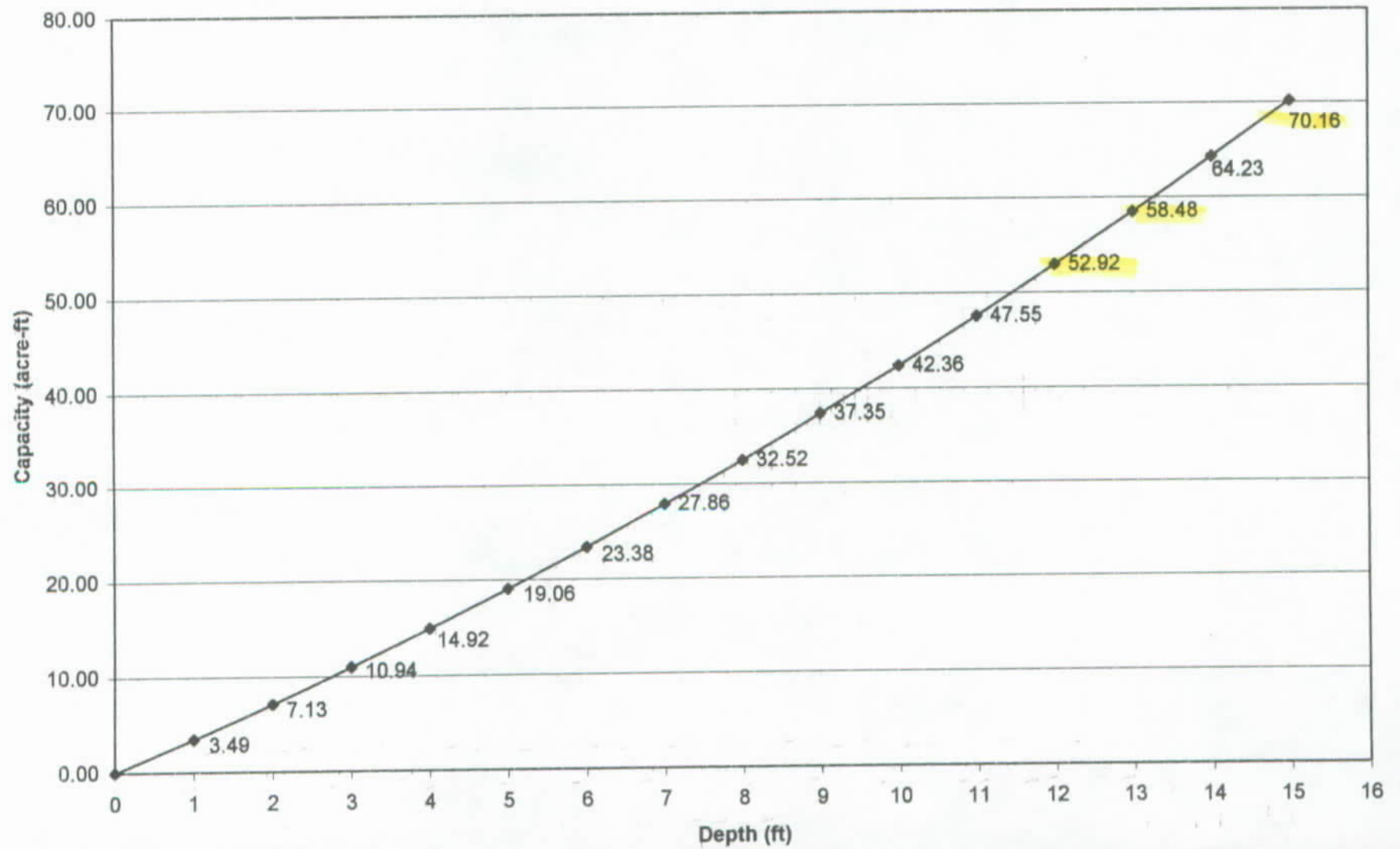
(See Plans, Sheet 4)

SECTION 4

AREA-CAPACITY CURVES

Wild Oaks Dam						
SPN Job #11236						
Reservoir Volume Calculations						
		Incremental	Incremental	Cumulative	Cumulative	Pond
Contour	Area (ac)	Volume (MG)	Volume (acre-ft)	Volume (MG)	Volume (acre-ft)	Depth (ft)
105	6.03	1.93	5.94	22.86	70.16	15
104	5.84	1.87	5.75	20.93	64.23	14
103	5.65	1.81	5.56	19.05	58.48	13
102	5.47	1.75	5.38	17.24	52.92	12
101	5.28	1.69	5.19	15.49	47.55	11
100	5.10	1.63	5.01	13.80	42.36	10
99	4.92	1.57	4.83	12.17	37.35	9
98	4.74	1.52	4.66	10.59	32.52	8
97	4.57	1.46	4.49	9.08	27.86	7
96	4.40	1.41	4.32	7.62	23.38	6
95	4.23	1.35	4.15	6.21	19.06	5
94	4.06	1.30	3.98	4.86	14.92	4
93	3.89	1.24	3.81	3.56	10.94	3
92	3.73	1.19	3.65	2.32	7.13	2
91	3.56	1.14	3.49	1.14	3.49	1
90	3.41	0.00	0.00	0.00	0.00	0

Capacity vs. Depth



SECTION 5

PIPING DETAILS

(See Plans, Sheets 4, 5 and 6)

SECTION 6

SPILLWAY CAPACITY

Hydrology and Hydraulic Design --

*** Hydro-Yardage Version 5.31 Dated: 12/2/97 ***

Landowner: Dave Backlund Site: Wild Oaks Dam

Location: Mitchell, SD in DAVISON County, South Dakota

Computer Operator: lrm -- Routed on 11-14-2002 @ 16:28:45

<< Hydrology Input >>

Drainage Area = 95 acres -- P - 10 24 Hour Rainfall = 3.8 Inches

Type II Storm

Runoff Curve Number = 69

Time of Concentration = 1.05 Hours

<< Principal Spillway Data for a Drop Inlet >> Pipe type = SPP >>

Pipe Diameter = 12 Inches Riser diameter = 36 Inches

Type of Principal Spillway Outlet >> Cantilever

Estimated Conduit Length = 104 Feet Mannings roughness coefficient = 0.010

Inlet Elevation = 102.0 Principal spillway outlet = 91.0

Elevation of the ditch bottom at the centerline of fill = 90.0

Storage below crest = 52.94 ac. ft. Aer. sediment storage = 0.00 ac. ft

<< Elevation-Storage-Outflow Table >>						
Elevation (Ft.)	Storage (Ac. Ft.)	Outflow (CFS)	*	Elevation (Ft.)	Storage (Ac. Ft.)	Outflow (CFS)
102.0	0.00	0.00	*	107.0	29.69	12.25
103.0	5.56	9.64	*	108.0	36.21	12.82
104.0	11.30	10.36	*	109.0	42.92	13.27
105.0	17.24	11.03	*	110.0	49.82	13.65
106.0	23.37	11.66	*			

The emergency spillway is set at elevation << 103.0 >>
with a temporary storage of << 5.56 >> acre feet
and a total storage to this elevation of << 58.50 >> acre feet

The <<TR-60>> product for this structure
is 761 and the effective fill height is 13.0 feet

The P- 10 year rainfall of 3.8 inches
produces a peak runoff of 50 cfs

Owner: Dave Backlund

- Principal Spillway Incremental Routing

*** Hydro-Yardage Version 5.31 Dated: 12/2/97 ***

TIME HR.	INFLOW CFS	OUTFLOW CFS	ELEVATION FEET	STORAGE ACRE-FT	TIME HR.	INFLOW CFS	OUTFLOW CFS	ELEVATION FEET	STORAGE ACRE-FT
11.0	0.59	0.00	102.01	0.03	18.6	4.23	6.86	102.72	3.98
11.2	0.73	0.02	102.01	0.04	18.8	4.13	6.79	102.71	3.94
11.4	0.89	0.05	102.01	0.05	19.0	4.03	6.71	102.70	3.90
11.6	1.07	0.07	102.01	0.07	19.2	3.91	6.63	102.69	3.85
11.8	1.40	0.10	102.02	0.09	19.4	3.80	6.55	102.68	3.81
11.9	1.56	0.12	102.02	0.10	19.5	3.74	6.51	102.68	3.78
12.0	1.99	0.15	102.02	0.11	19.6	3.68	6.47	102.68	3.76
12.1	2.98	0.18	102.02	0.13	19.7	3.63	6.43	102.67	3.74
12.2	5.71	0.24	102.03	0.17	19.8	3.57	6.39	102.67	3.71
12.3	10.86	0.35	102.04	0.23	19.9	3.51	6.35	102.66	3.69
12.4	18.59	0.56	102.06	0.35	20.0	3.46	6.31	102.66	3.67
12.5	28.20	0.88	102.10	0.54	20.1	3.43	6.27	102.66	3.64
12.6	38.00	1.34	102.14	0.80	20.2	3.40	6.23	102.65	3.62
12.7	45.68	1.92	102.20	1.13	20.3	3.36	6.19	102.65	3.60
12.8	50.42	2.58	102.27	1.51	20.4	3.33	6.15	102.64	3.57
12.9	50.45	3.26	102.34	1.91	20.5	3.30	6.11	102.64	3.55
13.0	50.47	3.93	102.41	2.29	20.6	3.27	6.07	102.63	3.53
13.1	44.74	4.55	102.48	2.65	20.7	3.24	6.03	102.63	3.50
13.2	39.01	5.08	102.53	2.96	20.8	3.21	5.99	102.63	3.48
13.3	34.46	5.53	102.58	3.22	20.9	3.18	5.95	102.62	3.46
13.5	26.78	6.23	102.65	3.62	21.1	3.12	5.87	102.61	3.41
13.7	21.33	6.73	102.70	3.91	21.3	3.05	5.79	102.61	3.37
13.9	17.39	7.08	102.74	4.11	21.5	2.99	5.71	102.60	3.32
14.1	14.67	7.33	102.77	4.25	21.7	2.93	5.64	102.59	3.28
14.3	12.49	7.50	102.78	4.36	21.9	2.87	5.56	102.58	3.23
14.5	11.03	7.62	102.80	4.42	22.1	2.76	5.48	102.57	3.19
14.7	9.84	7.70	102.80	4.47	22.3	2.62	5.40	102.57	3.14
14.9	8.94	7.75	102.81	4.50	22.5	2.48	5.32	102.56	3.10
15.1	8.23	7.77	102.81	4.51	22.7	2.34	5.24	102.55	3.05
15.3	7.71	7.78	102.81	4.51	22.9	2.20	5.16	102.54	3.00
15.5	7.19	7.77	102.81	4.51	23.1	2.06	5.07	102.53	2.95
15.7	6.87	7.75	102.81	4.50	23.3	1.91	4.98	102.52	2.90
15.9	6.56	7.72	102.81	4.48	23.5	1.77	4.89	102.51	2.85
16.1	6.28	7.68	102.80	4.46	23.7	1.63	4.80	102.50	2.80
16.3	6.03	7.64	102.80	4.43	23.9	1.49	4.71	102.49	2.74
16.5	5.78	7.59	102.79	4.40	24.1	1.35	4.62	102.48	2.69
16.7	5.53	7.53	102.79	4.37	24.3	1.20	4.52	102.47	2.64
16.9	5.28	7.47	102.78	4.34	24.5	1.06	4.43	102.46	2.58
17.1	5.06	7.41	102.77	4.30	24.7	0.92	4.33	102.45	2.53
17.3	4.88	7.34	102.77	4.26	24.9	0.78	4.23	102.44	2.47
17.5	4.70	7.27	102.76	4.22	25.1	0.64	4.13	102.43	2.41
17.7	4.63	7.19	102.75	4.18	25.3	0.50	4.03	102.42	2.35
17.9	4.57	7.12	102.74	4.13	25.5	0.35	3.93	102.41	2.29
18.1	4.48	7.05	102.74	4.09	25.7	0.21	3.83	102.40	2.24
18.3	4.38	6.97	102.73	4.05	25.9	0.07	3.72	102.39	2.18
18.5	4.28	6.90	102.72	4.01	26.1	0.00	0.00	0.00	0.00

Hydrology and Hydraulic Design --

*** Hydro-Yardage Version 5.31 Dated: 12/2/97 ***

Landowner: Dave Backlund Site: Wild Oaks Dam

Location: Mitchell, SD in DAVISON County, South Dakota

Computer Operator: lrm -- Routed on 11-14-2002 @ 16:28:45

<< Hydrology Input >>

Drainage Area = 95 acres -- P -100 24 Hour Rainfall = 5.6 Inches

Type II Storm

Runoff Curve Number = 69

Time of Concentration = 1.05 Hours

<< Principal Spillway Data for a Drop Inlet >> Pipe type = SPP >>

Pipe Diameter = 12 Inches Riser diameter = 36 Inches

Type of Principal Spillway Outlet >> Cantilever

Estimated Conduit Length = 104 Feet Mannings roughness coefficient = 0.010

Inlet Elevation = 102.0 Principal spillway outlet = 91.0

Elevation of the ditch bottom at the centerline of fill = 90.0

Storage below crest = 52.94 ac. ft. Aer. sediment storage = 0.00 ac. ft

<< Elevation-Storage-Outflow Table >>						
Elevation (Ft.)	Storage (Ac. Ft.)	Outflow (CFS)	*	Elevation (Ft.)	Storage (Ac. Ft.)	Outflow (CFS)
102.0	0.00	0.00	*	106.0	23.37	420.83
103.0	5.56	9.64	*	106.5	26.53	590.01
103.5	8.43	20.68	*	107.0	29.69	789.23
104.0	11.30	45.70	*	108.0	36.21	1210.83
104.5	14.27	107.88	*	109.0	42.92	1768.03
105.0	17.24	186.60	*	110.0	49.82	2490.04
105.5	20.31	288.67	*			

Elevation of the emergency spillway = 103.0

Bottom width of the emergency spillway = 20 feet

Vegetated Retardance = ' D ' Crest Length = 50 feet

Flow depth of the water in the emergency spillway = 0.70 feet

Emergency spillway flow = 15.9 cfs with a velocity of 3.0 ft./sec.

Minimum exit slope = 1% -- Maximum exit slope = 6 %

Maximum water surface in the emergency occurs at elevation 103.7

The P-100 year rainfall of 5.6 inches

produces a peak runoff of 118 cfs

The total storage to the top of fill elevation 105.0 equals 70.2 acre feet

Owner: Dave Backlund - Emergency Spillway Incremental Routing
 *** Hydro-Yardage Version 5.31 Dated: 12/2/97 ***

* TIME	INFLOW	OUTFLOW	ELEVATION	STORAGE	* TIME	INFLOW	OUTFLOW	ELEVATION	STORAGE	*
* HR.	CFS	CFS	FEET	ACRE-FT	* HR.	CFS	CFS	FEET	ACRE-FT	*
* 11.0	2.74	0.02	102.01	0.04	* 18.6	7.57	13.59	103.18	6.61	*
* 11.2	3.40	0.11	102.02	0.09	* 18.8	7.36	13.21	103.17	6.52	*
* 11.4	4.15	0.21	102.03	0.15	* 19.0	7.15	12.84	103.15	6.42	*
* 11.6	4.98	0.33	102.04	0.22	* 19.2	6.96	12.49	103.13	6.33	*
* 11.8	6.47	0.48	102.06	0.31	* 19.4	6.77	12.14	103.12	6.24	*
* 11.9	7.22	0.58	102.06	0.36	* 19.5	6.68	11.97	103.11	6.19	*
* 12.0	8.82	0.68	102.08	0.42	* 19.6	6.59	11.80	103.10	6.15	*
* 12.1	12.13	0.82	102.09	0.50	* 19.7	6.49	11.64	103.10	6.11	*
* 12.2	19.65	1.03	102.11	0.62	* 19.8	6.40	11.48	103.09	6.07	*
* 12.3	32.42	1.39	102.15	0.83	* 19.9	6.31	11.32	103.08	6.02	*
* 12.4	50.78	1.96	102.21	1.16	* 20.0	6.22	11.16	103.07	5.98	*
* 12.5	72.29	2.81	102.30	1.65	* 20.1	6.16	11.00	103.07	5.94	*
* 12.6	92.99	3.95	102.41	2.30	* 20.2	6.10	10.85	103.06	5.90	*
* 12.7	108.13	5.32	102.56	3.10	* 20.3	6.04	10.70	103.05	5.86	*
* 12.8	118.12	6.86	102.72	3.98	* 20.4	5.98	10.55	103.05	5.83	*
* 12.9	113.78	8.41	102.88	4.88	* 20.5	5.92	10.41	103.04	5.79	*
* 13.0	109.43	10.16	103.03	5.72	* 20.6	5.86	10.27	103.03	5.75	*
* 13.1	96.71	13.07	103.16	6.48	* 20.7	5.80	10.13	103.03	5.72	*
* 13.2	83.99	15.48	103.27	7.11	* 20.8	5.74	9.99	103.02	5.68	*
* 13.3	73.38	17.46	103.36	7.62	* 20.9	5.69	9.86	103.01	5.65	*
* 13.5	55.66	20.30	103.49	8.36	* 21.1	5.57	9.62	103.00	5.58	*
* 13.7	43.40	23.72	103.57	8.81	* 21.3	5.45	9.51	102.99	5.51	*
* 13.9	34.75	25.71	103.61	9.04	* 21.5	5.33	9.39	102.98	5.44	*
* 14.1	28.89	26.49	103.62	9.12	* 21.7	5.21	9.27	102.97	5.38	*
* 14.3	24.21	26.49	103.62	9.12	* 21.9	5.10	9.16	102.95	5.31	*
* 14.5	21.12	25.97	103.61	9.07	* 22.1	4.91	9.04	102.94	5.24	*
* 14.7	18.65	25.13	103.59	8.97	* 22.3	4.66	8.92	102.93	5.17	*
* 14.9	16.81	24.13	103.57	8.85	* 22.5	4.41	8.80	102.92	5.10	*
* 15.1	15.37	23.04	103.55	8.73	* 22.7	4.16	8.67	102.90	5.03	*
* 15.3	14.33	21.94	103.53	8.60	* 22.9	3.90	8.54	102.89	4.95	*
* 15.5	13.29	20.85	103.51	8.48	* 23.1	3.65	8.40	102.88	4.87	*
* 15.7	12.67	20.27	103.49	8.35	* 23.3	3.40	8.26	102.86	4.79	*
* 15.9	12.06	19.79	103.46	8.23	* 23.5	3.15	8.12	102.85	4.71	*
* 16.1	11.52	19.29	103.44	8.10	* 23.7	2.90	7.98	102.83	4.63	*
* 16.3	11.04	18.80	103.42	7.97	* 23.9	2.64	7.83	102.82	4.54	*
* 16.5	10.57	18.31	103.40	7.84	* 24.1	2.39	7.68	102.80	4.46	*
* 16.7	10.10	17.82	103.38	7.71	* 24.3	2.14	7.53	102.79	4.37	*
* 16.9	9.63	17.33	103.35	7.59	* 24.5	1.89	7.37	102.77	4.28	*
* 17.1	9.23	16.84	103.33	7.46	* 24.7	1.64	7.21	102.75	4.19	*
* 17.3	8.90	16.36	103.31	7.33	* 24.9	1.39	7.05	102.74	4.10	*
* 17.5	8.57	15.89	103.29	7.21	* 25.1	1.13	6.89	102.72	4.00	*
* 17.7	8.43	15.43	103.27	7.09	* 25.3	0.88	6.72	102.70	3.91	*
* 17.9	8.29	15.00	103.25	6.98	* 25.5	0.63	6.55	102.68	3.81	*
* 18.1	8.11	14.58	103.23	6.87	* 25.7	0.38	6.38	102.67	3.71	*
* 18.3	7.89	14.17	103.21	6.77	* 25.9	0.13	6.21	102.65	3.61	*
* 18.5	7.68	13.78	103.19	6.66	* 26.1	0.00	0.00	0.00	0.00	*

Anti-Seep Collar Design

Non-Deep loess design

Input Data-----

Watershed/ (Landowner)	Dave Backlund
Site Number or Name	Wild Oaks Dam
County or District	DAVISON County
Computer Operator	
Pipe Diameter	1rm
Length of Frontslope	12
Top width of Fill	15.2
Length of Backslope of fill	20
Date	63.2
	11-14-2002

Use 3 - 48 " x 48 " anti-seep collars

Number of antiseep collars determined by formula $N = L / 7(V-D)$

Where:

L = Length of pipe lying within the saturated zone in feet
V = The vertical height of the anti-seep collar in feet
D = The outside diameter of the principal spillway

<< Structure Summary >> Sheet 1 of 2
*** Hydro-Yardage Version 5.31 Dated: 12/2/97 ***
Computed by: lrm on 11-14-2002 @ 16:28:54

Owner's Name ----- Dave Backlund
Site name or number ----- Wild Oaks Dam
District ----- DAVISON County, South Dakota
Location ----- Mitchell, SD
Drainage area ----- 95 Acres

Permanent pond area ----- 5.47 acres
Permanent storage below crest ----- 52.94 acre feet
Temporary storage to the emergency spillway ----- 5.56 acre feet
Total storage to the emergency spillway ----- 58.50 acre feet
Total storage to the top of fill ----- 70.18 acre feet

Fill height at centerline of fill ----- 15.0 feet
Effective fill height ----- 13.0 feet
Overall fill height to downstream toe ----- 15.0 feet

TR-60 product > > > 761 < < <

*From X-Sec
Ht=17*

<< Principal Spillway Hydrology Design >>

Rainfall Distribution Type >>II << Runoff Curve Number 69
P 10 - 24 hr. rainfall = 3.8 inches - Time of concentration = 1.05 hr
Peak runoff = 50 cfs -- Peak runoff volume = 9.01 ac. ft.

<< Principal Spillway >>

(Note: Pipe length shown is the centerline of pipe
perpendicular to the centerline of fill)

Pipe length used in the routing = 101.0 lin. ft.

104.0 Lin. Feet of 12 inch diam. SPP with a Drop inlet
8.0 Lin. Feet of 36 inch diam. SPP for the riser
Mannings Friction value 'n' = 0.0100

<< Emergency Spillway Hydrology Design >>

P 100 - 24 hr. rainfall = 5.6 inches
Peak runoff = 118 cfs -- Peak runoff volume = 19.03 ac. ft.

<< Emergency Spillway >>

Bottom width of the emergency spillway = 20 feet
Vegetated Retardance = 'D' Crest Length = 50 feet
Emergency spillway flow = 15.9 cfs
Velocity = 3.0 ft./sec.
Minimum exit slope = 1% -- Maximum exit slope = 6%

SECTION 7

SPILLWAY DETAILS

(See Plans, Sheet 4)

SECTION 8

DOWNSTREAM ANALYSIS

Downstream Analysis

Introduction

This report is a study conducted to summarize the area downstream from the dam. The downstream conditions and flow capacities were studied for reasons of possible damages due to the runoffs from the dam spillways and downstream surrounding areas.

Dam Spillways and Surrounding Area Flow Analysis

A downstream analysis considering the dam spillways and surrounding area flows was conducted. Calculations indicate that the drainage area upstream from the dam will result in a flow of approximately 180 cfs, from the 100-year design storm. The construction of the dam and its storage will reduce this flow to a release of approximately 27 cfs at the 100-year design storm. Since the downstream area was capable of handling the area runoff, 180 cfs, prior to the construction of the dam, the reduced flow of 27 cfs will easily be handled by the downstream storm water facilities.

In the event of a dam failure, the downstream area will flood to some extent, but there should be little, if any, damage resulting from the flooding. The capacity of the dam at the crest height of the emergency spillway, of 13.7', is approximately 20.37 million gallons (MG). Conservatively, a failing dam will be assumed to have a 25' wide break in the dike and a water level of 13.7 feet. This would result in a flow of approximately 7,300 cfs as shown in Table 1.

TABLE 1: DAM FAILURE CHANNEL CAPACITY

Mannings Coefficient	0.035			
Channel Slope (ft/ft)	0.02			
North Side Slope (H:V)	0			
South Side Slope (H:V)	0			
Bottom Width (ft)	25			
Depth Variance	Channel Depth	Area	Wetted Perimeter	Discharge
(ft)	(ft)	(ft ²)	(ft)	(cfs)
2.3				
	2.30	57.50	29.60	538.95
	4.60	115.00	34.20	1553.98
	6.90	172.50	38.80	2807.98
	9.20	230.00	43.40	4209.07
	11.50	287.50	48.00	5708.68
	13.80	345.00	52.60	7277.93

The area immediately east or downstream of the dam is a channel about 50' wide with 6 to 1 side slopes and a slope of approximately 2.0%. This area is undeveloped consisting of pasture/grasslands. The channel is easily capable of handling the flow from the dam failure as shown in Table 2.

TABLE 2: DOWNSTREAM CHANNEL CAPACITY

Mannings Coefficient	0.035			
Channel Slope (ft/ft)	0.02			
North Side Slope (H:V)	6			
South Side Slope (H:V)	6			
Bottom Width (ft)	50			
Depth Variance	Channel Depth	Area	Wetted Perimeter	Discharge
(ft)	(ft)	(ft ²)	(ft)	(cfs)
3				
	3.00	204.00	86.50	2176.13
	6.00	516.00	122.99	8080.94
	9.00	936.00	159.49	18334.59
	12.00	1464.00	195.99	33680.97
	15.00	2100.00	232.48	54836.71
	18.00	2844.00	268.98	82484.02

Approximately 800 feet downstream from the dam, the downstream channel is dammed by State Highway 38. The top of the highway is approximately 18 feet above the bottom of the channel. The ditch along the north side of the highway is approximately 12 feet above the bottom of the channel. With the runoff from the dam collecting at this location to a height of 12', the area will hold approximately 6.35 MG. A 3' diameter RCP pipe is located under the highway. The RCP pipe invert is located about 3' above the bottom of the channel and will have a capacity of approximately 135 cfs at this level. ?

As the water level further rises, the runoff will flow into the ditch located along the north side of the highway. The ditch is 40' wide with 3 to 1 side slopes and slopes to the east at about a 10% grade. This ditch empties into a very flat bottom area located approximately 1000 feet east of the ponding area. The area is approximately 500' wide. This area is surrounded by roadways that connect to Highway 38. These roads essentially create a reservoir area approximately 3.5 feet deep. This area will hold approximately 7.07 MG. Once this area fills, the water will flow over the road into another flat area and into Firesteel Creek, which is approximately 500 feet of the pond area. Firesteel Creek eventually flows into the James River, both which are anticipated as having sufficient capacity to handle the runoff.

There is one home located at the bottom of this drainage area near Firesteel Creek that could be affected by a dam failure. However, the storage areas located above home and flat terrain surrounding the home would result in minimal if any damage. Another home is located sufficiently above the second storage area that a dam failure would not affect the home.

Summary

The downstream area contains only one home with any potential of damage of a complete dam failure. The only other facility of concern is SD Highway 38. However, the downstream area is capable of handling the runoff and the water level is expected to remain approximately 4 feet below the highway.

The maximum height of the dam is 15'. The maximum storage capacity at the maximum height of the dam is 70.16 acre-ft. The effective height of the dam at the crest of the emergency spillway is 13.7 feet. The volume of the dam at the emergency spillway crest height is 64.51 acre-ft. The intermediate storage capacity value is 883.79.

Therefore, with all things considered, the dam should be classified as a Category 3 dam of small size.

SECTION 9

SPECIFICATIONS

DIVISION 2 SITE WORK

SECTION 02010 - SUBSURFACE INVESTIGATIONS

SECTION 02100 - CLEARING AND GRUBBING

SECTION 02160 - SHEETING, SHORING AND BRACING

SECTION 02224 - TRENCHING, BACKFILLING AND COMPACTING

SECTION 02270 - SLOPE PROTECTION AND EROSION CONTROL

SECTION 02290 - EARTH DAM

SECTION 02720 - STORM DRAINAGE PIPING

SECTION 02771 - WATERING FOR EMBANKMENTS FOR PONDS AND RESERVOIRS

SECTION 02930 - SEEDING AND FERTILIZING

SECTION 02010 SUBSURFACE INVESTIGATIONS

PART 1 GENERAL

1.01 SCOPE AND DESCRIPTION

- A. This section describes the Contractor's requirements relative to the subsurface investigations to be completed on this project.
- B. Unless otherwise required, the Contractor shall return all areas disturbed by him to their original grade and seed or sod in accordance with the specifications.

1.02 SOIL INFORMATION

- A. Soils investigations were completed by Maxim Technologies, Inc. of Sioux Falls, South Dakota. The report(s) and test results are included at the end of this section for informational purposes only.
- B. The samples tested are not guaranteed to be indicative of any ground except at the particular and exact location of the sample. No claim shall be made or be considered resulting from any deviations from the sample test data. This information is made available to the Contractor for his own use and is in no event considered as a part of the contract.
- C. The Contractor shall accept the project site in its present condition. It shall be the Contractor's responsibility to determine to his own satisfaction the location and nature of all surface and sub-surface obstacles and the soils and water conditions which will be encountered during the construction of the treatment facility associated structures and piping.
- D. Additional test borings and other exploratory operations as may be desired shall be made by the Contractor at no cost to the Owner.

PART 2 PRODUCTS - Not Applicable

PART 3 EXECUTION - Not Applicable

* * * END OF SECTION * * *

SCHMUCKER, PAUL, NOHR AND ASSOCIATES
MITCHELL, SOUTH DAKOTA

#243-0648

GEOTECHNICAL EXPLORATION PROGRAM
PROPOSED SMALL DAM
WILD OAK GOLF CLUB
MITCHELL, SOUTH DAKOTA

October 14, 2002

October 14, 2002

Mr. Harlan J. Quenzer, P.E.
Schmucker, Paul, Nohr and Associates
620 North Lawler
P.O. Box 398
Mitchell, South Dakota 57301

Dear Mr. Quenzer:

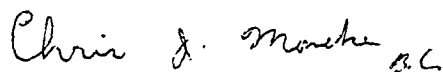
Subj: Geotechnical Exploration Program
Proposed Small Dam
Wild Oak Golf Club
Mitchell, South Dakota
#243-0648

We are pleased to submit the results of our geotechnical exploration program for the referenced project. The geotechnical work was performed in accordance with your verbal authorization of our proposal. Three copies of our report are enclosed for your use.

Representative samples of the soils obtained during our field operations will be retained for a period of one month and will then be discarded. Please advise us in writing if you wish to have the samples retained for a longer period of time.

Thank you for the opportunity to perform these services for you on this project. If you have any questions regarding the contents of this report or if we can be of further assistance to you in any way, please contact us at (605) 332-5371.

Sincerely,



Chris J. Moneke, EIT
Geotechnical Project Manager

g:\...\soils\2002\243-0648 Mitchell Earthen Dam

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geo-

technical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.*

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report prepared or authorized for their use.* Those who do not provide such access may proceed un-

der the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

Published by

ASFE THE ASSOCIATION
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PRACTICING IN THE GEOSCIENCES

8811 Colesville Road/Suite G106/Silver Spring, Maryland 20910/(301) 565-2733

EXECUTIVE SUMMARY

It is our opinion the on-site clay till soils encountered at the site will provide suitable material for the construction of the small dam. The clay till soils were encountered from about 3' to 11' below existing grade. Groundwater was encountered during our drilling operations and may affect construction of the dam.

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GEOTECHNICAL EXPLORATION PROGRAM

PROPOSED SMALL DAM

WILD OAK GOLF CLUB

MITCHELL, SOUTH DAKOTA

#243-0648

1.0 INTRODUCTION

1.1 Project Information

We understand the project will consist of the construction of a small dam located near Mitchell, South Dakota. The proposed dam will have an approximate maximum height of 44' and will be constructed with a 35' wide top. The upstream and downstream slopes will have an approximate ratio of 4 horizontal to 1 vertical.

1.2 Scope of Services

In accordance with authorization received, we have conducted a geotechnical exploration program for the proposed project. The scope of our work under this authorization is limited to the following:

1. To perform six soil borings to explore the subsurface soil and groundwater conditions.
2. To perform nominal laboratory testing to aid in judging soil properties.
3. To present a discussion and engineering recommendations concerning suitability of the on-site soils for use in construction of the small dam.

4. To present recommendations for compaction and moisture control of the borrow soils during construction of the small dam.
5. To point out potential construction difficulties of the dam site.
6. To make recommendations concerning construction observations and testing during construction of the small dam.

1.3 Purpose of Report

The purpose of this report is to present the results of our field and laboratory tests as well as our geotechnical engineering review and recommendations for the project. It should be noted that our work is intended for geotechnical purposes only and not to document the presence or extent of any contamination at the site.

2.0 EXPLORATION PROGRAM RESULTS

2.1 Scope of Exploration

Six soil borings were performed at the site on September 19, 2002. The site is located on the west side of South Gale Road and is between Highway 38 and East 1st Avenue. The site ^{is located in} ~~has a legal description of~~ the SE $\frac{1}{4}$ of Section 23, Township 103 North, Range 60 West in Davison County, South Dakota. ^{spell out}

The borings were advanced at locations shown on the sketch attached in Appendix A. Some settlement of the soils used to fill the open boreholes should be anticipated and final closure of the holes is the responsibility of the client or property owner. The surface elevations of the test borings were located and elevated by others.

2.2 Site Surface Conditions

The site consisted of hilly grassland at the time of our subsurface exploration. The surface elevations at the boring locations ranged from 90.67' to 104.41' based on the information provided by Schmucker, Paul, Nohr and Associates.

2.3 Site Subsurface Conditions

A review of the boring logs performed at the site suggests a general soil profile consisting of 0.5' to 1.5' of clay topsoil overlying clay and sand alluvium (water deposited) soils followed by clay till (glacier deposited) soils to a depth of 15.0' to 41.0' below existing grade.

The clay alluvium and clay till soils encountered at the site exhibited a consistency of medium to rather stiff to stiff to very stiff. The sand alluvium soils encountered at the site exhibited a density of loose to medium dense to dense. The consistency and density of the soils is estimated by the "N" values (penetration resistance) shown on the attached boring logs.

The subsurface conditions encountered at each test boring location are illustrated on logs included in Appendix A. We wish to point out that the subsurface conditions at other times and locations on this site may differ from those found at our test locations. If different subsurface conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed. The test boring logs also indicate the possible geologic origin of the materials encountered.

2.4 Water Levels

Observations for subsurface groundwater were made at the boring locations during our drilling operations. The time and level of the groundwater readings are shown on the boring

logs. Groundwater was encountered only at boring #2 at 9.5' below existing grade during our drilling operations.

We wish to point out that these groundwater observations are not necessarily a true indication of the static groundwater conditions due to the predominately clay soils encountered at the site. In order to accurately determine static groundwater levels, observation over a long period of time is usually required. Such periods of observation are normally not available in a typical soil boring program. Seasonal and annual fluctuations in groundwater levels can be expected to occur.

It should also be noted that clay till soils typically include sand and gravel lenses and/or layers, which sometimes contain perched groundwater. Generally, if necessary, perched groundwater encountered in this type of soil can easily be controlled with sump pumps.

2.5 Laboratory Test Program

2.5.1 Index Properties

Soil samples were selected for laboratory tests to determine the engineering and index properties. These tests consisted of the determination of moisture content, dry density, Atterberg limits and unconfined compressive strength.

The tests were performed in accordance with the American Society for Testing and Materials (ASTM) procedures. The test results are shown on the boring logs opposite the samples upon which the tests were made.

2.5.2 Proctor Test

The maximum density and optimum moisture content (proctor test) were determined for one soil sample consisting of mostly the lean clay till soils encountered at the site. The maximum density and optimum moisture content were determined in accordance with the Standard Proctor method (ASTM:D698). The results of the proctor test are attached in Appendix A and are titled "Moisture-Density Relations".

2.5.3 Permeability Testing

Upon the determination of the maximum density and optimum moisture content, the sample was submitted to the laboratory for permeability testing. The permeability test was performed on the proctor test specimen, which was remolded to 95% of the maximum density at a moisture content near the optimum moisture content.

The remolded test specimen was tested for permeability using the falling head procedure. The permeability test was performed in a chamber similar to a tri-axial chamber whereby an effective confining fluid pressure of 2.0 pounds per square inch is applied and accurately maintained throughout the test to completely seal off the interface between the specimen and the membrane. A maximum head differential of 5' was utilized for the test. The specimen was allowed to saturate after which readings were taken over a period of several days. The test results present an average of the latter, fairly constant readings. The permeability test results are indicated on the data sheet attached in Appendix A.

3.0 ENGINEERING REVIEW

3.1 Project Data

The engineering recommendations provided in this report are based on our understanding of the project as described in the following paragraphs. The recommendations are valid for a specific set of project conditions. If the characteristics of the project change from those indicated in this section, it is necessary that we be notified so that we can determine whether the new conditions affect our recommendations.

We understand the project will consist of the construction of a small dam with an approximate maximum height of 44' and will be constructed with a 35' wide top. The upstream and downstream slopes will have an approximate ratio of 4 horizontal to 1 vertical.

3.2 Discussion

Based on the results of our field and laboratory tests, it is our opinion that the clay till soils encountered at the site are suitable for small dam construction. The clay alluvium soils could be used for construction but should not be used for impervious core material unless they are thoroughly mixed with the clay till soils. It should be noted that sand soils could exist in other parts of the site. In areas where sand soils are encountered, additional excavation and placement of select fill should be anticipated.

3.3 Recommendations

3.3.1 Dam

It is our opinion that the on-site clay till soils are a suitable impervious material for dam construction. The clay alluvium soils should not be used for impervious material unless they are thoroughly mixed with the clay till soils. The mixing should be observed by a geotechnical engineer or their representative. The existing clay topsoil should be completely removed from the base of the dam area.

Based on the review of the boring logs, it is our opinion that a sufficient quantity of clay till soils are present at the site for use as core material. The excavation for the core trench should extend 2' into the clay till soils found at a depth of 6' to 11' below existing grade. We recommend scarifying and re-compacting a minimum of 6" of the exposed clay till material at the bottom of the excavation. If there are areas where sand soils are exposed at the floor of the core trench elevation, we recommend the complete excavation of the sand soils in these areas. The exposed soils at the base elevation should be thoroughly observed by a geotechnical engineer or their representative for the presence of any unusual soil conditions prior to placement of any fill soils.

The clay core soils should be compacted to at least 100% of the Standard Proctor density (ASTM:D698). The clay core soils should be placed at a moisture content ranging from optimum to 2% over optimum moisture content as determined by the Standard Proctor.

If similar soils are used throughout the dam, then an internal drain may be required. This will prevent the dam material from becoming completely saturated. The purpose of the internal drains is to control the seepage patterns and the saturation of the materials comprising the dam.

During construction and once the core has been completed, it should not be allowed to dry out. Drying of the core will cause cracking, which would be very difficult to repair, and may result in seepage rates above the desired rate. Therefore, once the core has been completed, we recommend that compaction tests along with a representative number of permeability tests be performed as soon as possible.

3.3.2 Shrinkage

It is our opinion that the clay alluvium and clay till soils encountered at the site will experience only a small amount of shrinkage when excavated and replaced during the construction of the dam. We recommend that a shrinkage factor of 17% be used for estimation purposes of the earthwork volumes.

3.3.3 Erosion Control

Once the general dam construction has been completed and the core placed and compacted, the embankment in the upstream slope of the dam, which would be subject to erosion, should be protected with some type of protection. This protection could possibly consist of riprap or vegetation excluding legumes. The downstream embankment should also be protected with some type of vegetation.

4.0 CONSTRUCTION CONSIDERATIONS

4.1 Site Excavation

Water should not be allowed to pond in the excavation for any length of time. If the soils are exposed to heavy construction traffic, especially in the presence of excessive moisture, disturbance will occur and additional excavation and backfilling will be required. The clay

alluvium soils encountered at the site could be especially sensitive to disturbance with heavy construction traffic.

All excavations must comply with the requirements of OSHA 29 CFR Part 1926, Subpart P, "Excavation." Reference to this OSHA requirement should be included in the project specifications.

5.0 CONSTRUCTION OBSERVATIONS AND TESTING

The recommendations contained in this report have been made based on the subsurface conditions found at the boring locations. It is possible that there are soil conditions on the site that were not represented by these borings. Consequently, on-site observation during construction is considered integral to the successful implementation of the recommendations. We believe that qualified field personnel need to be on-site at the following times to observe the soil conditions and effectiveness of the construction.

We recommend that a geotechnical engineer be retained during the preliminary site work to aid in identifying suitable material and to aid in determining if unsuitable soils have been satisfactorily removed from the dam area. We suggest that a number of representative soil compaction tests be taken during the placement of the core materials. The purpose of these tests is to document proper compaction and moisture uniformity and compliance with recommendations. Also, we suggest a number of in-place 3" thin walled tube samples of the completed core be taken and tested to document the coefficient of permeability.

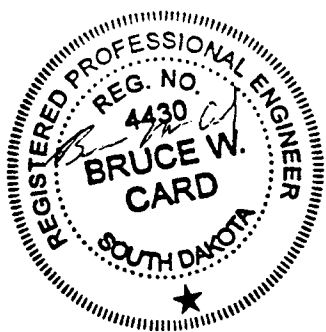
6.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering procedures at this time and location. Other than this, no warranty, either expressed or implied, is intended.

This report was prepared by:

Chris J. Moneke
Chris J. Moneke, EIT
Geotechnical Project Manager

This report is being written in accordance with our quality assurance program. This service is provided as an additional assurance to you that our work was performed with the level of care and skill ordinarily exercised by members of the profession practicing under similar conditions at the time the service is performed.

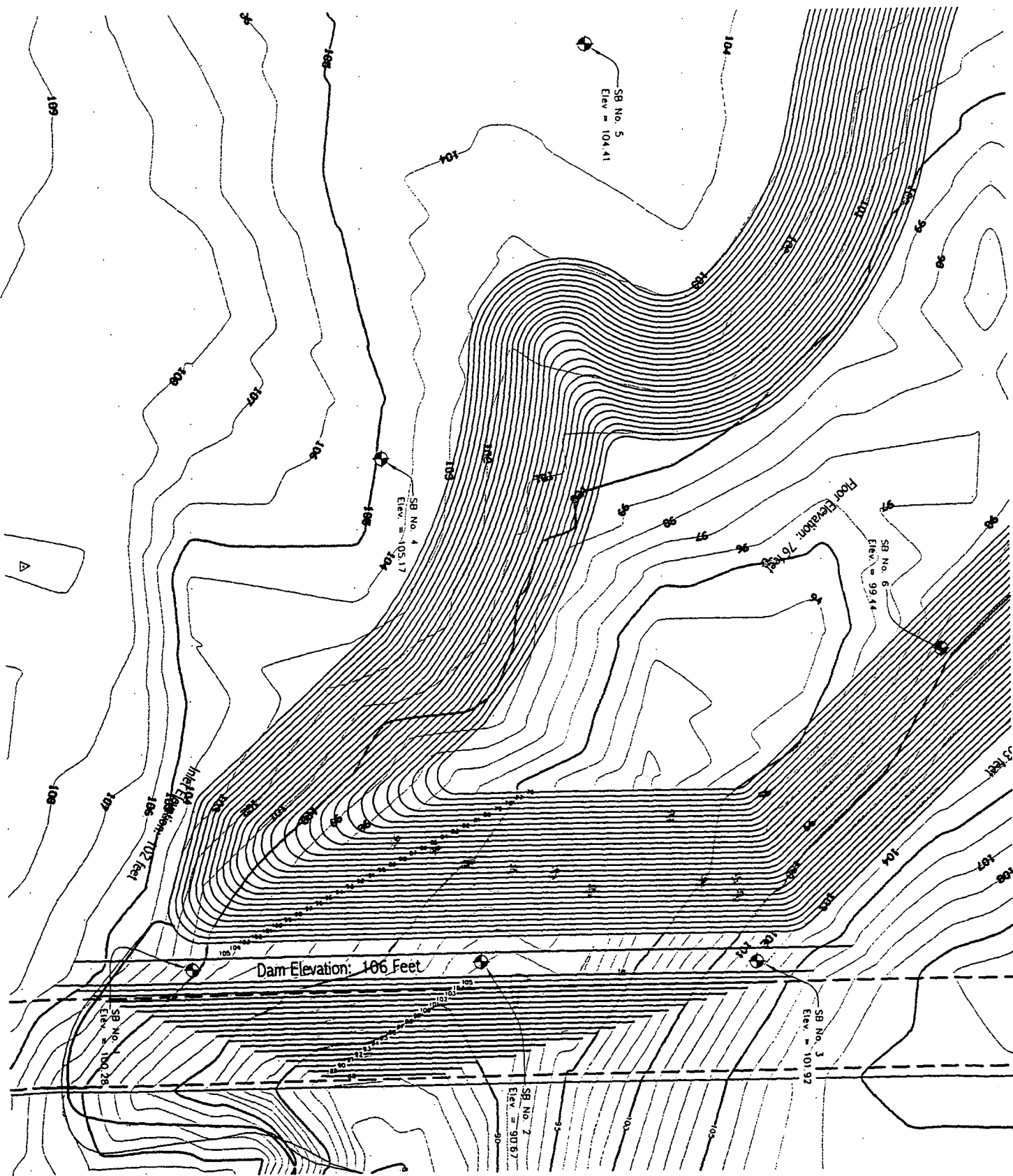


This report was reviewed by:

B. W. Card
Bruce W. Card, PE
Branch Manager

Proofread by:

[Signature]



NORTH
1"=100'

LOG OF TEST BORING

JOB NO. 243-0648 VERTICAL SCALE 1" = 6' BORING NO. 1
 PROJECT EARTHEN DAM, NEAR MITCHELL, SOUTH DAKOTA

SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION <u>100.28'</u>	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or ROD
1.5	SILTY CLAY, dark brown (ML-OL)	TOPSOIL			1	HSA					
	SANDY LEAN CLAY, brown mottled, stiff (CL)	MIXED ALLUVIUM		16	2	SB					
				28	3	SB					
9				22	4	SB					
10	SANDY LEAN CLAY, with a little gravel, brown mottled, stiff (CL)	TILL		22	5	SB					
11	SAND, fine to medium grained, brown, moist, dense (SP)	COARSE ALLUVIUM/ TILL		29	6	SB					
	SANDY LEAN CLAY, with a little gravel, brown mottled, stiff to very stiff, a 1" sand lens at 14.5' (CL)			29	7	SB	16	113			
				34	8	SB					
19.5	SANDY LEAN CLAY, with a little gravel, dark brown mottled, very stiff, a sand lens at 25' (CL)			39	9	SB					
26	END OF BORING			49	10	SB					

WATER LEVEL MEASUREMENTS

START 9/19/02 COMPLETE 9/19/02

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/ CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD	
9-19						NONE	3 1/4" HSA 0-24 1/2'	@ 3:20

CREW CHIEF: Roger Hanson

Maxim Technologies, Inc

601 East 48th Street North
 Sioux Falls, South Dakota 57104
 Telephone: 605-332-5371
 Fax: 605-332-8488

GEOTECHLOG 243-0648 GPJ MAXIMLOG.GDT 10/11/02

LOG OF TEST BORING

DB NO. 243-0648 VERTICAL SCALE 1" = 6' BORING NO. 2

PROJECT EARTHEN DAM, NEAR MITCHELL, SOUTH DAKOTA

SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or ROD
	↓ SURFACE ELEVATION <u>90.67'</u>										
1.5	SILTY CLAY, black (ML-OL)	TOPSOIL			1	HSA					
4	SANDY LEAN CLAY, dark brown, medium (CL)	MIXED ALLUVIUM		8	2	SB					
6	LEAN CLAY, brown mottled, medium (CL)			7	3	SB	16	100			
	SANDY LEAN CLAY, with a little gravel, brown mottled, rather stiff (CL)	TILL		12	4	SB	18	100	35	18	5000
					5	3T					
12	SANDY LEAN CLAY, with a little gravel, gray and brown mottled, stiff to rather stiff (CL)			18	6	SB					
				28	7	SB					
				23	8	SB					
				15	9	SB					
9.5	SANDY LEAN CLAY, with a little gravel, gray, stiff, a lens of waterbearing sand at 30' (CL)			21	10	SB					
				18	11	SB					
41	END OF BORING			19	12	SB					

WATER LEVEL MEASUREMENTS							START	9/19/02	COMPLETE	9/19/02
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD			
9-19	12:07	13'	11.5'	13'		12'	3 1/4" HSA 0-39 1/2'	@ 12:50		
9-19	12:21	21'	19.5'	21'		20'				
9-20	10:12	41'	---	18'		9.5' ▼				
							CREW CHIEF:	Roger Hanson		

Maxim Technologies, Inc

601 East 48th Street North
Sioux Falls, South Dakota 57104
Telephone: 605-332-5371
Fax: 605-332-8488

LOG OF TEST BORING

JOB NO. 243-0648

VERTICAL SCALE 1" = 6'

BORING NO. 3

PROJECT **EARTHEN DAM, NEAR MITCHELL, SOUTH DAKOTA**

SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS					
					NO.	TYPE	W	D	LL	PL	Qu or ROD	
	SURFACE ELEVATION 101.92'											
0.5	SILTY CLAY, black (ML-OL)	TOPSOIL MIXED ALLUVIUM			1	HSA						
	SILTY SAND, fine to medium grained, brown, moist, loose (SM)			6	2	SB						
4												
	SILTY SAND, fine grained, light brown, moist, loose (SM)			7	3	SB						
6.5		COARSE ALLUVIUM		14	4	SB						
	SAND, fine to medium grained, with a little gravel, brown, moist, medium dense (SP)											
9		TILL		10	5	SB	21	102				
	SANDY LEAN CLAY, with a little gravel, brown mottled, rather stiff to stiff, sand lenses (CL)			18	6	SB						
				22	7	SB						
19												
	SANDY LEAN CLAY, with a little gravel, dark brown mottled, very stiff (CL)			35	8	SB						
24		TILL		24	9	SB						
	SANDY LEAN CLAY, with a little gravel, gray, stiff (CL)											
26	END OF BORING											
WATER LEVEL MEASUREMENTS				START	9/19/02	COMPLETE	9/19/02					
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD 3 1/4" HSA 0-24 1/2'					
9-19						NONE						
CREW CHIEF: Roger Hanson							601 East 49th Street No					

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601 East 48th Street North
Sioux Falls, South Dakota 57104
Telephone: 605-332-5371
Fax: 605-332-8488

LOG OF TEST BORING

JOB NO. 243-0648 VERTICAL SCALE 1" = 6' BORING NO. 4
 PROJECT EARTHEN DAM, NEAR MITCHELL, SOUTH DAKOTA

SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>105.17'</u>	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or ROD
1	SILTY CLAY, black (ML-OL)	TOPSOIL			1	NSR					
	SAND, fine to medium grained, with gravel, brown, moist (SP)	COARSE ALLUVIUM			2	HSA					
7	SANDY LEAN CLAY, with a little gravel, gray mottled, cobbles (CL)	TILL			3	B*					
15	END OF BORING										

*Bag sample obtained from 7'-15'

WATER LEVEL MEASUREMENTS

START 9/20/02 COMPLETE 9/20/02

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/ CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD
9-19						NONE	6" FA 0-15'

CREW CHIEF: Roger Hanson

Maxim Technologies, Inc

601 East 48th Street North
 Sioux Falls, South Dakota 57104
 Telephone: 605-332-5371
 Fax: 605-332-8488

LOG OF TEST BORING

JOB NO. 243-0648 VERTICAL SCALE 1" = 6' BORING NO. 5

PROJECT EARTHEN DAM, NEAR MITCHELL, SOUTH DAKOTA SHEET 1 OF 1

WATER LEVEL MEASUREMENTS							START	9/20/02	COMPLETE	9/20/02
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/ CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD 6" FA 0-15'		@	
9-20						NONE				
							CREW CHIEF: Roger Hanson			

601 East 48th Street North
Sioux Falls, South Dakota 57104
Telephone: 605-332-5371
Fax: 605-332-8488

LOG OF TEST BORING

JOB NO. 243-0648 VERTICAL SCALE 1" = 6' BORING NO. 6

PROJECT EARTHEN DAM, NEAR MITCHELL, SOUTH DAKOTA

SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>99.44'</u>	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or ROD
1	SILTY CLAY, dark brown (ML-OL)	TOPSOIL			1	○ NSR					
2	SAND, fine grained, brown, moist (SP)	COARSE ALLUVIUM			2	○ NSR					
	SAND, fine to medium grained, with gravel, brown, moist (SP)				3	○ NSR					
4.5	SANDY LEAN CLAY, with a little gravel, brown mottled (CL)	TILL									
					4	B*					
15	END OF BORING										

*Bag sample obtained from 4.5'-15'

WATER LEVEL MEASUREMENTS

START 9/20/02 COMPLETE 9/20/02

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/ CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD
9-20						NONE	6" FA 0-15'

CREW CHIEF: Roger Hanson

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Telephone: 605-332-5371
Fax: 605-332-8488

GEOTECHLOG 243-0648 GP1 MAXIMLOG.GDT 10/11/02

REPORT OF MOISTURE-DENSITY RELATIONS

CLIENT: SCHMUCKER PAUL NOHR & ASSOC
620 N LAWLER
MITCHELL, SD 57301

PAGE 1 OF 1

PROJECT: EARTHEN DAM
NEAR MITCHELL, SD

PROJECT NO.: 2430648
REPORT NO.: 11829
DATE OF SERVICE: 10/02/2002
AUTHORIZATION:
REPORT DATE: 10/14/2002

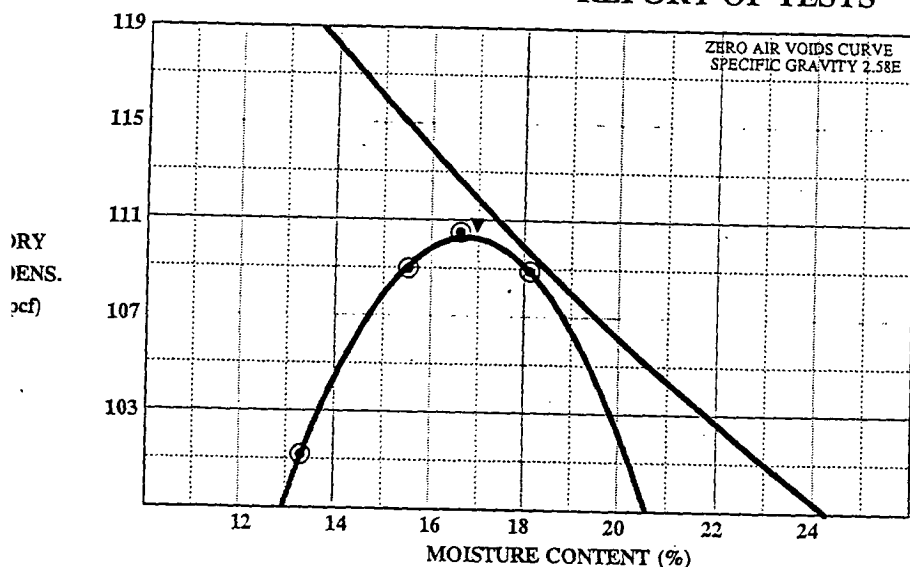
SERVICES:

PROJECT DATA

CONTRACTOR: SIOUX FALLS, CITY OF
DATE SAMPLED: 9/20/2002
SAMPLED BY: ROGER HANSON
TEST FOR:
SAMPLE LOCATION: BORING #5, SAMPLE #4,
DEPTH 7' - 15'

TEST DATE: 10/02/2002
MATERIAL: SANDY LEAN CLAY, BROWN
CLASSIFICATION: (CL)
MATERIAL PREPARATION METHOD: Moist
RAMMER TYPE: MANUAL
METHOD OF TEST: ASTM D698, Method A

REPORT OF TESTS



MAXIMUM DENSITY, PCF: 110.5

OPTIMUM MOISTURE (%): 17.0

% PASSING #200: 63.0

E = Estimated Value

Technician: BILL SUNDVOLD
TECHNICIAN

Report Distribution:
TO: SCHMUCKER PAUL NOHR & ASSOC

MAXIM TECHNOLOGIES INC.

Adam Johnson
ADAM JOHNSON
SR LAB TECHNICIAN

PERMEABILITY TEST DATA

PROJECT	Earthen Dam	DATE	10/14/2002
	Near Mitchell, SD		
REPORTED TO	Schmucker Paul & Nohr	JOB NO.	243-0648

Boring No.	5			
Sample No.	4			
Depth	7' - 15'			
Type of Sample	Bag			
Soil Classification (ASTM: D 2487) Symbol	Sandy Lean Clay, brown (CL)			
In-place Moisture Content (%)	17.5			
Moisture Density Relation of Soil (ASTM:D698)				
Max. Dry Density (PCF)	110.5			
Optimum Moisture Content (%)	17.0			
Permeability Test				
Trial No.	12			
Type of Test	Falling Head			
Type of Specimen	Remolded			
Specimen Height (inches)	3.00			
Specimen Diameter (inches)	2.78			
Dry Density (PCF)	105.0			
Percent of Max. Density	95			
Moisture Content (%)	17.5			
Max. Head Differential (ft)	5			
Confining Pressure (effective-PSI)	2			
Water Temperature (°C)	20			
Coefficient of Permeability				
K @ 20°C (cm/sec)	7.52×10^{-8}			
K @ 20°C (ft/min)	1.47×10^{-7}			
Atterberg Limits				
Liquid Limit (%)	Not Tested			
Plastic Limit (%)	Not Tested			
Plastic Index	Not Tested			

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 - 83

(Based on Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well graded gravel ^F	
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel	
		Gravels with Fines More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F,G,H}	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand ^I	
		Sands with Fines More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G,H,I}	
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silt and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K,L,M}	
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OL	Organic clay ^{K,L,M,N} Organic silt ^{K,L,M,O}	
		Silt and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
				PI plots below "A" line	MH	Elastic silt ^{K,L,M}
	organic		Liquid limit - oven dried < 0.75 Liquid limit - not dried	OH	Organic clay ^{K,L,M,P} Organic silt ^{K,L,M,O}	
	Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

^ABased on the material passing the 3-in. (75-mm) sieve.

^BIf field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^CGravels with 5 to 12% fines require dual symbols:

GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

^DSands with 5 to 12% fines require dual symbols:

SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

$$C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^EIf soil contains $\geq 15\%$ sand, add "with sand" to group name.

^FIf soil contains $\geq 15\%$ sand, add "with sand" to group name.

^GIf fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^HIf fines are organic, add "with organic fines" to group name.

^IIf soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^JIf Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

^KIf soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^LIf soil contains $\geq 30\%$ plus no. 200, predominantly sand, add "sandy" to group name.

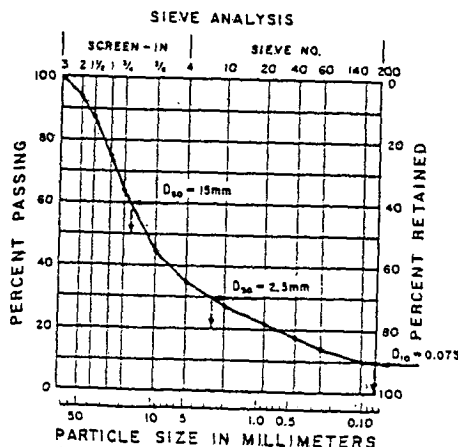
^MIf soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

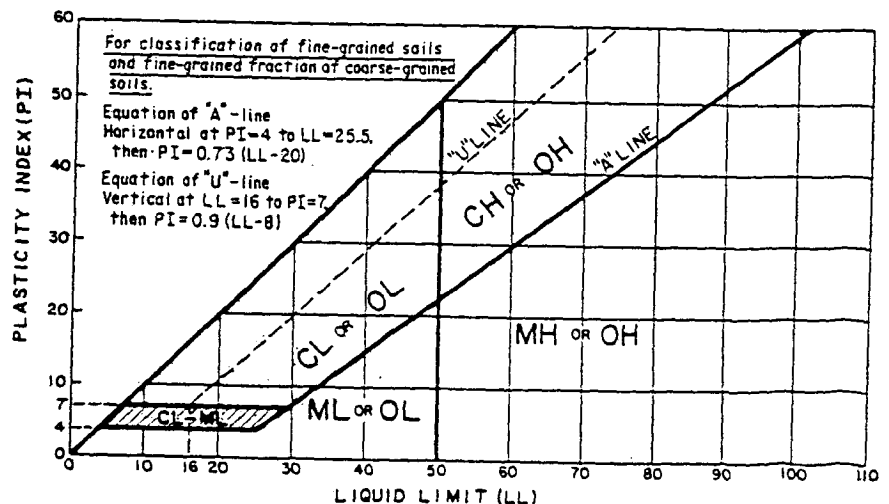
^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



$$C_u = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200 \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{(2.5)^2}{0.075 \times 15} = 5.6$$



GENERAL NOTES

DRILLING AND SAMPLING SYMBOLS

SYMBOL	DEFINITION
HSA	3 1/4" I.D. Hollow Stem Auger
_FA	4", 6" or 10" Diameter Flight Auger
_HA	2", 4" or 6" Hand Auger
_DC	2 1/2", 4", 5" or 6" Steel Drive Casing
_RC	Size A, B, or N Rotary Casing
PD	Pipe Drill or Cleanout Tube
CS	Continuous Split Barrel Sampling
DM	Drilling Mud
JW	Jetting Water
SB	2" O.D. Split Barrel Sample
_L	2 1/2" or 3 1/2" O.D. SB Liner Sample
_T	2" or 3" Thin Walled Tube Sample
3TP	3" Thin Walled Tube (Pitcher Sampler)
_TO	2" or 3" Thin Walled Tube (Osterberg Sampler)
W	Wash Sample
B	Bag Sample
P	Test Pit Sample
_Q	BQ, NQ, or PQ Wireline System
_X	AX, BX, or NX Double Tube Barrel
CR	Core Recovery - Percent
NSR	No Sample Recovered, classification based on action of drilling equipment and/or material noted in drilling fluid or on sampling bit.
NMR	No Measurement Recorded, primarily due to presence of drilling or coring fluid.



Water Level Symbol

TEST SYMBOLS

SYMBOL	DEFINITION
W	Water Content - % of Dry Wt. - ASTM D 2216
D	Dry Density - Pounds Per Cubic Foot
LL, PL	Liquid and Plastic Limit - ASTM D 4318
Additional Insertions in Last Column	
Qu	Unconfined Comp. Strength-psf - ASTM D 2166
Pq	Penetrometer Reading - Tons/Square Foot
Ts	Torvane Reading - Tons/Square Foot
G	Specific Gravity - ASTM D 854
SL	Shrinkage Limits - ASTM D 427
OC	Organic Content - Combustion Method
SP	Swell Pressure - Tons/Square Foot
PS	Percent Swell
FS	Free Swell - Percent
pH	Hydrogen Ion Content, Meter Method
SC	Sulfate Content - Parts/Million, same as mg/L
CC	Chloride Content - Parts/Million, same as mg/L
C*	One Dimensional Consolidation - ASTM D 2435
Qc*	Triaxial Compression
D.S.*	Direct Shear - ASTM D 3080
K*	Coefficient of Permeability - cm/sec
D*	Dispersion Test
DH*	Double Hydrometer - ASTM D 4221
MA*	Particle Size Analysis - ASTM D 422
R	Laboratory Resistivity, in ohm.-cm - ASTM G 57
E*	Pressuremeter Deformation Modulus - TSF
PM*	Pressuremeter Test
VS*	Field Vane Shear - ASTM D 2573
IR*	Infiltrometer Test - ASTM D 3385
RQD	Rock Quality Designation - Percent

* See attached data sheet or graph

WATER LEVEL

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels may be considered reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for test borings, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

DENSITY TERM	"N" VALUE	CONSISTENCY TERM	Lamination	Up to 1/2" thick stratum
Very Loose	0-4	Soft	Layer	1/2" to 6" thick stratum
Loose	5-8	Medium	Lens	1/2" to 6" discontinuous stratum, pocket
Medium Dense	9-15	Rather Stiff	Varved	Alternating laminations of clay, silt and /or fine grained sand, or colors thereof
Dense	16-30	Stiff	Dry	Powdery, no noticeable water
Very Dense	Over 30	Very Stiff	Moist	Below saturation
Standard "N" Penetration: Blows Per Foot of a 140 Pound Hammer Falling 30 inches on a 2 inch OD Split Barrel Sampler			Wet	Saturated, above liquid limit
			Waterbearing	Pervious soil below water

RELATIVE GRAVEL PROPORTIONS

CONDITION	TERM	RANGE
Coarse Grained Soils	A little gravel	2 - 14%
	With gravel	15 - 49%
Fine Grained Soils	A little gravel	2 - 7%
	With gravel	8 - 29%
15-29% + No. 200	A little gravel	2 - 14%
15-29% + No. 200	With gravel	15 - 24%
30% + No. 200	A little gravel	16 - 49%
30% + No. 200	With gravel	
30% + No. 200	Gravelly	

RELATIVE SIZES

Boulder	Over 12"
Cobble	3" - 12"
Gravel	
Coarse	3/4" - 3"
Fine	#4 - 3/4"
Sand	
Coarse	#4 - #10
Medium	#10 - #40
Fine	#40 - #200
Silt & Clay	- #200, Based on Plasticity

FIELD EXPLORATION PROCEDURES

Soil Sampling

Soil sampling was performed in accordance with ASTM:D1586. Using this procedure, a 2", outer diameter, split barrel sampler is driven into the soil by a 140 pound weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or "N" values. The "N" value is an index of the relative density of the cohesionless soils and the consistency of cohesive soils. Thin walled tube samples, if taken, were obtained according to ASTM:D1587 where indicated by the appropriate symbol on the boring logs. Rock core samples, if taken, were obtained by rotary drilling in accordance with ASTM:D2113. Power auger borings, if performed, were done in general accordance with ASTM:D1452.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM:D2487. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. Logs of the borings indicating the depth and identification of the various strata, the "N" value, water level information and pertinent information regarding the method of maintaining and advancing the drill holes are attached. Charts illustrating the soil classification procedure, the descriptive terminology and the symbols used on the boring logs are also included in Appendix A.

Maxim Technologies Inc®

GLOSSARY OF TERMS

AGGREGATE	Mineral material such as sand, gravel or combinations thereof.
ALLOWABLE BEARING PRESSURE	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
ALLUVIUM	Deposits from modern rivers.
ARGILLACEOUS	Rocks composed of or having a notable proportion of clay in their composition.
ARENACEOUS	Derived from or containing sand.
BACKFILL	A specified material placed and compacted in a confined area.
BASE COURSE	A layer of specified material placed on a subgrade or subbase.
BEDROCK	The solid rock underlying soils and other earthy surface formations.
BENCH	A horizontal surface in a sloped deposit.
BLOCKY STRUCTURE	Soil particles arranged around a point with the three dimensions of the same order of magnitude.
CAISSON	A concrete foundation element cast in a circular excavation, which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
CALCAREOUS	Containing calcium carbonate determined by effervescence when treated with dilute hydrochloric acid.
COLLUVIUM	Mixtures of soil and rock materials moved by gravity usually near base of strong slopes.
COMPACTION	Mechanical densification of soils causing the expulsion of air from the void spaces.
CONCRETE SLAB-ON-GRADE	A concrete surface layer cast directly on a base, subbase or subgrade.
CONSOLIDATION	The reduction of the void ratio of a soil mass due to its own weight or superimposed loads. The time rate of consolidation is dependent on the permeability of the soil and the rate of loading.
CRUSHED ROCK BASE COURSE	A base course composed of crushed rock of a specified gradation.
DIFFERENTIAL SETTLEMENT	Unequal settlement between or within foundation elements of a structure.
ENGINEERED FILL	Specified material placed and compacted to specified density and/or moisture conditions under observation of a representative of a soil engineer.
EXISTING FILL	Materials deposited through the action of man prior to exploration of the site.
EXISTING GRADE	The ground surface at the time for field exploration.
EXPANSIVE POTENTIAL	The potential of a soil to expand (increase in volume) due to the absorption of moisture.

FILL	Materials deposited by the action of a man.
FINISHED GRADE	The final grade created as a part of the project.
HORIZON	The various layers that comprise a soil (A-C) distinguished principally by its texture, color, structure and chemical content.
LOESS	Geological deposit of relatively uniform, primarily silt material presumably transported by wind.
NATIVE SOIL	The naturally occurring soils on the site.
OUTCROP	The exposure of bedrock at the surface of the ground.
OVERBURDEN	Undifferentiated, unconsolidated material directly over a deposit of rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
PUMPING	Phenomenon where the soil surface undulates under transient loads due to applied stress being carried by the fluids in the voids in the soil mass. Severe cases result in rupture of the soil surface.
ROCK	A natural agglomerate of mineral grains connected by strong and permanent cohesive forces. usually requires drilling, wedging, blasting of other methods of extraordinary force for excavation.
SCARIFY	To mechanically loosen soil or break down existing soil structure.
SETTLEMENT	Downward movement.
SILICEOUS	Containing silica.
SLICKENSIDE	Polished and striated surface that results from friction along a plane of movement.
SOIL	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
STRIP	To remove from present location.
SUBBASE	A layer of specified material placed to form a layer between the subgrade and base course.
SUBBASE GRADE	Top of subbase.
SUBGRADE	Prepared soil surface.
TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
VOID RATIO	The ratio of the volume of voids to the volume of solid particles in a soil mass.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and materials.
VARVE	Alternating thin layers of silt (or fine sand) and clay.
VUG	A cavity, often lined with a mineral of different composition than the parent material.

SECTION 02100 CLEARING AND GRUBBING

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section describes the work related to clearing, grubbing and disposal of materials from the project work sites. Each Contractor shall accept all sites in their present condition.
- B. Clearing and grubbing will consist of the removal and disposal of trees, stumps, brush, roots, vegetation, logs, rubbish, and other objectionable natural or manmade material, and the removal and restoration of fences on and near the site of the work. All grubbing shall be limited to those areas where new construction is shown.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 PROTECTION

- A. Trees, shrubs and brush designated for preservation by the Owner's representative, shall be carefully trimmed as directed. Trees, shrubs, etc., so designated shall be protected from scarring, barking, or other injuries during construction operations by fencing or other approved barricades.
- B. Paint required for cut or scarred surfaces of trees or shrubs selected for preservation shall be an approved asphaltum base paint prepared especially for tree surgery or orange shellac.

3.02 CLEARING

- A. The entire project site shall be cleared of all trees, stumps, brush, logs, and rubbish only as required to complete construction except such trees and brush as may be designated by the Owner to be left in place.

3.03 GRUBBING

- A. On areas required for construction of embankments, all stumps, roots, etc., shall be removed to a depth of at least one foot below the existing ground surface.
- B. On areas required for borrow sites and material sources, stumps, roots, etc., shall be removed to the complete extent necessary to prevent such objectionable matter becoming mixed with the material to be used on construction.
- C. Stump holes and other holes from which obstructions have been removed shall be backfilled and compacted in accordance with the requirements of the applicable sections of those specifications dealing with the excavation, backfill, embankment and compaction in the areas affected.

3.04 CLEANING OF THE WORK SITE

- A. All materials cleared and grubbed shall be disposed of as outlined in these specifications or as directed by the Engineer or Owner.
- B. All trees, shrubs, brush, and other vegetation shall be removed and disposed of on a daily basis.
- C. Before the work will be considered complete, the Contractor must remove all surplus materials, tools, equipment, or plant, leaving the site of the work and all portions of the finished work clean, unobstructed, free from all weeds, brush, rubbish, stumps, or other objectionable materials and ready for use.

3.05 DISPOSAL

- A. Materials and debris shall be removed from the project site and disposed of at locations outside the project limits. The Contractor shall be required to locate a disposal site at his own expense and must obtain and file with the Owner permission in writing from the property owner or owners for the use of private property for disposal purposes. Any disposal site the Contractor proposes to utilize shall be subject to final approval by the Owner, given in writing, prior to any work being done at the location under consideration. The Contractor shall comply with all applicable federal, state, and local laws, ordinances, and regulations governing the disposal of solid wastes.
- B. All perishable material shall be removed from the site. If burned, it shall be under the constant care of competent workmen and in such a manner that the surrounding vegetation and adjacent property is not jeopardized. The Contractor will be responsible for compliance with all federal, state, and local laws and regulations applicable to burning and controlling fires.
- C. Prior to certification of project completion, the Contractor shall obtain and furnish to the Owner a lien waiver or a letter of satisfaction written by the property owner of the disposal area and addressed to the Contractor.

* * * END OF SECTION * * *

SECTION 02160 SHEETING, SHORING, AND BRACING

PART I GENERAL

1.01 RELATED DOCUMENTS

A. Related requirements specified elsewhere:

1. Structural Excavating, Filling and Grading - Section 02222
2. Trenching, Backfilling and Compacting - Section 02224
3. Storm Drainage Piping - Section 02720

1.02 DESCRIPTION OF WORK

- A. Furnish and install all necessary sheeting, shoring, and bracing to adequately protect all new and existing structures, all existing piping as may be required during construction period, and all new piping.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 METHODS

- A. All excavation shall be properly shored, sheeted, and braced to furnish safe working conditions conforming to the current codes, regulations, and guidelines; to prevent any shifting and movement of material which may endanger personnel; to prevent damage to structures, or other work; and to avoid delay to the work.
- B. Bracing shall be so arranged as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength. If the Engineer is of the opinion that at any point the sheeting or supports furnished are inadequate or unsuited for the purpose, he may order additional sheeting or support to be installed. Whether so ordered by the Engineer or not, sufficient sheeting or support shall be installed to protect the work from any damage to new structures.
- C. No sheeting, shoring, and bracing which is within three feet of the surface of the finished grade may be left in place without the written permission of the Engineer.
- D. In general, the sheeting and bracing shall be removed as the excavation is refilled in such a manner as to avoid the caving in of the bank or disturbance to adjacent areas or structures. The voids left by the withdrawal of the sheeting shall be carefully filled by ramming or otherwise as directed. Permission of the Engineer shall be obtained before the removal of any shoring, sheeting, or bracing.
- E. It shall be the duty and responsibility of the Contractor to be familiar with all local, state, and federal regulations relating to this type of work and to comply with those regulations.

*** END OF SECTION ***

SECTION 02224 TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Related Requirements specified elsewhere:
1. Sheet piling, Shoring and Bracing - Section 02160
 2. Storm Drainage Piping - Section 02720
 3. Seeding and Fertilizing - Section 02930

1.02 SCOPE

- A. This section covers the excavation of all necessary trenching for underground utilities, and backfilling same, after the pipe and related material and structures have been properly placed, inspected and tested all in accordance with applicable federal, state and local laws and regulations.
- B. The term "structures" as used in these specifications shall include but not be limited to manholes, fittings and related appurtenances.

1.03 QUALITY ASSURANCE

- A. When requested by the Engineer or Resident Project Representative, the Contractor shall excavate and expose the pipe previously laid at any point.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL EXCAVATION

- A. All material encountered shall be excavated to the lines and grades as shown on the plans, set by the Engineer or as specified herein.
- B. Where pipe elevation is determined by minimum depth only, the excavation shall be sufficient at all points to grade the pipes on the tangents and vertical curves as dictated by the minimum bending radius of the pipe and fittings as recommended by the manufacturers.
- C. The trenches shall be sufficiently straight between designated angle points to permit the pipe to be laid true to line in the approximate center of the trench.
- D. All excavated material suitable for backfilling shall be placed in an area away from the trench edges so as to avoid overloading, sliding and cave-ins.
- E. The areas immediately adjacent to the trench shall be graded as required to prevent surface water from entering the trenches.

3.02 EXCAVATION FOR APPURTENANCES

- A. A minimum of twelve (12) inches shall be left between the trench wall and the outside surface of the appurtenance.

3.03 SHEETING, SHORING AND BRACING

- A. Refer to Section 02160 of these specifications

3.04 ROCK EXCAVATION

- A. Rock excavation shall be completed to a minimum of eight (8) inches below and on each side of all pipe, valves, fittings and other appurtenances.
- B. Excess excavation shall be backfilled with compacted material conforming to the bedding material required for the material being used.

3.05 DEWATERING

- A. Where water is encountered in a trench, water shall be removed by pumping to lower the water level to such elevation that the pipe may be laid dry at the grade shown on the plans.
- B. All water pumped from the trench shall be disposed of in a manner so as not to cause any damage to adjacent property.

3.06 TRENCH BOTTOM PREPARATION

- A. The sides of all trenches shall be vertical from the bottom of the trench to a point one (1) foot above the top of the pipe.
- B. The width of the trench shall be greater than six (6) inches but less than twelve (12) inches on each side of the pipe bell.
- C. The bottom of all trenches for underground piping shall be carefully and accurately formed to the lines and grades as shown on the plans, set by the Engineer or as specified herein.
- D. Removal of rock, boulders, and large stones, or other manmade material shall be completed in accordance with Paragraph 3.05 of this specification.
- E. If the trench bottom is inadvertently excavated deeper than necessary, it shall be backfilled to the proper grade with compacted bedding material.

3.07 UNSTABLE TRENCH BOTTOM

- A. Whenever wet, soft or unstable soils incapable of properly supporting the pipe, or other appurtenances are encountered in the trench, the Contractor shall be required to remove the unsuitable materials and backfill to the proper grade with bedding material as specified in Section 02720.
- B. Backfill material shall be compacted to a minimum density of 90% of maximum Standard Proctor Density (ASTM D698).

3.08 BACKFILLING AND COMPACTING

- A. Any trenches improperly backfilled or showing excessive settlement shall be reopened to a depth required for proper compaction.
- B. Backfill material shall be free of boulders, frozen clods, large roots, excessive sod or other vegetation, construction debris.
- C. No backfilling shall take place in freezing weather without written permission from the Engineer.
- D. Bedding material shall consist of borrowed granular material or material excavated from the site and shall conform to the requirements of Section 02720.
- E. The embedment material above the bedding material shall be finely divided material free from debris, organic material, and clods, lumps or stones larger than 1-1/2 inches maximum diameter. The material shall be borrowed material or job site excavated material. Placement of embedment material shall be completed by hand or mechanical method that is approved by the Engineer. The method selected and approved shall be such that the material is not dropped from the top of the trench in a manner that will harm or displace the pipe. Embedment material shall be placed in uniform layers not more than eight inches (8") thick and compacted to 95% maximum density as determined by ASTM D698 until the pipe has a cover of not less than one foot (1').
- F. The remainder of the backfill above the embedment material shall consist of selected material from excavation or borrow, and shall be free from cinders, ashes, refuse, organic and frozen material, boulders or other materials that are unsuitable. This material shall be placed from 12 inches above the top of the pipe to 6 inches below the ground surface, unless otherwise specified.
- G. After completing the bedding and embedment of the pipe as specified, the remainder of the backfill material shall be placed in uniform layers not more than eight inches (8") and shall be compacted to 95% maximum density as determined by ASTM D698.
- H. Excess excavated material not required for backfill or grading shall be removed from the site of excavation. Such removal and disposal shall be as specified hereinafter.
- I. Where sufficient excavated material is not available for backfilling and grading, the Contractor shall, at no additional cost to the Owner, be responsible for locating, obtaining and placing additional materials as may be required. Borrow of topsoil by stripping areas adjacent to the trench will not be allowed.
- J. No more than 100 feet of trench shall be left open at any time. Open trenches shall be properly marked and/or attended. Trenches shall be closed at the end of each day.

3.09 EXCESS EXCAVATION

- A. The Contractor shall be responsible for securing and maintaining an adequate area where excess excavation can be stockpiled for future use or wasted.
- B. The Contractor shall be responsible for the final cleanup of the site chosen. The site shall be cleaned to the satisfaction of the property owner, and a lien waiver or a letter of satisfaction written by the property owner and addressed to the Contractor shall be obtained by the Contractor and furnished to the Owner.

3.10 TOPSOIL

- A. All portions of the dam that are not riprapped shall be left smooth with a minimum of 6" of compacted black dirt throughout the entire area disturbed by the trench.
- B. Prior to topsoiling and finish grading, all rough grades shall be corrected, adjusted and brought to the required elevations.
- C. The subgrade surface shall be prepared for topsoiling by cross-discing to a depth of two (2) inches or more to permit bonding of the topsoil to the subgrade.
- D. All stones and other debris greater than two (2) inches in any dimension shall be removed from the surface of the subgrade prior to the placement of the topsoil.
- E. Topsoil material shall not be placed when the topsoil or subgrade is frozen or wet enough to cause clodding.
- F. Topsoiling operations shall be considered complete when the finished surface is:
 - 1. Free of sticks, stones and other material one (1) inch or more in any dimension.
 - 2. Smooth and true to required grades with a maximum allowable deviation of 0.1 foot.

* * * END OF SECTION * * *

SECTION 02270 SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Related Work Specified Elsewhere:

1. Earth Dam - Section 02290
2. Seeding and Fertilizing - Section 02930

1.02 DESCRIPTION OF THE WORK

- A. This section includes all labor, materials, equipment and services necessary to furnish and install the types and kinds of slope protection and erosion control to the lines, grades, and thicknesses shown on the drawings.
- B. Slope protection and erosion control shall be furnished and placed to the outlines and thicknesses as shown on the drawings and as specified for the protection of slopes, channels, and structures at the following locations:
1. The inner faces of the dam embankment
 2. Elsewhere as shown on the drawings and as directed

1.03 SAMPLES

- A. The Contractor shall furnish to the Engineer at the site of the work, without cost to the Owner, such samples of rock materials for testing as may be required by the Engineer from proposed quarry sites and from rock materials delivered to the construction site.

1.04 SUBMITTALS

- A. The Contractor shall furnish product information sufficient to determine conformance with these specifications, for the following materials:
1. Filter fabric to be installed under the riprap.
- B. The submittal data shall include three (3) sets of installation guidelines instructions and details.

1.05 PERMITS, EASEMENTS AND ROYALTIES

- A. The Contractor shall be responsible for obtaining the necessary state and federal permits for the operation of quarries and mines, for making all necessary arrangements with property owners for rights-of-way and easements and for payment of all fees and royalties for furnishing rock fragments, sand bedding, and other materials meeting the requirements of these specifications.

PART 2 PRODUCTS

2.01 FABRIC FILTER

- A. The fabric filter may be needle punched and shall consist of long chain polymeric filaments or fibers composed of polypropylene, polyethylene, or polyimide. The filaments and fibers shall be oriented and bonded whereby the relative position of the fibers is fixed and will allow the passage of water as specified.
- B. The fabric shall be mildew, insect, and rodent resistant and shall be inert to chemicals commonly found in soil. The geotextile shall conform to the minimum physical property requirements listed in Table I.

TABLE I

Physical Property	Test Method	Acceptable Typical Test Results
Weight, oz/sq yd	ASTM D-1910	6.0
Tensile Strength, wet, lbs	ASTM D-1682	200 (*min.)
Elongation, to break, wet	ASTM D-1682	50-80
Puncture Strength, lbs	ASTM D-751**	75 (minimum)
Mullen Burst Strength, psi	ASTM D-3786	260
Coefficient of water permeability cm/sec	Constant head	0.03 (min.)
Abrasion resistance, lbs.	ASTM D-1175 Taber Test	55 (* min.) (1,000 revolutions, 1 kg load/wheel)
Pore Size - EOS, U.S., Standard Corps of Engineers Sieve	CW-02215 (ASTM D-422)	100 +/- 40

* Minimum is the minimum value in any principal direction for the typical fabric weight.

**Tension testing machine with ring clamp; steel ball replaced with a 5/16" diameter solid steel cylinder with hemispherical tip centered within the ring clamp.

- C. The geotextile shall be furnished and stored at the site in a protective wrapping which shall protect the fabric from ultraviolet radiation and from abrasion due to shipping and handling. If the geotextile is to be exposed directly to sunlight in excess of two weeks, the fabric shall be ultraviolet stabilized.

2.02 RIPRAP

- A. Individual rock fragments shall be dense, sound, and resistant to abrasion and shall be free from cracks, seams, and other defects that would tend to increase unduly their destruction by water and frost actions.
- B. A minimum of 50% of the rock fragments shall have at least one (1) mechanically fractured face.

- C. Samples prepared and tested in accordance with applicable ASTM designations shall meet the requirements shown in Table II.

TABLE II

Specific Gravity (saturated surface - dry basis)	ASTM C127	Greater than 2.65
Water absorption (24 hr immersion)	ASTM C127	Less than 2.0%
Soundness Loss (5 cycle sodium sulfate method)	ASTM C88*	Less than 5.0% loss of weight

* Test procedure conducted on 1-1/2" to 3/4" size crushed particles.

- D. Riprap for the uses specified shall be well graded within the limits shown in Table III.

TABLE III

Riprap Size	Size by Weight	%Smaller by Weight
12"	125#	100
9"	52#	60 – 90
6"	18#	30 – 50
3"	5#	15 – 30
1½"	.25#	0 – 15

* Size of rock by weight is based upon a unit weight of 165 pounds per cubic foot or a specific gravity of 2.65. If the specific gravity of the riprap to be supplied varies by +/- 0.15, an adjustment in size by weight will be made. The volume of the rocks has been calculated as 0.75 dxdxd where "d" is the nominal dimension of the rock.

- E. "Well graded" is defined as a continuous distribution of particle sizes from the largest to the smallest components in the proportions such that the successively smaller particles just fill the spaces between the larger particles, so that the maximum overall density of riprap can be obtained.

2.03 ROCK SOURCE

- A. Rock for riprap may be obtained from any approved source.
- B. The Engineer reserves the right to make inspection of all quarry sites and quarries. The approval by the Engineer of some rock fragments from a particular quarry site shall not be construed as constituting the approval of all rock fragments taken from the quarry, and the Contractor will be held responsible for the specified quality and gradation of all rock fragments delivered to the site. All rock fragments not meeting the requirements of these specifications as determined by laboratory and field tests and/or inspection at the quarry and site will be rejected.

PART 3 EXECUTION

3.01 QUARRY AND SAND/GRAVEL PIT OPERATIONS

- A. The Contractor shall clear, strip, develop, and operate the sand pits and quarries; excavate and transport the rock and sand materials, dispose of waste material; construct and maintain haul routes and perform all other operations required to produce acceptable riprap and sand and gravel bedding materials.
- B. Blasting in the quarry shall be so controlled that so far as joint pattern in the quarry will permit the rock fragments shall meet gradation requirements specified herein.
- C. Methods of sorting and loading materials in the sand pits and quarries shall be such as to produce filter bedding and riprap of the quality and gradation as herein specified.
- D. Waste materials shall be disposed of in the exhausted areas of the quarries, or pits, or in areas as otherwise designated in writing by the property owner.

3.02 FABRIC FILTER INSTALLATION

- A. The embankment/riprap fabric filter material shall be placed in the manner and at the locations shown on the project plans. The surface to receive the geotextile shall be prepared to a smooth condition free of obstructions, depressions, and debris. The fabric shall be placed loosely, not in a stretched condition.
- B. The fabric shall be placed on the slopes so as to provide a minimum end-of-roll overlap of 18 inches. Side-of-roll overlap shall be as recommended by the manufacturer.
- C. The fabric shall be anchored, top and bottom, into the embankment as recommended by the manufacturer.

3.03 RIPRAP PLACEMENT

- A. The riprap need not be compacted. The riprap shall be placed to grade in a manner to insure that the larger rock fragments are uniformly distributed and the smaller rock fragments serve to fill the spaces between the larger rock fragments in such a manner as will result in well-keyed, densely placed, uniform layers of riprap of the specified thickness. Hand placing will be required only to the extent necessary to secure the results specified above.
- B. The riprap shall be placed in such a manner that will not result in displacement of the sand and gravel filter bedding. If the fabric filter is used, the riprap will be placed in such a manner that will avoid puncturing, displacing, or placing undue stress on the filter fabric. Recommendations of the fabric manufacturer for method of placement, maximum drop heights, etc., will be followed.

* * * END OF SECTION * * *

SECTION 02290 EARTH DAM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Related Work Specified Elsewhere:

1. Clearing and Grubbing - Section 02100
2. Slope Protection and Erosion Control - Section 02270
3. Watering for Embankments for Ponds and Reservoirs - Section 02771
4. Pond Structures - Section 02772
5. Seeding and Fertilizing - Section 02930

1.02 DESCRIPTION OF WORK

- A. The Work covered by this section of the specifications shall consist of furnishing all plant, labor, and equipment, appurtenances and material, and of performing all operations in connection with the excavation, embankment, compaction, and grading required for the construction of the earth dam and other related facilities in accordance with these specifications and in conformity with the dimensions and typical sections shown on the plans and with the lines and grades established by the Engineer.
- B. All suitable material taken from excavation shall be used in the formation of the earth dam and for backfilling as indicated on the plans.
- C. The Contractor shall be responsible for providing all slope and grade staking and other staking as may be necessary to complete construction.

1.03 QUALITY ASSURANCE

- A. Except as hereinafter specified, the Owner or his representative shall be responsible for performing or having performed tests as required to determine conformance with these specifications.
- B. During the construction of the core trench, embankment and pond floor, a representative of the Owner shall be on site to allow for the examination of the exposed sub-grade floor.
- C. The Contractor is responsible for controlling the quality of his work and product and may conduct additional quality control tests as desired for his own information and use at no additional cost to the Owner. The Contractor shall have submitted directly to the Engineer with copies to the Owner, three (3) copies of all field and laboratory tests and reports of inspections performed by him or his agents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall inform and satisfy himself as to the character, quantity, and distribution of all material to be excavated. All spoil areas shall be leveled to a uniform line and section and shall present a neat appearance before project acceptance.
- B. Those areas outside of the embankment areas in which the top layer of soil material becomes compacted due to hauling or to any other activity of the Contractor shall be scarified and disced to a depth of 4 inches as directed to loosen and pulverize the soil.
- C. The Contractor shall supervise the excavation, moving, placing, and deposition of all material. All material determined to be unsuitable and all excess topsoil shall be disposed of in waste areas or in the outer portions of the embankment areas.
- D. During the construction of the earth dam, the Contractor shall route his equipment at all times when loaded and when empty over the layers as they are placed and shall distribute the travel evenly. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the other material.
- E. The Contractor shall conduct his operations in such a manner that any required measurements and tests may be taken from the excavated or backfilled area. Measurements and/or tests may be taken either during placement operation or immediately upon completion of backfill placement.

3.02 STRIPPING

- A. All vegetation such as brush, heavy sods, heavy growth of grass, decayed vegetation, rubbish, and any other unsuitable material within the area to which excavation is to occur, or upon which the earth dam is to be placed, shall be cleared, stripped, grubbed, and disposed of in an approved location before the excavation or earth dam is started.
- B. In no case shall such objectionable material be allowed in or under the earth dam.
- C. Topsoil, matted roots, and other yielding unsuitable foundation material shall be excavated to a minimum depth of 24" below the bottom of the finished floor elevation as shown on the plans or to a depth determined by the Owner or his representative. The Contractor shall notify the Engineer prior to excavation of the unsuitable material. The portion so excavated shall be refilled with suitable, selected material and shall be thoroughly compacted as specified herein. The replacement material shall be obtained from the grading operations or borrow area and thoroughly compacted by watering and rolling in accordance with the requirements as specified in the section entitled "Formation of Earth Dam." The materials considered as unsatisfactory for earth dam shall be disposed of at locations designated by the Engineer.
- D. All depressions or holes below the ground surface, whether caused by grubbing or otherwise, shall be backfilled with suitable material and compacted to the ground surface elevation before the construction of the earth dam will be permitted to start.

3.03 EXCAVATION OF SUITABLE MATERIAL

- A. Excavation shall be performed to the lines, grades, and elevations as indicated in the plans or as directed by the Engineer; and material shall be handled so that the requirements for formation of the earth dam can be followed. No excavation or stripping shall be started until the Engineer has taken cross sectional elevations and measurements of the existing ground surface, if required, and has provided control stakes for the proposed work. During the process of excavation, the grade shall be maintained so that it will be properly drained at all times.
- B. Should the Contractor, through negligence or other fault, excavate below the designated lines or elevations, he shall replace the excavation with suitable materials and properly compact and control the moisture content in a manner as specified herein under "Formation of Earth Dam." All replacement work shall be at the Contractor's expense.
- C. The Contractor shall distribute the excavated material as indicated in the plans. Widening or narrowing of the section and raising or lowering of the grade to avoid haul will not be permitted. (The Engineer may make minor adjustments or revisions in lines or grades if found necessary as the work progresses to obtain satisfactory construction.)
- D. All loose or protruding rocks on the back slopes in cut areas shall be removed to a point below the finished grade of the slope. Blasting, when necessary, will be permitted only when precautions are taken for the protection and safety of all persons, the work and the property. All damage done to the work or any property shall be repaired at the Contractor's expense. All operations of the Contractor in connection with the transportation, storage, and use of explosives shall be in accordance with all applicable federal, state, and local laws and regulations.
- E. All slopes shall be uniformly dressed to the slope, cross section, and alignment as shown in the plans.

3.04 STOCKPILING

- A. If at the time of excavation it is not possible to place any material in its proper section of the permanent construction, it shall be stockpiled in approved areas for later use.
- B. The stockpiled material shall be handled and placed as specified in the section of these specifications covering excavation, embankment, and topsoil.
- C. Stockpiles of topsoil or any other material shall be located within the project limits as directed by the Owner. Stockpiles of topsoil shall not be placed within 50 feet of embankment areas and shall not be placed on areas which subsequently will require any excavation or embankment.

3.05 EXCESS EXCAVATION

- A. When the volume of excavation exceeds that required to construct the earth dam to the grades indicated, the excess shall be used to grade the areas of ultimate development or wasted in areas secured by the Contractor, subject to the approval of the Engineer and the Owner. In general, suitable excess excavation will be used in the widening of embankments, flattening of slopes, etc.

- B. If it is necessary to dispose of any material, it shall be disposed of in such a manner as to present a neat appearance and to not obstruct proper drainage or cause damage to abutting property.

3.06 BORROW EXCAVATION

- A. Borrow excavation shall consist of excavation made from borrow areas within the limits of the property outside the normal grading limits or from areas outside the property when specified. Borrow area(s) within the property from which borrow may be obtained will be designated. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed. On completion of borrow operations, the borrow area shall be finished to a neat and uniform grade acceptable to the Engineer and the Owner.
- B. The borrow areas shall not be located within 100' of the dike toes.
- C. When borrow sources are outside the boundaries of the property, it shall be the Contractor's responsibility to locate and obtain the supply. The Contractor shall be responsible for the cost of testing to determine acceptability by the Owner's representative. The Contractor shall notify the Engineer sufficiently in advance of the beginning of excavation so that necessary measurements can be made. All objectionable material shall be disposed of by the Contractor. All borrow areas shall be opened up immediately to expose the vertical face of various strata of acceptable material to enable obtaining a uniform product. Borrow pits shall be excavated to regular lines to permit accurate measurements and shall be drained and left in a neat and presentable condition with all slopes dressed uniformly and topsoiled.

3.07 PREPARATION OF EARTH DAM AREA

- A. Prior to the placement of any fill material, the entire layer of topsoil in the area upon which the earth dam is to be placed shall be removed for its entire depth to the bottom of the natural existing topsoil.
- B. If the depth of the topsoil is less than twelve (12) inches under that portion of the embankment from the inner toe of dike to a distance of fifteen (15) feet from the toe of dike, the soil under the topsoil shall also be removed so that the total depth is twelve (12) inches below the top of the pond floor.
- C. A minimum of six (6) inches of material below the bottom of the natural existing topsoil or to the depth as previously described shall be scarified from the inside toe to the center of the earth dam. The area shall be scarified in furrows uniformly spaced so that at least 50% of the surface will be broken to the required depth. All roots, debris, large stones, or objectionable material that would cause interference with the compaction of the foundation for fill shall be removed from the area and disposed of as specified.
- D. After removal of the topsoil and scarifying of the material under the earth dam, the area should be examined by the Owner's representative for the existence of unsuitable materials such as hardpan, loose rock, boulders, sand, gravel, etc. The area of unsuitable material shall be removed to a depth as shown in the plans or as directed by the Owner's professional soils consultant. The area shall be filled and compacted in accordance with the section entitled "Formation of Earth Dam."

- E. A thin layer (approximately 3 inches) of the fill material shall be uniformly spread over the scarified foundation and the whole area compacted to 95% of maximum density as determined by standard proctor ASTM Test Designation D698 at a moisture content between optimum and 3% of optimum.
- F. Where embankments are to be placed on natural slopes steeper than 3 to 1, horizontal benches shall be constructed. Suitable excavated material shall be incorporated in the horizontal bench embankment.

3.08 FORMATION OF EARTH DAM

- A. The core trench and embankments shall be formed of satisfactory materials placed in successive horizontal layers of not more than 8 inches loose depth for the full width of the cross section. All materials entering the earth dam shall be reasonably free of organic matter such as leaves, grass, roots, and other objectionable material.
- B. The grading operations shall be conducted and the various soil strata shall be placed to produce a soil structure as shown in the typical cross section or as directed.
- C. Topsoil shall not be used to construct the earth dam.
- D. Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions of the field. The Contractor shall drag, blade, or slope the embankment to provide proper surface drainage. Frozen material shall not be placed in the embankment nor shall the embankments be placed over frozen material.
- E. The material in the layers shall be of the proper moisture content before rolling to obtain the prescribed compaction. The Contractor shall manipulate the moisture content of the material by wetting or drying as necessary to secure a uniform moisture content throughout the layer. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the core trench or embankment thus affected shall be delayed until the material has dried to the required moisture content. Sprinkling shall be done in accordance with the requirements of Section 02771. Samples of the earth dam materials for testing, both before and after placement and compaction, will be taken. From these tests, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the earth dam.
- F. Where a large portion of the materials excavated consist of rock, the rock may be used in the construction of the earth dam as hereinafter specified:
 - 1. The maximum dimension of any rock used shall not exceed eight (8) inches.
 - 2. Rocks shall be carefully distributed throughout the core trench or embankment and imbedded with earth or other fine material so that the interstices between the large particles are filled and a dense, compact, uniform embankment is secured.
 - 3. No rock will be allowed in the upper eight (8) inches of any embankment as this portion of the embankment shall be composed solely of earth or other suitable material.

- G. Compaction and watering shall be continued on all areas of the earth dam until it has been compacted to 95% of maximum density in accordance with ASTM D698 (standard proctor) at a moisture within +/- 3% of optimum.
- H. The Contractor shall be responsible for the stability of the earth dam made under the contract and shall replace any portion which in the opinion of the Engineer has become displaced due to carelessness or negligence on the part of the Contractor.

3.09 TOPSOIL

- A. Enough topsoil shall be stripped and stockpiled from the regular grading areas; or when not available from regular grading areas, from areas selected by the Contractor and approved by the Engineer, to place a minimum of 6 inches compacted depth perpendicular to the slope on all disturbed areas not covered by the riprap or with water when the pond is at the proposed maximum water elevations as shown on the plans.
- B. The Contractor shall set grade stakes for topsoiling to assure proper depth replacement.

3.10 TOLERANCES

- A. The top of embankment surfaces and finished floor elevations shall be of such smoothness that it will not vary more than 0.10 of a foot from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding, or removing materials, reshaping, and compacting.

3.11 WATERING FOR CORE TRENCH AND EMBANKMENT AND POND FLOOR

- A. Refer to Section 02771 - Watering for Embankments for Ponds and Reservoirs.

*** END OF SECTION ***

SECTION 02720 STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Related Work Specified Elsewhere:

1. Trenching, Backfilling and Compacting – Section 02224

1.02 DESCRIPTION OF WORK

- A. The work covered under these specifications shall include the furnishing of all labor, material, tools, and equipment necessary to furnish and install, complete in place, all concrete risers, corrugated polyethylene storm water drainage piping and related appurtenances as shown on the drawings and as specified herein.

1.03 SUBMITTALS

- A. The Contractor shall submit for review copies of shop drawings for materials specified.
- B. Certificates from the manufacturer that the materials meet or exceed specified requirements.
- C. The manufacturer's installation recommendations, including types and amounts of gasket lubricant, where applicable, to be used.

PART 2 PRODUCTS

2.01 CONCRETE RISER PIPE

- A. The concrete riser pipe shall be reinforced concrete pipe and shall conform to the requirements of ASTM C 76, Class III. The pipe shall be of the diameter and size as shown on the plans.
- B. The acceptability of the pipe will be determined on the basis of plant load bearing tests, compressive strength of concrete, material tests and inspection of the complete product as delivered and installed.
- C. The concrete in special sections shall have a minimum compressive strength of 4000 psi. The strength shall be determined by test cylinders or by cores. Tests with the Swiss Hammer may be used to supplement the tests.
- D. Concrete riser pipe base sections shall be precast concrete and shall be constructed to the dimensions and details as shown on the plans or as called for in the specifications.
- E. Precast sections and bases shall be of the size as shown on the drawings and shall conform to ASTM C-478.

2.02 CORRUGATED POLYETHYLENE PIPE

- A. Corrugated polyethylene pipe shall have a smooth interior. Corrugated polyethylene pipe and fittings shall be manufactured from high density polyethylene resin that shall meet or exceed the requirements of Type III, Category 4 or 5, Grade P33 or 3P34, Class C as per ASTM D1248. The pipe and fittings shall be of the diameters and sizes as shown on the plans. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut squarely and cleanly so as to not adversely effect joining.
- B. The corrugated polyethylene pipe piping and fittings shall have minimum pipe stiffness values as follows:

Pipe Nominal Diameter (Inches)	Pipe Stiffness Value * (psi)
12	45
15	42
18	40
24	34
30	28
36	22

* Pipe Stiffness Value determined in accordance with ASTM Test Method D-2412

- C. The nominal size of the pipe and fittings shall be the inside diameter of the pipe. Inside diameter tolerances shall be limited to not greater than plus 3% nor less than minus 1.5%. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings produced by manufacturers other than the manufacturer of the pipe shall not be permitted without the approval of the Engineer and Owner.
- D. Joints for corrugated polyethylene pipe shall be made using couplings corrugated to match the pipe corrugations. The width of the couplings shall be not less than $\frac{1}{2}$ of the nominal diameter of the pipe. Split couplings shall be manufactured to engage an equal number of corrugations on each side of the pipe joint.
- E. Corrugated polyethylene pipe shall be manufactured to be untraviolet ray resistant in accordance with ASTM D3350.

2.03 WATERTIGHT JOINTS

- A. Watertight joints shall be provided for the corrugated polyethylene pipe. The joints shall be capable of withstanding a 10.8 psi pressure test as tested by ASTM Standard D3212 and shall also conform to the requirements of AASHTO Standard M294.

2.04 BEDDING MATERIAL

- A. Borrowed granular bedding material shall conform to the gradation for Size 67 Coarse Aggregate, ASTM C33, which is indicated below.

Sieve Opening	Bedding Material (Percent Passing)
1"	100
3/4"	90-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

- B. Bedding material excavated from the job site shall be finely divided material free from organic material and clods, lumps of frozen material or stones larger than 1 1/2" in maximum diameter. Bedding material shall be of proper moisture content to form a firm bed for the pipe.

PART 3 EXECUTION

3.01 CONCRETE RISER PIPE

- A. Concrete riser pipe shall be constructed in accordance with the details shown on the plans, as required by ASTM Specification C478 and as specified hereinafter.
- B. Concrete riser pipe base sections may be a base riser section and separate base slab or base section with integral floor.
- C. The concrete riser pipe and base slabs shall be placed using present acceptable construction methods.
- D. The openings in concrete riser pipe sections shall be sealed using non-shrink grout to make a flexible watertight connection.
- E. All lifting holes in the concrete riser pipe and base slabs shall be carefully grouted with non-shrink grout prior to backfilling.
- F. The base slab of the concrete riser pipe shall be constructed in such a manner as to drain into the invert proper.

3.02 CORRUGATED POLYETHYLENE PIPE

- A. Corrugated polyethylene pipe shall be installed in accordance with the requirements of ASTM D2321.
- B. All piping, fittings and special sections shall be laid true to line and grade as shown on the plans. Each section of pipe shall be laid such that the piping will have a smooth, straight and uniform flow line. Each section of pipe shall be laid and fitted together such that the piping joints shall not exhibit separation of greater than $\frac{1}{4}$ inch at any point along the circumference of the joint for pipe up to 24 inch internal diameter; not greater than $\frac{5}{8}$ inch for piping 27 inch through 84 inch internal diameter or $\frac{3}{4}$ inch for piping 90 inch internal diameter or larger. For joint separation exceeding the limits set forth above, the joint on the interior of the pipe shall be filled for the full depth and circumference of the joint with non-shrink, non-metallic concrete grout. In lieu of the internal repair, the Engineer may consider the placement of a concrete collar on the exterior of the joint for the full circumference of the pipe. For joint separation greater than 1-1/2 inches in any pipe diameter, the sections shall be exposed and re-laid to eliminate the joint separation.
- C. The ends and inside of all pipe shall be cleaned prior to installation. The ends and insides of all pipes shall be kept clean during and after assembly.
- D. All pipes and fittings shall be examined for defects before being lowered into the trench. The interior and exterior coating, if any, shall be inspected and field repaired, if required and possible, in accordance with applicable standards. All field repairs shall be authorized by the Engineer prior to the infiltration of the repairs.
- E. The pipe and fittings shall be laid upon properly placed bedding material so that the barrel of the pipe will have bearing for its full length. Depressions for joints shall be excavated after the trench bedding has been properly graded.
- F. Proper facilities shall be provided by the Contractor for lowering the sections of pipe into place. Dropping the pipe into place will not be permitted.
- G. The Contractor shall provide and maintain all necessary means and devices at all times to remove and dispose of all water entering the trench during the process of laying the pipe and fittings. The trench shall be kept dry until the pipe laying and jointing process is completed. Removal of the water shall comply with the requirements of Section 02224.

3.03 EXCAVATION

- A. Trenches shall be excavated to a width sufficient to allow for proper jointing of the pipe and thorough compaction of the bedding and backfill material under and around the pipe. Where feasible, trench walls shall be vertical. The completed trench bottom shall be firm for its full length and width.
- B. The foundation for each type of bedding shall be adequate to furnish a uniform stable support. Removal of unstable material or rock below bedding grade shall be performed as set forth in Section 02224.

3.04 INSTALLATION OF STORM SEWER JOINTS

- A. Watertight storm sewer joints shall be installed at every joint of the corrugated polyethylene pipe and in accordance with these specifications and the manufacturer's instructions.

3.05 BEDDING

- A. The placement of bedding material shall conform to requirements set forth in Section 02224 – Trenching, Backfilling and Compacting.

3.06 BACKFILL ABOVE BEDDING GRADE

- A. The placement of the embankment and backfill material above the bedding grade shall conform to the requirements set forth in Section 02224 – Trenching, Backfilling and Compacting.

*** END OF SECTION ***

SECTION 02771 WATERING FOR EMBANKMENTS FOR PONDS AND RESERVOIRS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Related Work Specified Elsewhere:

1. Earth Dam - Section 02290

1.02 DESCRIPTION OF WORK

- A. This item shall consist of furnishing and applying water required in the compaction of embankments, subgrades, pond liner, and for other purposes in accordance with the requirements of these specifications or as directed.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

- A. Water, when required, shall be applied at the locations, in the amounts, and during the hours, including nights, as required. An adequate water supply shall be provided by the Contractor.
- B. The equipment used for watering shall be of ample capacity and of such design as to assure uniform application of water in the amounts required.

* * * END OF SECTION * * *

SECTION 02930 SEEDING AND FERTILIZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Related Work specified elsewhere:

1. Slope Protection and Erosion Control - Section 02270
2. Earth Dam - Section 02290

1.02 DESCRIPTION OF WORK

- A. This section covers all labor, materials, equipment and services necessary to prepare the ground surfaces, furnish and apply fertilizer, furnish and sow seed and furnish and lay sod in those areas shown on the plans and in accordance with the specifications.

1.03 QUALITY ASSURANCE

- A. All seed shall be tested by a State Seed Lab or a Commercial Seed Testing Lab within eighteen (18) months prior to the planting date. Seed not planted within the eighteen (18) month period shall be retested for dormant seed, hard seed and germination.
- B. Testing of fertilizer will not be required.

1.04 SUBMITTALS

- A. Prior to the start of seeding operations, the vendor's certified analysis for the grass seed mixture shall be submitted for the Engineer's review. The information submitted shall state botanical and common name of each seed in the mixture; percentage of each by weight; percentage of purity and germination; and weed seed content.
- B. During the seeding operation, the Contractor shall furnish to the Engineer the tag from each bag of seed planted. Each tag shall contain the following information: Name and address of supplier; Suppliers lot number for each kind of seed in the mixture; Purity, germination and other information required by South Dakota Seed Law for each kind of seed; Pounds of bulk seed of each kind of seed in each bag; Total pounds of bulk seed mixture in each bag; Pounds of pure live seed of each kind of seed in each bag; Total pounds of pure live seed mixture in each bag; and Dormant Seed and Hard Seed.
- C. The manufacturer's certified analysis and delivery tickets for all commercial fertilizer shall be submitted stating quantity, source and date of delivery.
- D. The sod vendor's certification for the sod specified shall be submitted for review prior to cutting and delivery. Data submitted shall be grass seed mixture by botanical and common name, source of sod, approximate date of cutting and approximate date of delivery.

PART 2 PRODUCTS

2.01 GRASS SEED

- A. Provide fresh, clean, new crop seed, complying with the tolerances for purity and germination established by the Official Seed Analysis of North America and the South Dakota Seed Law. Seed shall not exceed 1% weed content. Provide seed of the grass species and proportions as follows:

<u>Grass Variety</u>	<u>% of Mix (By Weight/P.L.S.*)</u>
Durar Hard Fescue	11.1
Slender Wheat Grass	44.4
SD Common Kentucky Bluegrass	11.1
Side/oats Grama	33.4

	100.0

* P.L.S. - Pure Live Seed

2.02 COMMERCIAL FERTILIZER

- A. Commercial fertilizer shall be complete formula, uniform in composition, dry and free flowing, pelleted or granular with 50% of total nitrogen derived from natural organic material in a slowly available form. The fertilizer shall be delivered to the site and stored prior to incorporation, in original, unopened containers, bearing the manufacturer's guaranteed analysis.
- B. Fertilizer shall contain the following percentages of available plant nutrients by weight:
- | | |
|-----------------|---------|
| Nitrogen | 20% (N) |
| Phosphoric Acid | 10% (P) |
| Potassium | 5% (K) |
- C. All fertilizer shall conform to the South Dakota Fertilizer Laws and shall be registered with the South Dakota Department of Agriculture.

2.03 MULCH

- A. Mulching material shall consist of grass hay or straw which is substantially free of noxious weed seeds and objectionable foreign matter. The mulch shall have been baled dry, in bales of approximately equal weight and shall be relatively dry when applied. Materials having characteristics making them unsuitable for the purpose intended will be rejected by the Engineer.

PART 3 EXECUTION

3.01 PREPARATION FOR PLANTING

- A. Before seeding or fertilizing, remove stones, sticks, roots, rubbish, and other extraneous matter over one (1) inch in any dimensions.
- B. On slopes flatter than 2 horizontal to 1 vertical, the soil shall be tilled to a depth of at least 4 inches by disking, harrowing, by the use of rototillage machinery or other approved operation until a finely pulverized seed bed is obtained.
- C. On slopes which equal or exceed 2 horizontal to 1 vertical and up to 1 horizontal to 1 vertical, inclusive, tillage shall be done by scarifying the soil surface with heavy rakes, rotating chain links drawn by tractor at the top of the slope or a boom arrangement attached to a vehicle operating at the bottom of the slope or by other tools and equipment as approved by the Engineer. Where soil conditions and length of the slopes permit the use of power driven rototillage equipment, such machines shall be used to achieve necessary tillage. On these slopes minimum tillage depth shall be two (2) inches.
- D. On slopes steeper than 1 horizontal to 1 vertical, no tillage shall be done.
- E. Grade areas to smooth, even surface with loose, uniformly fine texture. Roll and rake and remove ridges and fill depressions as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
- F. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.
- G. Restore areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

3.02 FERTILIZING

- A. Fertilize at the sod or seed supplier's recommended rate.
- B. Fertilizer shall be incorporated into the soil to a depth of at least two (2) inches and may be incorporated as a part of the tillage operation.

3.03 PLANTING AND SEEDING

- A. Apply grass seed mixture at a rate of application which assures a minimum of nineteen and six tenths (19.6) pounds of Pure Live Seed (P.L.S.) per acre. Pure Live Seed shall be determined using the following formula:

$$(\text{Pounds of Seed}) \times (\% \text{ Purity}) \times (\% \text{ Germination}) = \text{pounds of Pure Live Seed (P.L.S.)}$$

- B. Seeding shall be done with a press drill equipped with a seed box with positive feed seeding mechanism with agitator, individually mounted double disk furrow openers and packer wheels spaced approximately three (3) inches apart, and a separate box for small seeded grasses ("Brillion") mechanical seeder or equal). Each drill shall be equipped with an accurate meter to measure the area covered by the drill.
- C. Seed shall be sown 1/2 in one direction and 1/2 at right angles to the direction of the first sowing. The direction of the final sowing shall be at right angles to the direction of the slope or parallel to the direction of the contour lines. Seed shall be sown at a final compacted depth of approximately three-fourths (3/4) to one (1) inch.
- D. Seeding may be carried on from the time the ground is workable in the spring to June 1, or between the dates of August 25 to September 15. Full advantage shall be taken of favorable weather conditions.

3.04 EROSION CONTROL

- A. Seeded slope areas, as shown on the plans, shall be protected against erosion by spreading the erosion control material immediately after completion of the seeding operation.
- B. The erosion control material and installation shall conform to the requirements of Section 02270-Slope Protection and Erosion Control.

3.05 HYDRO MULCHING

- A. Seed and fertilizer may be applied, in the amounts specified above, in conjunction with the hydro-mulching process.

3.06 MULCHING

- A. The mulch shall be placed within forty-eight (48) hours after the seeding has been completed. Mulching operations shall not be performed during periods of high winds which preclude the proper placing of the mulch. The placing of mulch shall begin on the windward side of the areas to be covered.
- B. The mulch shall be blown from a machine designed for the purpose and uniformly distributed over the seeded areas. The machine for placing the mulch shall be of a type which will blow or eject by constant air stream, a controlled amount of mulch. The machine shall cause a minimum of cutting or breakage in the length of the mulch.
- C. Mulch containing excessive moisture which prevents uniform feeding through the machine shall not be used. Bales shall be broken up and loosened as they are fed into the blower to avoid placing of matted or unbroken lumps.
- D. Mulch shall be placed uniformly over the seeded areas at a rate of 2000 lb per acre. The rates of application may be varied by the Engineer. Approximately ten (10) percent of the soil surface shall be visible through the mulch blanket prior to mulch tiller (punching) operation.

- E. Immediately following application, the mulch, shall be punched into the soil by a mulch tiller consisting of a series of dull, flat disks with notched or cutout edges. The disks shall be approximately twenty (20) inches in diameter, one-fourth (1/4) inch thick, shall be spaced approximately eight (8) inches apart and shall be fitted with scrapers.
- F. Working width of the tiller shall not exceed six (6) feet per member, but may be operated in gangs of not over three (3) members. The tiller shall be operated on contour, except on slopes 3:1 or steeper where the diagonal operation will be required. If necessary, dual drive wheels or crawler tread on the tractor shall be used to minimize side slip and rutting damage to slopes.
- G. Tiller members shall be ballasted to push mulch into the soil approximately three (3) inches with ends exposed above the soil surface. When light disking is required in existing cover so the seed can be drilled into a depth of one (1) to one and one-half (1 1/2) inches, the tiller members shall be ballasted to push mulch into the soil with the ends exposed above the soil surface.
- H. The mulch tiller shall follow as closely as possible behind the mulch blower. Mulch shall not be blown when wind velocity causes appreciable displacement before it can be anchored by the mulch tiller. The Engineer may require more than one (1) pass of the mulch tiller or diagonal passes where necessary to assure adequate anchoring.
- I. Traffic, either foot, equipment or vehicular shall be kept to a minimum over the seeded and mulched areas. The Contractor shall, prior to acceptance of the project, remulch any area on which the original mulch has been displaced as a result of excessive wind, water or other causes.

3.07 MAINTENANCE AND RESEEDING

- A. Maintenance of seeding will begin immediately after each area is planted and will continue until acceptance of the Contract. Maintenance shall consist of the repair of eroded areas, the repair or replacement and restapling of loose or undermined erosion control fabric/blanket, reseeding or resodding.
- B. Any area which fails to show a "catch" or uniform stand, for any reason whatsoever shall be reseeded with the original mixture and such reseeding shall be repeated until final acceptance.
- C. The Contractor shall properly water, mow, control weeds and otherwise maintain all seeded and sodded areas until final acceptance.

*** END OF SECTION ***

DIVISION 3 CONCRETE

SECTION 03100 - CONCRETE FORMWORK

SECTION 03200 - CONCRETE REINFORCEMENT

SECTION 03300 - CAST-IN-PLACE CONCRETE

SECTION 03100 CONCRETE FORMWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Related Work specified elsewhere:

1. Concrete Reinforcement - Section 03200
2. Cast-in-place Concrete - Section 03300

1.02 DESCRIPTION OF WORK

- A. The extent of formwork is indicated by the concrete structures shown on the drawings.
- B. The work includes providing of the form work and shoring for cast-in-place concrete, and installation into formwork of items required such as anchor bolts, setting plates, bearing plates, anchorages, inserts, frames, nosings, and other items to be embedded in concrete (not including reinforcing steel).

1.03 QUALITY ASSURANCE

- A. Examine the substrate and the conditions under which concrete formwork is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Unless otherwise shown or specified, design, construct, erect, maintain, and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard ACI 34, "Recommended Practice for Concrete Formwork."
- C. Allowable Tolerances: Construct formwork to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347, and as follows:
1. Variation from plumb in lines and surfaces of columns, piers, walls, and arrises; 1/4 inch per 10 feet, but not more than 1 inch total. For exposed corner columns, control joint grooves, and other conspicuous lines, 1/4 inch in any bay or 20 feet maximum; 1/2 inch maximum in 40 feet or more.
 2. Variation from level or grade in slab soffits, ceilings, beam soffits, and in arrises 1/4 inch in 10 feet, 3/8 inch in any bay or 20 feet maximum and 3/4 inch in 40 feet or more. For exposed lintels, sills, parapets, horizontal and vertical grooves, and other conspicuous lines, 1/4 inch in any bay or 20 feet maximum, and 1/2 inch in 40 feet or more.
 3. Variation from position of the linear building lines and related columns, walls, and partitions, 1/2 inch in any bay or 20 feet maximum and 1 inch in 40 feet or more.
 4. Variation in sizes and locations of sleeves, floor openings, and wall openings, 1/4 inch maximum.

5. Variation in cross sectional dimensions of columns and beams and thickness of slabs and walls, minus 1/4 inch and plus 1/2 inch.
 6. Variations in footings plan dimensions, minus 1/2 inch and plus 2 inches; misplacement or eccentricity, 2% of the footing width in direction of misplacement but not more than 2 inches thickness reduction, minus 5%.
 7. Variation in steps: in a flight of stairs, 1/8 inch for rise and 1/4 inch for treads; in consecutive steps, 1/16 inch for rise and 1/8 inch for treads.
- D. Before concrete placement, check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.
- E. During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Unless otherwise shown or specified, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed, plywood-faced, or other panel type materials acceptable to Engineer to provide continuous, straight, smooth, as-cast surfaces. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
- B. Form concrete surfaces which will be unexposed in the finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least 2 edges and 1 side for tight fit.
- C. Form ties shall be of removable end, permanently embedded body type and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders. Unless otherwise shown, cones shall be provided on the outer ends of each tie and the permanently embedded portion shall be at least 1 inch back from the concrete face. Form ties for waterbearing walls shall be provided with water seal washers located on the permanently embedded portions of the ties at the approximate center of the wall. Permanently embedded portions of form ties which are not provided with threaded ends shall be constructed so that the removable ends are readily broken off without damage to the concrete. The type of form ties used shall be acceptable to the Engineer. Form ties fabricated on the project site and the wire ties are not acceptable.
- D. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

- E. Provide metal inserts for anchorage of materials or equipment to concrete construction not supplied by other trades and as required for the work.

2.02 DESIGN OF FORMWORK

- A. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- C. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- D. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads for longspan members without intermediate supports.
- E. Provide temporary openings in wall forms, column forms and at other locations necessary to permit inspection and cleanout.
- F. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- G. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
- H. Side forms of footings may be omitted and concrete placed directly against excavation only when requested by Contractor and accepted by Engineer. When omission of forms is accepted, provide additional concrete required beyond the minimum design profiles and dimensions of the footings as detailed.

PART 3 EXECUTION

3.01 FORM CONSTRUCTION

- A. Construct forms complying with ACI 347, to the exact sizes, shapes, lines, and dimensions shown and as required to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes.
- B. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.
- C. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Brace temporary closures and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms in as inconspicuous location as possible, consistent with project requirements.
- D. Form intersecting planes to provide true, cleancut corners, with edge grain of plywood not exposed as form for concrete.
- E. Provide openings in forms to accommodate other work, including mechanical and electrical work. Accurately place and securely support items required to be built into the forms.
- F. Falsework:
 - 1. Erect falsework and support, brace, and maintain it to safely support vertical, lateral, and asymmetrical loads applied until such loads can be supported by in-place concrete structures. Construct falsework so that adjustments can be made for take-up and settlement.
 - 2. Provide wedges, jacks, or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.
- G. Forms for Exposed Concrete:
 - 1. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
 - 2. Do not use metal cover plates for patching holes or defects in forms.
 - 3. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.

4. Use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.
5. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
6. Form molding shapes, recesses, and projections with smooth finish materials, and install in forms with sealed joints to prevent displacement.

H. Corner Treatment:

1. Form exposed corners of beams and columns to produce square, smooth, solid, unbroken lines, except as otherwise shown.
2. Form chamfers with 3/4 inch x 3/4 inch strips unless otherwise shown, accurately formed and surfaces to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
3. Unexposed corners may be formed either square or chamfered.

I. See Section 03250 for treatment of control and construction joints. Locate as indicated.

J. Provide openings in concrete formwork to accommodate work of other trades, including those under separate prime contracts (if any). Size and location of openings, recesses, and chases are the responsibility of the trade requiring such items. Accurately place and securely support items to be built into forms.

K. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is to be placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.02 FORM COATINGS

A. Coat form contact surfaces with form-coating compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with a non-staining, rust preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of the items to be attached thereto.

- B. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

3.04 REMOVAL OF FORMS

- A. Formwork not supporting concrete, such as sides of beams, walls, columns, and similar parts of the work that may be removed after cumulatively curing at not less than 50° F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations and provided that curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements may not be removed in less than 14 days and not until concrete has attained design minimum 28-day compressive strength.
- C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.05 RE-USE OF FORMS

- A. Cleaned and repaired surfaces of forms may be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

*** END OF SECTION ***

SECTION 03200 CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent of concrete reinforcement is shown on the drawings and in schedules.
- B. The work includes fabrication and placement of reinforcement for cast-in-place concrete, including bars, welded wire fabric, ties, and supports.

1.02 QUALITY ASSURANCE

- A. Examine the substrate and the conditions under which concrete reinforcement is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Codes and Standards: Comply with requirements of the following codes and standards, except as herein modified.
 - 1. American Concrete Institute, ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
 - 2. American Concrete Institute, ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. American Welding Society, AWS D12.1 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."
 - 4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

1.03 SUBMITTALS

- A. For information only, submit 2 copies of steel producer's mill test certificates identifying chemical and physical analysis of each type of reinforcing steel delivered.
- B. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with the ACI 315 "Manual of Standard Practice for Detailing Concrete Structures," show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for the fabrication and placement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars shall conform to ASTM A615, Grade 60, except as otherwise indicated.
- B. Steel Wire shall be plain wire conforming to ASTM A82.

- C. Welded Wire Fabric shall be of the gauge and mesh size as shown conforming to ASTM A185.
- D. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place shall be as follows:
 - 1. For bar supports, use CRSI Class C, plastic protected or Class E, stainless steel protected.
 - 2. For slabs on grade, use supports with sand plates or horizontal runners where wetted base materials will not support chair legs.
 - 3. Over waterproof membranes, use precast concrete chairs to prevent penetration of the membrane.

2.02 FABRICATION

- A. Shop-fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Unacceptable materials shall be defined as reinforcement with any of the following defects and will not be permitted in the work:
 - 1. Bar lengths, depths, and bends exceeding specified tolerances.
 - 2. Bends or kinks not indicated on drawings or on the final shop drawings.
 - 3. Bars with reduced cross section due to excessive rusting or other cause.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Unless shown otherwise on drawings, comply with the specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.
- B. If the cover depth is not specifically indicated on the plan sheets, the reinforcing steel shall be protected by a minimum thickness of concrete as follows:
 - 1. Concrete against ground or exposed to water - 3" cover
 - 2. Concrete exposed to weather - 2" cover
 - 3. Beams and columns - 1-1/2" cover
 - 4. Slabs on grade or exposed to weather - 3/4" cover
- C. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

- D. Position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- E. Unless shown otherwise on drawings, place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports together with 16 gage wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that ends are directed away from exposed concrete surfaces.
- F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 gage wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps.
- G. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- H. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Comply with requirements of ACI 318 for minimum lap of spliced bars except as shown on drawings.

* * * END OF SECTION * * *

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Related work specified elsewhere:
 - 1. Concrete Formwork - Section 03100
 - 2. Concrete Reinforcement - Section 03200

1.02 DESCRIPTION OF WORK

- A. The extent of cast-in-place concrete work is shown on the drawings.
- B. The work includes providing cast-in-place concrete consisting of Portland cement, fine and coarse aggregate, water, and selected admixtures; combined, mixed, transported, placed, finished, and cured as herein specified.

1.03 QUALITY CONTROL AND TESTING

- A. The Contractor is responsible for controlling the quality of his product and shall make as many tests as necessary to satisfy himself and the Owner that his product meets or exceeds all specifications contained herein.
- B. Slump tests shall be made in accordance with the methods outlined in ASTM C-143-71 or latest revision thereof.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Water shall be clean and free of deleterious amounts of oils, acids, alkali, organic, silt, mud, grass, or other foreign material.
- B. Portland cement used shall meet the requirements of ASTM C150, Type II, for all usages. Only one brand of cement shall be used throughout the project unless otherwise accepted by the Engineer.
- C. Fine aggregate shall be clean, sharp, natural, uncoated sand free from silt, loam and clay, dune sand, bank run sand and manufactured sand are not acceptable. Fine aggregate shall conform to ASTM C33, fine aggregate sections.
- D. Coarse Aggregate shall be clean, uncoated, crushed stone or gravel conforming to ASTM C33. Clay and shale particles shall not exceed 1%. Maximum size aggregate allowed is 1/5 of narrowest dimensions between forms of the concrete member or 3/4 of minimum clear spacing between reinforcing bars. For cement finish use 1/8 inch minimum and 3/8 inch maximum size aggregate.

- E. Aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite or ochre which can cause strains on exposed surfaces will not be allowed.

2.02 CONCRETE ADMIXTURES

- A. Provide admixtures produced by established reputable manufacturers and use in compliance with the manufacturer's printed directions. Do not use admixtures which have not been incorporated and tested in the accepted mixes unless otherwise authorized in writing by the Engineer. All admixtures shall meet standards as specified herein.
- B. Air-Entraining Admixtures shall conform to ASTM C260 and shall be Grace "Darex AEA," Master Builders "MB-VR"; or Sika Chemicals "AER" or approved equal.
- C. Calcium Chloride: Do not use calcium chloride in concrete unless otherwise authorized in writing by the Engineer.

2.03 CONCRETE CLASS

A.	Class of Concrete	Req. Min. Strength 28 days	Max. Water Content Gal. per 94 lb. Bag	Entrained Air Volume Content	Slump
	A	4000 psi	6-0	5-7%	1"-4"
	B	2500 psi	7-1/4	5-7%	1"-4"

1. Class A concrete shall be used for all cast-in-place concrete. It may be used for all concrete requirements.
2. Class B concrete may be used to replace unsuitable materials excavated or as called for on the drawings.

B. Grout and Topping:

1. Plain grout where required shall be proportioned as follows:

By Volume

Type II Portland Cement	1 part
Sand	2 parts
1/4" aggregate	1-1/2 parts

2. Non-shrinking grout shall be Embeco, Pour-Rok, or approved equal.

2.04 CONSISTENCY

- A. Consistency required for each pour shall be established in advance by the Contractor in cooperation with the Engineer in accordance with ASTM C143.

- B. Concrete shall be of a consistency as to insure the required workability and result in compacted masses having dense, uniform surfaces. In general, the consistency of concrete mixture shall be such that:
1. The mortar will cling to the coarse aggregate.
 2. The aggregate will not segregate in the concrete.
 3. The concrete when dropped directly from the discharge chute of the mixer will flatten out at the center of the pile, but the edges of the pile will stand and not flow.
 4. The concrete and mortar will show no free water when removed from the mixer.
 5. The concrete will slide and not flow into place when transported in metal chutes at an angle of 30 degrees with the horizontal.
 6. The surface of the finished concrete will be free from a surface film of "laitance."
- C. Any concrete mix failing to meet the above outlined consistency requirements, although meeting the slump requirements, will be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

2.05 PROPORTIONING OF MATERIALS

- A. The proper proportioning of aggregates and cement will be determined by the Contractor and the professional testing laboratory. The proportioning of aggregates will be the most suitable combination of aggregates which will give the necessary workability and desired consistency when mixed with water and cement as specified.
- B. The ratio of cement to dry, fine aggregate shall be that necessary to provide the maximum density of the mixture when used with the minimum amount of water required to produce the specified slump in the resulting concrete. This determination of the proper ratio shall be made by a testing laboratory at the expense of the Contractor, using representative samples of the aggregates which will be used. Laboratory recommendations shall be submitted to the Engineer.

2.06 EXPANSION JOINT MATERIAL

- A. Expansion joint material shall be pre-molded, non-extruding asphalt impregnated joint filler conforming to ASTM D1751-73 unless shown otherwise on the plans. Joint materials shall be full depth of slab or joint and unless otherwise indicated 1/2 inch thick.

PART 3 EXECUTION

3.01 STORAGE OF MATERIALS

- A. Cement shall be stored in well ventilated weatherproof buildings which will protect the cement from dampness. The floor supporting the cement shall clear the ground a sufficient distance to prevent the absorption of moisture by the cement. The Engineer may permit small quantities of cement to be stored in the open for short periods of time (maximum of 48 hours) if a raised storage platform and adequate waterproof covering are provided. Lumpy or partially set cement shall not be used, and such cement shall be removed from the premises.

- B. The handling and storage of concrete aggregate shall be such as to prevent the admixture of foreign materials. If the aggregates are stored on the ground, sites for stockpiles shall be grubbed, cleared of all weeds and grass and leveled off. The bottom layer of aggregate shall not be disturbed or used without cleaning. Unless otherwise authorized by the Engineer, all fine aggregate shall be stockpiled at least 24 hours to reduce the free moisture content.

3.02 MIXING CONDITIONS

- A. The concrete shall be mixed in quantities required for immediate use, and any concrete which is not in place within 30 minutes after being discharged from the mixer shall not be used. Retempering of concrete will not be permitted.
- B. Where work has been started and changes in weather conditions require protective measures to be used, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall or damage due to freezing temperatures. In case it is necessary to continue mixing operations during rainfall, the Contractor shall provide protective coverings for the material stockpiled as well as for the concrete being placed. The covering for aggregate stockpiles will be required only to the extent as may be necessary to control the moisture conditions in the aggregates so that adequate control of the consistency of the concrete mix may be maintained.
- C. No concrete shall be mixed without the approval of the Engineer when the air temperature is at or below 40° F (taken in the shade away from artificial heat) and falling. If authorized by the Engineer, concrete may be mixed when the air temperature is at 35° F and rising. When permission is given for mixing when the temperature is below 40° F, the following requirements shall govern:
1. Water used for mixing shall be heated either by steam or by dry heat to a temperature of at least 70° F but not over 150° F.
 2. Aggregates shall be heated either by steam or by dry heat to a temperature of at least 70° F but not over 150° F.

3. The heating apparatus shall be such as to heat the mass of aggregates uniformly and preclude the occurrence of hot spots which will burn the material. Temperature of mixed concrete shall conform to the following Table when placed in the forms:

**TEMPERATURES FOR CONCRETE
PLACED AND CURED IN COLD WEATHER**

		<u>Thin Sections¹</u>	<u>Mass Concrete²</u>
Minimum Temperature of	Above 30° F.	60° F.	55° F.
Fresh Concrete as Mixed	0 to 30° F.	65° F.	60° F.
For Weather Below 40° F.	Below 0° F.	70° F.	65° F.
Minimum Temperature of			
Fresh Concrete After Placing			
and For First Four Days		55° F.	45° F.
Maximum Allowable Gradual			
Drop in Temperature			
Throughout First 24 Hours			
After End of Protection		40° F.	30° F.

¹Thin sections shall be defined as 12" thick or less.

²Mass Concrete shall be 12 1/2" thick or thicker.

4. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas, framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 55° F until at least 60% of the designed strength has been attained.
5. The use of an accelerating agent in lieu of proper cold weather protection will not be authorized. In hot weather suitable precautions shall be taken to avoid drying of the concrete prior to finishing operations. Use of windbreaks, sunshades, fog sprays, or other devices shall be provided.
6. Concrete deposited in hot weather shall not have a placing temperature that will cause difficulty from loss of slump, flash set or cold joints. Concrete temperatures shall be less than 90° F.

3.03 CONCRETE PLACEMENT

- A. Before placing concrete, the Contractor shall see that bottoms of form are properly leveled off and free of foreign materials. Forms shall be oiled or wetted prior to placing concrete. Excess water shall be removed from the forms before any concrete is deposited.

- B. The concrete shall be placed in the structure immediately after mixing. Concrete shall be placed in continuous horizontal layers approximately 12 inches in thickness. Not more than 1 hour shall elapse between the placing of successive layers of concrete in any portion of the structure included in a monolithic placement. Special care must be used to thoroughly surround all reinforcement with concrete and to leave no air space or other void in this work. All concrete shall be well vibrated into all areas of forms.
- C. No concrete shall be used after its initial set has taken place, and no retempered concrete will be allowed under any circumstances or conditions.
- D. Concrete handling from the point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit shall be completed as rapidly as practicable by methods which will prevent segregation and loss of concrete mix materials.
- E. Mechanical equipment for conveying concrete shall be provided to ensure a continuous flow of concrete at the delivery end. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the locations of final deposit. Keep interior surfaces of conveying equipment, including chutes free of hardened concrete, debris, water, snow, ice and other deleterious materials.

3.04 CONSTRUCTION JOINTS

- A. Construction joints shall be made at the locations indicated on the plans or at such other locations as designated by the Engineer. In no case shall vertical joints be made in walls at or near corners. Proper bonding shall be obtained in accordance with the above specifications and the CRSI.
- B. Keys shall be provided in all joints where required to provide for either shear or water tightness. The width of the keys shall be approximately 1/2 the thickness of the section at that point, and they shall be 1/2 as deep as they are wide unless otherwise specified.
- C. All concrete shall be deposited in forms at such rate that the forms will be filled at any point with a vertical rise of concrete surface of not less than 2 feet per hour. Where necessary, the forms shall be bulkheaded off and construction joint made to provide a form which will be filled at the above specified rate. The location of these construction joints shall be approved by the Engineer.
- D. If any concrete is allowed to stand at any elevation below the finished grade or top surface for more than 2 hours without fresh concrete being applied thereon, the top surface shall be considered a construction joint and shall be constructed in accordance with these specifications and provided with keys and water sealing strips.
- E. The Contractor shall furnish and install water stops in all construction joints. The water stops shall be fabricated from a plastic compound, the basic resin of which shall be polyvinyl chloride. The joint shall be a Durajoint and/or Duraseal as manufactured by Electrovert Inc., or approved equal. The water stop shall be thoroughly embedded in the concrete on each side of the joint. Care shall be taken to keep the material clean and free from dirt and from being damaged in any way during the process of placing the concrete. The sealing strip shall be continuous throughout the length of each construction joint including around corners. All water stops shall be accurately located in the construction joint.

- F. Where practicable, vertical construction joints shall make a slight angle with the vertical, not to exceed 1/2 inch per foot, in such manner that the freshly deposited concrete will overhang the hardened concrete, allowing the new concrete to settle upon the old during the process of hardening.

3.05 PROTECTING AND CURING

- A. All concrete, regardless of temperature, weather, or season, shall be protected from premature drying. Surface cracking shall be a cause for rejection, removal and replacement. Any concrete poured during freezing or hot weather conditions shall be protected. No salts or other non-freezing materials shall be used. All fresh concrete shall be protected from open rain. All concrete shall be kept damp for at least 6 days after pouring. Membrane curing may be used. Membrane curing compound if used shall be a resin base type approved by the Engineer. Curing will not be required longer than 72 hours if high early strength concrete is used.

3.06 FINISH OF FORMED SURFACES

A. Rough Form Finish:

1. Provide as-cast rough form finish to formed concrete surfaces that are to be concealed in the finish work or by other construction unless otherwise indicated.
2. Standard rough form finish shall be the concrete surface having the texture imparted by the form facing material used with the tie holes and defective areas repaired and patched and all fins and other projections exceed 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish:

1. Provide as-cast smooth form finish for formed concrete surfaces that are to be exposed to view or that are to be covered with a coating material applied directly to the concrete, or a covering material bonded to the concrete such as waterproofing, damp-proofing, painting or other similar system.
2. Produced smooth form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrical with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed.

- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off, smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surfaces unless otherwise shown.

3.07 MONOLITHIC SLAB FINISHES

A. Float Finish:

1. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified.

2. After placing concrete slabs do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float or both. Consolidate the surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Check and level the surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10 foot straightedge placed on the surface at not less than 2 different angles. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth granular texture.

B. Trowel Finish:

1. Apply trowel finish to monolithic slab surfaces that are to be exposed to view unless otherwise shown and slab surfaces that are to be covered with epoxy terrazzo, resilient flooring, paint, or other thin-film finish coating system.
2. After floating, begin the first trowel finish operation using a power-driven trowel if desired.
3. Consolidate the concrete surface by the final hand troweling operation, free of trowel marks, uniform in texture and appearance and with a surface plane tolerance not exceeding 1/8 inch in 10 feet when tested with a 10 foot straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

C. Non-slip Broom Finish:

1. Apply non-slip broom finish to exterior and interior concrete platforms and bridges, steps, walks and ramps and elsewhere as shown on the drawings or in schedules.
2. Immediately after trowel finishing slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route. Coordinate the required final finish with the engineer before application.

3.08 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas:

1. Repair and patch defective areas with cement mortar immediately after the removal of the forms but only after the Engineer has inspected the defective area.
2. Cut out honeycomb, rock pockets, voids over 1/2 inch diameter and holes left by tie rods and bolts, down to solid concrete, but , in no case, to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water and brushcoat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to the Engineer.

3. For exposed-to-view surfaces blend white Portland cement and standard Portland cement so that when dry the patching mortar will match the color of the surrounding concrete. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with the patching. Compact mortar in place and strike off slightly higher than the surrounding surface.
4. Fill holes extending through concrete by means of a plunger type gun or other suitable device from the last exposed face, using a slush stop held at the exposed face to ensure complete filling.

B. Repair of Formed Surfaces:

1. Repair exposed-to-view formed concrete surfaces where possible that contain defects which adversely affect the appearance of the finish. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the Engineer. Surface defects as such include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets and holes left by the rods and bolts; fins and other projections on the surface, and stains and other discoloration that cannot be removed by cleaning.
2. Repair concealed formed concrete surfaces where possible that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete having defective surfaces. Surface defects as such include cracks in excess of 0.01 inch wide, cracks of any width and other surface deficiencies which non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts and spalls except minor breakage at corner.

C. Repair of Unformed Surfaces:

1. Test unformed surfaces such as monolithic slabs for smoothness and to verify surface plane to the tolerances specified for each surface and finish. Correct low and high areas as herein specified.
2. Test unformed surfaces sloped to drain for trueens of slope in addition to smoothness, using a template having the required slope. Correct high and low areas as herein specified.
3. Repair finished unformed surfaces that contain defects which adversely affect the durability of the concrete. Surface defects as such include crazing, cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through non-reinforced sections regardless of width, sapling, popouts, honeycomb, rock pockets and other objectionable conditions.
4. Correct high areas in unformed surfaces by grinding after the concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.

5. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.
6. Repair defective areas except random cracks and single holes not exceeding 1 inch diameter by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen all concrete surface in contact with patching concrete and brush with a neat cement grout coating or use concrete bonding agent. Place concrete before grout takes its initial set. Mix patching concrete of the same materials to provide concrete of the same type of class as the original adjacent concrete. Place, compact and finish are required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
7. Repair isolated random cracks and single holes not over 1 inch in diameter by the dry-pack method. Groove the top of cracks and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with neat cement grout coating. Place dry-pack before the cement grout takes its initial set. Mix dry-pack consisting of 1 part Portland cement to 1-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patch areas continuously moist for not less than 72 hours.
8. Repair methods not specified above may be used subject to the acceptance of the Engineer.

3.09 DEFECTIVE WORK

- A. Concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes shall be corrected at the Contractor's expense without extension of time therefor. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

*** END OF SECTION ***

SCHMUCKER, PAUL, NOHR & ASSOCIATES
PO BOX 398, 620 N. LAWLER
MITCHELL, SOUTH DAKOTA 57301
Telephone - (605) 996-7761
Fax - (605) 996-0015

FACSIMILE TRANSMITTAL

DATE: November 19, 2002

TO: Tim Schaal
SD DENR
Fax (605) 773-4068

FROM: Lance McQueen, E.I.T.
Schmucker, Paul, Nohr & Associates

RE: Wild Oaks Dam
Mitchell, SD
SPN #11263

RECEIVED

NOV 19 2002

**WATER RIGHTS
PROGRAM**

Tim,

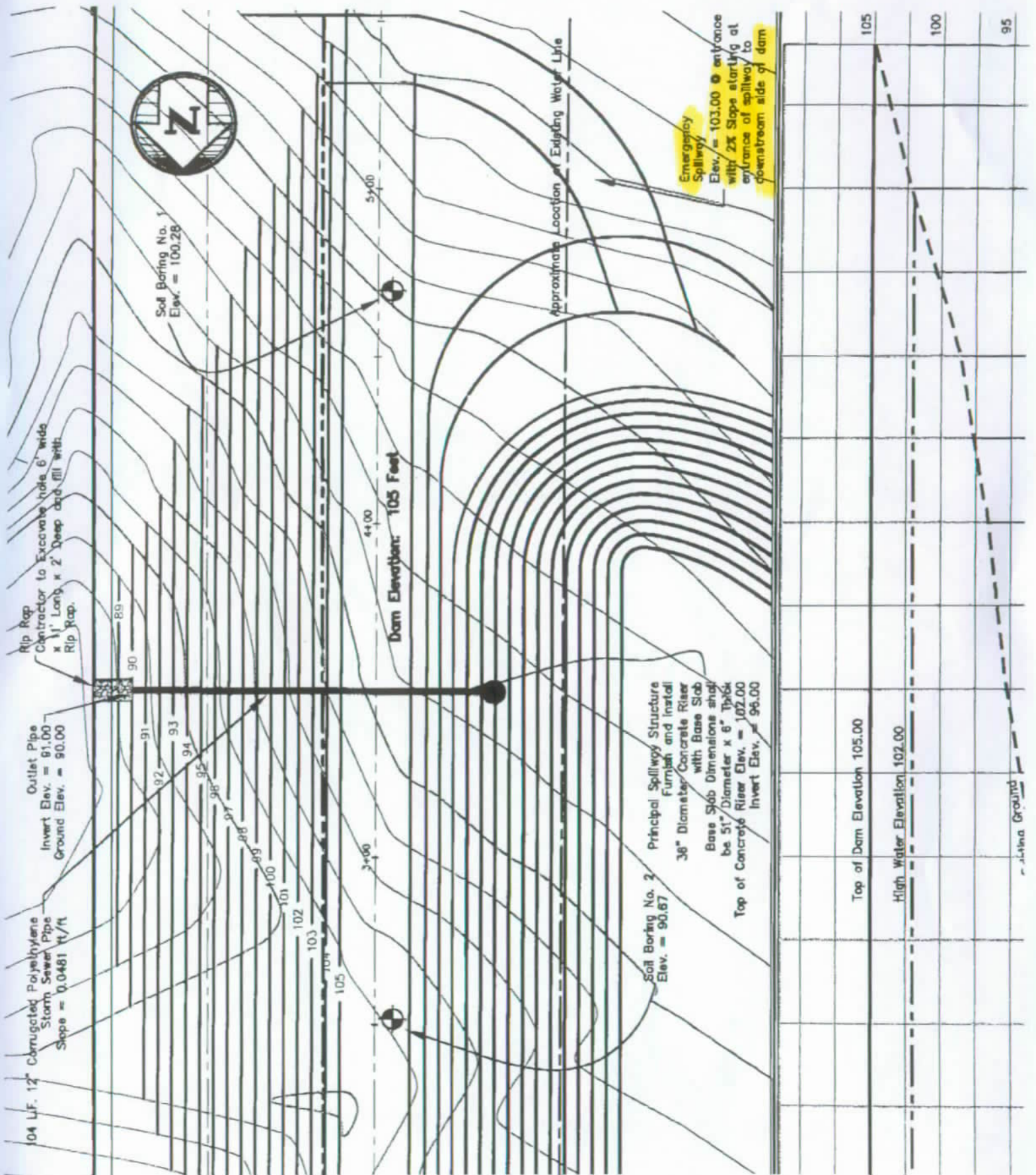
The 3" water main that is shown on our drawings for the Wild Oaks Dam is owned by Davison Rural Water Service. I have also included the revised drawing for the new location of the emergency spillway.

If you have any questions, please do not hesitate to give me a call @ (605) 996-7761.

Thanks

Lance

TOTAL PAGES (including this page) 2



* * * FACSIMILE TRANSMITTAL * * *

RECEIVED

NOV 19 2002

WATER RIGHTS
PROGRAM

SCHMUCKER, PAUL, NOHR & ASSOCIATES

**ENGINEERS
SURVEYORS**

DATE: 11/19/02

TIME: 10:45 A.M.

TO: SD DENR

FAX #: (605) 773-4068

ATTN: Tim Schaal

FROM: Lance McQueen w/SPN & Assoc.

RE: Section Line and Water Line Permits

SPN #: 11263

REMARKS:

TOTAL PAGES (including this page) 4

Reply Requested: (Yes) ☒ (No)

RESOLUTION No. 081302-01

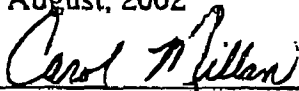
A PETITION having been filed with the Davison County Board of Commissioners requesting the vacation of a portion of a section line right-of-way located within Davison County, South Dakota, and being more particularly described as follows:

That part of the section line right-of-way between the Southeast Quarter (SE ¼) of Section Twenty-three (23), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota and the Southwest Quarter (SW ¼) of Section Twenty-four (24), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota, from the north boundary of the right-of-way for Highway 38 to the south boundary of the right-of-way of East 1st Avenue,

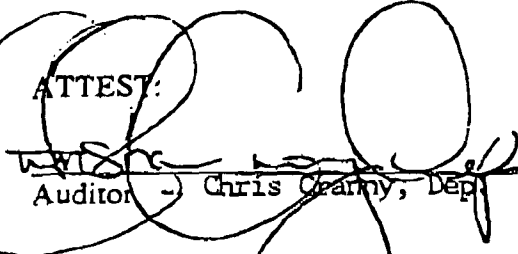
and the Davison County Board of Commissioners having deemed it expedient to proceed upon the Petition and having directed the Auditor to give notice of the hearing upon the said Petition as required by law; and it duly appearing from the records and files in the Auditor's office that due notice of the hearing upon the said Petition was legally and properly given, and the matter having come on for hearing before the Davison County Board of Commissioners on the 6th day of August, 2002, at the hour of 10:00 o'clock a.m., and the Commissioners having continued the hearing to the 13th day of August, 2002 at the hour of 10:00 o'clock a.m.; and one of the Petitioners having appeared personally on both August 6 and August 13, of 2002, and there having been no one appearing in opposition; and the Davison County Board of Commissioners having been fully advised and having found that the public interest would best be served by the said vacation in that the road located in the portion of the section line sought to be vacated has been misused by the public for garbage, deer carcasses, appliances and similar garbage constituting a health hazard and in that the planned future development for the area will increase the value of the property to Davison County; now, therefore,

BE IT RESOLVED BY THE DAVISON COUNTY BOARD OF COMMISSIONERS that that portion of the section line right-of-way between the Southeast Quarter (SE ¼) of Section Twenty-three (23), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota and the Southwest Quarter (SW ¼) of Section Twenty-four (24), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota from the north boundary of the right-of-way for Highway 38 to the south boundary of the right-of-way of East 1st Avenue be, and the same hereby is, vacated.

Passed and Approved this 13th day of August, 2002


Chairman, Davison County Board of Commissioners

ATTEST:


Auditor - Chris Cleary, Dep.

I hereby certify that I have examined the within instrument and find it to be the original and the same is true and correct in this county, and that it is a true and correct copy of the same and the same is true.
Dated 5th day of Sept, 2002

BOOK 63 PAGE 395

RESOLUTION NO. 1996

DOCUMENT 3012

The City Council of the City of Mitchell having been advised that at a meeting held on the 13th day of August, 2002, the County Commissioners of Davison County, South Dakota adopted a Resolution pursuant to SDCL Ch. 31-3 approving the vacation of a portion of a section line right-of-way located within Davison County and being more particularly described as follows:

That part of the section line right-of-way between the Southeast Quarter (SE ¼) of Section Twenty-three (23), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota and the Southwest Quarter (SW ¼) of Section Twenty-four (24), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota, from the north boundary of the right-of-way for Highway 38 to the south boundary of the right-of-way of East 1st Avenue;

and pursuant to SDCL 31-3-44, any resolution of a board of County Commissioners vacating a highway or section line right-of-way within a county and within the extra-territorial area of a municipality as defined in SDCL 11-6-10 is subject to the approval of the governing board of a municipality exercising comprehensive planning and zoning powers within such extra-territorial area; and the said highway and section line being vacated being within the extra-territorial area of the City of Mitchell as defined by SDCL 11-6-10; and the City Council of the City of Mitchell having been fully advised and finding that, for the reasons set out in the Resolution of the Davison County Board of Commissioners, it would be in the best interests of all parties concerned and for the best interests of the citizens of the City of Mitchell that the Resolution of the County Commissioners of Davison County be approved; now, therefore,

BE IT RESOLVED by the City Council of the City of Mitchell that the Resolution adopted by the County Commissioners of Davison County, South Dakota at a meeting held on August 13, 2002 approving the vacation of that part of the section line right-of-way between the Southeast Quarter (SE ¼) of Section Twenty-three (23), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota and the Southwest Quarter (SW ¼) of Section Twenty-four (24), Township One Hundred Three (103) North, Range Sixty (60), West of the 5th P.M., Davison County, South Dakota from the north boundary of the right-of-way for Highway 38 to the south boundary of the right-of-way of East 1st Avenue be, and the same hereby is, approved.

Passed and Approved this 19th day of August, 2002.

Alice Claggett
Alice Claggett, Mayor

ATTEST:

Marilyn Wilson
Marilyn Wilson, City Financial Officer
FILED FOR RECORD
DAVISON COUNTY
SOUTH DAKOTA

4:45 PM Fee \$ 32.00
SEP 06 2002
By *Debra A. Young* NS Fee
Debra A. Young, Register of Deeds

State of South Dakota } ss.
County of Davison
I hereby certify that I have carefully examined the within instrument and compared the same with the original now on file in my office and that it is a true and correct copy of the same.

Dated this 5th day of September, 2002
Michelle Butke
Deputy Finance Officer

BOOK 63 PAGE 395

TOTAL		
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SIZE		
TOTAL		

SIZE	2"	3"
	218	1034
	1098	74
	648	77
TOTAL	1964	1185

VALVES

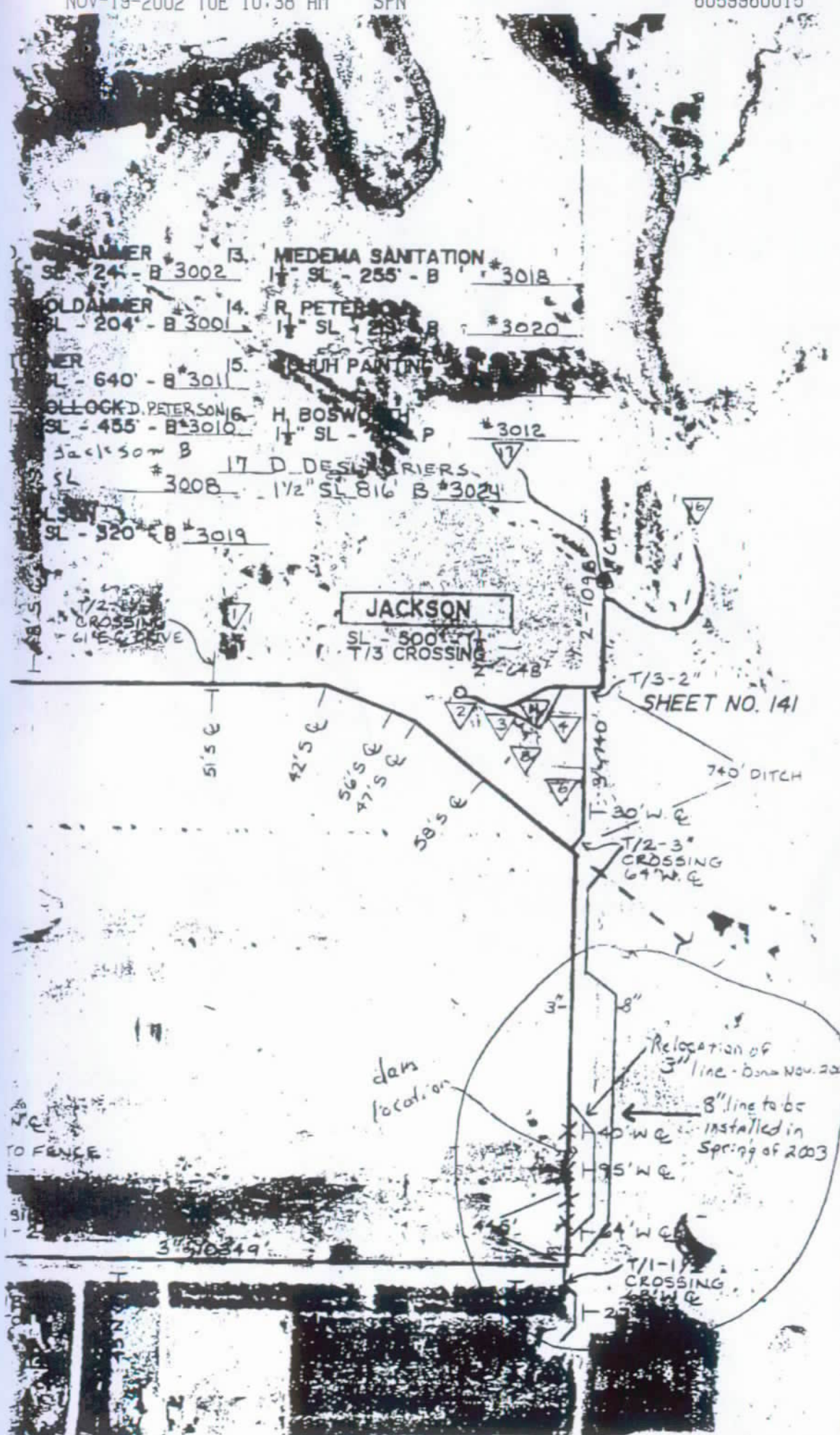
SIZE	1 1/2"	3"
TOTAL	17	1

MISC. BID ITEMS

HIGHWAY CROSSINGS		RAILROAD CROSSINGS		STREAM CROSSINGS		AIR RELIEF VALVES	
1/4"	1/2"	3/4"	2/3"	3/2"	"	"	M
1	1	1	1	1			

USER NO. & METE

NUMBER	1/2	Mass 10000
H. Bick	15	B
R. Gales	54	B
M. Gales	56	B
A. Murray	102	B
M. G. Gales	100	B
J. Gales	51	B
D. Gales	24	B
L. Gales	21	B
T. Gales	640	B
L. Gales	455	B
G. Gales	320	B
N. Gales	255	B
R. Gales	210	B
S. Gales	180	B
M. Gales	70	B
T. Gales	500	B





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

November 20, 2002

Wild Oak Golf Club
% Dave Backlund
117 S. Lawler
Mitchell, SD 57301

Dear Mr. Backlund:

We have reviewed the plans and specifications for your dam project located in the SE 1/4 of Section 23-T103N-R60W, in Davison County. The plans and specifications as submitted are approved and construction of the dam may begin at any time. Water Permit Application No. 6314-3 was approved on May 28, 2002, for two storage ponds with a combined storage capacity of 245 acre-feet of water. The permit will need to be modified to reflect the dam and reduced storage capacity during our licensing process after the project is completed.

Our review was to determine compliance with the requirements of the Water Management Board Safety of Dams Rules, Chapter 74:02:08. Approval of these plans and specifications does not release you, as owner of the dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

The Wild Oak Golf Club Dam will be classified as a small size Category 3, Low Hazard Dam with a dam height of 17 feet and a normal storage capacity of 53 acre-feet and a maximum storage capacity of 70 acre-feet.

If you have any questions, please feel free to contact us.

Sincerely,

Gale N. Selken, P.E.
Natural Resources Engineer Director
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

c: Terry Aaker, SPN Associates

IN: Unnamed wetland
AT: SE ¼, S23, T103N, R60W
COUNTY: Davison
DATE: 2/6/2003



OVERALL LAYOUT

IN: Unnamed wetland
AT: SE ¼, S23, T103N, R60W
COUNTY: Davison
DATE: 2/6/2003



PURPOSE: Site Grading
APPLICATION BY: Wild Oak Golf Course
APPLICATION NO. 200330004
SHEET 3 of 5

IN: Unnamed wetland
AT: SE ¼, S23, T103N, R60W
COUNTY: Davison
DATE: 2/6/2003



EXISTING WETLAND

February 9, 2003

Attn: Bill Baer
SD Department of Environment and Natural Resources
Division of Environmental Services
523 E. Capitol Avenue
Pierre, SD 57501-3181

RECEIVED

FEB 12 2003

SURFACE WATER PROGRAM

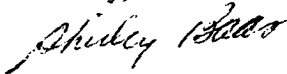
Dear Mr. Baer,

I am writing in response to the Public Notice received on Feb. 8, 2003 regarding the Wild Oak Golf Course. Since my property borders this development I would like some additional information or assurance that this project is not going to affect me in future years. I have two concerns. I currently have a stock pond (which dried up once since 1983) that borders this project and is filled by run-off of the ravine that is now being damned up by the projected lake. I have spoken with Dave Backlund on this subject and he has assured me this won't happen. What concerns me even more is that the water table not be affected. I currently get water in my heating ducts (they are under the cement slab) when the current golf course floods. It happens only during the years that the course floods. I have two pumps that work full time when the course is flooded. If this new lake is going to cause the water table to be even higher it could cause major problems for me. What can you do to assure me that this lake will not change the water table. Water can be a funny creature and move in mysterious ways. I would hate to see this project cause me great distress and harm to my house and to me personally because of stress and finances to repair damage. So, I have two concerns.

- 1) That the stock pond not be dried up because of lack of runoff.
 - 2) That the water table not be affected causing water to back up in my house.
- I also wonder why this public hearing notice is coming so much after fact. Major dirt work has already been in progress for weeks. Just wondering.

Thank you for your concern in this matter. A response would be appreciated.

Sincerely,



Shirley Baas
2601 E. First Ave.
Mitchell, SD 57301

cc
US Army Corps of Engineers
Regulatory Office
28563 Powerhouse Rd
Room 118
Pierre, SD 57501

Water Rights Division - DENR

Conversation or File Documentation

Name of Person: **Shirley Bass** File No. **6314-3**
Address: **2601 E. First Ave., Mitchell SD 57301** County: **Davison**
Date: **2-14-03** Telephone: **(605) 996-4236**
RE: **DENR received letter concerning 404 Permit Notice.**

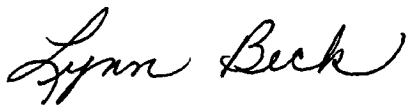
Comments:

Shirley Bass, a downstream landowner, wrote concerned about the dam in the SE corner of the new golf course expansion. Her letter was in response to the Corp 404 Notice and was to Bill Bear but addressed to DENR. Ms. Bass's concerns are 1) that her stock pond not dry up due to reduced runoff below the dam; and 2) that the water table not be affected causing water to back up in her house. She gets water in her heating ducts when the current golf course floods.

I spoke with Ms. Bass on Feb. 14th, telling her I did not think the 5 acre dam would affect the water table and suggested she contact Schmucker, Paul and Nohr the dam designer. I also suggested she contact the golf course owner to voice her concerns. Ms. Bass was not interested in doing either. Terry Acker, engineer for SP&N, said he felt the dam would not affect Ms. Bass. Terry called me back 2-27-03 and said he had a chance to look at the project. The high water level in the dam is 1283 fmsl and it looked like Ms. Bass's house was at 1265 fmsl. Terry still felt that the dam would not affect Ms. Bass.

Ms. Bass was also concerned that she did not know about the dam until the Corp Notice was published and work had already started. I informed her of the process to get a water right and that a notice was published before the May 2002 Board meeting. She did not see it in the paper.

I gave Ms. Bass Bill Bear's phone number at the Corps office and am currently trying to get ahold of her to let her know what Terry Acker told me.



Lynn Beck
Natural Resources Engineer

*Spoke with Ms. Bass 3-3-03 to relate what Terry Acker told me.
LB*

M I T C H E L L

23

CHICAGO

1300

1300

Radio Tower

1303

1300

1250

PURPOSE: Site Grading
APPLICATION BY: Wild Oak Golf Course
APPLICATION NO. 200330004
SHEET 5 of 5

IN: Unnamed wetland
AT: SE ¼, S23, T103N, R60W
COUNTY: Davison
DATE: 2/6/2003



ADDITIONAL ON-SITE STORAGE

**NOTICE OF COMPLETION OF WORKS AND
APPLICATION OF WATER TO BENEFICIAL USE**

Date 4-28-04

TO: Water Rights Program, DENR
523 E. Capitol
Pierre, SD 57501-3181

RECEIVED

MAY 04 2004

WATER RIGHTS
PROGRAM

FROM: Wild Oak Golf Club
(name)
117 S Lawler
(address)
Mitchell SD 57301 605-996-2084
(city, state, zip) (phone)

I have completed the construction of the water use system and I have put the water to beneficial use to the maximum extent it is going to be used.

Water Permit No. 6314-3 states that the water use system is to be constructed by
2004 (date), and water is to be put to beneficial use by 2004 (date).

The water use system was completed on Spring 2004 (date).

Applying the water to beneficial use was completed on Spring 2004 (date).

You may schedule an investigation so that the water license may be issued.





DeWild Grant Reckert and Associates Company
Consulting Engineers

6314-3
1109 East 14th Street
Sioux Falls, South Dakota 57104
16051 339-4157
FAX: 16051 339-4175

April 22, 2004

Mr. Jack Theeler, Esq.
Morgan Theeler Wheeler Cogley & Petersen
PO Box 1025
Mitchell, SD 57301

Mr. Dave Backlund
Wild Oak Golf Club
117 S. Lawler
Mitchell, SD 57301

RE: Review of Dam and Lake
Wild Oak Golf Club, Mitchell, SD

Dear Mr. Theeler and Mr. Backlund:

In accordance with your request and our engineering services retainer agreement, we are submitting this letter report of our findings as well as engineering opinions and recommendations relative to the dam and lake constructed on the Wild Oak Golf Club property at Mitchell, SD.

Information Reviewed. The following lists the information provided to our firm for review in regard to this project:

- A. Letter from Jack Theeler to Gary J. Pashby dated 2/3/04 (2 pages)
- B. Summary of Facts and Statement of Damages (2 pages)
- C. Exhibit 1, including Sections 1 through 9 inclusive and including the geotechnical exploration program prepared by Maxim Technologies, Inc.
- D. Exhibit 2 - Drawing Sheet Nos. 1 through 6 inclusive (6 sheets total) prepared by SPN Associates and certified by Terry L. Aaker, P.E. on 11/15/02, herein referred to as the project drawings
- E. Exhibit 3 - Plan of Wild Oak Golf Course Addition showing proposed dam, lake, nine holes of golf, and surrounding streets and lots for development into residential and commercial use (1 sheet)
- F. Exhibit 4 - Proposal from Schoenfelder Construction, Inc.
- G. Exhibit 5 - Proposal from Turf and Erosion Solutions, Inc.
- H. Letter from Gary J. Pashby to Jack Theeler dated 3/25/04 (2 pages)
- I. Letter dated 11/20/02 with attachments from Gale N. Selken, P.E., South Dakota Department of Environment and Natural Resources to Wild Oak Golf Club approving the plans and specifications for the dam project and granting permission to construct the dam and lake.
- J. Photographs Nos. 1 through 75 inclusive showing the dam, lake, and surrounding golf course area at various stages of construction

Site Visitation and Meeting. During the afternoon of 4/19/04, Todd Myhre, a surveyor with DGR, and I visited the site of the dam, lake, and surrounding golf course. During this site visitation, we met with Dave Backlund with Wild Oak Golf Club to discuss the history of the project. Mr. Backlund also pointed out to us five of the remaining survey stakes which were originally set around the perimeter of the proposed lake by SPN Associates. In response to our questions pertaining thereto, Mr. Backlund informed us that SPN Associates was involved with the project from inception to substantial completion of the dam in accordance with their plans. Mr. Backlund informed us that the services of SPN Associates were terminated after the dam was substantially completed, at which time they also provided him with a copy of the CAD drawing files for the project under a separate agreement. Mr. Backlund informed us that the water supply to the lake is by pumping from Firesteel Creek, and that water is then subsequently pumped from the lake to the golf course irrigation system.

April 22, 2004

Mr. Jack Theeler & Mr. Dave Backlund

RE: Review of Dam and Lake, Wild Oak Golf Club, Mitchell, SD

Page 2

Mr. Backlund informed us that the statutory section line right-of-way between the SW1/4 Section 24-103-60 and SE1/4 Section 23-103-60 where the dam is located has been vacated, and that he now owns the portion of the SW1/4 Section 23-103-60 previously owned by Shirley Baas. Mr. Backlund informed us that they did receive a permit for the dam and lake from the South Dakota Department of Environmental and Natural Resources, and that he would provide us with a copy for our review.

During the site visitation, we took photographs of the dam and lake and other pertinent features at the site. We also performed a survey of various dam features, ground elevations, and the location and ground elevation at the five remaining original survey stakes set by SPN Associates, as described above. The surveyed data is illustrated on the attached overlays to Sheet Nos. 2, 3, and 4 of the project drawings prepared by SPN Associates.

Project Understanding. It is our understanding that the dam and lake were designed and constructed with two main purposes in mind. The primary purpose was to provide a storage facility for water diverted from Firesteel Creek for subsequent use in irrigating the golf course. The secondary purpose was to provide an aesthetic amenity to the golf course and residential development, and offer a water hazard to the right in the play of Hole No. 14.

Findings From Our Field Survey. From the field surveys that we performed on 4/19/04 as described above, we have determined the following:

1. The bench mark elevation shown on Sheet 2 of the drawings and described as "BM Concrete Post Elev. 108.5 Feet" represents the approximate ground elevation at the base of this concrete highway right-of-way post, which was most likely estimated from the one-foot contours shown on this plan sheet. We initially assumed this elevation to be on the top of the post, which we discovered during our survey did not agree with the contour elevations on the project drawings. Since the ground around the post was not level and the elevation only estimated, we chose to use the top of the 36-inch diameter concrete riser which Mr. Backlund reports was constructed to the elevation 102.00 feet staked by SPN Associates for this riser. Using the top of the riser as elevation 102.00 feet as the bench mark, we found that the contours downstream of the dam agreed with this datum and that the elevation of the top of the concrete post indicated as the bench mark is 112.01 feet.
2. Based on the elevation of 102.00 feet for the top of the concrete rise pipe, we found that the upstream and downstream flowline elevations of the 12" CPE outlet pipe agreed closely with the elevations shown on the project drawings for the dam.
3. We surveyed a cross section of the dam approximately 15' north of the concrete riser pipe. This cross section is shown on our attached overlay to Sheet 4 of the project drawings. As can be seen on this overlay, this cross section fits well with the originally designed dam cross section, except that the top 4 feet of the dam has been removed. Mr. Backlund reports and the photographs furnished to us verify that the dam was originally constructed to the 105.0 feet plan elevation shown on the project drawings. Mr. Backlund reports that he subsequently cut the top of dam down to mitigate his fears of possible upstream flooding by this dam at this elevation.

April 22, 2004

Mr. Jack Theeler & Mr. Dave Backlund

RE: Review of Dam and Lake, Wild Oak Golf Club, Mitchell, SD

Page 3

4. The locations surveyed for the five remaining original stakes set by SPN Associates are shown as "lathe-1" through "lathe-5" inclusive on our overlay to Sheet 2 of the project drawings. Our location survey indicates that these stakes were set on or near the 102-foot contour line shown on Sheet 2 of the project drawings. At lathe-4 and lathe-5, the ground elevation is close to the 102-foot contour line. At lathe-1, lathe-2, and lathe-3, the ground elevation is slightly lower or higher than the 102-foot contour line. The markings on all five stakes were mostly faded away. All of the stakes appear to have been marked with the words "Top Lake". Lathe-2 had faint markings which appeared to be "F1x70". The rest of the markings on the stakes were too faded to read.
5. Our field survey indicates that the floor elevation of the pump station is at elevation 107.19 feet.
6. Our field survey indicates that the maximum full level of the lake should be about 97.5 feet elevation, with the corresponding 10 and 100-year peak elevations being about 98.5 and 99.5 feet, respectively.
7. Our field survey indicates that if this dam and lake were constructed to the plan elevations of 102.00 feet for the maximum full level of the lake and with the corresponding 10 and 100-year peak elevations being about 102.81 and 103.62 feet, respectively, then there would be major flooding impacts on the land adjoining the lake, especially on its south and west sides. To prevent these flooding impacts on this land by filling this land would not be practical, since such fill would require much dirt, a lot of expense, and would result in major impacts on the drainage of this adjoining and upstream land.

Summary of Findings and Conclusions. In Items B and H above, there is discussion of the staking of the project. There is reference to whether the stakes were correctly set as well as reference to whether the stakes were correctly interpreted and followed. Based on our investigation, we find that there is considerable evidence that the dam and lake were staked in accordance with the project drawings, both as provided in Exhibit 2 and as also contained in the SDDENR permit for the dam and lake. There is also considerable evidence that the dam and lake was constructed in accordance with the stakes which were set for said construction, with the top of dam being originally constructed to elevation 105 feet prior to being cut down to its present elevation.

Therefore, it is our conclusion from this investigation that the problem lies not with the stakes, but with the design of the dam and lake itself. As described above, a lake constructed to elevation 102.00 feet will not work, when you consider the elevation of the surrounding terrain. Our investigation reveals that a lake elevation of 97.5 feet was the appropriate maximum elevation for a lake in this area, in order to contain the lake and the 10 and 100-year flood levels within areas for which these flood elevations could be tolerated. In our opinion, the filling which would be required to increase the lake level to elevation 102.00 feet as called for on the project drawings is neither feasible nor practical. In our opinion, if all elevations with respect to the dam and lake design were lowered 4.5 feet, then the dam and lake design would have worked as desired in this setting. Based on this, the top of dam would be 100.5 feet, the top of the riser pipe would be 97.5 feet, and the emergency spillway would be 98.5 feet. The flowline elevations of the 12" CPE outlet pipe could have been lowered by about 3 feet and still outlet to the valley floor downstream of the dam.

April 22, 2004

Mr. Jack Theeler & Mr. Dave Backlund

RE: Review of Dam and Lake, Wild Oak Golf Club, Mitchell, SD

Page 4

Existing Conditions. Since the dam was originally constructed, Mr. Backlund reports that he had the top of the dam lowered. The profile shown on our overlay on Sheet 3 of the drawings indicates the elevation profile of the existing top of the dam as surveyed on 4/19/04. This profile shows that the lowest point in the top of the dam profile is about 100.5 feet and the lowest point in the emergency spillway crest is about 97.7 feet. The original top of dam width was designed at 20 feet at elevation 105.0. The existing top of dam as it has been cut down has a top of dam width of about 50 feet. The top of the concrete riser pipe is too high to function to drain flood runoff from the lake, and needs to be lowered by 4.5 feet to 97.5 feet. The upstream face of the dam and lake shoreline need to be riprapped to address major erosion problems with the clay soils, which are highly erodible. The downstream face of the dam, the top of the dam, and all disturbed area above the riprap line needs to be topsoiled and revegetated with grass in such a manner to stabilize the slopes and minimize erosion. The 6" PVC pipe which inputs water pumped from the Firesteel Creek pump station is now at an elevation of 102.65 feet. This pipe could be lowered about 4.5 feet to an inlet elevation of about 98 feet.

Review of Statement of Damages. If the dam would have been designed to a top of dam elevation of 100.5 feet, the amount of fill dirt needed to construct the dam would have been considerably less than the amount of dirt used to construct the dam to a top elevation of 105.0 feet. Therefore, extra cost was experienced to construct the dam to an elevation 4.5 feet higher than it needed to be. There has also been cost to cut the dam down to its present elevation. Further extra cost will be experienced to finish grade the dam at the lower elevations, riprap, and revegetate the dam to stabilize it. Therefore, the contractor was paid to build the dam too high and will be paid again to cut the dam down, regrade and reshape as needed, riprap and revegetate the dam. The crest of the concrete riser pipe will need to be cut down to elevation 97.5 feet, and fitted with a trash rack. The 12" CPE outlet needs to be modified to prevent erosion of the toe of the dam.

The pump house floor elevation is currently at elevation 107.19 feet. This pump house floor elevation could have been at about 100 feet (just above the 100-year flood elevation), which is about 7 feet lower than the elevation it was constructed at. This would have reduced the cost of the pump station structure and placed it at a less obtrusive elevation than it is currently built at. However, this elevation difference would have little, if any, net effect on power costs for pumping water from Firesteel Creek and subsequently pumping it to irrigate the golf course.

Concerning the loss of usable square footage, it is true that the footprint of the dam is larger than it needs to be. This difference in footprint is essentially the difference between the existing top of dam width of about 50 feet and the design top of dam width of 20 feet for a difference of 30 feet times the length of the dam which is about 450 feet. This area computes to 30 feet times 450 feet or 13,500 square feet. In our opinion, there is no other justification for area loss due to building the dam too high, since the lake area would have stayed the same as it is now. This is considerably less than the 80,000 square feet stipulated in the statement of damages.

Other damages could include loss of time and revenue, effort on part of the Owner to resolve the problems, legal fees, engineering fees, and possibly other damages which have not been ascertained at this time.

April 22, 2004

Mr. Jack Theeler & Mr. Dave Backlund

RE: Review of Dam and Lake, Wild Oak Golf Club, Mitchell, SD

Page 5

Recommendations. The following summarizes our recommendations of what needs to be done to the dam and lake to complete it in accordance with our findings described above:

1. We recommend that the minimum top of dam elevation be 100.5 feet. The existing top of dam elevation profile is at or above this minimum elevation. Therefore, there is no need to cut the dam down any further than it is presently cut down nor do we recommend it.
2. The emergency spillway section currently has a low point elevation of 97.7 feet, which is about 1.0 foot too low. We recommend that the emergency spillway be staked along its full length such that it can be filled and graded to an elevation of 98.75 feet (minimum elevation of 98.5 feet and a maximum elevation of 99.0 feet). The emergency spillway should be surfaced with topsoil and stabilized with grass.
3. We recommend that the concrete riser pipe be lowered by 4.5 feet to elevation 97.5 feet, and then fitted with a standard trash rack designed to sit on top of a 36-inch diameter RCP pipe. The ground adjacent to the concrete riser pipe should be lowered, such that after the riprap is placed, the top of the rip rap will be flush or slightly below the top of the concrete riser pipe.
4. We recommend that the upstream face of the dam from the toe to elevation 99.5 feet (98.75 feet at the emergency spillway) be armored with riprap, with fabric placed below the riprap to stabilize the soil of the dam face under the riprap. We recommend that the remaining upstream face, top of dam, and entire downstream face be topsoiled and stabilized with grass. The steep slopes of the dam are subject to erosion until a healthy dense grass cover develops. Therefore, we recommend use of an excelsior blanket or other equivalent means to hold the topsoil and seed in place until the grass gets fully established.
5. We recommend that the outlet area of the 12" CPE outlet pipe be stabilized to prevent erosion of the toe of the dam from water flowing from this outlet pipe. This could be done with a large concrete splash block in combination with riprap or possibly with a grouted riprap flume from the pipe to the toe of the dam and then riprap at the base of the toe. We would caution against using riprap only, since this may still be subject to erosion through, under, or around the riprap.
6. We recommend that the 6" PVC inlet pipe be lowered by about 4.5 feet to about elevation 98.0 feet. This could be done by excavating back along the 6" PVC pipe, installing a PVC bend, and relaying the PVC pipe so its discharge end is about elevation 98.0 feet. We would then recommend a grouted riprap flume to carry the water down the side slope of the lake shore at this water entry point, with the bottom of the flume being at the low water level expected for the lake. The lake level is presently at elevation 94.0 feet. It may be desirable to lower the water level even further before commencing with final grading and all riprapping described in these recommendations. This is appropriate, since any area below the bottom elevation of the riprap will remain subject to erosion and undermining of the riprap placed above it.

April 22, 2004

Mr. Jack Theeler & Mr. Dave Backlund

RE: Review of Dam and Lake, Wild Oak Golf Club, Mitchell, SD

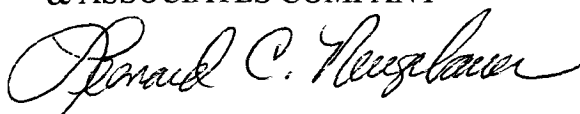
Page 6

7. We recommend that the entire lake shore be protected with riprap from as low an elevation as possible up to elevation 99.5 feet, with fabric placed below the riprap to stabilize the soil of the shoreline under the riprap. As described above, it is desirable to lower the water surface lower than the current lake surface elevation of 94.0 feet. All areas along the lake shoreline which are above elevation 99.5 feet should be topsoiled and revegetated with grass. Slopes along the lake shoreline are subject to erosion until a healthy dense grass cover develops. Therefore, we recommend use of an excelsior blanket or other equivalent means to hold the topsoil and seed in place until the grass gets fully established on the sloping areas.
8. As indicated above, the pump house could have been constructed about 7 feet lower at a floor elevation of 100.0 feet and still be above the 100-year flood level. The only concern over the pump house that we are aware of is aesthetics, since it is presently functioning to deliver water to the irrigation system. We would recommend that consideration be given to softening the appearance of the pump house by tree plantings and other landscaping, which will help to help make it less obtrusive to the appearance of the golf course and development. However, if it is determined that the pump house must be lowered to make it less obtrusive, then the pump house will need to be reconstructed to a lower elevation, with re-use of any salvagable material and equipment from the existing pump house.
9. The permit issued by the South Dakota Department of Environment and Natural Resources is based on the original project drawings, which drawings do not reflect the major changes in the construction of the dam and lake. We recommend that this letter with attached drawings be forwarded to this Department for their review and approval of the revisions being made. Since these revisions result in a dam and lake which is as safe or safer than that depicted by the original project drawings, we do not anticipate that they will have any concerns with the modifications being made to the dam and lake. However, since the design is being changed from that on the original project drawings, they should be notified and their approval should be sought through an amendment to their permit.

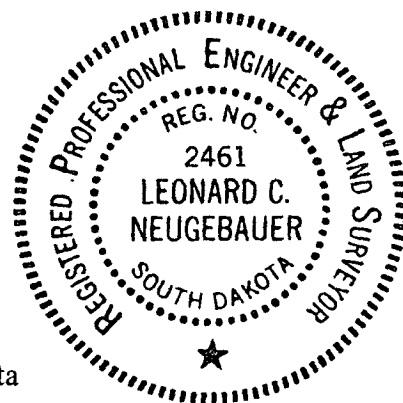
This completes our report on our investigation of this dam and lake project. If you have any questions or need further information, please let us know. By my signature and seal below, I hereby certify that this letter report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer and Land Surveyor under the laws of the State of South Dakota.

Sincerely yours,

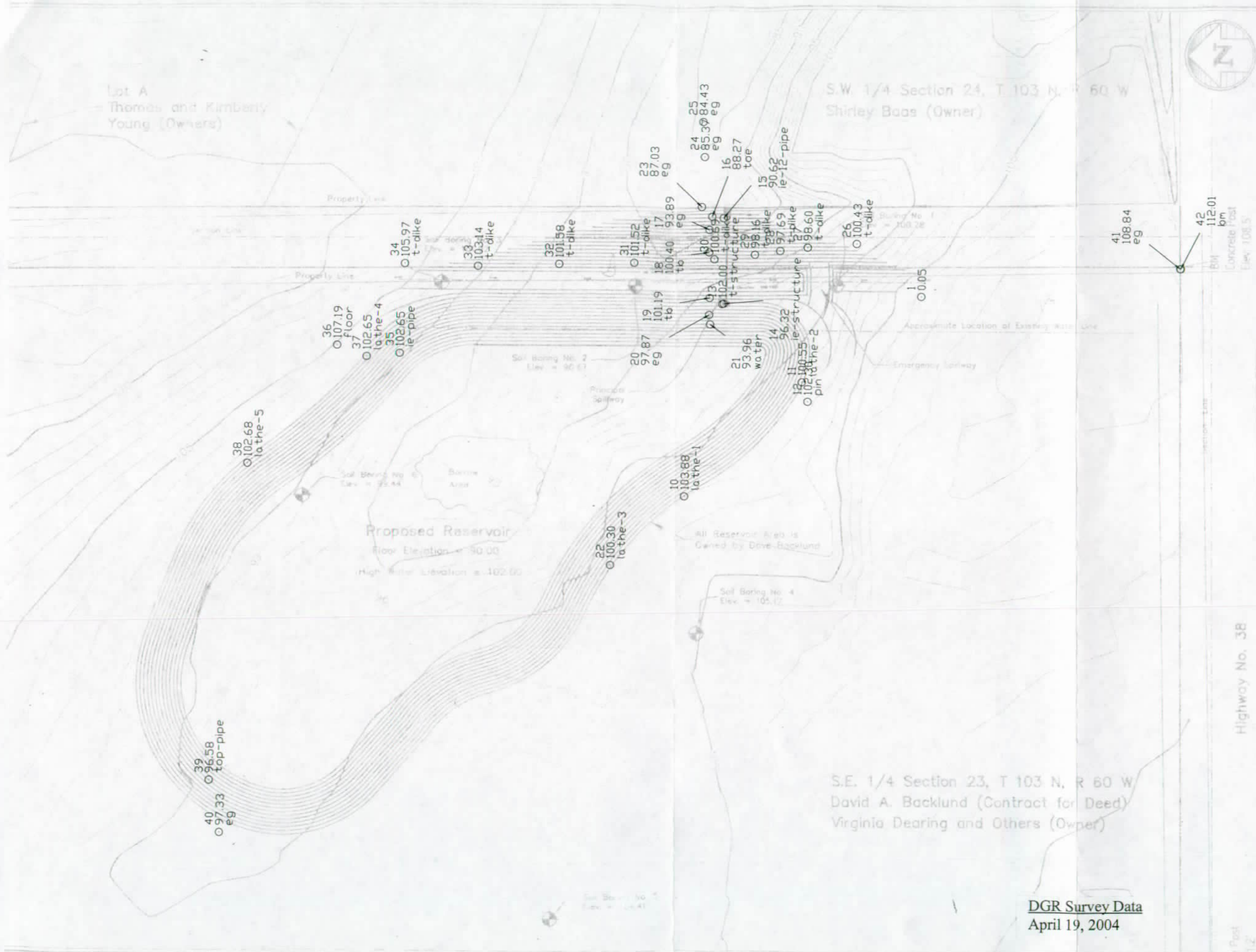
DEWILD GRANT RECKERT
& ASSOCIATES COMPANY



Leonard C. Neugebauer, PE/LS
South Dakota Reg. No. 2461



Attachments: Overlays to Sheet Nos. 2, 3 and 4 showing DGR survey data



SPD
ASSOCIATES

Engineers - Planners - Surveyors
3075 Santa Fe Avenue, P.O. Box 100
Mitchell, South Dakota 57301
Phone: (605) 936-7744 Fax: (605) 936-7745

Certificate

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of South Dakota.



Horizontal Scale	1" = 20' (20' x 30' Grid)
Vertical Scale	1" = 20' (20' x 30' Grid)
Horizontal Scale	1" = 20' (20' x 30' Grid)
Vertical Scale	1" = 20' (20' x 30' Grid)
Drawn By	TAC
Checked By	SPD
Date	11/20/02
Project No.	11262
Computer Name	Server
File Name	dam_reservoir

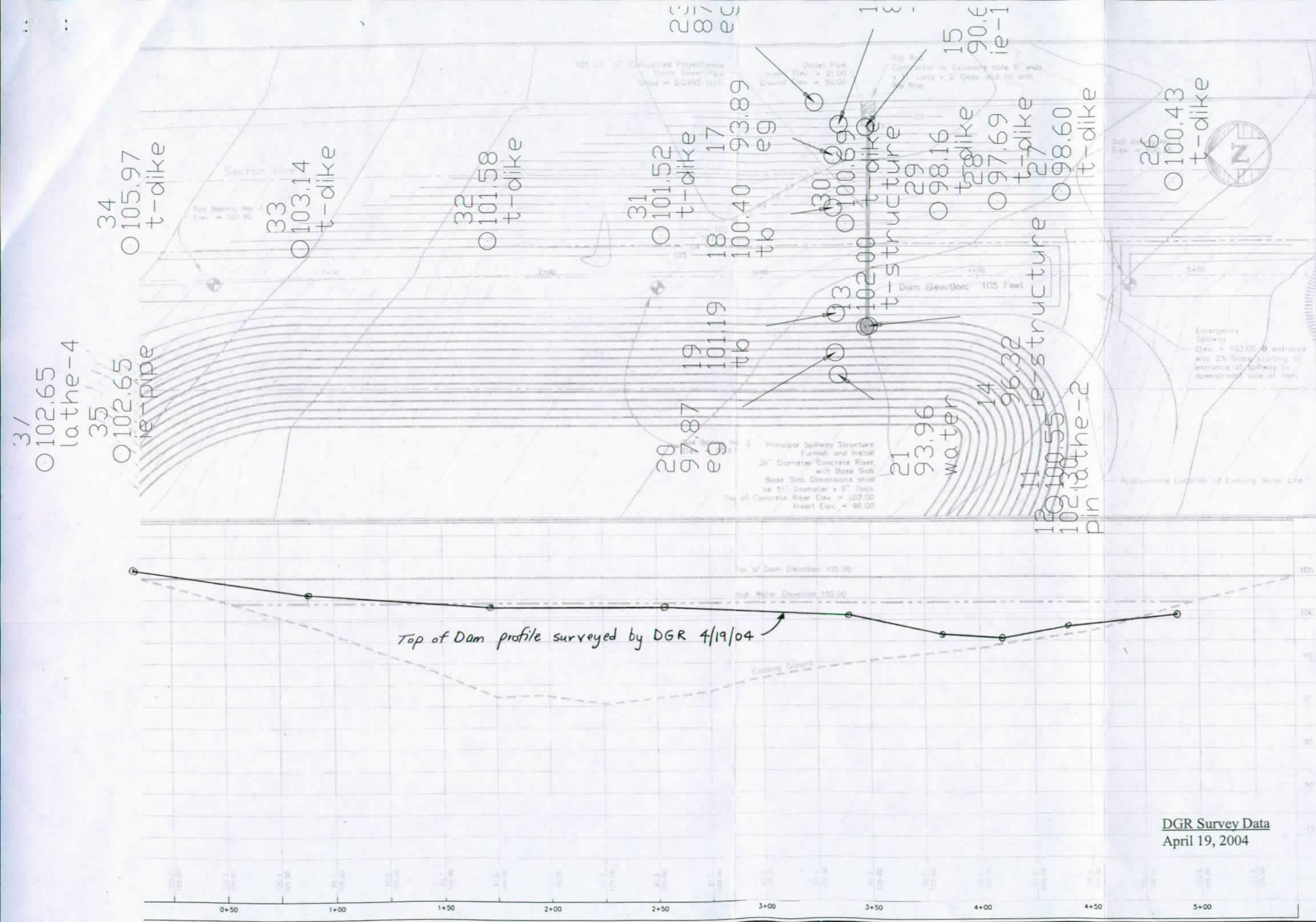
Project Name:
**Wild Oak
Golf Course
Addition**

Location:
**Mitchell,
South Dakota**

Sheet Name:
**Dam Structure
Overall Plan**

Sheet Number	Total Sheets
2	6

**DGR Survey Data
April 19, 2004**



Horizontal Scale	1" = 20' (0" = 1" Bar)
Vertical Scale	1" = 10' (0" = 1" Bar)
Horizontal Scale	1" = 10' (0" = 1" Bar)
Vertical Scale	1" = 10' (0" = 1" Bar)
Drawn By	TAA
Checked By	***
Date	2004
Project No.	11267
Computer Name	Serve
File Name	Wild Oak Dam.dwg

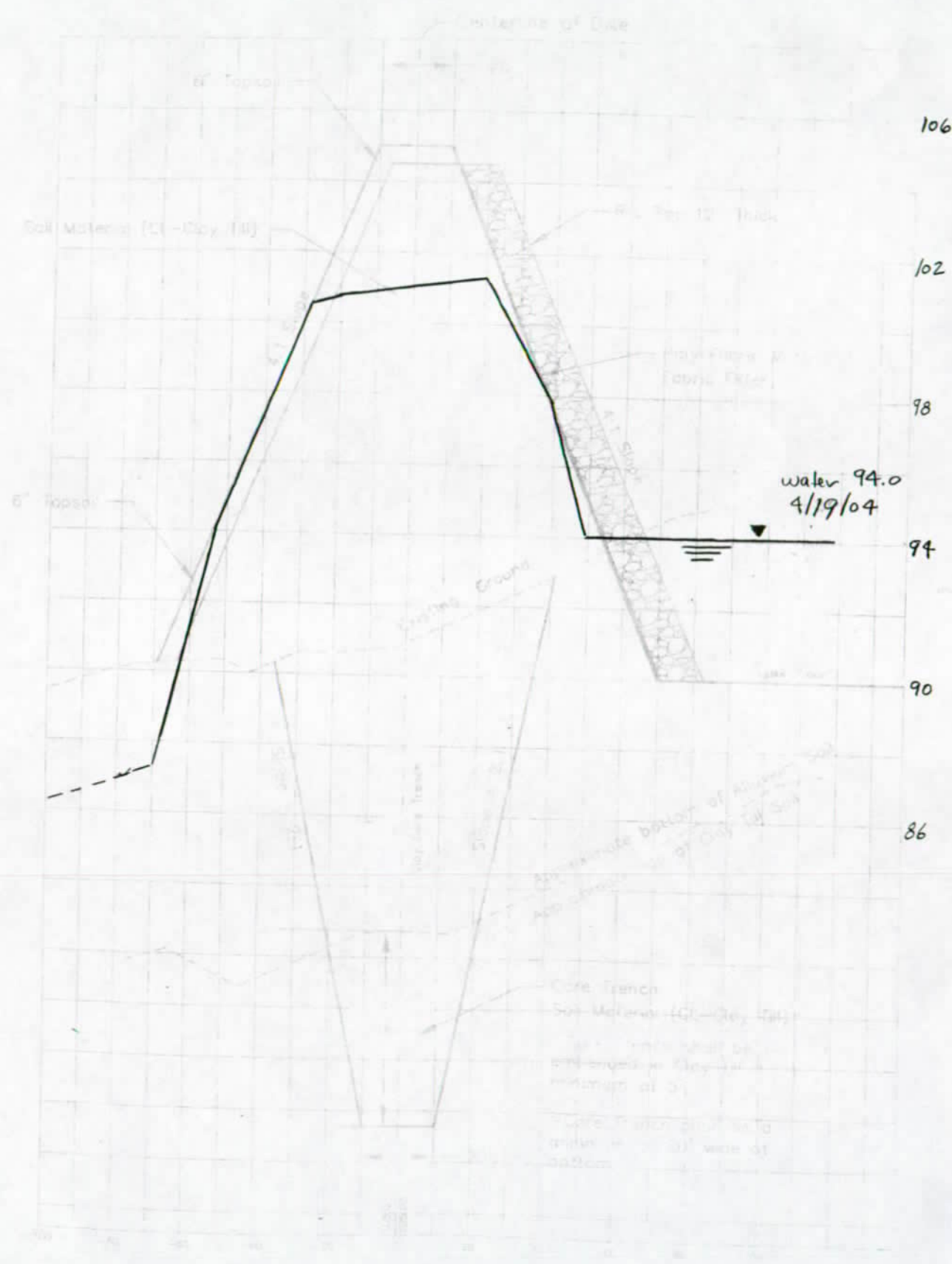
Project Name:
Wild Oak Golf Course Addition

City:
Mitchell, South Dakota

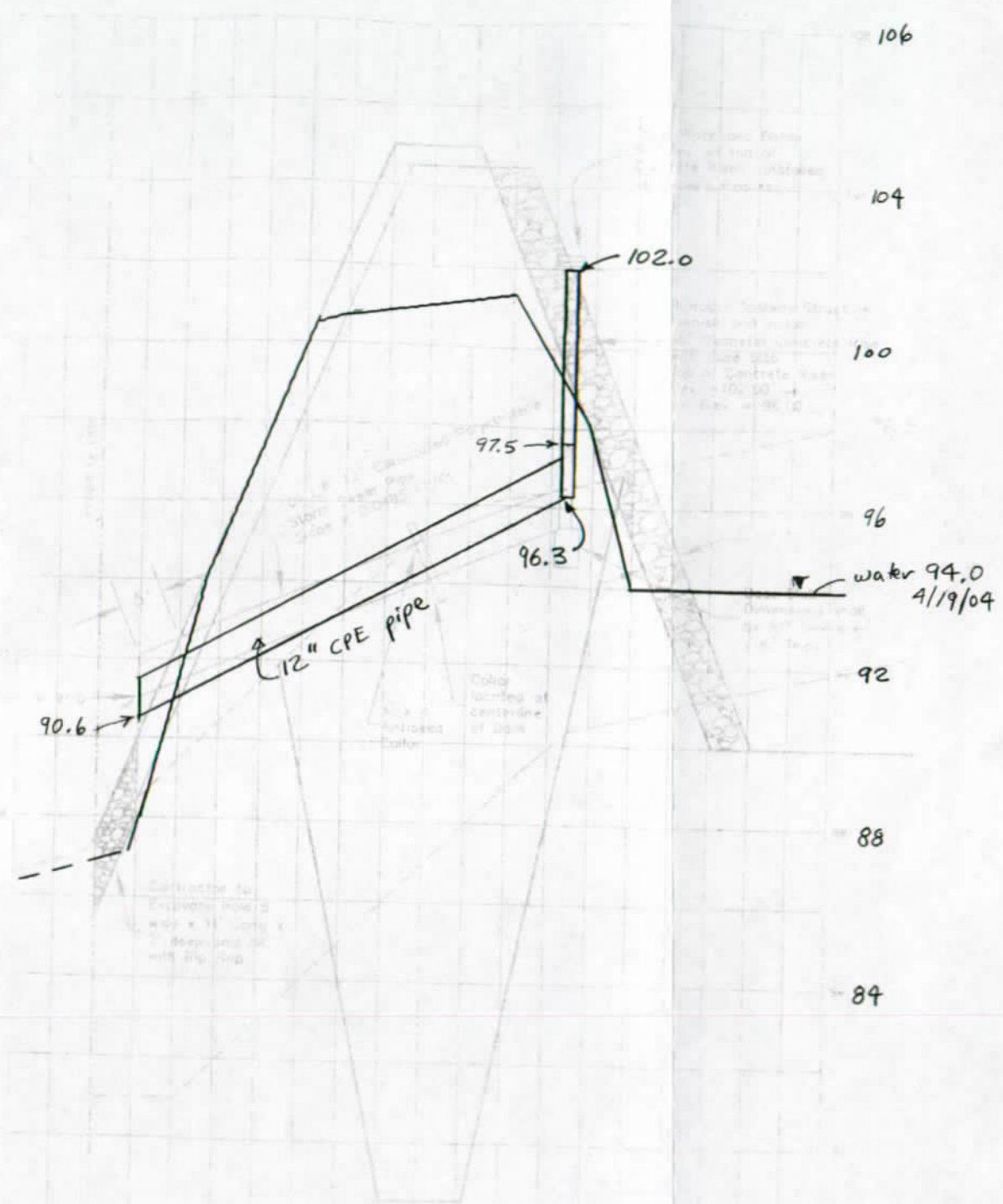
Sheet Name:
Dam Structure Plan and Profile

DGR Survey Data
April 19, 2004

Typical Dam Cross Section



Principal Spillway Detail, J+50



DGR Survey Data
April 19, 2004

SPH
ASSOCIATES

Engineering - Planning - Surveying
425 North Center, Suite 100
Mitchell, South Dakota 57301
Phone: 605/735-7751 Fax: 605/735-7752

CERTIFICATE

I hereby certify that this work was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer in the State of South Dakota.



Scale: 1" = 20' (2" = 40' for Dam)
Horizontal Scale: 1" = 40' (2" = 80' for Dam)
Vertical Scale: 1" = 20' (2" = 40' for Dam)
Drawn By: JLB
Checked By: JLB
Date: 10/20/04
Project No.: 10001
Computer Name: JLB
File Name: 000_000_000_000_000_000

Wild Oak
Golf Course
Addition

Mitchell
South Dakota

Dam and Principal Spillway
Cross Sections and Details



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

May 20, 2004

Dave Backlund
Wild Oak Golf Club
117 S. Lawler
Mitchell, SD 57301

Dear Mr. Backlund:

I am writing as a follow up to the investigation of Water Permit No. 6314-3 conducted by Tim Schaal on May 18, 2004. During the investigation you presented Mr. Schaal a letter with a report and recommendations from Leonard Neugebauer of DeWild Grant Reckert and Associates concerning the irrigation dam, located on the section line between the SE ¼ of Section 23 and SW ¼ of Section 24-T103N-R60W.

In his report, Mr. Neugebauer recommended lowering the dam embankment to elevation 100.5; the primary spillway to elevation 97.5; and the emergency spillway to elevation 98.5. These elevation changes were deemed necessary for the dam and reservoir to better fit into the golf course and residential area and prevent possible upstream flooding. We have reviewed Mr. Neugebauer's report and approve the recommended changes to the irrigation dam; however, we will need a final "As Built" drawing, signed and stamped by a Registered Engineer, indicating the final elevations achieved.

You also indicated to Mr. Schaal your plans to build another dam downstream of the existing dam and located in the SW ¼ of Section 24-T103N-R60W. Mr. Schaal advised you that Water Permit No. 6314-3 does not authorize a dam in this location; however, the permit could be amended to do so. This would require engineering information on the structure, such as height and storage capacity, and if necessary a review and approval of plans and specifications.

If you have any questions, please feel free to contact Tim Schaal at 773-3352.

Sincerely,

Gale N. Selken, P.E.
Natural Resources Engineer Director
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

c: Leonard Neugebauer, DGR



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
PMB 2020
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

October 19, 2010

1371-3
1747-3
6314-3

David Backlund, President
Wild Oak Golf Club
2500 E 1st Ave
Mitchell SD 57301-6456

Dear Mr. Backlund:

Enclosed is a "Notice" dated October 15, 2010 concerning the 2010 irrigation questionnaire.

The notice was originally mailed to 117 S Lawler, Mitchell, SD. The post office notified us that your address has changed and I will update our records accordingly.

If you have any questions, please contact me.

Sincerely,

A handwritten signature in black ink that reads "Genny McMath". The signature is written in a cursive, flowing style.

Genny McMath
Environmental Scientist
Water Rights Program
(605) 773-3352
email: genny.mcmath@state.sd.us

enclosures



JSA CONSULTING ENGINEERS/ LAND SURVEYORS, INC.

3700 S. West Avenue
Sioux Falls, South Dakota 57105-6352
Telephone (605) 367-1036
FAX (605) 367-1002

September 20, 2004

Garland Erbele
Chief Engineer, Water Rights Program
SD Department of Environment and Natural Resources
523 E. Capital
Pierre, SD 57501

RECEIVED

SEP 22 2004

WATER RIGHTS
PROGRAM

RE: Wild Oak Golf Course – East Reservoir
SW ¼ of the SW ¼ of Section 24, T103N, R60W, Davison County, Mitchell, SD

Mr. Erbele:

I talked briefly to Gale Selken this morning about the DENR reviewing plans for the above referenced project. Enclosed please find the following items for your review process:

1. One set of preliminary plans.
2. One copy of the Geotechnical Exploration Program completed by Maxim Technologies dated July 28, 2004.

Wild Oak Golf Course is proposing to construct a reservoir for additional storage just downstream from the existing pond on the golf course. The proposed dam is less than 25' in height and less than 25 acre-ft in storage at the spillway crest. The excess dirt excavated from the proposed reservoir will be used during grading on the Wild Oak Golf Course Development. Construction is scheduled to begin this fall as soon as plans are approved.

Forms for the Location Notice for Dam/Dugout and the Notice of Intent will be forwarded to your office from Mr. Dave Backlund of Wild Oak Golf Course.

Please call if you have questions.

Sincerely,

Kim Heck, PE/LS

cc: D. Backlund – Wild Oak Golf Course



6314-3

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

September 24, 2004

Dave Backlund
Wild Oak Golf Club
117 S. Lawler
Mitchell, SD 57301

Dear Mr. Backlund:

We have reviewed the plans and specifications we received from JSA Consulting Engineers/Land Surveyors Inc. for your proposed irrigation dam (East Reservoir) located in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 24-T103N-R60W, in Davison County. The plans and specifications as submitted are approved. Approval of these plans and specifications does not release you, as owner of the dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

In our May 20, 2004, letter to you we indicated that your existing Water Permit No. 6314-3 could be amended to allow an additional dam in this location. A Location Notice is not necessary and is not appropriate since the water is used for irrigation. Amendment of Water Permit No. 6314-3 is allowable because it authorizes 245 acre-feet of storage in the existing irrigation dam and upstream pond. With the lowering of the existing irrigation dam, you should have more than enough authorized storage to allow the additional dam; however, we also mentioned that we would need a final "As Built" drawing, signed and stamped by a Registered Engineer, indicating the final elevations and storage capacities achieved in the existing dam.

Thank you for submitting your plans for review. Since your proposed dam is less than 25 feet high and has a maximum storage capacity of less than 50 acre-feet, it is not necessary for the dam to meet the requirements of the Water management Board Safety of Dams Rules, Chapter 74:02:08. Kim Heck indicated that she designed the dam to safely handle a 100 year runoff event routed through the upstream dam and adjacent drainage area. This should be an adequate design for the structure.

If you have any questions, please feel free to contact Tim Schaal at 773-3352.

Sincerely,

Gale N. Selken, P.E.
Natural Resources Engineer Director
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

C: Kim Heck, JSA



6314-3

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

October 20, 2004

Dave Backlund
Wild Oak Golf Club
117 S. Lawler
Mitchell, SD 57301

Dear Mr. Backlund:

We have reviewed the revised plans and specifications dated October 11, 2004, from JSA Consulting Engineers/Land Surveyors Inc. for your proposed irrigation dam (East Reservoir) located in the SW ¼ SW ¼ of Section 24-T103N-R60W, in Davison County. The revised plans indicate a slight change in the dam layout and moving the secondary spillway over to the left (east) abutment. The plans and specifications as submitted are approved. Approval of these plans and specifications does not release you, as owner of the dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

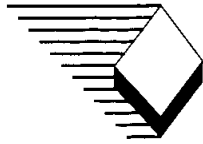
As indicated in our September 24, 2004 approval letter, a Location Notice for this structure is not necessary since Water Permit No. 6314-3 can be amended to allow an additional dam and storage in this location; however, we also mentioned that we would need a final "As Built" drawing, signed and stamped by a Registered Engineer, indicating the final elevations and storage capacities achieved in the existing (West) dam. Enclosed, we are returning the Location Notice and your \$10.00 check.

If you have any questions, please feel free to contact Tim Schaal at 773-3352.

Sincerely,

Gale N. Selken, P.E.
Natural Resources Engineer Director
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

C: Kim Heck, JSA



JSA CONSULTING ENGINEERS/ LAND SURVEYORS, INC.

3700 S. West Avenue
Sioux Falls, South Dakota 57105-6352
Telephone (605) 367-1036
FAX (605) 367-1002

October 11, 2004

Tim Schaal, PE
Water Rights Program
SD Department of Environment and Natural Resources
523 E. Capital
Pierre, SD 57501

RECEIVED
OCT 14 2004
WATER RIGHTS
PROGRAM

RE: Wild Oak Golf Course – East Reservoir
SW ¼ of the SW ¼ of Section 24, T103N, R60W, Davison County, Mitchell, SD

Mr. Schaal:

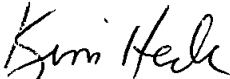
As per our telephone conversation on October 8, 2004, the layout for the above referenced project was revised at the owner's request. Enclosed please find one set of the final revised plans (dated 10-11-04) for your use. Please dispose of the plans dated 9-28-04.

The revised dam layout is less than 25' in height and less than 25 acre-ft in storage at the spillway crest. Construction is scheduled to begin this fall as soon as plans are approved.

Forms for the Location Notice for Dam/Dugout and the Notice of Intent will be forwarded to your office from Mr. Dave Backlund of Wild Oak Golf Course.

Please call if you have questions.

Sincerely,


Kim Heck, PE/LS

cc: D. Backlund – Wild Oak Golf Course

6314-3

7/26/17 TGS

Dam #1 - SE¹/₄ SE¹/₄ Sec. 23 - T103N - R 60W.

From April 22, 2004 DGR Report & Inspection on 7/18/17

Top of Dam has been lowered to Elen 100.5
 P. Spillway concrete Riser removed - 12 in HDPE pipe inlet
 Now at Elen. 96

Top of Dam Elev.	- 100.5	} <u>Ht. = 12.5 ft</u>
End Spillway Elev.	- 98.5	
P. Spillway Elev.	- 96	
Dis Emb Toe Elev.	- 88	

Normal Storage Capacity - 23 Ac-ft
 Int. Storage Capacity - 75
 Max Storage Capacity - 50

Dam #2 - SW¹/₄ SW¹/₄ Sec 24 - T103N - R 60W

From 2004 ISA P's (Dam/Dagond) & 7/18/17 Inspection

Top of Dam Elev.	- 93	} <u>Ht. = 13.5 ft</u>
End Spillway Elev.	- 90	
P. Spillway Elev.	- 89.5	
Dis Emb Toe Elev.	- 79.5	

Normal Storage Capacity - 24 Ac-ft
 Max Storage Capacity - 34



JSA CONSULTING ENGINEERS/ LAND SURVEYORS, INC.

3700 S. West Avenue
Sioux Falls, South Dakota 57105
Telephone (605) 367-1036
Fax (605) 367-1002
E-mail info.jsa@midconetwork.com

SEND TO: Company Name <u>DENR</u>	From <u>Kim Heck</u>
Attention <u>Tim Schaaf or Gale</u>	Date <u>9-24-04</u>
Fax Number <u>773-4068</u>	Phone Number

☐ Urgent ☐ Reply ASAP ☐ Please Comment ☐ Please Review ☒ For Your Information

Total Pages, including cover sheet: 2

COMMENTS:

Tim had requested a stage capacity table for the
Wild Oak Golf Course - East Reservoir

I know Tim is out of the office. Could you please
get this information to the correct person.

Thank you,
Kim

September 24, 2004

To: Tim Schall, DENR

From: Kim Heck, JSA Engineers

RE: Wild Oak Golf Course - Proposed East Reservoir, Davison County, SD

STORAGE- CAPACITY TABLE

Elevation	Area (SF)	Volume (CF)
90	140,564	
		135,449.5
89	130,335	
		125,430.0
88	120,525	
		116,163.5
87	111,802	
		108,237.0
86	104,672	
		97,998.0
85	91,324	
		88,516.5
84	85,709	
		82,854.5
83	80,000	
		77,444.0
82	74,888	
		72,097.0
81	69,306	
		66,419.5
80	63,533	
		61,427.0
79	59,321	
		57,351.0
78	55,381	
		53,380.0
77	51,379	
		49,437.0
76	47,495	
		45,611.0
75	43,727	
		41,902.0
74	40,077	
		38,310.5
73	36,544	
		34,835.5
72	33,127	
		31,477.5
71	29,828	
		27,843.0
70	25,858	
Total =		1,412,184.0 CF = 32.42 Acre-ft



JSA CONSULTING ENGINEERS/ LAND SURVEYORS, INC.

3700 S. West Avenue
Sioux Falls, South Dakota 57105
Telephone (605) 367-1036
Fax (605) 367-1002
E-mail info@jsa@midconnetwork.com

SEND TO: Company Name <u>DENR</u>	From <u>Kim Heck</u>
Attention <u>Tim Schaal</u>	Date <u>10-7-04</u>
Fax Number <u>1-605-773-4060</u>	Phone Number

☐ Urgent ☐ Reply ASAP ☐ Please Comment ☐ Please Review ☒ For Your Information

Total Pages, including cover sheet: 2

COMMENTS:

Tim,

Just for your information, this is the revised layout for the east reservoir for Wild Oak in Mitchell.

I will send revised plans to you next week.
The new dam top elev. = 93.0

approximate water surface elev = 89.5

floor bottom elev = 70.0

Approximate storage 24.0 acre ft.

The ^{overflow} spill way has been moved to the east side.

Mr. Badelund wanted to leave the area SW of the reservoir open for possible future lots.

We may be staking the dam next week so they can get started.

Thank you,
Kim

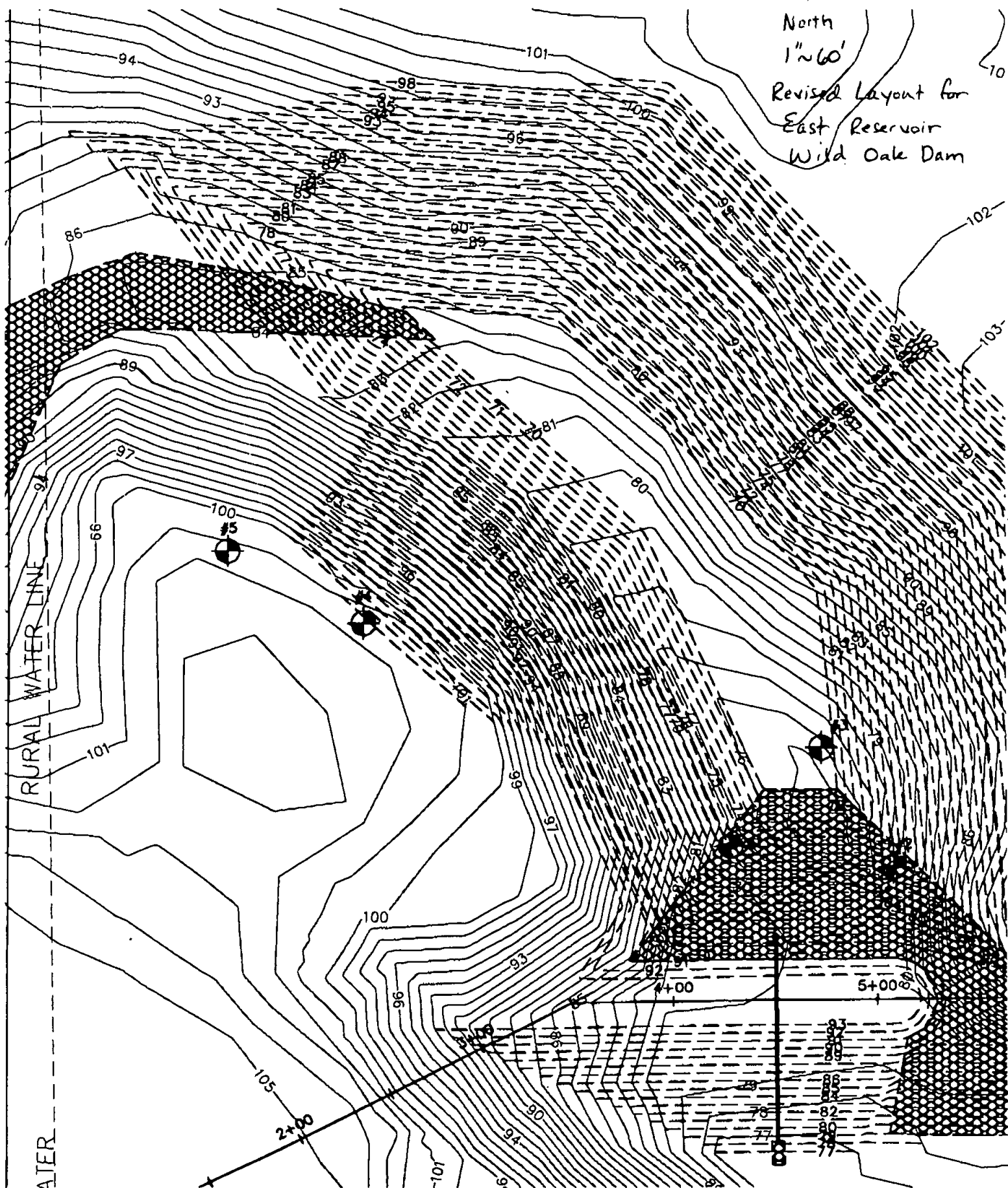
For: Tim Schaal

10/7/04

North

1"=60'

Revised Layout for
East Reservoir
Wild Oak Dam



CITY OF MITCHELL, SD

DAVISON COUNTY
PLANS FOR PROPOSED GRADING

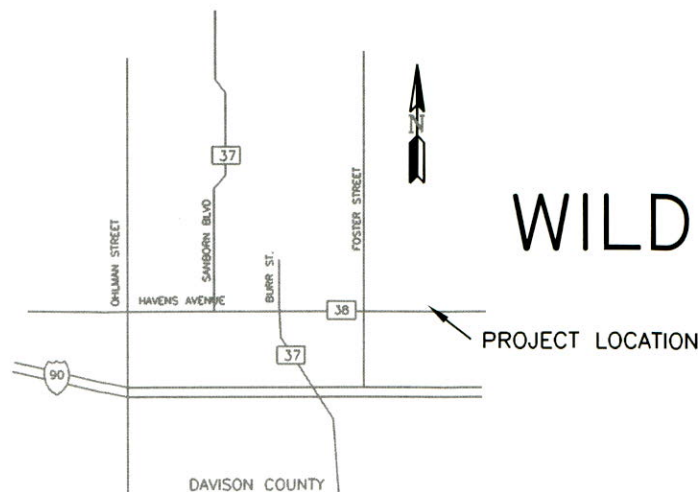
WILD OAK GOLF COURSE - PROPOSED EAST RESERVOIR

DEVELOPER: WILD OAK GOLF COURSE

117 S. LAWLER

MITCHELL, SD 57301

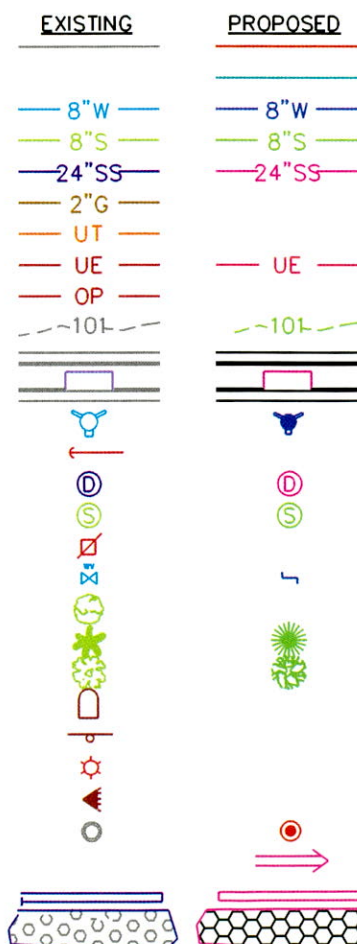
CONTACT: DAVE BACKLUND (605) 996-8175



VICINITY MAP
CITY OF MITCHELL

LEGEND

PROPERTY LINE
PROJECT LIMITS
WATERLINE
SANITARY SEWER
STORM SEWER
GAS LINE
UNDERGROUND TELEPHONE
UNDERGROUND ELECTRIC
OVERHEAD POWER
CONTOUR
CURB & GUTTER
DROP INLET
FIRE HYDRANT
GUY ANCHOR
STORM SEWER MANHOLE
SANITARY SEWER MANHOLE
POWER POLE
WATER VALVE
BUSH
CONIFEROUS TREE
DECIDUOUS TREE
MAILBOX
SIGN
LIGHT POLE
TRAFFIC SIGNAL LIGHT
PROPERTY PINS
DIRECTION OF DRAINAGE
CULVERT
RIPRAP



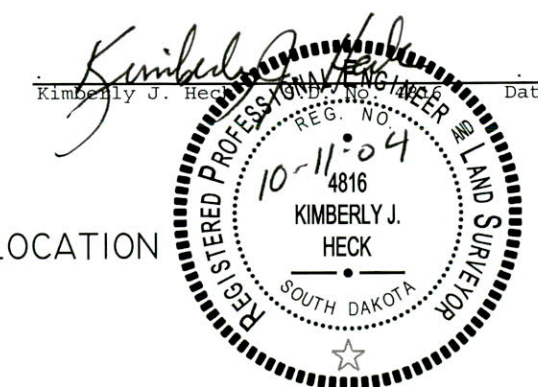
LOCATION MAP

SW 1/4 OF THE SW 1/4 OF SECTION 24, T103N, R60W

INDEX OF SHEETS

SHEET NO. A-1	TITLE SHEET
SHEET NO. E-1	NOTES
SHEET NO. K-1 AND K-2	EROSION CONTROL
SHEET NO. M-1	PLAN VIEW
SHEET NO. M-2	DAM STRUCTURE PLAN AND PROFILE
SHEET NO. M-3	DAM CROSS SECTION
SHEET NO. R-1 AND R-2	DETAILS

I, Kimberly J. Heck, hereby certify that these plans were prepared by me, or under my direct supervision and that I am a duly registered engineer under the laws of the State of South Dakota.



REVISED LAYOUT 10-8-04

JSA

CONSULTING ENGINEERS/LAND SURVEYORS, INC.
3700 S. WEST AVENUE, SIOUX FALLS, SD 57105-6352
(605)367-1036 FAX (605)367-1002

DRAWING INDICATES GENERAL UTILITY LOCATIONS ONLY.
NEITHER THE CORRECTNESS NOR COMPLETENESS OF
LOCATIONS ARE GUARANTEED. CONTACT SOUTH DAKOTA
ONE CALL PRIOR TO EXCAVATIONS. (1-800-781-7474)

SCOPE OF WORK:

- The scope of work on this project includes the following items:
1. Construct an earthen dam/dugout (height less than 25').
 2. Excavate for the east reservoir behind the dam/dugout.
 3. Construct a principal outfall structure and an emergency spillway.
 4. Install/repair rip rap from the existing emergency spillway from the reservoir to the west.
 5. Restoration of the site.

1 SPECIFICATIONS:

Specifications to be used are the South Dakota Department of Transportation "Standard Specifications for Roads and Bridges, 2004 Edition" unless revised, deleted or supplemented within.

The following items will be furnished in accordance with the SDDOT Specifications:

- Rip Rap Class B
- Filter Fabric for Rip Rap
- RCP
- Seeding, mulch, fertilizer

2 COORDINATION:

THE CONTRACTOR SHALL COORDINATE WITH DAVE BACKLUND
WILD OAK GOLF COURSE
(605-996-8175).

3 UTILITIES:

The plan shown location and elevation of all utilities shall be verified by the Contractor prior to starting work. One call service (1-800-781-7474) shall be contacted 48 hours prior to beginning work. The work is located in the SW 1/4 of the SW 1/4 of Sec. 24, T103N, R60W of the 5th Principal Meridian, Davison County, SD.

A rural water line is located along the west edge of the project.

Any damage done to the utilities because of the Contractor's carelessness shall be repaired at the Contractors expense.

4 SOIL BORINGS:

Contractor shall review the Geotechnical Exploration Program completed by Maxim Technologies dated July 28, 2004. Recommendation for the dam include extending the core a minimum of 2' into the clay till soils, scarify and recompact a minimum of 6" of the exposed clay, complete removal of any sandy soils encountered in the core area. The exposed soils at the base of the core should be thoroughly inspected by a geotechnical engineer (recommend Maxim Technologies) prior to placement of any fill soils

5 SURVEY INFORMATION:

Survey information was furnished by others. The benchmark referenced is a concrete post in the NW corner of Dean Drive and SD Hwy 38 with a top elevation of 112.01. Top of the existing 36" RCP riser in the west pond Elevation = 102.00.

6 GRADING OPERATIONS:

The estimated quantity of Unclassified Excavation for this site is 50,100 C.Y.
Approximately 9,594 C.Y to construct the earthen dam above the existing ground level.
Approximately 3,074 C.y. to construct the dam core below the existing ground level.
(shrink factor of 17% as per the Geotechnical Report).
Approximately 9,160 C.Y. will be hauled off site.

The dam core shall be compacted to 100% of the Standard Proctor density and placed at a moisture content ranging from optimum to 2% over optimum. The core shall not be allowed to dry out during construction to prevent cracking. Contractor shall have density tesing and permeability tests performed during the dam core construction.

The Contractor shall strip 6" of Topsoil from the project area and stockpile topsoil north/east of the proposed grading limits. A silt fence shall be placed around the downstream edges of the topsoil piles to prevent erosion.

A temporary sedimentation trap will be excavated at the lower end of the grading area. The sedimentation trap will be removed and restored once vegetation has been established on the project site.

7 DISTURBED AREAS:

All areas disturbed by construction and not surfaced shall be restored by placement of topsoil, fertilizer, seed and mulch. Seeding areas shall be graded smooth enough to allow for maintenance operations including mowing.

The permanent seeding mix shall be as follows:

	Pure Live Seed (PLS)
	Pounds per acre
Lincoln Smooth Bromme	3.0
Oahe Intermediate Wheat Grass	32.0
Annual Rye	65.0
Total PLS per Acre = 100.0	

Seeding may be done with a drill press, drop, cyclone or vertical groove spreader or a hydro-seeder. For areas too small to operate the necessary machinery, broadcast seeding and hand raking it into the soil will be permitted.

The planting area shall be raked to form grooves prior to placement of seed. After placement of seed, the area shall be lightly raked to ensure proper seed-soil contact.

Topsoil shall be placed on all disturbed areas to a minimum compacted depth of 6".

A commercial fertilizer with a minimum guaranteed analysis of 18-46-0 shall be applied to all areas designated for seed. The application rate shall be 0.0023 lbs/sf.

Following seeding and fertilizer application, a mulch consisting of grass hay or straw shall be blown on and punched into all newly seeded areas. Estimate of quantity for mulch is based on an assumed coverage of 2 tons per acre. No rye straw will be used.

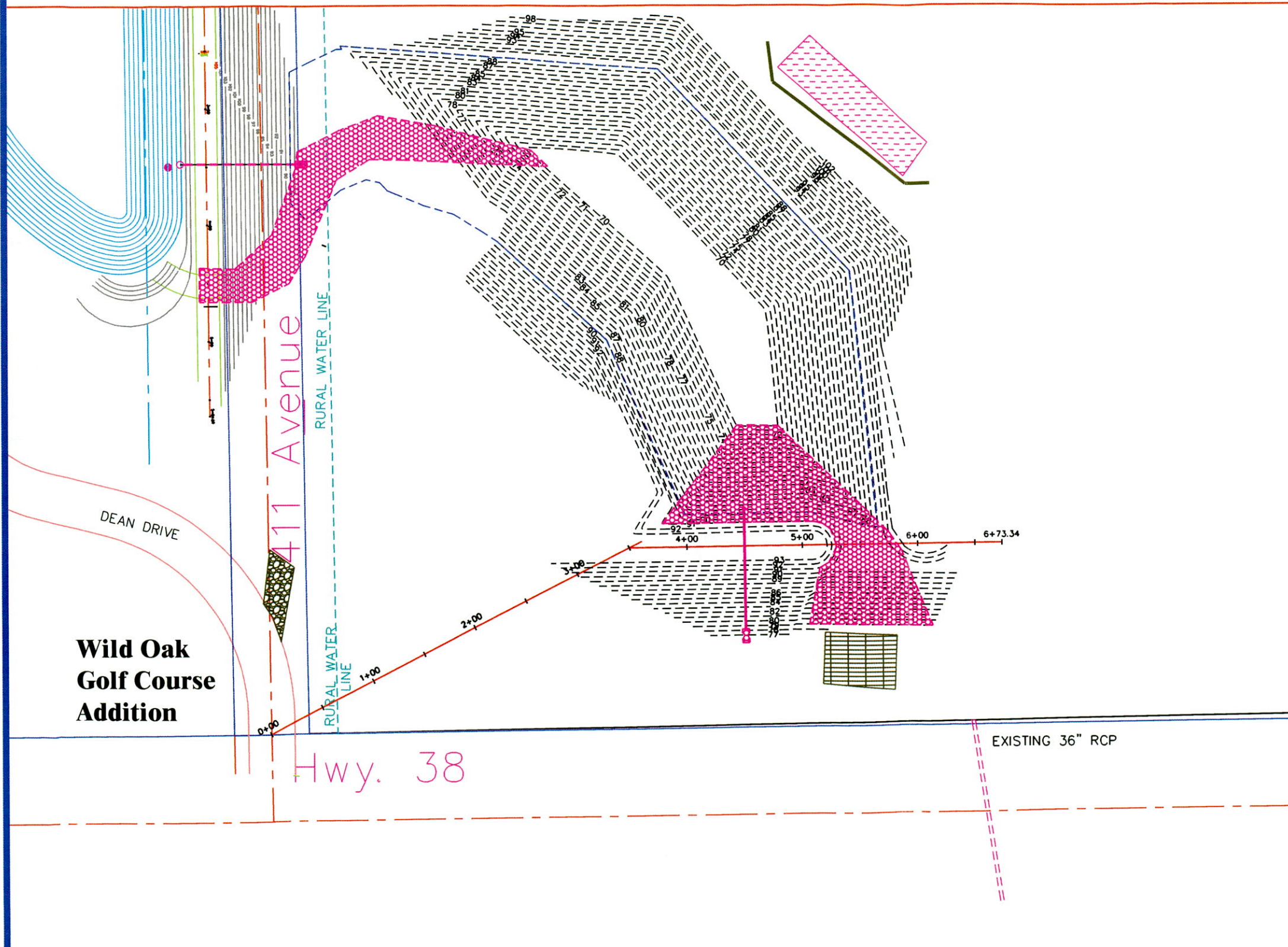


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Rev:	By:	Date:

WILD OAK GOLF COURSE – EAST RESERVOIR
GENERAL NOTES
DATE: 9-2004
DESIGNED BY: KJH
DRAWN BY: KJH
CHECKED BY: RRS
PROJECT: 70052.04
DRAWING: 70052-04.dwg
CONST

EROSION CONTROL PLAN



NOT TO SCALE

LEGEND

-  = VEHICLE TRACKING STATION
-  = TEMPORARY SEDIMENTATION POND
-  = TEMPORARY SILT FENCE
-  = TOPSOIL STOCKPILE
-  = RIP RAP



JSA

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WILD OAK GOLF COURSE - EAST RESERVOIR
EROSION CONTROL

DATE: 9-2004 DRAWN BY: KJH PROJECT: 70052.04
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Sheet No.
K-1

EROSION CONTROL NARRATIVE

EROSION CONTROL NARRATIVE

Primary Responsible Party: Wild Oak Golf Course
117 S. Lawler
Mitchell, South Dakota

Contractors: _____

Project Description:

The project consists of constructing a dam/dugout (height less than 25') to impound water for irrigation of the Wild Oak Golf Course. Work on this project will include excavation for the reservoir, constructing an earthen dam, an outfall structure for the reservoir and emergency spillway. Rip rap will be installed along the dam face, at the outlet point of the outfall structure and on the emergency spillway. The project is contained in SW ¼ of the SW 1/4 of Section 24, T103N, R60W, of the 5th PM in Davison County. Silt fence will be installed around the topsoil pile and a temporary sedimentation basin will be constructed.

Existing Site Conditions:

The low point on the property is the drainage way which runs from the existing dam outlet on the west edge to the existing 36" RCP under SD Hwy 38 on the south edge of the proposed project. The adjacent areas on the north, east and west drain towards the drainage way and will remain the same after construction.

Adjacent Areas:

This project drains south through an existing 36" RCP under SD HWY 38. The Wild Oaks Golf Course Addition is located on the west side of the project, SD Hwy 38 is on the south side of the project, private pasture land is on the east and north side of the project.

Soils:

Natural soils in the project area are alluvial deposits along the drainage way and sandy lean clay farther away from the drainage way.

Area and Volume:

The approximate area to be graded is 3.64 acres. Approximately 21,827 CY of unclassified excavation.

Erosion and Sediment Control Measures:

Erosion control measures to be installed and removed as grading progresses. Erosion control measures shall be maintained by the Contractor or his designated representative at all times during construction.

Permits will not be issued until the site passes the initial inspection and the Contact Information sign is properly posted onsite.

A tracking station shall be constructed at the access point off Dean Drive and SD Hwy 38.

Temporary Silt Fence will be installed around the lower side of topsoil stockpile.

Rip Rap shall be placed on the face of the dam, at the outlet of the reservoir outfall structure and on the emergency spillway as permanent Erosion Control Measures.

A Temporary Sedimentation Basin shall be constructed at the downstream end of proposed grading area.

Area for Stockpiles and Storage:

Topsoil shall be stockpiled northeast of the proposed reservoir. Temporary silt fence will be placed along the down slope side of the piles.

Time Schedule:

- 1 week Stockpile topsoil, install tracking station, begin grading site
- 1 week Construct reservoir outfall structure, dam core, continue grading
- 1-2 weeks Complete grading, place rip rap
- 1 week Place topsoil, seeding, general cleanup

After construction begins, soil surface stabilization shall be applied within 14 days to all disturbed areas that may not be at final grade but will remain dormant (undisturbed) for periods longer than an additional 21 calendar days. Within 14 days after final grade is reached on any portion of the site, permanent or temporary soil surface stabilization shall be applied to disturbed areas and soil stockpiles.

Table 12.1

Maximum Time Limits of Land Exposures for Selection of Erosion Controls

Erosion Control Method	Maximum Allowable Period of Exposure (Months)
Surface Roughening	1
Mulching	12
Temporary Revegetation	12-24
Permanent Revegetation	24 or more
Soil Stockpile Revegetation	2
Early Application of Road Base	1

Permanent Stabilization Practices:

Rip Rap shall be placed on the face of the dam, at the outlet of the reservoir outfall structure and on the emergency spillway.

Seeding will be placed within 2 weeks of final grading (dependent on weather).

Stormwater Management Considerations:

Drainage from adjacent properties on the north, east and west flows onto this project, no protection required. Drainage from the project flows south to the existing culvert under SD Hwy 38. A temporary sedimentation basin will be constructed at the lower end of the project site.

Maintenance:

Inspection of erosion and sediment control measures should be scheduled weekly and following any storm event of 0.5 inches or greater. All measures shall be maintained in good working order. Inspection and maintenance procedures will continue until all disturbed areas are stabilized.

Construction Site, Nonstructural Control Measures and Other Information:

- Spill Prevention - Fertilizers will be according to manufacturer's recommendations.
- Concrete Trucks will not be allowed to wash out or discharge surplus on the site.
- Petroleum products - Onsite construction equipment will be monitored for leaks and receive regular preventative maintenance.

Spill Control Practices - Spill of toxic or hazardous material will be reported to the appropriate state or local government agency. All spills will be cleaned up immediately after discovery.

Site Plan - The existing contours and proposed contours are shown at one foot intervals. The grading limits, silt fence, vehicle tracking station are shown on the erosion control plan.

Has a Notice of Intent been filed with SD DENR? Yes with the plans for review.

Are Wetlands onsite? Drainageway was determined to be non-jurisdictional on the adjacent property to the west.

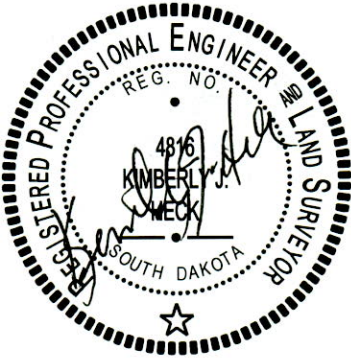
Project Inspection Priority: Low

Contractor's Acknowledgement of responsibility:

The Contractor (or Contractor's Representative Acknowledging the review and acceptance of responsibility for the erosion and sediment controls.

Signed: _____ Date: _____

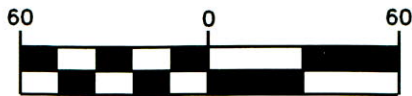
Contractor: _____



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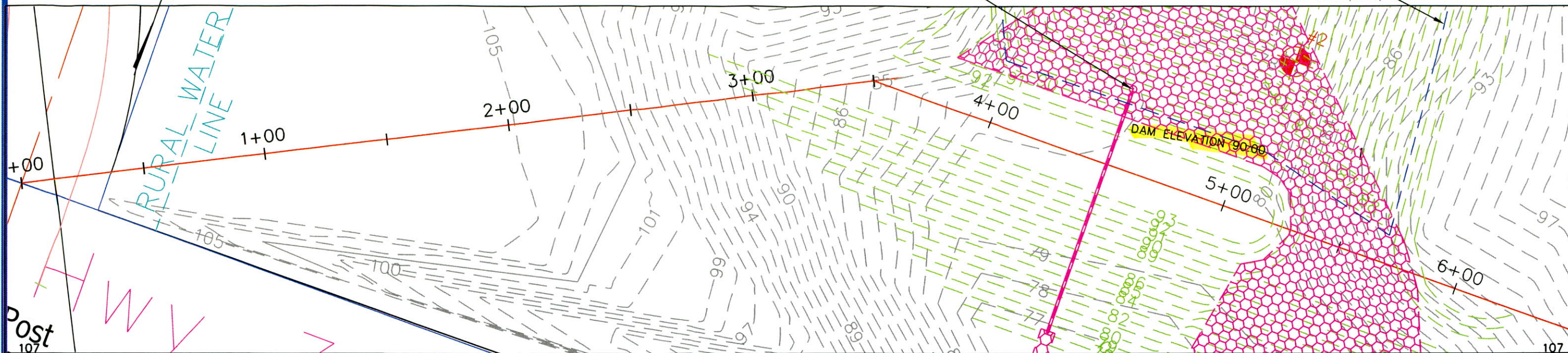
WILD OAK GOLF COURSE – EAST RESERVOIR
EROSION CONTROL
DATE: 9-2004
DESIGNED BY: KJH
DRAWN BY: KJH
CHECKED BY: RRS
PROJECT: 70052.04
DRAWING: 70052-04.dwg
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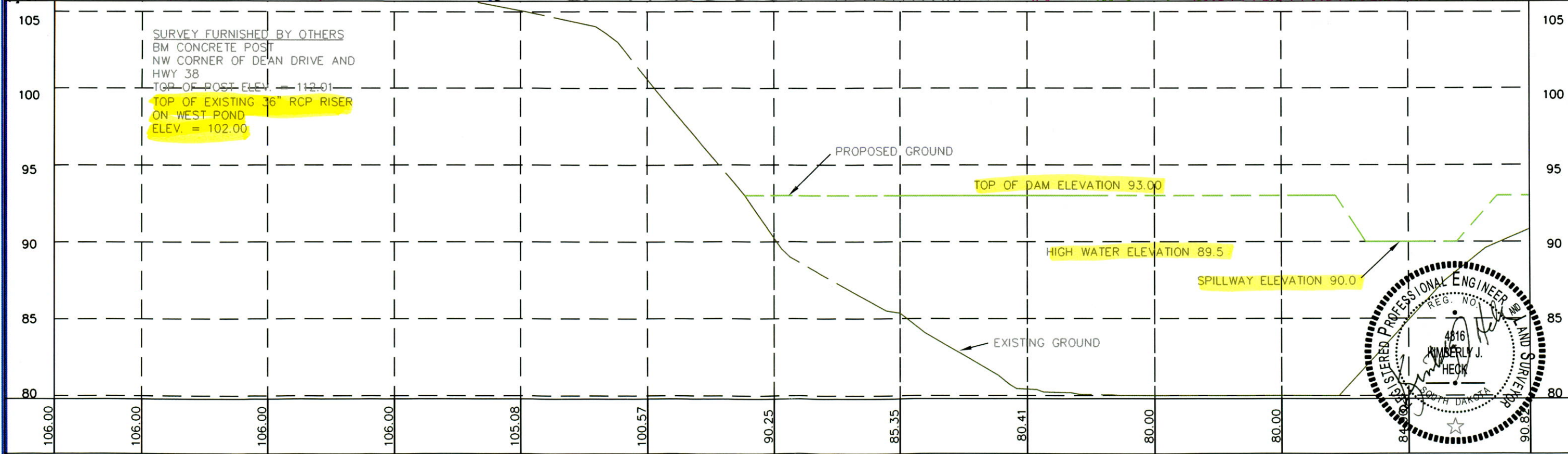
EMERGENCY SPILLWAY
ELEVATION = 90.0 WITH 2%
CROSS SLOPE
AND 2% SLOPE STARTING AT
ENTRANCE OF SPILLWAY TO
DOWNSTREAM SIDE OF DAM

STA. 4+50 - 32' LT
PRINCIPAL SPILLWAY STRUCTURE
FURNISH AND INSTALL 36" RCP RISER WITH BASE SLAB
BASE SLAB DIMENSIONS SHALL BE
51" DIAMETER X 8" THICK
TOP OF CONCRETE RISER ELEV. = 89.50
12" CORR. POLY PIPE INV. ELEV. = 79.50
SEE DETAILS SHEET R-1

STA. 4+50 - 32' LT TO STA. 4+50 - 72' RT
INSTALL 104 LF OF 12" CORR. POLY. PIPE @ 1.44%
INV. IN = 79.50
INV. OUT = 78.00
INSTALL 6' X 11' OF RIP RAP (WITH FILTER FABRIC
UNDERNEATH) AT THE OUTFALL
APPROXIMATE LOCATION
OF WATER LINE (89.5)



SURVEY FURNISHED BY OTHERS
BM CONCRETE POST
NW CORNER OF DEAN DRIVE AND
HWY 38
TOP OF POST ELEV. = 112.01
TOP OF EXISTING 36" RCP RISER
ON WEST POND
ELEV. = 102.00



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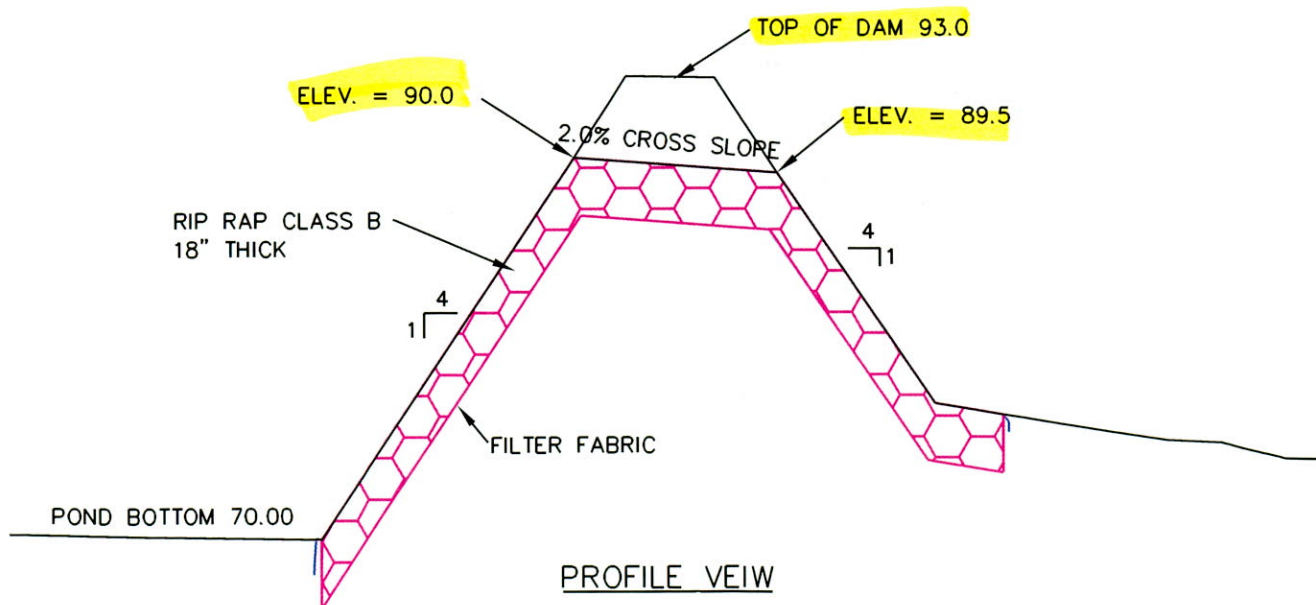
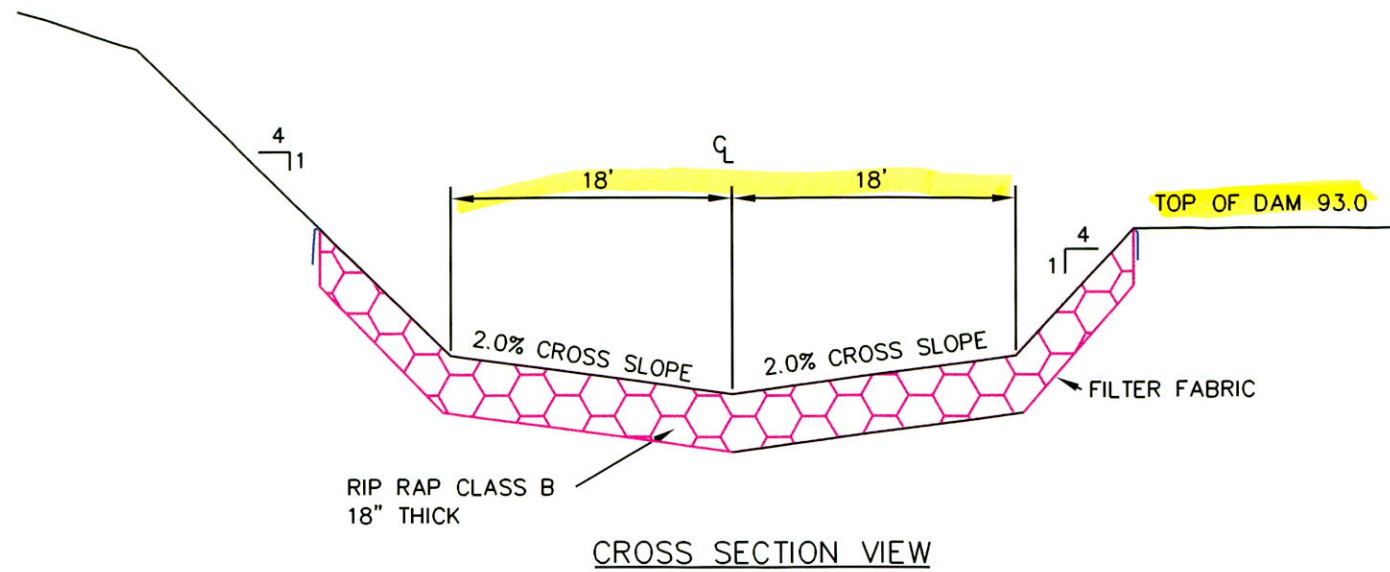
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WILD OAK GOLF COURSE - EAST RESERVOIR
DAM STRUCTURE PLAN AND PROFILE
DATE: 9-2004 DESIGNED BY: KJH
DRAWN BY: KJH CHECKED BY: RRS
PROJECT: 70052.04 DRAWING: 70052-04.dwg

Sheet No.
M-2

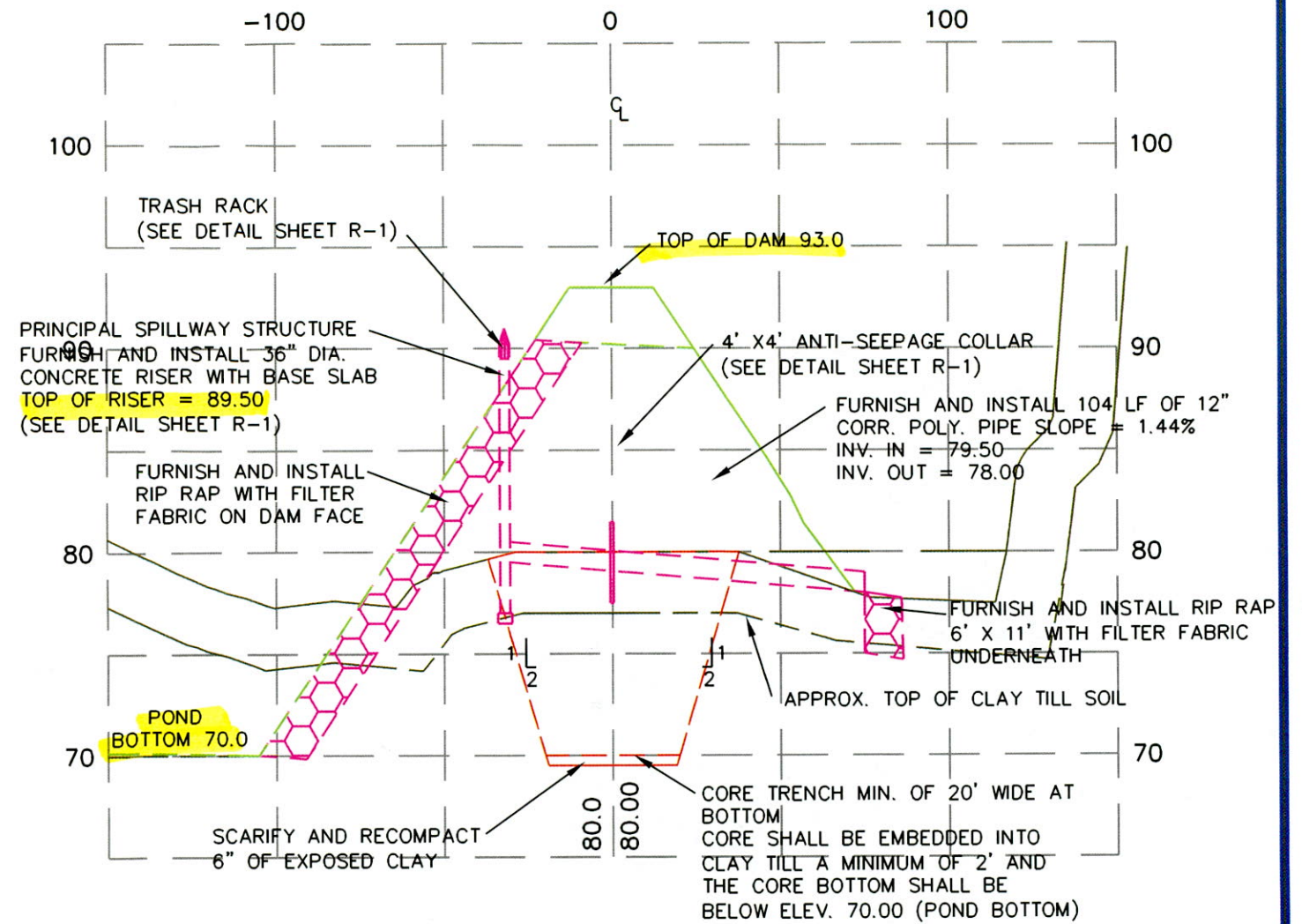
CONST

EMERGENCY SPILLWAY DETAIL
NOT TO SCALE



TYPICAL DAM CROSS SECTION
PRINCIPAL SPILLWAY DETAIL

4+50



COMPLETELY REMOVE ANY SAND SOILS IN THE AREA OF THE CORE



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WILD OAK GOLF COURSE - EAST RESERVOIR
DAM AND PRINCIPAL SPILLWAY CROSS SECTIONS

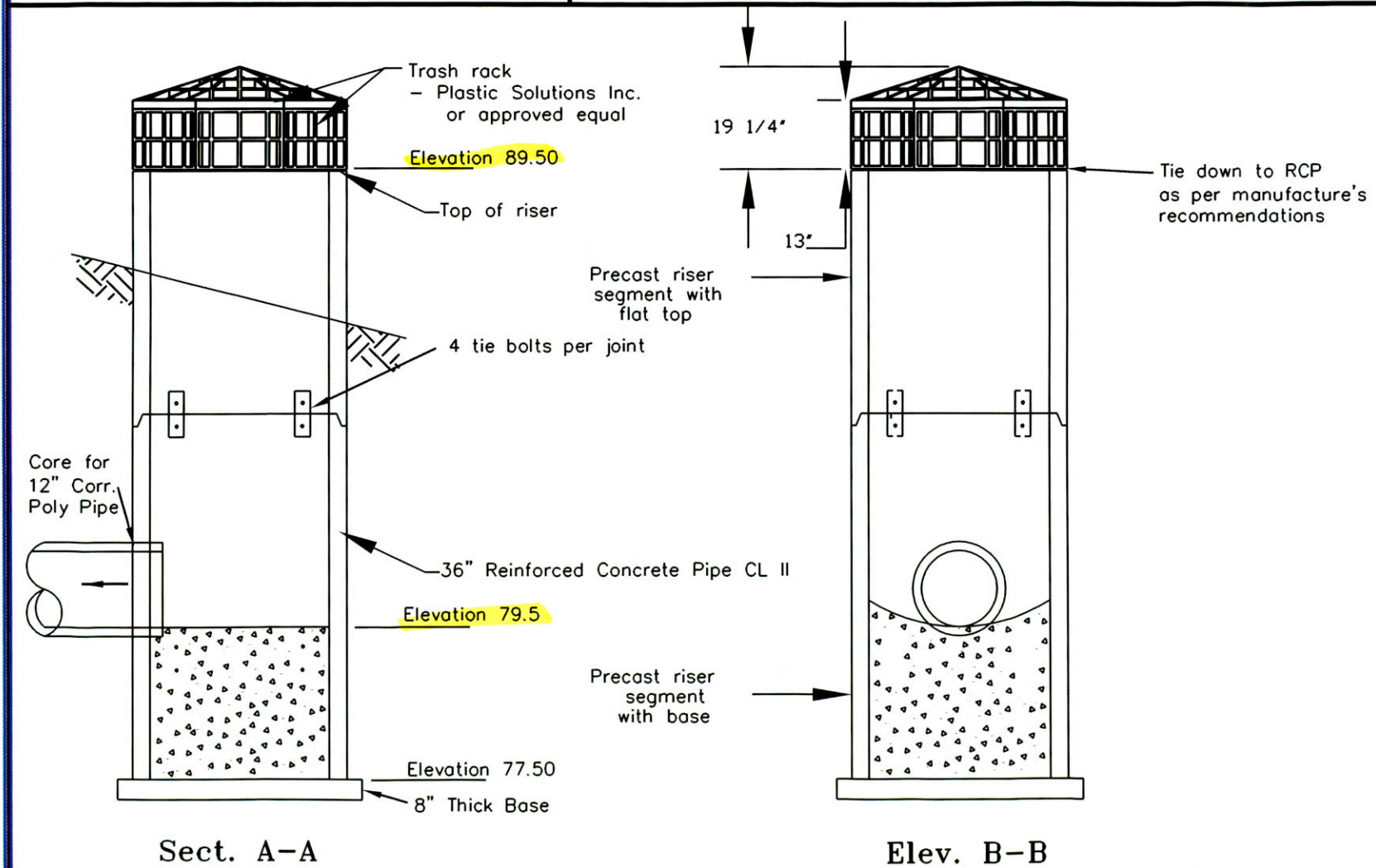
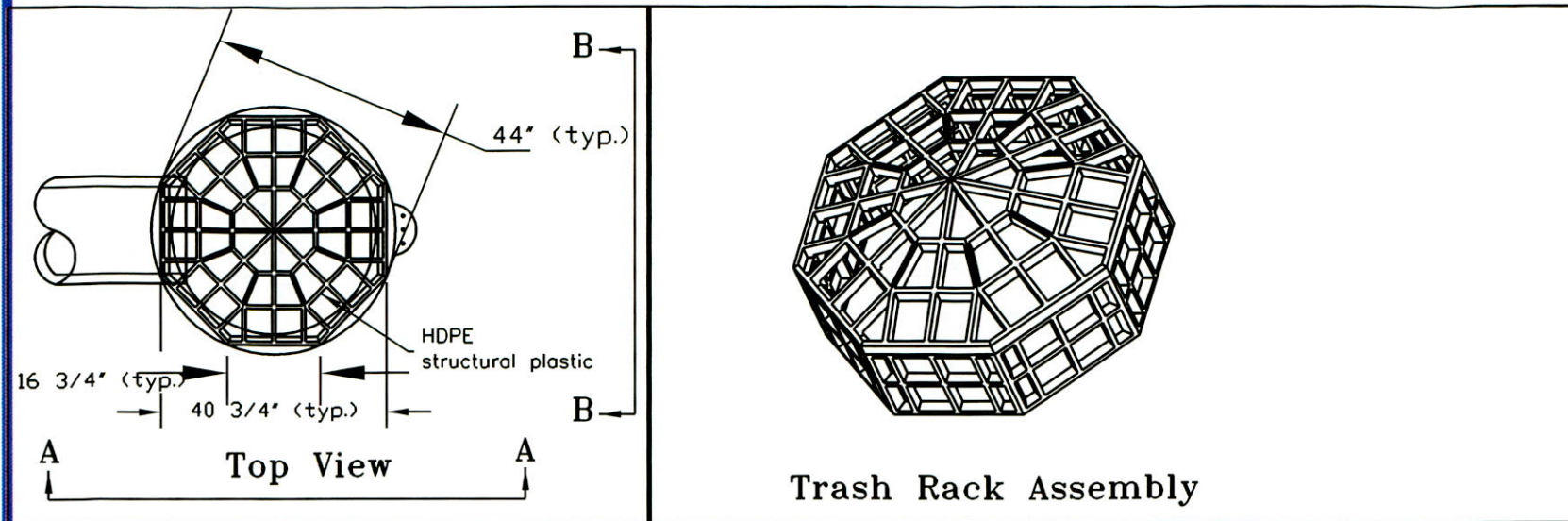
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Sheet No.

M-3

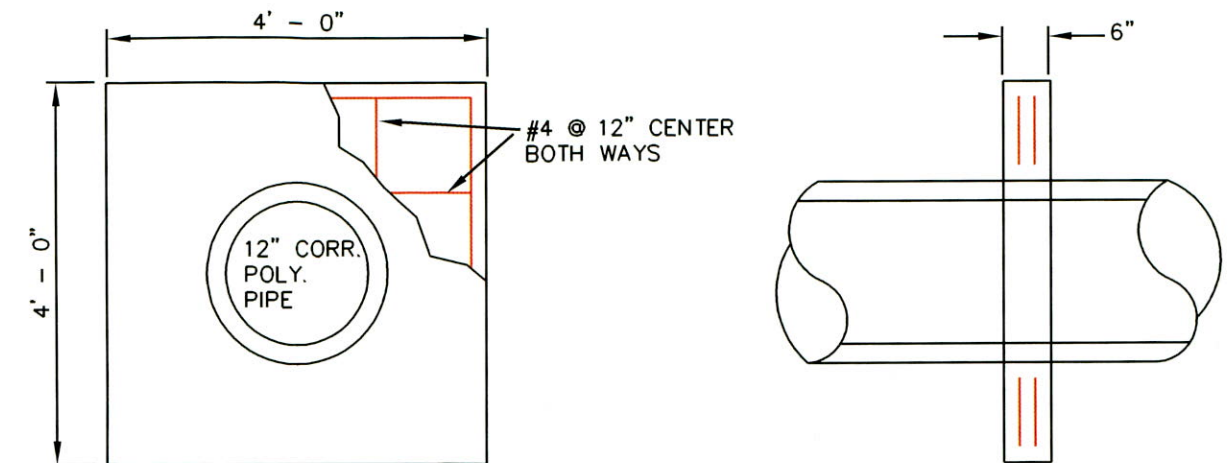
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TRASH RACK FOR 36" CONCRETE RISER

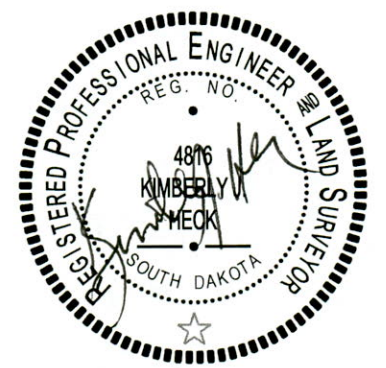


ANTI-SEEPAGE COLLAR

NOT TO SCALE



2" CLEAR COVER FROM ALL EDGES ON REBAR



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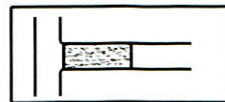
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WILD OAK GOLF COURSE - EAST RESERVOIR
DETAILS - TRASH RACK AND ANTI-SEEPAGE COLLAR

DATE: 9-2004 DRAWN BY: KJH PROJECT: 70052.04
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Sheet No.
R-1



VTC

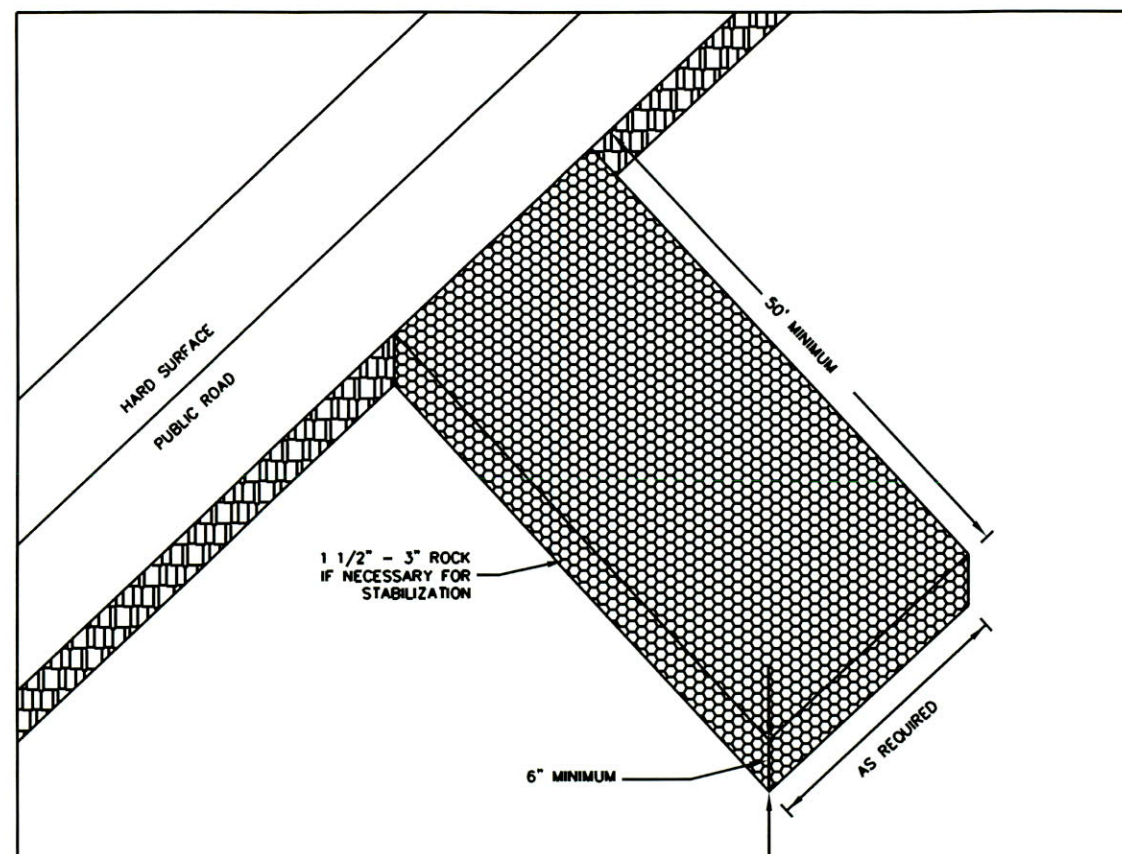
VEHICLE TRACKING CONTROL

DEFINITION:

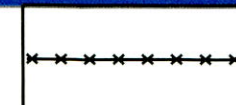
A STONE STABILIZED PAD LOCATED AT POINTS OF VEHICULAR INGRESS AND EGRESS ON A CONSTRUCTION SITE.

PURPOSES:

TO REDUCE THE AMOUNT OF MUD TRANSPORTED ONTO PUBLIC ROADS BY MOTOR VEHICLES OR RUNOFF.



TEMPORARY VEHICLE TRACKING CONTROL



SILT FENCE

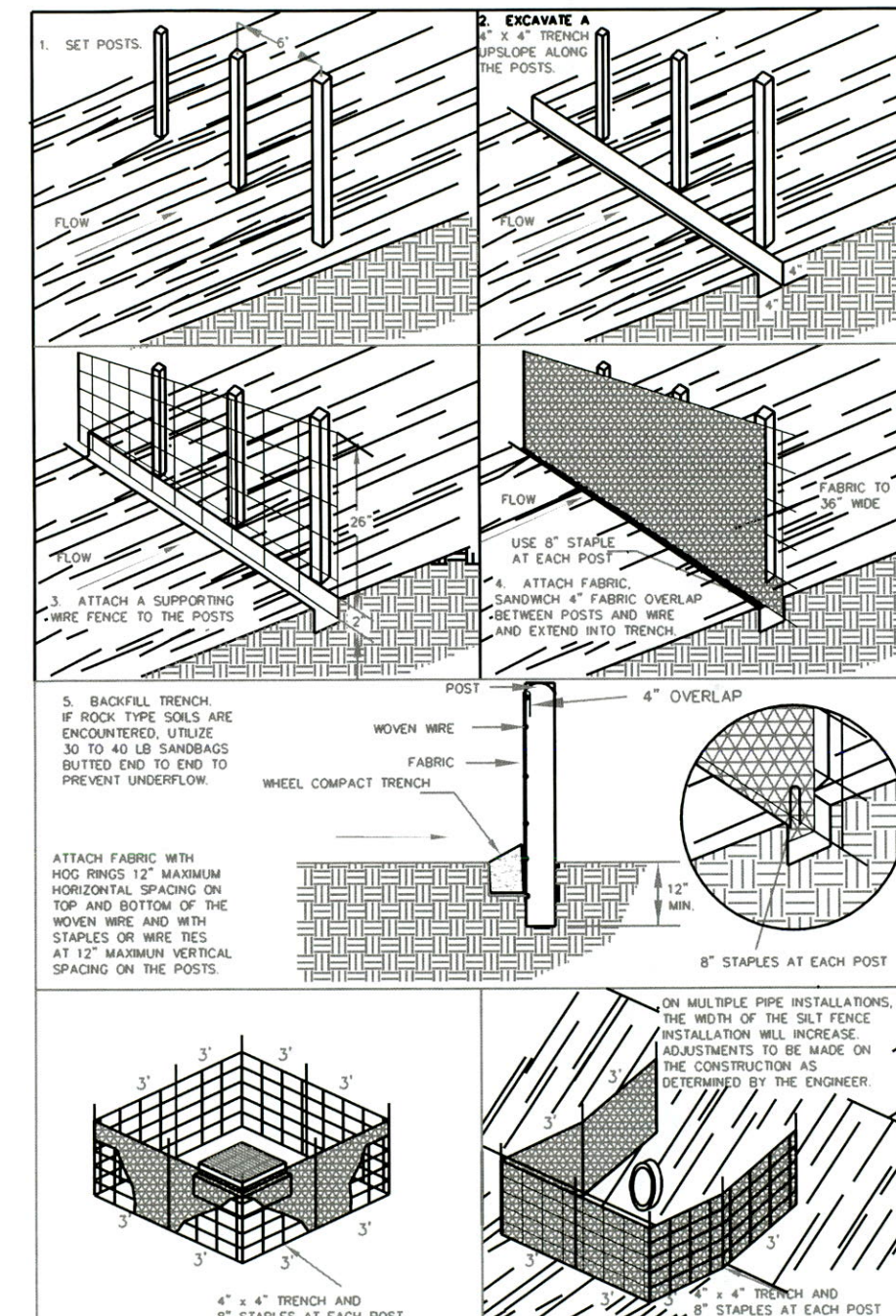
SF

DEFINITION:

A TEMPORARY SEDIMENT BARRIER CONSISTING OF A FILTER FABRIC STRETCHED ACROSS AND ATTACHED TO SUPPORTING POSTS AND ENTRENCHED. THE SILT FENCE IS A TEMPORARY LINEAR BARRIER CONSTRUCTED OF SYNTHETIC FILTER FABRIC AND SUPPORTED BY WOODEN OR STEEL POSTS.

PURPOSES:

1. TO INTERCEPT AND DETAIN SMALL AMOUNTS OF SEDIMENT FROM DISTURBED AREAS DURING CONSTRUCTION OPERATIONS IN ORDER TO REDUCE SEDIMENT IN RUNOFF FROM LEAVING THE SITE.
2. TO DECREASE THE VELOCITY OF SHEET FLOWS AND LOW-TO-MODERATE LEVEL CONCENTRATED FLOWS.



FENCE MATERIAL SHALL CONFORM TO GEOTEXTILE SPECIFICATIONS, SECTION 831 OF SDDOT STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES, 1998 EDITION.

SILT FENCE (WOVEN WIRE)

JSA

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WILD OAK GOLF COURSE - EAST RESERVOIR DETAILS

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Sheet No.

R-2

July 28, 2004

Mrs. Kim Heck
JSA
3700 South West Avenue
Sioux Falls, South Dakota 57105

RECEIVED

SEP 22 2004

**WATER RIGHTS
PROGRAM**

Dear Mrs. Heck:

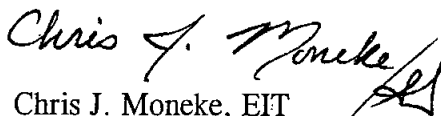
Subj: Geotechnical Exploration Program
Proposed Small Dam
Wild Oak Golf Club
Mitchell, South Dakota
#443-0464

We are pleased to submit the results of our geotechnical exploration program for the referenced project. The geotechnical work was performed in accordance with your verbal authorization of our proposal. Three copies of our report are enclosed for your use.

Representative samples of the soils obtained during our field operations will be retained for a period of one month and will then be discarded. Please advise us in writing if you wish to have the samples retained for a longer period of time.

Thank you for the opportunity to perform these services for you on this project. If you have any questions regarding the contents of this report or if we can be of further assistance to you in any way, please contact us at (605) 332-5371.

Sincerely,


Chris J. Moneke, EIT
Geotechnical Project Manager

g:\...\soils\2004\443-0464 Mitchell Earthen Dam

JSA
SIOUX FALLS, SOUTH DAKOTA

#443-0464

GEOTECHNICAL EXPLORATION PROGRAM
PROPOSED SMALL DAM
WILD OAK GOLF CLUB
MITCHELL, SOUTH DAKOTA

July 28, 2004

MAXIM

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geo-

technical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.*

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

EXECUTIVE SUMMARY

It is our opinion the on-site clay till soils encountered at the site will provide suitable material for the construction of the small dam. The clay till soils were encountered from about 1' to 11.5' below existing grade. Groundwater was encountered during our drilling operations and may affect construction of the dam.

TABLE OF CONTENT

#443-0464

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GEOTECHNICAL EXPLORATION PROGRAM

PROPOSED SMALL DAM

WILD OAK GOLF CLUB

MITCHELL, SOUTH DAKOTA

#443-0464

1.0 INTRODUCTION

1.1 Project Information

We understand the project will consist of the construction of a small dam located near Mitchell, South Dakota. The proposed dam will have an approximate maximum height of 15'.

1.2 Scope of Services

In accordance with authorization received, we have conducted a geotechnical exploration program for the proposed project. The scope of our work under this authorization is limited to the following:

1. To perform five soil borings to explore the subsurface soil and groundwater conditions.
2. To perform nominal laboratory testing to aid in judging soil properties.
3. To present a discussion and engineering recommendations concerning suitability of the on-site soils for use in construction of the small dam.

4. To present recommendations for compaction and moisture control of the borrow soils during construction of the small dam.
5. To point out potential construction difficulties of the dam site.
6. To make recommendations concerning construction observations and testing during construction of the small dam.

1.3 Purpose of Report

The purpose of this report is to present the results of our field and laboratory tests as well as our geotechnical engineering review and recommendations for the project. It should be noted that our work is intended for geotechnical purposes only and not to document the presence or extent of any contamination at the site.

2.0 EXPLORATION PROGRAM RESULTS

2.1 Scope of Exploration

Five soil borings were performed at the site on July 14 and 15, 2004. The site is located on the east side of South Gale Road and is between Highway 38 and East 1st Avenue. The site is located in the southwest quarter of Section 24, Township 103 North, Range 60 West in Davison County, South Dakota.

The borings were advanced at the locations shown on the sketch in Appendix A. Some settlement of the soils used to fill the open bore holes should be anticipated and final closure of the holes is the responsibility of the client or property owner.

2.2 Site Surface Conditions

The site consisted of hilly grassland at the time of our subsurface exploration. The surface elevations at the boring locations ranged from 1286.0' to 1293.0' based on the information provided by GPS.

2.3 Site Subsurface Conditions

A review of the boring logs performed at the site suggests a general soil profile consisting of 1' to 1.5' of clay topsoil overlying clay and sand alluvium (water deposited) soils followed by clay till (glacier deposited) soils to a depth of 15.0' to 41.0' below existing grade. In borings #1 and #5, no clay or sand alluvium soils were encountered.

The clay alluvium and clay till soils encountered at the site exhibited a consistency of very soft to soft to medium to stiff to very stiff. The sand alluvium soils encountered at the site exhibited a density of very loose. The consistency and density of the soils is estimated by the "N" values (penetration resistance) shown on the boring logs.

The subsurface conditions encountered at each test boring location are illustrated on logs included in Appendix A. We wish to point out that the subsurface conditions at other times and locations on this site may differ from those found at our test locations. If different subsurface conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed. The test boring logs also indicate the possible geologic origin of the materials encountered.

2.4 Water Levels

Observations for subsurface groundwater were made at the boring locations during our drilling operations. The time and level of the groundwater readings are shown on the boring

logs. Groundwater was encountered only in borings #2 and #3 at 5.8' to 39.5' below existing grade during our drilling operations.

We wish to point out that these groundwater observations are not necessarily a true indication of the static groundwater conditions due to the predominately clay soils encountered at the site. In order to accurately determine static groundwater levels, observation over a long period of time is usually required. Such periods of observation are normally not available in a typical soil boring program. Seasonal and annual fluctuations in groundwater levels can be expected to occur.

It should also be noted that clay till soils typically include sand and gravel lenses and/or layers, which sometimes contain perched groundwater. Generally, if necessary, perched groundwater encountered in this type of soil can easily be controlled with sump pumps.

2.5 Laboratory Test Program

2.5.1 Index Properties

Soil samples were selected for laboratory tests to determine the engineering and index properties. These tests consisted of the determination of moisture content, dry density, and Atterberg limits.

The tests were performed in accordance with the American Society for Testing and Materials (ASTM) procedures. The test results are shown on the boring logs opposite the samples upon which the tests were made.

2.5.2 Proctor Test

The maximum density and optimum moisture content (proctor test) were determined for one soil sample consisting of mostly the lean clay till soils encountered at the site. The maximum density and optimum moisture content were determined in accordance with the Standard Proctor method (ASTM:D698). The results of the proctor test are attached in Appendix A and are titled "Moisture-Density Relations".

2.5.3 Permeability Testing

Upon the determination of the maximum density and optimum moisture content, the sample was submitted to the laboratory for permeability testing. The permeability test was performed on the proctor test specimen, which was remolded to 95% of the maximum density at a moisture content near the optimum moisture content.

The remolded test specimen was tested for permeability using the falling head procedure. The permeability test was performed in a chamber similar to a tri-axial chamber whereby an effective confining fluid pressure of 2.0 pounds per square inch is applied and accurately maintained throughout the test to completely seal off the interface between the specimen and the membrane. A maximum head differential of 5' was utilized for the test. The specimen was allowed to saturate after which readings were taken over a period of several days. The test results present an average of the latter, fairly constant readings. The permeability test results are indicated on the data sheet attached in Appendix A.

3.0 ENGINEERING REVIEW

3.1 Project Data

The engineering recommendations provided in this report are based on our understanding of the project as described in the following paragraphs. The recommendations are valid for a specific set of project conditions. If the characteristics of the project change from those indicated in this section, it is necessary that we be notified so that we can determine whether the new conditions affect our recommendations.

We understand the project will consist of the construction of a small dam with an approximate maximum height of 15'. We assume the upstream slope will have an approximate ratio of at least 3 horizontal to 1 vertical and the downstream slope will have an approximate ratio of at least 2 horizontal to 1 vertical.

3.2 Discussion

Based on the results of our field and laboratory tests, it is our opinion that the clay till soils encountered at the site are suitable for small dam construction. The clay alluvium soils could be used for construction but should not be used for impervious core material unless they are thoroughly mixed with the clay till soils. It should be noted that sand soils could exist in other parts of the site. In areas where sand soils are encountered, additional excavation and placement of select fill should be anticipated.

3.3 Recommendations

3.3.1 Dam

It is our opinion that the on-site clay till soils are a suitable impervious material for dam construction. The clay alluvium soils should not be used for impervious material unless they are thoroughly mixed with the clay till soils. The mixing should be observed by a geotechnical engineer or their representative. The existing clay topsoil should be completely removed from the base of the dam area.

Based on the review of the boring logs, it is our opinion that a sufficient quantity of clay till soils are present at the site for use as core material. The excavation for the core trench should extend 2' into the clay till soils found at a depth of 1' to 11.5' below existing grade. We recommend scarifying and re-compacting a minimum of 6" of the exposed clay till material at the bottom of the excavation. If there are areas where sand soils are exposed at the floor of the core trench elevation, we recommend the complete excavation of the sand soils in these areas. The exposed soils at the base elevation should be thoroughly observed by a geotechnical engineer or their representative for the presence of any unusual soil conditions prior to placement of any fill soils.

The clay core soils should be compacted to at least 100% of the Standard Proctor density (ASTM:D698). The clay core soils should be placed at a moisture content ranging from optimum to 2% over optimum moisture content as determined by the Standard Proctor.

If similar soils are used throughout the dam, an internal drain may be required. This will prevent the dam material from becoming completely saturated. The purpose of the internal drains is to control the seepage patterns and the saturation of the materials comprising the dam.

During construction and once the core has been completed, it should not be allowed to dry out. Drying of the core will cause cracking, which would be very difficult to repair, and may result in seepage rates above the desired rate. Therefore, once the core has been completed, we recommend that compaction tests along with a representative number of permeability tests be performed as soon as possible.

3.3.2 Shrinkage

It is our opinion that the clay alluvium and clay till soils encountered at the site will experience only a small amount of shrinkage when excavated and replaced during the construction of the dam. We recommend that a shrinkage factor of 17% be used for estimation purposes of the earthwork volumes.

3.3.3 Erosion Control

Once the general dam construction has been completed and the core placed and compacted, the embankment in the upstream slope of the dam, which would be subject to erosion, should be protected with some type of protection. This protection could possibly consist of riprap or vegetation excluding legumes. The downstream embankment should also be protected with some type of vegetation.

4.0 CONSTRUCTION CONSIDERATIONS

4.1 Site Excavation

Water should not be allowed to pond in the excavation for any length of time. If the soils are exposed to heavy construction traffic, especially in the presence of excessive moisture, disturbance will occur and additional excavation and backfilling will be required. The clay

alluvium soils encountered at the site could be especially sensitive to disturbance with heavy construction traffic.

All excavations must comply with the requirements of OSHA 29 CFR Part 1926, Subpart P, "Excavation." Reference to this OSHA requirement should be included in the project specifications.

5.0 CONSTRUCTION OBSERVATIONS AND TESTING

The recommendations contained in this report have been made based on the subsurface conditions found at the boring locations. It is possible that there are soil conditions on the site that were not represented by these borings. Consequently, on-site observation during construction is considered integral to the successful implementation of the recommendations. We believe that qualified field personnel need to be on-site at the following times to observe the soil conditions and effectiveness of the construction.

We recommend that a geotechnical engineer be retained during the preliminary site work to aid in identifying suitable material and to aid in determining if unsuitable soils have been satisfactorily removed from the dam area. We suggest that a number of representative soil compaction tests be taken during the placement of the core materials. The purpose of these tests is to document proper compaction and moisture uniformity and compliance with recommendations. Also, we suggest a number of in-place 3" thin walled tube samples of the completed core be taken and tested to document the coefficient of permeability.

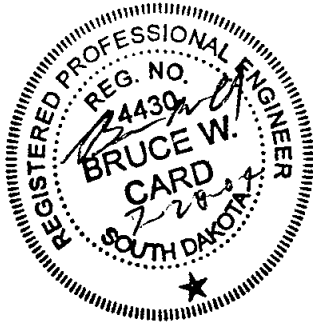
6.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering procedures at this time and location. Other than this, no warranty, either expressed or implied, is intended.

This report was prepared by:

Chris J. Moneke
Chris J. Moneke, EIT
Geotechnical Project Manager

This report is being written in accordance with our quality assurance program. This service is provided as an additional assurance to you that our work was performed with the level of care and skill ordinarily exercised by members of the profession practicing under similar conditions at the time the service is performed.



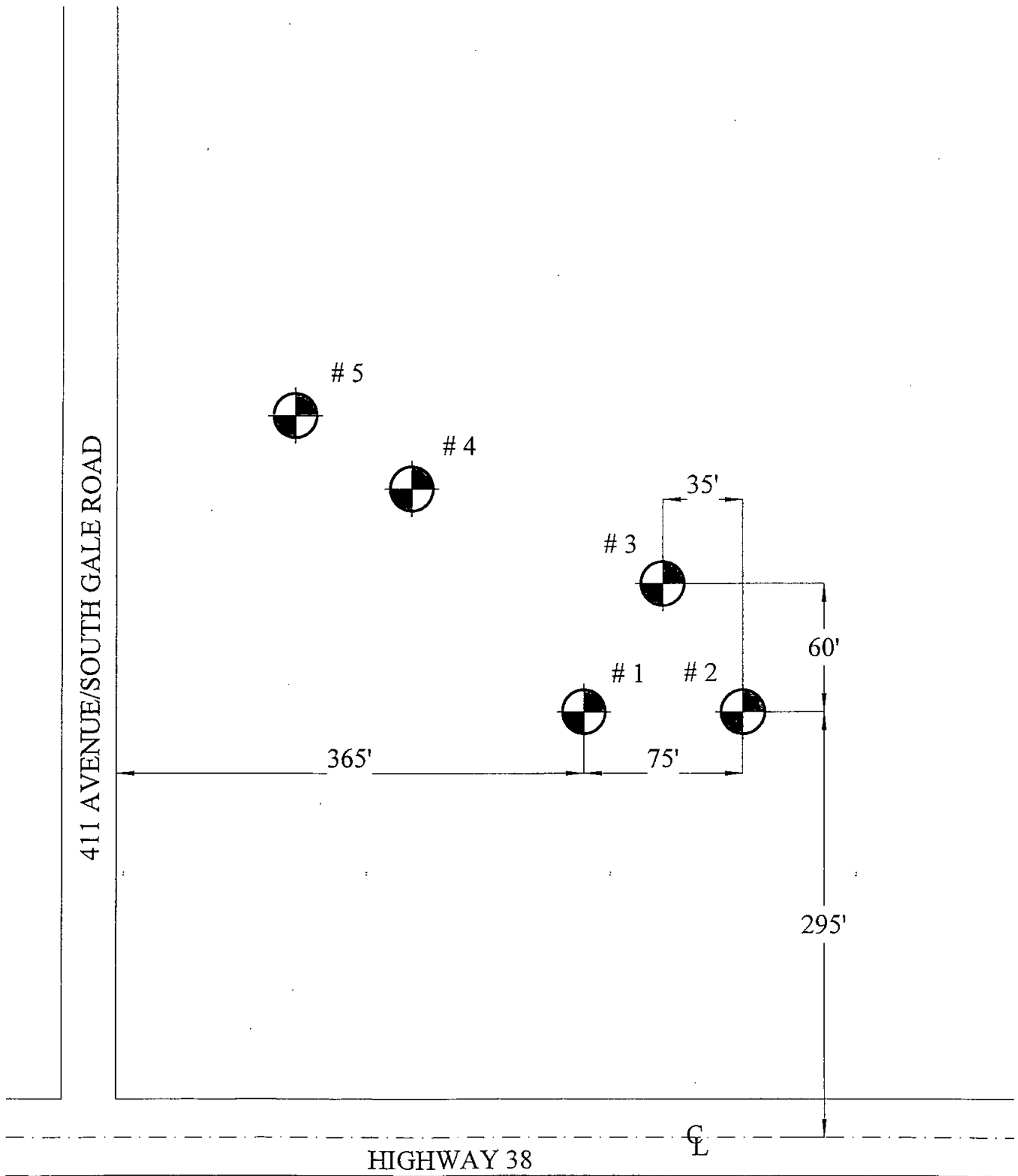
This report was reviewed by:

B. W. Card
Bruce W. Card, PE
Branch Manager

Proofread by: [Signature]



-DENOTES APPROXIMATE SOIL BORING LOCATIONS



LOG OF TEST BORING

JOB NO. 443-0464 VERTICAL SCALE 1" = 6' BORING NO. 1
 PROJECT MITCHELL SMALL DAM, HIGHWAY 38 & 411 AVENUE, MITCHELL, SOUTH DAKOTA SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION <u>1293.0'</u>	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or RQD
1	SILTY CLAY, dark brown, dry, medium (ML-OL)	TOPSOIL		4	1	SB					
	SANDY LEAN CLAY, with a little gravel, brown mottled, moist, stiff to very stiff to stiff (CL)	TILL		11	2	SB	19	102	38	17	
				16	3	SB	17	111			
				21	4	SB					
				23	5	SB					
				15	6	SB					
				14	7	SB					
19	SANDY LEAN CLAY, with a little gravel, gray, moist, stiff (CL)			9	8	SB					
26	END OF BORING			11	9	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/ CAVE-IN	BAILED DEPTHS	WATER LEVEL	START	COMPLETE	
7-15	9:11	26'	24.5'	26'		NONE	7/15/04	7/15/04	
							METHOD		@ 9:00
							3 1/4" HSA 0-24 1/2'		
							CREW CHIEF:	Roger Hanson	

Maxim Technologies, Inc

601 E 48th Street N
 Sioux Falls, South Dakota 57104
 Telephone: 605-332-5371
 Fax: 605-332-8488

LOG OF TEST BORING

JOB NO. 443-0464 VERTICAL SCALE 1" = 6' BORING NO. 2
 PROJECT MITCHELL SMALL DAM, HIGHWAY 38 & 411 AVENUE, MITCHELL, SOUTH DAKOTA SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>1287.0'</u>	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or ROD
1	SILTY CLAY, black, moist, medium (ML-OL)	TOPSOIL		4	1	SB					
	SANDY LEAN CLAY, dark brown, very moist, soft (CL)	MIXED ALLUVIUM		2	2	SB					
4				5	3	SB					
	SANDY LEAN CLAY, with a little gravel, brown mottled, moist, medium to stiff (CL)	TILL		11	4	SB	22	104			
				12	5	SB					
				14	6	SB					
					7	3T					
16				10	8	SB					
	SANDY LEAN CLAY, with a little gravel, gray, moist, stiff (CL)			11	9	SB					
				9	10	SB					
				10	11	SB					
				13	12	SB					
				12	13	SB					
41	END OF BORING										

WATER LEVEL MEASUREMENTS							START	7/14/04	COMPLETE	7/14/04
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD		@ 1:15	
7-14	1:17	41'	39.5'	41'		39.5' ▼	3 1/4" HSA 0-39 1/2'			
CREW CHIEF:							Roger Hanson			

GEOTECHLOG 443-0464.GPJ MAXIMLOG.GDT 7/22/04

Maxim Technologies, Inc

601 E 48th Street N
 Sioux Falls, South Dakota 57104
 Telephone: 605-332-5371
 Fax: 605-332-8488

LOG OF TEST BORING

JOB NO. 443-0464 VERTICAL SCALE 1" = 6' BORING NO. 3
 PROJECT MITCHELL SMALL DAM, HIGHWAY 38 & 411 AVENUE, MITCHELL, SOUTH DAKOTA SHEET 1 OF 1

DEPTH IN FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>1286.0'</u>	GEOLOGICAL ORIGIN	WL	N or CR	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	LL	PL	Qu or ROD
1.5	SILTY CLAY, black, moist (ML-OL)	TOPSOIL			1	○ NSR					
	SANDY LEAN CLAY, dark brown, moist to wet, very soft to soft (CL)	MIXED ALLUVIUM		1/2	2	⊗ SB					
				2 1/2	3	⊗ SB					
6.5	CLAYEY SAND, fine grained, dark brown, wet, very loose (SC)			2	4	⊗ SB					
				1 1/2	5	⊗ SB					
11.5	SANDY LEAN CLAY, with a little gravel, gray and brown mottled, moist, stiff (CL)	TILL		13	6	⊗ SB					
14.5	SANDY LEAN CLAY, with a little gravel, gray, moist, stiff (CL)			14	7	⊗ SB					
				9	8	⊗ SB					
26	END OF BORING			13	9	⊗ SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	HOLE/ CAVE-IN	BAILED DEPTHS	WATER LEVEL	METHOD	START	COMPLETE	
7-14	2:10	26'	24.5'	26'		NONE	3 1/4" HSA 0-24 1/2'	7/14/04		7/14/04
7-14	2:24	26'	—	6'		5.8 ▼				@ 2:10

CREW CHIEF: Roger Hanson

Maxim Technologies, Inc

601 E 48th Street N
 Sioux Falls, South Dakota 57104
 Telephone: 605-332-5371
 Fax: 605-332-8488

JOB NO. 443-0464 VERTICAL SCALE 1" = 6' BORING NO. 4
PROJECT MITCHELL SMALL DAM, HIGHWAY 38 & 411 AVENUE, MITCHELL, SOUTH DAKOTA SHEET 1 OF 1

*Bag sample obtained from 5'-15'. Composite Proctor & Permeability test-see attached sheets.

CREW CHIEF: Roger Hanson

601 E 48th Street N
Sioux Falls, South Dakota 57104
Telephone: 605-332-5371
Fax: 605-332-8488

JOB NO. 443-0464 VERTICAL SCALE 1" = 6' BORING NO. 5
PROJECT MITCHELL SMALL DAM, HIGHWAY 38 & 411 AVENUE, MITCHELL, SOUTH DAKOTA SHEET 1 OF 1

*Bag sample obtained from 1'-15'. Composite Proctor & Permeability test-see attached sheets.

CREW CHIEF: Roger Hanson

601 E 48th Street N
Sioux Falls, South Dakota 57104
Telephone: 605-332-5371
Fax: 605-332-8488

REPORT OF MOISTURE-DENSITY RELATIONS

CLIENT: JSA CONSULTING & ENGINEERING

PAGE 1 OF 1

PROJECT: P SMALL DAM NEAR MITCHELL
GEOTECHNICAL EXPLORATION PRGM
NEAR MITCHELL, SD

PROJECT NO.: 4430464
REPORT NO.: 14938
DATE OF SERVICE: 7/22/2004
AUTHORIZATION:
REPORT DATE: 7/22/2004

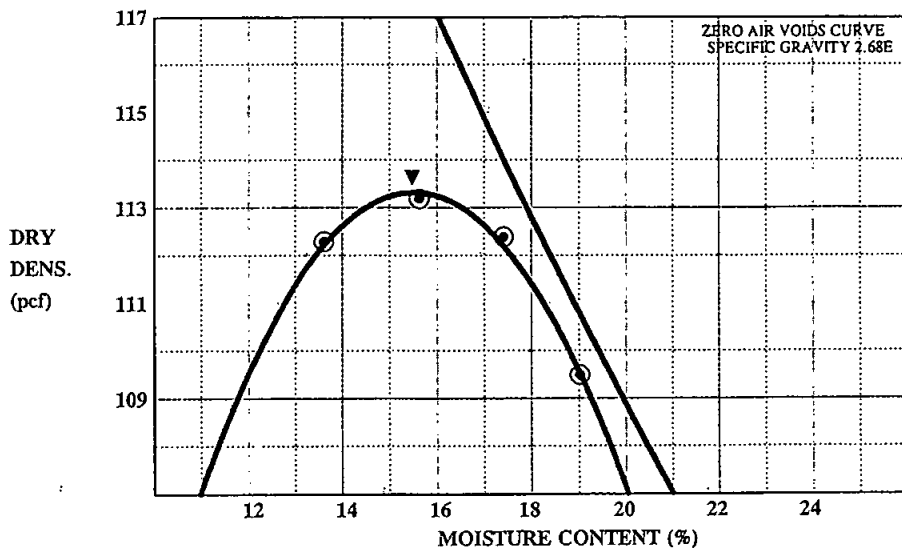
SERVICES:

PROJECT DATA

CONTRACTOR: JSA CONSULTING & ENGINEERING
DATE SAMPLED: 7/22/2004
SAMPLED BY: ROGER HANSON
TEST FOR:
SAMPLE LOCATION: COMPOSITE B #5/#6, SMPLS #2/#4
DEPTH 5'-15' & 1'-15'

TEST DATE: 7/22/2004
MATERIAL: SANDY LEAN CLAY, BROWN
CLASSIFICATION: (CL)
MATERIAL PREPARATION METHOD: Moist
RAMMER TYPE: MANUAL
METHOD OF TEST: ASTM D698, Method A

REPORT OF TESTS



MAXIMUM DENSITY, PCF: 113.5

OPTIMUM MOISTURE (%): 15.5

% PASSING #200: 60.0

E = Estimated Value

Technician: ADAM JOHNSON
SR LAB TECHNICIAN

Report Distribution:
(0) JSA CONSULTING & ENGINEERING

MAXIM TECHNOLOGIES INC.

ADAM JOHNSON
SR LAB TECHNICIAN

PERMEABILITY TEST DATA

PROJECT	Mitchell Small Dam	DATE	7/27/2004
	Highway 38 & 411 Avenue, Mitchell, SD		
REPORTED TO	JSA Consulting	JOB NO.	443-0464

Boring No.	5 & 6			
Sample No.	2 & 4			
Depth	5' - 15' & 1' - 15'			
Type of Sample	Bag			
Soil Classification (ASTM: D 2487) Symbol	Sandy Lean Clay Brown, (CL)			
In-place Moisture Content (%)	16.3			
Moisture Density Relation of Soil (ASTM:D698)				
Max. Dry Density (PCF)	113.5			
Optimum Moisture Content (%)	15.5			
Permeability Test				
Trial No.	12			
Type of Test	Falling Head			
Type of Specimen	Remolded			
Specimen Height (inches)	3.00			
Specimen Diameter (inches)	2.78			
Dry Density (PCF)	107.5			
Percent of Max. Density	95			
Moisture Content (%)	16.3			
Max. Head Differential (ft)	5			
Confining Pressure (effective-PSI)	2			
Water Temperature (°C)	24			
Coefficient of Permeability				
K @ 20°C (cm/sec)	8.68×10^{-8}			
K @ 20°C (ft/min)	1.70×10^{-7}			
Atterberg Limits				
Liquid Limit (%)	Not Tested			
Plastic Limit (%)	Not Tested			
Plastic Index	Not Tested			

GENERAL NOTES

DRILLING AND SAMPLING SYMBOLS

SYMBOL	DEFINITION
HSA	3 1/4" I.D. Hollow Stem Auger
_FA	4", 6" or 10" Diameter Flight Auger
_HA	2", 4" or 6" Hand Auger
_DC	2 1/2", 4", 5" or 6" Steel Drive Casing
_RC	Size A, B, or N Rotary Casing
PD	Pipe Drill or Cleanout Tube
CS	Continuous Split Barrel Sampling
DM	Drilling Mud
JW	Jetting Water
SB	2" O.D. Split Barrel Sample
_L	2 1/2" or 3 1/2" O.D. SB Liner Sample
_T	2" or 3" Thin Walled Tube Sample
3TP	3" Thin Walled Tube (Pitcher Sampler)
_TO	2" or 3" Thin Walled Tube (Osterberg Sampler)
W	Wash Sample
B	Bag Sample
P	Test Pit Sample
_Q	BQ, NQ, or PQ Wireline System
_X	AX, BX, or NX Double Tube Barrel
CR	Core Recovery - Percent
NSR	No Sample Recovered, classification based on action of drilling equipment and/or material noted in drilling fluid or on sampling bit.
NMR	No Measurement Recorded, primarily due to presence of drilling or coring fluid.
	Water Level Symbol

TEST SYMBOLS

SYMBOL	DEFINITION
W	Water Content - % of Dry Wt. - ASTM D 2216
D	Dry Density - Pounds Per Cubic Foot
LL, PL	Liquid and Plastic Limit - ASTM D 4318
Additional Insertions in Last Column	
Qu	Unconfined Comp. Strength-psf - ASTM D 2166
Pq	Penetrometer Reading - Tons/Square Foot
Ts	Torvane Reading - Tons/Square Foot
G	Specific Gravity - ASTM D 854
SL	Shrinkage Limits - ASTM D 427
OC	Organic Content - Combustion Method
SP	Swell Pressure - Tons/Square Foot
PS	Percent Swell
FS	Free Swell - Percent
pH	Hydrogen Ion Content, Meter Method
SC	Sulfate Content - Parts/Million, same as mg/L
CC	Chloride Content - Parts/Million, same as mg/L
C*	One Dimensional Consolidation - ASTM D 2435
Qc*	Triaxial Compression
D.S.*	Direct Shear - ASTM D 3080
K*	Coefficient of Permeability - cm/sec
D*	Dispersion Test
DH*	Double Hydrometer - ASTM D 4221
MA*	Particle Size Analysis - ASTM D 422
R	Laboratory Resistivity, in ohm.- cm - ASTM G 57
E*	Pressuremeter Deformation Modulus - TSF
PM*	Pressuremeter Test
VS*	Field Vane Shear - ASTM D 2573
IR*	Infiltrometer Test - ASTM D 3385
RQD	Rock Quality Designation - Percent

* See attached data sheet or graph

WATER LEVEL

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels may be considered reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for test borings, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeding in reaching the water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

DENSITY TERM	"N" VALUE	CONSISTENCY TERM	Lamination	Up to 1/2" thick stratum
Very Loose	0-4	Soft	Layer	1/2" to 6" thick stratum
Loose	5-8	Medium	Lens	1/2" to 6" discontinuous stratum, pocket
Medium Dense	9-15	Rather Stiff	Varved	Alternating laminations of clay, silt and /or fine grained sand, or colors thereof
Dense	16-30	Stiff	Dry	Powdery, no noticeable water
Very Dense	Over 30	Very Stiff	Moist	Below saturation
Standard "N" Penetration: Blows Per Foot of a 140 Pound Hammer Falling 30 inches on a 2 inch OD Split Barrel Sampler			Wet	Saturated, above liquid limit
			Waterbearing	Pervious soil below water
RELATIVE GRAVEL PROPORTIONS			RELATIVE SIZES	
CONDITION	TERM	RANGE	Boulder	Over 12"
Coarse Grained Soils	A little gravel	2 - 14%	Cobble	3" - 12"
	With gravel	15 - 49%	Gravel	
Fine Grained Soils			Coarse	3/4" - 3"
			Fine	#4 - 3/4"
15-29% + No. 200	A little gravel	2 - 7%	Sand	
15-29% + No. 200	With gravel	8 - 29%	Coarse	#4 - #10
30% + No. 200	A little gravel	2 - 14%	Medium	#10 - #40
30% + No. 200	With gravel	15 - 24%	Fine	#40 - #200
30% + No. 200	Gravelly	16 - 49%	Silt & Clay	- #200, Based on Plasticity

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 - 83

(Based on Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well graded gravel ^F	
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel ^F	
		Gravels with Fines More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F,G,H}	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand ^I	
		Sands with Fines More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G,H,I}	
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silt and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K,L,M}	
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay ^{K,L,M,N} Organic silt ^{K,L,M,O}	
		Silt and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
				PI plots below "A" line	MH	Elastic silt ^{K,L,M}
	organic		$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay ^{K,L,M,P} Organic silt ^{K,L,M,O}	
	Highly organic soils				PT	Peat
	Primarily organic matter, dark in color, and organic odor					

^ABased on the material passing the 3-in. (75-mm) sieve.

^BIf field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^CGravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

^DSands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

$$C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^EIf soil contains $\geq 15\%$ sand, add "with sand" to group name.

^GIf fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^HIf fines are organic, add "with organic fines" to group name.

^IIf soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^JIf Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

^KIf soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^LIf soil contains $\geq 30\%$ plus no. 200, predominantly sand, add "sandy" to group name.

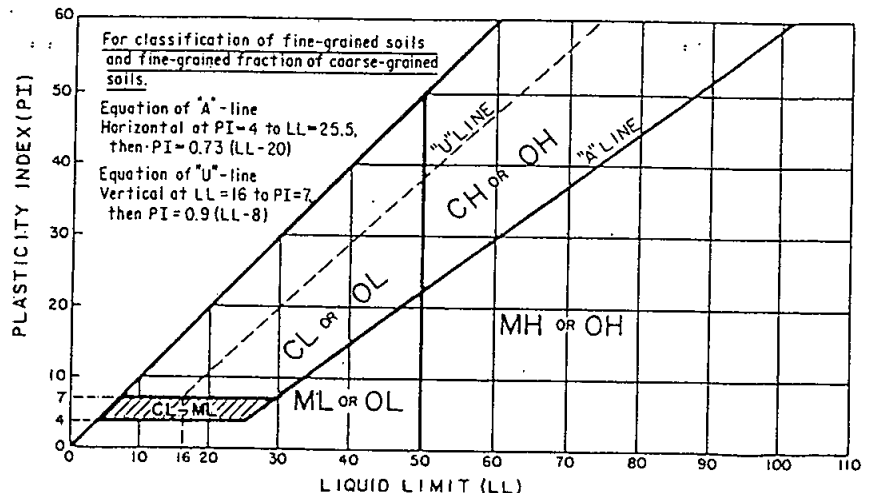
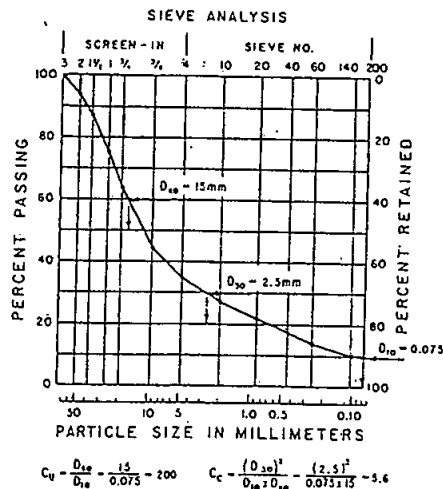
^MIf soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



FIELD EXPLORATION PROCEDURES

Soil Sampling

Soil sampling was performed in accordance with ASTM:D1586. Using this procedure, a 2", outer diameter, split barrel sampler is driven into the soil by a 140 pound weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or "N" values. The "N" value is an index of the relative density of the cohesionless soils and the consistency of cohesive soils. Thin walled tube samples, if taken, were obtained according to ASTM:D1587 where indicated by the appropriate symbol on the boring logs. Rock core samples, if taken, were obtained by rotary drilling in accordance with ASTM:D2113. Power auger borings, if performed, were done in general accordance with ASTM:D1452.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM:D2487. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. Logs of the borings indicating the depth and identification of the various strata, the "N" value, water level information and pertinent information regarding the method of maintaining and advancing the drill holes are attached. Charts illustrating the soil classification procedure, the descriptive terminology and the symbols used on the boring logs are also included in Appendix A.

Maxim Technologies Inc®

GLOSSARY OF TERMS

AGGREGATE	Mineral material such as sand, gravel or combinations thereof.
ALLOWABLE BEARING PRESSURE	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
ALLUVIUM	Deposits from modern rivers.
ARGILLACEOUS	Rocks composed of or having a notable proportion of clay in their composition.
ARENACEOUS	Derived from or containing sand.
BACKFILL	A specified material placed and compacted in a confined area.
BASE COURSE	A layer of specified material placed on a subgrade or subbase.
BEDROCK	The solid rock underlying soils and other earthy surface formations.
BENCH	A horizontal surface in a sloped deposit.
BLOCKY STRUCTURE	Soil particles arranged around a point with the three dimensions of the same order of magnitude.
CAISSON	A concrete foundation element cast in a circular excavation, which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
CALCAREOUS	Containing calcium carbonate determined by effervescence when treated with dilute hydrochloric acid.
COLLUVIUM	Mixtures of soil and rock materials moved by gravity usually near base of strong slopes.
COMPACTION	Mechanical densification of soils causing the expulsion of air from the void spaces.
CONCRETE SLAB-ON-GRADE	A concrete surface layer cast directly on a base, subbase or subgrade.
CONSOLIDATION	The reduction of the void ratio of a soil mass due to its own weight or superimposed loads. The time rate of consolidation is dependent on the permeability of the soil and the rate of loading.
CRUSHED ROCK BASE COURSE	A base course composed of crushed rock of a specified gradation.
DIFFERENTIAL SETTLEMENT	Unequal settlement between or within foundation elements of a structure.
ENGINEERED FILL	Specified material placed and compacted to specified density and/or moisture conditions under observation of a representative of a soil engineer.
EXISTING FILL	Materials deposited through the action of man prior to exploration of the site.
EXISTING GRADE	The ground surface at the time for field exploration.
EXPANSIVE POTENTIAL	The potential of a soil to expand (increase in volume) due to the absorption of moisture.

FILL	Materials deposited by the action of a man.
FINISHED GRADE	The final grade created as a part of the project.
HORIZON	The various layers that comprise a soil (A-C) distinguished principally by its texture, color, structure and chemical content.
LOESS	Geological deposit of relatively uniform, primarily silt material presumably transported by wind.
NATIVE SOIL	The naturally occurring soils on the site.
OUTCROP	The exposure of bedrock at the surface of the ground.
OVERBURDEN	Undifferentiated, unconsolidated material directly over a deposit of rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
PUMPING	Phenomenon where the soil surface undulates under transient loads due to applied stress being carried by the fluids in the voids in the soil mass. Severe cases result in rupture of the soil surface.
ROCK	A natural agglomerate of mineral grains connected by strong and permanent cohesive forces. usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
SCARIFY	To mechanically loosen soil or break down existing soil structure.
SETTLEMENT	Downward movement.
SILICEOUS	Containing silica.
SLICKENSIDE	Polished and striated surface that results from friction along a plane of movement.
SOIL	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
STRIP	To remove from present location.
SUBBASE	A layer of specified material placed to form a layer between the subgrade and base course.
SUBBASE GRADE	Top of subbase.
SUBGRADE	Prepared soil surface.
TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
VOID RATIO	The ratio of the volume of voids to the volume of solid particles in a soil mass.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and materials.
VARVE	Alternating thin layers of silt (or fine sand) and clay.
VUG	A cavity, often lined with a mineral of different composition than the parent material.

Schaal, Tim

From: Duvall, Ron
Sent: Thursday, May 22, 2008 9:04 AM
To: Erbele, Garland
Cc: Gronlund, Eric; Schaal, Tim; Beck, Lynn; Rath, Mark
Subject: FW: Atten: Water Rights

Wild Oak may have built a dam on Firesteel to create a pumping point for Permit No. 6314-3. There are some plans and specs in the permit file for a dam but I think they refer one of the holding ponds that are filled from the creek. If true, dumping rubble in the creek may involve the Corps as well as us.

-----Original Message-----

From: St. Sauver, Todd
Sent: Thursday, May 22, 2008 8:45 AM
To: DENR INTERNET INFORMATION
Cc: Petersen, Andy
Subject: Atten: Water Rights

Good Morning,

Yesterday I received an inquiry from the public about the legality of a rubble dam placed across Firesteel Creek immediately below Lake Mitchell in Davison County. This dam is reportedly constructed of concrete highway rubble complete with steel rebar and appears to have been constructed to provide irrigation water for the Wild Oak County Club golf course (996-2084). The person inquiring about this dam is upset because he claims it has blocked fish migration upstream to the base of the Lake Mitchell spillway and he can no longer catch fish there.

I respectfully request that your agency look into this situation to make sure the country club had the right and/or proper permits to block this creek for irrigation purposes. Thank you.

Todd St. Sauver
Regional Fisheries Manager
4500 S. Oxbow
Sioux Falls, SD 57106
Phone: (605) 362-2726
E-mail: todd.st.sauver@state.sd.us

Schaal, Tim

From: Beck, Lynn
Sent: Monday, June 02, 2008 2:10 PM
To: Schaal, Tim
Subject: FW: Firesteel Creek Dam

Here is what I've got so far.

-----Original Message-----

From: St. Sauver, Todd
Sent: Monday, June 02, 2008 1:47 PM
To: Beck, Lynn
Cc: Petersen, Andy
Subject: Firesteel Creek Dam

Lynn,

Michael Blaaid, one of my interns, was the person who discovered this dam and reported it to me. He had a hard time describing exactly where it was but thought it was about 1/2 mile north of the James confluence, probably in Section 25, Mitchell Township. He described the dam as 20-30 yards wide by 6 feet high. It is constructed of scrap concrete with no culverts and is not suitable for driving across. He said the water simply tops the dam on the north side. He mentioned there is a house nearby. His cell phone number is 770-6859 if you'd like to talk to him.

Andy, do you know anything about this dam and would you have some time to attempt to locate it and take some pictures for us?

Schaal, Tim

From: Schaal, Tim
Sent: Friday, October 17, 2008 10:58 AM
To: Tom Lowin (thomas.a.lowin@usace.army.mil); St. Sauver, Todd
Cc: Miller, John (DENR)
Subject: Wild Oak pictures

Tom & Todd---FYI, here are a few pictures of the rock crossing/dam on Firesteel Creek at the Wild Oak Golf Club at Mitchell. I was down there on Tuesday Oct. 14, and visited with Scott Fergen, cell number 656-0008. Picture #1 & #2 are of the "old" dam that washed out several years ago and they moved about 100 yards downstream and constructed the "new" dam. It needs repair and they would like to "do it right" this time. I told them we would need to talk it over here in Water Rights and I would also let the COE and GF&P know about it. They have a Water Permit to divert out of Firesteel, but the Permit does not mention storage, however, the original permit to divert from Firesteel shows a small dam on the Creek. The dams are located in the SW 1/4 of Sec. 24-T103N-R60W.. There was one small culvert, maybe 18" and Scott said there was another where it washed out. He said they would like to be sure it had enough culvert capacity to be sure it did not wash out again. Please let me know if you have any issues or concerns with this project.

Thanks

Tim Schaal
SD DENR
773-3352

10/17/2008



6514-3

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

October 31, 2008

Scott Fergen
Wild Oak Golf Club
117 S. Lawler St.
Mitchell, SD 57301

Dear Mr. Lawler:

As we discussed, enclosed is a map with the area I thought may be irrigated on the new course. Also enclosed are the past two years Irrigation Questionnaires and a copy of Water Permit Application No. 6314-3. The other day, you mentioned irrigation of the home lawns. A couple of problems with that are the time frame, everything should have been developed by May 28, 2007, and you are limited to only 80 acres. Your past Irrigation Questionnaires mention 45 and 50 acres, and I have about 68 acres outlined on the map, but I may have included more area by including some rough. If you want to include the home lawns, it will probably take a new Water Permit Application for additional acres. Please review the map and give me a call.

Sincerely,

Timothy G. Schaal, P.E.
Natural Resources Engineering Specialist
SD DENR Water Rights Program
(605) 773-3352

enclosures





REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
SOUTH DAKOTA REGULATORY OFFICE
28563 POWERHOUSE ROAD, ROOM 118
PIERRE, SOUTH DAKOTA 57501-6174

October 15, 2009

6314-3
RECEIVED
OCT 16 2009
WATER RIGHTS
PROGRAM

South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, South Dakota 57501

Wild Oak Golf Club
Attn: Dave Backlund
117 S. Lawler
Mitchell, South Dakota 57301

CERTIFIED MAIL
RETURN RECEIPT
REQUESTED

Dear Mr. Backlund:

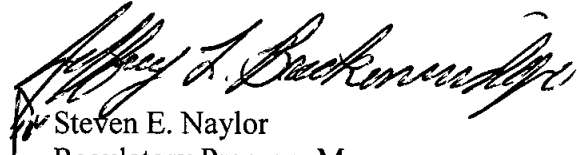
Reference is made to our Section 404 of the Clean Water Act (33 U.S.C. 1344) "Notice of Violation" letter dated November 6, 2008, that was addressed to Mr. Scott Fergen, of your staff. The letter confirmed the unauthorized construction of a rock (broken concrete) crossing/dam on Firesteel Creek constructed by Wild Oak Golf Club in the SW 1/4 of Sec. 24, Township 103 North, Range 60 West, Davison County, South Dakota. At the time, this office allowed that a voluntary restoration plan for removal of the structure could be delayed until an appropriate assessment of the condition of the dam could be conducted.

It is now clear to this office that, due to the condition of the structure, its removal is the most appropriate option, as any practicable repair and remediation attempts would be equivalent to building a new structure. Therefore, in regard to the unauthorized fill material that currently exists below the ordinary high water mark of Firesteel Creek, you are hereby directed to develop a restoration plan on how you intend to remove all unauthorized material from Firesteel Creek. The restoration plan should identify all authorized fill, and describe in detail how you intend to remove the unauthorized material, where the removed material will be placed, and what the final restoration state of Firesteel Creek will be. The restoration plan should include narrative, pictures, and drawings w/dimensions as necessary to clearly describe the restoration process and end state of the restored area. This restoration plan shall be submitted for our approval within 30 days of receipt of this letter. No restoration work shall commence until the restoration plan is approved. Once the restoration plan is approved in writing from this office, the restoration shall be completed within 30 days of the date of written approval. Upon restoration completion, you are to contact this office, so a compliance inspection can be conducted. Failure to comply with this order will result in referral to the US Environmental Protection Agency for resolution of this enforcement action. Compliance with this order will not foreclose the Governments options which may include legal action in Federal District Court for fines. Your continued cooperation in resolving this matter will be factored into our decisions on which options will be pursued.

The federally endangered Topeka shiner is a known resident of Firesteel Creek. This placement of unauthorized fill material may constitute a violation of the Section 9 of the Endangered Species Act. Furthermore, potential impacts to the Topeka shiner caused during the removal of the unauthorized fill shall be considered during the development of the restoration plan. It is recommended that the restoration plan be developed in consultation with the U.S. Fish and Wildlife Service.

Please submit the requested information to the address listed above. Should you have any questions, please contact Thomas Lowin of my staff, at the above address or by telephone at (605) 224-8531.

Sincerely,


Steven E. Naylor
Regulatory Program Manager,
South Dakota

Cf: David LaGrone, U.S. Army Corps of Engineers, Omaha District
Ron Gillen, Brosz Engineering, White Lake, SD
Tim Schaal, SD-DENR, Pierre
Natalie Gates, U.S. Fish and Wildlife Service



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
SOUTH DAKOTA REGULATORY OFFICE
28563 POWERHOUSE ROAD, ROOM 118
PIERRE SD 57501-6174

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NOV - 5 2010

WATER RIGHTS
PROGRAM

November 4, 2010

South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, South Dakota 57501

Wild Oak Golf Club
Attn: Dave Backlund
117 S. Lawler
Mitchell, South Dakota 57301

Dear Mr. Backlund:

This in reference to an on-site inspection completed October 27, 2010 by Jeff Breckenridge of my staff, regarding the voluntary restoration of the unauthorized discharge of fill material into Firesteel Creek in the Southwest Quarter of Section 24, Township 103 North, Range 60 West, Davison County, South Dakota.

Mr. Breckenridge has confirmed that the fill materials have been removed from the stream and placed on an upland site. Accordingly, I am considering the violation resolved.

If you have any questions, please feel free to contact this office at the above address, or telephone Jeff Breckenridge of my staff, or myself at (605) 224-8531.

Sincerely,

Steven E. Naylor
Regulatory Program Manager,
South Dakota

Cf: David LaGrone, U.S. Army Corps of Engineers, Omaha District
Ron Gillen, Brosz Engineering, White Lake, SD
Tim Schaal, SD-DENR, Pierre
Natalie Gates, U.S. Fish and Wildlife Service



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
SOUTH DAKOTA REGULATORY OFFICE
28563 POWERHOUSE ROAD, ROOM 118
PIERRE SD 57501-6174

November 6, 2008

COPY
RECEIVED

NOV - 7 2008

WATER RIGHTS
PROGRAM

South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, South Dakota 57501

Wild Oak Golf Club
Attn: Scott Fergan
117 South Lawler
Mitchell, South Dakota 57301

CERTIFIED MAIL
RETURN RECEIPT
REQUESTED

Dear Mr. Fergan:

Based on information and photos furnished by the South Dakota Department of Environment and Natural Resources (SD-DENR) and a subsequent phone conversation with you on November 4, 2008, this office has confirmed that the rock crossing/dam on Firesteel Creek constructed by Wild Oak Golf Club in the SW 1/4 of Sec. 24, Township 103 North, Range 60 West, Davison County, South Dakota, is in violation of Section 404 of the Clean Water Act (33 U.S.C. 1344).

It is my responsibility to issue this Notice of Violation. My staff is conducting an investigation to determine the most appropriate enforcement action to address this violation.

This office has several options available in regard to this violation. On an administrative level, penalties may be assessed. The Corps may levy a Class I Administrative penalty in an amount not exceeding \$25,000 in a case such as this. Available enforcement options also include actions in Federal District Court for fines and injunctions requiring restoration of the stream channel. However, **voluntary restoration** is a recommended option available to you.

You are advised to acknowledge receipt of this letter within 10 days along with your written explanation, to the best of your knowledge, describing when the dam/crossing was constructed, the methods of construction and materials used, and the purpose and need of the structure. You may also submit a voluntary restoration plan for removal of the structure. A voluntary restoration plan should include a detailed plan describing the methods that will be used to control erosion, protect the stream water quality and restore the site to preconstruction conditions.

Upon resolution of this matter, at any time in the future, you may submit a Department of the Army application for this type of project or any other proposal that would involve work in waters of the United States.

Please submit the requested information to the address listed above. Should you have any questions, please contact Thomas Lowin or Jeff Breckenridge of my staff, at the above address or by telephone at (605) 224-8531 and reference action No. NWO 2008-02860. You can obtain additional information about the Regulatory Program from our website: <https://www.nwo.usace.army.mil/html/od-rsd/frame.html>.

Sincerely,

Steven E. Naylor
Regulatory Program Manager,
South Dakota

CF: LaGrone, U.S. Army Corps of Engineers, Omaha District
Schaal, SD-DENR, Pierre
Miller, SD-DENR, Pierre



DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
SOUTH DAKOTA REGULATORY OFFICE
28563 POWERHOUSE ROAD, ROOM 118
PIERRE, SOUTH DAKOTA 57501-6174

COPY

November 20, 2009

South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, South Dakota 57501

RECEIVED

NOV 23 2009

WATER RIGHTS
PROGRAM

Wild Oak Golf Club
Attn: Dave Backlund
117 S. Lawler
Mitchell, South Dakota 57301

Dear Mr. Backlund:

We have reviewed your restoration plan for the unauthorized construction of a rock (broken concrete) crossing/dam in Firesteel Creek received October 30, 2009. This restoration plan was submitted in response to the Corps of Engineers notice of violation dated October 15, 2009. The site is located in the SW ¼ of Section 24, Township 103 North, Range 60 West, Davison County, South Dakota. Based upon the review, and concurrence from US Fish and Wildlife Service, we approve the restoration plan.

All unauthorized fill material shall be removed in accordance of the approved restoration plan within 30 days of the date of this letter (December 20, 2009). Upon restoration completion, you are to contact this office, so a compliance inspection can be conducted. Failure to comply with this order could result in referral to the US Environmental Protection Agency for resolution of this enforcement action. Compliance with this order will not foreclose the Government's options which may include legal action in Federal District Court for fines. Your continued cooperation in resolving this matter will be factored into our decisions on which options to pursue.

Should you have any questions, please contact Jeff Breckenridge of my staff, at the above address or by telephone at (605) 224-8531, and reference project ID NWO-2008-2860.

Sincerely,

Steven E. Naylor
Regulatory Program Manager,
South Dakota

Cf: David LaGrone, U.S. Army Corps of Engineers, Omaha District
Ron Gillen, Brosz Engineering, White Lake, SD
Tim Schaal, SD-DENR, Pierre
Natalie Gates, U.S. Fish and Wildlife Service



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
SOUTH DAKOTA REGULATORY OFFICE
28563 POWERHOUSE ROAD, ROOM 118
PIERRE, SOUTH DAKOTA 57501-6174

December 12, 2016

South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, South Dakota 57501

Wild Oak Golf Club
Attn: David Backlund
2500 East 1st Avenue
Mitchell, South Dakota 57301

Dear Mr. Backlund:

We have reviewed your request for Department of the Army authorization for the temporary placement of concrete blocks in Firesteel Creek. The project is located in the southwest quarter of Section 24, Township 103 North, Range 60 West, Davison County, South Dakota.

Based on the information you provided, this office has determined that your work is authorized by the Department of the Army Nationwide Permit No. (12), found in the February 21, 2012 Federal Register (77 FR 10184), Reissuance of Nationwide Permits. Enclosed is a fact sheet that fully describes this Nationwide Permit and lists the General Conditions that must be adhered to for this authorization to remain valid. Please note that deviations from the original plans and specifications of your project could require additional authorization from this office. **In addition, the following Special Condition must be adhered to in order for this authorization to remain valid:**

All temporary fills shall be removed in their entirety and the area restored to its preconstruction contours within one month of initial placement.

You are responsible for all work accomplished in accordance with the terms and conditions of the Nationwide Permit. If a contractor or other authorized representative will be accomplishing the work authorized by the Nationwide Permit on your behalf, it is strongly recommended that they be provided a copy of this letter and the attached conditions so that they are aware of the limitations of the applicable Nationwide Permit. Any activity that fails to comply with all of the terms and conditions of the Nationwide Permit will be considered unauthorized and subject to appropriate enforcement action.

In compliance with General Condition 30, the attached Compliance Certification form must be signed and returned to the address listed upon completion of the authorized work and any required mitigation.

This verification is valid until the Nationwide Permit is modified, reissued, or revoked. All of the existing Nationwide Permits are scheduled to be modified, reissued, or revoked prior to March 18, 2017. It is incumbent upon you to remain informed of changes to the Nationwide Permits. We will issue a public notice when the Nationwide Permits are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant Nationwide Permit is modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the Nationwide Permit to complete the activity under the present terms and conditions of this Nationwide Permit.

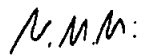
Should you at any time become aware that either an endangered and/or threatened species or its critical habitat exists within the project area, you must immediately notify this office.

You can obtain additional information about the Regulatory Program from our website:
<http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/SouthDakota.aspx>

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. If you do not have Internet access, you may call and request a paper copy of the survey that you can complete and return to us by mail or fax.

If you have any questions concerning this determination, please feel free to contact this office at the above Regulatory Office address, or telephone Harry Decker at (605) 224-8531 and reference action ID NWO-2008-2860-PIE.

Sincerely,


Steven E. Naylor
Regulatory Program Manager,
South Dakota

Enclosures

**U.S. ARMY CORPS OF ENGINEERS
APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT**
33 CFR 325. The proponent agency is CECW-CO-R.

*Form Approved -
OMB No. 0710-0003
Expires: 30-SEPTEMBER-2015*

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO. 2008-2860	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE
--	----------------------	------------------	------------------------------

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME First - David Middle - Last - Backlund Company - Wild Oak Golf Club E-mail Address - davebacklundsr@gmail.com		8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required) First - Drew Middle - Last - Boyden Company - Wild Oak Golf Club E-mail Address - 500magnum@hotmail.com	
6. APPLICANT'S ADDRESS: Address- 2500 E 1st Ave City - Mitchell State - SD Zip - 57301 Country - USA		9. AGENT'S ADDRESS: Address- PO Box 884 City - Mitchell State - SD Zip - 57301 Country - USA	
7. APPLICANT'S PHONE NOs. w/AREA CODE a. Residence b. Business c. Fax (605) 996-2084		10. AGENTS PHONE NOs. w/AREA CODE a. Residence b. Business c. Fax (605) 999-3532	

STATEMENT OF AUTHORIZATION

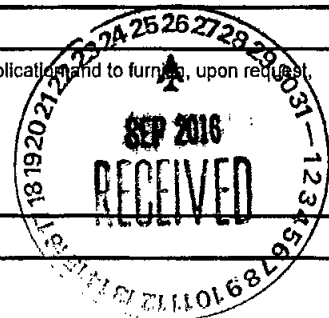
11. I hereby authorize, Drew Boyden to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

SIGNATURE OF APPLICANT

DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions) Fill Pump Dam			
13. NAME OF WATERBODY, IF KNOWN (if applicable) Firesteel Creek		14. PROJECT STREET ADDRESS (if applicable) Address	
15. LOCATION OF PROJECT Latitude: •N 43, 42' 17.0" Longitude: •W 97, 58' 39.2"		City - State - Zip -	
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) State Tax Parcel ID Municipality Section - 24 Township - 103 N Range - 60 W			



17. DIRECTIONS TO THE SITE

Intersection of Hwy 38 and E. 1st Ave. - Proceed 400' N to end of curve on 1st Ave. - Follow gravel driveway approximately 400' NE to Firesteel Creek

18. Nature of Activity (Description of project, include all features)

Construct a dam across Firesteel Creek consisting of 2400# concrete blocks. Length of structure - 70' Height of structure - 3'

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

Raise the water level in Firesteel Creek to adequately submerge an existing irrigation pump intake.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
-------------------------------	-------------------------------	-------------------------------

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres
or
Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address-

City -

State -

Zip -

b. Address-

City -

State -

Zip -

c. Address-

City -

State -

Zip -

d. Address-

City -

State -

Zip -

e. Address-

City -

State -

Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT

DATE

SIGNATURE OF AGENT

DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

PLAN VIEW
FILL PUMP DAM
DAVID BACKLUND SR.
WILD OAK GOLF CLUB

NOT TO SCALE

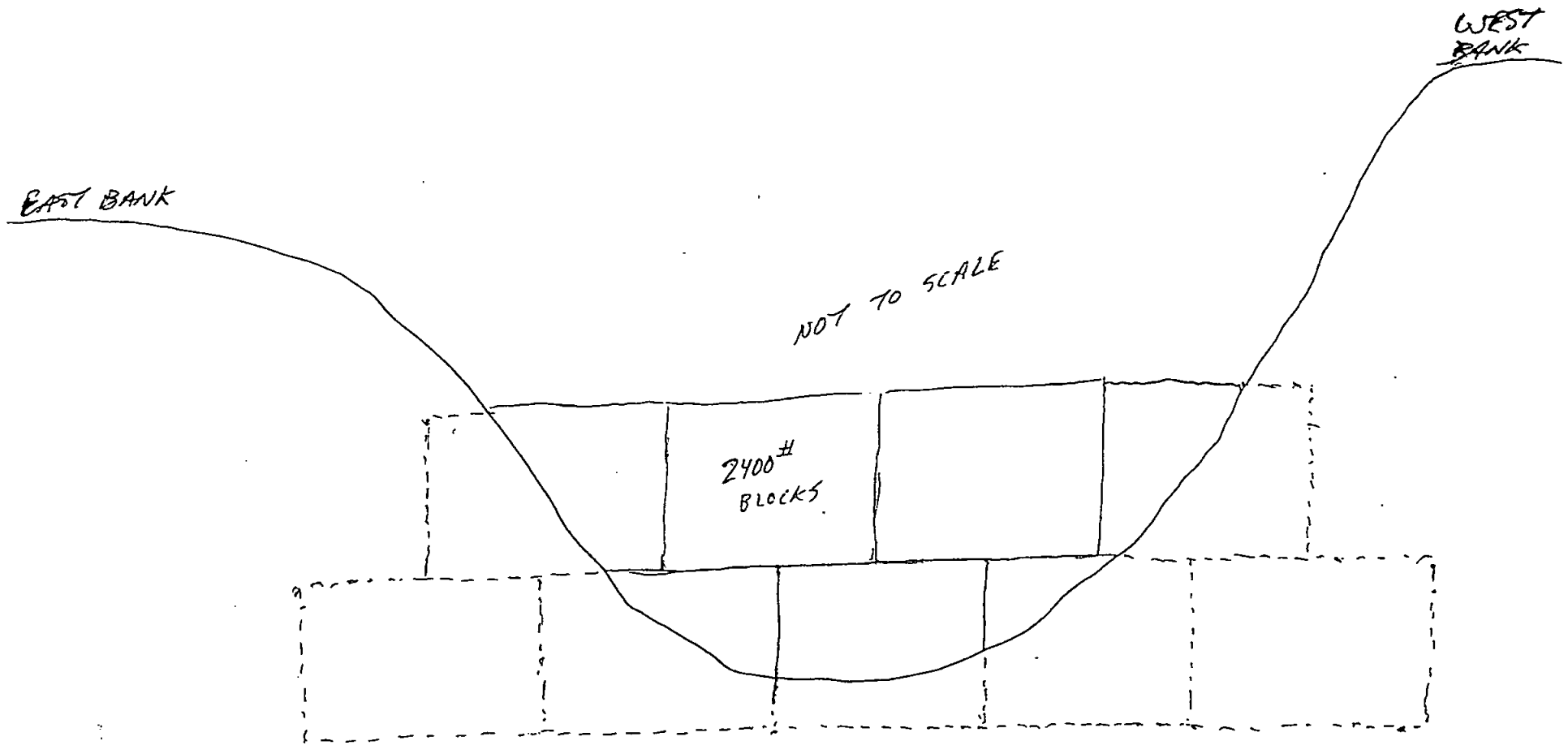
EAST BANK

WEST BANK

DOUBLE STACK
2400# CONCRETE BLOCKS

MAIN
CHANNEL

CROSS SECTIONAL VIEW
FILL PUMP DAM
DAVID BACKLUND SR.
WILD OAK GOLF CLUB



FILL PUMP DAM

VICINITY MAP #1

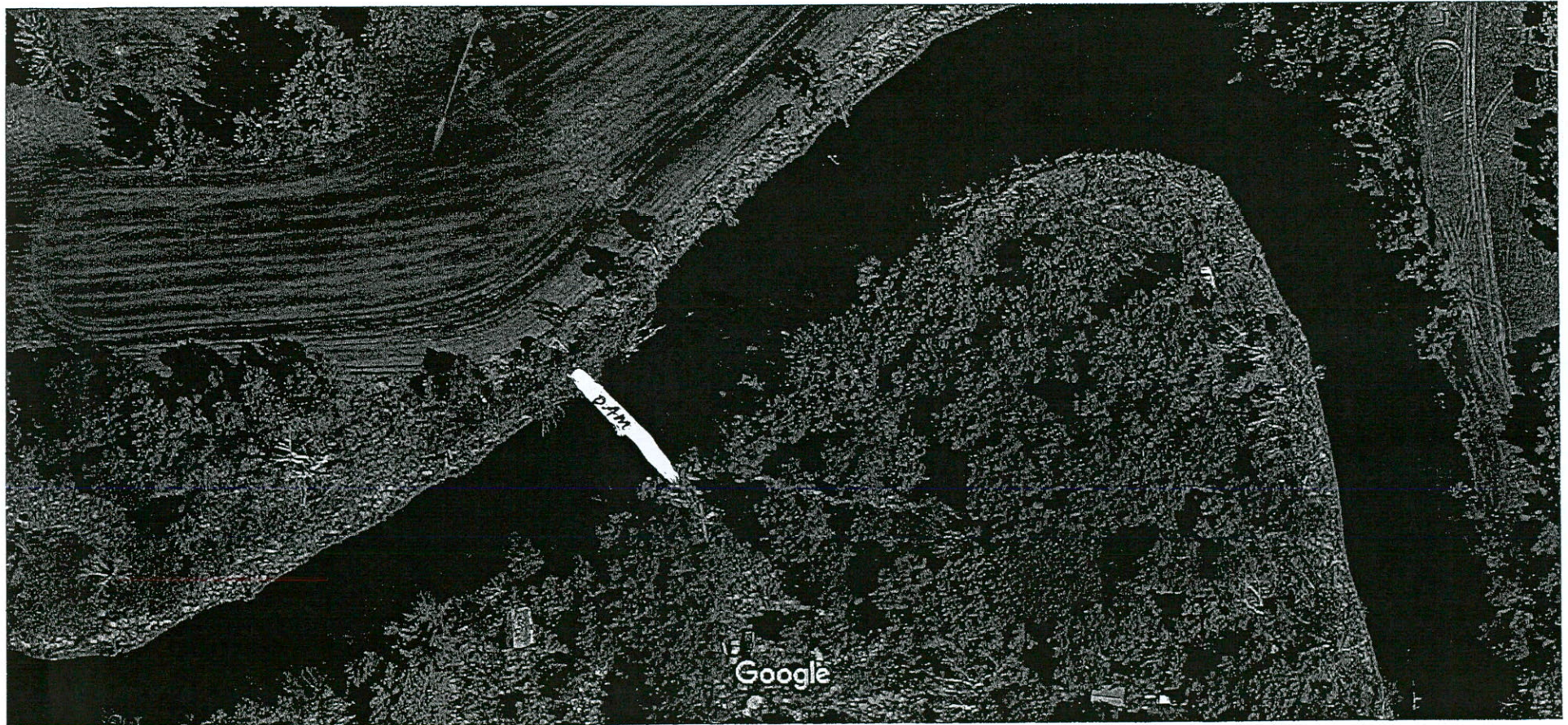
Google Maps

DAVID BACKLUND SR.

WILD OAK GOLF CLUB



Imagery ©2016 Google, Map data ©2016 Google 200 ft



Water Rights Division -DENR
Conversation or File Documentation

NAME OF PERSON OR FILE: Wild Oak Golf Course

ADDRESS: 2500 E. 1st Ave., Mitchell, SD 57301 COUNTY: Davison

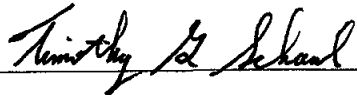
DATE: July 21, 2017 TELEPHONE: 996-2084

RE: concrete barrier on Firesteel Creek

On July 18, 2017, Mike DeFea and I met with the David Backland Sr. (owner) and Scott Fergan (manager) of the Wild Oak Golf Course. We explained to them that we were there to investigate several complaints we received concerning a concrete barrier they constructed on Firesteel Creek in the SE ¼ SW ¼ of Section 24-T103N-R60W and to inspect and license their existing Water Permit No. 6314-3.

Both of them mentioned they had a permit from the Corps of Engineers to construct the concrete barrier. We told them they would also need a Water Right Permit, since they were storing water and affecting the stage, level or flow of Firesteel Creek. We also reminded them, and showed them a copy of a pending incomplete Water Permit Application we had on file to construct the concrete barrier. We discussed what was needed to complete their application, mainly the application fee and an estimate of storage capacity. We reminded them that even though they submit a completed application that it would still need to be advertised and it would likely be contested and may not be approved.

We then made a tour of the golf course, including the concrete barrier, irrigation pumps and storage ponds associated with Water Permit No. 6341-3. Later Mike and I inspected the barrier closer by entering the property from the south. We took several more pictures and measured the water elevation, both on the upstream side and downstream side of the barrier. Using a surveying rod and hand level, we measured the water level on the upstream side to be one foot higher than the water level on the downstream side.



Timothy G. Schaal, P.E.
Natural Resources Engineer IV
--Water Rights Program

Permit No. 6314-3
James River - Water District

Report Of Examination Of Works And/Or Application of Water To Beneficial Use

TO: Chief Engineer, Water Rights Program, DENR, Foss Bldg., Pierre, SD 57501

I have this day, **July 18, 2017**, made a thorough examination of the water use system constructed by **Wild Oak Golf Club % David Backland** of **2500 E. 1st Ave., Mitchell, SD 57301** holder of Permit No. **6314-3**, bearing the priority of **February 26, 2002 for 0.17 cfs additional and February 17, 1967 for 0.5 cfs from Water Right No. 1371-3** authorizing the diversion of **0.67 cfs (300 gpm)** and the storage of **245** acre-feet of the waters of **Firesteel Creek** for **irrigation** purposes, in **Davison** County.

I have to report on the conditions of the same as follows:

A. Works used to divert the water:

Diversion Pt. #1—30 Hp General Electric motor, Model SKE286D77601101 with a Fairbanks Morse turbine pump, 300 gpm capacity, Serial No. MA4845628-17

Diversion Pt. #2 (at West dam)—60 Hp US Electric motor, Model BF59A with Fairbanks Morse Turbine pump, 300 gpm capacity

B. Works used to transport water to place of use:

Buried 6 inch PVC pipe from pump to West storage dam (Dam #1)

C. Works used to apply water to beneficial use:

Golf Course sprinkler irrigation system

The system is in the following condition **good**. The point of diversion is located **Div. Pt. #1—810 ft. north & 760 ft. west of the South ¼ corner (SE ¼ SW ¼) of Sec. 24-T103N-R60W (Lat. 43.70484, Long. -97.97939) and Div. Pt. #2—920 ft. north & 100 ft. west of the SE corner (SE ¼ SE ¼) of Sec. 23-T103N-R60W (Lat. 43.70503, Long. -97.98689)**. The works are capable of diverting and conveying to the place of use **0.67 (300 gpm)** cu. ft. per second of water and storing **47** acre-feet of water which is to be used for **irrigation**. Water has been put to beneficial use to the maximum extent as follows: **all in Sec. 23-T103N-R60W**

SE ¼ SE ¼---17 acres

SW ¼ SE ¼ --14 acres

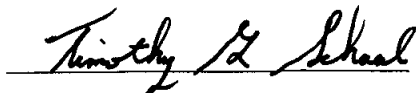
NW ¼ SE ¼ --16 acres

NE ¼ SE ¼ ---21 acres

Total = 68 acres

comprising a total of **68** acres of land and the license should be issued for **0.67 cfs (300 gpm)** and **47** acre-feet of storage. Applicable permit qualifications have been complied with: Yes **X**

Exceptions to compliance are: **none** Date Report Completed: **July 27, 2017**



Timothy G. Schaal, P.E.
Engineer IV
SD DENR, Water Rights Program

REPORT ON INSPECTION OF PERMIT No. 6314-3

Other permit(s) associated with the project: 1747-3 & 1371-3

DATE OF INSPECTION: July 18, 2017

NAME & ADDRESS OF INSPECTION CONTACT/ David Backlund & Scott Fergan

RELATIONSHIP TO PERMIT HOLDER, IF APPLICABLE: owner & manager

DIVERSION POINT LEGAL LOCATION: Div. Pt. #1—810 ft. north & 760 ft. west of the South ¼ corner (SE ¼ SW ¼) of Sec. 24-T103N-R60W (Lat. 43.70484, Long. -97.97939) and Div. Pt. #2—920 ft. north & 100 ft. west of the SE corner (SE ¼ SE ¼) of Sec. 23-T103N-R60W (Lat. 43.70503, Long. -97.98689).

Pump: Div. Pt. #1

- 1) Make Fairbanks Morse turbine pump
- 2) Serial No. MA4845628-17
- 3) Capacity 300 gpm

Pump: Div. Pt. #2

- 1) Make Fairbanks Morse turbine pump
- 3) Capacity 300 gpm

Motor:

- 1) Make General Electric
- 2) Model No. SKE286D776601101
- 3) Horsepower rating 30 hp

Motor:

- 1) Make US Electric
- 2) Model BF59A
- 3) Horsepower 60 hp

SYSTEM TYPE: golf course sprinkler irrigation system

DAM INFORMATION:

Dam #1 (SE ¼ SE ¼ Sec. 23)

- 1) Height to crest 12.5 feet
- 2) Height to primary spillway 8 feet
- 3) Height to secondary spillway 10.5 feet
- 4) Crest width 50 feet
- 5) Crest length 450 feet
- 6) Spillway length XXX feet
- 7) Spillway width 20 feet
- 8) Approx. storage (Normal) 23 acre-feet
- 9) Approx. storage (Maximum) 50 acre-feet
- 10) Date constructed: 2002

Dam #2 (SW ¼ SW ¼ Sec. 24)

- 1) Height to crest 13.5 feet
- 2) Height to primary spillway 10 feet
- 3) Height to secondary spillway 10.5 feet
- 4) Crest width 25 feet
- 5) Crest length 195 feet
- 6) Spillway length XXX feet
- 7) Spillway width 50 feet
- 8) Approx. storage (Normal) 24 Ac-Ft
- 9) Approx. storage (Max.) 34 Ac-Ft
- 10) Date constructed 2004

PERMIT QUALIFICATIONS AND REGULATIONS:

- 1) Soil and water permit lands agree with lands being irrigated and lands listed on permit N/A
- 2) Special qualifications to permit being abided by yes
- 3) All structures, wells and lands on map yes
- 4) Irrigation Questionnaires checked to determine if permit owner started irrigation by the end of construction period yes

NOTES:

1. Water Right No. 1747-3-- still used to irrigate the "old" golf course in Section 24 from groundwater.
2. Water Right No. 1371-3—0.50 cfs from Firesteel Creek with a priority date of February 17, 1967 should be incorporated into Water Permit No. 6314-3 to irrigate the "new" golf course in Section 23.
3. Dam #1—several elevations have been changed to better fit into the golf course configuration and to prevent upstream flooding (see April 2004 DGR report). Dam #2 was added as a Change of Diversion Point (see 2004 letter & JSA P&S). Total storage capacity from both dams is 47 acre-feet and Water Permit No. 6314-3 authorized 245 acre-feet.

Water Permit Application No. 6314-3



0 0.25 0.5 1 Miles



Timothy G. Schaal
Timothy G. Schaal, P.E.
Engineer IV
SD DENR, Water Rights Program
7/27/17

Approval of Location Change and/or Additional Diversion Point(s)

NAME: Wild Oak Golf Club

ADDRESS: 2500 E. 1st. Ave, Mitchell SD, 57301

DATE: July 25, 2017 **COUNTY:** Davison **TELEPHONE:** 996-2084

AUTHORITY:

Pursuant to SDCL 46-5-13.1, the location of a diversion point may be changed or additional diversion points may be licensed provided the following conditions are met and the potential for interference with other existing diversions is not increased:

- **Developed water source same as permitted source and no additional water appropriated**

Yes

- **If irrigation, no new land is irrigated**

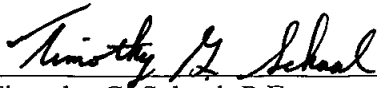
Yes

- **Review of Existing Diversions**

Water Permit No. 6314-3 authorized 245 acre-feet of storage in two ponds located in the W ½ SE ¼, and the SE ¼ SE ¼ of Section 23-T103N-R60W. The pond in the W ½ SE ¼ was never developed, instead a new dam with a storage capacity of 24 acre-feet was constructed in the SW ¼ SW ¼ of Section 24-T103N-R60W. Wild Oak Golf Club was told this would be okay and the location and amount of storage capacity would be corrected when Water Permit No. 6314-3 was licensed. The two dams have a combined storage capacity of 47 acre-feet.

RECOMMENDED ACTION

Based on the above criteria, it is recommended that the diversion point(s) be licensed as developed.



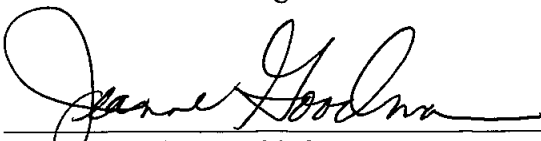
Timothy G. Schaal, P.E.

Engineer IV

SD DENR, Water Rights Program

The Chief Engineer makes a finding pursuant SDCL 46-5-13.1 and ARSD 74:02:01:14.01 that:

This change in location and/or additional diversion point(s) does not increase the potential for adverse effects to existing diversions.



Jeanne Goodman, Chief Engineer

Water Rights Program



July 21, 2017

6314-3
DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

NOTICE AND ORDER

TO: David Backlund
Wild Oak Golf Course
2500 East 1st Ave
Mitchell, SD 57301

FROM: Jeanne Goodman, Chief Engineer
Water Rights Program

SUBJECT: Notice and Order to remove the concrete barrier from Firesteel Creek by August 7, 2017.

Pursuant to SDCL 46-2-18 this notice is an order to remove by August 7, 2017, the concrete barrier installed in Firesteel Creek (see enclosed photo) for the purpose of creating adequate depth of water for the diversion pump (see enclosed photo) all located in the SE1/4 SW1/4 Section 24-T103N-R60W.

On July 13, 2017, the SD Department of Environment and Natural Resources (DENR) Water Rights Program received a phone call and an e-mail from a recreational user of Firesteel Creek indicating a barricade had been constructed across Firesteel Creek. Also on July 13, 2017, the Mitchell Police Department reported to DENR similar information regarding a concrete barrier placed across Firesteel Creek.

On July 14, 2017, Mitchell area SD Department of Game, Fish and Parks (GF&P) staff investigated the situation at DENR's request. GF&P staff confirmed the structure was in place, impounding water, and impacting recreational use. GF&P indicated they also had received complaints regarding the concrete structure.

On July 18, 2017, DENR Water Rights staff met with you and the manager of Wild Oak Golf Course to conduct a licensing inspection of Water Permit No. 6314-3 held by Wild Oak Golf Course and to investigate the complaints regarding the concrete structure crossing the creek. During the course of the inspection, Water Rights staff observed the concrete structure obstructing and interfering with the stage, level, and flow of the creek. They also measured the depth of impounded water approximately one foot higher on the upstream side of the structure.

You told Water Rights staff that because of the low creek flows, the structure was installed to impound water and create adequate depth for the golf course's pump located upstream of the structure. This pump is used to divert Firesteel Creek water as permitted by Water Right Nos.

6314-3 and 1371-3 to holding ponds within the Wild Oak Golf Course from which the golf course is irrigated.

Wild Oak Golf Course holds active South Dakota Water Right Permit Nos. 6314-3 and 1371-3, which combined authorize diversion of 0.67 cubic feet per second (300 gallons per minute) of water from Firesteel Creek to irrigate 80 acres of the golf course. The permits authorize the water from Firesteel Creek to be diverted into two holding ponds prior to irrigation of the course. These permits do not authorize a dam or any other obstruction in the creek to impound water for irrigation purposes.

Firesteel Creek is a navigable stream and, as per South Dakota Codified Law (SDCL) 46-5-1.1, "[n]o person, except under lawful authority to do so, may intentionally obstruct, tamper with, or interfere with the stage, level, or flow of water[.]" A Water Right permit is required as per Administrative Rule of South Dakota 74:02:01:03 to construct a dam across a navigable water course for any purpose.

You indicated you have coverage under a Nationwide Section 404 permit from the US Army Corps of Engineers (Corps) to install the concrete structure. An approved Corps permit and Water Right permit Nos. 6314-3 and 1371-3 appropriated water from Firesteel Creek, do not allow you to use whatever means available to move the creek water to the irrigation ponds. The Water Right inspectors also advised you that the current Water Right permits do not allow for creating storage within Firesteel Creek.

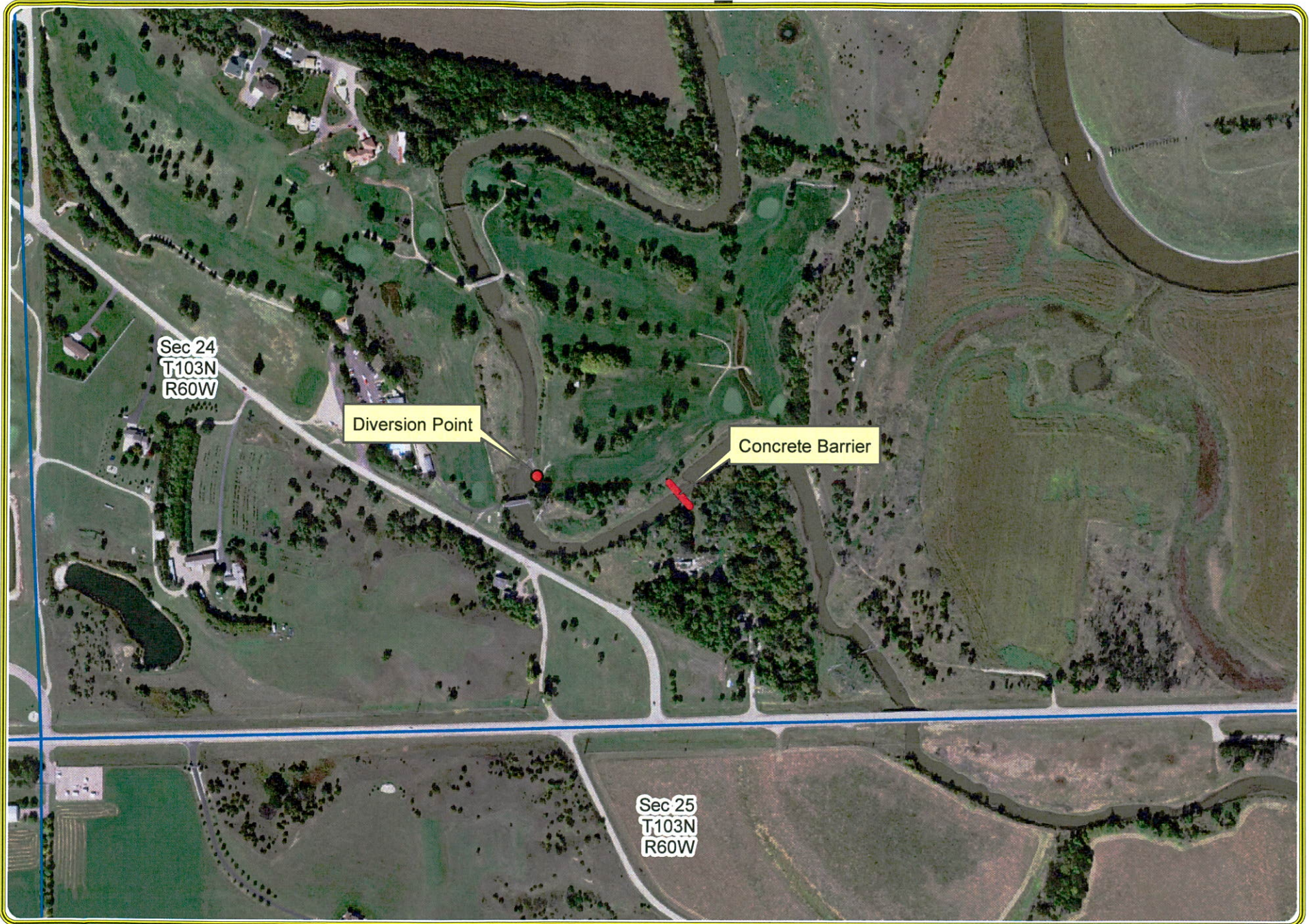
Wild Oak Golf Course, under your signature, submitted a Water Right Permit application in 2014 to create storage in Firesteel Creek; however, you were informed the application was incomplete. No further information has been submitted to date to complete that application. You have the options of withdrawing the application, modifying the application, or completing it. Once a completed application is received, it will be reviewed, a recommendation made, and a notice will be published in the newspaper providing an opportunity for individuals to support or oppose the application at a hearing before the Water Management Board. With the incomplete application on hold, it may be to Wild Oak Golf Course's advantage to consider alternatives to obstructing the creek channel. One possibility is excavating a sump hole in the creek channel, with the Corps' approval, within which to place the pump to operate.

Intentionally obstructing, tampering with, or interfering with the stage, level, or flow of public waters without lawful authority to do so is a violation of South Dakota's water law and subject to penalties of up to \$500 per day per violation. Therefore, I am issuing this order to Wild Oak Golf Course to remove the concrete structure obstructing Firesteel Creek by August 7, 2017. If the structure is not timely removed, DENR will take further action to include penalties. If you have any questions, please contact me at (605) 773-3352.

Cc: Harry Decker, US Army Corps of Engineers
Ann Mines Bailey, South Dakota Attorney General's Office

Enclosure

Wild Oak Golf Course_Firesteel Creek



Prepared By:
Mike DeFea
DENR, Water Rights Program
July 21, 2017

0 330 660 1,320
Feet

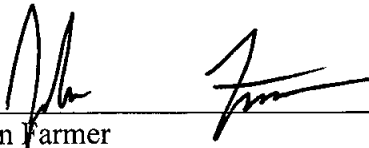


CERTIFICATION

I hereby certify that on July 21, 2017, I have personally deposited with the United States mail at Pierre, South Dakota, first class postage, prepaid envelopes containing a Notice and Order dated July 21, 2017, regarding removal of the concrete barrier from Firesteel Creek, as addressed:

David Backlund
Wild Oak Golf Course
2500 East 1st Avenue
Mitchell SD 57301

Harry Decker
US Army Corps of Engineers
28563 Powerhouse Rd
Pierre SD 57501



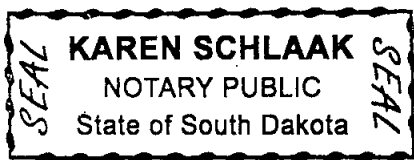
John Farmer
Water Rights Program, DENR

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 21st day of July, 2017



Karen Schlaak
Notary Public
My Commission expires April 1, 2019



6314-3



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

MAR 20 2018

1371-3
6314-3

David Backlund
Wild Oak Golf Club
2500 E 1st Ave
Mitchell SD 57301

Dear Mr. Backlund:

Enclosed is Water License No. 6314-3. This is the final water right document completing your process of obtaining a Water Right. Included with your license is a map prepared by the staff engineer who conducted the field investigation.

For informational purposes, each October you will now receive only two questionnaires. One for use of water from Firesteel Creek as authorized under No. 6314-3 and one for use of water from ground water as authorized under Water Right No. 1747-3. Keep in mind that water use must be reported separately for the two sources.

As long as you use the water beneficially, as stated in the Water License, State Water Laws provide that you have a continuing right to use the water.

Sincerely,

Jeanne Goodman, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

Note: Upon licensing, the applicable portions of Water Right No. 1371-3 were incorporated into Water License No. 6314-3.

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 6314-3

(1) Wild Oak Golf Club, 2500 E 1st Avenue, Mitchell SD 57301 made Application No. 6314-3, February 26, 2002 for a water permit to divert 0.17 cubic feet of water per second (cfs) from Firesteel Creek, Davison County, South Dakota for irrigation purposes. Permit No. 6314-3, with a priority date of February 26, 2002 was approved May 28, 2002 and issued to the applicant for diversion of water with construction of the described water supply system to be completed on or before May 28, 2007 and for the application to beneficial use of said water on or before May 28, 2011.

Water Permit No. 6314-3 appropriated an additional 0.17 cfs, changed the location of a diversion point and changed the location of acres authorized under Water Right No. 1371-3 from the S ½ Section 24 to the SE ¼ Section 23, T103N, R60W. The original nine hole golf course located in the S ½ Section 24 will continue to be irrigated from a well as authorized under Water Right No. 1747-3.

The applicable portions of Water Right No. 1371-3 have been incorporated into this water license. The priority date of February 17, 1967, established under No. 1371-3, is retained for 0.50 cfs. A priority date of February 26, 2002, established under No. 6314-3, is retained for 0.17 cfs.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the water supply system and is entitled to divert 0.67 cubic feet of water per second for beneficial use.

The location of the diversion points are:

- **Firesteel Creek:** 810'N & 760'W of the S ¼ corner of Section 24, T103N, R60W (SE ¼ SW ¼ Sec 24);
- **Dam #1:** 920'N & 100'W of the SE corner of Section 23, T103N, R60W (SE ¼ SE ¼ Sec 23);
- **Dam #2:** SW ¼ SW ¼ Section 24, T103N, R60W (not used for irrigation of the golf course)

Total storage capacity of the two dams is 47 acre feet. Dam #2 is used to supply water to Dam #1.

(3) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use to irrigate the following land:

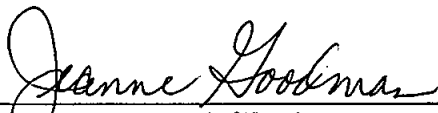
Section 23, T103N, R60W	SE ¼ SE ¼	17 acres
	SW ¼ SE ¼	14 acres
	NW ¼ SE ¼	16 acres
	NE ¼ SE ¼	21 acres
Total		68 acres

(4) Pursuant to South Dakota Water Law 46-5-30.1 Wild Oak Golf Club, 2500 E 1st Avenue, Mitchell SD 57301 the holder and/or owner of Incorporated Water Right No. 6314-3 is issued a license to appropriate water, the right to use 0.67 cubic feet of water per second from Firesteel Creek with priority dates of February 17, 1967 (0.50 cfs) and February 26, 2002 (0.17 cfs) from the locations specified in (2) of this license for irrigation purposes.

continued

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 6314-3 and subject to the following qualifications:

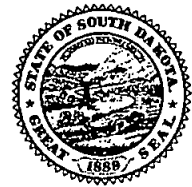
- The City of Mitchell has priority right to Firesteel Creek water under a future use withdrawal permit. Water Permit No. 6314-3 is subject to their prior rights if or when the city develops the reserved water supply.
- Water Permit No. 6314-3 is subject to written shut-off orders from the Chief Engineer if necessary to protect downstream senior water rights on the James River.
- This Permit is approved subject to the irrigation water use questionnaire being submitted each year.



Jeanne Goodman, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

MAR 20 2018

date





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

December 10th, 2025

6314-3
1747-3

Chase Kristensen
204 N Mattie St
Mitchell, SD 57301

Dear Mr. Kristensen:

Each year, the State of South Dakota sends out Water Management Irrigation Questionnaires to collect information based on annual water use from our state's waters.

Per our email correspondence, you have purchased both WR Permits 6314-3 and 1747-1, from Wild Oak Golf Club. For your convenience I have enclosed partially completed "Transfer of Ownership" forms for you to complete and return in the pre-paid envelope.

Please return the form with a check for \$100.00 (\$50.00/transfer) made payable to "SD Water Rights Program" to cover the transfer fee. If you would prefer to pay by card you may call our Fiscal Office at 605.773.5559. This form will still need to be returned even if you are submitting payment over the phone.

If you have any questions or concerns, please give me a call. My direct number is 605.773.8204.

Sincerely,

Shannon Konst
Water Rights Program
605 773-3352
Shannon.konst@state.sd.us

enclosures

RECEIVED

DEC 30 2025

NOTICE OF TRANSFER OF OWNERSHIP

For assistance call (605) 773-3352

OFFICE OF
WATER

Mail to: SD DANR, Water Rights Program
523 E Capitol Ave
Pierre, SD 57501-3182

Water Right/Permit No. 6314-3Date: 12-18-25I/We request that Water Right/Permit No. 6314-3 formerly owned by:Wild Oak Golf Club

be transferred to:

New Owner Name: Legacy Links, LLC D.B.A. Wild Oak Golf CourseAddress: 204 W. Matter Stmobile: 605-9203City, State, Zip Mitchell, SD 57301email: charl@wildoakgolfcourse.com

Title to the following described land(s)/property has been transferred as described above:

68 acres located in Section 23, T103N, R60W

SE1/4 SE1/4 - 17 acres

SW1/4 SE1/4 - 14 acres

NW1/4 SE1/4 - 16 acres

NE1/4 SE1/4 - 21 acres

☒ I understand that the validity of Water Right/Permit No. 6314-3 has not been determined by this transfer action. If I have any questions on validity, I understand that only the Water Management Board has the authority to determine if a water right/permit is valid (see note below).

You are requested to file this "Notice of Transfer" in the appropriate file with the Water Rights Program, as evidence of the change of ownership.

A fee of Fifty Dollars (\$50.00) is included to cover the filing fee as required by SDCL 46-2-13.

I, Chase Kristensen, the new owner, certify that the above information is true and correct.

Chase Kristensen
(signed by new owner)

NOTE: Water permits may be cancelled for nonconstruction after the five-year construction period has expired. Once a water permit is developed, an inspection is conducted to issue a water right license for the project as developed. A water permit/right may be cancelled for one or more of the following reasons:

1. Abandonment - no intent to use water and use is abandoned.
2. Forfeiture - no use of water for three-year period without legal excuse.
3. For a third violation of a condition of a water permit/right.

RECEIPT

WATER RIGHTS PROGRAM South Dakota Department of Agriculture and Natural Resources

Date December 29, 2025

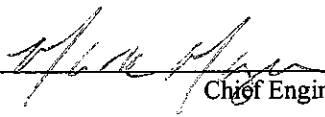
RECEIVED OF Legacy Links LLC 204 N Mattie St Mitchell, SD 57301

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	\$ _____
Fee for Application for Permit No. _____ to Appropriate Water for Future use	\$ _____
Fee to retain Future Use Permit No. _____ after period of seven years.	\$ _____
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____	\$ _____
Fee for Filing Transfer Form #6314-3	\$50.00
Fee for _____	\$ _____
Fee for Issuing New Well Driller's License No. _____	\$ _____
Fee for Renewal of Well Driller's License No. _____	\$ _____
Fee for Issuing Well Pump Installer's License No. _____	\$ _____
Fee for Renewal of Well Pump Installer's License No. _____	\$ _____
(Any Other Work Provided by Law)	
TOTAL	\$50.00

By




Chief Engineer



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

January 2nd, 2026

6314-3

Legacy Links LLC
204 N Mattie St.
Mitchell, SD 57301

Dear Mr. Kristensen,

The South Dakota Water Rights Program is in receipt of the "Notice of Transfer of Ownership" form and the required fees you submitted for Water Right No. 6314-3. Enclosed is a receipt of payment for your records.

Water Right No. 6314-3, previously held by Wild Oak Golf Club is now listed under Legacy Links, LLC. I have also updated your contact information in our system.

As a reminder, so long as you use the water beneficially, as stated in the License (copy enclosed), State Water Laws provide that you have a continuing right to use the water. Should the water not be put to beneficial use for a period longer than 3 consecutive years, without legal excuse, the License will be subject to cancellation.

If you have any questions, please contact me.

Sincerely,

Shannon Konst
Water Rights Program
605 773-3352
Shannon.konst@state.sd.us

NOTE: The validity of Water Right No. 6314-3 has not been determined by this transfer action. Only the Water Management Board has the authority to determine if a water permit/right is valid.

enclosure