

WATER PERMIT NO. 2536-2

Name of Applicant: Ray McQuiston

Address: 20489 Willow Creek Rd, Ft. Pierre SD 57501

Phone: 605 223-3197

Amount of Water Claimed: 45.40

Total Acres: NA

Source of Water Supply: runoff

Water to be used for: fish & wildlife propagation

County: Stanley

Type of Waste Disposal System:

Location: 15 miles northwest of Ft. Pierre

PRIORITY

Date Received: 8-25-04

Application/License Fee: \$200

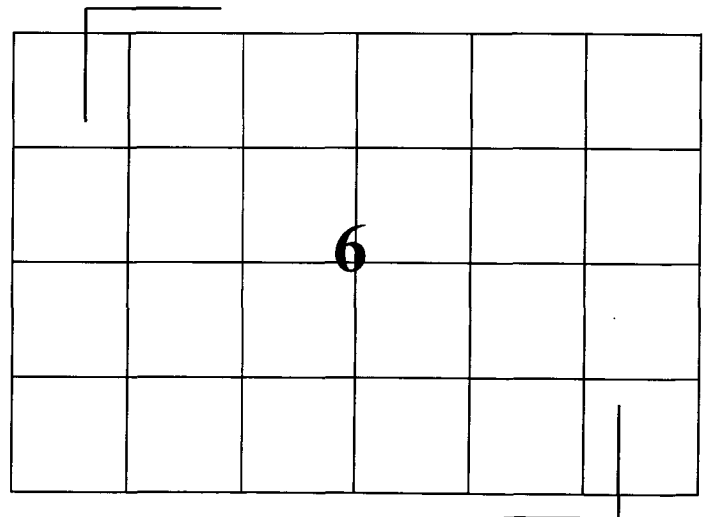
Corrected Application Received:

Period of Annual Use: January 1 – December 31

Remarks: East Dam

Diversion Point: S ½ NE ¼ Sec 6-T5N-R29E

Water Impounded: S ½ NE ¼, NW ¼ NE ¼, Sec 6-T5N-R29E



Depth of Well: NA

Well Driller: : NA

Remarks:

Type of Map: topo

Prepared by: Angela Roman, NRCS

Reviewed and the Number Assigned on: 8-25-04

By: Karen Schlaak

Notice of Hearing - date to intervene: _____

RECEIVED
AUG 25 2004
AIR QUALITY
PROGRAM

Mail to: Water Rights Program Joe Foss Building 523 E. Capitol Pierre, SD 57501-3181 (605) 773-3352	No. <u>2536-2</u> (office use only)
	Hydrologic Unit <u>10140102</u>
	Basin <u>Bad River</u>
	Newspaper <u>Capital Journal, Pierre</u>

Application For Permit To Appropriate Water Within The State Of South Dakota

Check use(s) of water:

- | | | | |
|---|---|--|--|
| ☐ Municipal | ☐ Suburban Housing | ☐ Recreational | ☐ Institutional |
| ☐ Rural Water System | ☐ Commercial | ☒ Fish & Wildlife | ☐ Geothermal Heat |
| ☐ Domestic (over 18 gpm) | ☐ Industrial | ☒ Other <u>Livestock</u> | |

Type of Application: (check one)

- ☒ New ☐ Vested Right (Use predates Mar 2, 1955) ☐ Future Use Reservation
☐ Place to Beneficial Use Water Reserved by Future Use Permit No. _____
☐ Amendment/Correction to Permit No. _____

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)

1. Name of Applicant Ray McQuiston Phone (605) 223-3197
(check one) ☒ Owner ☐ Tenant/lessee
Mailing Address 20489 Willow Creek Road Fort Pierre State SD 57532
(Street, RR, or Box and City) (Zip Code)
2. Amount of water claimed _____ *CFS or _____ **GPM 45.40 ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)
3. Source of water supply Runoff from Watershed
4. Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) County Stanley
S1/2 NE 1/4, section 6-T5N-R29E Water Impounded: S1/2 NE1/4 NW1/4 NE1/4
Sec 6-T5N-R29E
5. County or counties where water will be used Stanley
6. Annual period during which water is to be used continuous January 1 - Dec 31
7. Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

Attached design report, plans, and specifications.

East Dam

STATE OF SOUTH DAKOTA)
County of Stanley) SS

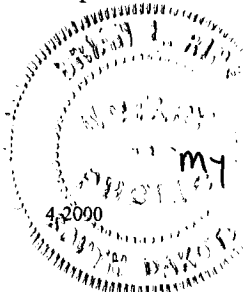
Attachments: Attach Form 2A if diversion is from a well or dugout, or if storage of water is proposed. Attach map and any other technical information. (see instructions)

I, Ray McQuiston, 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 Ray McQuiston

Subscribed and sworn to before me this 20th day of August 2004

[Signature]
Notary Public signature



SOUTH DAKOTA
WATER PERMIT NO. 2536-2

Date of first receipt of application August 25, 2004.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 2536-2 to Ray McQuiston, 20489 Willow Creek Road, Ft. Pierre SD 57532 authorizing the construction of the dam and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 2536-2 authorizes impoundment of 45.4 acre-feet of water from runoff by constructing a dam located in the S $\frac{1}{2}$ NE $\frac{1}{4}$ Section 6 with water impounded in the S $\frac{1}{2}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 6; all in T5N-R29E.
2. The water appropriated shall be used for the purpose of fish & wildlife propagation and livestock water and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date of approval of Permit No. 2536-2 is November 12, 2004.
5. The date from which applicant may claim right is August 25, 2004.
6. One-fifth of the construction is to be completed on or before March 12, 2007.
7. All construction is to be completed on or before November 12, 2009.
8. Water is to be put to beneficial use on or before November 12, 2013.
9. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. Water Permit No. 2536-2 authorizes a dam with a storage capacity of 45.4 acre feet of water and sufficient water annually to maintain the water level to an outlet elevation.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

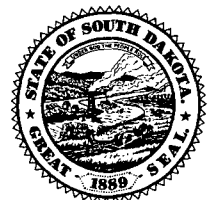
WATER MANAGEMENT BOARD

By: Garland Erbele

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

NOV 19 2004

date



(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

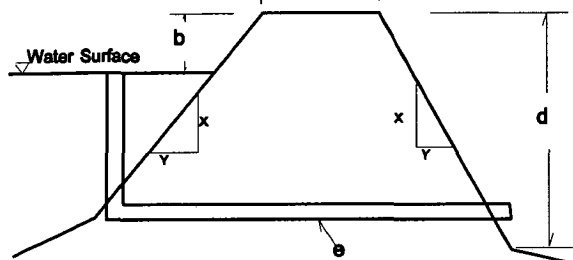
- a) Surface Dimensions _____ Depth _____
- b) Depth to water (ground surface to water level) _____

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:

Field Support Office
USDA-Natural Resources
Conservation Service
P.O. Box 1258
Pierre, SD 57501-1258



- b) Freeboard _____ 5.1
- c) Crest Width _____ 12
Crest Length _____ 672
- d) Height _____ 20.6
- e) Primary Outlet Capacity _____ 67.3 cfs
If pipe, diameter _____ 24"
- f) Secondary Spillway Capacity _____ 546.7 cfs
Spillway Width _____ 100'
- g) X & Y Slope _____
Upstream _____ 3:1
Downstream _____ 3:1
- h) Surface Area of Impoundment _____ 11.51
- i) Storage _____ 45.4 _____ Acre Feet
- j) Drainage Area Above Dam _____ 1,388.0 _____ Acres

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date August 25, 20 04

RECEIVED OF Stanley County Conservation Dist., 316 S Coteau Suite 103, Pierre SD 57501

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. <u>2536-2</u> 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. <u>2536-2</u>	50	00
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	200.00

No. 01104

By J. Duane Ebel
Chief Engineer gm

United States Department of Agriculture



Natural Resources Conservation Service
Field Support Office
314 S. Henry Street, Suite 300
P. O. Box 1258
Pierre, SD 57501-1258

Telephone: (605) 224-2476
Fax: (605) 224-6615

July 23, 2004

South Dakota Department of
Environment and Natural Resources
Foss Building
523 E. Capitol Avenue
Pierre, SD 57501

To Whom It May Concern:

Attached are plans, specifications, design data, and a completed water rights permit application for a dam for Ray McQuiston. This project is being constructed under the Bad River Water Quality Project, which means the structure must be completed this fall in order to receive the funding allotted for this dam. Your promptness is appreciated with this project.

Please don't hesitate to call me at the above number with any concerns or questions.

A handwritten signature in cursive script that reads "Angela Roman".

ANGELA D. ROMAN
Agricultural Engineer

RECEIVED

AUG 25 2004

AIR QUALITY
PROGRAM

Attachments

cc: Dana Edwards, Civil Engineer, NRCS, Pierre, SD

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY	"AS BUILT" QUANTITY
Excavation (core trench) (outlet)	cu. yd.	2,743	
Earthfill Class A	cu. yd.	13,390	
Topsoil	sq. yd.	4,254	
Seeding	acre	2.4	
60" dia. x 4' deep concrete drop structure	each	1	
24" dia. dual wall smooth lined PE pipe	lin. ft.	122	
4" PVC Perforated Pipe (SCH 40 min)	lin. ft.	13	
4" PVC NON Perforated Pipe (SCH 40 min)	lin. ft.	80	
Fine Drainfill	cu.yd.	11	
Outlet Support	each	1	

Construction Specifications

Clearing and Grubbing
Stripping
Excavation
Earth Fill, Class S
Drain Fill and Filter
Salvaging and Spreading Topsoil
Concrete for Minor Structures
Steel Reinforcement
Wood Fabrication and Installation
Seeding
Plastic Pipe

SD-2
SD-4
SD-5
SD-7
SD-9
SD-10
SD-12B
SD-13
SD-16
SD-28
SD-55

Hydraulic Data

Drainage Area
Time of Concentration
Runoff Curve Number

1388 Acres
2.86 hrs
80

Principal Spillway, 2 yr, 24-hr. Rainfall
Emergency Spillway 50 yr, 24-hr. Rainfall

2.1 Inches
4.4 Inches

Principal Spillway Discharge at ES
Emergency Spillway Discharge

79.4 CFS
547.1 CFS

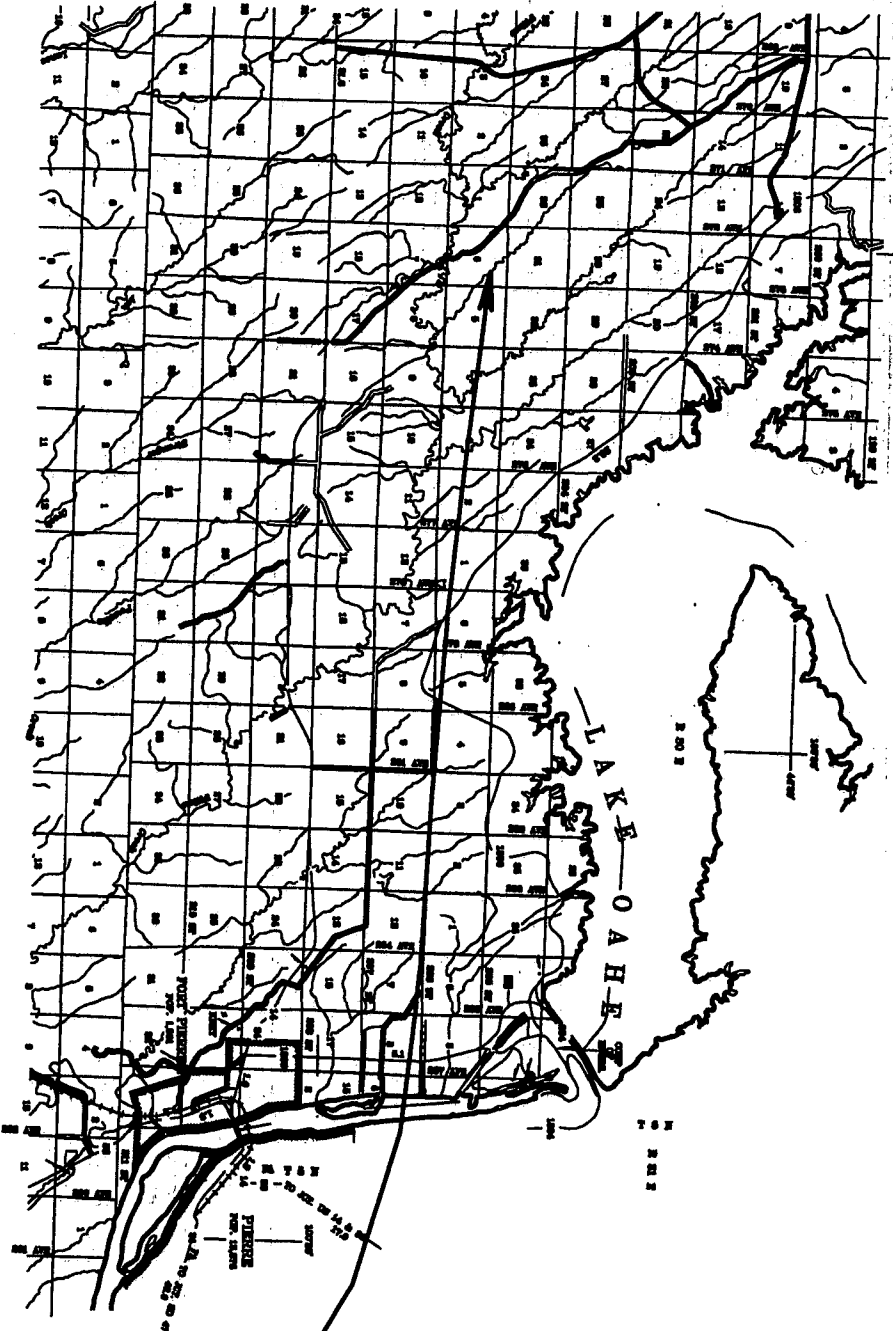
Required Sediment Storage (35 yrs)
Sed. Storage Below Crest
Sed. Storage Above Crest

57.1 AcFt
45.7 AcFt
11.4 AcFt

Crest of Normal Pool
Crest of Emergency Spillway
Top of Dam

11.51 Acres
15.40 Acres
21.20 Acres

45.4 AcFt
72.3 AcFt
127.1 AcFt



Notes

1. A preconstruction meeting is required before construction between NRCS, Ray McQuiston, and the contractor.
2. Water Rights Permit and Location Notice is required by South Dakota Department of Environment and Natural Resources. This is the responsibility of the landowner.

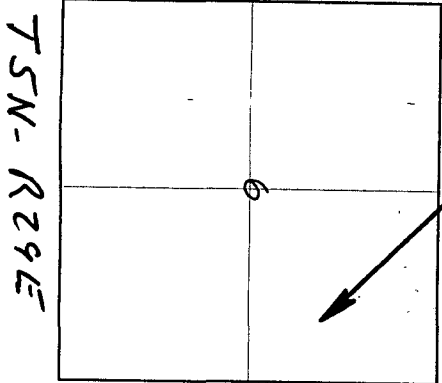
Sheet Index

- 1 Cover
- 2 Plan
- 3 General Layout
- 4 Profile of Dam
- 5 Cross Section of Dam
- 6 Concrete Riser
- 7 Trash Rack and Baffle
- 8 Sand Anti-Seep Collar
- 9 Timber Structure

Hazard Class A
Job Class IV

Contact Information

Ray McQuiston
20489 Willow Creek Road
Ft. Pierre, SD 57532
605-223-3197



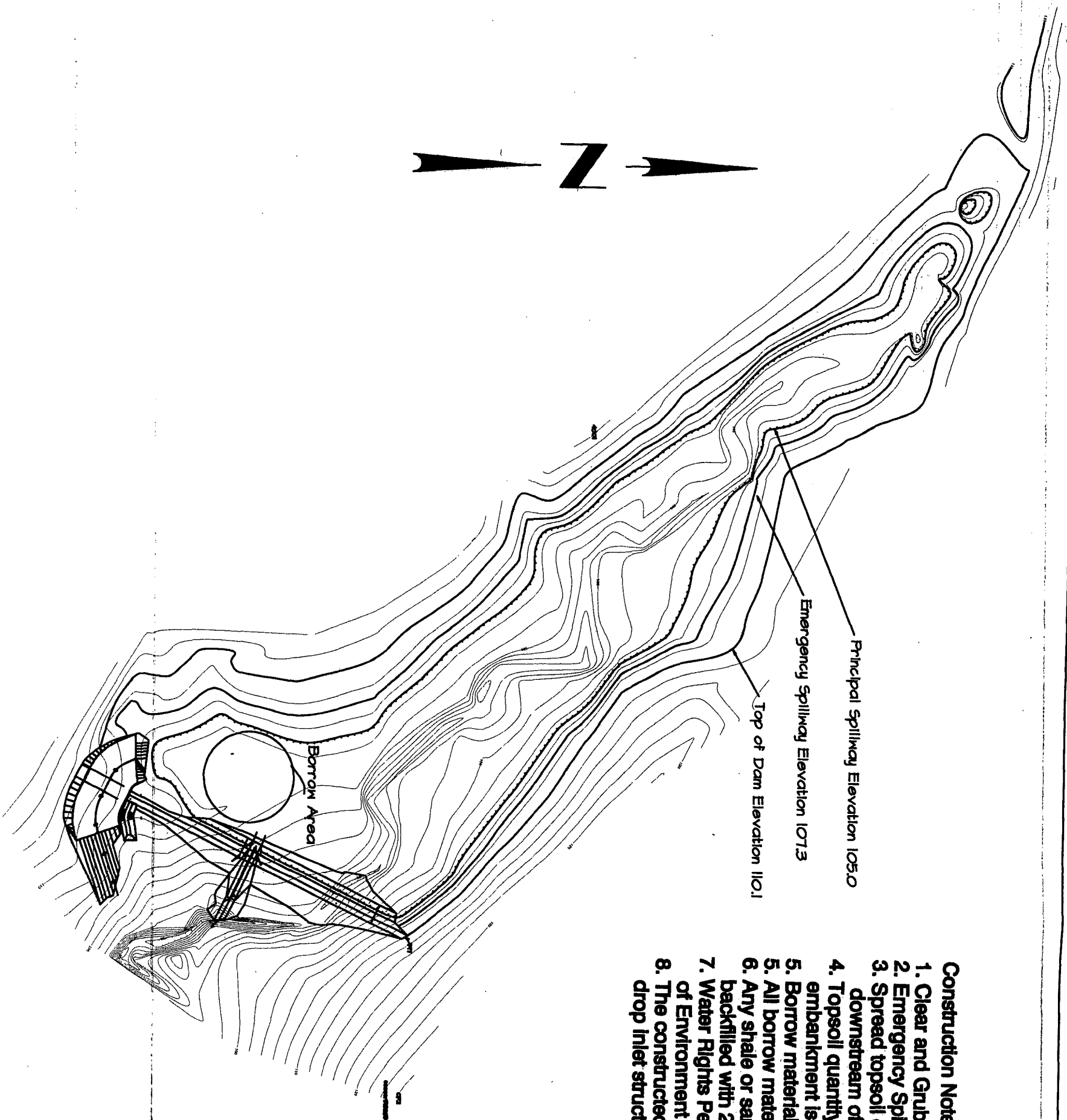
According to South Dakota State Law, "No excavator may begin any excavation without first notifying the One-Call Notification Center of the proposed excavation" at 1-800-761-7474

Ray McQuiston East Pond
NE 1/4. Section 6, T5N, R29E
Stanley County, South Dakota

NRCS NATURAL RESOURCES
CONSERVATION SERVICE
USDA-NRCS PIERRE FIELD SUPPORT OFFICE
314 South Henry Suite #300
PIERRE, SOUTH DAKOTA 57501-1258

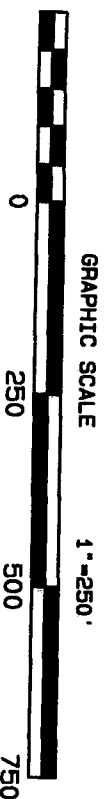
Designed by: A. Roman Date: 6/23/04
Drawn by: A. Roman Date: 6/24/04
Traced by: _____
Checked by: WMD 9/10/04

Approved by: [Signature]
Title: ASLE
Title: _____
Title: _____



Construction Notes

1. Clear and Grub the entire area within the Work Limits.
2. Emergency Spillway Excavation shall be subsidiary to the earthfill.
3. Spread topsoil on all surfaces on the emergency spillway and embankment downstream of elevation 103.6, to a depth of not less than 0.5 feet.
4. Topsoil quantity based only on Emergency spillway volume. Topsoil on embankment is subsidiary to earthfill.
5. Borrow material should be excavated below water line if salvageable.
5. All borrow material must be suitable as described in Specification SD-7S.
6. Any shale or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of earth fill.
7. Water Rights Permit and Location Notice is required by South Dakota Department of Environment and Natural Resources. This is the responsibility of the landowner.
8. The constructed wave berm shall be flat, at elev. 105.0, for 10' on both sides of the drop inlet structure and sloped back up to the existing sloping berm at a 3:1.

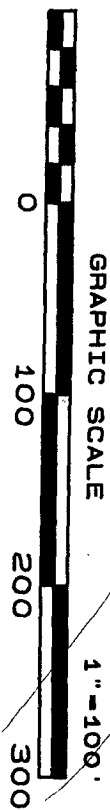


Ray McQuiston East Pond
NE 1/4. Section 6, T5N, R29E
Stanley County, South Dakota

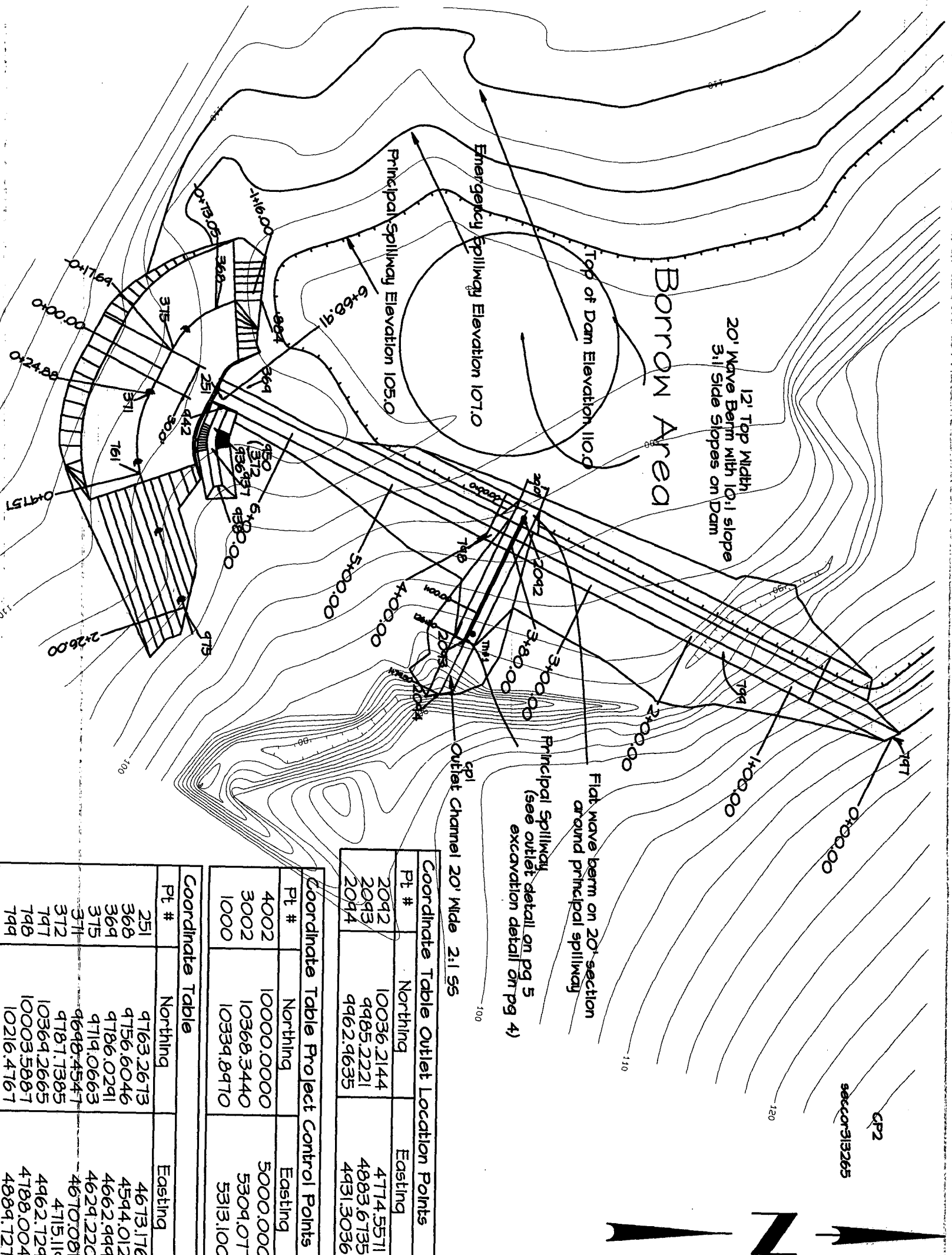
 **NATURAL RESOURCES
CONSERVATION SERVICE**
USDA-NRCS PIERRE FIELD SUPPORT OFFICE
314 South Henry Suite #300
PIERRE, SOUTH DAKOTA 57501-1208

Designed by:	A. Roman	Date:	6/23/04
Drawn by:	A. Roman		6/24/04
Traced by:			
Checked by:			

Approved by:	
Title:	
Title:	



100' Bottom Width
3:1 Side Slopes



Coordinate Table Outlet Location Points			
Pt #	Northing	Easting	Elevation
2092	10036.2144	4774.5571	
2093	9985.2221	4883.6735	
2094	9962.9635	4931.3036	
CL of OUTLET STA 0+00			
CL of OUTLET STA 126+50			
CL of OUTLET STA 179+50			

Coordinate Table Project Control Points			
Pt #	Northing	Easting	Elevation
4002	10000.0000	5000.0000	100.00
3002	10368.3440	5304.0770	126.95
1000	10339.8970	5313.1000	125.39
secor313265			

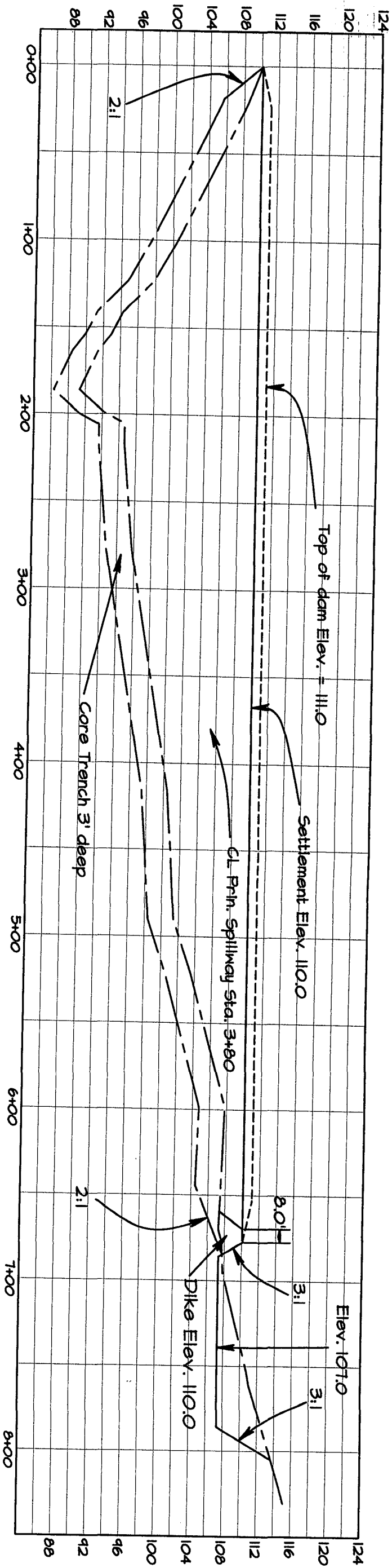
Coordinate Table			
Pt #	Northing	Easting	Elevation
251	9763.2673	4673.1765	110.10
368	9756.6046	4594.0120	106.28
369	9786.0291	4662.9990	
375	9719.0663	4629.2205	106.96
371	9698.4547	4670.0812	106.80
372	9787.7385	4715.1191	
797	10369.2665	4962.7293	110.10
798	10003.5887	4788.0046	110.10
799	10216.4767	4884.7276	110.10
884	9797.0088	4586.0122	
936	9756.8761	4699.6193	109.50
937	9754.8281	4718.1872	109.50
938	9760.7293	4750.7842	107.50
942	9764.5775	4681.3424	110.0
950	9787.0833	4712.3479	
971	9742.7333	4820.9505	
975	9733.6786	4862.7023	
SM CL of Dam			
CL Spillway			
Spillway Radius Pt 75			
CL Spillway			
Spillway 50' Radius			
NE CL of Dam			
CL of Dam			
CL Dam & Pipe			
CL Spillway			
CL Dike			
CL Dike			
CL Dike			
CL Dike			
Dike Radius Pt			
CL Spillway			
CL Spillway			

Ray McQuistion East Pond
NE 1/4. Section 6, T5N, R29E
Stanley County, South Dakota

NRCS NATURAL RESOURCES
CONSERVATION SERVICE
USDA-NRCS PIERRE FIELD SUPPORT OFFICE
314 South Henry Suite #300
PIERRE, SOUTH DAKOTA 57501-1258

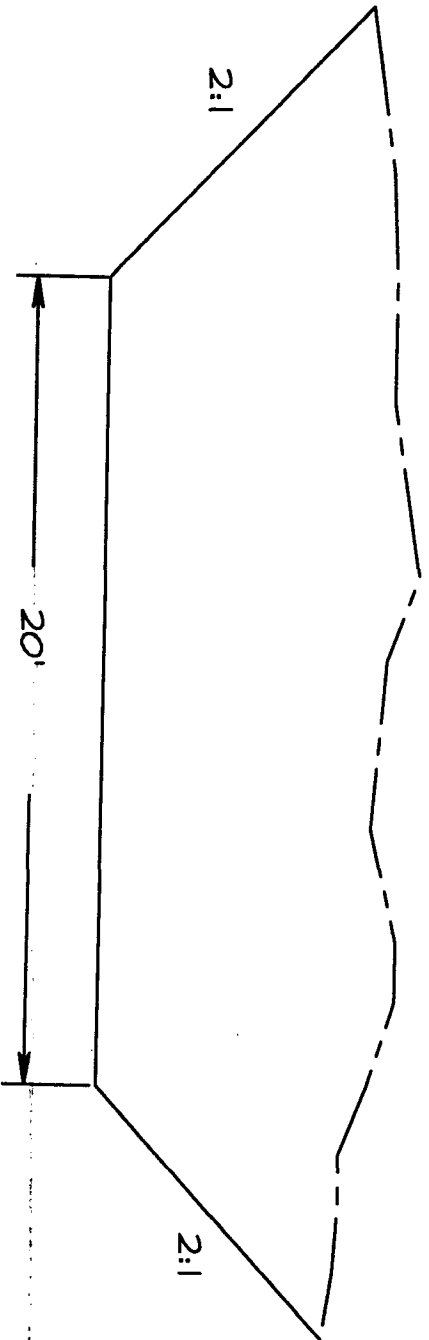
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Drawn by: A. Roman Date: 5/24/04
Traced by: _____
Checked by: _____

Approved by: _____
Title: _____
Title: _____

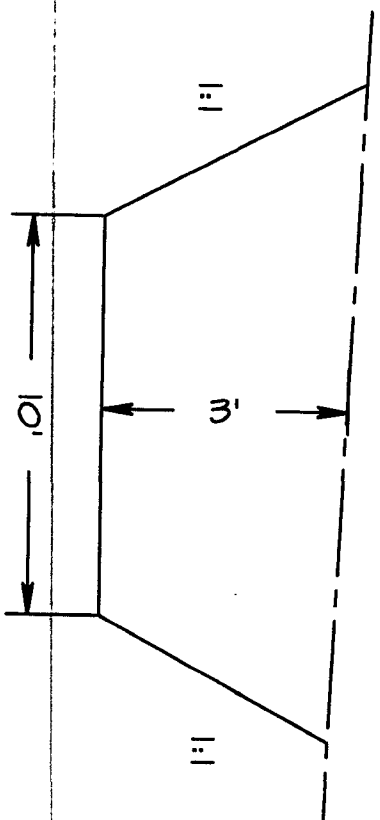


Cross Section on Centerline of Embankment

Typical Pipe Trench Cross Section
Not to Scale



Typical Core Trench Cross Section
Not to Scale

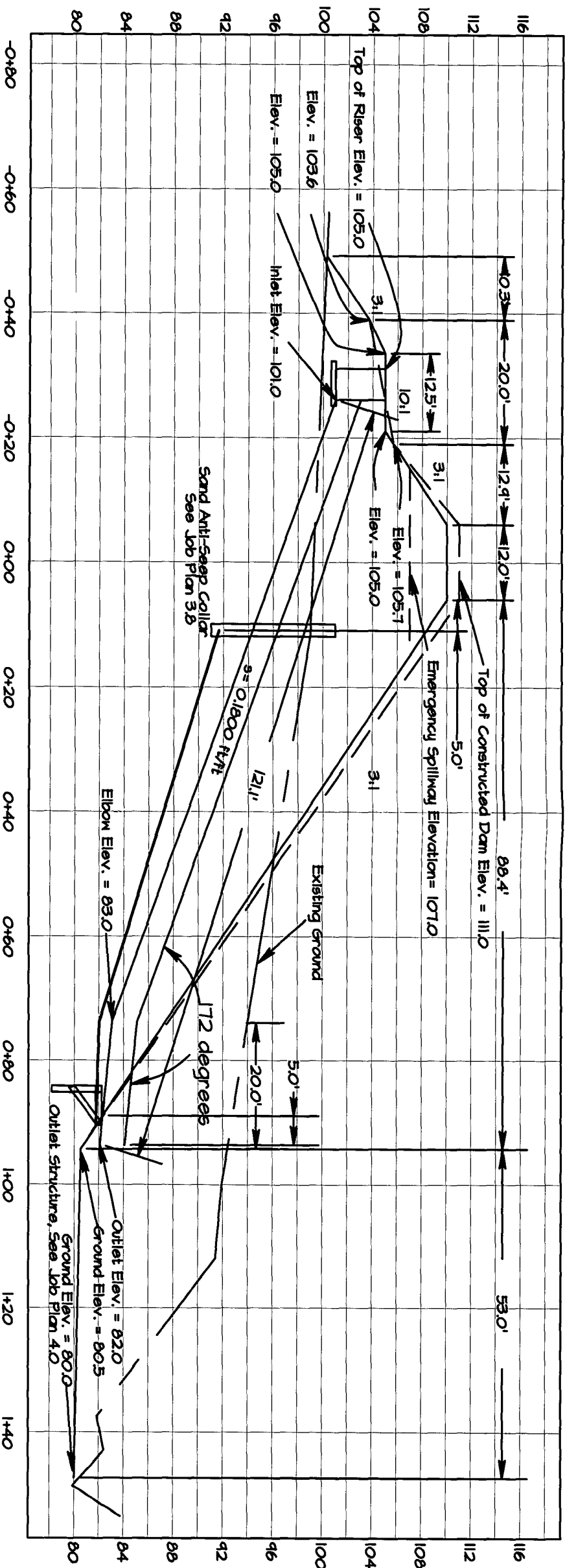


Ray McQuistion East Pond
NE 1/4. Section 6, T5N, R29E
Stanley County, South Dakota

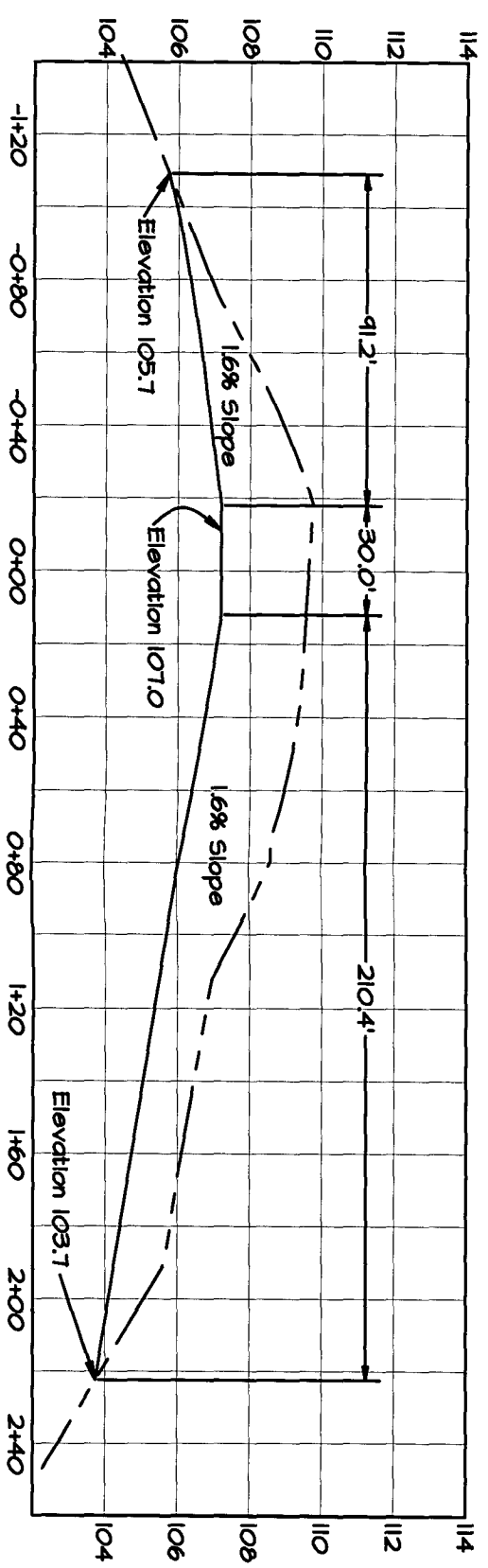
NRCS NATURAL RESOURCES
CONSERVATION SERVICE
USDA-NRCS PIERRE FIELD SUPPORT OFFICE
314 South Henry Suite #300
PIERRE, SOUTH DAKOTA 57501-1298

Designed by: A. Roman Date: 8/23/04
Drawn by: A. Roman Date: 8/24/04
Traced by: _____
Checked by: _____

Approved by: _____
Title: _____
Title: _____

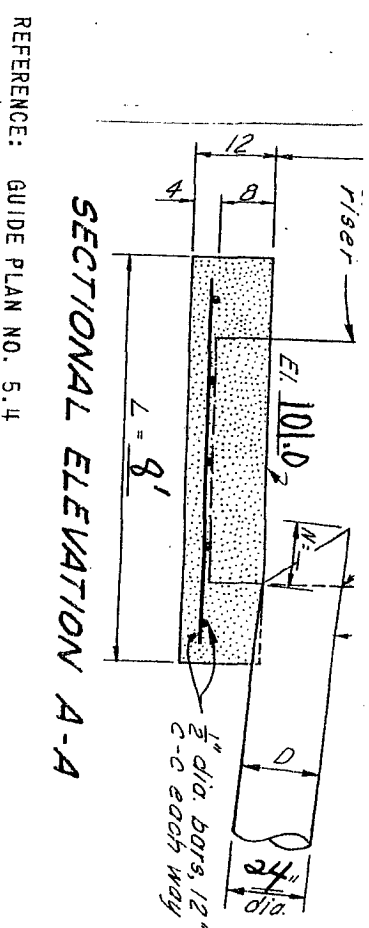
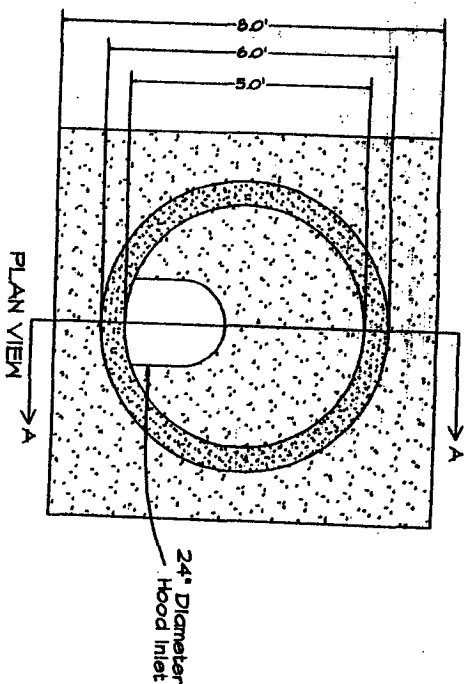


Cross Section of Dam



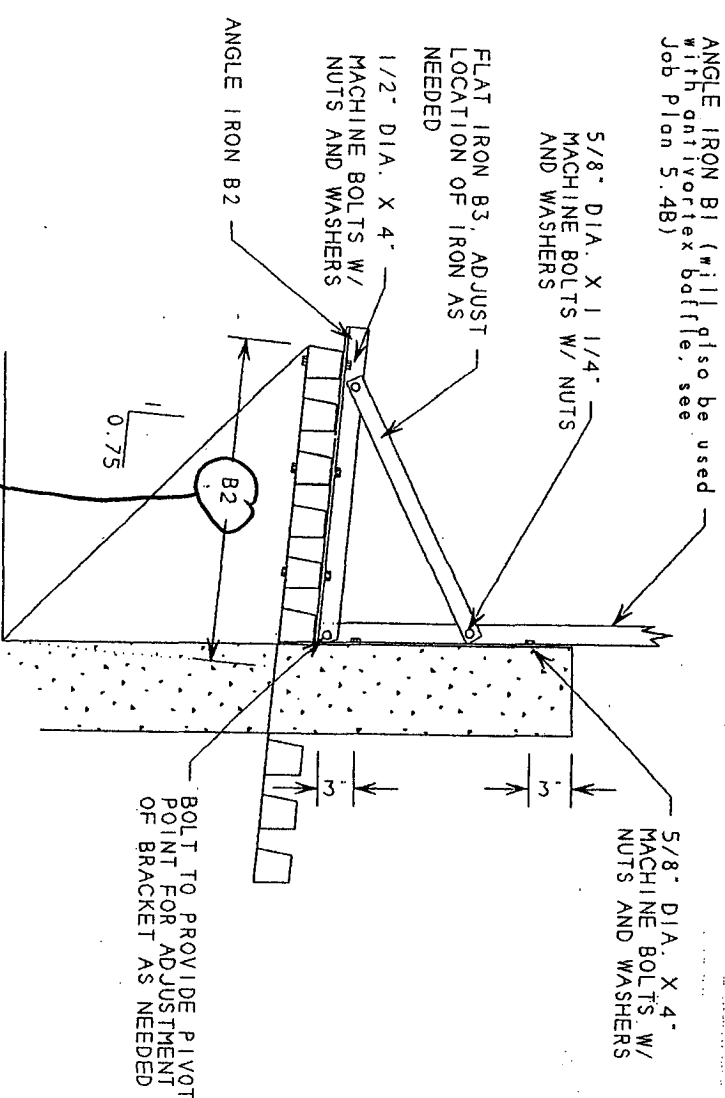
Emergency Spillway Profile

Note: Excavation of Emergency Spillway (3,061 CY) and Stripping (1,001 CY) is subsidiary to Earth Fill.



SECTIONAL ELEVATION A-A

REFERENCE: GUIDE PLAN NO. 5.4



SUPPORT BRACKET DETAIL

BARREL DIA. D
10'-
12'-
15'-
18'-
24'-
30'-
36'-

Base = 2.4 CY Dep Structure = 5.2 CY

SUPPORT BRACKET				BOLTS W/ WASHERS & NUTS			
2" X 2" 3/16" ANGLE IRON	3/16" X 2" FLAT IRON	1/2" DIA 5/8" DIA 5/8" DIA					
LENGTH FT. - IN.	BILENGTH FT. - IN.	B2	LENGTH FT. - IN.	B3	X 4"	X 1 1/4"	X 4"
2'-10 1/4"	7 1/2"	1'-3"	2	2	2	2	2
2'-10 1/8"	9"	1'-4"	2	2	2	2	2
2'-10 3/8"	11 1/4"	1'-5"	2	2	2	2	2
2'-10 3/4"	1'-1 1/2"	1'-6"	2	2	2	2	2
3'-8 1/4"	1'-6"	1'-9"	3	2	2	2	2
3'-8"	1'-10 1/2"	2'-0"	3	2	2	2	2
4'-3 1/4"	2'-3"	2'-4"	3	2	2	2	2

NOTE: 1. CONCRETE AROUND PIPE NEEDS TO BE VIBRATED TO INSURE A GOOD SEAL AROUND PIPE.

3. PE DOUBLE WALL CORRUGATED PIPE W/ SMOOTH INTERIOR (ASHTO M294 TYPE S) WITH BELL & SPIGOT JOINT AND WATER TIGHT GASKET.

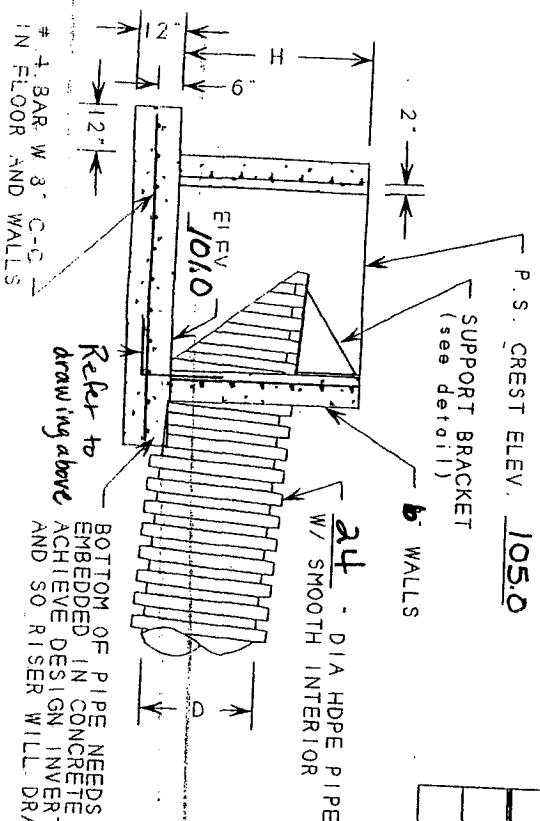
CONCRETE RISER AND POLYETHYLENE HOOD INLET COMBINATION

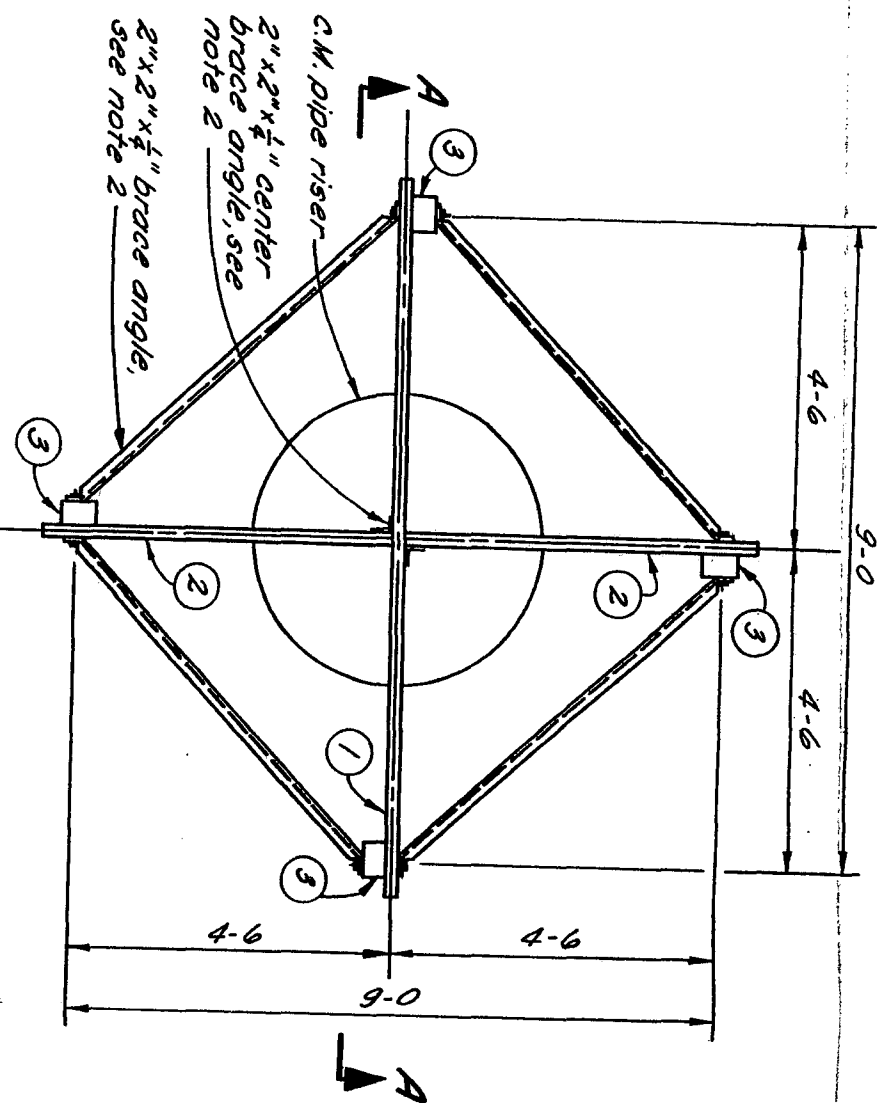
Ray McQuiston
statley county

USDA U.S. Department of Agriculture
Natural Resources Conservation Service

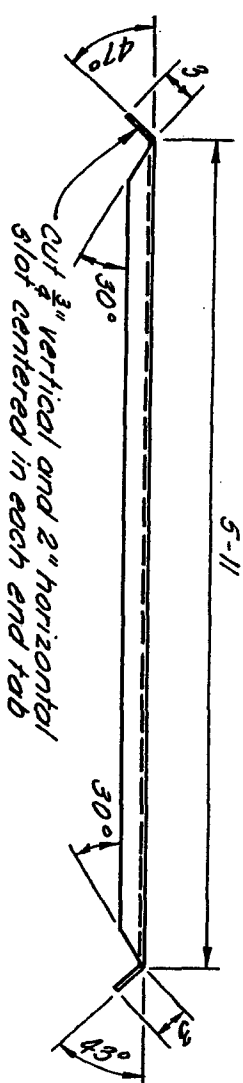
DESIGNED BY: A. Roman
DATE: 7/9/04
APPROVED BY: [Signature]
TITLE: [Blank]
SHEET: 6 OF 9

SECTIONAL ELEV. A-A





PLAN VIEW



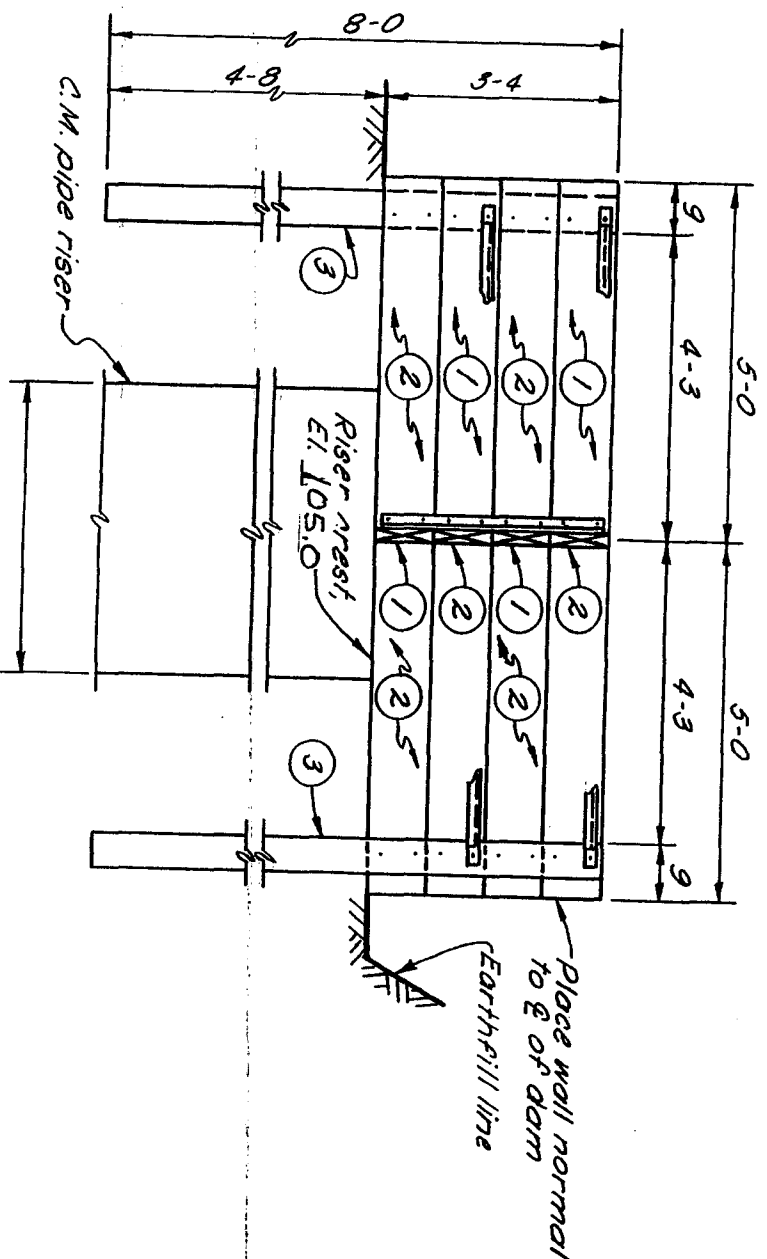
PLAN VIEW OF BRACE ANGLE

TABLE OF QUANTITIES

ITEM	MARK	NO. REQ'D.	QUANTITY
2" X 10" X 10' PRESSURE TREATED LUMBER	1	4	67 BD. FT.
2" X 10" X 4'-11" PRESSURE TREATED LUMBER	2	8	66 BD. FT.
4" X 6" X 8' PRESSURE TREATED POST	3	4	64 BD. FT.
2" X 2" X 1/4" X 6'-5" STEEL ANGLE		8	164 LB.
2" X 2" X 1/4" X 3'-2" STEEL ANGLE		2	20 LB.
5/8" X 8" STEEL BOLTS, NUTS, 2 WASHERS		32	32 SETS
1/2" X 3" STEEL BOLTS, NUTS, 2 WASHERS		32	32 SETS

NOTES:

1. 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.
2. FOR CENTER BRACE ANGLES DRILL 8 - 9/16" HOLES 5/8" FROM OUTER EDGE OF EACH LEG OF EACH ANGLE AND CENTERED 5 1/4" APART ALONG THE LEG.
3. ATTACH BRACE ANGLES TO TOP BOLT ON TOP 2" X 10" BOARD AND TO TOP BOLT ON NEXT TO BOTTOM BOARD.



SECTIONAL ELEVATION A-A

TRASH RACK AND BAFFLE
FOR RISER DIA. 36" THRU 60"

OPERATOR: Ray McQuiston

CONSERVATION DISTRICT: Stanley City

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by: Alman 4/4

Drawn: Alman 4/4

Traced: Alman 4/4

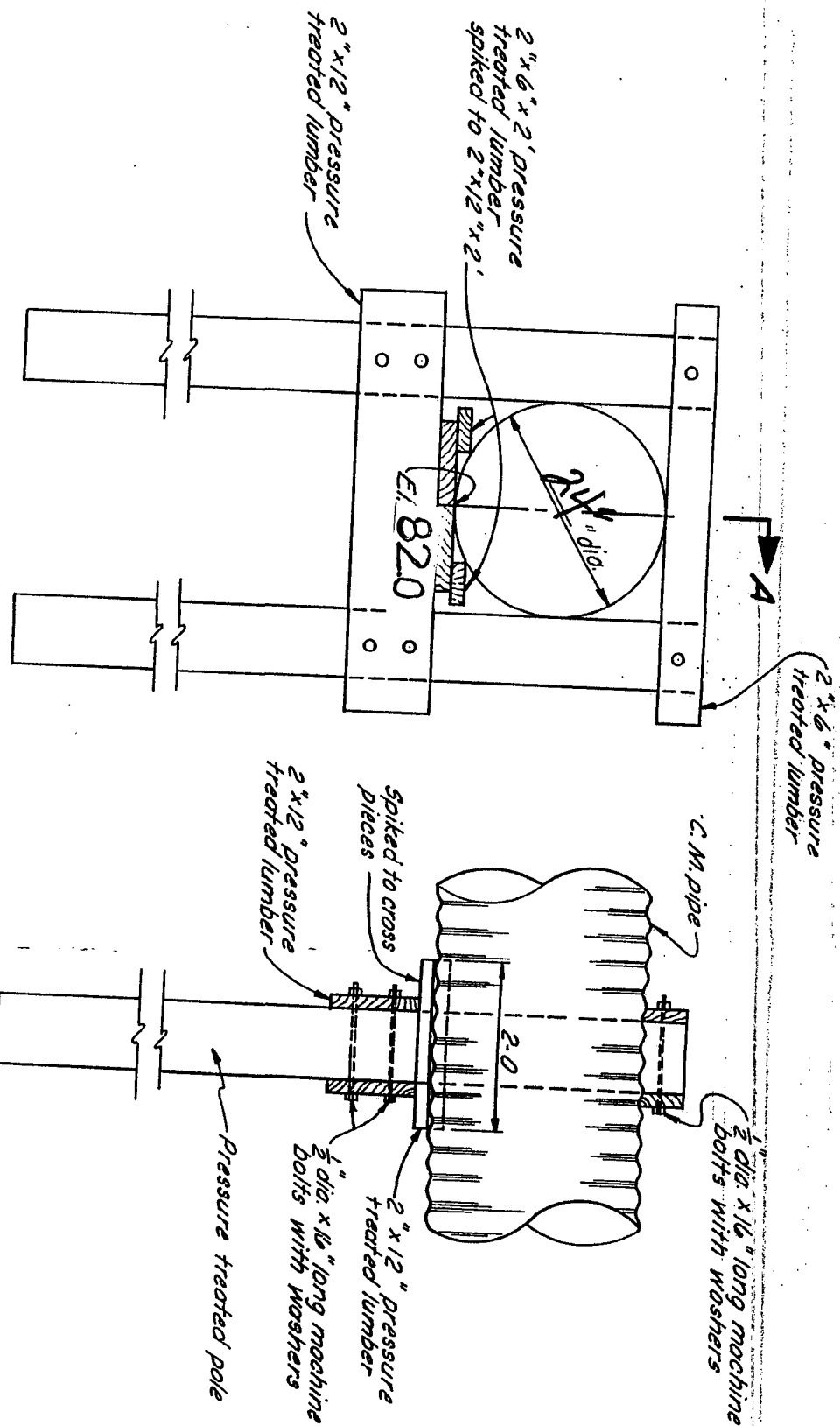
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Approved by: Alman 4/4

Title: Alman 4/4

Sheet: Alman 4/4

Drawing No. Alman 4/4



NOTES:

1. HAND OR MACHINE TAMP BACKFILL THOROUGHLY AROUND FOOTINGS AND COLUMNS.

ELEVATION
SECTIONAL ELEVATION A-A

TABLE OF QUANTITIES

ITEM	LENGTH FOR 24" DIA. C.M. PIPE	UNIT	QUANTITY
PRESSURE TREATED POLE 10" DIA.	10'	EACH	2
2" X 12" PRESSURE TREATED LUMBER	4'	EACH	6
2" X 6" PRESSURE TREATED LUMBER	4'	EACH	2
2" X 12" PRESSURE TREATED LUMBER	2'	EACH	3
2" X 6" PRESSURE TREATED LUMBER	2'	EACH	2
1/2" DIA. MACHINE BOLTS WITH NUTS	1-4	EACH	10
1/2" DIA. WASHERS		EACH	20

REFERENCE: GUIDE PLAN NO. 4.0

JOB PLAN NO. 4.0

TIMBER PIPE SUPPORT

OPERATOR: Ray McQuiston

CONSERVATION DISTRICT: Stanley Cty.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed: A. R. Brown 7/24/41

Drawn: [Signature]

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Checked: [Signature]

Approved by: [Signature]

Title: [Blank]

Sheet No. 9 of 9

Drawing No. [Blank]

5, N-29, 073.4a

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
SOUTH DAKOTA

OPERATION AND MAINTENANCE PLAN
POND
CODE 378

Landowner/Operator Ray McQuiston

Job Location NE 1/4 6-T5N-R29E GPS _____

Prepared by Angela Roman Date July 26, 2014

Operation and Maintenance Items

A properly operated and maintained Pond is an asset to your farm. This structure was designed and installed to provide storage to runoff water for beneficial use. The estimated life span of this installation is at least 10 - 20 years. The life of this installation can be assured and usually increased by developing and carrying out an effective operation and maintenance program. Here are some recommendations for effective operation and maintenance:

- ☐ Inspect the pond after the first significant rainfall and again after each rain until the pond is filled to the inlet elevation.
- ☐ Avoid using vegetated spillways as a travel lane for vehicles and/or farm machinery.
- ☐ Excessive erosion, settlement and/or cracks in earthen sections must be investigated (to determine the cause) and repaired.
- ☐ Periodically inspect spillways and control gates, valves and weirs for proper functioning and their ability to maintain the water level to design elevations. Remove debris or flow blockages.
- ☐ Inspect metal surfaces for rust and other damage. Especially inspect sections in contact with earthfill and/or other materials. Repair or replace damaged sections and apply a protective covering.
- ☐ Inspect concrete for accelerated weathering, spalling, settlement, misalignment or cracks. Repair defects.
- ☐ Inspect rock riprap for accelerated weathering and displacement. Repair to original grades if necessary.
- ☐ Check for unusual seepage on the backside of the dam. Check for water flowing underneath the pipe at the outlet, water flowing in the inlet but not out the outlet, and for water flowing out the outlet but not in the inlet. Make sure all structure drains are functional and soil is not being transported through the drainage system. Screens and/or rodent guards must be maintained and in place.
- ☐ Repair any rodent, burrowing animal, vandalism, vehicle, or livestock damage.
- ☐ Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization, and application of herbicides when necessary. Periodic mowing or short term grazing may also be needed.
- ☐ If fences are installed, they must be maintained to prevent unauthorized entry.

Other _____

CONSTRUCTION SPECIFICATIONS

For:

Ray McQuiston
East Pond
Section 6-T5N-R29W

Prepared by:

USDA-NATURAL RESOURCES CONSERVATION SERVICE
Pierre Field Support Office
605-224-2476

Assisting:

Stanley County Conservation District

According to South Dakota State Law no excavator may begin any excavation without first notifying the One-Call Notification Center of the proposed excavation.

1-800-781-7474

CHECKLIST

NRCS SOUTH DAKOTA CONSTRUCTION SPECIFICATIONS

Check Column	Spec. No.	Construction Specification Title
	SD-1	Clearing
X	SD-2	Clearing and Grubbing
	SD-3	Structure Removal
X	SD-4	Stripping
	SD-6	Excavated Pond (dugout)
X	SD-5	Excavation
	SD-7A	Earth Fill, Class A (controlled compaction)
	SD-7A(CNMS)	Earth Fill, Class A (Comprehensive Nutrient Mgt. System)
X	SD-7S	Earth Fill, Class S (method compaction)
	SD-7U	Earth Fill, Class 7U (uncompacted)
	8	Rock Riprap and Bedding
	SD-8A	Rock Riprap (SD Dept. of Transportation, Class A)
	SD-8B	Rock Riprap (SD Dept. of Transportation, Class B)
X	SD-9	Drain Fill and Filter
X	SD-10	Salvaging and Spreading Topsoil
	SD-12A	Concrete (Class 3500)
X	SD-12B	Concrete for Minor Structures (less than 10 cubic yards)
X	SD-13	Steel Reinforcement (for concrete)
	SD-15	Corrugated Metal Pipe
X	SD-16	Wood Fabrication and Installation
	SD-17	Metal Fabrication and Installation
	SD-18	Wire Mesh Gabion Baskets and Mattresses
	SD-19	PVC Drain for Sediment Basin (Comp. Nutrient Mgt. System)
	SD-20	Plastic Irrigation Pipeline
	SD-20A	Plastic Pipeline (Stockwater and/or Domestic)
	SD-20RC	Plastic Pipeline (Stockwater and/or Domestic)
	SD-21	Steel Pipeline
	SD-22	Concrete Pipeline
	SD-24	Land Leveling
	SD-25	Diversion
	SD-26	Terrace
	SD-27	Grassed Waterway
X	SD-28	Seeding (specific site recommendations required)
	SD-29	Sodding (specific site recommendations required)
	SD-30	Fence
	SD-31	Cathodic Protection
	SD-32	Well
	SD-33	Mulch Blankets and Nets
	SD-34	Clay Lining (Comprehensive Nutrient Management System)
	SD-95	Geotextile

CLEARING AND GRUBBING (SD-2)

CONSTRUCTION SPECIFICATION

1. Scope

The work shall consist of clearing, grubbing and disposal of trees, snags, logs, brush, shrubs, stumps, and rubbish from the designated areas.

2. Protection of Existing Vegetation

Trees and other woody vegetation designated to remain undisturbed shall be protected from damage throughout the entire construction period. Vehicles, stockpiled materials, and/or ground disturbance shall not be allowed within the dripline of the vegetation designated to remain in place. The contractor shall repair any damage resulting from the contractor's operations or neglect.

3. Marking

Limits of the areas to be cleared and grubbed will be marked by stakes, flags, tree markings or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about six feet above the ground surface.

4. Clearing and Grubbing

Unless otherwise specified, all stumps, roots, and root clusters that have a diameter one inch or larger shall be grubbed out to a depth of at least two feet below subgrade for concrete structures and one foot below ground surface for embankment and other designated sites. All trees not marked for preservation, and all snags, logs, brush, shrubs, stumps, rubbish, and similar materials shall be cleared from within the limits of the marked areas.

5. Disposal

Where brush piles for wildlife are not specified on the drawings, cleared and grubbed materials shall be disposed of by burning and/or burying at locations shown on the drawings or shall be disposed of by methods and at sites selected by the contractor and approved by the NRCS Inspector. Materials to be buried shall be placed at least two feet below the surrounding ground line, and shall be covered by at least two feet of soil with the soil surface graded to drain.

The contractor is responsible for complying with all applicable laws and regulations and the payment of any and all fees that may result from disposal at locations away from the construction site.

STRIPPING (SD-4)
CONSTRUCTION SPECIFICATION

1. Scope

The work shall consist of removing topsoil and other undesirable materials from borrow areas and foundations of structures and earth fills.

2. General

Required stripping excavation depth will be the depth needed to expose subsoil reasonably free of roots and other perishable material. Excavated earth material suitable for fill shall be placed in earth fills as appropriate. Stripped material suitable for topsoil shall be stockpiled and placed over disturbed areas as shown on the drawings or as approved by the NRCS Inspector. All waste material shall be disposed of as shown on the drawings or as approved by the NRCS Inspector.

3. Foundation Stripping

Remove loose soil and extend stripping to a reasonably smooth surface in consolidated subsoil. Except as shown on the drawings, foundation slopes shall be excavated to one horizontal to one vertical, or flatter.

4. Borrow Area Stripping

Borrow areas shall be stripped to expose material suitable for earth fill.

EXCAVATION (SD-5)

CONSTRUCTION SPECIFICATION

1. **Scope**

The work shall consist of excavation required by the drawings and specifications and disposal of the excavated material.

2. **Classification**

Common Excavation is defined as the excavation of all materials that can be excavated, transported and unloaded using heavy ripping equipment, and heavy rubber tired loaders or scrapers with pusher tractors. This classification includes rocks smaller than one cubic yard.

Rock Excavation is defined as the excavation of all hard, compacted, or cemented materials that require blasting or the use of unusually large ripping and excavating equipment. This classification includes the removal of isolated rocks larger than one cubic yard.

Unclassified Excavation is defined as the excavation of all materials (including rock) encountered, regardless of the nature of the material or the excavation method needed.

3. **Use of Excavated Materials**

To the extent needed, all suitable materials from excavations shall be used in the construction of specified earth or rock fills. Suitability of materials for specific purposes will be determined by the NRCS Inspector. The contractor shall not waste or otherwise dispose of suitable excavated materials.

4. **Disposal of Waste Materials**

All surplus and unsuitable excavated materials will be disposed of at the locations shown on the drawings or designated by the landowner or NRCS Inspector. The disposal site shall be left in a neat condition and sloped to provide drainage.

5. **Excavation Limits**

Excavated surfaces too steep to be safe without support, shall be supported as necessary to safeguard the work and workers. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring and other supporting installations. The contractor shall furnish, place and subsequently remove such supporting installations. Excavation side slopes may be flattened for safety reasons where approved by the NRCS Inspector. Excavations shall be completed to specified lines and grades prior to placement of earth fill or construction of structures.

7. **Borrow Excavation**

When suitable materials from specified excavations are insufficient to construct specified fills, additional material shall be obtained from designated borrow areas. The extent and depth of borrow pits shall be as approved by the NRCS Inspector. Borrow pits must be shaped to eliminate unsightly conditions and steep or unstable slopes.

EARTH FILL-CLASS S (SD-7S)

CONSTRUCTION SPECIFICATION

1. Scope

The work shall consist of the construction of compacted earth fills where the amount of compaction is to be controlled by specifying a construction method.

2. Materials

All fill materials shall be obtained from required excavations and designated borrow areas. Selection, blending, placement and compaction of fill will be subject to approval of the NRCS Inspector.

Fill materials shall contain no frozen material, sod, roots or other perishable material, or rocks larger than eight inches in diameter. Fill shall not be placed on a frozen surface.

3. Foundation Preparation

All foundation (including abutment) surfaces shall be shaped one horizontal to one vertical or flatter except as otherwise specified.

After stripping (see stripping specification), the foundation shall be loosened thoroughly by scarifying or plowing to a minimum depth of four inches. The foundation shall then be compacted by the process specified for the fill.

4. Placement

All foundation excavation and preparation shall be completed before placing fill. Except as required by the drawings, fill material shall be mixed and uniformly placed throughout the entire fill without lenses, streaks, pockets, or layers of material that differ significantly from surrounding material.

Placement and compaction methods must prevent damage to structures and allow the structure to assume backfill loads gradually and uniformly. Within 2 feet of any structure, fill layer thickness must not exceed 4 inches and equipment loads must not exceed 400 pounds.

Fill shall be placed in approximately horizontal layers. Except as described above, fill layer thickness shall not exceed nine inches for compaction by large machines or four inches for small hand directed power tampers.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill, to a depth of not less than two inches, before the next layer is placed.

Except as otherwise specified, openings temporarily left in dam fills (for pipe installation, streamflow, etc.) shall have side slopes three horizontal to one vertical or flatter. When filling the opening, the bonding surface of the fill in place shall be stripped of all material not meeting the requirements of this specification and shall be scarified, moistened, and recompacted as new earthfill is placed.

5. Control of Moisture Content

At the time of compaction, earth fill shall have a moisture content that when kneaded in the hand will form a ball that does not easily crumble when pressed between the hands. If the soil is too wet, it will yield free water when kneaded in the hand.

Fill materials must be wetted or dried as needed to achieve proper moisture prior to compaction.

6. Compaction (Class S)

Fill layers shall be compacted by one of the following methods.

- a. By routing the hauling and spreading equipment such that all points of the fill are traversed by at least one tread track of the loaded equipment traveling parallel to the centerline of the fill.
- b. By at least 2 passes of a tamping (sheepsfoot) roller weighing at least 100 pounds per square inch of bearing area.

Fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators. Within 2 feet of any structure, equipment loads must not exceed 400 pounds.

Compaction of fill adjacent to concrete structures shall not be started for at least the following number of days after placement of the concrete.

Concrete Structure	Days After Concrete Placement
Vertical or near-vertical walls with earth load on one side only	14
Walls backfilled on both sides simultaneously	7
Conduits and spillway risers, cast-in-place (with inside forms in place)	7
Conduits and spillway risers, cast-in-place (forms removed)	14
Conduits, pre-cast, cradled	2
Conduits, pre-cast, bedded	1
Anti-seep Collars and Cantilever Pipe Supports (backfill both sides simultaneously)	3

DRAINFILL AND FILTER (SD-9)

CONSTRUCTION SPECIFICATION

1. Scope

The work shall consist of furnishing, placing and compacting drain fill and filter sands and/or gravels.

2. Materials

Aggregates shall be sand, gravel, crushed stone, or mixtures thereof, composed of clean, hard, durable mineral particles free of organic matter, clay balls, soft particles or other substances that would interfere with free draining properties of the aggregates.

Not more than five percent of the material may be limestone, and not more than 15 percent may be flat elongated particles.

The aggregates shall meet the following gradation requirements except as otherwise specified.

Filter Aggregate Size	percent Finer by Weight
3"	100
1"	90 to 100
#4	50 to 85
#50	10 to 40
#200	0 to 5

3. Subgrade Preparation

Surfaces on which drain fill will be placed shall be as undisturbed as possible (do not scarify), and must be free of standing water during placement of drain aggregates. Care shall be taken to prevent collapse of drain walls.

4. Placement

Drain fill shall not be placed until the subgrade has been made available for inspection by the NRCS Inspector. Drain fill shall not be placed around pipes until the pipe installation has been made available for inspection by the NRCS Inspector.

Material must be placed in uniform, approximately six-inch thick layers. Extreme care shall be taken to assure uniformity of the drain fill, and to prevent segregation or contamination of the drain fill with foreign mater. When collector pipes are included in drains, the fill materials shall be placed in a manner to avoid displacing the pipe.

SALVAGING AND SPREADING TOPSOIL (SD-10)

CONSTRUCTION SPECIFICATION

1. Scope

The work shall consist of salvaging topsoil from borrow pits or other excavations and spreading it in the designated areas to the specified depths.

2. Quality of Topsoil

Topsoil shall consist of friable soil reasonably free of grass, roots, weeds, sticks, stones or other foreign materials.

3. Excavation

Topsoil shall be removed after clearing, grubbing and removing vegetation and shall be stockpiled. Objectionable materials shall be removed and buried, or disposed of, at locations approved by the NRCS Inspector.

4. Spreading

Spreading shall not be done when the ground or topsoil is frozen, excessively wet or otherwise in a condition detrimental to the work. Surfaces to be covered shall be lightly scarified just prior to the spreading operation.

All earth fills not to be submerged shall be covered with topsoil to a depth of 6 to 18 inches measured perpendicular to the surface of the fill and placed to the neat lines shown on the drawings.

After placement is completed, the topsoil surface shall be left in a condition that will permit seeding equipment to be operated without excessive smoothing.

CONCRETE FOR MINOR STRUCTURES (generally for structures <10 cu. yd.) (SD-12B)

CONSTRUCTION SPECIFICATION

1. Scope

The work shall consist of proportioning, forming, placing, finishing, and curing portland cement concrete.

2. Materials

Portland Cement shall conform to ASTM C150, Type II or IIA and shall be low alkali. Partially hydrated or damaged cement shall not be used.

Aggregates shall conform to the requirements of ASTM C33. Coarse aggregates shall be size 467 (1/2 inch to #4 sieve) unless otherwise specified. Aggregates must be free of contamination and segregation.

Water shall be clean, free of harmful chemicals and suitable for drinking.

Air-entraining admixtures must follow the Manufacturer's recommendations.

3. Concrete Mix Design

The contractor or person in charge of construction shall be responsible for designing a concrete mix that will produce 3000 pounds per square inch compressive strength at 28 days and meet the following requirements:

The concrete mix must contain less than six gallons of water per bag of cement.

The mix must contain at least six bags of cement per cubic yard of concrete.

Air-entrainment shall be between four and seven percent by volume.

Concrete slump after mixing must be between two and five inches.

Use of Ready Mixed concrete meeting this specification is encouraged. Upon request, the vendor must provide the owner and NRCS Inspector a signed delivery ticket giving the quantities of concrete, cement, fine aggregate, coarse aggregate, and water contained in the batch.

Calcium chloride, Sodium chloride (salt) or other corrosive accelerators shall not be used.

4. Concrete Forms

Forms shall be wood, plywood, metal, fiberglass or other approved material. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags, or other irregularities. Forms shall not be embedded in the concrete.

5. Placing Concrete

Concrete shall be placed in final position within 1.5 hours after adding cement (water if using sack-concrete premix) to the mix.

Earth surfaces under concrete shall be compacted, and free of debris, frost, ice, or flowing water. Concrete shall not be dropped more than five feet vertically without use of equipment designed to prevent segregation.

Each layer of concrete must be completely consolidated by spading, hand tamping, and/or mechanical vibration. Vibration shall compact the concrete and bring it into intimate contact with the forms, reinforcing steel, and other embedded items while removing voids and pockets of trapped air.

Unformed concrete surfaces (excluding slip-formed surfaces) exposed in the completed work shall be accurately struck off to grade and then float finished. Concrete edges exposed in the final work shall be chamfered or finished with molding tools.

Concrete shall be placed at air temperatures between 40°F and 80°F unless special measures are taken to protect the concrete. Concrete must be protected from freezing for 24 hours after placement.

6. **Curing**

All concrete shall be cured by keeping all exposed surfaces wet for 7 days (counting only days above 50°F). Alternately, the wet cure process can be stopped when curing compound is applied as recommended by the manufacturer.

7. **Defective Concrete**

Honey combed areas and other voids in concrete must be promptly repaired with mortar patching immediately upon discovery.

Damaged concrete and concrete not meeting requirements of this specification will be rejected.

STEEL REINFORCEMENT (SD-13)

CONSTRUCTION SPECIFICATION

CS-59

1. Scope

The work shall consist of furnishing and placing steel reinforcement for reinforced concrete or pneumatically applied mortar.

2. Materials

Steel reinforcement shall be free of flaky rust, oil, grease, paint, mill scale, or other deleterious matter. **Steel bar reinforcement** (except as otherwise specified) shall be grade 40, 50, or 60 deformed bars conforming to one of the following specifications.

- Deformed and Plain Billet-steel Bars for Concrete Reinforcement ASTM A615
- Rail-steel Deformed and Plain Bars for Concrete Reinforcement ASTM A616 with S1 Supplement Requirements
- Axle-steel Deformed and Plain Bars for Concrete Reinforcement ASTM A617

Dowels shall be plain round bars conforming to the above specifications.

Fabricated deformed steel bar mats for concrete reinforcement shall meet ASTM A184.

Plain steel welded wire fabric for concrete reinforcement shall meet ASTM A185.

Deformed steel welded wire fabric for concrete reinforcement shall meet ASTM A497.

Epoxy-coated steel bars for concrete reinforcement shall meet ASTM A775.

3. Cutting and Bending

Reinforcing bars may be shop or field cut and/or bent. All bends must be made without heating or otherwise weakening the bar. Shop bends must meet American Concrete Institute Standard 315. Bars with kinks, cracks, or improper bends will be rejected.

4. Splicing Bar Reinforcement

Except as otherwise specified, splices of reinforcing bars shall provide an overlap of at least 30 times the smaller bar diameter, but not less than 12 inches.

5. Splicing Welded Wire Fabric

Welded wire fabric shall be overlapped one full mesh (rectangle) not counting cut portions.

6. Placing

Reinforcing shall be accurately placed and secured in position to prevent its displacement during concrete placement. Tack welding of bars is not permitted. Dimensions shown on the plans indicating concrete cover, are the clear distances from the concrete surface to the reinforcing steel.

Metal hangers, spacers, and ties shall be placed in a manner that they are not exposed in the finished concrete surface. The legs of metal chairs or side form spacers that may be exposed on any surface of slabs, walls, beams, or other concrete surfaces shall be a design that will not corrode at the concrete surface. Precast concrete chairs shall be clean and moist at the time of concrete placement.

On structures exceeding four cubic yard of concrete, concrete shall not be placed until the reinforcement has been inspected and approved by the NRCS Inspector. For any size pour, inspection of reinforcement embedded in concrete may be performed by the NRCS Inspector using radar, or other inspection instruments.

WOOD FABRICATION AND INSTALLATION (SD-16)

CONSTRUCTION SPECIFICATION

CS-68

1. Scope

The work shall consist of furnishing and constructing wood structures and wood parts of composite structures.

2. Plywood Material

Plywood and Oriented Strand Board (OSB) for use in above ground sheltered construction (buildings etc.) shall meet Product Standard PS-1 and shall conform to the requirements shown on the drawings.

Plywood for use in exposed above ground construction shall be exterior grade, meet Product Standard PS-1 and shall conform to the requirements shown on the drawings.

Treated plywood for use above ground shall meet Product Standard PS-1 and be pressure treated with waterborne preservatives (Arsenicals) to a retention level of at least 0.4 pounds per cubic foot except as shown on the drawings.

Treated plywood that is to be in permanent contact with water or the earth must meet Product Standard PS-1 and be pressure treated with waterborne preservatives (Arsenicals) to a retention level of 0.6 pounds per cubic foot, except as shown on the drawings.

3. Structural Timber and Lumber Material

All wood material shall be sound wood free from decay and disease damage, shall be straight, not cracked, and shall meet the requirements shown on the drawings. Structural timber and lumber shall be structural grade or better.

Unless otherwise specified, all timber and all nominal lumber sizes 2X10 or larger shall be pressure treated by one of the following preservatives:

- Cresote
- Pentachlorophenol
- Waterborne Preservatives (Arsenicals)

Unless otherwise specified, all nominal lumber sizes 2X8 or smaller shall be pressure treated using waterborne preservatives (Arsenicals). Wood for use above ground shall be treated to a retention level of at least 0.4 pounds per cubic foot. Wood for use in permanent contact with water or earth shall be treated to a retention level of at least 0.6 pounds per cubic foot.

4. Metal Hardware

Bolts, nuts, washers, rods, angle iron, and other metal hardware shall be an appropriate grade of steel, and if installed underground, shall be galvanized, or have equal corrosion protection.

5. Installation

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to close fit. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. Bolt holes shall be drilled for snug fit. Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread. Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

SEEDING (SD-28) CONSTRUCTION SPECIFICATION

CS-54

1. **Scope**

The work shall consist of furnishing all labor, equipment, and materials needed for seeding the areas shown on the drawings.

2. **General**

Seeding and related operations shall be performed in the following time period.
Dates: _____

3. **Fertilizer**

Fertilizer shall be uniformly applied commercial liquid or dry fertilizer conforming to South Dakota laws and regulations. Fertilizer shall be supplied and applied as follows.
Types and rates: _____

4. **Seed**

Seed requirements and seeding rates are listed below. Documentation must be provided showing the seed meets current South Dakota laws and regulations. The seed must be planted within one year of its latest germination test.

5. **Seedbed Preparation**

The area to be seeded shall be made reasonably smooth and firm. Ditches shall be filled to conform to design lines and grades before seedbed preparation is begun. Prior to seeding, required fertilizer shall be applied and mixed with the soil surface to a depth of three inches. The contractor shall suspend operations when the soil is too wet.

6. **Cover and/or Nurse Crops**

When specified, cover and/or nurse crops shall be seeded as follows:

7. **Sowing Seed**

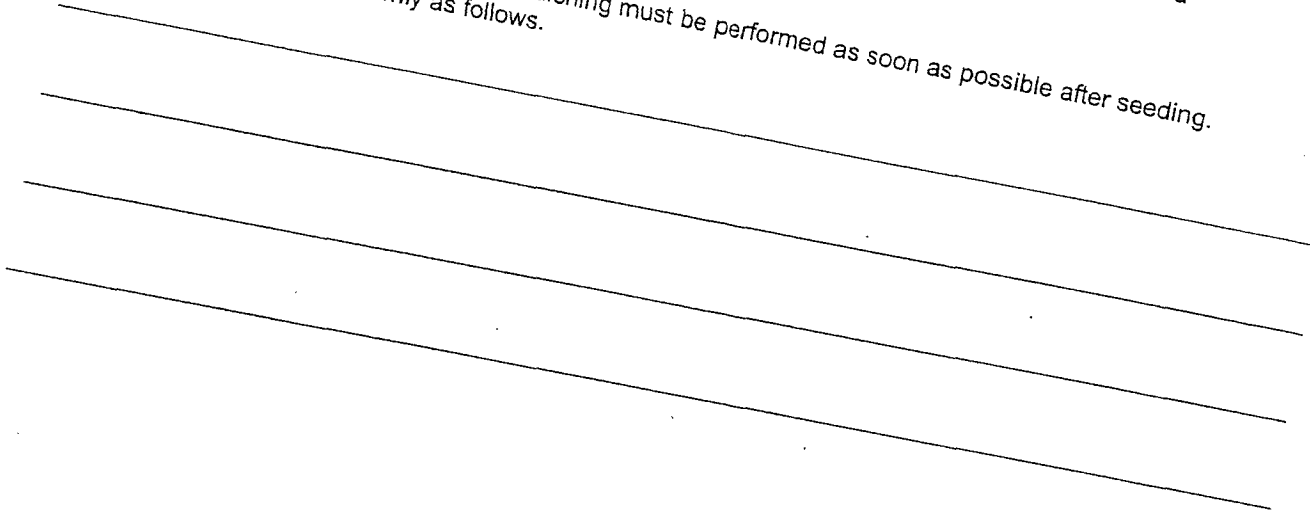
Except as otherwise specified, seeding shall be performed immediately after seedbed preparation. Seeding shall be drilled or broadcast and incorporated in a manner that will achieve uniform distribution of seed placed at appropriate soil depth.

When seeding waterways or similar water flow areas, machinery operations must be performed in a direction that is not parallel to water flow (use Figure 8, serpentine, etc.).

8.

Mulching

Except as otherwise specified, required mulching must be performed as soon as possible after seeding. Mulch shall be applied uniformly as follows.



CORRUGATED POLYETHYLENE (PE) PIPE (SD-55A)
MATERIAL SPECIFICATION

1. **Scope**

This specification covers the quality of corrugated polyethylene (PE) tubing and fittings.

2. **Pipe and Tubing**

Corrugated polyethylene tubing shall conform to the following requirements for the specified tubing types, sizes, and fittings.

ASTM F667

ASTM F667

ASTM F894

Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings

Standard Specification for Corrugated Polyethylene Pipe and Fittings

Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

AASHTO M252 Standard Specification for Polyethylene Corrugated Drainage Pipe

AASHTO M294 Standard Specification for Corrugated Polyethylene Pipe, 12" to 36" diameter

STATE SD		PROJECT McQuiston East		
BY ADR	DATE 7/1/04	CHECKED BY WMD	DATE 8/13/04	JOB NO.
SUBJECT Annual yield + sediment storage				SHEET _____ OF _____

→ Annual surface yield REF: EFM 2-83 Method A

Data

Isogram #2

CN = 80

Contr. acres = 1388

90 chance = 50

1.66" runoff

$$\frac{\text{Acres} \times \text{" runoff}}{12} = \text{AcFt}$$

$$\frac{1388 \times 1.66}{12} = 76.34 \text{ AcFt}$$

Storage @ Prim. spillway = 45.4 AcFt

→ Sediment Yield

Erodibility Area = P

Gross Rate .0042 AcFt/Ac/Yr

Drainage Area 1388 Acres

Delivery Rate 28%

Design Life = 35 yrs

57.1 AcFt

$$10042 \times 1388 \times .28 \times 35 = 57.1$$

$$((.0042 \times 1388 \times 28) \times X = 45.4$$

$$X = \frac{45.4}{10042 \times .28} = \frac{45.4}{2811.76} = 27.8 \text{ years} \checkmark$$

below point

Sediment in flood pool = 20%

$$20\% \text{ of sediment yield} = 45.7 \text{ AcFt}$$

Since 35 yr sediment yield, consider dam to have sediment storage. Sediment storage is 20 years sediment. Upstream of this dam are at least 4 structures that will retain sediment as well, allowing for flood pool storage 20%. Will allow for additional storage. J. K. M. 7/7/04 ✓

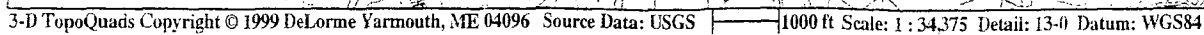
STATE <u>SD</u>		PROJECT _____		
BY <u>A. Roman</u>	DATE _____	CHECKED BY _____	DATE _____	JOB NO. _____
SUBJECT _____				SHEET _____ OF _____

A	1600	1
B	5000	5
C	5600	6
D	6250	6
E	6800	8
F	7400	9
G	7100	9
H	6700	7
I	6300	9
J	1900	5
K	600	2
1	250	0
2	2000	3
3	3600	4
4	5000	4
5	5100	6
6	5400	8
7	6000	8
8	6400	8
9	5600	5
10	4600	5
11	4200	7
12	4000	7
13	2200	6
<u>109,600</u>		<u>138</u>

Drainage Area = 1,388 acms
Length = 19,500'

$$S = \frac{1.571 (20 \times 138)}{109,600} \times 100 = 3.95616\% \approx 3.96\%$$

1,388 1000 crop 388 grass



Date 6-30-04

Hole No. 1

Soil Name

Drilling Location

[illegible]

Notes: Located at west bank of drainage way. Clay texture down to 7 feet. Hit shale at 7 feet.

Unified Symbols and Group Names		Agricultural Waste Management Field Handbook, Chapter 10				
GW = Well graded gravel, gravel-sand mix, few fines GP = Poorly Graded gravel, gravel-sand mix, few fines GC = Clayey gravel, gravel-sand-clay mix	Table 10D-3 (1161 test results)		Table 10D-2			
	Soil Group	Median K, cm/s	Median K, ft/d	Unified Class	Perm Group I II III IV	In Perm Group

Location In Section (X)



Z

Trimble
 5475 Kellenburger Road
 Dayton, Ohio 45424-1099, USA
 1-937-233-8921
 Tuesday, August 17, 2004 7:21:31 AM

PROJECT: S:\engineering\Angela\McQuistionEastFinalModified.pro

DTM TO DTM VOLUME

Cut and Fill Volumes

Shrinkage/swell factors: Cut 1.0000 Fill 1.0000

Original DTM Layer Name	# of Points	Final DTM Layer Name	# of Points
MERGEFILL	320	DAM	80
Cut Volume (Cu. Yd.)	Cumulative Cut Volume	Fill Volume (Cu. Yd.)	Cumulative Fill Volume
43.0	43.0	13,224.6	13,224.6

Net Difference: 13181.6 Cu. Yd. BORROW

Trimble
 5475 Kellenburger Road
 Dayton, Ohio 45424-1099, USA
 1-937-233-8921
 Tuesday, August 10, 2004 6:55:21 AM

PROJECT: C:\home\angela.roman\Dams\McQuistion\McQuistionEastFinalModified.pro

DTM TO DTM VOLUME

Cut and Fill Volumes

Shrinkage/swell factors: Cut 1.0000 Fill 1.0000

Original DTM Layer Name	# of Points	Final DTM Layer Name	# of Points
POINTS	286	SPILLWAYNATURAL	186
Cut Volume (Cu. Yd.)	Cumulative Cut Volume	Fill Volume (Cu. Yd.)	Cumulative Fill Volume
3,060.2	3,060.2	4.6	4.6

Net Difference: 3055.6 Cu. Yd. WASTE

Trimble
 5475 Kellenburger Road
 Dayton, Ohio 45424-1099, USA
 1-937-233-8921
 Tuesday, August 10, 2004 6:57:26 AM

PROJECT: C:\home\angela.roman\Dams\McQuistion\McQuistionEastFinalModified.pro

DTM TO DTM VOLUME

Cut and Fill Volumes

Shrinkage/swell factors: Cut 1.0000 Fill 1.0000

Original DTM Layer Name	# of Points	Final DTM Layer Name	# of Points
POINTS	286	DAM	60
Cut Volume (Cu. Yd.)	Cumulative Cut Volume	Fill Volume (Cu. Yd.)	Cumulative Fill Volume
0.0	0.0	12,922.8	12,922.8

Net Difference: 12922.8 Cu. Yd. BORROW

Trimble
 5475 Kellenburger Road
 Dayton, Ohio 45424-1099, USA
 1-937-233-8921
 Tuesday, August 10, 2004 6:58:03 AM

PROJECT: C:\home\angela.roman\Dams\McQuistion\McQuistionEastFinalModified.pro

DTM TO DTM VOLUME

Cut and Fill Volumes

Shrinkage/swell factors: Cut 1.0000 Fill 1.0000

Original DTM Layer Name	# of Points	Final DTM Layer Name	# of Points
POINTS	286	DIKE	56
Cut Volume (Cu. Yd.)	Cumulative Cut Volume	Fill Volume (Cu. Yd.)	Cumulative Fill Volume
0.0	0.0	164.4	164.4

Net Difference: 164.4 Cu. Yd. BORROW

STATE <u>SD</u>	PROJECT <u>McQuishon East</u>			
BY <u>A Roman</u>	DATE <u>7/27/04</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>Core trench, topsoil, stripping</u>				SHEET <u>1</u> OF <u>1</u>

Core trench



$$\left(\frac{10 + 16}{2} \right) \times 3 = 672' = 22,208 \text{ ft}^3$$

$$\frac{22,208}{27} = 970.6 \text{ CY} \approx 971 \text{ CY}$$

Stripping

(Terra model = 54,054 ft²)

$$54,054 \text{ ft}^2 \times 1.83 = 98,918.82 \text{ ft}^3 \div 27 = 3,663.66 \text{ CY} \approx 3,664 \text{ CY}$$

Topsoil Terra model = 3,664 ft²

You might want to set up a spreadsheet with the various quantities summarized. I will send you mine if you want to try it.

Client: Ray McQuiston
 County: STANLEY
 Practice: East Dam
 Calculated By: ADR
 Checked By: _____

State: SD

Date: 7/22/2004

Date: _____

Drainage Area: 1388 Acres (User entered value)
 Curve Number: 80 (User entered value)
 Watershed Length: 19500 Feet
 Watershed Slope: 3.96 Percent
 Time of Concentration: 2.865 Hours (Calculated value)
 Rainfall Type: II

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr rainfall (in)	1.80	2.10	2.90	3.40	4.00	<u>4.40</u>	5.10
Ia/P Ratio	0.28	0.24	0.17	0.15	0.13	0.11	0.10
Used	0.28	0.24	0.17	0.15	0.13	0.11	0.10
Runoff (in)	0.44	0.62	1.18	1.56	2.04	2.38	2.98
Unit Peak Discharge (cfs/acre/in)	0.229	0.238	0.253	0.259	0.264	0.267	0.270
Peak Discharge (cfs)	141	206	413	560	749	881	1,117

DRAINAGE DIAPHRAGM LOCATOR

McQuiston ^{East}~~West~~

Data Input	
Elev. Invert	100
Pipe slope (ft/ft)	0.1129
Top of Fill	110.1
SS ratio	3
Dist from invert to ds edge top dam	26.7
pipe diam (ft)	2
dist from pipe CL to top diaphragm	5
Diaphragm thickness (ft)	2

(This solver button doesn't work)

X (max dist from invert to U/S diaph.) 39

(PLAY WITH THIS UNTIL b16 AND b17 ARE EQUAL)

theta 18.43495

1/2 of top of fill to top Diaphragm 4.308

1.005543

perp dist from to diaph to backslope 4.284254 Adjust X so that these are equal

Elevation of top of Diaphragm 101.484

A. Roman
7-8-04

Data Input	
Pipe Size (in)	24
Corrugation depth (in)	1
Outside Diameter	26
Req. Projection	4.333333
Total Width	10.83333
use	11
volume	363

13.44444 cu.yds

Principal Spillway Routing

1*****
 SITES XEQ 08/06/2004 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2000 (USER MANUAL - DATED MAY 2001)
 TIME 09:33:28

***** 80-80 LIST OF INPUT DATA *****

SITES 05/01/2000 McQuiston East 2.16875 H7
 SAVMOV 0 101
 SAVMOV 101 1 1
 * Principle Spillway = 2yr
 * Emergency Spillway = 50 yr
 STRUCTURE
 90 .00
 92 .11
 94 .49
 95 .73
 96 1
 97 1.37
 98 2.04
 99 2.82
 100 3.631
 101 4.465
 102 5.7414
 103 7.2373
 104 9.6881
 105 11.5057
 106 13.4359
 107 15.4023
 108 17.3232
 109 19.1104
 110 21.1958

ENDTABLE
 WSDATA 5A1 AC 80 1388 19500 3.96
 PDIRECT 2.1 4.00 4.40
 POOLDATA ELEV 105 105 89.4 89.4 SC
 PSINLET 1 15.71
 PSDATA 1 125 24 .009 81.5
 ASDATA 41 0 50 3 .016667 2
 ASINSURF 41 5.6 C
 ASINLET 41 0.0 0.0 50 0.0 3
 100 1

ENDTABLE
 ASEXSURF 41 5.6
 0.67 0
 1
 1.5 0
 .007

ENDTABLE
 ASEXIT 41 N 80
 BTMWIDTH FEET 100
 GRAPHICS 1
 GO,DESIGN HL TYPE2 24 TYPE2378 24
 SAVMOV 2 101 1
 ENDJOB

1SITES XEQ 08/06/2004 ----- COMMENT PAGE -----
VER 2000 McQuiston East WSID =

Principle Spillway = 2yr

Emergency Spillway = 50 yr

***** MESSAGE - ALTERNATE STRUCTURE ID (S 1) BEING USED
SINCE USER DID NOT INPUT AN ID.

***** MESSAGE - ALTERNATE SUBWATERSHED ID (A) BEING USED SINCE
USER DID NOT INPUT AN ID.

***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.

1SITES -----
XEQ 08/06/2004 McQuiston East WSID=
VER 2000 SUBW= A
TIME 09:33:28 SITE = S 1 PASS= 1 PART= 1

***** BASIC DATA *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS A1 = LT 3000.

STORM DISTRIBUTION-PSH 24 HOUR TYPE II RAINFALL DISTRIBUTION

STORM DISTRIBUTION AUX. -24 HOUR TYPE II RAINFALL DISTRIBUTION

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	P-SD	P-FB
2.10	0.00	4.00	4.40

WSDATA - CN	DA-SM	TC/L	-/H	QRF
80.00	2.17	19500.00	3.96	0.00

SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
105.00	105.00	0.00	89.40	YES

BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE
0.00	0.00	0.00	DESIGN

PSDATA - NO. COND	COND L	DIA/W	-/H
1.00	125.00	24.00	0.00

PS N	KE	WEIR L	TW EL
0.009	1.00	15.71	81.50

2ND STG	ORF H	ORF L	START AUX.
0.00	0.00	0.00	0.00

ASCRESTS - AUX.1	AUX.2	AUX.3	AUX.4	AUX.5
0.00	0.00	0.00	0.00	0.00

AUX.DATA - REF.NO. RETARD. Ci TIE STATION INLET LENGTH
41 0.00 0.00 50

AUX.DATA - INLET Ci SIDE SLOPE EXIT Ci EXIT SLOPE ACTUAL AUX?
5.600 3.00 5.600 0.017 NO

BTM WIDTH - BW1 BW2 BW3 BW4 BW5
ft 100.00 0.00 0.00 0.00 0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----
XEQ 08/06/2004 McQuiston East WSID=
VER 2000 SUBW= A
TIME 09:33:28 SITE = S 1 PASS= 1 PART= 2

PERM POOL 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS

CREST PS 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS

SED ACCUM 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS

START ELEV 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS

NRCS-PSH D= 24.00 HR P= 2.10 IN Q= 0.62 IN DA= 2.17 SM
TC= 2.86 HR CN= 80.00 VOL= 72.2 ACFT

PEAK = 196.9 CFS, AT 13.7 HRS.

ROUTED RESULT - HYD TYPE EMAX VOL-MAX AMAX QMAX
NRCS-PSH 106.97 FT 71.9 ACFT 15.35 AC 76.8 CFS

PS STORAGE 26.5 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 105.00 FT 45.4 ACFT 0.00 CFS
CONTROL IS 0.000 DETENTION STORAGE

TIME = 1.69 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

RATING TABLE DEVELOPED, SITE = S 1:
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 1

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	105.00	0.00	0.00	0.00	45.43	11.51
2	105.34	9.47	9.47	0.00	49.40	12.15
3	105.67	26.80	26.80	0.00	53.59	12.80

7	106.50	76.06	76.06	0.00	64.87	14.42
8	106.58	76.18	76.18	0.00	66.01	14.57
9	106.66	76.30	76.30	0.00	67.16	14.73
10	106.74	76.42	76.42	0.00	68.32	14.88
11	106.81	76.54	76.54	0.00	69.50	15.04
12	106.89	76.66	76.66	0.00	70.69	15.19
13	106.97	76.78	76.78	0.00	71.89	15.35
14	107.12	81.23	77.00	4.22	74.23	15.64
15	107.27	85.68	77.23	8.45	76.62	15.93
16	107.55	93.65	77.64	16.01	81.04	16.45
17	107.88	153.49	78.13	75.36	86.62	17.09
18	108.49	457.02	79.02	378.00	97.31	18.19
19	109.24	944.31	80.13	864.19	111.61	19.62
20	110.00	1538.67	81.21	1457.46	127.05	21.20

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA	TO STA	SLOPE	RETARDANCE	VEGETAL	MAINT.	ROOTING	REACH
	STA	STA	CURVE	COVER	CODE	DEPTH	LOCATION	
	(ft)	(ft)	(%)	INDEX	FACTOR	(ft)	*	
1	-50.	0.	0.0	5.6	**	**	**	CREST
2	0.	80.	1.7	5.6	0.67	1	1.5	EXIT !

* Upper case indicates a reach of constructed spillway channel.

** The program does not use vegetal cover factor, maintenance code, and rooting depth for inlet and crest reaches in computations.

! Reach 2 used in computing exit channel velocities.

ROUTED RESULTS	BTM	WIDTH	MAX ELEV	VOL-MAX	AREA-MAX	AUX.-HP	VOL-AUX.
	FT	FT	ACFT	AC	FT	ACFT	
NRCS-SDH	100.0	108.76	102.3	18.7	1.78	30.4	

PEAK - CFS Q-PS Q-AUX. Q-TOT.
DISCHARGE = 79.4 547.1 626.5

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
AUXILIARY SPILLWAY ---	FT	FT/SEC	FT/FT	FT/FT
	0.97	5.50	0.026	0.102

AUXILIARY SPILLWAY DURATION FLOW = 12.4 HOURS

***** MESSAGE - NHCP378 CRITERIA USED BUT AUXILIARY SPILLWAY RATING NOT BASED ON ASFILE RATINGS.

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 4.8 FT/SEC
EXIT SLOPE = 0.017 FT/FT
FLOW DEPTH = 1.1 FT

EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
(Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)

Aux. Discharge = 547. cfs; Bottom Width = 100. ft

REACH FROM TO SLOPE MANNING'S VELOCITY STRESS

NO.	STA	STA	%	n	ft/s	lb/ft^2
2	0.	80.	1.67	0.042	4.78	0.052

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 106.97 FT.

DRAWDOWN (DDT) TEST 105.00 FT 45.4 ACFT 0.00 CFS
CONTROL IS 0.000 DETENTION STORAGE

TIME = 1.68 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

ROUTED	BTM WIDTH	MAX ELEV	VOL-MAX	AREA-MAX	AUX.-HP	VOL-AUX.
RESULTS	FT	FT	ACFT	AC	FT	ACFT
NRCS-FBH	100.0	108.94	105.8	19.0	1.97	33.9

PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
DISCHARGE =	79.7	665.6	745.3

	CRITICAL	CRITICAL	CRITICAL	25% OF Q
	DEPTH	VELOCITY	SLOPE-Sc	Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	1.10	5.86	0.023	0.081

AUXILIARY SPILLWAY DURATION FLOW = 13.4 HOURS
ATTACK, OE/B = 1.6 ACFT/FT

***** MESSAGE - NHCP378 CRITERIA USED BUT AUXILIARY SPILLWAY RATING NOT
BASED ON ASFILE RATINGS.

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 5.3 FT/SEC
EXIT SLOPE = 0.017 FT/FT
FLOW DEPTH = 1.2 FT

>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS 2.00 FT.
NEW TOP OF DAM ELEVATION = 108.97.

ROUTED	BTM WIDTH	MAX ELEV	VOL-MAX	AREA-MAX	AUX. HP	VOL-AUX.
RESULTS	FT	FT	ACFT	AC	FT	ACFT
MINIMUM AUX.	100.0	108.97	106.5	19.1	2.01	34.6

PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
DISCHARGES =	79.7	690.1	769.8

	CRITICAL	CRITICAL	CRITICAL	25% OF Q
	DEPTH	VELOCITY	SLOPE-Sc	Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	1.13	5.93	0.022	0.078

>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED
FOR THIS PASS. NEW TOP OF DAM ELEVATION = 109.94.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	100.0	109.94	125.8	21.1	2.97	54.0

PEAK - CFS Q-PS Q-AUX. Q-TOT.
DISCHARGES = 81.1 1410.9 1492.1

	CRITICAL DEPTH	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	1.80	7.43	0.014	0.038

INFLOW HYD 1 PSH-PEAK = 76.77 CFS AT 16.37 HRS, LOCATION POINT
INFLOW HYD 1 SDH-PEAK = 626.51 CFS AT 14.40 HRS, LOCATION POINT
INFLOW HYD 1 FBH-PEAK = 745.34 CFS AT 14.40 HRS, LOCATION POINT
HYDOUT 1

1SITES.....JOB NO. 1 COMPLETE.

McQuiston East

0 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

3 HYDROGRAPHS ROUTED AT LOWEST SITE.

0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

SITES.....COMPUTATIONS COMPLETE

>>>	SITE ID	SUBWS ID	SUBWS (SQ MI)	DA NO.	CURVE (HRS)	TC (SQ MI)	TOTAL DA	TYPE DESIGN	STRUC CLASS	<<<
	S 1	A	2.17	80.	2.86	2.17	378NR	A1		

PASS NO.	DIA./WIDTH (IN/FT)	AUX.CREST (FT)	BTM. (FT)	MAX. WIDTH (FT)	MAX. HP (FT)	EMB. ELEV (CY)	INTEGR. VOL. (FT)	*EXIT* DIST. (FT/SEC)	TYPE VEL. HYD
1	24.0	107.0	100.0	3.0	109.9	0.	0.	5.3 MIN. AUX.	

* INTEGRITY DIST. AND EXIT VEL. ARE BASED ON THE ROUTED HYDROGRAPH
AND WILL NOT RELATE TO THE MAX. ELEV. (TOP OF DAM),
WHICH IS SET BY MINIMUM DESIGN CRITERIA.

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2000 ,05/01/2000
FILES

INPUT

C:\home\angela.roman\SITES\McQuistonEast\EastNS.D2C

OUTPUT - DATED 08/06/2004 09:33:28

C:\home\angela.roman\SITES\McQuistonEast\EastNS.OUT

GRAPHICS FILES GENERATED

OPTION "L" DATED 08/06/2004 09:33:28

C:\home\angela.roman\SITES\McQuistonEast\EastNS.DRG

OPTION "P" DATED 08/06/2004 09:33:28

C:\home\angela.roman\SITES\McQuistonEast\EastNS.DHY

OPTION "E" DATED 08/06/2004 09:33:28

C:\home\angela.roman\SITES\McQuistonEast\EastNS.DEM

1*****

SITES XEQ 08/17/2004 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2000 (USER MANUAL - DATED MAY 2001)
 TIME 07:32:11

***** 80-80 LIST OF INPUT DATA *****

SITES 05/01/2000 McQuiston East 2.16875 H6
 SAVMOV 0 101
 SAVMOV 101 1 1
 * Principle Spillway = 2yr
 * Emergency Spillway = 50 yr

STRUCTURE

90	.00
92	.11
94	.49
95	.73
96	1
97	1.37
98	2.04
99	2.82
100	3.631
101	4.465
102	5.7414
103	7.2373
104	9.6881
105	11.5057
106	13.4359
107	15.4023
108	17.3232
109	19.1104
110	21.1958

ENDTABLE

WSDATA	5A1	AC 80	1388	19500	3.96		
PDIRECT			4.00	4.40			
POOLDATA	ELEV	105	105	89.4	89.4	SC	
PSINLET	1	15.71					
PSDATA	1	125	24	.009	81.5		
ASDATA	41	300	125	3	.016	2	
ASCREST	ELEV	107.0					
ASINSURF	41	5.6				C	
ASINLET	41	0.0	0.0	25	0.0	3	
	125	1.6					

ENDTABLE

ASEXSURF	41	5.6					
		0.67	0				
		1					
		1.5	0				
		.007					

ENDTABLE

ASEXIT	41	N		100			
BTMWIDTH	FEET	100					
GRAPHICS	I						
GO,DESIGN	HL	TYPE2	24	TYPE2378	24		
SAVMOV	2	101	1				
ENDJOB							

1SITES XEQ 08/17/2004 ----- COMMENT PAGE -----
VER 2000 McQuiston East WSID =

Principle Spillway = 2yr

Emergency Spillway = 50 yr

***** MESSAGE - ALTERNATE STRUCTURE ID (S 1) BEING USED
SINCE USER DID NOT INPUT AN ID.

***** MESSAGE - ALTERNATE SUBWATERSHED ID (A) BEING USED SINCE
USER DID NOT INPUT AN ID.

***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.

1SITES -----
XEQ 08/17/2004 McQuiston East WSID=
VER 2000 SUBW= A
TIME 07:32:11 SITE = S 1 PASS= 1 PART= 1

***** BASIC DATA *****

CLIMATE AREA - NOT DEFINED DESIGN CLASS A1 = LT 3000.

STORM DISTRIBUTION-PSH 24 HOUR TYPE II RAINFALL DISTRIBUTION

STORM DISTRIBUTION AUX. -24 HOUR TYPE II RAINFALL DISTRIBUTION

PRECIP. - Q-PS,1-DAY Q-PS,10-DAY P-SD P-FB
0.00 0.00 4.00 4.40

WSDATA - CN DA-SM TC/L -/H QRF
80.00 2.17 19500.00 3.96 0.00

SITEDATA- PERM POOL CREST PS FP SED VALLEY FL 378?
105.00 105.00 0.00 89.40 YES

BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
0.00 0.00 0.00 DESIGN

PSDATA - NO. COND COND L DIA/W -/H
1.00 125.00 24.00 0.00

PS N KE WEIR L TW EL
0.009 1.00 15.71 81.50

2ND STG ORF H ORF L START AUX.
0.00 0.00 0.00 0.00

ASCRESTS - AUX.1 AUX.2 AUX.3 AUX.4 AUX.5

107.00 0.00 0.00 0.00 0.00

AUX.DATA - REF.NO. RETARD. CI TIE STATION INLET LENGTH
41 0.00 300.00 125

AUX.DATA - INLET CI SIDE SLOPE EXIT CI EXIT SLOPE ACTUAL AUX?
5.600 3.00 5.600 0.016 NO

BTM WIDTH - BW1 BW2 BW3 BW4 BW5
ft 100.00 0.00 0.00 0.00 0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----
XEQ 08/17/2004 McQuiston East WSID=
VER 2000 SUBW= A
TIME 07:32:11 SITE = S 1 PASS= 1 PART= 2

PERM POOL 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS
CREST PS 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS
SED ACCUM 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS
START ELEV 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS

1SITES -----
XEQ 08/17/2004 McQuiston East WSID=
VER 2000 SUBW= A
TIME 07:32:11 SITE = S 1 PASS= 1 PART= 3

AUX. CREST 107.00 FT 72.3 ACFT 15.40 AC 76.8 CFS

PS STORAGE 26.9 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 105.00 FT 45.4 ACFT 11.51 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 17.6 FEET, PRODUCT= 1273. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.

NRCS-SDH D= 24.00 HR P= 4.00 IN Q= 2.04 IN DA= 2.17 SM
TC= 2.86 HR CN= 80.00 VOL= 236.1 ACFT

PEAK = 714.0 CFS, AT 13.7 HRS.

NRCS-FBH D= 24.00 HR P= 4.40 IN Q= 2.38 IN DA= 2.17 SM
TC= 2.86 HR CN= 80.00 VOL= 274.9 ACFT

PEAK = 835.8 CFS, AT 13.7 HRS.

RATING TABLE DEVELOPED, SITE = S 1:
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	105.00	0.00	0.00	0.00	45.43	11.51
2	105.34	9.47	9.47	0.00	49.40	12.15
3	105.67	26.80	26.80	0.00	53.59	12.80
4	106.01	49.23	49.23	0.00	58.00	13.45
FULL CONDUIT FLOW, ELEV = 106.34 FT						
5	106.34	75.80	75.80	0.00	62.63	14.11
6	106.43	75.95	75.95	0.00	63.79	14.27
7	106.51	76.07	76.07	0.00	64.97	14.43
8	106.59	76.20	76.20	0.00	66.16	14.59
9	106.67	76.32	76.32	0.00	67.37	14.76
10	106.75	76.45	76.45	0.00	68.59	14.92
11	106.84	76.57	76.57	0.00	69.82	15.08
12	106.92	76.69	76.69	0.00	71.06	15.24
13	107.00	76.82	76.82	0.00	72.32	15.40
14	107.15	81.38	77.04	4.33	74.65	15.69
15	107.30	85.93	77.27	8.66	77.03	15.98
16	107.57	94.16	77.67	16.49	81.41	16.50
17	107.90	154.33	78.16	76.16	86.96	17.13
18	108.50	439.73	79.05	360.68	97.57	18.22
19	109.25	899.29	80.14	819.15	111.74	19.63
20	110.00	1464.10	81.21	1382.88	127.05	21.20

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX	VEGETAL COVER FACTOR	MAINT. CODE	ROOTING DEPTH (ft)	REACH LOCATION
1	175.	275.	-1.6	5.6	**	**	**	INLET
2	275.	300.	0.0	5.6	**	**	**	CREST
3	300.	400.	1.6	5.6	0.67	1	1.5	EXIT !

* Upper case indicates a reach of constructed spillway channel.

** The program does not use vegetal cover factor, maintenance code, and rooting depth for inlet and crest reaches in computations.

! Reach 3 used in computing exit channel velocities.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX ACFT	AUX.-HP FT	VOL-AUX. ACFT
NRCS-SDH	100.0	108.80	103.2	18.8	1.80	30.8

PEAK - CFS Q-PS Q-AUX. Q-TOT.
DISCHARGE = 79.5 541.6 621.0

CRITICAL CRITICAL CRITICAL 25% OF Q

	DEPTH	VELOCITY	SLOPE-Sc	Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	0.96	5.48	0.026	0.103

AUXILIARY SPILLWAY DURATION FLOW = 12.1 HOURS

***** MESSAGE - NHCP378 CRITERIA USED BUT AUXILIARY SPILLWAY RATING NOT BASED ON ASFILE RATINGS.

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 4.7 FT/SEC
 EXIT SLOPE = 0.016 FT/FT
 FLOW DEPTH = 1.1 FT

EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
 (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
 Aux. Discharge = 542. cfs; Bottom Width = 100. ft

REACH FROM TO SLOPE MANNING'S VELOCITY STRESS

NO.	STA	STA	%	n	ft/s	lb/ft^2
3	300.	400.	1.60	0.042	4.69	0.050

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 107.00 FT.

DRAWDOWN (DDT) TEST 105.00 FT 45.4 ACFT 0.00 CFS
 CONTROL IS 0.000 DETENTION STORAGE

TIME = 1.72 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX ACFT	AUX.-HP	VOL-AUX.
NRCS-FBH	100.0	109.00	106.9	19.1	2.00	34.5

PEAK - CFS Q-PS Q-AUX. Q-TOT.
 DISCHARGE = 79.8 661.2 741.0

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	1.10	5.85	0.023	0.082

AUXILIARY SPILLWAY DURATION FLOW = 13.4 HOURS
 ATTACK, OE/B = 1.6 ACFT/FT

***** MESSAGE - NHCP378 CRITERIA USED BUT AUXILIARY SPILLWAY RATING NOT BASED ON ASFILE RATINGS.

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 5.2 FT/SEC
 EXIT SLOPE = 0.016 FT/FT
 FLOW DEPTH = 1.2 FT

>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS 2.00 FT.

NEW TOP OF DAM ELEVATION = 109.00.

ROUTED	BTM	WIDTH	MAX	ELEV	VOL-MAX	AREA-MAX	AUX.HP	VOL-AUX.
RESULTS	FT	FT	ACFT	AC	FT	ACFT		
MINIMUM AUX.	100.0	109.00	107.0	19.1	2.01	34.7		

PEAK - CFS Q-PS Q-AUX. Q-TOT.
DISCHARGES = 79.8 666.3 746.1

	CRITICAL	CRITICAL	CRITICAL	25% OF Q
	DEPTH	VELOCITY	SLOPE-Sc	Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	1.10	5.86	0.023	0.081

>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED
FOR THIS PASS. NEW TOP OF DAM ELEVATION = 110.00.

ROUTED	BTM	WIDTH	MAX	ELEV	VOL-MAX	AREA-MAX	AUX.HP	VOL-AUX.
RESULTS	FT	FT	ACFT	AC	FT	ACFT		
MINIMUM AUX.	100.0	110.00	127.0	21.2	3.00	54.7		

PEAK - CFS Q-PS Q-AUX. Q-TOT.
DISCHARGES = 81.2 1381.3 1462.5

	CRITICAL	CRITICAL	CRITICAL	25% OF Q
	DEPTH	VELOCITY	SLOPE-Sc	Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	1.78	7.38	0.015	0.039

INFLOW HYD 1 SDH-PEAK = 621.04 CFS AT 14.40 HRS, LOCATION POINT

INFLOW HYD 1 FBH-PEAK = 741.00 CFS AT 14.40 HRS, LOCATION POINT
HYDOUT 1

1SITES.....JOB NO. 1 COMPLETE.

McQuiston East

0 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

2 HYDROGRAPHS ROUTED AT LOWEST SITE.

0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

SITES.....COMPUTATIONS COMPLETE

>>> SITE SUBWS SUBWS DA CURVE TC TOTAL DA TYPE STRUC <<<									
ID	ID	(SQ MI)	NO.	(HRS)	(SQ MI)	DESIGN	CLASS		
S	1	A	2.17	80.	2.86	2.17	378NR	A1	

PASS DIA./ AUX.CREST BTM. MAX. MAX. EMB. INTEGR.* EXIT* TYPE									
NO.	WIDTH	ELEV	WIDTH	HP	ELEV	VOL.	DIST.	VEL.	HYD
(IN/FT)	(FT)	(FT)	(FT)	(FT)	(CY)	(FT)	(FT/SEC)		
1	24.0	107.0	100.0	3.0	110.0	0.	0.	5.2	MIN. AUX.

* INTEGRITY DIST. AND EXIT VEL. ARE BASED ON THE ROUTED HYDROGRAPH AND WILL NOT RELATE TO THE MAX. ELEV. (TOP OF DAM), WHICH IS SET BY MINIMUM DESIGN CRITERIA.

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2000 ,05/01/2000
FILES

INPUT

C:\home\angela.roman\SITES\McQuistonEast\EastNSemerg3.D2C

OUTPUT - DATED 08/17/2004 07:32:11

C:\home\angela.roman\SITES\McQuistonEast\EastNSemerg3.OUT

GRAPHICS FILES GENERATED

OPTION "L" DATED 08/17/2004 07:32:11

C:\home\angela.roman\SITES\McQuistonEast\EastNSemerg3.DRG

OPTION "P" DATED 08/17/2004 07:32:11

C:\home\angela.roman\SITES\McQuistonEast\EastNSemerg3.DHY

OPTION "E" DATED 08/17/2004 07:32:11

C:\home\angela.roman\SITES\McQuistonEast\EastNSemerg3.DEM



**Design Report
Ray McQuistion
East Dam**

Summary

This is a multi-purpose dam for sediment control, livestock water, and wildlife. This is a new construction of the dam. Funding for this project will be provided by the Bad River Water Quality Project and Ray McQuistion.

Job Description

This site is a Hazard "A" and Job Class IV structure with a drainage area of 1388 acres. In the event of a breach, range and pastureland could be damaged. The principle spillway of this site is a 24" diameter corrugated smooth lined polyethelylene pipe, with a concrete 60" diameter drop structure.

Basis for Design

Overall design of this structure was governed by the 378 Pond standard. The design is routing the 2yr- 24hr storm through the principle spillway with approval of Walter Delp, Assistant State Conservation Engineer. The emergency spillway contains the 50yr-24hr storm.

General Basic Data

This pond will require a Water Rights Permit from South Dakota Department of Environment and Natural Resources. Refer to storage tables on sheet 1 of 9.

Hydrology

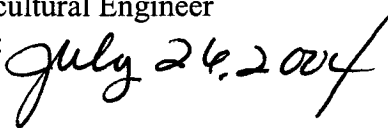
The principle spillway was routed using a 2 year frequency 24 hour duration storm of 2.1 inches. The emergency spillway was routed using a 50 year frequency 24 hour duration storm of 4.4 inches.

Soils

Roger Assmus and Kevin Paulsen conducted a soils investigation; the results are attached to this report.


Angela Roman, EIT

Agricultural Engineer

Date: 

Water Permit Application No. 2536-2
 Ray McQuiston
 (East Dam - Sec. 6-TSH-R29C)

Top of Dam Elev. - 110
 2nd Spillway Elev. - 107.3
 P. Spillway Elev. - 105
 D/S Toe Elev. - 89.4

Cat. 3 - Low Hazard Dam

Ht = 20.6 ft

Normal Storage Capacity - 45.40 A.-Ft
 Int. Storage Capacity - 72.3
 Max. Storage Capacity - 127.1

Int. Capacity x Eff Ht. = $72.3 \times 17.9 = 1294 < 3000 \therefore 25 \text{ yr}$
Minimum Spillway Design

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

DA = 1388 Ac = 2.17 mi.²

Slope = 80 ft/mi.

S_i = 1.76

$$\begin{aligned} Q_{25} &= 83.4 A^{.65} S^{.44} S_i^{-.72} \\ &= 83.4 (2.17)^{.65} (80)^{.44} (1.76)^{-.72} \\ &= 83.4 (1.59) (6.87) (0.6656) \\ &= \underline{610 \text{ cfs}} \end{aligned}$$

$$\begin{aligned} Q_{100} &= 132 A^{.65} S^{.44} S_i^{-.67} \\ &= 132 (2.17)^{.65} (80)^{.44} (1.76)^{-.67} \\ &= 132 (1.65) (7.50) (0.6847) \\ &= \underline{1170 \text{ cfs}} \end{aligned}$$

Secondary Spillway Flow

$$\begin{aligned} Q &= CLH^{3/2} \quad C = 2.6 \\ &= (2.6)(100)(2.7)^{1.5} \quad L = 100 \\ &= \underline{1155 \text{ cfs}} \quad H = 2.7 \end{aligned}$$

Section 74:02:08:09

1. Topo Map - OK
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. Std NRCS - OK
9. EPP - N/A Cat. 3 - OK

NRCS Annual Yield

DA = 1388 ISO = 2 CN = 80

80% chance = 0.26 A.-Ft
 $0.26 \times 1388/12 = \underline{30 \text{ A.-Ft}}$

50% chance = 0.66
 $0.66 \times 1388/12 = \underline{76 \text{ A.-Ft}}$

10% chance = 2.50
 $2.50 \times 1388/12 = \underline{290 \text{ A.-Ft}}$



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

September 21, 2004

Ray McQuiston
20489 Willow Creek Rd.
Ft. Pierre, SD 57501

Dear Mr. McQuiston:

We have reviewed the plans and specifications for your dam projects located in the SE 1/4 of Section 2-T5N-R28E and the NE 1/4 Section 6-T5N-R29E, in Stanley County. The plans and specifications as submitted are approved. Approval of the plans and specifications does not authorize construction of the dams. The construction may not begin until Water Permit Application Nos. 2535-2 and 2536-2 are approved.

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 dams, from the responsibility for operating and maintaining the dams in good repair to ensure the safety of the dams.

Both dams will be classified as a small size Category 3, Low Hazard dam with the McQuiston West Dam having a dam height of 28 feet with a normal storage capacity of 52.3 acre-feet and a maximum storage capacity of 136 acre-feet; and the McQuiston East Dam having a dam height of 21 feet with a normal storage capacity of 45.4 acre-feet and a maximum storage capacity of 127 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: Angela Roman, NRCS, Pierre

REPORT ON
WATER PERMIT APPLICATION No. 2536-2
Ray McQuiston
August 31, 2004

Water Permit Application No. 2536-2 has been filed by Ray McQuiston to impound 45.4 acre-feet of water from runoff by constructing a dam located in the S ½ NE ¼ of Section 6-T5N-R29E, in Stanley County. The application also requests impoundment of sufficient water to maintain water at the outlet elevation. The water will be used for fish and wildlife production and livestock water purposes.

Discussion:

The dam will be classified as a small size, Category 3, Low Hazard dam. The Natural Resources Conservation Service (NRCS) has designed the dam. The plans and specifications have been reviewed and will be approved; however, reconstruction of the dam can not begin until Water Permit Application No. 2536-2 is approved.

The McQuiston East Dam will be 21 feet high with a normal storage capacity of 45.4 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 127 acre-feet with a reservoir level at the top of dam elevation. A dam of this size and hazard classification is required to have a minimum spillway design capable of passing a 25-year frequency event.

The dam has a drainage area of 1388 acres or 2.17 square miles. The dam is designed to have a 5 foot diameter concrete riser and a 24 inch diameter HDPE barrel with 5 feet of available freeboard as the primary spillway, and a 100 foot wide earthcut secondary spillway with 2.7 feet of available freeboard. A 25-year frequency event for this drainage produces a peak runoff off of approximately 610 cfs and a 100-year frequency event produces a peak runoff of approximately 1120 cfs. The 100 foot wide secondary spillway has a capacity of approximately 1155 cfs.

The annual yield for this drainage area with an 80 percent chance of occurrence, or 8 out of 10 years, is expected to be 30 acre-feet. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 76 acre-feet and the annual yield with a 10 percent chance, or 1 out of 10 years, is expected to be 220 acre-feet.

The McQuiston East Dam will be located in the S ½ NE 1/4 of Section 6-T5N-R29E on an unnamed tributary to Willow Creek about one mile upstream of the confluence of the unnamed tributary and Willow Creek and about 12 miles upstream of the confluence of Willow Creek and the Bad River. There are no existing Water Permits/Rights located on the unnamed tributary or Willow Creek between the proposed dam and the Bad River.

Conclusions:

1. Water Permit Application No. 2536-2 should be approved since unappropriated water is available and approval should not have any adverse effect on existing Water Permits/Rights.
2. If approved, the low flow bypass requirement for downstream domestic use should be a qualification on Water Permit Application No. 2536-2.



Timothy G. Schaal, P.E.
Natural Resources Engineer Specialist

Approved by:



Gale N. Selken, P.E.
Natural Resources Engineer Director



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 2536-2, Ray McQuiston**

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. 2536-2, Ray McQuiston, 20489 Willow Creek Road, Fort Pierre SD 57501.

The Chief Engineer is recommending APPROVAL of Application No. 2536-2 because 1) there is 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. Water Permit No. 2536-2 authorizes a dam with a storage capacity of 45.4 acre feet of water and sufficient water annually to maintain the water level to an outlet elevation.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

See report on application for additional information.

Garland Erbele, Chief Engineer
September 21, 2004

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
) SS
 County of Hughes)

I, Marilyn Baker

certify that the attached printed Notice was taken

from the Capital Journal

printed and published in Pierre

County of Hughes and

state of South Dakota. The notice was published

in the newspaper on the following two dates:

October 25, 2004

November 2, 2004

Cost of Printing no change
(correction)

Marilyn Baker
 (Signature)

Bookkeeper - Accts Receivable
 (Title)

11-10-04
 (Date Signed)

No. 6467

2tdly 10/25, 11/2

**NOTICE OF APPLICATION
 NOS. 2535-2 and 2536-2
 to Appropriate Water**

Notice is given that Ray McQuiston, 20489 Willow Creek Rd, Ft. Pierre SD 57532 has filed the following water permit applications. Application No. 2535-2 proposes to impound 52.30 acre-feet of water from runoff by constructing a dam located in the N 1/2 SE 1/4 Section 2 with water impounded in the N 1/2 SE 1/4, S 1/2 NE 1/4 Section 2; all in T5N-R28E. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock water purposes.

Application No. 2536-2 proposes to impound 45.40 acre-feet of water from runoff by constructing a dam located in the S 1/2 NE 1/4 Section 6 with water impounded in the S 1/2 NE 1/4, NW 1/4 NE 1/4 Section 6; all in T5N-R29E. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application Nos. 2535-2 and 2536-2 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 applica-

tions, as recommended, unless a petition is filed opposing the applications or the applicant files a petition contesting the Chief Engineer's recommendations. If a petition opposing the applications or contesting the recommendations is filed, then a hearing will be scheduled and the Water Management Board will consider the applications. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting these applications or recommendations must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendations. 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 November 12, 2004.

The petition may be informal, but must include a statement describing the petitioner's interest in the applications, the petitioner's reasons for opposing or supporting the applications, 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 these applications. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

RECEIVED

NOV 12 2004

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

September 21, 2004

Capital Journal
PO Box 878
Pierre SD 57501-0878

ATTENTION: Legal Public Notice

Enclosed is a Notice on Application Nos. 2535-2 & 2536-2 to Appropriate Water to be published twice. Please publish the first notice on September 28, 2004 with the second publication 7 days later. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352.

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 Ray McQuiston, 20489 Willow Creek Rd, Ft. Pierre SD (Ph # 605-223-3197).

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-----

Nos. 2535-2 & 2536-2

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

Date _____

We are in receipt of your letter of September 21, 2004 enclosing Notice to Appropriate Water by Application Nos. 2535-2 & 2536-2 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 September 28, 2004 with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF APPLICATION NOS. 2535-2 and 2536-2 to Appropriate Water

Notice is given that Ray McQuiston, 20489 Willow Creek Rd, Ft. Pierre SD 57532 has filed the following water permit applications. Application No. 2535-2 proposes to impound 52.30 acre-feet of water from runoff by constructing a dam located in the N $\frac{1}{2}$ SE $\frac{1}{4}$ Section 2 with water impounded in the N $\frac{1}{2}$ SE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$ Section 2; all in T5N-R28E. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock water purposes.

Application No. 2536-2 proposes to impound 45.40 acre-feet of water from runoff by constructing a dam located in the S $\frac{1}{2}$ NE $\frac{1}{4}$ Section 6 with water impounded in the S $\frac{1}{2}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 6; all in T5N-R29E. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application Nos. 2535-2 and 2536-2 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 applications, as recommended, unless a petition is filed opposing the applications or the applicant files a petition contesting the Chief Engineer's recommendations. If a petition opposing the applications or contesting the recommendations is filed, then a hearing will be scheduled and the Water Management Board will consider the applications. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting these applications or recommendations must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendations. 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 October 15, 2004.

The petition may be informal, but must include a statement describing the petitioner's interest in the applications, the petitioner's reasons for opposing or supporting the applications, 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 these applications. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.



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

September 21, 2004

Ray McQuiston
20489 Willow Creek Rd
Fort Pierre SD 57532

Dear Mr. McQuiston:

Water Permit Application Nos. 2535-2 & 2536-2 for fish & wildlife propagation use have been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Publisher of the Capital Journal printed at Pierre, SD (Ph # 605-224-7301). You will need to contact the newspaper and authorize publication of this notice. For your information, a copy of the notice, the recommendations of the Chief Engineer and reports on the applications 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 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. 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 applications.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

cc: Angela Roman, NRCS

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NOTE: If you plan to contest any part of the Chief Engineer's recommendations, 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 applications.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

NOV 19 2004

Ray McQuiston
20489 Willow Creek Road
Ft Pierre SD 57532

Dear Mr. McQuiston:

Enclosed are Water Permit Nos. 2536-2 and 2535-2 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

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Permit No. 2536-2
Bad 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, November 9, 2005, made a thorough examination of the water use system constructed by Ray McQuiston of 20489 Willow Creek Rd, Ft. Pierre, SD 57532 holder of Permit No. 2536-2, bearing the priority of August 25, 2004 authorizing the storage of 45.4 acre-feet of the waters of runoff for fish & wildlife propagation purposes, in Stanley County.

I have to report on the conditions of the same as follows:

A. Works used to divert the water:

A 21 foot high earth dam with a normal storage capacity of 45.4 acre-feet

B. Works used to transport water to place of use:

N/A

C. Works used to apply water to beneficial use:

A 21 foot high earth dam with a normal storage capacity of 45.4 acre-feet

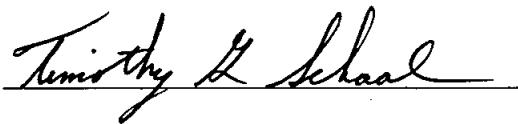
The system is in the following condition good. The point of diversion is located 2000 ft. south & 950 ft. west of the NE corner of Sec. 6-T5N-R29E (SE ¼ NE ¼) (Lat. 44.424283, Long. -100.655566). The works are capable of storing 45.40 acre-feet of water which is to be used for fish & wildlife propagation use. Water has been put to beneficial use to the maximum extent as follows:

A 21 foot high earth dam with a normal storage capacity of 45.4 acre-feet

and the license should be issued for 45.4 acre-feet of storage.

Applicable permit qualifications have been complied with: Yes X

Exceptions to compliance are: none Date Report Completed: January 27, 2005



Timothy G. Schaal, P.E.
Natural Resources Engineer Specialist
DENR, Water Rights Program

REPORT ON INSPECTION OF PERMIT NO. 2536-2

DATE OF INSPECTION: **November 9, 2005**

NAME & ADDRESS OF INSPECTION CONTACT/ **Ron McQuiston**

RELATIONSHIP TO PERMIT HOLDER, IF APPLICABLE: **son**

NAME & ADDRESS OF PERMIT HOLDER: **Ray McQuiston, 20489 Willow Creek Road, Ft. Pierre, SD 57532**

DIVERSION POINT LEGAL LOCATION: 2000 ft. south & 950 ft. west of the NE corner of Sec. 6-T5N-R29E (SE ¼ NE ¼) (Lat. 44.424283, Long. -100.655566).

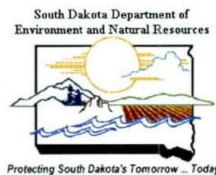
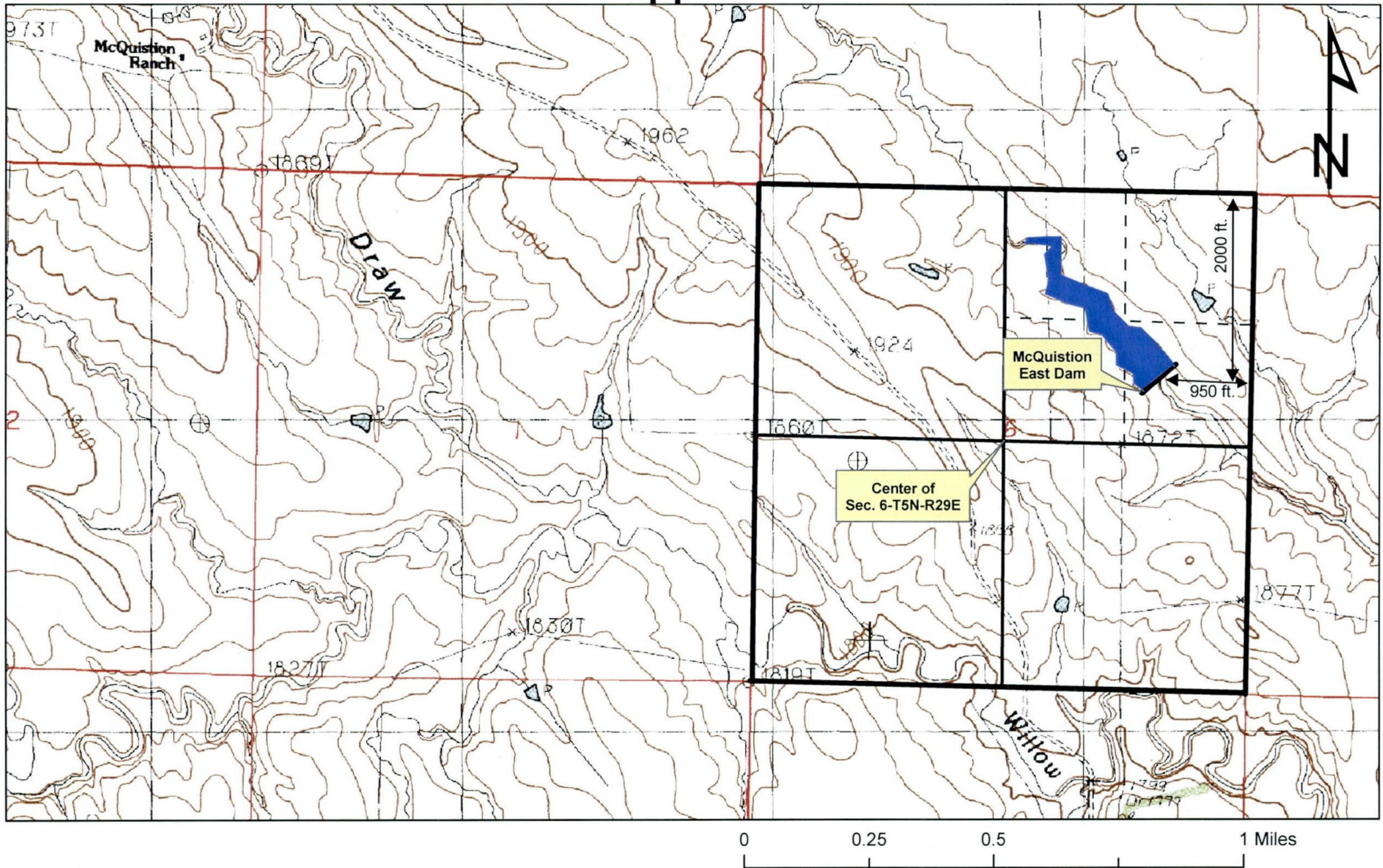
DAM INFORMATION:

- 1) Height to crest **21** feet
- 2) Height to primary spillway **16** feet
- 3) Height to secondary spillway **18** feet
- 4) Crest width **12** feet
- 5) Crest length **672** feet
- 6) Spillway length **XXX** feet
- 7) Spillway width **100** feet
- 8) Approx. storage (Normal) **45.4** acre-feet
- 9) Approx. storage (Maximum) **127** acre-feet
- 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 **N/A**

Water Permit Application No. 2536-2



Timothy G. Schaal

Timothy G. Schaal, P.E.
Natural Resources Engineering Specialist
DENR, Water Rights Program

1/27/06

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 2536-2

(1) Ray McQuiston, 20489 Willow Creek Rd, Ft Pierre SD 57532 made Application No. 2536-2, August 25, 2004 for a water permit to impound 45.4 acre feet of water from runoff in Stanley County, South Dakota for fish and wildlife propagation and domestic purposes. Permit No. 2536-2, with a priority date of August 25, 2004 was approved November 12, 2004 and issued to the applicant for construction of the described water supply system to be completed on or before November 12, 2009 and for the application to beneficial use of water on or before November 12, 2013.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the construction of the water supply system and is entitled to impound 45.4 acre feet of water for beneficial use with sufficient water annually to maintain the water level to the outlet elevation.

The location of the storage dam (spillway) is 2,000 feet south and 950 feet west of the NE corner of Section 6, T5N, R29E (SE ¼ NE ¼).

(3) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use for fish and wildlife propagation and domestic use.

(4) Pursuant to South Dakota Water Law 46-5-30.1 Ray McQuiston, 20489 Willow Creek Rd, Ft Pierre SD 57532 the holder and/or owner of Water Right No. 2536-2 is issued a license to appropriate water, the right to impound 45.4 acre feet of water from runoff with sufficient water annually to maintain the water level to the outlet elevation from the location specified in (2) of this license. Water Right No. 2536-2 carries a priority date of August 25, 2004.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 2536-2 and subject to the following qualifications:

- Water Right No. 2536-2 authorizes a dam with a storage capacity of 45.4 acre feet of water and sufficient water annually to maintain the water level to an outlet elevation.
- Low flows as needed for downstream domestic use, including livestock water and prior water rights must be bypassed.



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

APR 07 2006

date





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
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www.state.sd.us/denr

APR 07 2008

2535-2
2536-2

Ray McQuiston
20489 Willow Creek Rd
Ft Pierre SD 5732

Dear Mr. McQuiston:

Enclosed are Water License Nos. 2535-2 and 2536-2. The maps prepared by the staff engineer who conducted the field investigation are also included. Water License Nos. 2535-2 and 2536-2 are the final documents which complete the process of obtaining a water right.

As long as you use the water beneficially, as stated in the Water Licenses, State Water Laws provide that you have a continuing right to use the water.

Sincerely,

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

enclosures