

WATER PERMIT NO. 2787-2

Name of Applicant: **Aaron & Angela Doolittle**

Address: **PO Box 145, Midland SD 57552** Phone: **605 843-2521**

Amount of Water Claimed: **78.9 AF** Total Acres: **NA**

Source of Water Supply: **runoff**

Water to be used for: **livestock** County: **Stanley**

Type of Waste Disposal System:

Location: **approximate 7 miles northwest of Midland**

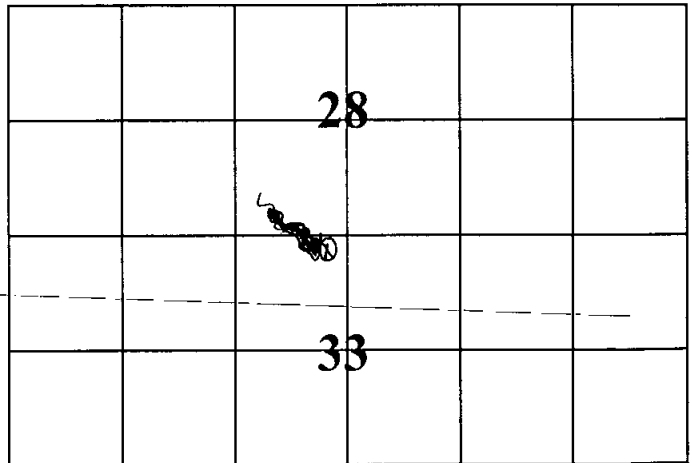
PRIORITY Date Received: **3-27-2018** Application/License Fee: **\$ 700**

Corrected Application Received: Period of Annual Use: **Jan 1 – Dec 31**

Remarks:

Diversion Point: **NE 1/4 NW 1/4 Sec 33-T3N-R25E**

Water Impounded: **NE 1/4 NW 1/4 Sec 33; S 1/2
SW 1/4 Sec 28; all in T3N-R25E**



Depth of Well: **NA**

Well Driller:

Remarks:

Type of Map: **aerial**

Prepared by:

Reviewed and the Number Assigned on: **3-29-18**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

**SOUTH DAKOTA
WATER PERMIT NO. 2787-2**

Date of first receipt of application March 27, 2018.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 2787-2 to Aaron & Angela Doolittle, PO Box 145, Midland SD 57552 authorizing the reconstruction of the dam and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 2787-2 authorizes impoundment 78.9 acre-feet of water from runoff by reconstructing a dam located in the NE 1/4 NW 1/4 Section 33 with water impounded in the NE 1/4 NW 1/4 Section 33 and S 1/2 SW 1/4 Section 28; all in T3N-R25E. This permit authorizes impoundment of sufficient water to the primary outlet elevation. The dam is located approximately 7 miles northeast of Midland SD.
2. The water appropriated shall be used for the purpose of 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. 2787-2 is June 4, 2018.
5. The date from which applicant may claim right is March 27, 2018.
6. One-fifth of the construction is to be completed on or before December 4, 2020.
7. All construction is to be completed on or before June 4, 2023.
8. Water is to be put to beneficial use on or before June 4, 2027.
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. 2787-2 authorizes a dam with a storage capacity of 78.9 acre feet of water annually to the primary outlet elevation.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

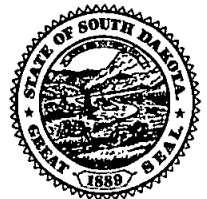
WATER MANAGEMENT BOARD

By: Jeanne Goodman

Jeanne Goodman, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

JUN 20 2018

date



Mail to: DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	No. <u>2787-2</u> (office use only) Hydrologic Unit <u>10140102</u>
	Basin <u>Bad River</u>
	Newspaper <u>Capitol Journal</u>

RECEIVED
MAR 27 2018
WATER RIGHTS
PROGRAM

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

Check use(s) of water:

☐ Municipal	☐ Water Distribution System	☐ Recreational	☐ Institutional
☐ Rural Water System	☐ Commercial	☐ Fish & Wildlife	☐ Geothermal
☐ Domestic (over 18 gpm)	☐ Industrial	☒ Other <u>Agricultural</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.)

Original Location Notice No. 12905, only authorizes 31 ACFT. Size of structure is not changing, assuming there was an error in the original paper work for location notice.

1. Name to Appear on Water Permit Aaron & Angela Doolittle

Mailing Address PO Box 145 Midland SD 57552
(Address) (City) (State) (Zip Code)

Phone 605-843-2521 Mobile _____ Email _____

2. Amount of water claimed _____ *CFS or _____ **GPM and 78.9 ***AF or _____ Gallons
Flow rate and volume are both required. (*Cubic Feet per Second) (**Gallons per Minute) (**Acre Feet - storage capacity of dam/dugout or annual use)

3. Source of water supply runoff

4. Location of point of diversion Embankment Pond in NE1/4, NW1/4 Sec. 33-T3N-R25E County Stanley
(example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W)

If not a public water supply (e.g. municipal), will water be used outside of the area described above? ☐ Yes ☒ No

If "Yes," where will water be used? Water Impounded: NE 1/4 NW 1/4 Sec 33; S 1/2 SW 1/4 Sec 28; all in T3N-R25E
(example - NW1/4 section 12-T104N-R53W)

5. County or counties where water will be used Stanley

6. Annual period during which water is to be used year round Jan 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)

Existing dam had location notice (no. 12905) filed in April of 1959. The principal spillway (CMP) has corroded and is failing. New PVC pipe will replace CMP. Top of dam and current water level will remain the same. Auxiliary spillway will be widened to meet NRCS Pond Standard Specifications. Existing embankment is solid.

I, Angela Doolittle Aaron Doolittle landowner, the applicant, certify under
Name of Person Title (if applicable)

penalty of perjury that I have read this application, examined the attached map, and that the matters stated are true. I further certify, if acting on behalf of an entity or individual other than myself, that I am authorized to submit this application.

Supplemental Information

(type or print)

1. Well Information (check one or both as applicable) ☐ Drilling new well(s) ☐ Using existing well(s)

- a) If new wells, how many ____ Have test holes been drilled ☐ Yes ☐ No Drilled by ____
(if yes, please provide copies of logs)
- b) If existing wells, how many ____ Provide copy of log(s), if available. Drilled by ____

For either Existing or Proposed Wells:

- c) Well Depth (required) ____ Depth to Top of Water Bearing Material ____ Depth to Water from Surface ____
- d) Distance to nearest domestic well on applicant's property ____ 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) ____

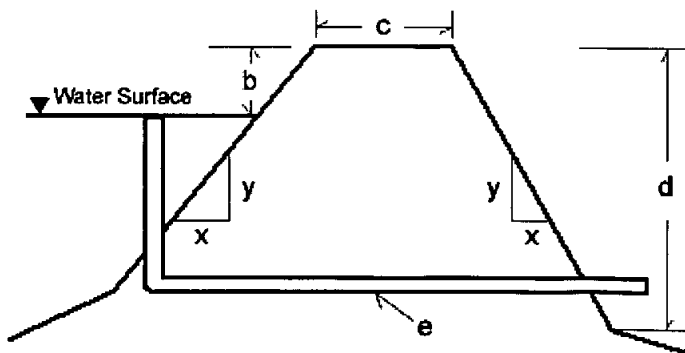
4. Water Storage Dams

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:

USDA-NRCS
1717 North Lincoln, Suite #104
Pierre, SD 57501

- b) Freeboard 5.3
- c) Crest Width 14
Crest Length 365
- d) Height 20.3
- e) Primary Outlet Capacity 62.6
If pipe, diameter 24"
- f) Secondary Spillway Capacity 512.5
Spillway Width 50'
- g) X & Y Slope (e.g. 3 to 1 is a typical slope)
Upstream 3:1
Downstream 3:1
- h) Surface Area of Impoundment 12.5
- i) Storage 78.9 Acre Feet
- j) Drainage Area Above Dam 1,961.0 Acres



Doolittle Hazard Classification

33-3N-25E

Legend


Doolittle

Little

Colman Ranch

Olsen Ranch

Dodd Ranch

Normoc Ranch

STANLEY CO 240 E
223rd St
HAakon CO

1011

14
Google earth

N

4000 ft

Sec 29
T003N
R25E

Sec 28
T003N
R25E

Sec 27
T003N
R25E

Sec 32
T003N
R25E

Sec 33
T003N
R25E

Sec 34
T003N
R25E



JOINS MAP 10

SADDLE BUTTE TWP

A map of the Chesapeake Bay area, showing the locations of 35 maps. The map is divided into a grid with labels for various locations and map numbers. A large 'S' is in the top right corner.

Map Number	Location
MAP 1	Clear West
MAP 2	Clear East
MAP 3	Taken
MAP 4	Clear West
MAP 5	Clear East
MAP 6	Clear West
MAP 7	Clear East
MAP 8	Clear West
MAP 9	Clear East
MAP 10	Clear West
MAP 11	Clear East
MAP 12	Clear West
MAP 13	Clear East
MAP 14	Clear West
MAP 15	Clear East
MAP 16	Clear West
MAP 17	Clear East
MAP 18	Clear West
MAP 19	Clear East
MAP 20	Clear West
MAP 21	Clear East
MAP 22	Clear West
MAP 23	Clear East
MAP 24	Clear West
MAP 25	Clear East
MAP 26	Clear West
MAP 27	Clear East
MAP 28	Clear West
MAP 29	Clear East
MAP 30	Clear West
MAP 31	Clear East
MAP 32	Clear West
MAP 33	Clear East
MAP 34	Clear West
MAP 35	Clear East

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date March 29, 2018

RECEIVED OF Aaron or Angela Doolittle 107 Main Street BO Box 145 Midland, SD 57552-0145

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

Fee for Application for Permit No. <u>2787-2</u> <u>2787-2</u> to Appropriate Water, to construct and to put water to beneficial use	500	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>2787-2</u> <u>2787-2</u>	200	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	700 00

No. **08640**

By

Jeannie Goodman
Chief Engineer
Jgm

Design Report 378 Pond Aaron & Angela Doolittle, Stanley County

Summary

This dam is located in the NE ¼ of the NW ¼ of Section 33, T3N, and R25E. The original location notice is dated April 20, 1959. Dry Draw No.12905. This dam has a failed CMP as a principal spillway, this will be replaced with a new 24" diameter PVC pipe and a concrete drop riser. The top of dam will remain the same, and the auxiliary spillway will remain the same elevation, but will be widened to 50'. The embankment is in good condition and there is minor erosion in the auxiliary spillway. Some damage to the face of the dam is also present, as a result of this the dam has somewhat formed its own wave berm in front of the dam. For this reason, no wave berm is included in the design, the water immediately upstream of the dam is shallow. This structure is in good shape, at 59 years old, the only issue is the corrosion of the CMP pipe in the dam. The auxiliary spillway erosion will be repaired.

Job Description

This site is a Hazard "A" and Job Class IV structure with a drainage area of 1961 acres. In the event of a breach, a minimal amount of rangeland would be damaged as the dam drains into a much larger drainage-Little Prairie Creek.

Basis for Design

Overall design of this structure was governed by the 378 Pond standard. The design is routing the 2yr- 24 hr storm through the principal spillway and a 50 yr- 24hr storm through the auxiliary spillway. SITES program was used to flood route the design. The principal spillway will be placed in the exact same location of the failed CMP. Additional borrow will be obtained from selected locations, such as the auxiliary spillway, near the dam.

Environmental Considerations

The disturbed area is 0.6 acres, since this is under 1 acre a storm water discharge permit application is not required. Critical area seeding will take place on all disturbed areas immediately following construction.

Basic Data of the Dam

HYDRAULIC DATA		
<i>Drainage Area</i>	<i>1961</i>	<i>Acres</i>
<i>Annual Runoff Yield (50% Chance)</i>	<i>40.9</i>	<i>Ac. Ft</i>
<i>Time of Concentration</i>	<i>4.29</i>	<i>Hours</i>
<i>Runoff Curve Number</i>	<i>72</i>	
<i>Principal Spillway, 2 Year – 24 Hour Rainfall</i>	<i>2.10</i>	<i>Inches</i>
<i>Auxiliary Spillway, 50 Year – 24 Hour Rainfall</i>	<i>4.20</i>	<i>Inches</i>
<i>Peak Runoff 2 Year – 24 Hour Rainfall</i>	<i>121.2</i>	<i>CFS</i>
<i>Principal Spillway Discharge</i>	<i>62.6</i>	<i>CFS</i>
<i>Peak Runoff 50 Year – 24 Hour Rainfall</i>	<i>652.0</i>	<i>CFS</i>
<i>Auxiliary Spillway Discharge</i>	<i>512.5</i>	<i>CFS</i>
<i>Auxiliary Spillway Flow Depth</i>	<i>2.470</i>	<i>Feet</i>

STRUCTURE DATA		
<i>Length of Top of Dam</i>	<i>365</i>	<i>Feet</i>
<i>Water Depth to Crest of Principal Spillway</i>	<i>13</i>	<i>Feet</i>
<i>Height of Downstream Toe to Top of Dam</i>	<i>20.3</i>	<i>Feet</i>
<i>Effective Height</i>	<i>12.7</i>	<i>Feet</i>
<i>Product of Storage X Effective Height</i>	<i>1301</i>	

POOL DATA			
	ELEV.	AREA	STORAGE
<i>Crest of Principal Spillway</i>	<i>2067.0</i>	<i>12.5 Ac.</i>	<i>78.9 Ac.-Ft</i>
<i>Crest of Auxiliary Spillway</i>	<i>2068.8</i>	<i>14.8 Ac.</i>	<i>102.3 Ac.-Ft</i>
<i>Top of Dam</i>	<i>2072.3</i>	<i>20.3 Ac.</i>	<i>166.4 Ac.-Ft</i>

Construction Schedule

Construction of this dam is proposed to begin during the construction season of 2018.

Authority

This project was designed by Angela Roman, Agricultural Engineer for the United States Department of Agriculture- Natural Resources Conservation Service. This dam is classified as a Class IV. Plans were reviewed by Dana Edwards, PE, Area Engineer and Job Approval Authority is exercised by Angela Roman.

Landowner Information

Aaron & Angela Doolittle
PO Box 145
Midland, SD 57552
605-843-2521

Angela Roman
Agricultural Engineer
USDA-NRCS
1717 North Lincoln Ave, Suite #104
Pierre, SD 57501
605-301-3422
angela.roman @sd.usda.gov

Date

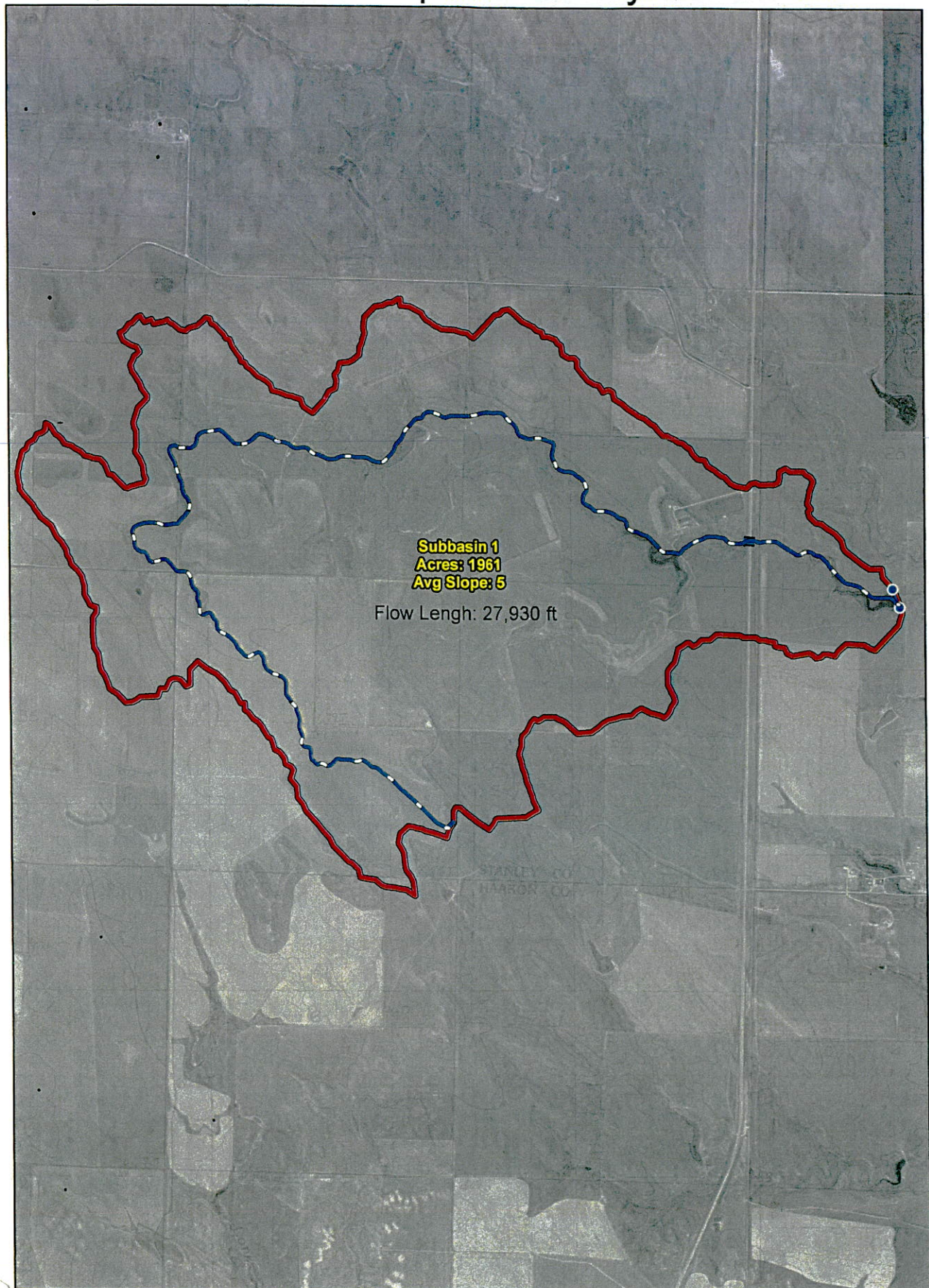
Client: Doolittle
 County: STANLEY MSE1
 Practice: 378 Pond Rebuild
 Calculated By: ADR
 Checked By: _____

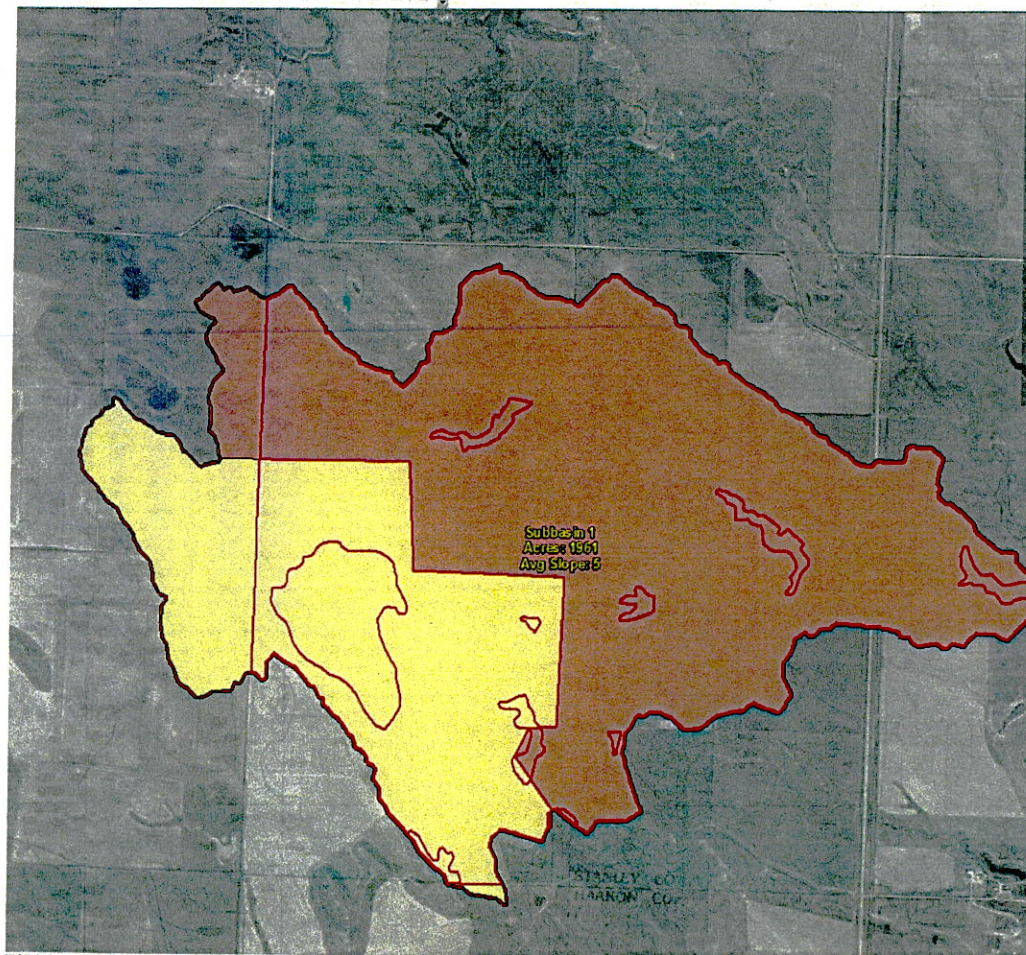
State: SD
 Date: 6/30/2017
 Date: _____

Drainage Area: _____ Acres (user entered value)
 Curve Number: _____ (user entered value)
 Watershed Length: _____ Feet
 Watershed Slope: _____ Percent
 Time of Concentration: _____ Hours (user entered value)
 Rainfall Type: MSE1

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	2.60	3.10	3.70	4.20	4.70
Ia/P Ratio	00.00	00.00	00.00	00.00	00.00	00.00	00.00
Used	00.00	00.00	00.00	00.00	00.00	00.00	00.00
Runoff (in)							
(ac-ft)	00.00	00.00	00.00	00.00	00.00	00.00	00.00
Unit Peak Discharge (cfs/acre/in)	00.000	00.000	00.000	00.000	00.000	00.000	00.000
Peak Discharge (cfs)							

Dolittle Dam Repair--Stanley Co. SD





OBJECTID *	Shape *	Shape_Length	Shape_Area	LANDUSE	CONDITION
1	Polygon	14544.896938	5123924.079269	Pasture or Grassland	Fair
2	Polygon	9416.523957	2811816.590614	Small Grain Straight Row with Crop Residue (SR + CR)	Fair

RCN=72

PARTICIPANT RESPONSIBILITIES

PARTICIPANT Aaron & Angela Doolittle		County Stanley		
PRACTICE(S) 378 Pond				
LEGAL DESCRIPTION NW 1/4		Sec.33	T 3N	R 25E
GPS				

GENERAL: Policies and regulations of the United States Department of Agriculture (USDA) assistance programs place responsibility on the participant for obtaining necessary local, state, and federal permits, adequate real property rights and interests, applicable water rights, and necessary approvals, easements, and licenses. The participant must also meet requirements for installation, inspection, and operation and maintenance. For copies of South Dakota (SD) laws, please see the Internet at:
<http://www.state.sd.us/state/legis/lrc/statutes/lrcmenu.htm>.

For **ALL** conservation practices, if the participant elects to install proposed practices in locations **other than where approved by the Natural Resources Conservation Service (NRCS)**, the participant may be in violation of applicable NRCS policy, federal, state, or Tribal laws, and said action may result in the termination of their NRCS contract or withdrawal of financial and technical assistance related to the project.

1. CULTURAL/HISTORICAL RESOURCES

An NRCS approved cultural/historical evaluation **must** be made of all contracted and/or technically assisted practices that have the potential to affect historic properties or culturally significant sites **prior** to construction. If the NRCS approved construction activities expose cultural/historical resources, human remains (bones), or similar objects, the participant and/or contractor **must** immediately stop construction and notify the NRCS. Any further construction without clearance **could jeopardize assistance** (financial/technical) and may be a **violation of state or federal law**.

2. CLEAN WATER ACT

Clean Water Act Section 10 or 404 permits from the US Army Corps of Engineers (COE) are required where proposed construction will involve dredging or filling a wetland or stream. Information may be obtained by contacting: US Army Corps of Engineers, SD Regulatory Office, 28563 Powerhouse Road, Room 120, Pierre, SD 57501, (Phone (605) 224-8531). Forms are available on the Internet at:
<https://www.nwo.usace.army.mil/html/od-rsd/applications.html>.

National Pollutant Discharge Elimination System permits or approval from the SD Department of Environment and Natural Resources (DENR) may be needed where discharge of polluted water or wastewater (ag waste, etc.) to waters of the state (including wetlands) may occur or have occurred. In addition, a Storm Water Permit is needed for any **construction** disturbance of over one acre. Information is available by telephone at (605) 773-3351, or on the Internet at:
<http://www.state.sd.us/denr/DES/Surfacewater/surface.htm>.

3. WATER RIGHTS, CONSTRUCTION PERMIT, AND LOCATION NOTICE

South Dakota Codified Law 46-5 requires securing a permit from the SD Chief Engineer **before construction work begins** for any development involving storage or use of water. Small user exceptions are explained on the Internet. Forms and information are available on the Internet at:
<http://www.state.sd.us/denr/DES/WaterRights/waterprg.htm>.

Compliance with all requirements of SD water laws is necessary to avoid possible penalties and/or loss of your rights. Forms, signed map, fees, and other pertinent information for filing a **SD Water Right** application should be submitted to: **DENR Water Rights Program, Joe Foss Building, 523 East Capitol, Pierre, SD 57501-3181 (Phone (605) 773-3352)**.

South Dakota Codified Law 46-4 requires the filing of a **Location Notice** for small nonnavigable stream and dry draw dams. **South Dakota Codified Law 46A-10A** regulates **drainage**, in SD, generally through **County Drainage Commissions**. **Administrative Rules (Dam Safety, etc.)** are located at: http://www.state.sd.us/denr/DES/WaterRights/WR_laws.htm.

Other Laws may also apply. The participant is responsible for obtaining all necessary rights and permits, including but not limited to easements, rights-of-way, zoning approval, permits to construct, etc., required by any applicable level of government.

4. PROPERTY RIGHTS (INCLUDING WETLAND EASEMENTS)

The participant is responsible, financially and otherwise, for any costs incurred by the failure to obtain adequate and necessary real property rights and interests, easements, subordination agreements, permits, and/or licenses required for the installation. Participants are cautioned to be sure the area to be affected is either not covered by a **wetland easement** or a written agreement is reached with the easement owner. Property rights documents should be recorded for your future protection.

5. CONSTRUCTION SUPERVISION AND INSPECTION PARTICIPANT RESPONSIBILITIES

(A) South Dakota Codified Law 49-7A, (also know as **SD One-Call**) requires that no **excavator** may **begin** any excavation without first notifying the One-Call Notification Center of the proposed excavation (**Phone 1-800-781-7474**).

The NRCS makes **no representation** as to the existence or nonexistence of any utility or buried object and assumes **no liability** for damage to utilities or buried objects caused by construction of this or other conservation practices.

(B) All conservation practice standards (CPS) require onsite supervision and inspection during construction. The NRCS cannot provide all of the assistance or inspection that may be needed to assure the practice is installed correctly. **Participants must actively lead construction supervision and inspection efforts.** Items requiring **inspection by you** are as follows: Notify office a minimum of 2 weeks prior to beginning of construction for staking and inspection.

The NRCS must be notified and given the opportunity to inspect the following items **prior to installation**: Pipe Material and drain fill materials.

(C) If you employ a contractor to do your construction work, it is your responsibility to clearly inform the contractor, **prior** to start of construction, that materials and construction must be in accordance with the plans and specifications.

(D) If necessary, the plans can be modified during construction. However, any changes to project location and/or design such as sizes, grades, elevations, etc., **must be approved by the NRCS** for permits, certifications, and payment to be assured. **Get approvals before construction!**

(E) The completed practice must be checked and/or approved by the NRCS. The NRCS will ask for written certification from you and/or the contractor for those items not inspected by the NRCS and for those items you agreed to inspect. **Certification for practice payment** will be made by the NRCS when it has been determined that the NRCS approved design has been completed. Otherwise, the NRCS will either require construction changes before certification or the practice will not be certified.

(F) The NRCS designed practices, as well as, financially assisted practices designed by contractors (or others), **must** meet NRCS CPSs and **must** be approved by a NRCS employee with appropriate Job Approval Authority **prior to construction**.

7. OPERATION AND MAINTENANCE (O&M)

The participant is responsible for the safe O&M of the improvements for the life of the practice. The O&M requirements or special O&M plans are listed below and/or attached. Attached.

8. PARTICIPANT RESPONSIBILITIES AND CERTIFICATION

I have reviewed the conservation plan, associated job sheets, and plans and specifications provided to me. I understand my responsibility to follow the conservation plan, job sheets, and plans and specifications for proper installation of the CPSs. I understand the endangered species and cultural/historical resources requirements and certify that I will obtain the necessary land rights, easements, water rights, permits, and other authorizations necessary to complete the planned conservation improvements.

Participant signature: _____ Date: _____

I have reviewed the requirements as set forth in this document with the participant.

NRCS _____ Date: _____
Employee: _____

Annual Yield and Sediment Storage

Project: Doolittle

Calculations By: Angela Roman

Checked By: *A. Roman 1/16/18*

*****Annual Surface Yield*****

Input Data

Isogram # =	2
Curve Number =	72
Contributing Acres =	1961
% chance =	50

runoff= 0.25 inches

Contributing Acres* Inches of Runoff = 40.9 ACFT

Storage at Principal Spillway = 78.9 ACFT

*****Sediment Yield*****

Input Data

Erodibility Area =	P
Gross Rate =	0.0034 <25% cultivated
Drainage Area =	1961
Delivery Rate =	18 Median-Minimum- fields are primarily no till and some grass
Design Life =	25

Gross Rate * Drainage Area* Delivery Rate*Years = 30.0 ACFT

Available Sediment Storage = 65.7 years

REF:
EFM 2-83 Method A

Prepared By Angela Roman, Pierre FSO
9/21/04

1/16/2018

Doolittle Dam

 SITES XEQ 11/01/2017 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2005.1.8 (USER MANUAL - DATED DECEMBER 2005)
 TIME 16:55:55

A. Roman 1/16/18

***** 80-80 LIST OF INPUT Data *****

SITES 01/01/2005 Doolittle 3.0640625 H5
 SAVMOV 0 101
 SAVMOV 101 1 1
 * 2 yr 24 hr storm through principal
 * 50 yr 24 hr strom through auxiliary
 * 4' tall riser, 48" diameter
 * 24" PVC pipe
 STRUCTURE 1 Dam Repair

50' width spillway

2054	0
2063	8.4
2064	9.3
2065	10.1
2066	11.3
2067	12.5
2068	13.8
2069	15.2
2070	16.8
2071	18.3
2072	19.8
2073	21.3
2074	22.5
2075	23.5
2076	24.5

0

37.41
58.14
60.21
62.21
64.14
66.03
67.86
69.94
71.37

*PS = 2067.0
 AS = 2068.8
 TD = 2072.3*

ENDTABLE
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0.001030	0.001290	0.001570	0.001870	0.002180
0.002510	0.002860	0.003230	0.003620	0.004020
0.004440	0.004880	0.005340	0.005810	0.006310
0.006820	0.007350	0.007890	0.008460	0.009040
0.009640	0.010260	0.010900	0.011550	0.012230
0.012920	0.013630	0.014350	0.015100	0.015860
0.016640	0.017440	0.018250	0.019090	0.019940
0.020810	0.021700	0.022600	0.023530	0.024470
0.025430	0.026410	0.027400	0.028420	0.029450
0.030500	0.031560	0.032650	0.033750	0.034870
0.036010	0.037170	0.038350	0.039540	0.040750
0.041980	0.043220	0.044490	0.045770	0.047070
0.048390	0.049730	0.051080	0.052450	0.053840
0.055250	0.056680	0.058120	0.059580	0.061060
0.062560	0.064080	0.065610	0.067160	0.068730
0.070320	0.071930	0.073550	0.075190	0.076850
0.078530	0.080220	0.081940	0.083670	0.085420
0.087180	0.090120	0.093100	0.096120	0.099190
0.102290	0.105450	0.108640	0.111880	0.115160
0.118490	0.121850	0.125270	0.128720	0.132220
0.135760	0.141150	0.147320	0.154280	0.162030
0.170560	0.179880	0.189980	0.200870	0.212540
0.225000	0.243980	0.269120	0.304660	0.356220

0.456270	0.643780	0.695340	0.730880	0.756020
0.775000	0.787460	0.799130	0.810020	0.820120
0.829440	0.837970	0.845720	0.852680	0.858850
0.864240	0.867780	0.871280	0.874730	0.878150
0.881510	0.884840	0.888120	0.891360	0.894550
0.897710	0.900810	0.903880	0.906900	0.909880
0.912820	0.914580	0.916330	0.918060	0.919780
0.921470	0.923150	0.924810	0.926450	0.928070
0.929680	0.931270	0.932840	0.934390	0.935920
0.937440	0.938940	0.940420	0.941880	0.943320
0.944750	0.946160	0.947550	0.948920	0.950270
0.951610	0.952930	0.954230	0.955510	0.956780
0.958020	0.959250	0.960460	0.961650	0.962830
0.963990	0.965130	0.966250	0.967350	0.968440
0.969500	0.970550	0.971580	0.972600	0.973590
0.974570	0.975530	0.976470	0.977400	0.978300
0.979190	0.980060	0.980910	0.981750	0.982560
0.983360	0.984140	0.984900	0.985650	0.986370
0.987080	0.987770	0.988450	0.989100	0.989740
0.990360	0.990960	0.991540	0.992110	0.992650
0.993180	0.993690	0.994190	0.994660	0.995120
0.995560	0.995980	0.996380	0.996770	0.997140
0.997490	0.997820	0.998130	0.998430	0.998710
0.998970	0.999210	0.999435	0.999641	0.999830
1.000000				

ENDTABLE

PDIRECT

POOLDATA	ELEV	2.1			4.20	
ASDATA	41 300	2067	2054	2067	2056	2054
ASINSURF	41	100		3		.06 2
ASINLET	41	0.0	0.035	70	0.0	
		170	10			3

ENDTABLE

ASEXSURF	41		.035		
			.75	0	
			2		
			1.5	0	
			.0075		

ENDTABLE

ASEXIT	41	N			100
BTMWIDTH	FEET	50			
GRAPHICS	I				
GO,DESIGN	HL	MSE1	24	MSE1 378	24
SAVMOV	2 101	1		1	

ENDJOB

1SITES XEQ 11/01/2017	-----	COMMENT PAGE	-----
VER 2005.1.8		Doolittle	WSID =

2 yr 24 hr storm through principal

50 yr 24 hr strom through auxiliary

4' tall riser, 48" diameter

24" PVC pipe

***** 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 11/01/2017 Doolittle WSID=
VER 2005.1.8 Dam Repair SUBW= A
TIME 16:55:55 SITE = 1 PASS= 1 PART= 1

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

— STORM DISTRIBUTION-PSH_MSE1 WinTR-20 rf dist
PRINCIPAL SPILLWAY DURATION = 24.00 HOURS

STORM DISTRIBUTION AUX. -MSE1 WinTR-20 rf dist

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	P-SD	P-FB	
2.10	0.00	0.00	4.20	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
72.00	3.06	27930.00	5.00	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
2067.00	2054.00	2067.00	2054.00	YES
BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE	
0.00	0.00	0.00	DESIGN	
PSDATA - NO. COND	COND L	DIA/W	-/H	
0.00	0.00	0.00	0.00	
PS N	KE	WEIR L	TW EL	
0.000	0.00	0.00	0.00	
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	300.00	100	
AUX.Data - INLET N	SIDE SLOPE	EXIT N	EXIT SLOPE	ACTUAL AUX?
0.035	3.00	0.035	0.060	NO
BTM WIDTH - BW1	BW2	BW3	BW4	BW5
ft 50.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----

XEQ 11/01/2017 Doolittle WSID=
 VER 2005.1.8 Dam Repair SUBW= A
 TIME 16:55:55 SITE = 1 PASS= 1 PART= 2

MESSAGE ---- Climatic Index changed from 0.0 to 1.0 for this run.

PERM POOL	2067.00 FT	78.9 ACFT	12.50 AC	0.0 CFS
CREST PS	2054.00 FT	0.0 ACFT	0.00 AC	0.0 CFS
SED ACCUM	2067.00 FT	78.9 ACFT	12.50 AC	0.0 CFS
START ELEV	2067.00 FT	78.9 ACFT	12.50 AC	0.0 CFS
NRCS-PSH	D= 24.00 HR TC= 4.29 HR	P= 2.10 IN CN= 72.00	Q= 0.34 IN VOL= 54.8 ACFT	DA= 3.06 SM

PEAK = 121.1 CFS, AT 15.2 HRS.

ROUTED RESULT - HYD TYPE	EMAX	VOL-MAX	AMAX	QMAX
NRCS-PSH	2068.72 FT	102.3 ACFT	14.80 AC	52.0 CFS

PS STORAGE 23.4 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 2054.00 FT 0.0 ACFT 0.00 CFS
 CONTROL IS 0.000 DETENTION STORAGE

***** MESSAGE - DRAWDOWN TEST ELEVATION CANNOT BE LESS THAN SEDIMENT,
 BASEFLOW ELEVATION, OR INPUT DRAWDOWN ELEVATION;
 DDT TEST USED 2067.00 FT, 78.9 ACFT, 0.0 CFS.

DRAWDOWN TIME = 1.95 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

 RATING TABLE DEVELOPED, SITE = 1 :
 WITH PS GIVEN AND AUX. COMPUTED BY PROGRAM
 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	2054.00	0.00	0.00	0.00	0.00	0.00
2	2063.00	0.00	0.00	0.00	37.80	8.40
3	2064.00	0.00	0.00	0.00	46.65	9.30
4	2065.00	0.00	0.00	0.00	56.35	10.10
5	2066.00	0.00	0.00	0.00	67.05	11.30
6	2067.00	0.00	0.00	0.00	78.95	12.50
7	2068.00	37.41	37.41	0.00	92.10	13.80
8	2069.00	58.14	58.14	0.00	106.60	15.20
9	2070.00	60.21	60.21	0.00	122.60	16.80

10	2071.00	62.21	62.21	0.00	140.15	18.30
11	2072.00	64.14	64.14	0.00	159.20	19.80
12	2073.00	66.03	66.03	0.00	179.75	21.30
13	2074.00	67.86	67.86	0.00	201.65	22.50
14	2075.00	69.94	69.94	0.00	224.65	23.50
15	2076.00	71.37	71.37	0.00	248.65	24.50

1SITES

XEQ 11/01/2017
VER 2005.1.8
TIME 16:55:55

Doolittle
Dam Repair

WSID=
SUBW= A
PART= 3

SITE = 1

PASS= 1

AUX. CREST 2068.72 FT 102.3 ACFT 14.80 AC 52.0 CFS

PS STORAGE 23.4 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 2067.00 FT 79.0 ACFT 12.50 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 12.7 FEET, PRODUCT= 1301. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.

NRCS-FBH D= 24.00 HR P= 4.20 IN Q= 1.60 IN DA= 3.06 SM
TC= 4.29 HR CN= 72.00 VOL= 261.8 ACFT

PEAK = 652.0 CFS, AT 14.9 HRS.

RATING TABLE DEVELOPED, SITE = 1 :
WITH PS GIVEN AND AUX. COMPUTED BY PROGRAM
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	2054.00	0.00	0.00	0.00	0.00	0.00
2	2055.23	0.00	0.00	0.00	0.70	1.14
3	2056.45	0.00	0.00	0.00	2.81	2.29
4	2057.68	0.00	0.00	0.00	6.32	3.43
5	2058.91	0.00	0.00	0.00	11.23	4.58
6	2060.13	0.00	0.00	0.00	17.54	5.72
7	2061.36	0.00	0.00	0.00	25.26	6.87
8	2062.58	0.00	0.00	0.00	34.39	8.01
9	2063.81	0.00	0.00	0.00	44.90	9.13
10	2065.04	0.00	0.00	0.00	56.72	10.14
11	2066.26	0.00	0.00	0.00	70.07	11.62
12	2067.49	18.31	18.31	0.00	85.22	13.14
13	2068.72	52.25	52.25	0.00	102.34	14.80
14	2069.08	72.22	58.31	13.92	107.82	15.33
15	2069.44	108.87	59.06	49.81	113.51	15.91
16	2070.10	229.71	60.41	169.30	124.29	16.95
17	2070.90	456.63	62.01	394.62	138.35	18.15
18	2072.36	1086.23	64.82	1021.42	166.38	20.34

19	2074.18	2159.67	68.23	2091.44	205.69	22.68
20	2076.00	3574.34	71.37	3502.97	248.65	24.50

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	200.	230.	-10.0	0.035	**	**	**	INLET
2	230.	300.	0.0	0.035	**	**	**	CREST
3	300.	400.	6.0	0.035	0.75	2	1.5	EXIT !

@ The program interprets retardance curve index entries of less than 1 as Manning's n values.

* 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.

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 2068.72 FT.

DRAWDOWN (DDT) TEST 2067.00 FT 78.9 ACFT 10.73 CFS
CONTROL IS 0.000 DETENTION STORAGE

DRAWDOWN TIME = 0.52 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
NRCS-FBH	50.0	2071.19	143.6	18.6	2.47	41.3

PEAK - CFS DISCHARGE =	Q-PS	Q-AUX.	Q-TOT.
	62.6	512.5	575.1

78fps = allowable

AUXILIARY SPILLWAY	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
----	1.44	6.55	0.016	0.022

2068.8
+ 2.47

2071.27
+ 1' free board

2072.2

Ref: NEH Part 650, Chapter 11, Table 1, pg 11-54a

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

Aux. Spillway Discharge = 513. cfs; Bottom Width = 50. ft

REACH NO.	FROM STA	TO STA	SLOPE %	MANNING'S n	VELOCITY ft/s	TOTAL EFFECTIVE STRESS lb/ft^2	STRESS lb/ft^2
3	300.	400.	6.00	0.035	9.87	3.67	0.730

AUXILIARY SPILLWAY DURATION FLOW = 13.0 HOURS
ATTACK, OE/B = 3.4 ACFT/FT

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

EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY= 9.9 FT/SEC
 EXIT SLOPE = 0.060 FT/FT
 FLOW DEPTH = 1.0 FT

>>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED
 FOR THIS PASS. NEW TOP OF DAM ELEVATION = 2072.19.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	50.0	2072.19	163.1	20.1	3.47	60.8

PEAK - CFS DISCHARGES =	Q-PS FT	Q-AUX. ACFT	Q-TOT. ACFT
	64.5	948.4	1012.9

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	2.14	7.86	0.015	0.019

Inflow Hyd 1 PSH-Peak = 52.04 CFS at 18.15 hrs., Location Point

Inflow Hyd 1 FBH-Peak = 575.07 CFS at 15.49 hrs., Location Point
 HYDOUT 1 1

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

Doolittle

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 ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
	1	A	3.06	72.	4.29	3.06	378CR	A1	

PASS	DIA./	AUX.CREST	BTM.	MAX.	MAX.	EMB.	INTEGR.*	EXIT*	TYPE
------	-------	-----------	------	------	------	------	----------	-------	------

NO.	WIDTH (IN/FT)	ELEV (FT)	WIDTH (FT)	HP (FT)	ELEV (FT)	VOL. (CY)	DIST. (FT)	VEL. (FT/SEC)	HYD
1	0.0	2068.7	50.0	3.5	2072.2	0.	0.	9.9	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 2005.1.8 ,01/01/2005
FILES

INPUT =S:\NRCS\PierreFSO\engineering\Angela\Doolittle\Sites\Sites\48to2450yr.D2C
OUTPUT = S:\NRCS\PierreFSO\engineering\Angela\Doolittle\Sites\Sites\48to2450yr.OUT
DATED 11/01/2017 16:55:55

GRAPHICS FILES GENERATED

OPTION "L" = S:\NRCS\PierreFSO\engineering\Angela\Doolittle\Sites\Sites\48to2450yr.DR
OPTION "P" = S:\NRCS\PierreFSO\engineering\Angela\Doolittle\Sites\Sites\48to2450yr.DH
OPTION "E" = S:\NRCS\PierreFSO\engineering\Angela\Doolittle\Sites\Sites\48to2450yr.DET

Project Name: Doolittle
 Computed by: A. Roman

laHoodInlet.xls Ver 1.10

Date: 11/1/2017
 Checked by: *A. Roman*
 Date: 11/6/18

Computed by: A. Roman				Outflow, CFS						
Date: 11/1/2017				Weir	Slug Flow	Full Pipe	Structure Outflow, CFS	Controlling Factor		
Checked by: <i>A. Roman</i>										
Date: 1/16/18				Elev	HW Ft					
Input Data				2063.0	0.0	0.00	0.00	43.71	0.00	Weir Flow
				2063.1	0.1	0.23	0.00	43.99	0.23	Weir Flow
				2063.2	0.2	0.45	0.00	44.26	0.45	Weir Flow
				2063.3	0.3	0.68	0.00	44.54	0.68	Weir Flow
Principal Spillway Crest Elev (ft)		2063	2063.4	0.4	0.91	0.00	44.81	0.91	Weir Flow	
				2063.5	0.5	1.33	0.00	45.09	1.33	Weir Flow
				2063.6	0.6	1.75	0.00	45.36	1.75	Weir Flow
Inside Wall - Type		Smooth		2063.7	0.7	2.18	0.00	45.63	2.18	Weir Flow
Pipe Diameter (in)			24	2063.8	0.8	2.60	0.00	45.89	2.60	Weir Flow
Pipe Length (ft)			100	2063.9	0.9	3.14	0.00	46.16	3.14	Weir Flow
Entrance Coefficient 'Ke'			1	2064.0	1.0	3.68	0.00	46.42	3.68	Weir Flow
Mannings 'n-value'			0.009	2064.1	1.1	4.33	0.00	46.69	4.33	Weir Flow
Elbow Elev (if None, Leave 'BLANK')				2064.2	1.2	4.98	0.00	46.95	4.98	Weir Flow
Length of Outlet ('BLANK' if none)				2064.3	1.3	5.94	0.00	47.21	5.94	Weir Flow
Outlet Type			Cantilever	2064.4	1.4	6.90	0.00	47.47	6.90	Weir Flow
Outlet Elevation (ft)			2054	2064.5	1.5	7.86	0.00	47.73	7.86	Weir Flow
Tailwater Elev (if unknown, leave 'Blank')				2064.6	1.6	8.82	0.00	47.98	8.82	Weir Flow
Auxiliary Spillway Elev (ft)			2068.8	2064.7	1.7	9.73	0.00	48.24	9.73	Weir Flow
Maximum Headwater Elev (ft)			2076	2064.8	1.8	10.63	0.00	48.49	10.63	Weir Flow
Elev Increment After Full Pipe Flow			1	2064.9	1.9	11.54	0.00	48.74	11.54	Weir Flow
Basic Output				2065.0	2.0	12.45	0.00	48.99	12.45	Weir Flow
				2065.1	2.1	13.29	0.00	49.24	13.29	Weir Flow
Full Pipe Flow - Max. Outflow (cfs):		71.37	2065.2	2.2	14.14	11.31	49.49	14.14	Weir Flow	
Full Pipe Flow - Max. Velocity (fps):		22.72	2065.3	2.3	14.99	22.63	49.74	22.63	Slug Flow	
				2065.4	2.4	15.84	33.94	49.98	33.94	Slug Flow
				2065.5	2.5	16.55	45.25	50.23	45.25	Slug Flow
Barrel Area (Sq Ft):		3.14	2065.6	2.6	17.25	56.57	50.47	50.47	Full Pipe Flow	
Kp:		0.005952	2066.0	3.0	20.08	101.82	51.43	51.43	Full Pipe Flow	
Friction Slope (HW at the A.S. Crest):		0.03119	2067.0	4.0			53.76	53.76	Full Pipe Flow	
Pipe Slope:		0.09037	2068.0	5.0			55.99	55.99	Full Pipe Flow	
Outlet Elbow Angle (deg):		0.0	2069.0	6.0			58.14	58.14	Full Pipe Flow	
				2070.0	7.0		60.21	60.21	Full Pipe Flow	
				2071.0	8.0		62.21	62.21	Full Pipe Flow	
Km:		0.00000	2072.0	9.0			64.14	64.14	Full Pipe Flow	
Tailwater Elev Used For Full Pipe Flow:		2055.2	2073.0	10.0			66.03	66.03	Full Pipe Flow	
Notes & Warnings				2074.0	11.0		67.86	67.86	Full Pipe Flow	
				2075.0	12.0		69.64	69.64	Full Pipe Flow	
				2076.0	13.0		71.37	71.37	Full Pipe Flow	

Project Name: Doolittle
Computed by: A. Roman

laDropInlet.xls Ver 1.02

Date: 11/1/2017
Checked by: *A. Roman*
Date: 1/16/18

Input Data

Riser Type & Diameter (in)	Circular	48
Length of Weir Obstruction (ft)		0.5
		6
Principal Spillway Crest Elev (ft)		2067
Invert of Barrel Elevation (ft)		2063
Barrel Orifice Coefficient (C)		0.6
Pipe Diameter (in)		24
Pipe Length (ft)		100
Entrance Coefficient 'Ke'		1
Mannings 'n'-value		0.009
Elbow Elev (if None, Leave 'BLANK')		
Length of Outlet ('BLANK' if none)		
Outlet Type	Cantilever	
Outlet Elevation (ft)		2054
Tailwater Elev (if unknown, leave 'Blank')		
Auxiliary Spillway Elev (ft)		2070
Maximum Headwater Elev (ft)		2076
Elev Increment After Full Pipe Flow		1

Basic Output

Full Pipe Flow - Max. Outflow (cfs):	0.00
Full Pipe Flow - Max. Velocity (fps):	0.00
Useable Weir Length (ft):	12.07
Riser Area (Sq Ft):	12.57
Barrel Area (Sq Ft):	3.14
Kp:	0.005952
Friction Slope (HW at the A.S. Crest):	0.03394
Pipe Slope:	0.09037
Outlet Elbow Angle (deg):	0.0
Maximum Barrel Invert Elevation for avoiding Barrel Orifice Control:	2053.28
Km:	0.00000
Tailwater Elev Used For Full Pipe Flow:	2055.2

Notes & Warnings

NOTE: Pipe slope computed to be greater than friction slope - a 5D riser can eliminate flow problems

NOTE: Barrel Orifice control can be eliminated by increasing the riser depth.

		Outflow, CFS					
Elev	HW Ft	Weir	Inlet Orifice	Barrel Orifice	Full Pipe	Structure Outflow, CFS	Controlling Factor
2067.0	0.0	0.00	0.00	26.20	53.76	0.00	Weir Flow
2067.1	0.1	1.18	19.13	26.63	53.99	1.18	Weir Flow
2067.2	0.2	3.35	27.06	27.06	54.21	3.35	Weir Flow
2067.3	0.3	6.15	33.14	27.48	54.44	6.15	Weir Flow
2067.4	0.4	9.46	38.27	27.89	54.66	9.46	Weir Flow
2067.5	0.5	13.22	42.78	28.30	54.89	13.22	Weir Flow
2067.6	0.6	17.38	46.87	28.70	55.11	17.38	Weir Flow
2067.7	0.7	21.91	50.62	29.10	55.33	21.91	Weir Flow
2067.8	0.8	26.77	54.12	29.49	55.55	26.77	Weir Flow
2067.9	0.9	31.94	57.40	29.87	55.77	29.87	Barrel Orifice
2068.0	1.0	37.41	60.51	30.25	55.99	30.25	Barrel Orifice
2068.1	1.1	43.15	63.46	30.63	56.21	30.63	Barrel Orifice
2068.2	1.2	49.17	66.28	31.00	56.43	31.00	Barrel Orifice
2068.3	1.3	55.44	68.99	31.37	56.64	31.37	Barrel Orifice
2068.4	1.4	61.96	71.59	31.73	56.86	31.73	Barrel Orifice
2068.5	1.5	68.72	74.11	32.09	57.07	32.09	Barrel Orifice
2068.6	1.6	75.70	76.54	32.44	57.29	32.44	Barrel Orifice
2068.7	1.7	82.91	78.89	32.79	57.50	32.79	Barrel Orifice
2068.8	1.8	90.33	81.18	33.14	57.71	33.14	Barrel Orifice
2068.9	1.9	97.96	83.40	33.48	57.93	33.48	Barrel Orifice
2069.0	2.0	105.80	85.57	33.82	58.14	33.82	Barrel Orifice
2069.1	2.1	113.83	87.68	34.16	58.35	34.16	Barrel Orifice
2069.2	2.2	122.06	89.75	34.49	58.56	34.49	Barrel Orifice
2069.3	2.3	130.48	91.76	34.82	58.76	34.82	Barrel Orifice
2069.4	2.4	139.08	93.74	35.15	58.97	35.15	Barrel Orifice
2069.5	2.5	147.86	95.67	35.48	59.18	35.48	Barrel Orifice
2069.6	2.6	156.82	97.56	35.80	59.39	35.80	Barrel Orifice
2069.7	2.7	165.95	99.42	36.11	59.59	36.11	Barrel Orifice
2069.8	2.8	175.26	101.25	36.43	59.80	36.43	Barrel Orifice
2069.9	2.9	184.73	103.04	36.74	60.00	36.74	Barrel Orifice
2070.0	3.0	194.37	104.80	37.05	60.21	37.05	Barrel Orifice
2070.1	3.1	204.16	106.53	37.36	60.41	37.36	Barrel Orifice
2070.2	3.2	214.12	108.24	37.67	60.61	37.67	Barrel Orifice
2070.3	3.3	224.24	109.92	37.97	60.81	37.97	Barrel Orifice
2070.4	3.4	234.51	111.57	38.27	61.01	38.27	Barrel Orifice
2070.5	3.5	244.93	113.20	38.57	61.21	38.57	Barrel Orifice
2070.6	3.6	255.50	114.80	38.86	61.41	38.86	Barrel Orifice
2070.7	3.7	266.22	116.39	39.15	61.61	39.15	Barrel Orifice
2070.8	3.8	277.09	117.95	39.45	61.81	39.45	Barrel Orifice
2070.9	3.9	288.09	119.49	39.73	62.01	39.73	Barrel Orifice
2071.0	4.0	299.25	121.01	40.02	62.21	40.02	Barrel Orifice
2071.1	4.1	310.54	122.52	40.31	62.40	40.31	Barrel Orifice
2071.2	4.2	321.97	124.00	40.59	62.60	40.59	Barrel Orifice
2071.3	4.3	333.53	125.47	40.87	62.79	40.87	Barrel Orifice
2071.4	4.4	345.24	126.92	41.15	62.99	41.15	Barrel Orifice
2071.5	4.5	357.07	128.35	41.43	63.18	41.43	Barrel Orifice
2071.6	4.6	369.04	129.77	41.70	63.38	41.70	Barrel Orifice
2071.7	4.7	381.14	131.18	41.97	63.57	41.97	Barrel Orifice
2071.8	4.8	393.37	132.56	42.25	63.76	42.25	Barrel Orifice
2071.9	4.9	405.73	133.94	42.52	63.95	42.52	Barrel Orifice
2072.0	5.0	418.21	135.30	42.78	64.14	42.78	Barrel Orifice
2072.1	5.1	430.82	136.64	43.05	64.34	43.05	Barrel Orifice
2072.2	5.2	443.55	137.98	43.32	64.53	43.32	Barrel Orifice
2072.3	5.3	456.41	139.30	43.58	64.72	43.58	Barrel Orifice
2072.4	5.4	469.38	140.61	43.84	64.90	43.84	Barrel Orifice
2072.5	5.5	482.48	141.90	44.10	65.09	44.10	Barrel Orifice
2072.6	5.6	495.70	143.19	44.36	65.28	44.36	Barrel Orifice
2072.7	5.7	509.04	144.46	44.62	65.47	44.62	Barrel Orifice
2072.8	5.8	522.49	145.72	44.87	65.65	44.87	Barrel Orifice
2072.9	5.9	536.06	146.97	45.13	65.84	45.13	Barrel Orifice
2073.0	6.0	549.75	148.21	45.38	66.03	45.38	Barrel Orifice
2073.1	6.1	563.55	149.44	45.63	66.21	45.63	Barrel Orifice
2073.2	6.2	577.47	150.66	45.88	66.40	45.88	Barrel Orifice
2073.3	6.3	591.49	151.87	46.13	66.58	46.13	Barrel Orifice
2073.4	6.4	605.63	153.07	46.38	66.76	46.38	Barrel Orifice
2073.5	6.5	619.88	154.26	46.62	66.95	46.62	Barrel Orifice
2073.6	6.6	634.24	155.44	46.87	67.13	46.87	Barrel Orifice

DROP Inlet

Project Name: Doolittle
Computed by: A. Roman

laDropInlet.xls Ver 1.02

Date: 11/1/2017
Checked by: *A. Roman*
Date: 1/16/18

Elev	HW Ft	Outflow, CFS				Structure Outflow, CFS	Controlling Factor
		Weir	Inlet Orifice	Barrel Orifice	Full Pipe		
2073.7	6.7	648.71	156.62	47.11	67.31	47.11	Barrel Orifice
2073.8	6.8	663.29	157.78	47.35	67.49	47.35	Barrel Orifice
2073.9	6.9	677.97	158.94	47.60	67.67	47.60	Barrel Orifice
2074.0	7.0	692.76	160.09	47.83	67.86	47.83	Barrel Orifice
2074.1	7.1	707.66	161.23	48.07	68.04	48.07	Barrel Orifice
2074.2	7.2	722.67	162.36	48.31	68.22	48.31	Barrel Orifice
2074.3	7.3	737.77	163.48	48.55	68.39	48.55	Barrel Orifice
2074.4	7.4	752.98	164.60	48.78	68.57	48.78	Barrel Orifice
2074.5	7.5	768.30	165.70	49.02	68.75	49.02	Barrel Orifice
2074.6	7.6	783.72	166.81	49.25	68.93	49.25	Barrel Orifice
2074.7	7.7	799.23	167.90	49.48	69.11	49.48	Barrel Orifice
2074.8	7.8	814.85	168.99	49.71	69.28	49.71	Barrel Orifice
2074.9	7.9	830.58	170.07	49.94	69.46	49.94	Barrel Orifice
2075.0	8.0	846.40	171.14	50.17	69.64	50.17	Barrel Orifice
2075.1	8.1	862.31	172.21	50.40	69.81	50.40	Barrel Orifice
2075.2	8.2	878.33	173.27	50.62	69.99	50.62	Barrel Orifice
2075.3	8.3	894.45	174.32	50.85	70.16	50.85	Barrel Orifice
2075.4	8.4	910.66	175.37	51.07	70.34	51.07	Barrel Orifice
2075.5	8.5	926.97	176.41	51.30	70.51	51.30	Barrel Orifice
2075.6	8.6	943.38	177.44	51.52	70.68	51.52	Barrel Orifice
2075.7	8.7	959.88	178.47	51.74	70.86	51.74	Barrel Orifice
2075.8	8.8	976.48	179.49	51.96	71.03	51.96	Barrel Orifice
2075.9	8.9	993.17	180.51	52.18	71.20	52.18	Barrel Orifice
2076.0	9.0	1009.96	181.52	52.40	71.37	52.40	Barrel Orifice
2076.1	9.1	1026.83	182.53	52.62	71.55	52.62	Barrel Orifice



U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION PLANS AND SPECIFICATIONS

378 - Pond

for

Aaron & Angela Doolittle

NW 1/4 Section: 33
Township: 3N Range: 25 E
County: Stanley

Prepared By:

Pierre Field Support Office

Designed By: Angela Roman

Prepared For:

Hughes/Stanley Conservation District, South Dakota

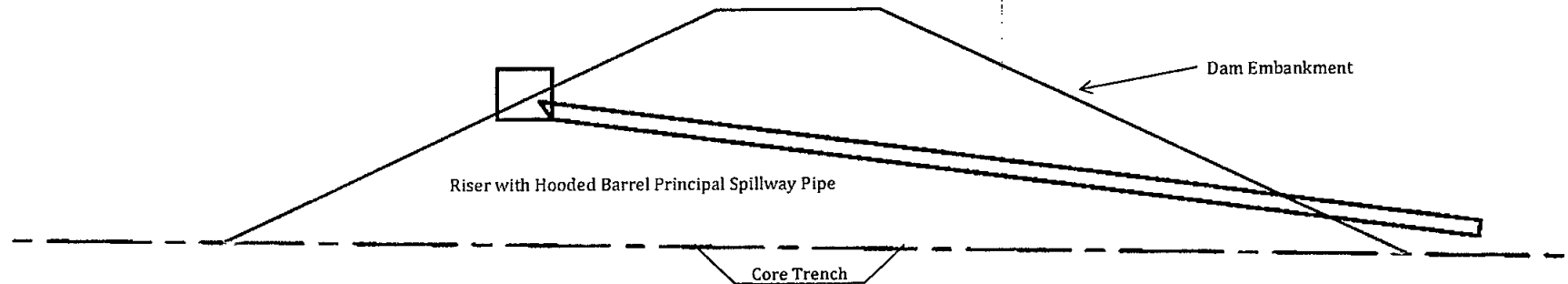
PROJECT Aaron & Angela Doolittle
SUBJECT 378 - Pond **COUNTY** Stanley
BY Angela Roman **DATE** 1/17/2018

PIPE LENGTH AND SLOPE CALCULATOR FOR EARTH DAM Version 1.0

U.S. Department of Agriculture
 Natural Resources Conservation Service
 Rev. 02/2017

Skew Angle of Pipe = 116 Degrees
 Elevation of Top of Dam = 2072.3
 Top Width of Dam = 14 Feet
 Settlement of Fill = 5 %

Elevation of Aux. Spillway = 2068.8
 Downstream SS = 3 :1
 Length of Pipe Past Toe = 5 Feet
 Elevation of Pipe Outlet = 2054



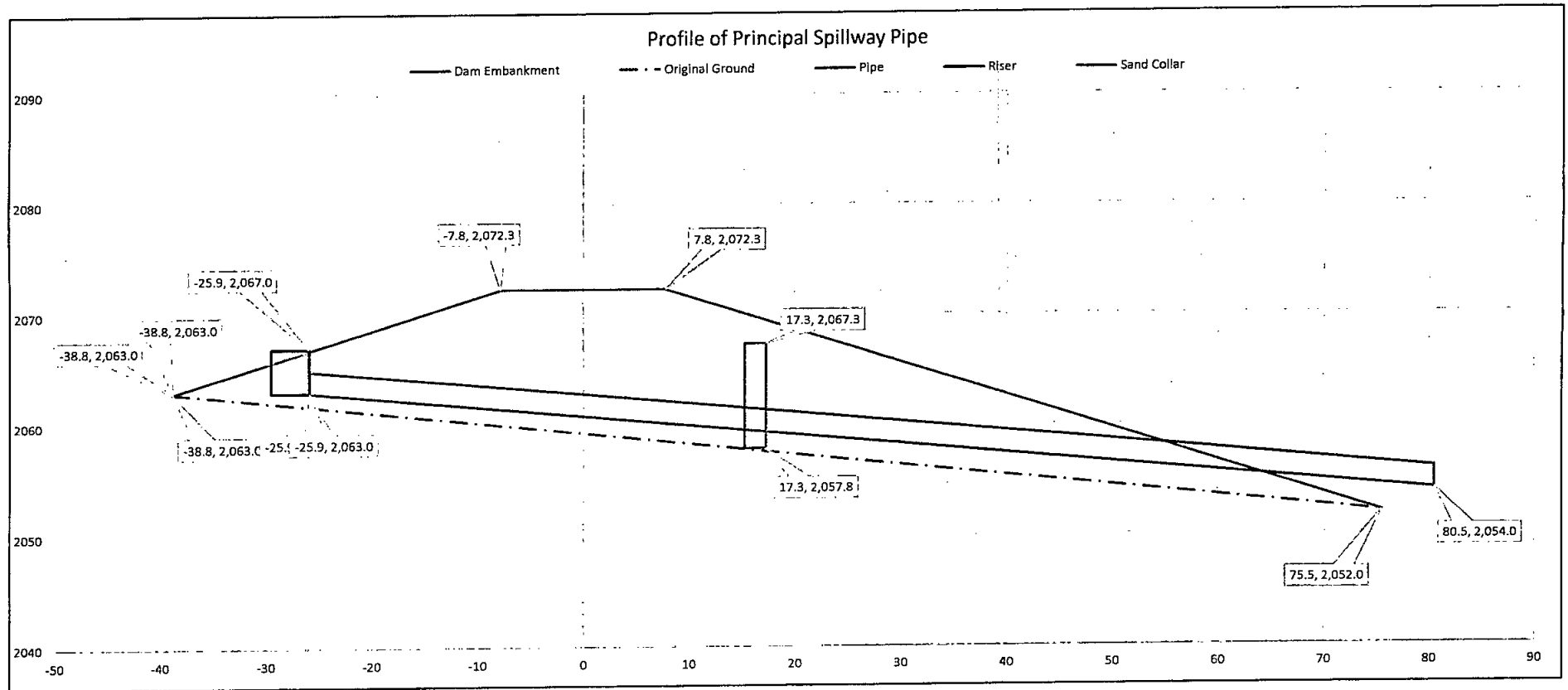
Elevation of Principal
 Spillway Crest = 2067
 Elevation of Barrel Invert = 2063
 Upstream SS = 3 :1
 Elevation of Upstream Toe = 2063

Pipe Diameter = 24 Inches
 Is the Riser Round or Rectangular? Circular
 Riser Diameter = 48 Inches
 Riser Wall Thickness = 5 Inches

Elevation of Downstream Toe = 2052

Pipe Length = 106.8 Feet
 Pipe Slope = 0.0846 Ft./Ft.

Maximum Fill Over Pipe = 10.9 Feet



STATE	South Dakota	PROJECT	Aaron & Angela Doolittle	378 Pond
BY	Angela Roman	DATE	1/17/2018	CHECKED BY
SUBJECT	Drainage Diaphragm Calculations	JOB NO.		
		SHEET	1	OF 1

Rev. 02/2017

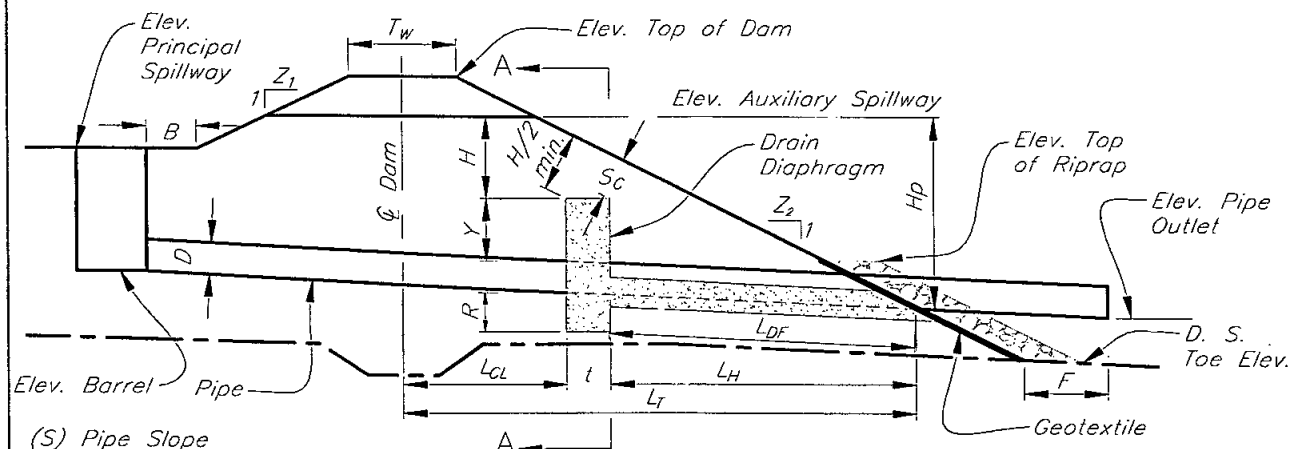
Drain Filter Material

(T _w) Top Width of Dam	14	Feet
(Z ₁) Side Slope (Pool)	3	:1
(Z ₂) Side Slope (Downstream)	3	:1
(B) Dist on Wave Berm	0.0	Feet
(D) Pipe Diameter	24	Inches
(F) Length of Pipe Past Fill	5	Feet
(L _p) Pipe Length	106.8	Feet
(S ₁) Pipe Slope	0.0846	Ft/Ft

Elev. Top of Dam	2072.30
Elev. Auxiliary Spillway	2068.80
Elev. Principal Spillway	2067.00
Elev. Barrel Inlet Invert	2063.00
Elev. Pipe Outlet Invert	2054.00
Elev. Downstream Toe	2052.00

(R) Depth of Sand Below Pipe Feet

Design Data					
H	1.5	Feet	D	2.00	Feet
X	5	Feet	Y	6	Feet
H _p	13.4	Feet	2.5*D	5.00	Feet

(L_{CL}) CL of Dam to Diaphragm Feet(L_T) Total Length (Horizontal) Feet(L_{DF}) Length of Envelope Feet(W) Sand Width Feet(T) Sand Height Feet(t) Sand Thickness Feet(L_H) Length of Drain Filter Feet
(Horizontal)(SC) Sand Clearance Feet
(Perpendicular to Downstream Dam Surface - Minimum 2 Ft.) **Sand Clearance is Good**Is the fill over the sand collar greater than H/2?
Yes - Sand Clearance is GoodTotal Volume of Sand Cu. Yds**Geotextile**(G_w) Width of Geotextile Feet(G_L) Length of Geotextile FeetArea of Geotextile Sq. Yd.**Rock Riprap**(RR_t) Rock Riprap Thickness Inches(RR_w) Rock Riprap Width FeetElevation Top of Rock Elevation Bottom of Rock Total Volume of Rock Riprap Cu. Yds

PROFILE ALONG ϕ OF CONDUIT
NO SCALE



► PVC GRAVITY SEWER PIPE | Gasketed Pipe Specifications

Northern Pipe Products PVC Gasketed Sewer Pipe 4" through 15" meets all dimensional and physical specifications of ASTM D3034. 18" through 24" sewer pipe meets all dimensional and physical specifications of ASTM F679. 4" through 24" SDR-35 sewer pipe products are available with the CSA (Canadian Standards Association) mark of acceptance. All Gasketed Sewer Pipe is manufactured to laying lengths.

► ASTM D3034 | Gasketed Sewer Pipe

NOMINAL PIPE SIZE (IN.)	PIPE OUTSIDE DIAMETER (IN.)	SDR-35 (PS 46)			SDR-26 (PS 115)		
		MINIMUM WALL (IN.)	POUNDS PER FOOT		MINIMUM WALL (IN.)	POUNDS PER FOOT	
			14' LENGTH	20' LENGTH		14' LENGTH	20' LENGTH
4"	4.215"	.120"	1.04 lbs.	1.03 lbs.	.162"	1.38 lbs.	1.36 lbs.
6"	6.275"	.180"	2.32 lbs.	2.30 lbs.	.241"	3.08 lbs.	3.06 lbs.
8"	8.400"	.240"	4.18 lbs.	4.13 lbs.	.323"	5.57 lbs.	5.50 lbs.
10"	10.500"	.300"	6.55 lbs.	6.46 lbs.	.404"	8.74 lbs.	8.64 lbs.
12"	12.500"	.360"	9.36 lbs.	9.22 lbs.	.481"	12.41 lbs.	12.28 lbs.
15"	15.300"	.437"	13.97 lbs.	13.75 lbs.	.588"	18.65 lbs.	18.40 lbs.

Note: 4" and 6" diameter SDR-28 with the Canadian Standards Association mark of acceptance is available on special order.

► ASTM F679 | Gasketed Sewer Pipe

NOMINAL PIPE SIZE (IN.)	PIPE OUTSIDE DIAMETER (IN.)	SDR-35 (PS 46)			SDR-26 (PS 115)		
		MINIMUM WALL (IN.)	POUNDS PER FOOT		MINIMUM WALL (IN.)	POUNDS PER FOOT	
			14' LENGTH	20' LENGTH		14' LENGTH	20' LENGTH
18"	18.701"	.536"	21.03 lbs.	20.70 lbs.	.720"	27.90 lbs.	27.51 lbs.
21"	22.047"	.632"	29.62 lbs.	N/A	.849"	39.40 lbs.	N/A
24"	24.803"	.709"	37.40 lbs.	N/A	.954"	49.80 lbs.	N/A



► PVC GRAVITY SEWER PIPE | Gasketed Pipe Truckload Data

NOMINAL PIPE SIZE (IN.)	PIPE OUTSIDE DIAMETER (IN.)	LENGTH (FT.)	PIECES PER PALLET	FEET PER PALLET	FEET PER TRUCKLOAD
4"	4.215"	14'	63 pcs.	882'	21,168'
4"	4.215"	20'	63 pcs.	1,260'	20,160'
6"	6.275"	14'	40 pcs.	560'	10,080'
6"	6.275"	20'	40 pcs.	800'	9,600'
8"	8.400"	14'	24 pcs.	336'	6,048'
8"	8.400"	20'	24 pcs.	480'	5,760'
10"	10.500"	14'	12 pcs./15 pcs.	168'/210'	3,402'
10"	10.500"	20'	12 pcs./15 pcs.	240'/300'	3,240'
12"	12.500"	14'	4 pcs./8 pcs.	56'/112'	2,352'
12"	12.500"	20'	4 pcs./8 pcs.	80'/160'	2,240'
15"	15.300"	14'	6 pcs.	84'	1,512'
15"	15.300"	20'	6 pcs.	120'	1,440'
18"	18.701"	14'	2 pcs./3 pcs.	28'/42'	1,050'
18"	18.701"	20'	2 pcs./3 pcs.	40'/60'	1,000'
21"	22.047"	14'	4 pcs.	56'	672'
24"	24.803"	14'	4 pcs.	56'	672'

Cut/Fill Report

Generated: 2018-01-17 14:12:27

By user: Angela.Roman

Drawing: S:\NRCS\PierreFSO\engineering\Angela\Doolittle\S:\NRCS\PierreFSO\engineering\Angela\Doolittle\Dam_Pipe.dwg

Volume Summary							
Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
VolumeAux	full	1.000	1.000	8176.77	251.26 ¹⁵²	25.16	226.11<Cut>
VolumePipe (1)	full	1.000	1.000	5142.30	1121.80 ⁹⁶ _{strip}	0.00	1121.80<Cut>
VolumeDamFill (1)	full	1.000	1.000	11139.85	117.09	189.16	72.07<Fill>

Totals				
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	24458.91	1490.16	214.32	1275.84<Cut>

* Value adjusted by cut or fill factor other than 1.0

Stripping

$$\text{Pipe replacement} = 5142.3 \text{ sqft} \times .5 \text{ ft} = \frac{2571.15 \text{ ft}^3}{27} = \underline{\underline{96 \text{ CY}}}$$

$$\text{Aux} = 8,176.77 \text{ sqft} \times .5 \text{ ft} = \frac{4,088.39}{27} = \underline{\underline{152 \text{ CY}}}$$

Excavation

$$\text{Pipe replacement} = 1121.8 \text{ CY} - 96 \text{ CY (strip)} = \underline{\underline{1026 \text{ CY}}}$$

$$\text{Aux} = 251.3 - 152 = \underline{\underline{100 \text{ CY}}}$$

Structural Design of Solid Wall, Plastic Pipe

Version 1.0 (1/30/06)

Ref: Part 636 Structural Engineering National Engineering Handbook
Chapter 52 Structural Design of Flexible Conduits

By: Angela Roman 1/18/18

Proposed Pipe

Description	24" SDR 26 (PS-115) ASTM F679	
D _o	24.803	in
SDR or SDR?	SDR	26
wall thickness, t	0.954	in Table 52C-15
E _{long}	140,000	psi Page 52-12
E _{short}	400,000	psi Page 52B-25
allow comp stress, σ	2000	psi (from table 52C-1)

Loads

SOIL		
depth of soil cover, h	13	ft
unit weight of soil, γ _s	120	psf
water ht. above pipe, h _w	0	ft
P _s	1560	psf
W _s	3224.39	lb/ft

VACUUM

P _v	0	psf
D _i	22.895	in
W _v	0.0	lb/ft

WHEEL		
Load class	Field Equipment	
Load, P _L	10,000	lb
Do-t < 2.67h x 12 ?	N/A	(b14>2, use Eq. 52-22)
Impact factor, I _r	1	
W _L	40	lb/ft
P _w	19	psf

Total Load	1,579	psf
P _s + P _w + P _v		

1. Wall Crushing (solid wall pipe)

Thrust in pipe wall, T _{pw}	1,632	lb/ft
Required wall area, A _{pw}	0.068	in ² /in
Thickness, t	0.954	in

Proposed Pipe okay for wall crushing

2. Deflection (solid wall pipe)

Deflection Lag Factor, D _L	1.5	(varies from 1.0 to 1.5)
Bedding Constant, K	0.1	(generally 0.1)
Modulus of soil reaction, E'	300	(see table 52-2 chose 300 based on installation compaction in combination with soil type)

Using Eq. 52-29 for SDR pipe

Deflection (% ΔX / D)	4.63	%
Maximum deflection	5.0	%

Proposed Pipe okay for deflection

3. Wall Buckling

Use E _{long} or E _{short} ?	E-long	
E =	140,000	psi
Factor of Safety, FS	2.5	h / (Do/12) > 2
R _w	1.0	ft
Coeff of elastic support, B'	0.663	
Moment of Inertia, I _{pw}	0.072	in ⁴ / in
Modulus of soil reaction, E'	300	psi
Allowable buckling, q _a	26.00	psi
Reduction factor, C	0.66	
Adj. allow. Buckling, q _a C	17.19	psi
q _a C	2,475	psf
Total pressure, P	1,579	psf

Proposed Pipe okay for wall buckling

4. Strain (solid wall pipe)

Max strain, flexure, e _f	0.0059	
Max strain, hoop strain, e _h	0.0003	
e _h due to external load?	Yes	
Max combined strain, e	0.0055	e = e _f - e _h
Allowable strain, e _{all}	0.05	

Proposed Pipe okay for strain

DOCUMENTATION FOR HAZARD CLASSIFICATION

Producer: **Doolittle** Name of Site
County: **Stanley**
Field #: Watershed
Location
1/4 Section: **NW** Section: **33** Township: **3N** Range: **5E**

Latitude: Longitude

Dam in Series: **No**
Explain:

Dam and Reservoir Data

Assumed Job Class	IV
Assumed Hazard Class	A
Centerline Elevation Channel Bottom*	2054
Centerline Elevation Flood Plain*	2067
Centerline Elevation Top of Dam*	2072.2
Centerline Elevation Auxiliary Spillway Crest*	2068.8

*Elevation is based on Mean Sea Level Datum

Max. Depth of Water within Reservoir **13** Ft.

Storage

Storage Below Principal Spillway	78.9 Ac.-Ft.
Storage between Principal Spillway and Auxiliary Spillway	23.4 Ac.-Ft.
Storage between Auxiliary Spillway and Top of Dam	64.1 Ac.-Ft.
Other	 Ac.-Ft.
Total Storage to Top of Dam	166.4 Ac.-Ft.

Downstream Conditions

1. Valley Conditions Downstream of Structure	Divergent
Approximate Slope of Channel	
2. Stream Channel Size	
Depth	4 Ft.
Bottom Width	1 Ft.
Top Width	60 Ft.
3. Valley Characteristics	
Width	100 Ft.
Roughness Coefficient	0.035
Slope	1%

Downstream valley may be described in breach routing rather than on this form.

Describe Type of Infrastructure, Distance Downstream and Distance Above Floodplain Elevation	Distance Downstream From Dam	Approx. Distance Above Floodplain Elevation	Location in Potential Impact Area?	
			YES	NO
Roads				
Other, Describe:			☐	☒
			☐	☒
			☐	☒
Bridges: Describe type and opening size				
			☐	☒
Railroads:				
Major Railroad, Describe:			☐	☒
Buildings and Utilities:				
Farm Building(s)	1.9		☐	☒
Public, Industrial or Commercial Buildings			☐	☒
Rel. Import. Utility serving mult. rural users			☐	☒
			☐	☒
Describe: Farm buildings are above flood plain, tributary where dam is located joins with Little Prairie Creek, which is drainage area of approx. 9,000 acres.				

Location:

Is Dam located within five miles of urban development?

No

Describe Potential Development:

Located approx. 8 miles north of Midland, SD. Extremely rural area, no public access road to areas within 1 mile downstream of structure.

Rational For Determining Hazard Class:

Unnamed tributary 2,310 LF from Little Prairie Creek. Drainage area of Little Prairie Creek at point of junction is approx. 9,000 acres. Home site 1.4 miles south of junction, home is approx. 65' above channel elevation.

Method Used for Evaluation of Impact Area

Visual Assessment

Further Evaluation Needed

No

Attached: Breach Routings ☐

Maps ☒

Other supporting documents:

Actual Hazard Class*

A

Final Job Class

IV

Hazard Analysis by

Angela Roman

Date: 1/16/2018

Approved by

Angela Roman

Date: 1/16/18

*Definition of Hazard Classification in National Engineering Manual 520.21 and SD Amendment 19



NW 1/4 Section 33, T3N, R25E
Stanley County, South Dakota

LOCATION MAP

GENERAL NOTES

1. If cultural resources are discovered during construction, discontinue construction and notify the local Natural Resources Conservation Service office.
2. The landowner is responsible for complying with all federal, state, and local laws.

CONSTRUCTION NOTES

1. Clear and grub the entire area within the work limits.
2. All fill material must not contain frozen material, sod, roots, or other perishable material, or rock larger than eight inches in diameter as described in SD Construction Specification SD-7S.
3. Any shale, gravel, or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
4. Six inches topsoil will be incorporated into the earthfill to meet the neat lines shown on the typical section.
5. All areas top-dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD-28.
6. 110 LF of CMP to be removed and disposed of, includes 3' CMP riser. Face of dam will be repaired, auxiliary spillway will be widened. New pipe with concrete riser to be installed.

NO EXCAVATOR MAY BEGIN ANY EXCAVATION WITHOUT FIRST NOTIFYING THE ONE-CALL NOTIFICATION CENTER OF THE PROPOSED EXCAVATION AT 1-800-781-7474.

Aaron & Angela Doolittle
PO Box 145
Midland, SD 57552
605-843-2521

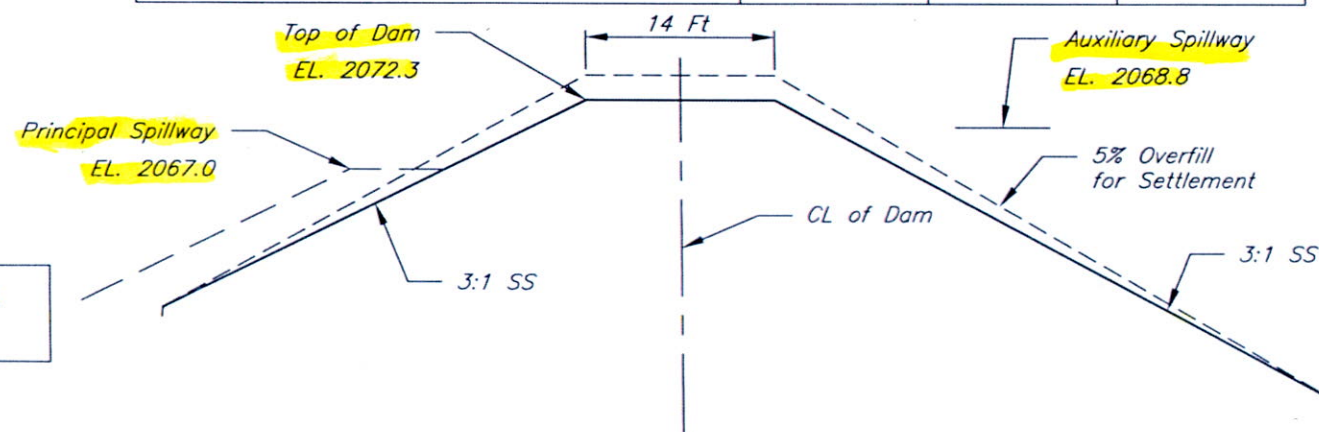
NRCS HAZARD CLASS A
NRCS JOB CLASS IV

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

SD-4 Stripping
SD-5 Excavation
SD-7S Earthfill - Class S
SD-8 Rock Riprap And Bedding
SD-10 Salvaging And Spreading Topsoil
SD-12A Concrete (Class 3500)
SD-13 Steel Reinforcement
SD-14 Wood And Steel Structures
SD-28 Seeding
SD-55 Plastic Pipe
SD-592 Geotextile
For A Full Text Version See
http://www.sd.usda.gov/technical/SD_Engineering.html

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY	AS-BUILT
Earthfill Class S - Embankment	Cu. Yd.	193	
Earthfill Class S - replacing pipe	Cu. Yd.	1026	
Earthfill Class S - Stripping	Cu. Yd.	96	
Earthfill Class S - 5%		66	
Total Earthfill	Cu. Yd.	1381	
Excavation - removal of existing pipe and riser	Cu. Yd.	1122	
Topsoil Auxiliary Spillway	Cu. Yd.	152	
Excavation - Auxiliary Spillway	Cu. Yd.	252	
Seeding (Earthfill and Auxiliary Spillway)	Acre	.6	
Principal Spillway Pipe			
24" Dia. (PS 115) ASTM F679 PVC Pipe	Lin. Ft.	110.0	
48" Dia. 4' Tall Riser and Base	Each	1	
with Trash Rack and Baffle	Each	1	
Drainage Diaphragm	Each	1	
Timber Pipe Support	Each	1	



TYPICAL CROSS SECTION OF DAM

INDEX OF DRAWINGS

1. Cover Sheet
2. Plan View and Design Data
3. Detail Plan View
4. Profile of Dam and Auxiliary Spillway and Cross-Section of Auxiliary Spillway
5. Profile of Principal Spillway and Maximum Cross-Section of Dam
6. Concrete Riser Detail
7. Trash Rack and Baffle Detail
8. Drainage Diaphragm Detail
9. Timber Pipe Support Detail

STATEMENT OF COMPLIANCE

Construction (was) (was not) completed in accordance with approved construction plans and specifications.

JAA Date

POND WITH PRINCIPAL SPILLWAY PIPE
JOB PLAN 1.0P REV. 4/2016

AARON & ANGELA DOOLITTLE
378 POND
COVER SHEET



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Doolittle.dwg

Drawing No.

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Sheet 1 of 9

Date 1/12/18
Designed Angela Roman
Drawn Angela Roman
Checked Angela Roman
Approved Angela Roman

Stanley County, South Dakota

NW 1/4, Sec 33, T3N, R 25E

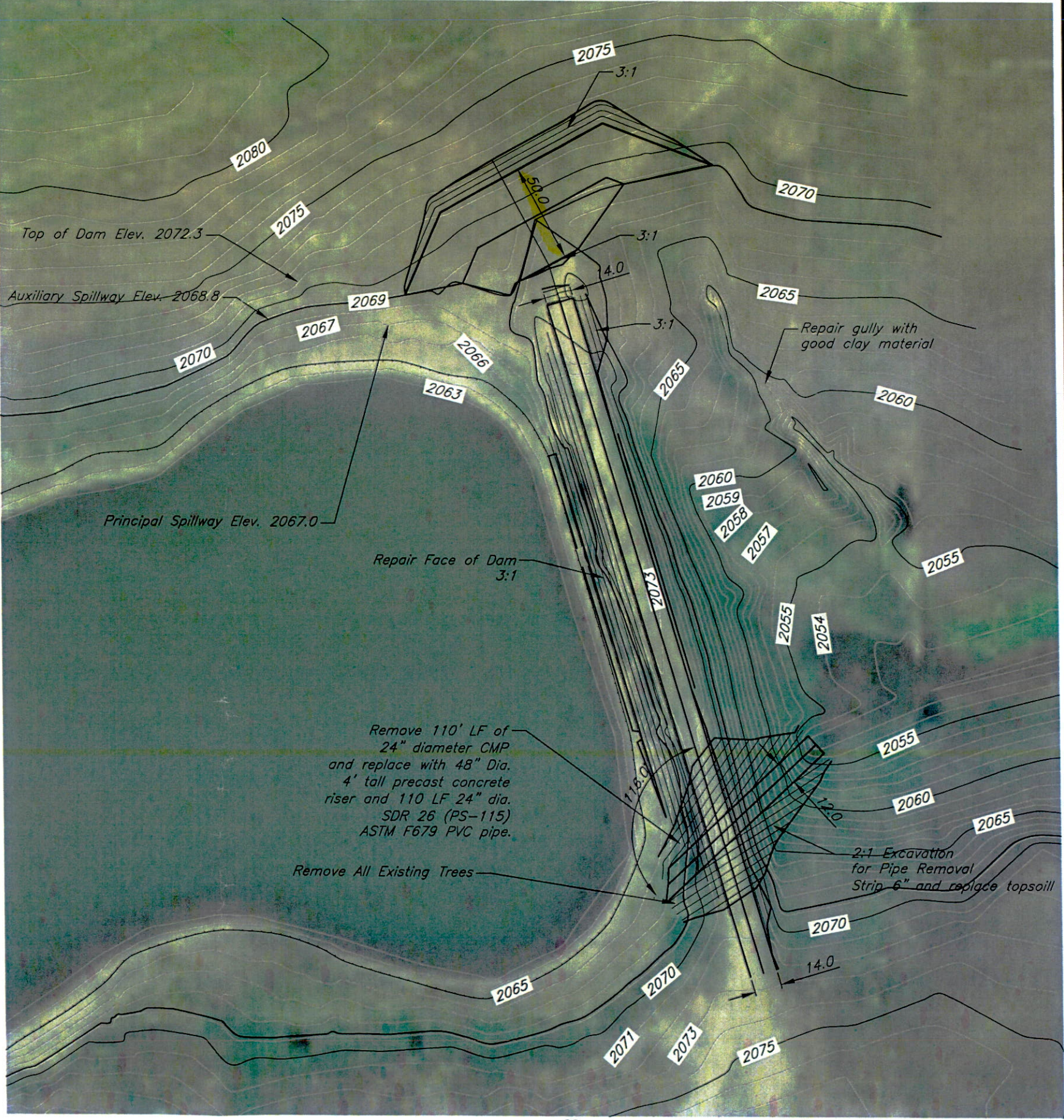
HYDRAULIC DATA		
Drainage Area	1961	Acres
Annual Runoff Yield (50% Chance)	40.9	Ac. Ft
Time of Concentration	4.29	Hours
Runoff Curve Number	72	
Principal Spillway, 2 Year - 24 Hour Rainfall	2.10	Inches
Auxiliary Spillway, 50 Year - 24 Hour Rainfall	4.20	Inches
Peak Runoff 2 Year - 24 Hour Rainfall	121.2	CFS
Principal Spillway Discharge	62.6	CFS
Peak Runoff 50 Year - 24 Hour Rainfall	652.0	CFS
Auxiliary Spillway Discharge	512.5	CFS
Auxiliary Spillway Flow Depth	2.470	Feet

STRUCTURE DATA		
Length of Top of Dam	365	Feet
Water Depth to Crest of Principal Spillway	13	Feet
Height of Downstream Toe to Top of Dam	20.3	Feet
Effective Height	12.7	Feet
Product of Storage X Effective Height	1301	

POOL DATA			
	ELEV.	AREA	STORAGE
Crest of Principal Spillway	2067.0	12.5 Ac.	78.9 Ac.-Ft
Crest of Auxiliary Spillway	2068.8	14.8 Ac.	102.3 Ac.-Ft
Top of Dam	2072.3	20.3 Ac.	166.4 Ac.-Ft

SEDIMENT YIELD					
Erodibility Area	Gross Rate (A.F./Ac./Yr.)	Drainage Area (Acres)	Delivery Rate (%)	Design Period (Years)	Required Sediment Volume (Ac.-Ft.)
P	.0034	1961	18	25	30.000

BENCHMARK POINTS TABLE					
NO.	ID	ELEVATION	NORTHING	EASTING	BENCHMARK DESCRIPTION
	B M 1	2079.26	16057055.10	1085244.737	Along fence line SE of dam
	B M 2	2076.75	16057767.60	1085038.26	On south side of fence line located north of auxiliary.



PLAN VIEW



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Agriculture
USDA
Natural Resources
Conservation Service

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Sheet 2 of 9

AARON & ANGELA DOOLITTLE
378 POND
PLAN VIEW AND DESIGN DATA

NW 1/4, Sec 33, T3N, R 25E
Stanley County, South Dakota

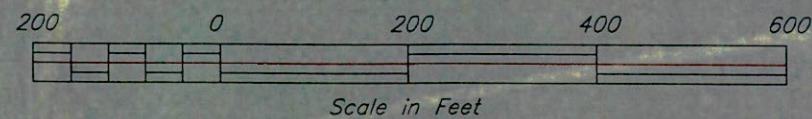
Date
1/12/18

Designed
Angela Roman

Drawn
Angela Roman

Checked
Angela Roman

Approved
Angela Roman



PLAN VIEW

Top of Dam Elev. 2072.3
Auxiliary Spillway Elev. 2068.8
Principal Spillway Elev. 2067.0

Top of Dam Elev. 2072.3
Auxiliary Spillway Elev. 2068.8

Principal Spillway Elev. 2067.0

CP2
N: 16057767.60
E: 1085038.26
Elev. 2076.75

Remove 110' LF of
24" diameter CMP
and replace with 48" Dia.
4' tall precast concrete
riser and 110 LF 24" dia.
SDR 26 (PS-115)
ASTM F679 PVC pipe.

CP1-Base
N: 16057055.10
E: 1085244.737
Elev. 2079.262

Designed	Angela Roman	Date	1/12/18
Drawn	Angela Roman		1/17/18
Checked	DSE		1/19/18
Approved	Angela Roman		1/19/18

AARON & ANGELA DOOLITTLE
378 POND
PLAN VIEW

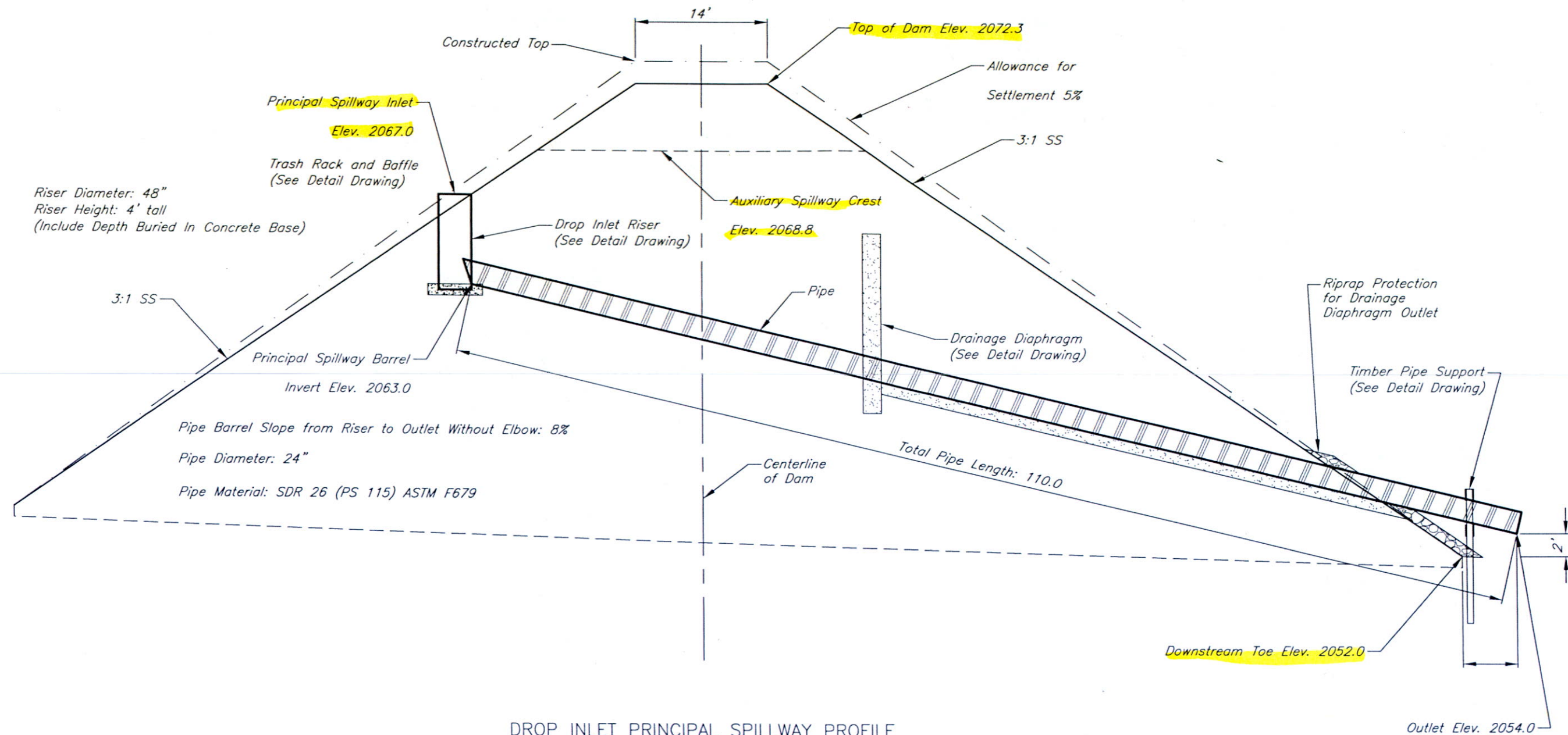
NW 1/4, Sec 33, T3N, R 25E
Stanley County, South Dakota

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Sheet 3 of 9



DROP INLET PRINCIPAL SPILLWAY PROFILE
(No Scale)

TRENCH SAFETY NOTES

1. All trench work shall comply with the Occupational Safety and Health Administration (OSHA) regulations.
2. Any trench over four (4) feet deep shall have a means of egress from the trench by a ladder, ramp, or other means of egress; and
3. Any trench over five (5) feet deep shall be protected from cave-ins by a sloping, benching or shoring protection system. Benches must be constructed so the overall slope meets the slope required by OSHA regulations.

DROP INLET PRINCIPAL SPILLWAY PROFILE

AARON & ANGELA DOOLITTLE
378 POND
PROFILE OF PRINCIPAL SPILLWAY

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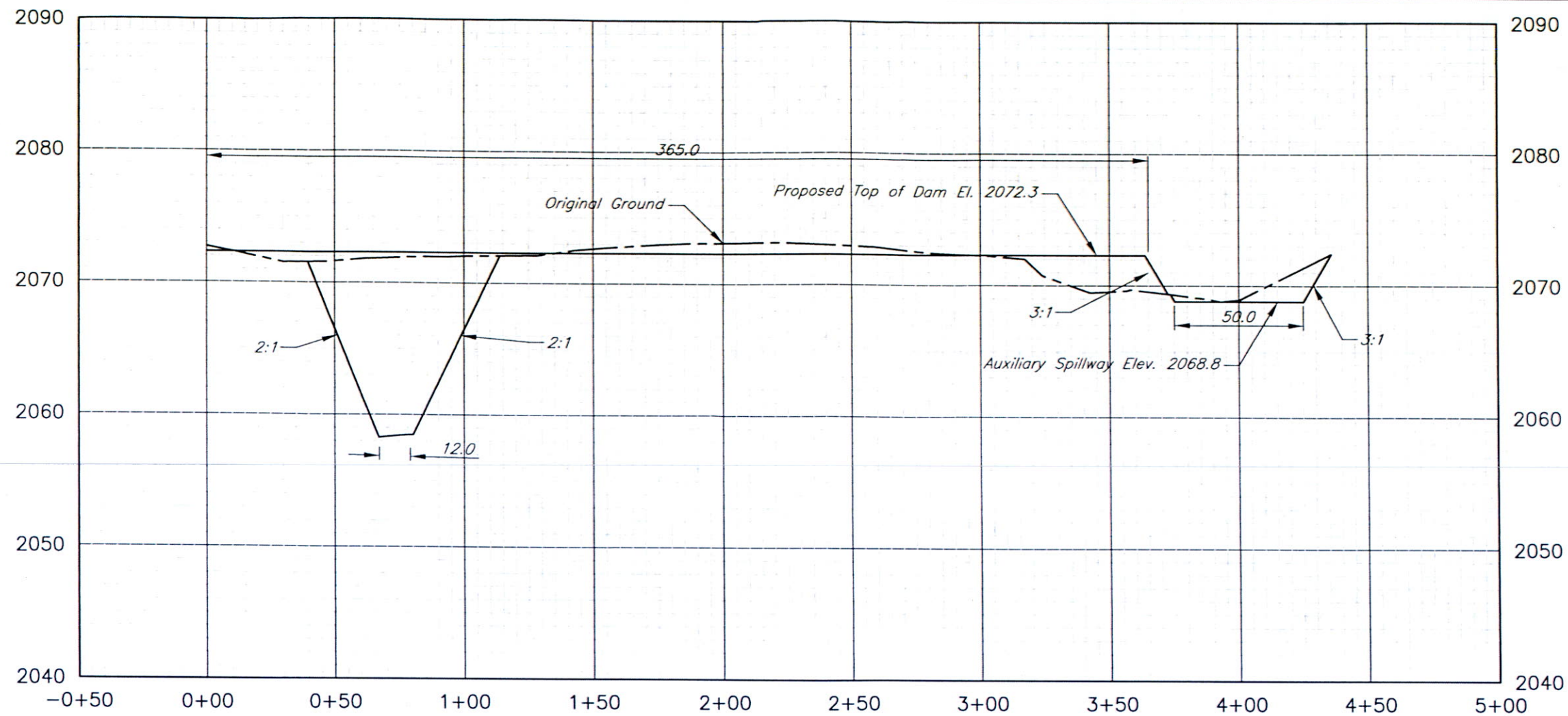
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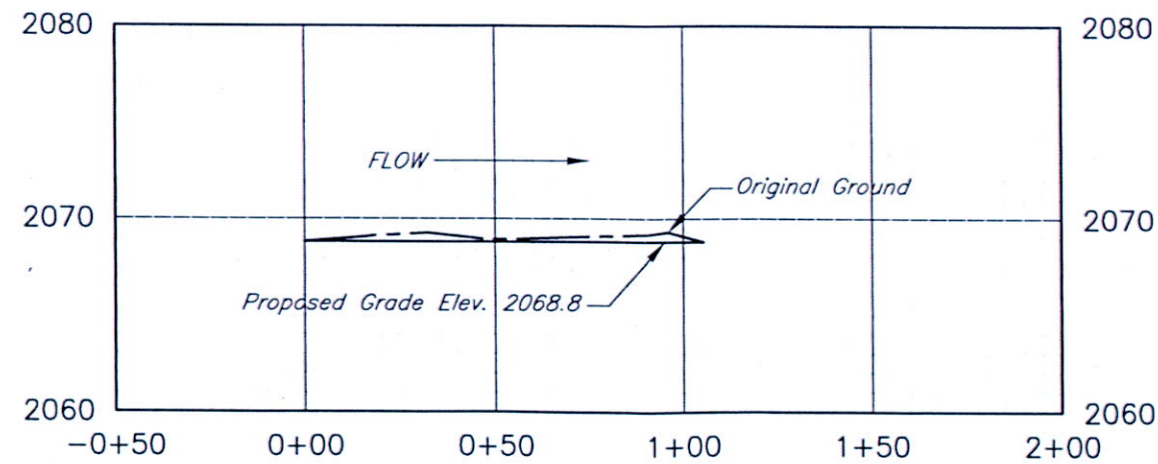
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Sheet 4 of 9

NW 1/4, Sec 33, T3N, R 25E
Stanley County, South Dakota

Designed Angela Roman 1/12/18
Drawn Angela Roman 1/17/18
Checked *AB* 1/18/18
Approved *Angela Roman* 1/19/18



CL Dam PROFILE



CL Auxiliary PROFILE

Horizontal Scale 1" = 50' Vertical Scale 1" = 10'
 PROFILE OF DAM AND AUXILIARY SPILLWAY AND
 CROSS-SECTION OF AUXILIARY SPILLWAY

AARON & ANGELA DOOLITTLE
378 POND

PROFILES AND CROSS-SECTIONS OF DAM AND AUXILIARY SPILLWAY

NW 1/4, Sec 33, T3N, R 25E

Stanley County, South Dakota

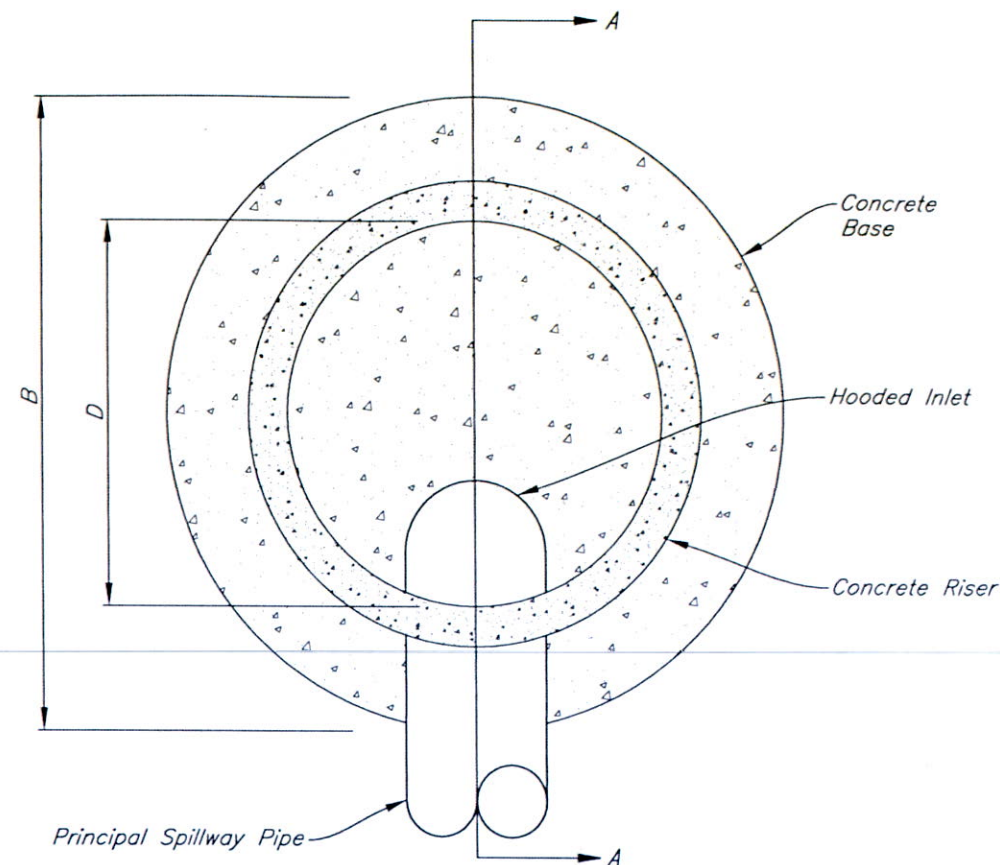
Designed	Angela Roman	1/12/18
Drawn	Angela Roman	1/17/18
Checked	Angela Roman	1/18/18
Approved	Angela Roman	1/18/18

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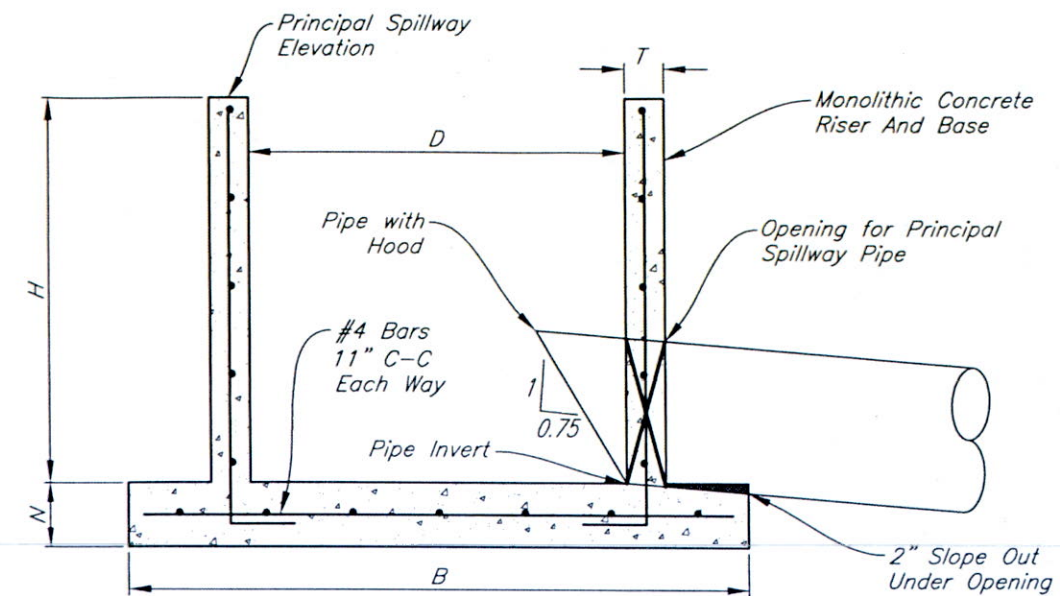


PLAN VIEW PRECAST RISER AND BASE

CONSTRUCTION NOTES

1. The riser and base is precast reinforced concrete and is manufactured according to ASTM C478 Standard Specification For Precast Reinforced Concrete Manhole Sections.
2. Provide a watertight joint between the precast concrete riser and the principal spillway pipe barrel.
3. Contact NRCS prior to installation for other options for the construction of the riser if a precast monolithic riser and base is not used.

Selected Riser



SECTION VIEW A-A

GUIDE TABLE FOR PRECAST RISER AND BASE DIMENSIONS

(D) RISER DIAMETER	(H) RISER HEIGHT	(T) WALL THICKNESS	(B) BASE DIAMETER	(N) BASE THICKNESS	ESTIMATED WEIGHT	DIA. PIPE BARREL
30"	4'	3.5"	51"	6"	2,600 LBS	10" to 18"
30"	4.5'	3.5"	51"	6"	2,790 LBS	10" to 18"
30"	5'	3.5"	51"	6"	2,980 LBS	10" to 18"
36"	4'	4"	64"	6"	3,770 LBS	10" to 24"
36"	4.5'	4"	64"	6"	4,030 LBS	10" to 24"
36"	5'	4"	64"	6"	4,290 LBS	10" to 24"
36"	5.5'	4"	64"	6"	4,550 LBS	10" to 24"
36"	6'	4"	64"	6"	4,815 LBS	10" to 24"
48"	4'	5"	79"	8"	6,870 LBS	10" to 30"
48"	4.5'	5"	79"	8"	7,300 LBS	10" to 36"
48"	5'	5"	79"	8"	7,740 LBS	10" to 36"
48"	5.5'	5"	79"	8"	8,170 LBS	10" to 36"
48"	6'	5"	79"	8"	8,600 LBS	10" to 36"

PRECAST CONCRETE RISER AND BASE
WITH HOODED INLET
REV. 1/2012

Date 1/12/18
 Designed Angela Roman
 Drawn Angela Roman
 Checked 1/17/18
 Approved 1/18/18

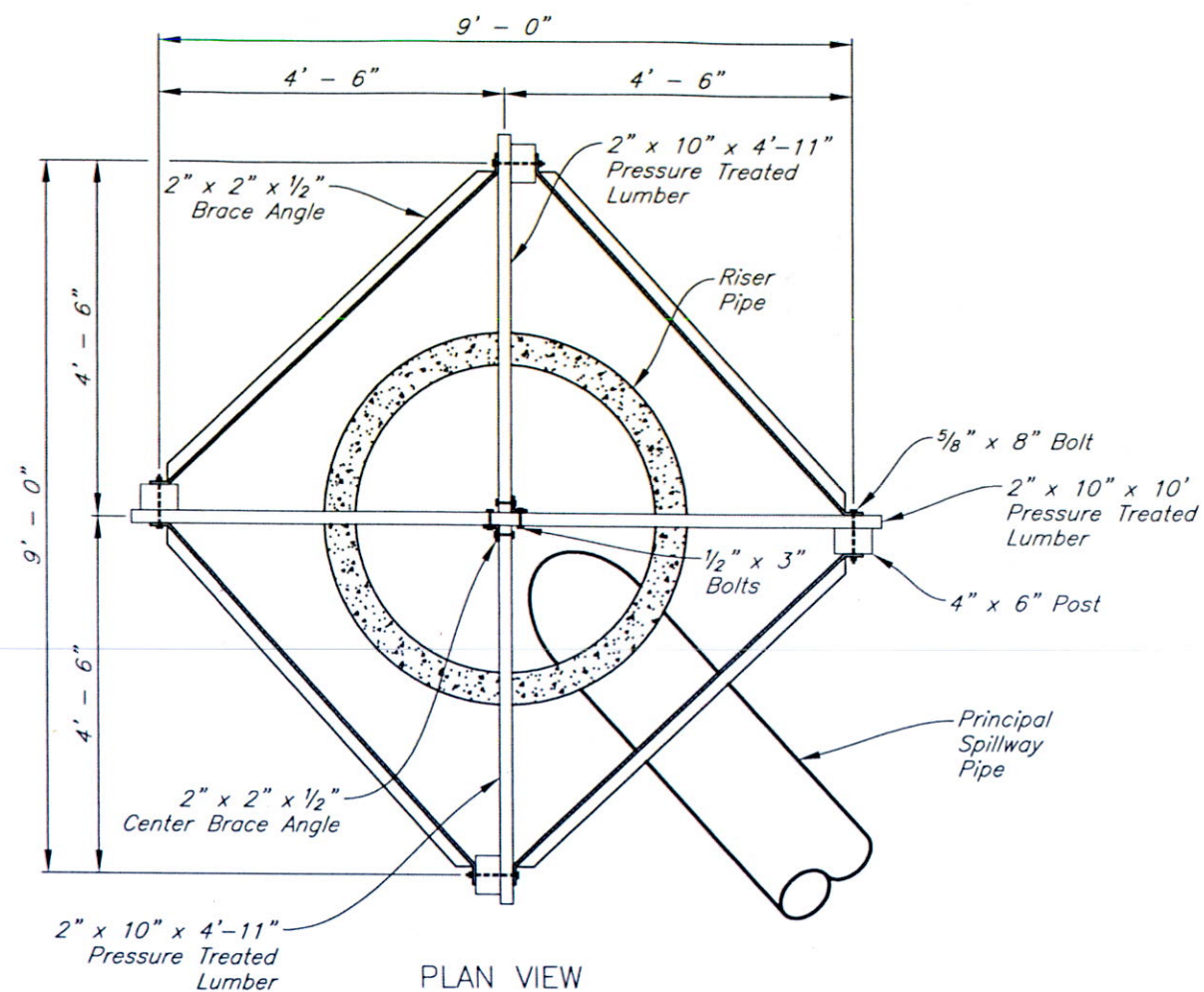
AARON & ANGELA DOOLITTLE
 378 POND
 PRECAST CONCRETE RISER AND BASE WITH HOODED INLET

United States
 Department of
 Agriculture
 USDA
 Natural Resources
 Conservation Service

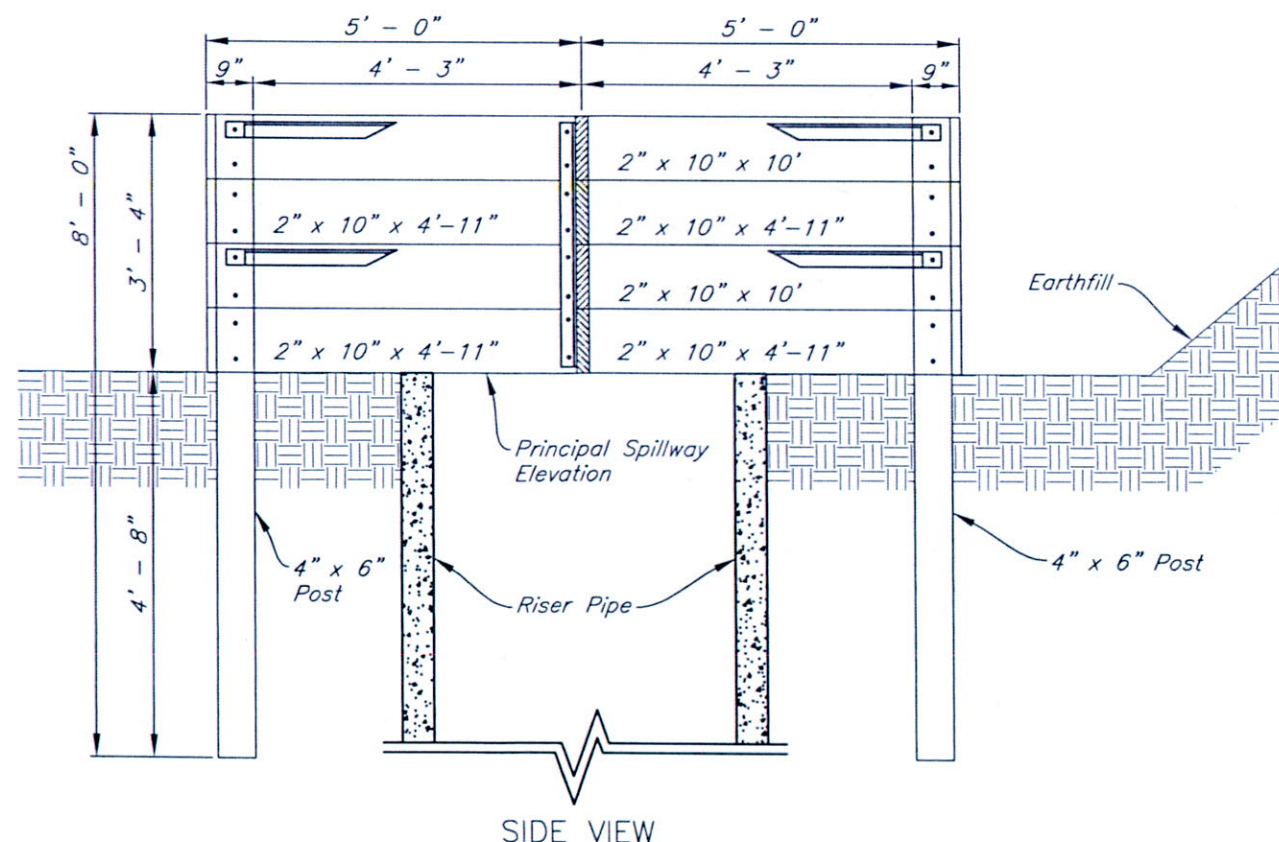
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Stanley County, South Dakota

NW 1/4, Sec 33, T3N, R 25E



PLAN VIEW

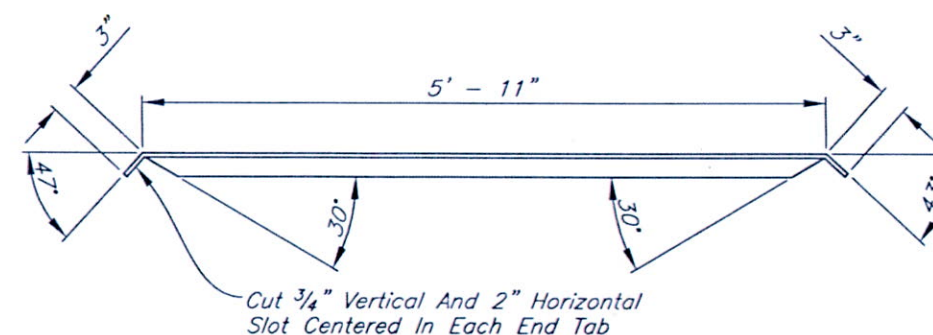


SIDE VIEW

TABLE OF QUANTITIES			
ITEM	LENGTH OR SIZE	UNIT	QUANTITY
4" X 6" Pressure Treated Post	8 Ft	Each	4
2" X 10" Pressure Treated Lumber	10 Ft	Each	4
2" X 10" Pressure Treated Lumber	4' - 11"	Each	8
2" X 2" X 1/4" Steel Angle	6' - 5"	Each	8
2" X 2" X 1/4" Steel Angle	3' - 2"	Each	2
Steel Bolt (with nut and 2 washers)	5/8" X 8"	Sets	32
Steel Bolt (with nut and 2 washers)	1/2" X 3"	Sets	32

CONSTRUCTION NOTES

1. Bolt 4" x 6" posts and 2" x 10" lumber together using two 5/8" x 8" bolts. Do not place bolts closer than 1 1/2" from edge of board.
2. For center brace angles drill eight, 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 of 2" x 10" board and to top bolt on next to bottom board.
4. All nuts, bolts, and washers shall be galvanized.



PLAN VIEW OF BRACE ANGLE

TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"
JOB PLAN NO. 6.4 REV. 1/2012

Date: 1/12/18
Designed: Angela Roman
Drawn: Angela Roman
Checked: B.C.
Approved: Angela Roman

AARON & ANGELA DOOLITTLE
378 POND

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

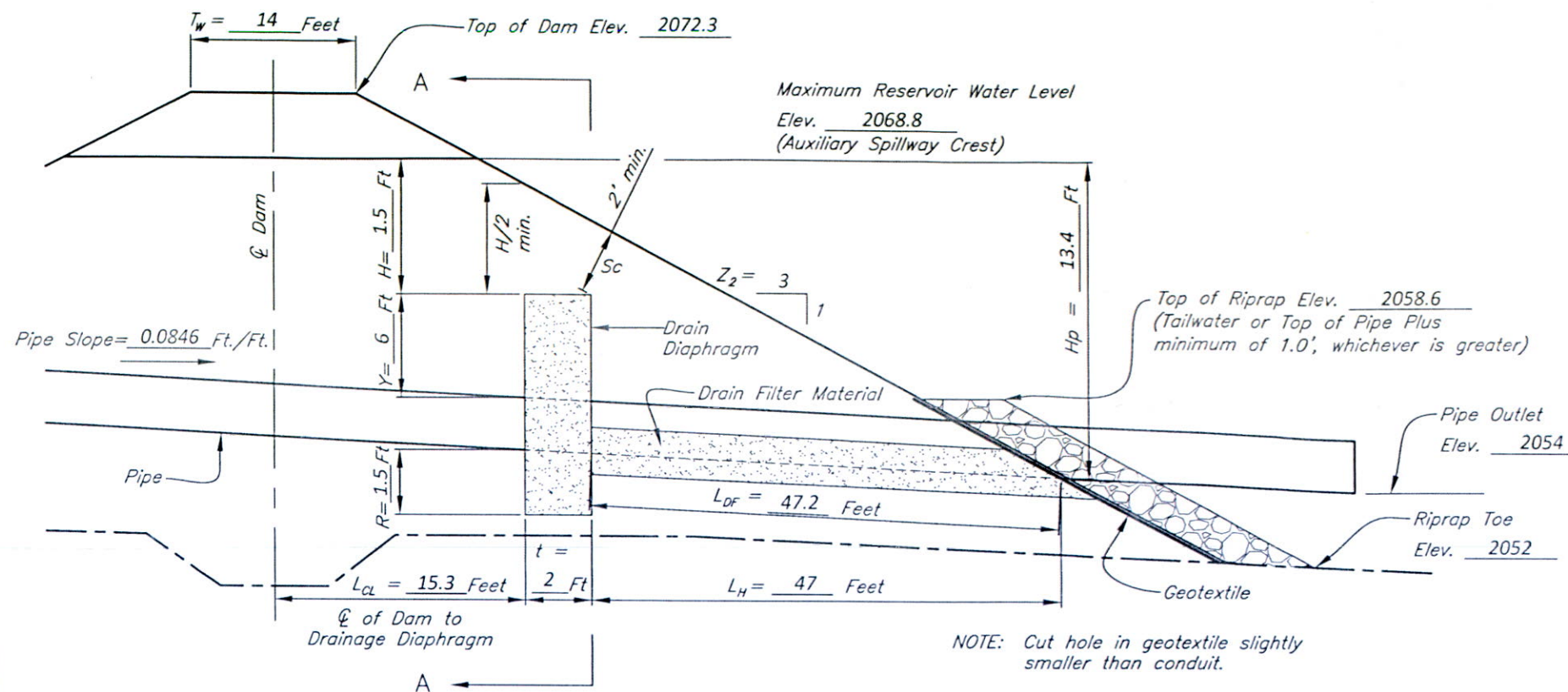
NW 1/4, Sec 33, T3N, R 25E

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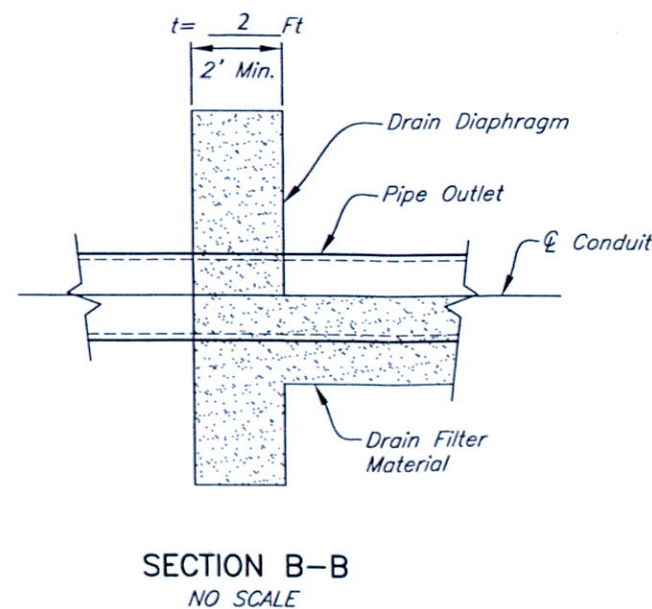
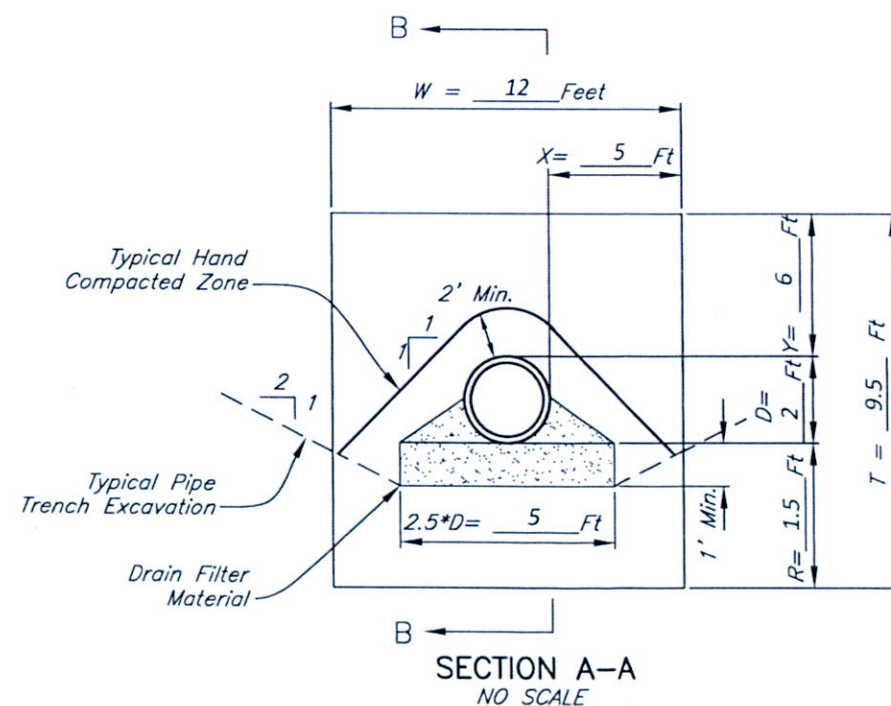
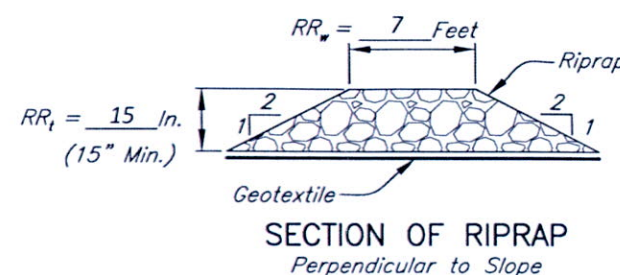
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PROFILE ALONG ϕ OF CONDUIT
NO SCALE



SUMMARY OF SAND DRAINFILL DIMENSIONS		
$W =$	12 Feet	(Total Width of Drain Diaphragm)
$T =$	9.5 Feet	(Total Height of Drain Diaphragm)
$t =$	2 Feet	(Thickness of Single Filter)
$L_{df} =$	47.2 Feet	(Length of Sand Along Pipe)

SUMMARY OF GEOTEXTILE DIMENSIONS		
$G_w =$	12 Feet	(Total Width of Geotextile)
$G_L =$	20.9 Feet	(Total Length of Geotextile)

SUMMARY OF ROCK RIPRAP DIMENSIONS		
$RR_t =$	15 Inches	(Total Thickness of Rock Riprap)
$RR_w =$	7 Feet	(Total Width of Rock Riprap)

ESTIMATED TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
Sand Drain Filter Material	Cu. Yds.	20.6
Geotextile	Sq. Yds.	27.9
Rock Riprap	Cu. Yds.	9.2

DRAIN FILTER GRADATION

SIEVE SIZE	PERCENT PASSING
3/8	100
4	95-100
8	80-100
16	50-85
30	25-60
50	2-30
100	0-10

ASTM, C-33
FINE CONCRETE
AGGREGATE GRADATION

RIPRAP GRADATION

PERCENT SMALLER	WEIGHT RANGE (LBS.)	SIZE RANGE (IN.)
100	50 lb.	10"
50-85	30 lb.	7"
15-50	10 lb.	5"
0-15	3 lb.	3"

CONSTRUCTION NOTES

- The Drainage Diaphragm and envelope will be installed by placing Drain Filter Material in maximum 15 inch thick uncompacted lifts. Each lift will be saturated uniformly with approximately 1.2 gallons of water per cubic foot of loose Drain filter Material prior to compaction. Each lift will then be compacted by a minimum of two passes of a hand-directed vibratory compactor over the entire lift surface. No compaction of the drain envelope above the pipe invert will be required.
- The maximum height of drop of the rock riprap onto the Geotextile in the pipe outlet area shall be 3 feet. Rock riprap shall be placed without damaging the underlying geotextile.

MATERIAL NOTE

- The geotextile shall conform to the Class 1 requirements in Table 2 for Nonwoven Geotextiles in Material Specification SD-592.

DRAINAGE DIAPHRAGM DETAILS
JOB PLAN 3.8 REV. 02/2017

Date 1/17/2018
Designed Angela Roman
Drawn A. Roman
Checked A. Roman
Approved A. Roman

NAME: Aaron & Angela Doolittle

378 - POND
Drainage Diaphragm Detail

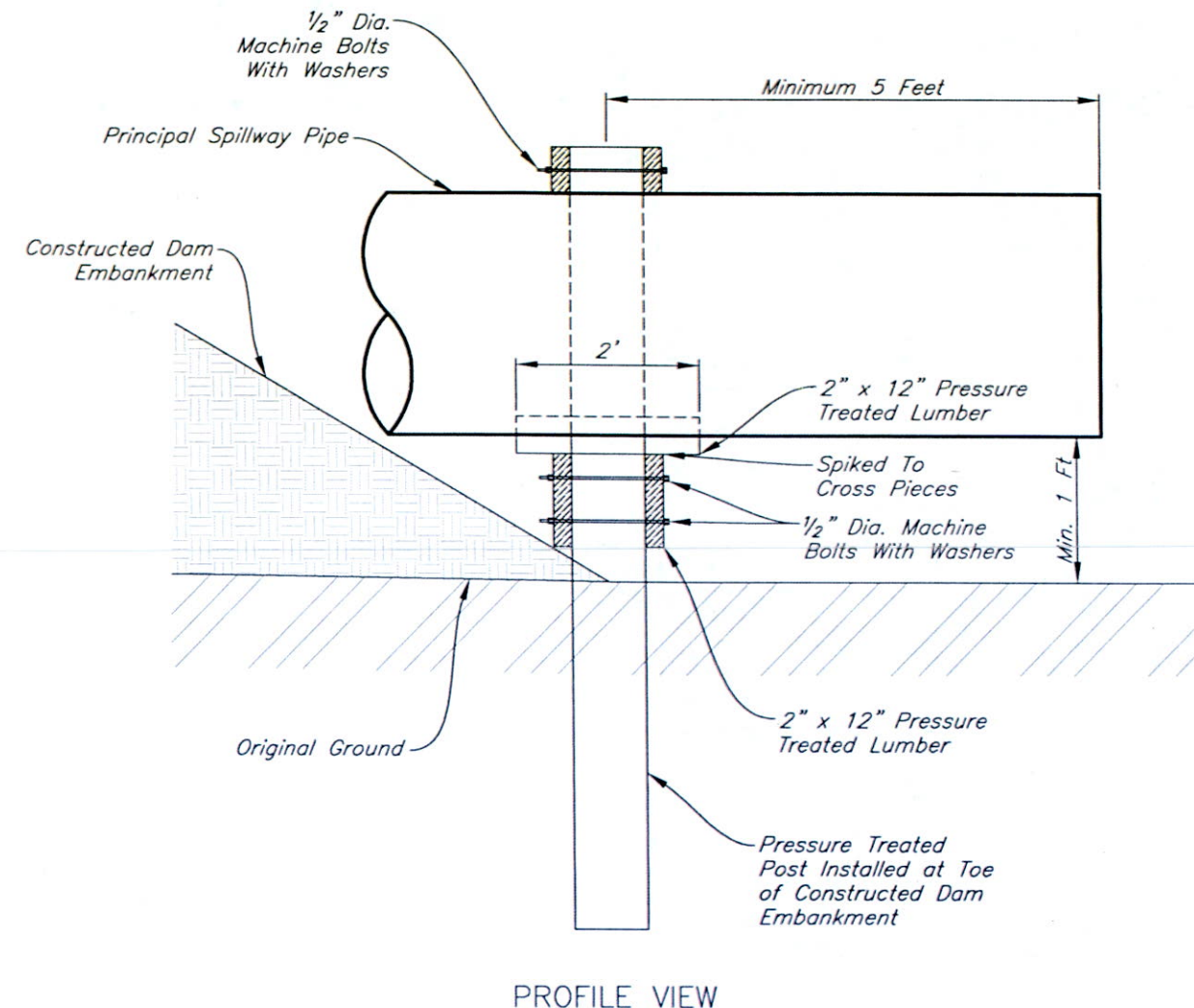
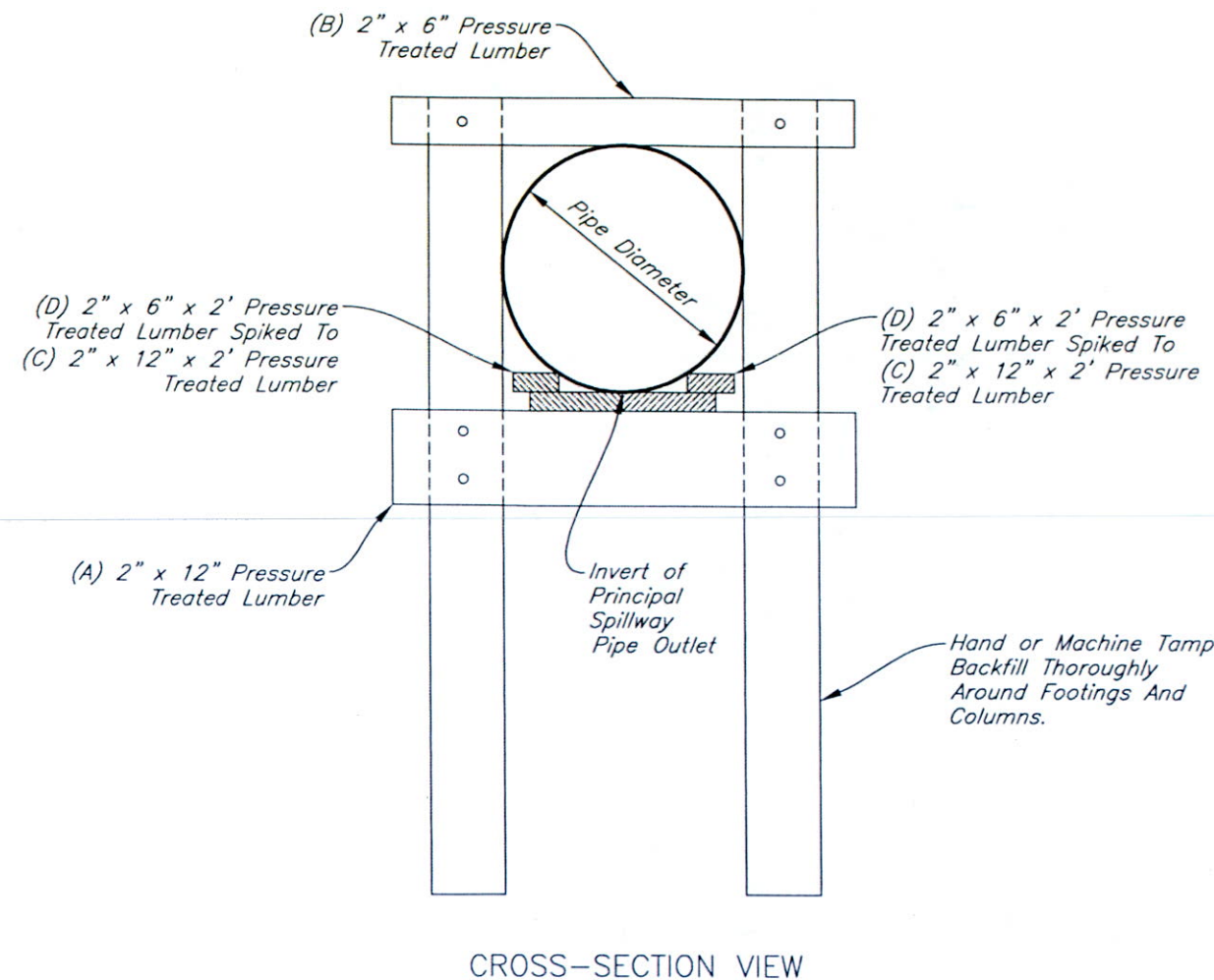
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NW 1/4, Sect. 33, T. 3N, R. 25E Stanley County, South Dakota



LENGTHS REQUIRED FOR DIFFERENT PIPE DIAMETERS						
ITEM	MATERIAL SIZES BASED ON PIPE DIAMETER				UNIT	QUANTITY
	12" TO 18"	21" TO 24"	30" TO 36"	42" TO 48"		
8" Dia. Pressure Treated Post	8 Ft	--	--	--	Each	2
10" Dia. Pressure Treated Post	--	10 Ft	10 Ft	12 Ft		
(A) 2" X 12" Pressure Treated Lumber	4 Ft	4 Ft	5 Ft	6 Ft	Each	2
(B) 2" X 6" Pressure Treated Lumber	4 Ft	4 Ft	5 Ft	6 Ft	Each	2
(C) 2" X 12" Pressure Treated Lumber	2 Ft	2 Ft	2 Ft	2 Ft	Each	2
(D) 2" X 6" Pressure Treated Lumber	2 Ft	2 Ft	2 Ft	2 Ft	Each	2
1/2" Dia. Machine Bolts With Nuts	12 In.	14 In.	14 In.	14 In.	Each	6
1/2" Dia. Washers					Each	12
Spike Nails					Each	20

CONSTRUCTION NOTES

1. All nuts, bolts, and washers shall be galvanized.
2. If PVC pipe is used, protect the portions of pipe that will be permanently exposed to ultraviolet light from sunlight by priming the pipe with PVC solvent and painting with two coats high quality exterior latex paint.
3. Hand or machine tamp backfill thoroughly around footings and columns.

TIMBER PIPE SUPPORT
JOB PLAN NO. 4.0 REV. 1/2012

Date 1/12/18
Designed Angela Roman 1/12/18
Drawn Angela Roman 1/17/18
Checked D.B.E. 1/18/18
Approved Angela Roman 1/19/18

AARON & ANGELA DOOLITTLE
378 POND
TIMBER PIPE SUPPORT

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Sheet 9 of 9

NW 1/4, Sec 33, T3N, R 25E Stanley County, South Dakota

StreamStats Report

Region ID:

Workspace ID:

Clicked Point (Latitude, Longitude):

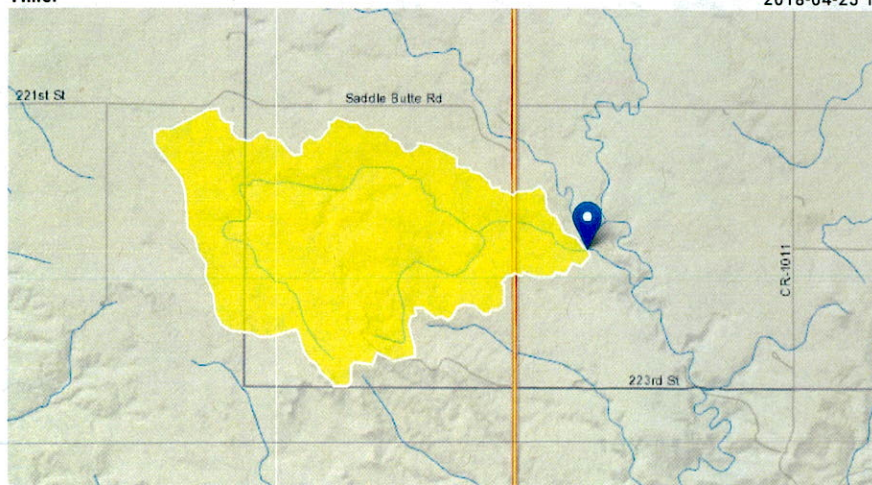
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2018-04-25 11:27:09 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
CONTDA	Area that contributes flow to a point on a stream	3.43	square miles
		2195	Ac

Peak-Flow Statistics Parameters [Subregion C]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CONTDA	Contributing Drainage Area	3.43	square miles	0.06	904

Peak-Flow Statistics Flow Report [Subregion C]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	Plu	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	50.4	ft ³ /s	11.7	218	108	108	1.8
5 Year Peak Flood	148	ft ³ /s	53.5	408	67	67	4.8
10 Year Peak Flood	255	ft ³ /s	105	621	58	58	8.3
25 Year Peak Flood	419	ft ³ /s	183	960	53	53	12
50 Year Peak Flood	577	ft ³ /s	254	1310	53	53	14.9
100 Year Peak Flood	761	ft ³ /s	326	1780	55	55	16.5
500 Year Peak Flood	1320	ft ³ /s	490	3540	65	65	16.6

Peak-Flow Statistics Citations

Sando, Steven K., 1998, A Method for Estimating Magnitude and Frequency of Floods in South Dakota: U.S. Geological Survey Water-Resources Investigations Report 98-4055, 48 p. (<http://pubs.water.usgs.gov/wri98-4055/>)

United States Department of Agriculture



Natural Resources Conservation Service
Field Support Office
1717 North Lincoln Avenue Suite# 104
Pierre, SD 57501

RECEIVED

MAR 27 2018

WATER RIGHTS
PROGRAM

Telephone: (605) 301-3422

March 27, 2018

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

Mr. Tim Schaal,

Attached are plans, specifications and design data for a dam in Stanley County for Aaron and Angela Doolittle. With 78.9 AcFt of storage at the principal spillway elevation, there is a need for the attached water rights application. This dam was originally built in 1959, and had a location notice (#12905) which indicated 31 AcFt of storage. I believe this may have been in error, as the existing pool area is being maintained. A corroded CMP will be removed and replaced with a 24" PVC pipe and concrete riser. The auxiliary spillway will be widened to meet NRCS specs and some minor repair of the outlet of the spillway will be completed. All elevations of the principal spillway, auxiliary spillway, and the top of dam will remain the same.

Please contact me with any questions.

Thank You,

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

ANGELA ROMAN
USDA-NRCS
605-301-3422

Attachments

Water Permit Application No. 2787-2
Aaron & Angela Doolittle

Top of Dam Elev. - 2072.3
Emb Spillway Elev. - 2068.8
P. Spillway Elev. - 2067.0
D/S Emb Toe Elev. - 2052.0

Cat. 3 - Low Hazard Dam

Ht. = 20.3 ft

Normal Storage Capacity - 78.9 Ac-Ft
Int. Storage Capacity - 102.3
Max. Storage Capacity - 166.4

Int. Capacity x Eff. Ht. = $102.3 \times 12.7 = 1300 < 3000 \therefore$ 25 year
Min. Spillway Design

From USGS WRI 98-4055 "Tech for Est Peak Flows ... in SD"
Region C $DA = 1961 A_c = 3.06 \text{ mi}^2$

$$Q_{es} = 207 C A^{.573}$$

$$= 207 (3.06)^{.573}$$

$$= 207 (1.90)$$

$$= \underline{392 \text{ cfs}}$$

$$Q_{100} = 379 C A^{.566}$$

$$= 379 (3.06)^{.566}$$

$$= 379 (1.88)$$

$$= \underline{714 \text{ cfs}}$$

Secondary Spillway Capacity

$$Q = C L H^{3/2}$$

$$C = 2.6$$

$$L = 50$$

$$H = 3.5$$

$$= (2.6)(50)(3.5)^{1.5}$$

$$= \underline{851 \text{ cfs}}$$

Section 74:02:08:09

1. Topo Map - OK
2. Dam Axis Profile - OK
3. Dam Max X-Section - OK
4. Outlet Details - OK
5. Area Capacity - OK
6. Spillway Rating - OK
7. Spillway Details - OK
8. Spans - Sub NRCS - OK
9. EPP - Cat 3 N/A - OK

NRCS Annual Flood

$DA = 1961 \text{ CN} = 72 \text{ ISO} = 2$

$$80\% \text{ chance} = 0.09$$

$$0.09 \times 1961/2 = \underline{14.7 \text{ Ac-Ft}}$$

$$50\% \text{ chance} = 0.25$$

$$0.25 \times 1961/2 = \underline{41 \text{ Ac-Ft}}$$

$$10\% \text{ chance} = 1.4$$

$$1.4 \times 1961/2 = \underline{229 \text{ Ac-Ft}}$$



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

May 11, 2018

Aaron & Angela Doolittle
PO Box 145
Midland SD 57552

Dear Mr. & Mrs. Doolittle:

We have reviewed the plans and specifications for your dam project located NE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 33-T3N-R25E, in Stanley County. The plans and specifications for the reconstruction of the dam are approved. Approval of the plans and specifications does not authorize reconstruction of the dam. The reconstruction of the dam may not begin until Water Permit No. 2787-2 is 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 dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

The Doolittle Dam will be classified as a small size Category 3, Low Hazard dam with a dam height of 20.3 feet and a normal storage capacity of 78.9 acre-feet and a maximum storage capacity of 166.4 acre-feet.

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

Sincerely,

Timothy G. Schaal, P.E.
Engineer IV
for Jeanne Goodman, Chief Engineer
Water Rights Program
(605) 773-3352

c: Angela Roman, NRCS, Pierre

Schlaak, Karen

From: Schlaak, Karen
Sent: Tuesday, May 15, 2018 7:34 AM
To: 'angela.roman@sd.usda.gov'
Subject: Water Permit Application No. 2787-2, Aaron & Angela Doolittle
Attachments: DOC051418-05142018163946.pdf

Angela,

Attached is a copy of the letters, public notice, report and recommendation for Water Permit Application No. 2787-2 filed by Aaron & Angela Doolittle. If you have questions, please contact this office.

Karen Schlaak
SD DENR, Water Rights Program
(605) 773-3352



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 2787-2, Aaron & Angela Doolittle**

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. 2787-2, Aaron and Angela Doolittle, PO Box 145, Midland SD 57552.

The Chief Engineer is recommending APPROVAL of Application No. 2787-2 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. 2787-2 authorizes a dam with a storage capacity of 78.9 acre feet of water annually to the primary 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.

A handwritten signature in black ink that reads "Jeanne Goodman". The signature is written in a cursive style with a large, looped initial "J".

Jeanne Goodman, Chief Engineer
May 14, 2018

REPORT ON
WATER PERMIT APPLICATION No. 2787-2
Aaron & Angela Doolittle
May 1, 2018

Water Permit Application No. 2787-2 has been filed by Aaron & Angela Doolittle to impound 78.9 acre-feet of water from runoff by reconstructing an existing dam located in NE ¼ NW ¼ of Section 33-T3N-R25E, in Stanley County. The dam was originally built in 1959, and had Location Notice No. 12905 filed for 31 acre-feet of water. The application, if approved, appropriates sufficient runoff to fill the dam annually. The water will be used for livestock water purposes.

Discussion:

The dam will be classified as a small size, Category 3, Low Hazard dam. The dam has been designed by the Natural Resources Conservation Service (NRCS). The plans and specifications have been reviewed and will be approved; however, reconstruction of the dam cannot begin until Water Permit Application No. 2787-2 is approved.

The dam will be 20.3 feet high with a normal storage capacity of 78.9 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 166.4 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 1961 acres or 3.06 square miles. The dam will have a 24 inch diameter PVC conduit and a 4 foot diameter concrete riser with 5.3 feet of freeboard as the primary spillway; and a 50 foot wide earth secondary spillway with 3.2 feet of available freeboard. A 25-year frequency event produces a peak runoff of approximately 392 cfs and a 100-year frequency event produces a peak runoff of approximately 714 cfs. The earthcut secondary spillway will have a capacity of approximately 850 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 14.7 acre-feet. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 41 acre-feet; and the annual yield with a 10 percent chance of occurrence, or 1 out of 10 years, is expected to be 229 acre-feet.

The Doolittle Dam will be located in the NE ¼ NW ¼ of Section 33-T3N-R25E on an unnamed tributary to Little Prairie Dog Creek, about 7 miles upstream of the confluence of Little Prairie Dog Creek and the Bad River. There are no existing Water Rights/Permits filed on the unnamed tributary or Little Prairie Dog Creek between the Doolittle Dam and the Bad River.

Conclusions:

1. Water Permit Application No. 2787-2 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. 2787-2.


Timothy G. Schaal, P.E.
Engineer IV

Form 8

RECEIVED
JUN 11 2018
WATER RIGHTS
PROGRAM

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County of Hughes) SS

I, Marylinn 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 date:

5-24-18

Cost of Printing \$29.68

Marylinn Baker
(Signature)

Business Office Asst.
(Title)

6-5-18
(Date Signed)

SNAXLP 18354
1st 5/24
NOTICE OF
APPLICATION NO. 2787-2
to Appropriate Water
Notice is given that Aaron
& Angela Doolittle, PO Box
145, Midland, SD 57552
has filed an application for
a water permit to impound
78.8 acre-feet of water from
runoff by reconstructing a
dam located in the NE 1/4
NW 1/4 Section 33 with wa-
ter impounded in the NE
1/4 NW 1/4 Section 33 and
S 1/2 SW 1/4 Section 28;
all in T3N-R25E. This appli-
cation requests impound-
ment of sufficient water to
the primary outlet elevation.
The water is for livestock
water and is located ap-
proximately 7 miles north-
west of Pierre, SD.

600 Public Notice
recommends APPROVAL
of Application No. 2787-2
with qualifications because:
1) unappropriated water is
available, 2) existing rights
will not be unlawfully im-
paired, 3) it is a beneficial
use of water, and 4) it is in
the public interest. The
Chief Engineer's recom-
mendation with qualifica-
tions, the application and
staff report are available at
<http://dnr.sd.gov/wrpubs> or
contact Eric Gronlund for
this information, or other in-
formation, at the Water
Rights Program address
provided below.
Any person interested in
opposing or supporting this
application or recommenda-
tion must file a written peti-
tion with BOTH the appli-
cant and Chief Engineer.
The applicant must file a
petition if contesting the
Chief Engineer's recom-
mendation. The Chief Engi-
neer's address is "Water
Rights Program, Foss
Building, 523 E Capitol, Pi-
erre, SD 57501 (805
773-3352)" and the appli-
cant's mailing address is
given above. A petition filed
by either an interested per-
son or the applicant must
be filed by June 4, 2018.
The petition may be infor-
mal, but must include a
statement describing the
petitioner's interest in the
application, the petitioner's
reasons for opposing or
supporting the application,
and the signature and mail-
ing address of the petitioner
or the petitioner's legal
counsel, if legal counsel is
obtained.
If the applicant does not
contest the recommenda-
tion of the Chief Engineer
and no petition to oppose
the application is received,
the Chief Engineer shall act
on the application pursuant
to the recommendation with
no hearing held before the
Water Management Board.
If a petition opposing the
application or contesting
the recommendation is
filed, then a hearing will be
scheduled and the Water
Management Board will
consider this application.
Notice of the hearing will be
given to the applicant and
any person filing a petition.

Steven M. Pimer,
Secretary,
Department of Environment
and Natural Resources

Published once at the total
approximate cost of \$29.68.

Schlaak, Karen

From: Schlaak, Karen
Sent: Monday, May 14, 2018 4:43 PM
To: legals@capjournal.com
Subject: 2787-2, Aaron & Angela Doolittle
Attachments: 2787-2public.short.docx; FORM8.FRM.doc

Attached is a notice to be published on May 24, 2018.

Aaron and Angela Doolittle, PO Box 145, Midland SD 57552 (605 843-2521) have been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, 523 E Capitol, Pierre-SD-57501.

Let me know if you have questions. Please acknowledge receipt of this email.

Karen Schlaak

SD DENR, Water Rights Program
(605) 773-3352





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

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

May 15, 2018

Aaron & Angela Doolittle
PO Box 145
Midland SD 57552

Dear Mr. & Mrs. Doolittle:

Water Permit Application No. 2787-2 for livestock water use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to 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 recommendation of the Chief Engineer and report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper to authorize publication of your Notice and to arrange for payment. Early contact with the paper can eliminate delays. Upon receiving authorization from you, the publisher has been instructed to publish your notice. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

enclosures

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

NOTICE OF APPLICATION NO. 2787-2 to Appropriate Water

Notice is given that Aaron & Angela Doolittle, PO Box 145, Midland SD 57552 has filed an application for a water permit to impound 78.9 acre-feet of water from runoff by reconstructing a dam located in the NE 1/4 NW 1/4 Section 33 with water impounded in the NE 1/4 NW 1/4 Section 33 and S 1/2 SW 1/4 Section 28; all in T3N-R25E. This application requests impoundment of sufficient water to the primary outlet elevation. The water is for livestock water and is located approximately 7 miles northeast of Midland SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2787-2 with qualifications 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. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 4, 2018.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

If the applicant does not contest the recommendation of the Chief Engineer and no petition to oppose the application is received, the Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition.

Steven M. Pirner, Secretary, Department of Environment and Natural Resources. Published once at the total approximate cost of_____.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

JUN 20 2018

Aaron & Angela Doolittle
PO Box 145
Midland SD 57552

Dear Mr. & Mrs. Doolittle:

Enclosed is Water Permit No. 2787-2 authorizing reconstruction of the dam 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.

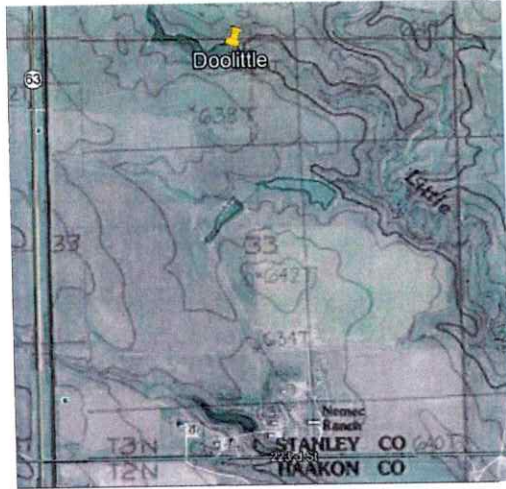
An informational sheet *Common Water Right Questions?* is also enclosed. This sheet is intended to answer some of the questions associated with obtaining and keeping a water right.

Sincerely,

Jeanne Goodman, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

2787-2



NW 1/4 Section 33, T3N, R25E
Stanley County, South Dakota

LOCATION MAP

Aaron & Angela Doolittle
PO Box 145
Midland, SD 57552
605-843-2521

Asbuilt survey completed
on October 17, 2018 by A.
Roman. Seeding not
completed at time of
survey. Practice Payment
to be made on 2640
DialnFlt (24"x110 LF)

GENERAL NOTES

1. If cultural resources are discovered during construction, discontinue construction and notify the local Natural Resources Conservation Service office.
2. The landowner is responsible for complying with all federal, state, and local laws.

CONSTRUCTION NOTES

1. Clear and grub the entire area within the work limits.
2. All fill material must not contain frozen material, sod, roots, or other perishable material, or rock larger than eight inches in diameter as described in SD Construction Specification SD-75.
3. Any shale, gravel, or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
4. Six inches topsoil will be incorporated into the earthfill to meet the neat lines shown on the typical section.
5. All areas top-dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD-28.
6. 110 LF of CMP to be removed and disposed of, includes 3' CMP riser. Face of dam will be repaired, auxiliary spillway will be widened. New pipe with concrete riser to be installed.

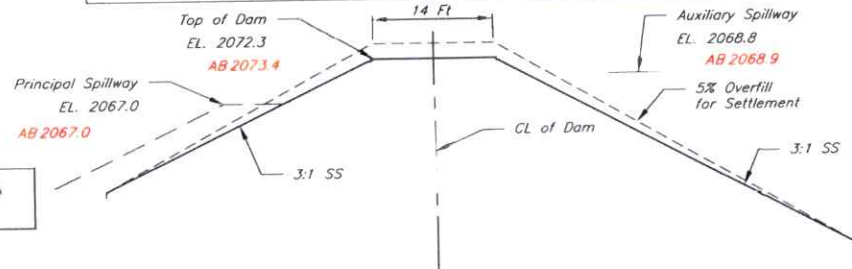
NO EXCAVATOR MAY BEGIN ANY EXCAVATION WITHOUT FIRST NOTIFYING THE ONE-CALL NOTIFICATION CENTER OF THE PROPOSED EXCAVATION AT 1-800-781-7474.

NRCS HAZARD CLASS A
NRCS JOB CLASS IV

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

- SD-4 Stripping
 - SD-5 Excavation
 - SD-7S Earthfill - Class S
 - SD-8 Rock Riprap And Bedding
 - SD-10 Salvaging And Spreading Topsoil
 - SD-12A Concrete (Class 3500)
 - SD-13 Steel Reinforcement
 - SD-14 Wood And Steel Structures
 - SD-28 Seeding
 - SD-55 Plastic Pipe
 - SD-592 Geotextile
- For A Full Text Version See
http://www.sd.usda.gov/technical/SD_Engineering.html

TABLE OF QUANTITIES			
ITEM	UNIT	QUANTITY	AS-BUILT
Earthfill Class S - Embankment	Cu. Yd.	193	
Earthfill Class S - replacing pipe	Cu. Yd.	1026	
Earthfill Class S - Stripping	Cu. Yd.	96	
Earthfill Class S- 5%		66	
Total Earthfill	Cu. Yd.	1381	1381
Excavation - removal of existing pipe and riser	Cu. Yd.	1122	1122
Topsoil Auxiliary Spillway	Cu. Yd.	152	231
Excavation - Auxiliary Spillway	Cu. Yd.	252	582
Seeding (Earthfill and Auxiliary Spillway)	Acre	.6	
Principal Spillway Pipe			
24" Dia. (PS 115) ASTM F679 PVC Pipe	Lin. Ft.	110.0	112.5
48" Dia. 4' Tall Riser and Base with Trash Rack and Baffle	Each	1	1
	Each	1	1
Drainage Diaphragm	Each	1	1
Timber Pipe Support	Each	1	1



TYPICAL CROSS SECTION OF DAM

INDEX OF DRAWINGS

1. Cover Sheet
2. Plan View and Design Data
3. Detail Plan View
4. Profile of Dam and Auxiliary Spillway and Cross-Section of Auxiliary Spillway
5. Profile of Principal Spillway and Maximum Cross-Section of Dam
6. Concrete Riser Detail
7. Trash Rack and Baffle Detail
8. Drainage Diaphragm Detail
9. Timber Pipe Support Detail

STATEMENT OF COMPLIANCE

Construction (was) (was not) completed in accordance with approved construction plans and specifications.

JAA Date

POND WITH PRINCIPAL SPILLWAY PIPE
JOB PLAN 1.0P REV. 4/2016

2787-2

Designed: Angela Roman 1/12/18
Drawn: Angela Roman 1/17/18
Checked: [Signature] 1/18/18
Approved: [Signature] 1/19/18

AARON & ANGELA DOOLITTLE
378 POND
COVER SHEET

Stanley County, South Dakota
NW 1/4, Sec. 33, T3N, R. 25E

United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

File No.
Doolittle.dwg
Drawing No.
1/17/18 5:15 PM
Sheet 1 of 9

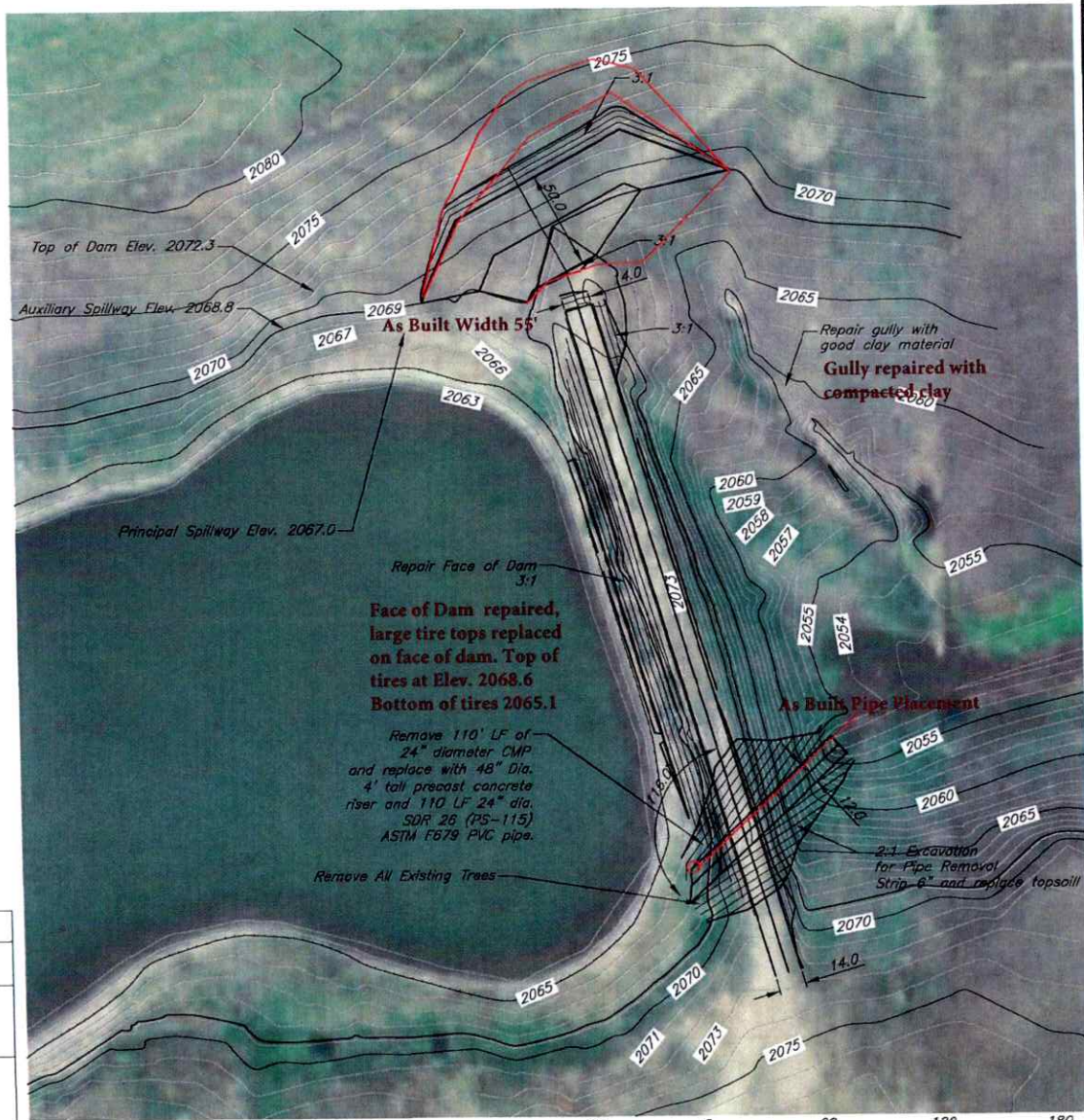
HYDRAULIC DATA		
Drainage Area	1961	Acres
Annual Runoff Yield (50% Chance)	40.9	Ac. Ft
Time of Concentration	4.29	Hours
Runoff Curve Number	72	
Principal Spillway, 2 Year - 24 Hour Rainfall	2.10	Inches
Auxiliary Spillway, 50 Year - 24 Hour Rainfall	4.20	Inches
Peak Runoff 2 Year - 24 Hour Rainfall	121.2	CFS
Principal Spillway Discharge	62.6	CFS
Peak Runoff 50 Year - 24 Hour Rainfall	652.0	CFS
Auxiliary Spillway Discharge	512.5	CFS
Auxiliary Spillway Flow Depth	2.470	Feet

STRUCTURE DATA		
Length of Top of Dam	365	Feet
Water Depth to Crest of Principal Spillway	13	Feet
Height of Downstream Toe to Top of Dam	20.3	Feet
Effective Height	12.7	Feet
Product of Storage X Effective Height	1301	

POOL DATA			
	ELEV.	AREA	STORAGE
Crest of Principal Spillway	2067.0	12.5 Ac.	78.9 Ac.-Ft
Crest of Auxiliary Spillway	2068.8	14.8 Ac.	102.3 Ac.-Ft
Top of Dam	2072.3	20.3 Ac.	166.4 Ac.-Ft

SEDIMENT YIELD					
Erodibility Area	Gross Rate (A.F./Ac./Yr.)	Drainage Area (Acres)	Delivery Rate (%)	Design Period (Years)	Required Sediment Volume (Ac.-Ft.)
P	0034	1961	18	25	30,000

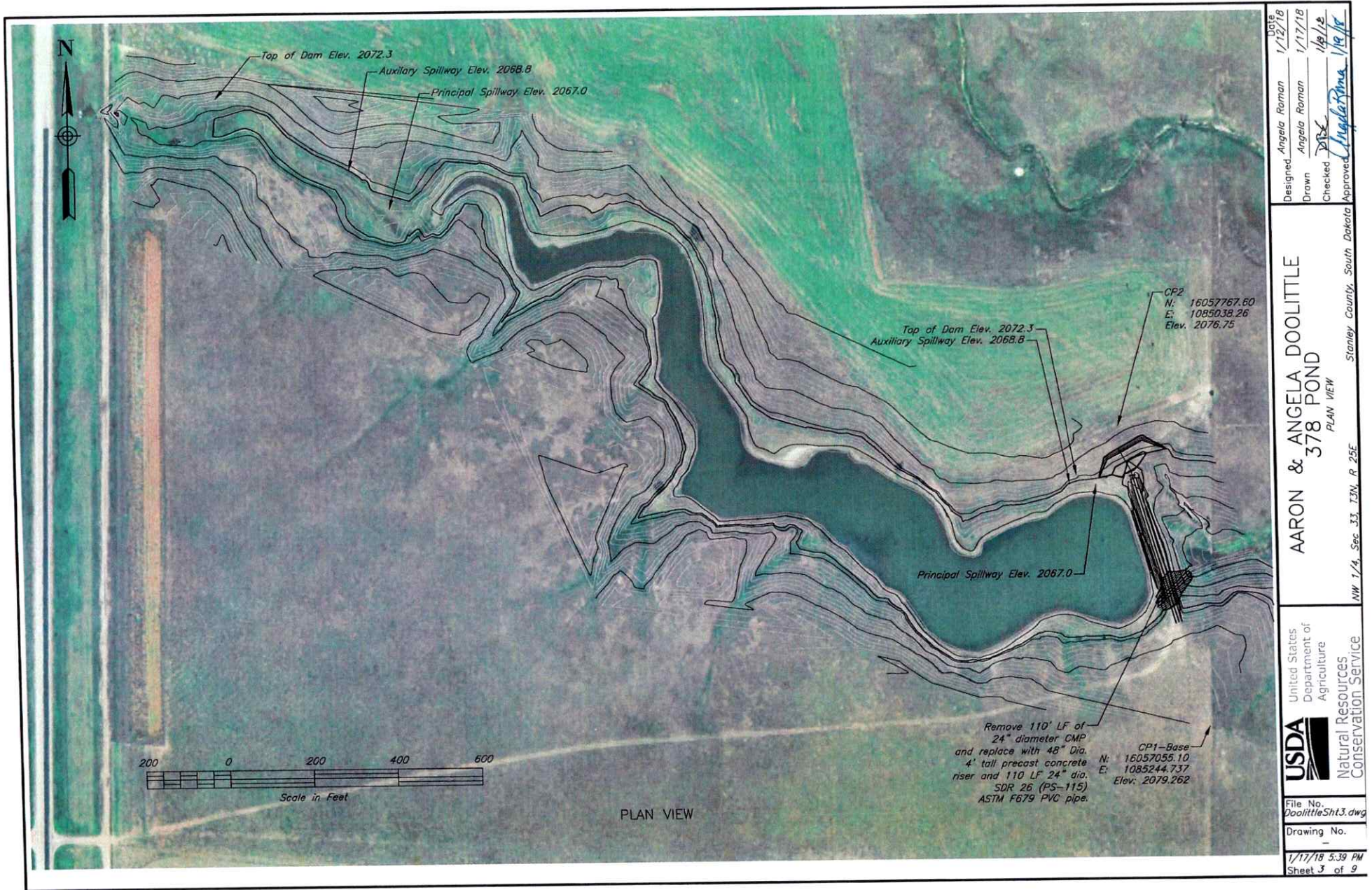
BENCHMARK POINTS TABLE					
NO.	ID	ELEVATION	NORTHING	EASTING	BENCHMARK DESCRIPTION
	B M 1	2079.26	16057055.10	1085244.737	Along fence line SE of dam
	B M 2	2076.75	16057767.60	1085038.26	On south side of fence line located north of auxiliary.



PLAN VIEW



Date 1/12/18 Designed Angela Roman Drawn Angela Roman Checked Angela Roman Approved Angela Roman	Stanley County, South Dakota NW 1/4, Sec. 33, T3N, R 25E AARON & ANGELA DOOLITTLE 378 POND PLAN VIEW AND DESIGN DATA United States Department of Agriculture Natural Resources Conservation Service File No. Doolittle.dwg Drawing No. 1/17/18 5:15 PM Sheet 2 of 9
---	--



Date	Designed	Drawn	Checked	Approved
1/12/18	Angela Roman	Angela Roman	DRS	Angela Roman
1/17/18				
1/18/18				
1/19/18				

**AARON & ANGELA DOOLITTLE
378 POND**
PLAN VIEW

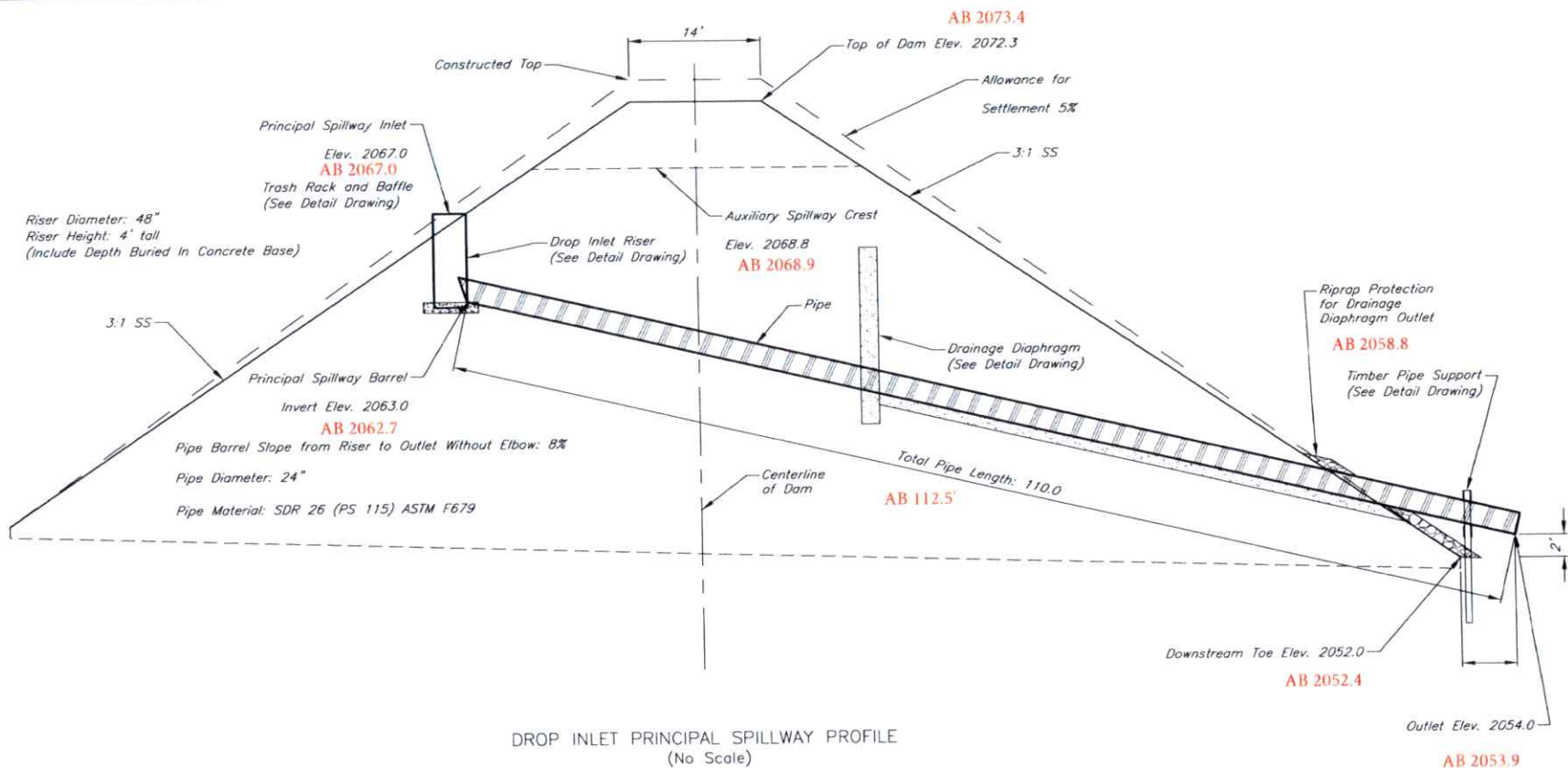
United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

File No.
DoolittleSht3.dwg

Drawing No.
-

1/17/18 5:39 PM
Sheet 3 of 9

NW 1/4, Sec 33, T3N, R 25E
Stanley County, South Dakota



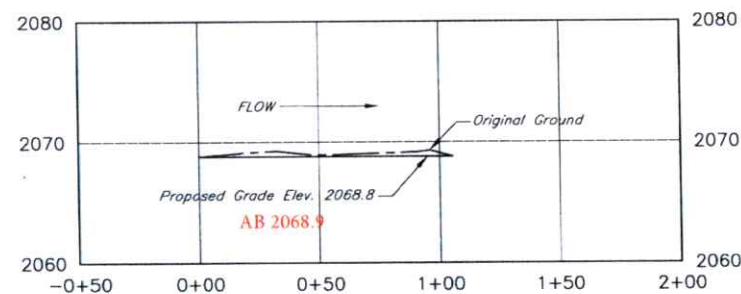
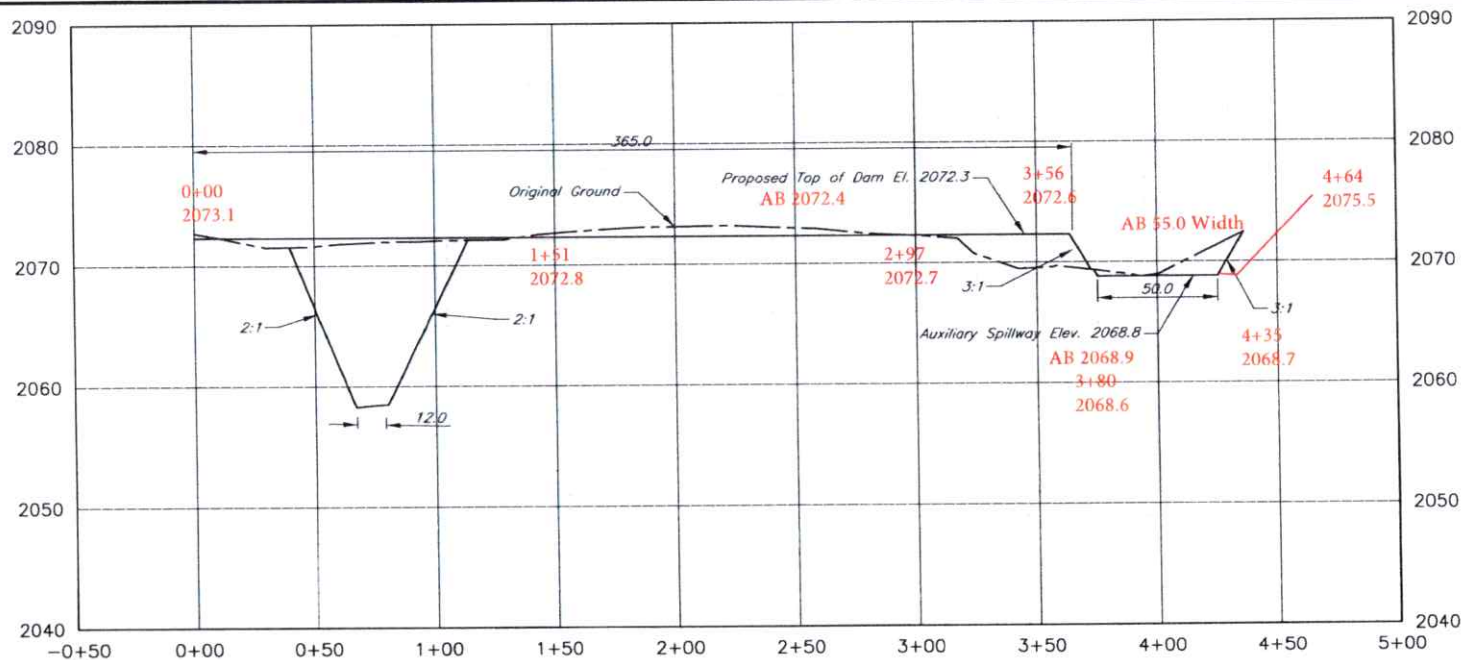
DROP INLET PRINCIPAL SPILLWAY PROFILE
(No Scale)

TRENCH SAFETY NOTES

1. All trench work shall comply with the Occupational Safety and Health Administration (OSHA) regulations.
2. Any trench over four (4) feet deep shall have a means of egress from the trench by a ladder, ramp, or other means of egress; and
3. Any trench over five (5) feet deep shall be protected from cave-ins by a sloping, benching or shoring protection system. Benches must be constructed so the overall slope meets the slope required by OSHA regulations.

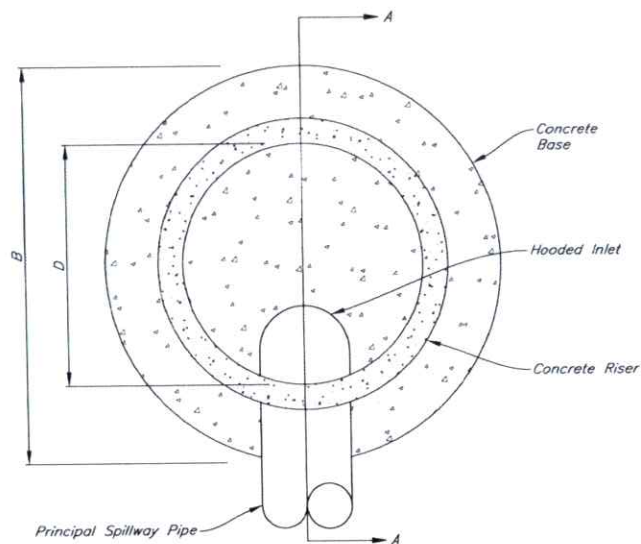
DROP INLET PRINCIPAL SPILLWAY PROFILE

Designed Angela Roman 1/12/18	Drawn Angela Roman 1/17/18	Checked Angela Roman 1/18/18	Approved Angela Roman 1/19/18
AARON & ANGELA DOOLITTLE 378 POND PROFILE OF PRINCIPAL SPILLWAY NW 1/4, Sec. 33, T3N, R. 25E Stanley County, South Dakota			
United States Department of Agriculture Natural Resources Conservation Service			
File No. Doolittle.dwg			
Drawing No. 1			
1/18/18 2:31 PM Sheet 4 of 9			



Horizontal Scale 1" = 50' Vertical Scale 1" = 10'
 PROFILE OF DAM AND AUXILIARY SPILLWAY AND
 CROSS-SECTION OF AUXILIARY SPILLWAY

 United States Department of Agriculture Natural Resources Conservation Service	File No. Doolittle.dwg
	Drawing No.
	1/18/18 2:31 PM Sheet 5 of 9
	NW 1/4, Sec 33, T3N, R 25E Stanley County, South Dakota
AARON & ANGELA DOOLITTLE 378 POND PROFILES AND CROSS-SECTIONS OF DAM AND AUXILIARY SPILLWAY	
Date 1/12/18 Designed Angela Roman Drawn Angela Roman Checked Angela Roman Approved Angela Roman	Date 1/17/18 Drawn Angela Roman Checked Angela Roman Approved Angela Roman

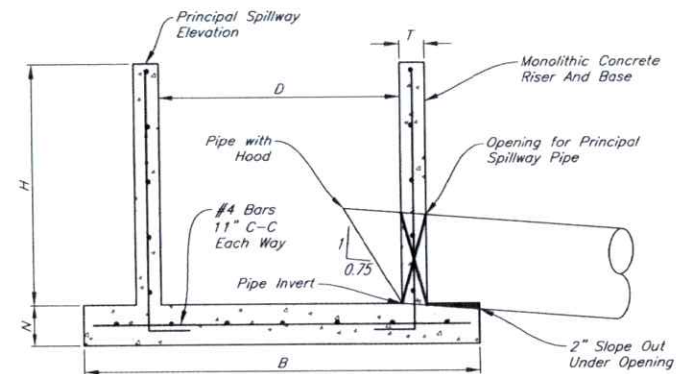


PLAN VIEW PRECAST RISER AND BASE

CONSTRUCTION NOTES

1. The riser and base is precast reinforced concrete and is manufactured according to ASTM C478 Standard Specification For Precast Reinforced Concrete Manhole Sections.
2. Provide a watertight joint between the precast concrete riser and the principal spillway pipe barrel.
3. Contact NRCS prior to installation for other options for the construction of the riser if a precast monolithic riser and base is not used.

Selected Riser



SECTION VIEW A-A

GUIDE TABLE FOR PRECAST RISER AND BASE DIMENSIONS

(D) RISER DIAMETER	(H) RISER HEIGHT	(T) WALL THICKNESS	(B) BASE DIAMETER	(N) BASE THICKNESS	ESTIMATED WEIGHT	DIA. PIPE BARREL
30"	4'	3.5"	51"	6"	2,600 LBS	10" to 18"
30"	4.5'	3.5"	51"	6"	2,790 LBS	10" to 18"
30"	5'	3.5"	51"	6"	2,980 LBS	10" to 18"
36"	4'	4"	64"	6"	3,770 LBS	10" to 24"
36"	4.5'	4"	64"	6"	4,030 LBS	10" to 24"
36"	5'	4"	64"	6"	4,290 LBS	10" to 24"
36"	5.5'	4"	64"	6"	4,550 LBS	10" to 24"
36"	6'	4"	64"	6"	4,815 LBS	10" to 24"
48"	4'	5"	79"	8"	6,870 LBS	10" to 30"
48"	4.5'	5"	79"	8"	7,300 LBS	10" to 36"
48"	5'	5"	79"	8"	7,740 LBS	10" to 36"
48"	5.5'	5"	79"	8"	8,170 LBS	10" to 36"
48"	6'	5"	79"	8"	8,600 LBS	10" to 36"

PRECAST CONCRETE RISER AND BASE
WITH HOODED INLET
REV. 1/2012

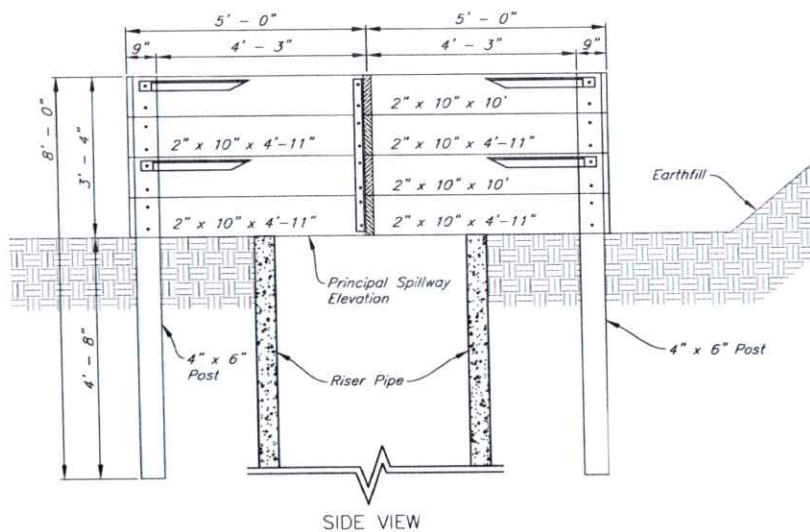
Date: 1/12/18
 Designed: Angela Roman
 Drawn: Angela Roman
 Checked: 1/13/18
 Approved: Angela Roman

AARON & ANGELA DOOLITTLE
 378 POND
 PRECAST CONCRETE RISER AND BASE WITH HOODED INLET

NW 1/4, Sec. 33, T3N, R. 25E

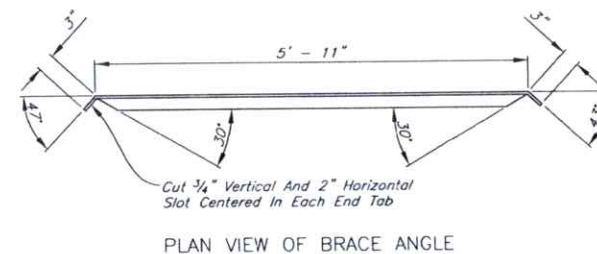
USDA
 United States Department of Agriculture
 Natural Resources Conservation Service

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 Sheet 6 of 9



CONSTRUCTION NOTES

1. Bolt 4" x 6" posts and 2" x 10" lumber together using two $\frac{3}{8}$ " x 8" bolts. Do not place bolts closer than 1 $\frac{1}{2}$ " from edge of board.
2. For center brace angles drill eight, $\frac{3}{16}$ " holes, $\frac{3}{8}$ " from outer edge of each leg of each angle and centered 5 $\frac{1}{4}$ " apart along the leg.
3. Attach brace angles to top bolt on top of 2" x 10" board and to top bolt on next to bottom board.
4. All nuts, bolts, and washers shall be galvanized.



TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"
JOB PLAN NO. 6.4 REV. 1/2012

	Date
Designed _____	Angela Roman 1/12/18
Drawn _____	Angela Roman 1/17/18
Checked _____	ABE 1/18/18
Approved _____	Angela Roman 1/18/18

AARON & ANGELA DOOLITTLE
378 POND

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

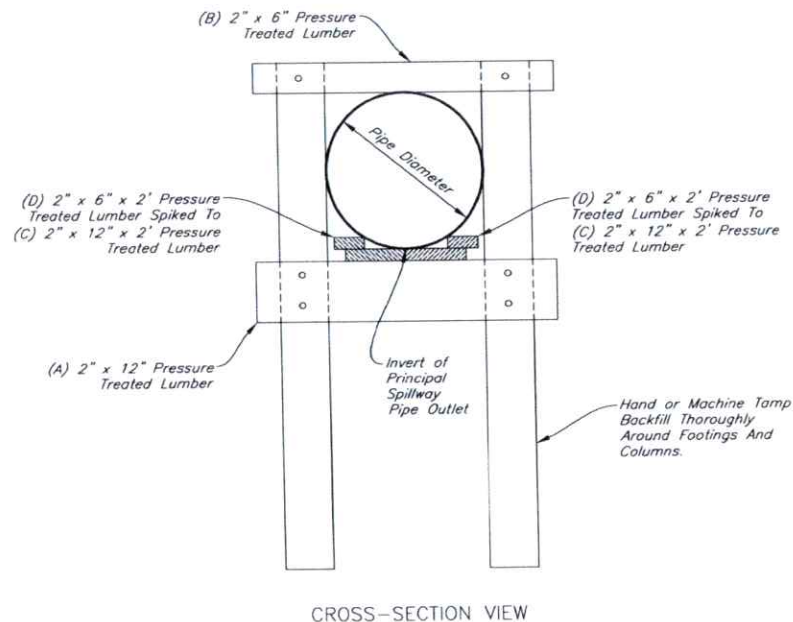
NW 1/4, Sec 33, T3N, R 25E Stanley County,

NW 1/4, Sec 33, T3N, R 25E

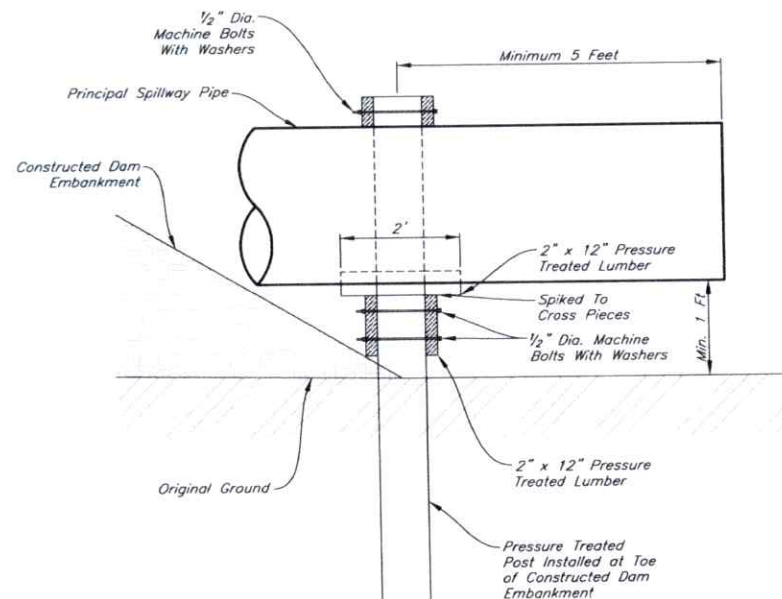


United States
Department of
Agriculture
Natural Resources
Conservation Service

File No. Doolittle.dwg
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CROSS-SECTION VIEW



PROFILE VIEW

LENGTHS REQUIRED FOR DIFFERENT PIPE DIAMETERS

ITEM	MATERIAL SIZES BASED ON PIPE DIAMETER				UNIT	QUANTITY
	12" TO 18"	21" TO 24"	30" TO 36"	42" TO 48"		
8" Dia. Pressure Treated Post	8 Ft	--	--	--	Each	2
10" Dia. Pressure Treated Post	--	10 Ft	10 Ft	12 Ft	Each	2
(A) 2" X 12" Pressure Treated Lumber	4 Ft	4 Ft	5 Ft	6 Ft	Each	2
(B) 2" X 6" Pressure Treated Lumber	4 Ft	4 Ft	5 Ft	6 Ft	Each	2
(C) 2" X 12" Pressure Treated Lumber	2 Ft	2 Ft	2 Ft	2 Ft	Each	2
(D) 2" X 6" Pressure Treated Lumber	2 Ft	2 Ft	2 Ft	2 Ft	Each	2
1/2" Dia. Machine Bolts With Nuts	12 In.	14 In.	14 In.	14 In.	Each	6
1/2" Dia. Washers					Each	12
Spike Nails					Each	20

CONSTRUCTION NOTES

1. All nuts, bolts, and washers shall be galvanized.
2. If PVC pipe is used, protect the portions of pipe that will be permanently exposed to ultraviolet light from sunlight by priming the pipe with PVC solvent and painting with two coats high quality exterior latex paint.
3. Hand or machine tamp backfill thoroughly around footings and columns.

TIMBER PIPE SUPPORT
JOB PLAN NO. 4.0 REV. 1/2012

Date 1/12/18 Designed Angela Roman Drawn Angela Roman 1/17/18 Checked Angela Roman 1/18/18 Approved Angela Roman 1/19/18	NW 1/4, Sec 33, T3N, R 25E Stanley County, South Dakota	AARON & ANGELA DOOLITTLE 378 POND TIMBER PIPE SUPPORT	United States Department of Agriculture Natural Resources Conservation Service
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