

WATER PERMIT NO. 2708-2

Name of Applicant: **Hollingsworth-Schaffer Ranch Partnership**

Address: **2400 W Dakota Ave, Pierre SD 57501** Phone: **605 280-0693**

Amount of Water Claimed: **30 AF** Total Acres: **NA**

Source of Water Supply: **runoff**

Water to be used for: **fish & wildlife propagation, recreation and livestock** County: **Stanley**

Type of Waste Disposal System:

Location: **5 miles southeast of Hayes**

PRIORITY Date Received: **3-20-13** Application/License Fee: **\$ 700**

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

Remarks:

Diversion Point: **NW 1/4 SE 1/4 Sec 12-T4N-R26E**

Water Impounded: **N 1/2 SE 1/4 Sec 12-T4N-R26E**

Depth of Well: **NA**

Well Driller:

Remarks:

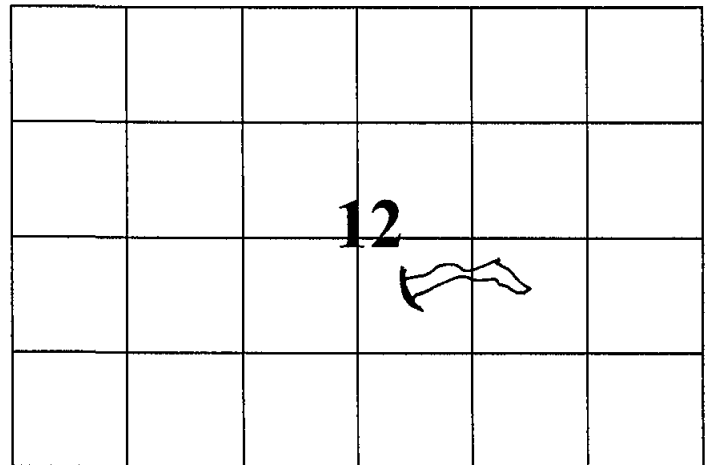
Type of Map: **aerial**

Prepared by:

Reviewed and the Number Assigned on: **3-21-13**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____



SD EForm - 1585LD V4**FORM 2: Application for uses other than irrigation**
(type or print)Mail to:
PMB 2020
DENR - Water Rights
523 E Capitol Ave
Pierre, SD 57501-3182
ph. (605) 773-3352(office use only)
No. 2708-2 Hydrologic Unit 10140102
Basin Bad River
Newspaper Capital Journal
PO Box 878 Pierre 57501 605-224-7301

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MAR 20 2013

WATER RIGHTS
PROGRAM**Application For Permit To Appropriate Water Within The State Of South Dakota****Check use(s) of water:**

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

Type of Application:
(check one)
☒ **New** ☐ **Vested Right** (Use predates Mar 2, 1955) ☐ **Future Use Reservation**
☐ **Place to Beneficial Use Water Reserved by Future Use Permit No.** _____
☐ **Amendment/Correction to Permit No.** _____
Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)
_____1. Name to Appear on Water Permit Hollingsworth-Shaffer Ranch Partnership(check one) ☒ Owner ☐ Tenant/lessee ☐ Owner's Legal Agent

(name and complete address if different than above name)

Mailing Address 2400 East Dakota Avenue Pierre SD 57501
(Address) (City) (State) (Zip Code)Home Phone _____ Cell 605-280-0693 Email tds@coneag.com2. Amount of water claimed _____ *CFS or _____ **GPM 30.0 ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)3. Source of water supply Surface runoff Water Impounded N 1/2 SE 1/44. Location of point of diversion NW 1/4, SE 1/4, Section 12, T4N, R26E 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? _____

(example - NW1/4 section 12-T104N-R53W)

5. County or counties where water will be used Stanley6. 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)

Construction of an earth embankment dam, 29.2' in height, 743' in length, with a 120' wide earthen auxiliary spillway. Installation of principal spillway consisting of a 36" diameter concrete riser with a 16" PVC barrel.

I, Theris Shaffer, the applicant, certify that I have read this application, have examined the attached map, and that the matters stated are true.

2012-09

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

SOUTH DAKOTA
WATER PERMIT NO. 2708-2

Date of first receipt of application March 20, 2013.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 2708-2 to Hollingsworth-Shaffer Ranch Partnership, c/o Travis Shaffer, 2400 E Dakota Ave, Pierre SD 57501 authorizing the construction of the dam and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 2708-2 authorizes impoundment of 30 acre-feet of water from runoff by constructing a dam located in the NW 1/4 SE 1/4 Section 12 with water impounded in the N 1/2 SE 1/4 Section 12; all in T4N-R26E. This permit authorizes impoundment of sufficient water to maintain water to the outlet elevation of 1,898.0 feet mean sea level.
2. The water appropriated shall be used for the purpose of fish & wildlife propagation, recreation and livestock water purposes 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. 2708-2 is June 10, 2013.
5. The date from which applicant may claim right is March 20, 2013.
6. One-fifth of the construction is to be completed on or before December 10, 2015.
7. All construction is to be completed on or before June 10, 2018.
8. Water is to be put to beneficial use on or before June 10, 2022.
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. 2708-2 authorizes an impoundment with a storage capacity of 30 acre feet of water and sufficient water annually to maintain the water level to the 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, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

JUN 20 2013

date



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 ____
- c) Well Depth ____ Depth to Top of Water Bearing Material ____ Depth to Water from Surface ____
- d) Distance to nearest existing domestic well:
On applicant's property ____ On property owned by others ____

2. Wastewater Disposal System Information

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

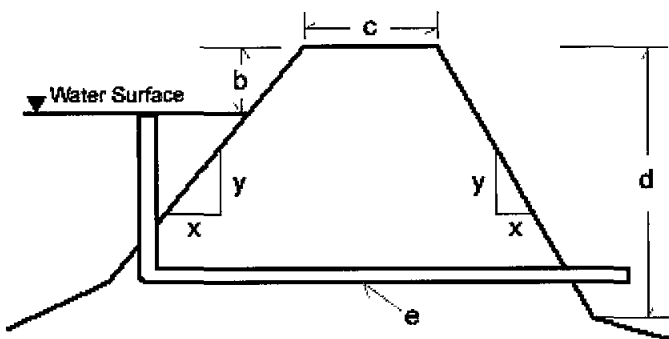
3. Dugout Information

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

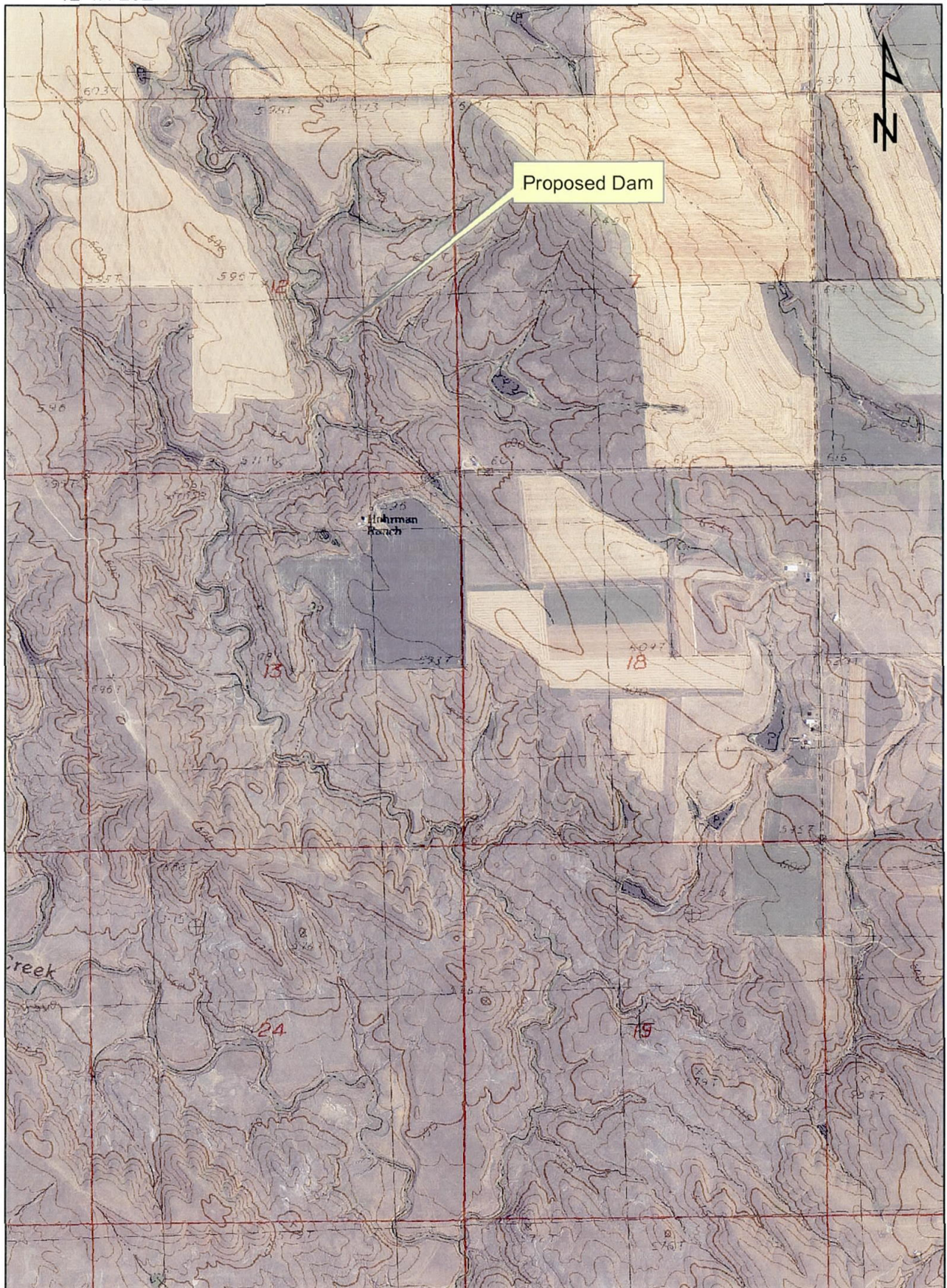
4. Water Storage Dams

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

- a) If a private engineering firm or government agency was involved in the design of this dam, please give their name and address:
Angela Roman
USDA-Natural Resources Conservation Service
1717 North Lincoln Ave, Suite #104
Pierre, SD 57501



- b) Freeboard 2.6'
- c) Crest Width 12'
Crest Length 743'
- d) Height 29.2
- e) Primary Outlet Capacity 30.8 cfs
If pipe, diameter 16"
- f) Secondary Spillway Capacity 463.4 cfs
Spillway Width 120'
- g) X & Y Slope (e.g. 3 to 1 is a typical slope)
Upstream 3:1
Downstream 3:1
- h) Surface Area of Impoundment 3.65
- i) Storage 30.0 Acre Feet
- j) Drainage Area Above Dam 389.8 Acres



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WATER RIGHTS
PROGRAM

1 inch equals 2,000 feet

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 3/21, 2013

RECEIVED OF Hollingsworth Shaffer Ranch 145 Riverplace Dr Pierre SD 57501

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

Fee for Application for Permit No. <u>2708-2</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>2708-2</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. 06257

By

James L. Erbe
Chief Engineer

United States Department of Agriculture



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

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MAR 20 2013

WATER RIGHTS
PROGRAM

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

March 20, 2013

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 the Hollingsworth-Shaffer Ranch Partnership. This dam will require a water rights permit and safety of dams review. Construction is anticipated in the summer of 2013, as soon as weather permits.

Please call me at the above number with any concerns or questions.

Thank You,

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

ANGELA ROMAN
Agricultural Engineer

Attachments

**Design Report
378 Pond
Hollingsworth-Shaffer Ranch Partnership, Stanley County**

Summary

This dam is located in the SE ¼ of Section 12, T4N, and R26E. This is a multi-purpose dam for livestock water and wildlife. This is a new construction of a dam located directly upstream from a failed dam. The existing dam has failed as a result of an inadequate principal spillway in the dam. Funding for this project will be provided by the USDA-NRCS (EQIP) and the Hollingsworth-Shaffer Ranch Partnership.

Job Description

This site is a Hazard "A" and Job Class III structure with a drainage area of 389.8 acres. In the event of a breach, a minimal amount of rangeland would be damaged as the dam drains into a much larger drainage-Plum 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 25 yr- 24hr storm through the auxiliary spillway. SITES program was used to flood route the design. The principal spillway outlet is located in a large head cut and the existing embankment will be left in place. It is anticipated that some of the borrow material will come from below the elevation of the principal spillway. To account for this, an additional 4.0 AcFt of storage is included in the dam. This has no effect on the flood routing from the principal spillway to the top of dam. Additional borrow will be obtained from selected locations near the dam.

Soils

The soils were investigated by drilling 2 test holes adjacent to the centerline of the dam. All CL and CH materials were found, as expected in this area.

Environmental Considerations

The disturbed area is 2.3 acres, since this is over 1 acre a storm water discharge permit application has been completed. A storm water pollution prevention plan has been developed and requires all disturbed areas to be seeded and/or mulched (depending on the date of seeding). The seeding is to be completed immediately following construction. The use of silt fences will be used if necessary.

Basic Data of the Dam

HYDRAULIC DATA		
<i>Drainage Area</i>	389.8	<i>Acres</i>
<i>Annual Runoff Yield (50% Chance)</i>	32.5	<i>Ac. Ft</i>
<i>Time of Concentration</i>	0.83	<i>Hours</i>
<i>Runoff Curve Number</i>	84	
<i>Principal Spillway, 2 Year - 24 Hour Rainfall</i>	2.1	<i>Inches</i>
<i>Auxiliary Spillway, 25 Year - 24 Hour Rainfall</i>	4	<i>Inches</i>
<i>Peak Runoff 2 Year - 24 Hour Rainfall</i>	194.1	<i>CFS</i>
<i>Principal Spillway Discharge</i>	30.8	<i>CFS</i>
<i>Peak Runoff 25 Year - 24 Hour Rainfall</i>	590.7	<i>CFS</i>
<i>Auxiliary Spillway Discharge</i>	463.4	<i>CFS</i>
<i>Auxiliary Spillway Flow Depth</i>	1.57	<i>Feet</i>

STRUCTURE DATA		
<i>Length of Top of Dam</i>	743	<i>Feet</i>
<i>Water Depth to Crest of Principal Spillway</i>	16	<i>Feet</i>
<i>Height of Downstream Toe to Top of Dam</i>	29.2	<i>Feet</i>
<i>Effective Height</i>	19.9	<i>Feet</i>
<i>Product of Storage X Effective Height</i>	841.8	

POOL DATA			
	ELEV.	AREA	STORAGE
<i>Crest of Principal Spillway</i>	1,898	3.65 Ac.	30 Ac.-Ft
<i>Crest of Auxiliary Spillway</i>	1,901	4.56 Ac.	42.3 Ac.-Ft
<i>Top of Dam</i>	1,903.6	5.3 Ac.	54.8 Ac.-Ft

SEDIMENT YIELD					
<i>Erodibility Area</i>	<i>Gross Rate (A.F./Ac./Yr.)</i>	<i>Drainage Area (Acres)</i>	<i>Delivery Rate (%)</i>	<i>Design Period (Years)</i>	<i>Required Sediment Volume (Ac.-Ft.)</i>
P	0.0011	389.8	24	50	15.9

Construction Schedule

Construction of this dam is proposed to begin as soon as the project receives approval from the South Dakota Department of Environment and Natural Resources for the water right permit application.

Authority

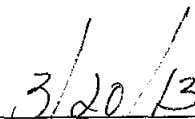
This project was designed by Angela Roman, Agricultural Engineer for the United States Department of Agriculture- Natural Resources Conservation Service. This dam is classified as a Class III. Plans were reviewed by Dana Edwards, PE, Area Engineer and Job Approval Authority is exercised by Angela Roman.

Landowner Information

Hollingsworth-Shaffer Ranch Partnership
%Travis Shaffer
2400 East Dakota Avenue
Pierre, SD 57501
605-280-0693



Angela Roman
Agricultural Engineer
USDA-NRCS
1717 North Lincoln Ave, Suite #104
Pierre, SD 57501
605-224-2476, ext. 136
angela.roman @sd.usda.gov



Date

Client: Travis Shaffer
 County: STANLEY
 Practice: Pond

State: SD

Calculated By: wphifer

Date: 7/10/2012

Checked By: *A. Roman*

Date: _____

Drainage Area: ~~23.8~~ Acres (user entered value)
 Curve Number: ~~84~~ (user entered value)
 Watershed Length: ~~2002~~ Feet
 Watershed Slope: ~~9.66~~ Percent
 Time of Concentration: ~~0.26~~ Hours (calculated value)
 Rainfall Type: ~~II~~

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr rainfall (in)	1.80	2.10	2.90	3.40	4.00	4.40	5.10
Ia/P Ratio	0.21	0.18	0.13	0.11	0.10	0.09	0.07
Used	0.21	0.18	0.13	0.11	0.10	0.10	0.10
Runoff (in)	0.61	0.82	1.43	1.85	2.37	2.73	3.36
(ac-ft)	1.21	1.63	2.84	3.67	4.70	5.41	6.66
Unit Peak Discharge (cfs/acre/in)	1.033	1.057	1.098	1.113	1.123	1.123	1.123
Peak Discharge (cfs)	15	21	37	49	63	73	90

 SITES XEQ 03/01/2013 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2005.1.6 (USER MANUAL - DATED DECEMBER 2005)
 TIME 13:58:49 *A. Roman 3/1/13*

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

SITES 01/01/2005 0.6090625 H5
 SAVMOV 0 101
 SAVMOV 101 1 1
 * Rebuild of failed pond. 36" diameter 4' tall concrete riser,
 * 16" PVC SDR 25 137LF 120' AS

STRUCTURE

1881	0.0000
1887	.7941
1890	1.4229
1892	1.9651
1893	2.2757
1894	2.5570
1895	2.8310
1896	3.1016
1897	3.3797
1898	3.6474 0
1899	3.9293 27.67
1900	4.2411 29.27
1901	4.5602 29.89
1902	4.8834 30.50
1903	5.2240 31.10
1904	5.4 31.69
1905	5.7 32.27

*PS = 1898.0
 AS = 1901.0
 TD = 1903.6*

ENDTABLE

WSDATA	5A1	AC	84	389.8	7792.7	8.38	
PDIRECT			2.1			4.00	
POOLDATA	ELEV		1898	1881	1898	1881	1881
ASDATA	41 300		100		3	.065	2
ASINSURF	41			.035			
ASINLET	41	0.0		0.0	130	0.0	3
		230		10			

ENDTABLE

ASEXSURF	41		.035		
			.67	0	
			2		
			2	0	
			.0075		

ENDTABLE

ASEXIT	41	N			200
BTMWIDTH	FEET	120			
GRAPHICS	I				
GO, DESIGN	HL	TYPE2	24	TYPE2378	24
SAVMOV	2	101	1		
ENDJOB					

1SITES XEQ 03/01/2013 ----- COMMENT PAGE -----
 VER 2005.1.6 WSID =

Rebuild of failed pond. 36" diameter 4' tall concrete riser,
16" PVC SDR 25 137LF 120' AS

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

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

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

1SITES -----
XEQ 03/01/2013 WSID=
VER 2005.1.6 SUBW= A
TIME 13:58:49 SITE = S 1 PASS= 1 PART= 1

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

STORM DISTRIBUTION-PSH 24 HOUR TYPE II RAINFALL DISTRIBUTION

STORM DISTRIBUTION AUX. -24 HOUR TYPE II RAINFALL DISTRIBUTION

PRECIP. - P-PS, 1-DAY	P-PS, 10-DAY	P-SD	P-FB	
2.10	0.00	0.00	4.00	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
84.00	0.61	7792.70	8.38	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
1898.00	1881.00	1898.00	1881.00	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	0.065	NO

BTM WIDTH -	BW1	BW2	BW3	BW4	BW5
ft	120.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----
 XEQ 03/01/2013
 VER 2005.1.6
 TIME 13:58:49 SITE = S 1 PASS= 1 PART= 2
 WSID= SUBW= A

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

PERM POOL	1898.00 FT	26.0 ACFT	3.65 AC	0.0 CFS
CREST PS	1881.00 FT	0.0 ACFT	0.00 AC	0.0 CFS
SED ACCUM	1898.00 FT	26.0 ACFT	3.65 AC	0.0 CFS
START ELEV ✓	1898.00 FT	26.0 ACFT	3.65 AC	0.0 CFS

Water Right

NRCS-PSH	D= 24.00 HR	P= 2.10 IN	Q= 0.82 IN	DA= 0.61 SM
	TC= 0.83 HR	CN= 84.00	VOL= 26.5 ACFT	

PEAK = 194.1 CFS, AT 12.4 HRS.

ROUTED RESULT - HYD TYPE	EMAX	VOL-MAX	AMAX	QMAX
NRCS-PSH	1900.94 FT	38.0 ACFT	4.54 AC	29.9 CFS

PS STORAGE 12.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 1881.00 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 1898.00 FT, 26.0 ACFT, 0.0 CFS.

DRAWDOWN TIME = 0.99 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

 RATING TABLE DEVELOPED, SITE = S 1:
 WITH PS GIVEN AND AUX. COMPUTED BY PROGRAM
 AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 1						
	ELEV.	Q-TOTAL	Q-PS	Q-AUX.	VOLUME	AREA
	FEET	CFS	CFS	CFS	AC-FT	ACRE
1	1881.00	0.00	0.00	0.00	0.00	0.00
2	1887.00	0.00	0.00	0.00	2.38	0.79
3	1890.00	0.00	0.00	0.00	5.71	1.42
4	1892.00	0.00	0.00	0.00	9.10	1.97
5	1893.00	0.00	0.00	0.00	11.22	2.28

6	1894.00	0.00	0.00	0.00	13.63	2.56
7	1895.00	0.00	0.00	0.00	16.33	2.83
8	1896.00	0.00	0.00	0.00	19.29	3.10
9	1897.00	0.00	0.00	0.00	22.53	3.38
10	1898.00	0.00	0.00	0.00	26.05	3.65
11	1899.00	27.67	27.67	0.00	29.84	3.93
12	1900.00	29.27	29.27	0.00	33.92	4.24
13	1901.00	29.89	29.89	0.00	38.32	4.56
14	1902.00	30.50	30.50	0.00	43.04	4.88
15	1903.00	31.10	31.10	0.00	48.10	5.22
16	1904.00	31.69	31.69	0.00	53.41	5.40
17	1905.00	32.27	32.27	0.00	58.96	5.70

1SITES

XEQ 03/01/2013

VER 2005.1.6

TIME 13:58:49

SITE = S 1

PASS= 1

WSID=

SUBW= A

PART= 3

AUX. CREST 1900.94 FT 38.0 ACFT 4.54 AC 29.9 CFS

PS STORAGE ≈ 1901.0 12.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 1898.00 FT 26.1 ACFT 3.65 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 19.9 FEET, PRODUCT= 759. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.

NRCS-FBH D= 24.00 HR P= 4.00 IN Q= 2.37 IN DA= 0.61 SM
TC= 0.83 HR CN= 84.00 VOL= 77.0 ACFT

PEAK = 590.7 CFS, AT 12.4 HRS.

***** WARNING - UPSTREAM END OF CREST 170. IS UPSTREAM OF THE
FIRST GROUND POINT 200. STATION.

RATING TABLE DEVELOPED, SITE = S 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	1881.00	0.00	0.00	0.00	0.00	0.00
2	1882.66	0.00	0.00	0.00	0.18	0.22
3	1884.32	0.00	0.00	0.00	0.73	0.44
4	1885.98	0.00	0.00	0.00	1.64	0.66
5	1887.65	0.00	0.00	0.00	2.94	0.93
6	1889.31	0.00	0.00	0.00	4.77	1.28
7	1890.97	0.00	0.00	0.00	7.22	1.69
8	1892.63	0.00	0.00	0.00	10.40	2.16
9	1894.29	0.00	0.00	0.00	14.39	2.64

10	1895.95	0.00	0.00	0.00	19.15	3.09
11	1897.62	0.00	0.00	0.00	24.67	3.54
12	1899.28	28.11	28.11	0.00	30.94	4.02
13	1900.94	29.85	29.85	0.00	38.05	4.54
14	1901.14	43.12	29.98	13.14	38.97	4.61
15	1901.35	57.46	30.10	27.36	39.92	4.67
16	1901.71	138.81	30.32	108.49	41.64	4.79
17	1902.16	297.87	30.59	267.27	43.82	4.94
18	1902.97	759.20	31.08	728.12	47.94	5.21
19	1903.98	1535.57	31.68	1503.88	53.33	5.40
20	1905.00	2530.95	32.27	2498.68	58.96	5.70

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	170.	300.	0.0	0.035	**	**	**	CREST
2	300.	500.	6.5	0.035	0.67	2	2.0	EXIT !

130' level section

- @ 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 2 used in computing exit channel velocities.

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 1900.94 FT.

DRAWDOWN (DDT) TEST 1898.00 FT 26.0 ACFT 6.19 CFS
CONTROL IS 0.000 DETENTION STORAGE

TIME TO DDT TEST DISCHARGE IS 0.47 DAYS - DRAWDOWN CONTINUING.

DRAWDOWN TIME = 0.47 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	120.0	1902.51	45.6	5.1	1.57	7.5

***** NOTE -- ACTUAL Hp OF 1.57 RAISED TO MEET MIN. 378 CRITERIA.

PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
DISCHARGE =	30.8	463.4	494.2

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	0.77	4.93	0.020	0.027

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

Aux. Spillway Discharge = 463. cfs; Bottom Width = 120. ft

REACH NO.	FROM STA	TO STA	SLOPE %	MANNING'S n	VELOCITY ft/s	TOTAL STRESS lb/ft^2	EFFECTIVE STRESS lb/ft^2
2	300.	500.	6.50	0.035	7.09	2.18	0.433

AUXILIARY SPILLWAY DURATION FLOW = 5.9 HOURS
 ATTACK, OE/B = 0.3 ACFT/FT

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

EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY= 7.1 FT/SEC
 EXIT SLOPE = 0.065 FT/FT
 FLOW DEPTH = 0.5 FT

>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS 2.00 FT.
 NEW TOP OF DAM ELEVATION = 1902.94.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	120.0	1902.94	47.8	5.2	2.00	9.7
PEAK - CFS DISCHARGES =		Q-PS 31.1	Q-AUX. 710.9	Q-TOT. 742.0		
		CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT	
AUXILIARY SPILLWAY ---		1.02	5.66	0.018	0.024	

>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED FOR THIS PASS. NEW TOP OF DAM ELEVATION = 1903.51.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	120.0	1903.51	50.8	5.3	2.57	12.8
PEAK - CFS DISCHARGES =		Q-PS 31.4	Q-AUX. 1140.0	Q-TOT. 1171.4		
		CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT	
AUXILIARY SPILLWAY ---		1.39	6.59	0.016	0.022	

Inflow Hyd 1 PSH-Peak = 29.85 CFS at 3.95 hrs., Location Point
 Inflow Hyd 1 FBH-Peak = 494.24 CFS at 5.77 hrs., Location Point
 HYDOUT 1

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

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	<<<
	-----	-----	-----	-----	-----	-----	-----	-----	
	S 1	A	0.61	84.	0.83	0.61	378CR	A1	
PASS	DIA./	AUX.CREST	BTM.	MAX.	MAX.	EMB.	INTEGR.*	EXIT*	TYPE
NO.	WIDTH	ELEV	WIDTH	HP	ELEV	VOL.	DIST.	VEL.	HYD
	(IN/FT)	(FT)	(FT)	(FT)	(FT)	(CY)	(FT)	(FT/SEC)	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1	0.0	1900.9	120.0	2.6	1903.5	0.	0.	7.1	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 2005.1.6 ,01/01/2005
FILES

INPUT = S:\PierreFSO\engineering\Angela\Hollingsworth - Shaffer\SITES\16.36.120.1898.D
OUTPUT = S:\PierreFSO\engineering\Angela\Hollingsworth - Shaffer\SITES\16.36.120.1898.O
DATED 03/01/2013 13:58:49

GRAPHICS FILES GENERATED

OPTION "L" = S:\PierreFSO\engineering\Angela\Hollingsworth - Shaffer\SITES\16.36.120.18

OPTION "P" = S:\PierreFSO\engineering\Angela\Hollingsworth - Shaffer\SITES\16.36.120.18

OPTION "E" = S:\PierreFSO\engineering\Angela\Hollingsworth - Shaffer\SITES\16.36.120.18

DROP Inlet

Project Name: Shaffer

laDropInlet.xls Ver 1.02

Computed by: A.Roman

Date: 3/1/2013

Checked by: A.Roman

Date: 3/1/13

Input Data

Riser Type & Diameter (in)	Circular	36
Length of Weir Obstruction(ft)	0.5	6
Principal Spillway Crest Elev (ft)	1898	1894
Invert of Barrel Elevation (ft)	1894	0.6
Barrel Orifice Coefficient (C)	0.6	16
Pipe Diameter (in)	16	137
Pipe Length (ft)	137	1
Entrance Coefficient 'Ke'	1	0.009
Mannings 'n'-value	0.009	
Elbow Elev (if None, Leave 'BLANK')		
Length of Outlet ('BLANK' if none)		
Outlet Type	Cantilever	
Outlet Elevation (ft)	1876	
Tailwater Elev (if unknown, leave 'Blank')		
Auxiliary Spillway Elev (ft)	1905	
Maximum Headwater Elev (ft)	1905	
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):	8.92
Riser Area (Sq Ft):	7.07
Barrel Area (Sq Ft):	1.40
Kp:	0.01022
Friction Slope (HW at the A.S. Crest):	0.08476
Pipe Slope:	0.13254
Outlet Elbow Angle (deg):	0.0
Maximum Barrel Invert Elevation for avoiding Barrel Orifice Control:	1880.20
Km:	0.00000
Tailwater Elev Used For Full Pipe Flow:	1876.8

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
1898.0	0.0	0.00	0.00	12.27	27.98	0.00	Weir Flow
1898.1	0.1	0.87	10.76	12.46	28.04	0.87	Weir Flow
1898.2	0.2	2.47	15.22	12.64	28.11	2.47	Weir Flow
1898.3	0.3	4.55	18.64	12.81	28.18	4.55	Weir Flow
1898.4	0.4	7.00	21.53	12.99	28.24	7.00	Weir Flow
1898.5	0.5	9.78	24.07	13.16	28.31	9.78	Weir Flow
1898.6	0.6	12.86	26.36	13.33	28.37	12.86	Weir Flow
1898.7	0.7	16.20	28.48	13.50	28.44	13.50	Barrel Orifice
1898.8	0.8	19.80	30.44	13.67	28.50	13.67	Barrel Orifice
1898.9	0.9	23.62	32.29	13.83	28.57	13.83	Barrel Orifice
1899.0	1.0	27.67	34.04	13.99	28.63	13.99	Barrel Orifice
1899.1	1.1	31.92	35.70	14.16	28.70	14.16	Barrel Orifice
1899.2	1.2	36.37	37.28	14.31	28.76	14.31	Barrel Orifice
1899.3	1.3	41.01	38.81	14.47	28.82	14.47	Barrel Orifice
1899.4	1.4	45.83	40.27	14.63	28.89	14.63	Barrel Orifice
1899.5	1.5	50.83	41.68	14.78	28.95	14.78	Barrel Orifice
1899.6	1.6	55.99	43.05	14.93	29.02	14.93	Barrel Orifice
1899.7	1.7	61.32	44.38	15.08	29.08	15.08	Barrel Orifice
1899.8	1.8	66.81	45.66	15.23	29.14	15.23	Barrel Orifice
1899.9	1.9	72.46	46.91	15.38	29.21	15.38	Barrel Orifice
1900.0	2.0	78.25	48.13	15.53	29.27	15.53	Barrel Orifice
1900.1	2.1	84.20	49.32	15.67	29.33	15.67	Barrel Orifice
1900.2	2.2	90.28	50.48	15.81	29.39	15.81	Barrel Orifice
1900.3	2.3	96.51	51.62	15.96	29.46	15.96	Barrel Orifice
1900.4	2.4	102.87	52.73	16.10	29.52	16.10	Barrel Orifice
1900.5	2.5	109.36	53.81	16.24	29.58	16.24	Barrel Orifice
1900.6	2.6	115.99	54.88	16.38	29.64	16.38	Barrel Orifice
1900.7	2.7	122.75	55.93	16.51	29.71	16.51	Barrel Orifice
1900.8	2.8	129.63	56.95	16.65	29.77	16.65	Barrel Orifice
1900.9	2.9	136.63	57.96	16.79	29.83	16.79	Barrel Orifice
1901.0	3.0	143.76	58.95	16.92	29.89	16.92	Barrel Orifice
1901.1	3.1	151.01	59.92	17.05	29.95	17.05	Barrel Orifice
1901.2	3.2	158.37	60.88	17.18	30.02	17.18	Barrel Orifice
1901.3	3.3	165.86	61.83	17.32	30.08	17.32	Barrel Orifice
1901.4	3.4	173.45	62.76	17.45	30.14	17.45	Barrel Orifice
1901.5	3.5	181.16	63.67	17.57	30.20	17.57	Barrel Orifice
1901.6	3.6	188.98	64.58	17.70	30.26	17.70	Barrel Orifice
1901.7	3.7	196.91	65.47	17.83	30.32	17.83	Barrel Orifice
1901.8	3.8	204.94	66.35	17.96	30.38	17.96	Barrel Orifice
1901.9	3.9	213.09	67.21	18.08	30.44	18.08	Barrel Orifice
1902.0	4.0	221.33	68.07	18.21	30.50	18.21	Barrel Orifice
1902.1	4.1	229.69	68.92	18.33	30.56	18.33	Barrel Orifice
1902.2	4.2	238.14	69.75	18.45	30.63	18.45	Barrel Orifice
1902.3	4.3	246.70	70.58	18.57	30.69	18.57	Barrel Orifice
1902.4	4.4	255.35	71.39	18.70	30.75	18.70	Barrel Orifice
1902.5	4.5	264.11	72.20	18.82	30.81	18.82	Barrel Orifice
1902.6	4.6	272.96	73.00	18.94	30.87	18.94	Barrel Orifice
1902.7	4.7	281.91	73.79	19.06	30.93	19.06	Barrel Orifice
1902.8	4.8	290.95	74.57	19.17	30.98	19.17	Barrel Orifice
1902.9	4.9	300.09	75.34	19.29	31.04	19.29	Barrel Orifice
1903.0	5.0	309.32	76.10	19.41	31.10	19.41	Barrel Orifice
1903.1	5.1	318.65	76.86	19.52	31.16	19.52	Barrel Orifice
1903.2	5.2	328.07	77.61	19.64	31.22	19.64	Barrel Orifice
1903.3	5.3	337.58	78.35	19.75	31.28	19.75	Barrel Orifice
1903.4	5.4	347.18	79.09	19.87	31.34	19.87	Barrel Orifice
1903.5	5.5	356.86	79.82	19.98	31.40	19.98	Barrel Orifice
1903.6	5.6	366.64	80.54	20.09	31.46	20.09	Barrel Orifice
1903.7	5.7	376.51	81.26	20.21	31.52	20.21	Barrel Orifice
1903.8	5.8	386.46	81.97	20.32	31.57	20.32	Barrel Orifice
1903.9	5.9	396.49	82.67	20.43	31.63	20.43	Barrel Orifice

Hood Inlet

Project Name: Shaffer

laHoodInlet.xls Ver 1.10

Computed by: A. Roman

Date: 3/1/2013

Checked by: A. Roman

Date: 3/1/13

			Outflow, CFS				Structure Outflow, CFS	Controlling Factor
			Elev	HW Ft	Weir	Slug Flow	Full Pipe	
Input Data			1894.0	0.0	0.00	0.00	25.20	0.00
			1894.1	0.1	0.12	0.00	25.27	0.12
			1894.2	0.2	0.25	0.00	25.35	0.25
			1894.3	0.3	0.41	0.00	25.42	0.41
Principal Spillway Crest Elev (ft)		1894	1894.4	0.4	0.64	0.00	25.49	0.64
			1894.5	0.5	0.87	0.00	25.57	0.87
Inside Wall - Type		Smooth	1894.6	0.6	1.14	0.00	25.64	1.14
Pipe Diameter (in)		16	1894.7	0.7	1.45	0.00	25.71	1.45
Pipe Length (ft)		137	1894.8	0.8	1.81	0.00	25.78	1.81
Entrance Coefficient 'Ke'		1	1894.9	0.9	2.33	0.00	25.85	2.33
Mannings 'n-value'		0.009	1895.0	1.0	2.85	0.00	25.92	2.85
Elbow Elev (if None, Leave 'BLANK')			1895.1	1.1	3.37	0.00	25.99	3.37
Length of Outlet ('BLANK' if none)			1895.2	1.2	3.86	0.00	26.07	3.86
Outlet Type		Cantilever	1895.3	1.3	4.35	0.00	26.14	4.35
Outlet Elevation (ft)		1876	1895.4	1.4	4.82	0.00	26.21	4.82
Tailwater Elev (if unknown, leave 'Blank')			1895.5	1.5	5.29	6.16	26.28	6.16
Auxiliary Spillway Elev (ft)		1905	1895.6	1.6	5.75	12.32	26.35	12.32
Maximum Headwater Elev (ft)		1905	1895.7	1.7	6.13	18.48	26.42	18.48
Elev Increment After Full Pipe Flow		1	1895.8	1.8	6.52	24.63	26.49	24.63
Basic Output			1895.9	1.9	6.90	30.79	26.56	26.56
Full Pipe Flow - Max. Outflow (cfs):		32.27	1896.0	2.0	7.29	36.95	26.63	26.63
Full Pipe Flow - Max. Velocity (fps):		23.11	1897.0	3.0			27.31	27.31
			1898.0	4.0			27.98	27.98
			1899.0	5.0			28.63	28.63
			1900.0	6.0			29.27	29.27
Barrel Area (Sq Ft):		1.40	1901.0	7.0			29.89	29.89
Kp:		0.01022	1902.0	8.0			30.50	30.50
Friction Slope (HW at the A.S. Crest):		0.08476	1903.0	9.0			31.10	31.10
Pipe Slope:		0.13254	1904.0	10.0			31.69	31.69
Outlet Elbow Angle (deg):		0.0	1905.0	11.0			32.27	32.27
Km:		0.00000						
Tailwater Elev Used For Full Pipe Flow:		1876.8						

Notes & Warnings

Annual Yield and Sediment Storage

Project: Travis Shaffer
Calculations By: Angela Roman
Checked By: *A. Roman 3/1/13*

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

Input Data <table border="1" style="border-collapse: collapse; width: 150px;"> <tr><td>Isogram # =</td><td style="text-align: center;">2</td></tr> <tr><td>Curve Number =</td><td style="text-align: center;">84</td></tr> <tr><td>Contributing Acres =</td><td style="text-align: center;">389.8</td></tr> <tr><td>% chance =</td><td style="text-align: center;">50</td></tr> </table> runoff= 1 inches	Isogram # =	2	Curve Number =	84	Contributing Acres =	389.8	% chance =	50	$\frac{\text{Contributing Acres} \times \text{Inches of Runoff}}{12} = \boxed{32.5} \text{ ACFT}$ Storage at Prinicipal Spillway = 0.0 ACFT
Isogram # =	2								
Curve Number =	84								
Contributing Acres =	389.8								
% chance =	50								

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

Input Data <table border="1" style="border-collapse: collapse; width: 150px;"> <tr><td>Erodibility Area =</td><td style="text-align: center;">P</td></tr> <tr><td>Gross Rate =</td><td style="text-align: center;">0.0034</td></tr> <tr><td>Drainage Area =</td><td style="text-align: center;">389.8</td></tr> <tr><td>Delivery Rate =</td><td style="text-align: center;">24</td></tr> <tr><td>Design Life =</td><td style="text-align: center;">25</td></tr> </table>	Erodibility Area =	P	Gross Rate =	0.0034	Drainage Area =	389.8	Delivery Rate =	24	Design Life =	25	<25% cultivated Median-Minimum- fields are primarily no till and some grass
Erodibility Area =	P										
Gross Rate =	0.0034										
Drainage Area =	389.8										
Delivery Rate =	24										
Design Life =	25										

Gross Rate * Drainage Area* Delivery Rate*Years = 8.0 ACFT

Available Sediment Storage = 0.0 years

REF:
 EFM 2-83 Method A

DRILLING LOG DOCUMENTATION

Cooperator Travis Schaeffer County Stanley Date 8/16/12
Practice Pond Cons. District _____ Hole No. _____
Farm _____ Tract _____ Field _____ R _____ Soil Name #2 FL
Investigator K. Paken P. Sisneros Hole El. _____ Drilling Location _____

Depth, feet	Unified Symbol	Group Name Soil Material	Description of Material					Permeability Group*	Other: (Concrections, Stratification, Moisture Content, etc.)
			Depth feet	Munsell Color	USDA Texture	Unified Classification	Geological Material (Oxidized ?)	WT:	
0			0-1.5			CL			original
5			1.5-5			CH			flaked scales
10									
15									
20									
25									

Notes:

Agricultural Waste Management Field Handbook, Chapter 10									
Unified Symbols and Group Names					Table 10D-3 (1161 test results)				
Symbol	Group Name	Soil Group	Median K, cm/s	Median K, ft/d	Unified Class	Perm Group I	Perm Group II	Perm Group III	Perm Group IV
GW	Well graded gravel, gravel-sand mix, few fines	I	7.2x10-4	2.0	CH	N	N	S	U
GP	Poorly graded gravel, gravel-sand mix, few fines	I	3.5x10-4	1.0	MH	N	S	U	S
GC	Clayey gravel, gravel-sand-clay mix	I			CL	N	S	U	S
GM	Silty gravel, gravel-sand-silt mix	II	4.8x10-6	0.014	ML	N	U	S	N
SW	Well graded sand, gravelly sand with few fines	II	1.5x10-6	0.004	CL-ML	N	A	N	N
SP	Poorly graded sand, gravelly sand with few fines	II			GC	N	S	U	S
SC	Clayey sand, sand-clay mix	III	8.8x10-7	0.0025	GM	S	U	S	S
SM	Silty sand, sand-silt mix	III	2.1x10-7	0.0006	GW	A	N	N	N
CL	Lean inorganic clay, low to medium plastic	IV	4.9x10-7	0.0014	SM	N	N	U	S
CH	Fat inorganic clay, gravely/sandy/silty clay	IV	3.5x10-8	0.0001	SC	A	N	N	N
CL-ML	Silty Clay				SW	A	N	N	N
OL	Organic silts and organic silty clays, low plasticity				SP	A	N	N	N
OH	Organic silt/clay, medium to high plasticity				GP	A	N	N	N
ML	Inorganic silt, very fine sand, low plastic								
MH	Inorganic silt, fine sand or silty soils								

Location In Section (X)



RECEIVED

MAR 20 2013

DRILLING LOG DOCUMENTATION

WATER RIGHTS
PROGRAM
Date

Cooperator Travis Schaffer County Stanley Hole No. 1 So. side
Practice Pond Cons. District Stanley Co.
Farm _____ Tract _____ Field _____ R _____ Soil Name _____

Investigator K. Rauken/P. Sinner Hole El. _____

Drilling Location _____

Depth, feet	Unified Symbol	Group Name Soil Material	Description of Material					Permeability Group*	Other: (Concretions, Stratification, Moisture Content, etc.)
			Munsell Color	USDA Texture	Unified Classification	Geological Material (Oxidized?)	WT:		
0									
5					CH				
10					CH				
15									
20									
25									

Notes:

Agricultural Waste Management Field Handbook, Chapter 10									
Unified Symbols and Group Names					Table 10D-3 (1161 test results)				
GW = Well graded gravel, gravel-sand mix, few fines					Soil Group	Median K, cm/s	Median K, ft/d	Unified Class	Perm Group
GP = Poorly graded gravel, gravel-sand mix, few fines					I	7.2x10-4	2.0	CH	N S U
GC = Clayey gravel, gravel-sand-clay mix					I	3.5x10-4	1.0	MH	N S U S
GM = Silty gravel, gravel-sand-silt mix					II	4.8x10-6	0.014	CL	N S U S
SW = Well graded sand, gravelly sand with few fines					II	1.5x10-6	0.004	ML	N A N N
SP = Poorly graded sand, gravelly sand with few fines					III	8.8x10-7	0.0025	CL-ML	N S U S
SC = Clayey sand, sand-clay mix					III	2.1x10-7	0.0006	GC	S U S S
SM = Silty sand, sand-silt mix					IV	4.9x10-7	0.0014	GM	A N N N
CL = Lean inorganic clay, low to medium plastic LL < 50						3.5x10-8	0.0001	GW	S S S S
CH = Fat inorganic clay, gravely/sandy/silty clay LL > 50								SM	S S S S
CL-ML = Silty Clay								SC	N N U S
OL = Organic silts and organic silty clays, low plasticity								SW	A N N N
OH = Organic silt/clay, medium to high plasticity								SP	A N N N
ML = Inorganic silt, very fine sand, low plasticity LL < 50								GP	A N N N
MH = Inorganic silt, fine sand or silty soils LL > 50									

Location In Section (x)



N

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

Proposed Pipe

Description	16" SDR 25
D_o	17.4 in
SDR or SDR?	SDR 25
wall thickness, t	0.696 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	12.1	ft
unit weight of soil, γ_s	120	psf
water ht. above pipe, h_w	0	ft
P_s	1452	psf
W_s	2105.4	lb/ft

VACUUM

P_v	0	psf
U_i	16.008	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_f	1	
W_L	32	lb/ft
P_w	22	psf

Total Load	1,474	psf
$P_s + P_w + P_v$		

1. Wall Crushing (solid wall pipe)

Thrust in pipe wall, T_{pw}	1,069	lb/ft
Required wall area, A_{pw}	0.045	in ² /in
Thickness, t	0.696	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'	200	(see table 52-2)

Using Eq. 52-29 for SDR pipe

Deflection (% $\Delta X / D$)	4.85	%
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'	0.665	
Moment of Inertia, I_{pw}	0.028	in ⁴ / in
Modulus of soil reaction, E'	200	psi
Allowable buckling, q_a	22.54	psi
Reduction factor, C	0.65	
Adj. allow. Buckling, $q_a C$	14.61	psi
$q_a C$	2,104	psf
Total pressure, P	1,474	psf

Proposed Pipe okay for wall buckling

4. Strain (solid wall pipe)

Max strain, flexure, e_f	0.0064	
Max strain, hoop strain, e_h	0.0003	
e_h due to external load?	Yes	
Max combined strain, e	<u>0.0061</u>	$e = e_f - e_h$
Allowable strain, e_{all}	0.05	Proposed Pipe okay for strain

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SD-ENG-57
Rev. 10/09

DOCUMENTATION FOR HAZARD CLASSIFICATION

Producer: **Hollingsworth-Shaffer** Name of Site: **378 Pond**
County: **Stanley**
Field #: Watershed:
Location
1/4 Section: **SE** Section: **12** Township: **4N** Range: **26E**
Latitude: Longitude:

Dam in Series: **No**

Explain:

Dam and Reservoir Data

Assumed Job Class	III
Assumed Hazard Class	A
Centerline Elevation Channel Bottom*	1874.5
Centerline Elevation Flood Plain*	1888
Centerline Elevation Top of Dam*	1903.6
Centerline Elevation Auxiliary Spillway Crest*	1901
*Elevation is based on Mean Sea Level Datum	

Max. Depth of Water within Reservoir **20 Ft.**

*assuming proposed borrow areas

Storage

Storage Below Principal Spillway	26 Ac.-Ft.
Storage between Principal Spillway and Auxiliary Spillway	12.3 Ac.-Ft.
Storage between Auxiliary Spillway and Top of Dam	12.5 Ac.-Ft.
Other-proposed borrow area	4 Ac.-Ft.
Total Storage to Top of Dam	54.8 Ac.-Ft.

Downstream Conditions

1. Valley Conditions Downstream of Structure	Parallel
Approximate Slope of Channel	1%
2. Stream Channel Size	Depth 13 Ft.
	Bottom Width 11 Ft.
	Top Width 125 Ft.
3. Valley Characteristics	Width 76 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 Paved Township or Paved County Road, D>2' Other, Describe:			☐	☒
			☐	☒
			☐	☒
Bridges: Describe type and opening size			☐	☒
Railroads: Major Railroad, Describe:			☐	☒
Buildings and Utilities: Farm Building(s) Public, Industrial or Commercial Buildings Rel. Import. Utility serving mult. rural users			☐	☒
			☐	☒
			☐	☒
			☐	☒
Describe:				

Location:

Is Dam located within five miles of urban development?

No

Describe Potential Development:

Located 4 miles South and 5 miles East of Hayes, SD. Site is in rough terrain and near the bottom of Plum Creek.

Rational For Determining Hazard Class:

Site is located 9 miles from nearest town. Development in this area is unlikely. There are no roads or buildings for 3+ miles downstream of site.

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

III

Hazard Analysis by: Angela Roman

Date: 3/18/2013

Approved by

Angela Roman

Date: 3/18/13

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

Hollingsworth Watershed output

Tuesday, Jul 10 2012

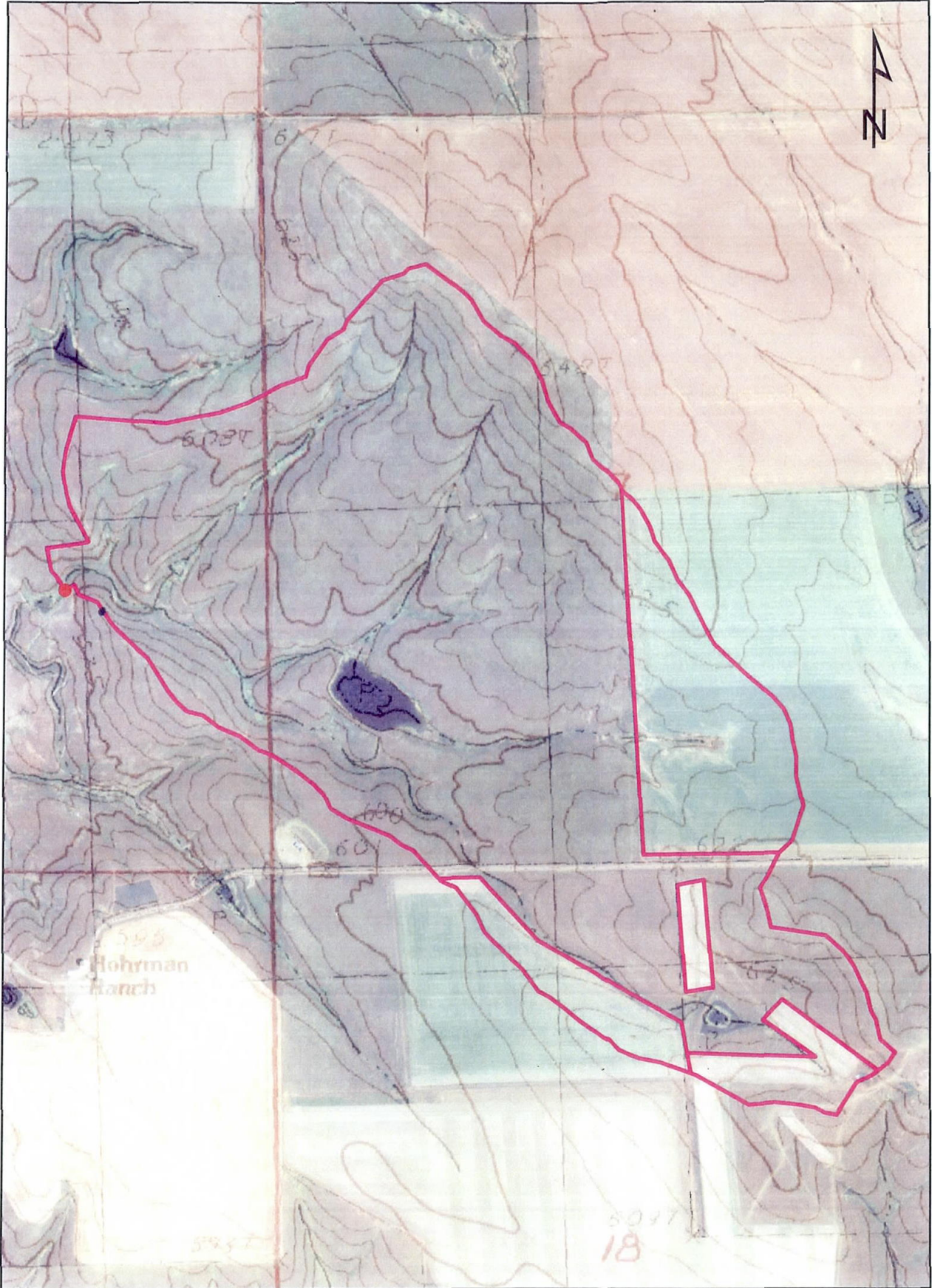
Field number 1 rcn is 84 -- Rangeland-- Fair

Field number 1 area is 23.8 Acres

The Longest Flow Length is 2001.7 Feet

The Average Slope for the watershed is 9.66 %

Hollingsworth - Shaffer
12-4N-26E



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1 inch equals 1,000 feet

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Hollingsworth Watershed output

Tuesday, Jul 10 2012

Field number 1 rcn is 84 -- Rangeland-- Fair

Field number 1 area is 23.8 Acres

The Longest Flow Length is 2001.7 Feet

The Average Slope for the watershed is 9.66 %

Water Permit Application No. 2708-2
Hollingsworth Shaffer Ranch Partnership
c/o Travis Shaffer

Top of Dam Elev. - 1903.6
2nd Spillway Elev. - 1901
P. Spillway Elev. - 1898
Dis Emb. Toe Elev. - 1874.4

Cat. 3 - low Hazard Dam

Ht. = 29.2 ft.

Normal Storage Capacity - 30 Ac.-Ft.
Int. Storage Capacity - 42.3
Max. Storage Capacity - 54.8

Int. Capacity x Eff. Ht. = $42.3 \times 19.9 = 841.8 < 3000 \therefore 25 \text{ yr.}$
Minimum Spillway Design

From USGS WRI 98-4055 "Tech. Ser. Est. Peak flows ... in SD"
Region D DA = 390 Ac. = 0.61 mi.²

$$\begin{aligned} Q_{25} &= 676 CA^{.585} \\ &= 676 (0.61)^{.585} \\ &= 676 (.7489) \\ &= \underline{506 \text{ cfs}} \end{aligned}$$

$$\begin{aligned} Q_{100} &= 1270 CA^{.663} \\ &= 1270 (0.61)^{.663} \\ &= 1270 (.7206) \\ &= \underline{915 \text{ cfs}} \end{aligned}$$

Secondary Spillway Capacity

$$\begin{aligned} Q &= CLH^{3/2} \quad C = 2.6 \\ &= 2.6 (120)^{1.5} \quad L = 120 \\ &= 1309 \text{ cfs} \quad H = 2.6 \end{aligned}$$

NRCS Annual Yield

$$DA = 390 \text{ Ac} \quad CN = 84 \quad ISO = 2$$

Section 74:02:08:09

1. Topo Map - OK
2. Dam Axis Profile - OK
3. Dam Max Section - OK
4. Area Capacity - OK
5. Outlet Details - OK
6. Spillway Routing - OK
7. Spillway Details - OK
8. Specs - S&H NRCS - OK
9. EPP - N/A - Cat 3 - OK

$$\begin{aligned} 80\% \text{ chance} &= 0.45 \\ 0.45 \times 390/2 &= \underline{15 \text{ Ac.-Ft}} \end{aligned}$$

$$\begin{aligned} 50\% \text{ chance} &= 1.0 \\ 1.0 \times 390/2 &= \underline{32.5 \text{ Ac.-Ft}} \end{aligned}$$

$$\begin{aligned} 10\% \text{ chance} &= 3.4 \\ 3.4 \times 390/2 &= \underline{114 \text{ Ac.-Ft}} \end{aligned}$$



SE 1/4, Section 12, Township 4 North, Range 26W
Stanley County, South Dakota

LOCATION MAP

Project Location

Hollingsworth-Shaffer Ranch Partnership
378 Pond
Stanley County, South Dakota

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TABLE OF QUANTITIES			
ITEM	UNIT	QUANTITY	AS-BUILT
Earthfill Class S - Embankment including 5%	Cu. Yd.	22,312	
Earthfill Class S - Principal Spillway Install	Cu. Yd.	258	
Earthfill Class S - Core Trench	Cu. Yd.	916	
Earthfill Class S - Stripping	Cu. Yd.	1,196	
Total Earthfill	Cu. Yd.	24,682	
Principal Spillway - Excavation	Cu. Yd.	258	
Auxiliary Spillway - Excavation	Cu. Yd.	676	
Seeding (Earthfill and Auxiliary Spillway)	Acre	2.3	
Principal Spillway Pipe			
16" Dia. SDR 25 AWWA C905 PVC Pipe	Lin. Ft.	137	
36" Dia. 4' Tall Riser and Base with Trash Rack and Baffle	Each	1	
	Each	1	
Drainage Diaphragm	Each	1	
Timber Pipe Support	Each	1	

GENERAL NOTES

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

CONSTRUCTION NOTES

- Clear and grub the entire area within the work limits.
- 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.
- Any shale, gravel, or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
- Six inches topsoil will be incorporated into the earthfill to meet the neat lines shown on the typical section.
- All areas top-dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD-28.

Contact Information:
Travis Shaffer
605-280-0693

NRCS HAZARD CLASS A
NRCS JOB CLASS III

SD CONSTRUCTION AND
MATERIAL SPECIFICATIONS

SD-4 Stripping
SD-5 Excavation
SD-7S Earthfill - Class S
SD-8 Rock Rip Rap and Bedding
SD-10 Salvaging And Spreading Topsoil
SD-12B Concrete for Minor Structures
SD-13 Steel Reinforcement
SD-14 Wood and Steel Structures
SD-28 Seeding
SD-55 Plastic Pipe
SD-592 Geotextile Fabric Material

For A Full Text Version See
http://www.sd.usda.gov/technical/SD_Engineering.html

INDEX OF DRAWINGS

- Cover Sheet
- Location Map and Design Data
- Plan View
- Detailed Plan View
- Profile of Principal Spillway
- Profile of Dam
- Concrete Riser
- Trash Screen
- Timber Pipe Outlet Structure
- Sand Anti-Seep Collar

STATEMENT OF COMPLIANCE

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

JAA Date

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

POND WITH PRINCIPAL SPILLWAY PIPE
JOB PLAN 1.0P REV. 1/2012

HOLLINGSWORTH-SHAFFER
378 POND
COVER SHEET



File No.
H-S.dwg

Drawing No.
-

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Sheet 1 of 10

Date
Designed A. Roman 3/1/13
Drawn A. Roman 3/19/13
Checked DRE 3/19/13
Approved Angela Roman 3/20/13

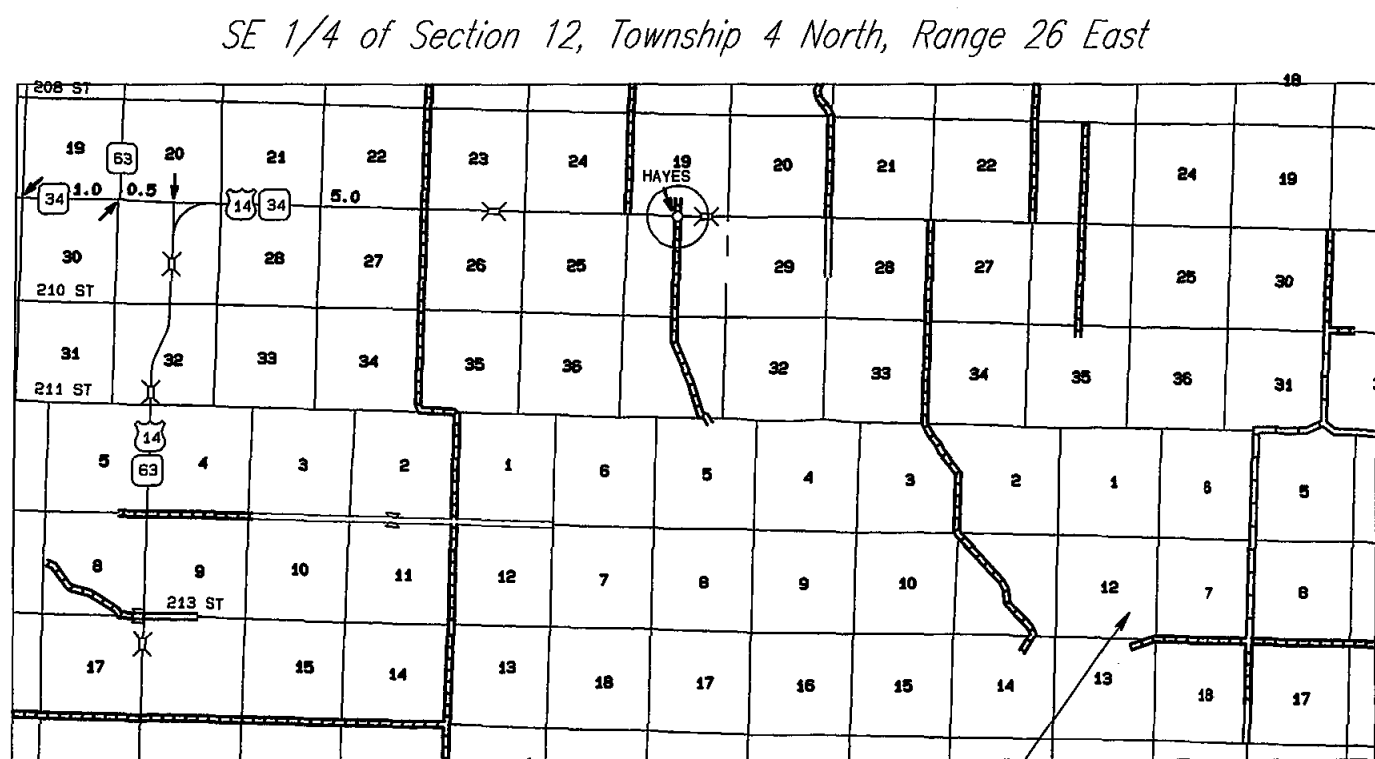
Stanley County, South Dakota
SE 1/4, Sec 12, T 6 N, R 26E

HYDRAULIC DATA		
Drainage Area	389.8	Acres
Annual Runoff Yield (50% Chance)	32.5	Ac. Ft
Time of Concentration	0.83	Hours
Runoff Curve Number	84	
Principal Spillway, 2 Year - 24 Hour Rainfall	2.1	Inches
Auxiliary Spillway, 25 Year - 24 Hour Rainfall	4	Inches
Peak Runoff 2 Year - 24 Hour Rainfall	194.1	CFS
Principal Spillway Discharge	30.8	CFS
Peak Runoff 25 Year - 24 Hour Rainfall	590.7	CFS
Auxiliary Spillway Discharge	463.4	CFS
Auxiliary Spillway Flow Depth	1.57	Feet

STRUCTURE DATA		
Length of Top of Dam	743	Feet
Water Depth to Crest of Principal Spillway	16	Feet
Height of Downstream Toe to Top of Dam	29.2	Feet
Effective Height	19.9	Feet
Product of Storage X Effective Height	841.8	

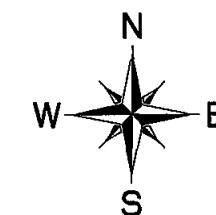
POOL DATA			
	ELEV.	AREA	STORAGE
Crest of Principal Spillway	1,898	3.65 Ac.	30 Ac.-Ft
Crest of Auxiliary Spillway	1,901	4.56 Ac.	42.3 Ac.-Ft
Top of Dam	1,903.6	5.3 Ac.	54.8 Ac.-Ft

SEDIMENT YIELD					
Erodibility Area	Gross Rate (A.F./Ac./Yr.)	Drainage Area (Acres)	Delivery Rate (%)	Design Period (Years)	Required Sediment Volume (Ac.-Ft.)
P	0.0011	389.8	24	50	15.9



Proposed Dam Location

Coordinate Table				
Pt #	Northing	Easting	Elevation	Descriptor
683	10039.9144	9492.5686	1903.60	CL Dam Station 4+98.06
685	9800.8730	9724.8899	1903.60	CL Dam Station 1+64.72
686	9835.0472	9886.0235	1903.60	CL Dam Station 0+00
1089	10357.5966	9502.1666	1901.00	CL Auxiliary Sta 11+02.67
2	10,000.0000	10,000.0000	1918.2	Base
3199	10422.0219	9451.6051	1901.00	CL Aux Sta. 11+84.57
3432	10446.6743	9404.6889	1901.00	CL Auxiliary Sta. 12+37.50
3473	10258.8255	9530.2076	1901.00	CL Auxiliary Sta. 10+00.0
3927	10277.4499	9431.8037	1903.60	CL Dam Sta. 7+42.99



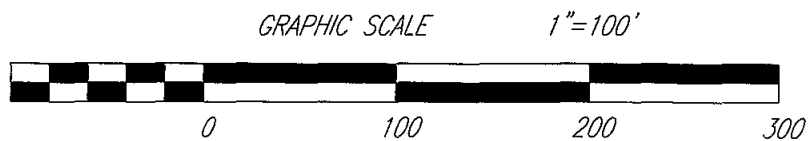
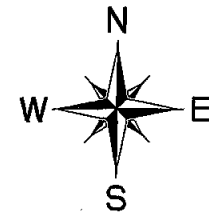
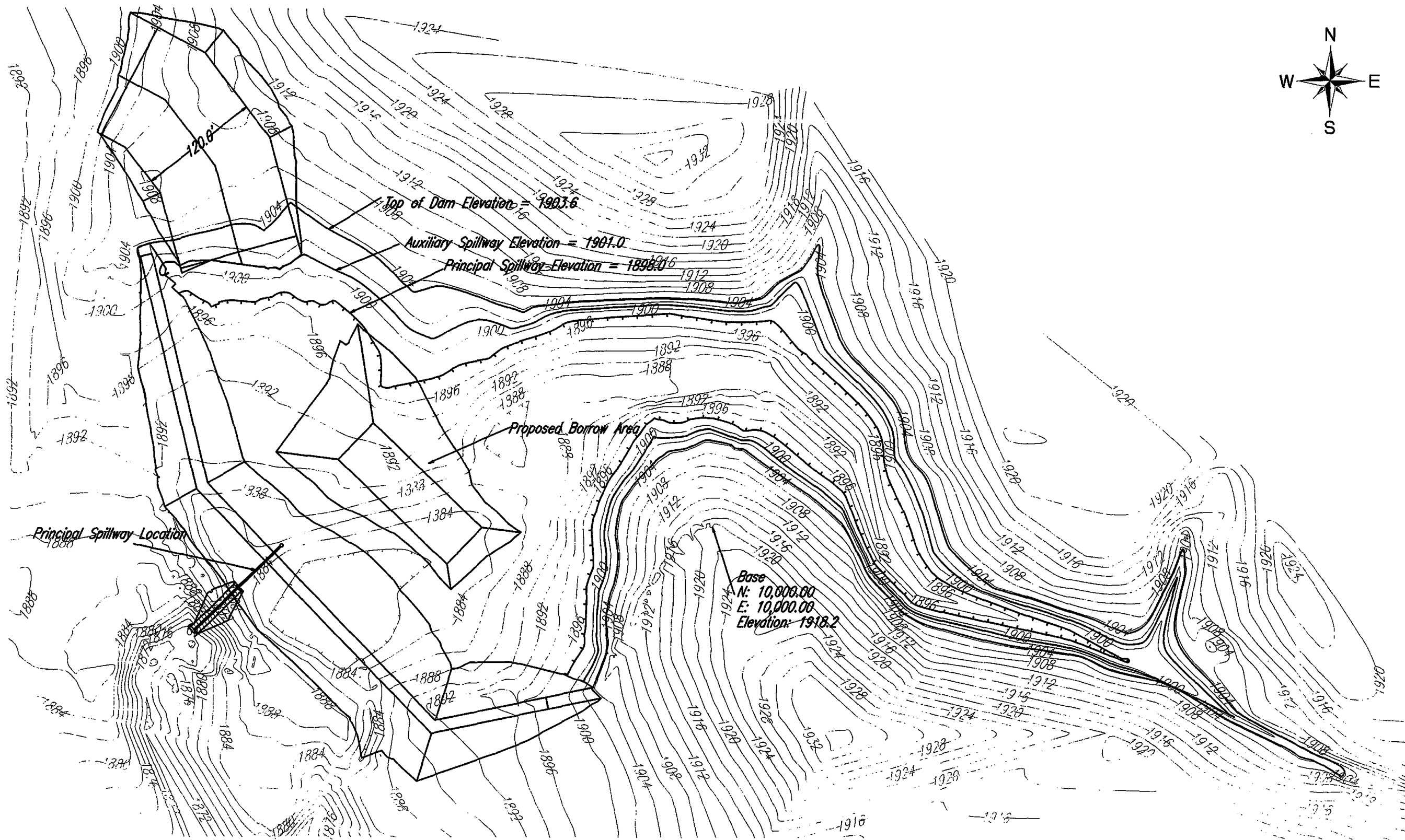
Date 3/19/2013
 Designed A. Roman
 Drawn A. Roman
 Checked 3/19/13
 Approved Angela Roman 3/20/13

PRODUCER Hollingsworth-Shaffer
 SE 1/4 SECT. 12 T. 4 North R. 26 East
 Stanley COUNTY
 Hughes-Stanley CONSERVATION DISTRICT

USDA - NRCS
 FIELD SUPPORT OFFICE
 1717 N. LINCOLN AVE. SUITE 104
 PIERRE, SOUTH DAKOTA 57501

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 Natural Resources Conservation Service
 United States Department of Agriculture

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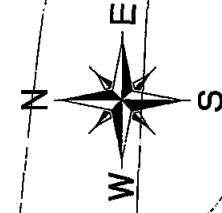
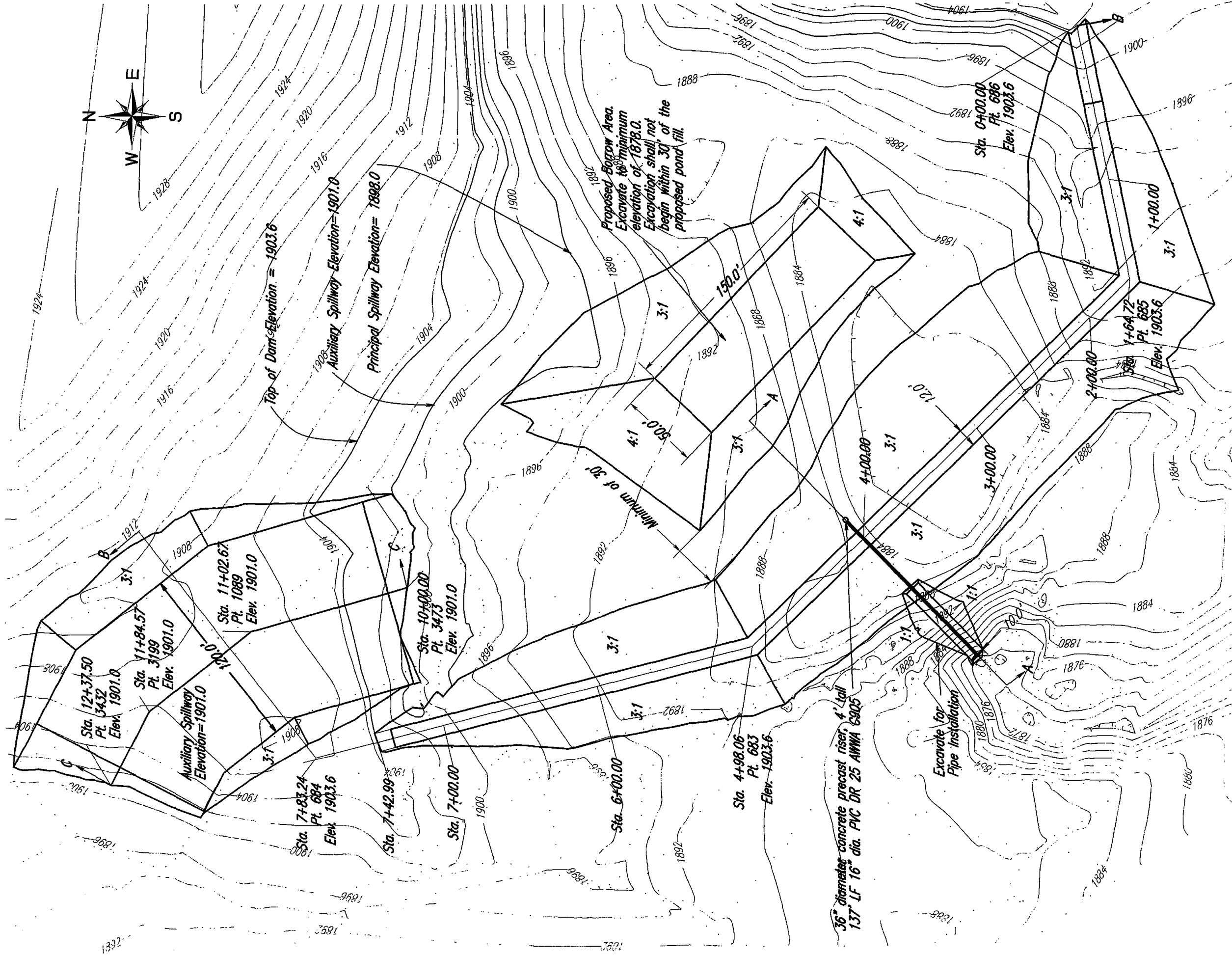
Designed	A. Roman	Date	3/20/2013
Drawn	A. Roman		3/20/2013
Checked	DBE		3/20/2013
Approved	<i>[Signature]</i>		3/20/2013

PRODUCER Travis Shaffer
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Stanley COUNTY
Hughes-Stanley CONSERVATION DISTRICT

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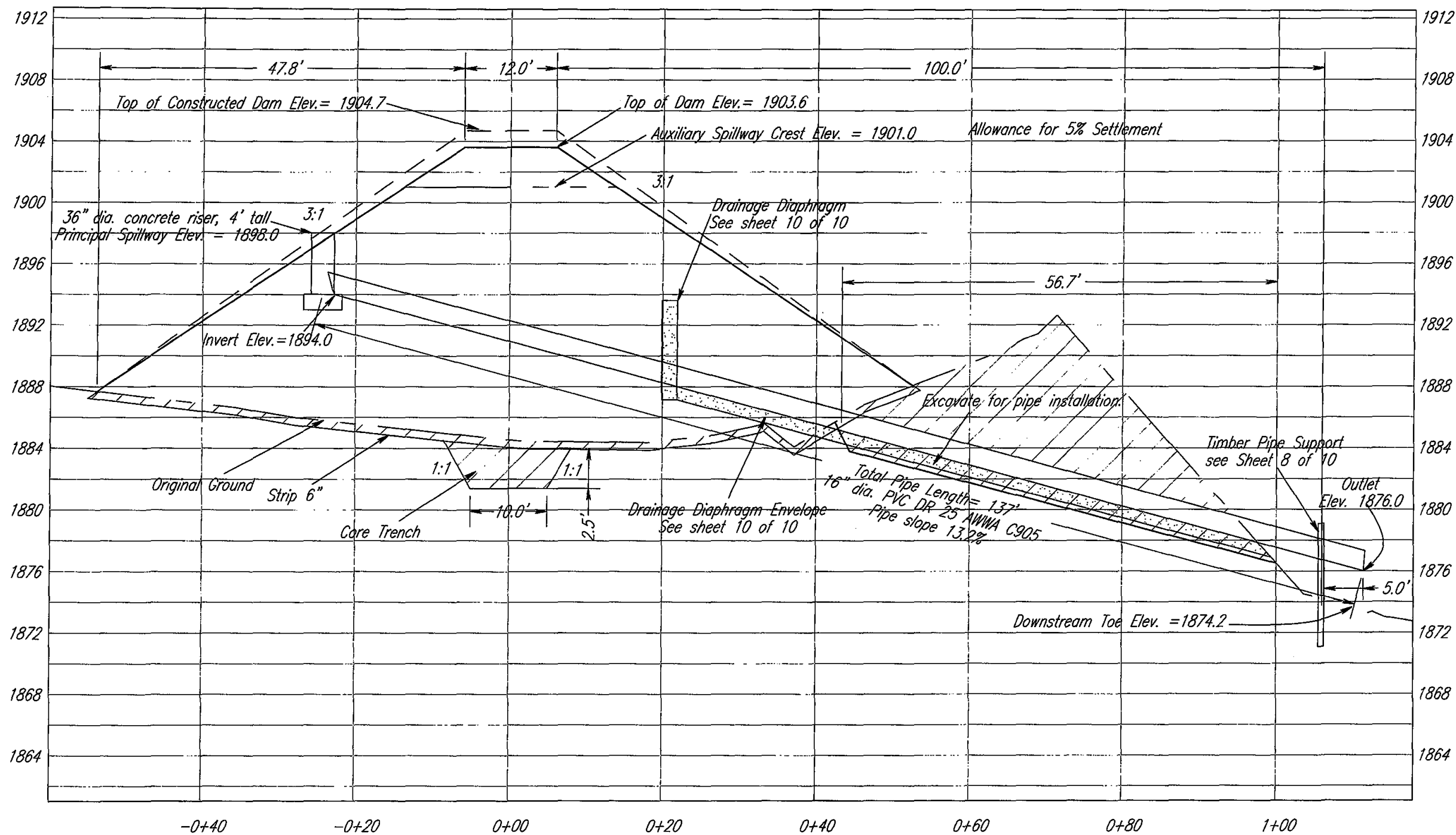


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Stanley COUNTY
Hughes-Stanley CONSERVATION DISTRICT

Date
Designed A. Roman 3/19/2013
Drawn A. Roman 3/19/2013
Checked D.B.E. 3/19/13
Approved Angela Roman 3/20/13



DROP INLET SPILLWAY PROFILE A-A
Horizontal Scale: 1"=15' Vertical Scale: 1" = 7.5'

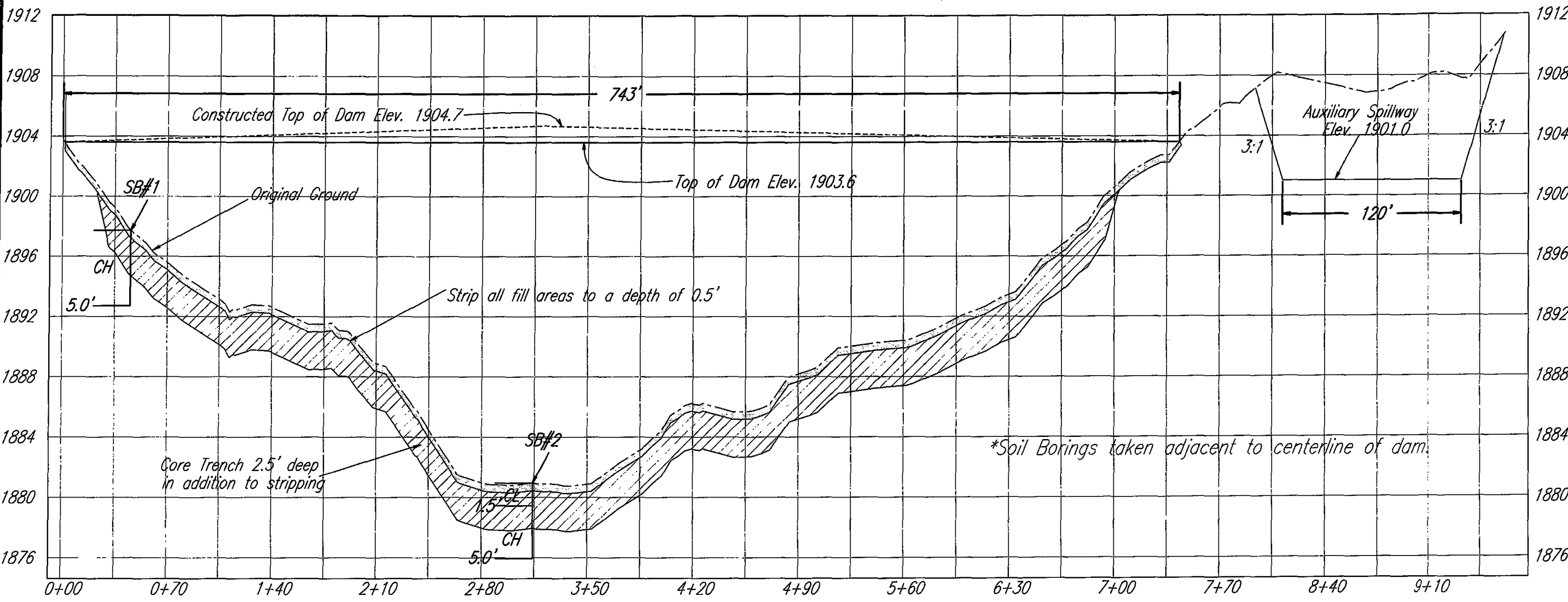
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Drawn	A. Roman
Checked	DBE
Approved	Angela Roman

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SE 1/4 SECT. 12 T. 4 North R. 26 East
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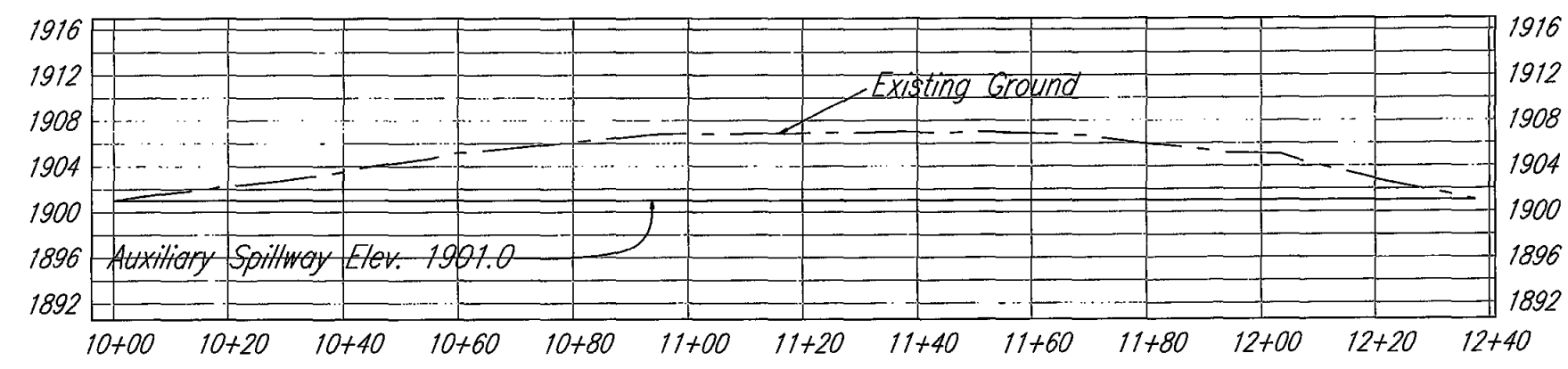
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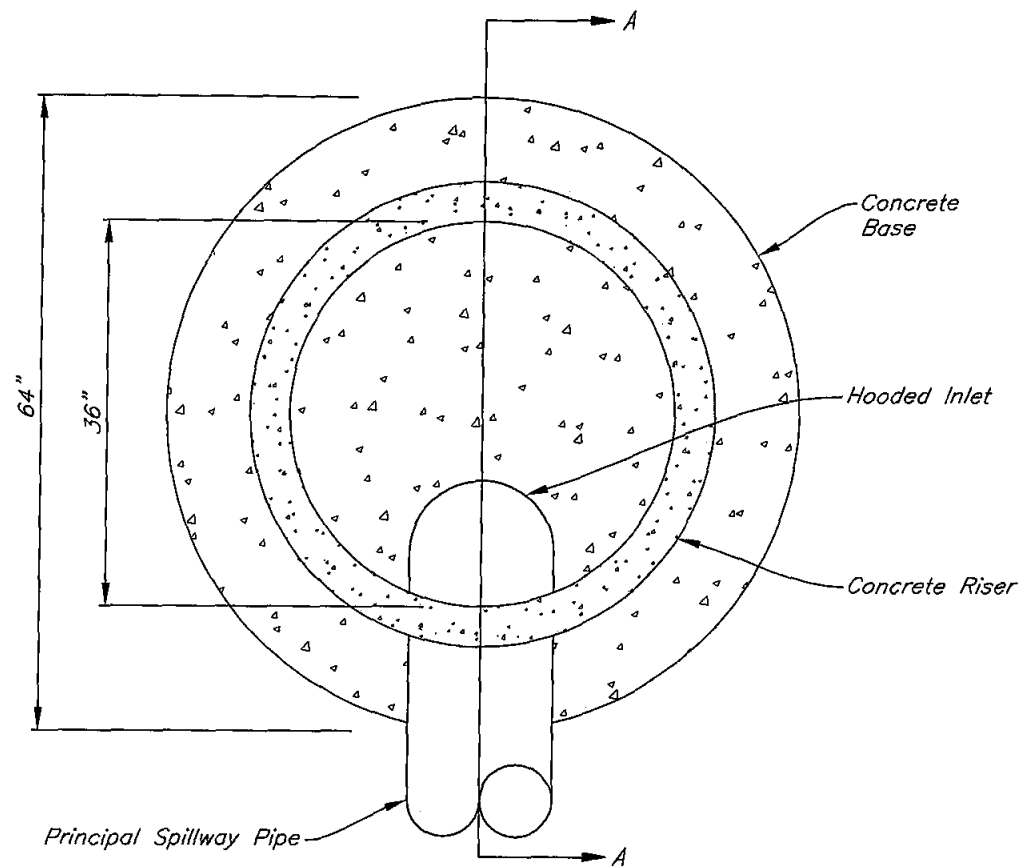


PROFILE OF DAM AND CROSS SECTION OF AUXILIARY SPILLWAY B-B
Horizontal Scale: 1"=70' Vertical Scale: 1" = 7'



AUXILIARY SPILLWAY PROFILE C-C
Horizontal Scale: 1"=30' Vertical Scale: 1" = 15'

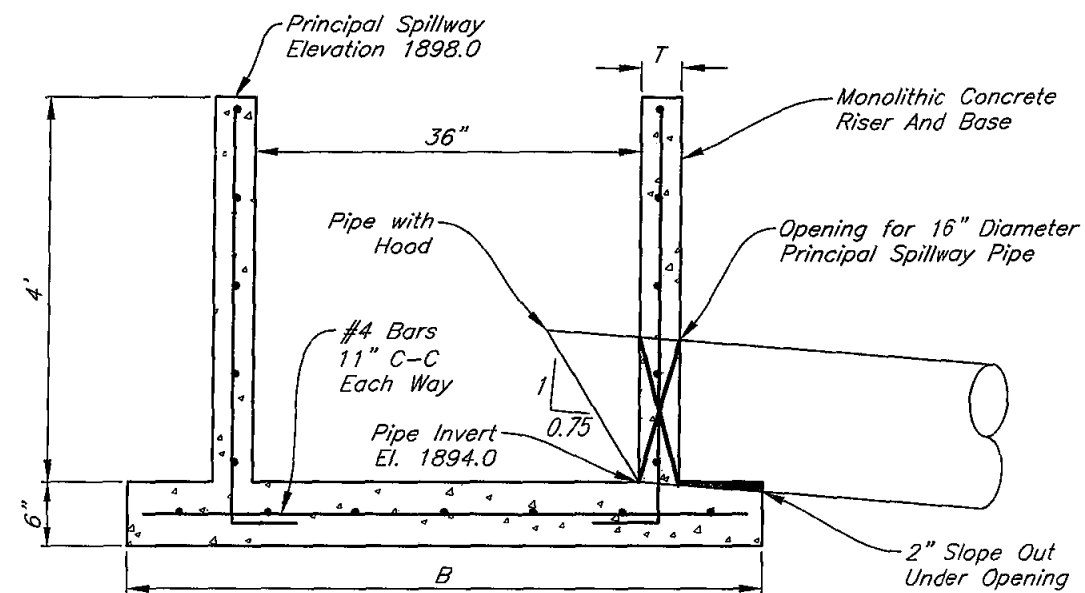
Date 3/20/2013	
Designed A. Roman	Drawn A. Roman
Checked DBE	Approved <i>[Signature]</i>
PRODUCER Hollingsworth-Shaffer	
SE 1/4 SECT. 12, T. 4 North R. 26 East	
Stanley COUNTY	
Hughes-Stanley CONSERVATION DISTRICT	
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PLAN VIEW PRECAST RISER AND BASE

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.



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

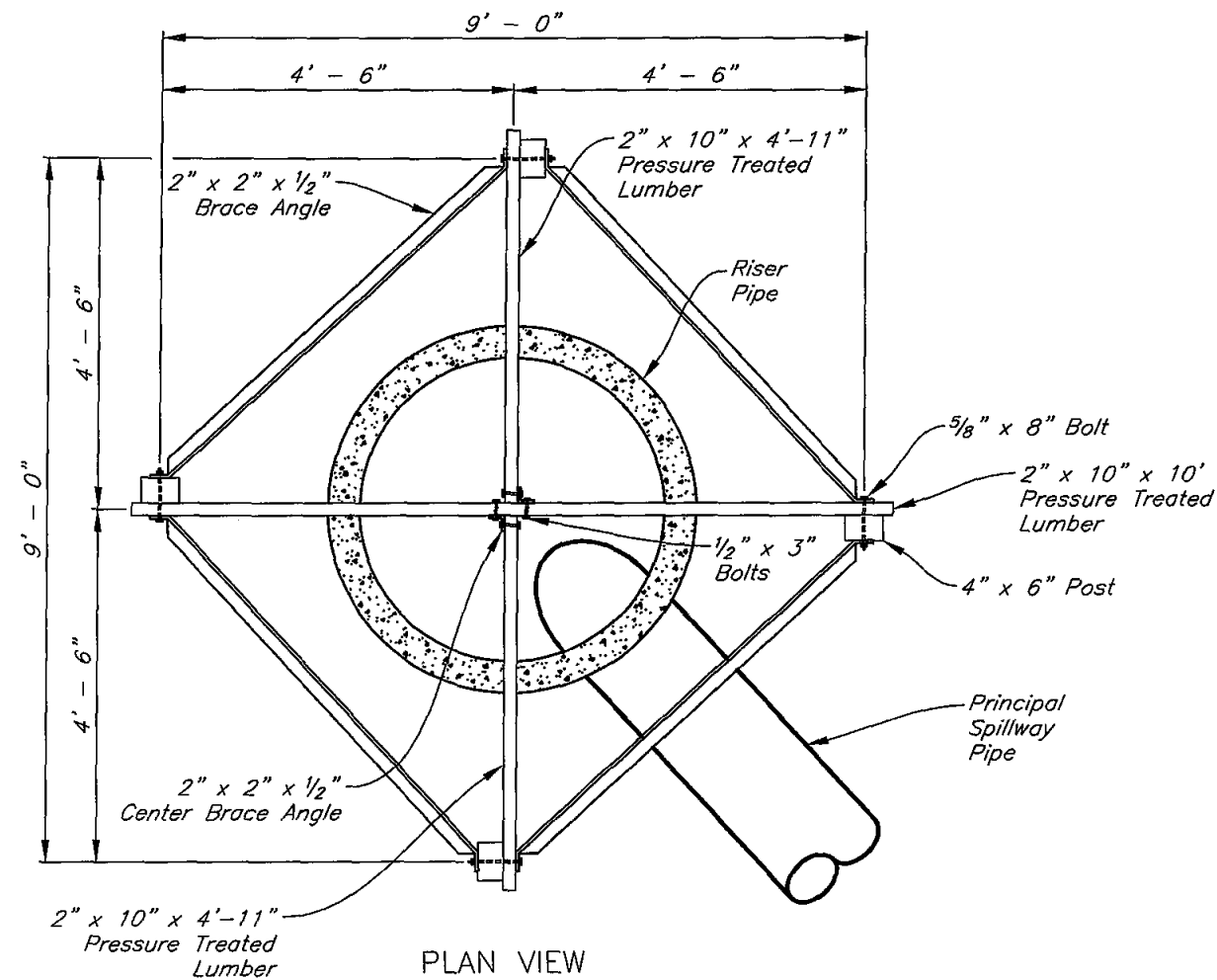
HOLLINGSWORTH-SHAFFER
378 POND
PRECAST CONCRETE RISER AND BASE WITH HOODED INLET



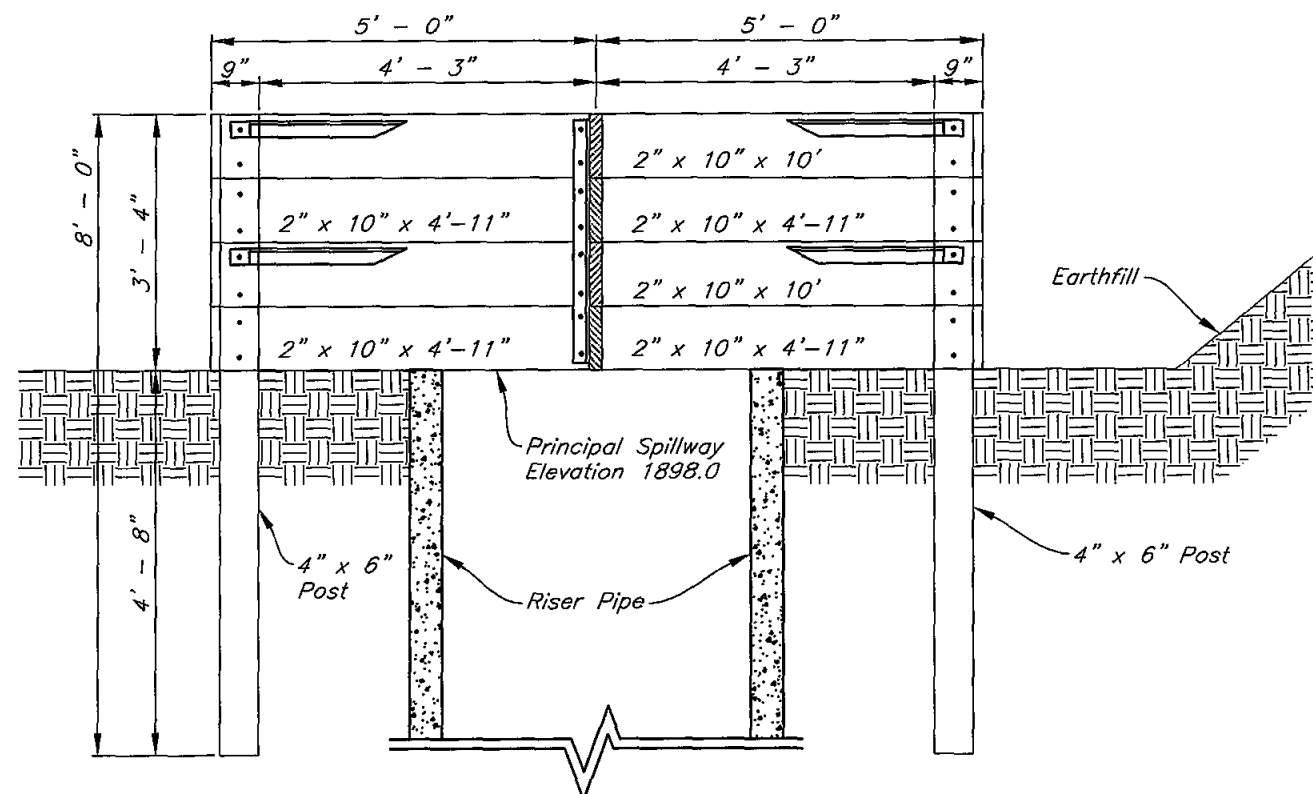
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3/1/13
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A. Roman
Drawn
A. Roman
Checked
3/18/13
3/19/13
Approved
3/20/13

Stanley County, South Dakota
SE 1/4, Sec 12, T 6 N, R 26 E



PLAN VIEW



SIDE VIEW

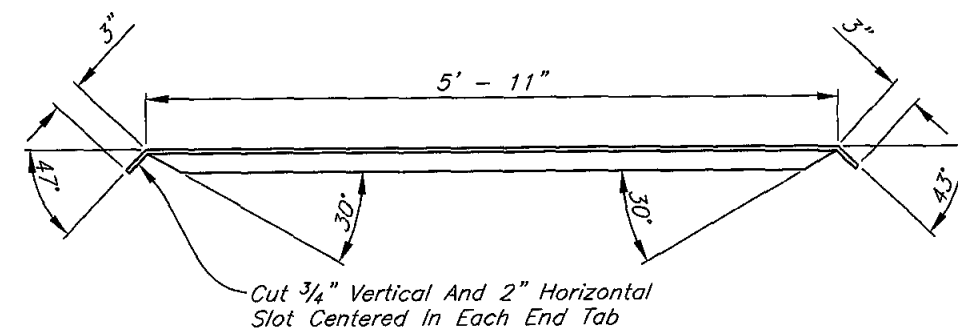
TABLE OF QUANTITIES			
ITEM	LENGTH OR SIZE	UNIT	QUANTITY
4" X 6" Pressure Treated Post	8 Ft	Each	4
2" X 10" Pressure Treated Lumber	10 Ft	Each	4
2" X 10" Pressure Treated Lumber	4' - 11"	Each	8
2" X 2" X 1/4" Steel Angle	6' - 5"	Each	8
2" X 2" X 1/4" Steel Angle	3' - 2"	Each	2
Steel Bolt (with nut and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

CONTRACTOR NOTES

1. Alternative trash rack and baffle may be used with PRIOR approval from NRCS. Submit photos and drawings to local NRCS office to request approval.



PLAN VIEW OF BRACE ANGLE

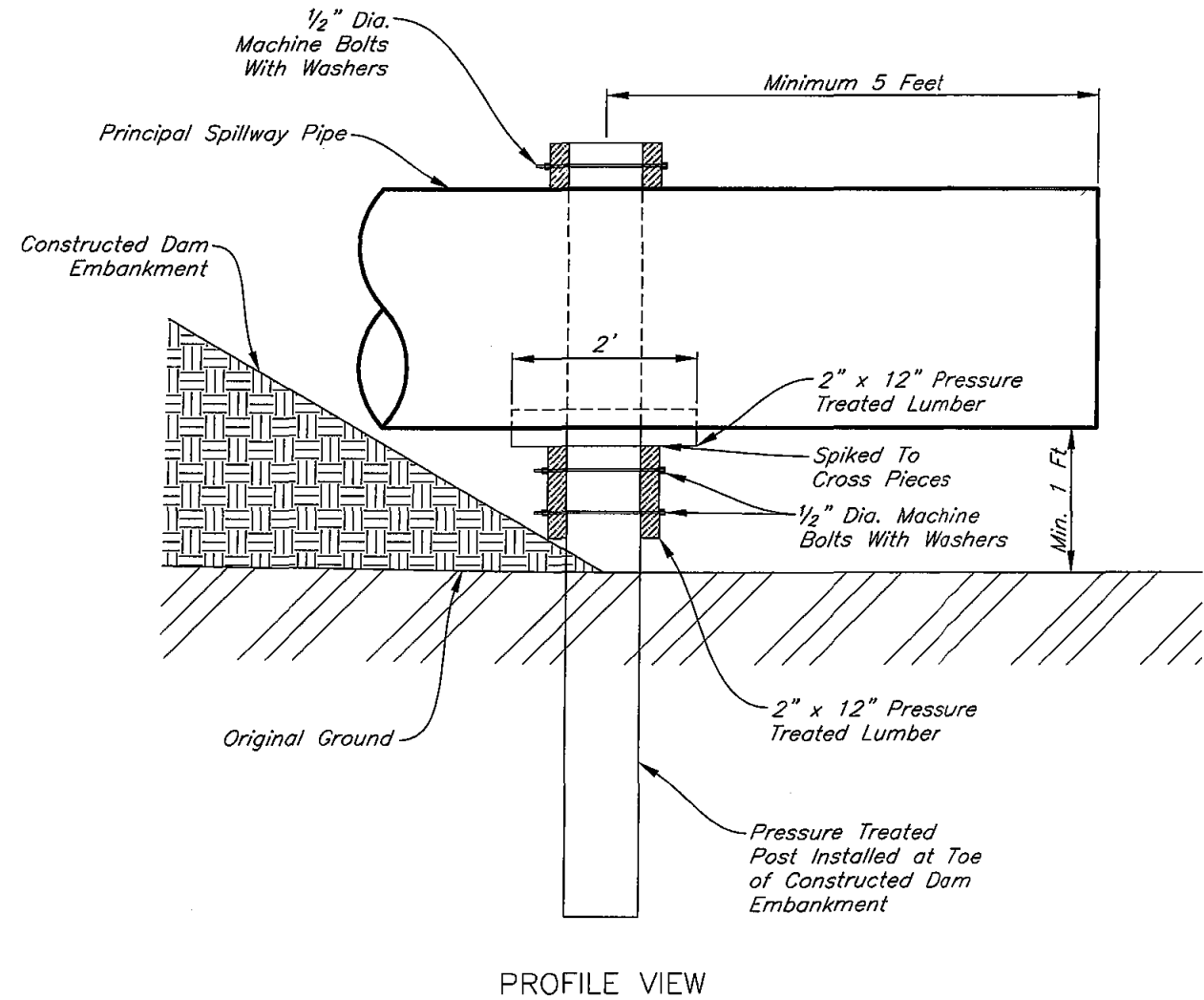
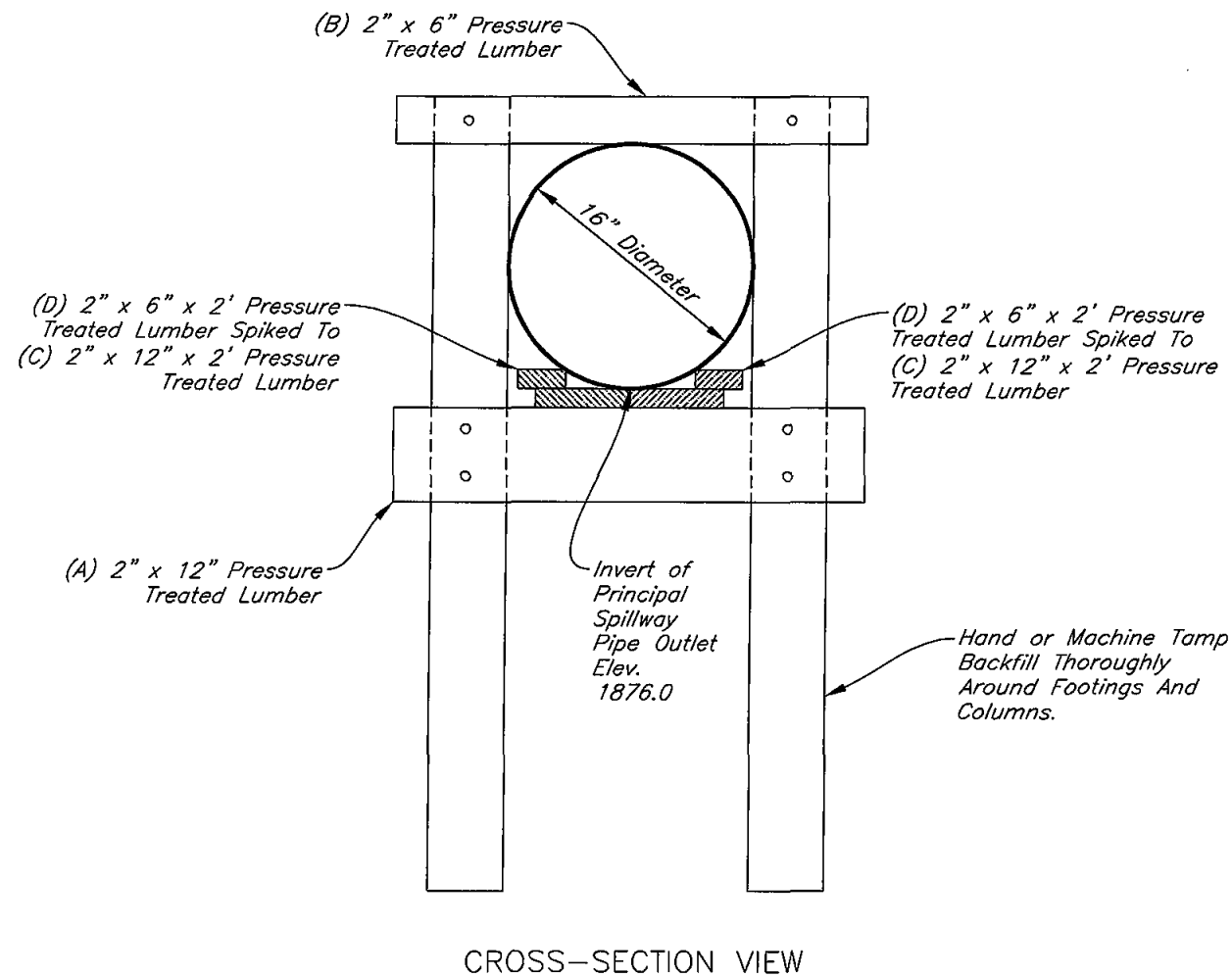
TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"
JOB PLAN NO. 6.4 REV. 1/2012

Designed A. Roman 3/1/13
Drawn A. Roman 3/18/13
Checked J. Roman 3/18/13
Approved J. Roman 3/18/13

HOLLINGSWORTH-SHAFFER
378 POND
TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"
Stanley County, South Dakota
SE 1/4, Sec 12, T 6 N, R 26 E

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File No.
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Drawing No.
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Sheet 8 of 10



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		
(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

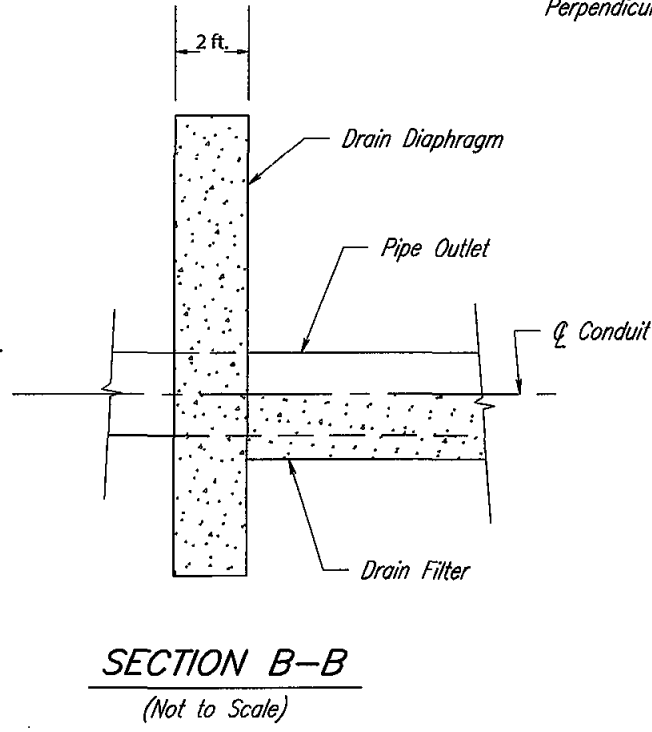
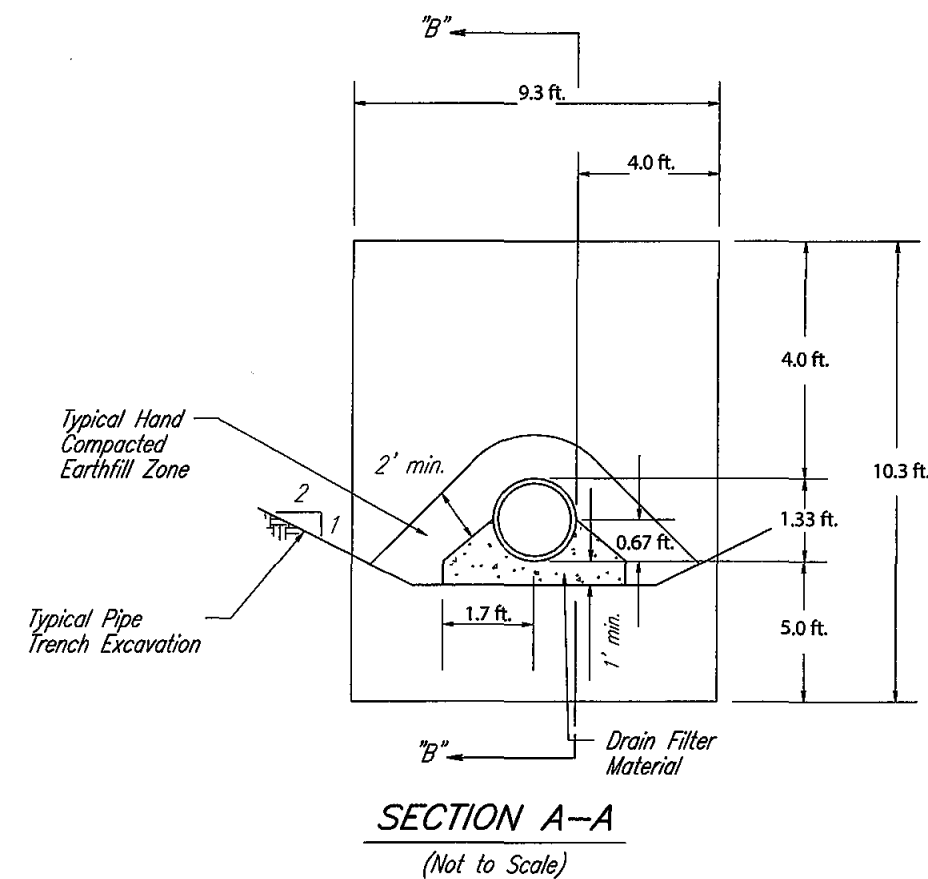
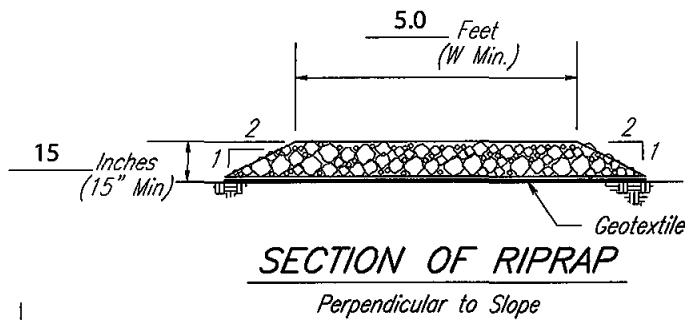
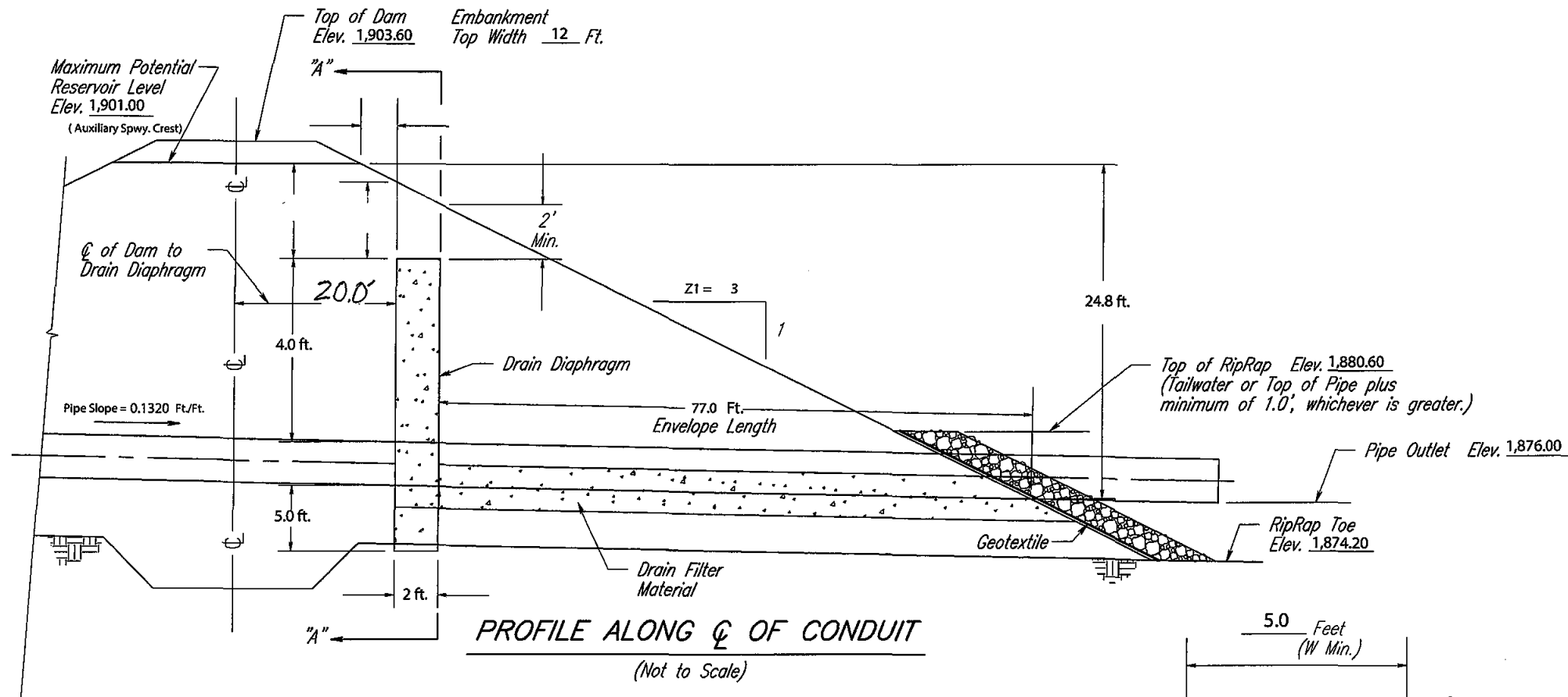
HOLLINGSWORTH-SHAFFER
378 POND
TIMBER PIPE SUPPORT

Designed A. Roman 3/1/13
Drawn A. Roman 3/18/13
Checked J. Roman 3/19/13
Approved J. Roman 3/20/13



File No.
H-S.dwg
Drawing No.
-
3/18/13 6:17 PM
Sheet 9 of 10

SE 1/4, Sec. 12, T 6 N, R 26E Stanley County, South Dakota



SUMMARY OF DESIGN AND DIMENSIONS

DESIGN DATA	
H = 16.4 Feet	Hd = 24.75 Feet
X = 4.0 Feet	D = 16 Inches
R = 5.0 Feet	Y = 4.0 Feet
C = Feet	Aggregate Gradation #1
Embankment Backslope (Z1) = 3.0 Pipe Slope (S) 0.1320 Ft./Ft.	
DIMENSIONS	
W = 9.3 Feet	(Total Width of Drain Diaphragm)
T = 10.3 Feet	(Total Height of Drain Diaphragm)
t = 2 Feet	(Thickness of Single Filter)

ESTIMATED QUANTITIES

Drain Filter Material	19.0 Cubic Yards
Geotextile	22.5 Square Yards
Rock Riprap	7.0 Cubic Yards

DRAIN FILTER MATERIAL GRADATION

SIEVE SIZE	PERCENT PASSING
3/8 in.	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

ROCK RIPRAP GRADATION

PERCENT SMALLER	WEIGHT RANGE (LBS.)	AVERAGE CUBIC DIMENSION
100	50 lb.	10"
50-80	30 lb.	7"
15-50	10 lb.	5"
0-15	3 lb.	3"

CONSTRUCTION NOTES

- 1.) 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.
- 2.) The maximum height of drop of the Riprap onto the Geotextile in the pipe outlet area shall be 3 feet.

MATERIAL NOTES

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

DRAINAGE DIAPHRAGM DETAILS

JOB PLAN 3.8 (07/2009)

REVISIONS		
DATE	APPROVED	TITLE
07/21/2009	Jay B. Cobb	State Conservation Engineer

Designed	A. Roman	3/18/13
Drawn	A. Roman	3/18/13
Checked	A. Roman	3/18/13
Approved	Jana Schaefer	3/19/13

PRODUCER Hollingsworth-Shaffer
SE 1/4 SECTION 12 4N R. 26E
Stanley COUNTY
Hughes-Stanley CONSERVATION DISTRICT

USDA - NRCS
State Office Engineering Staff
200 Fourth Street SW
Huron, South Dakota 57350



File Name:	5016Plan_Drainage Diaphragm071213.dwg
Drawing No.	
Sheet	1 of 1



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

May 20, 2013

Hollingsworth-Shaffer Ranch Partnership
c/o Travis Shaffer
2400 E. Dakota Ave.
Pierre, SD 57501

Dear Mr. Shaffer:

We have reviewed the plans and specifications for your dam project located in the NW ¼ SE ¼ of Sec. 12-T4N-R26E, in Stanley County. The plans and specifications for the construction of the dam are approved. Approval of the plans and specifications does not authorize construction of the dam. The construction of the dam may not begin until Water Permit No. 2708-2 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 Hollingsworth-Shaffer Ranch Dam will be classified as a small size Category 3, Low Hazard dam with a dam height of 19.2 ft. and a normal storage capacity of 30 acre-feet and a maximum storage capacity of 54.8 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



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 2708-2, Hollingsworth-Shaffer Ranch Partnership**

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. 2708-2, Hollingsworth-Shaffer Ranch Partnership, c/o Travis Shaffer, 2400 E Dakota Avenue, Pierre SD 57501 .

The Chief Engineer is recommending APPROVAL of Application No. 2708-2 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. 2708-2 authorizes an impoundment with a storage capacity of 30 acre feet of water and sufficient water annually to maintain the water level to the 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.

Jeanne Goodman, Chief Engineer
May 15, 2013

REPORT ON
WATER PERMIT APPLICATION No. 2708-2
Hollingsworth-Shaffer Ranch Partnership
March 28, 2013

Water Permit Application No. 2708-2 has been filed by Hollingsworth-Shaffer Ranch Partnership, c/o Travis Shaffer to impound 30 acre-feet of water from runoff by constructing a dam located in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 12-T4N-R26E, in Stanley County. The application also requests impoundment of sufficient water to maintain water at the outlet elevation. The water will be used for fish and wildlife propagation, recreation and livestock water purposes.

Discussion:

The dam will be 29.2 feet high with a normal storage capacity of 30 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 54.8 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.

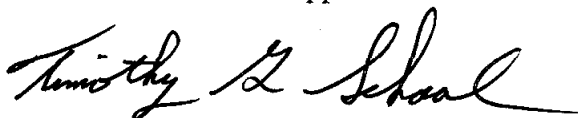
The dam has a drainage area of 390 acres or 0.61 square miles. The dam has a 36 inch diameter concrete riser with a 16 inch diameter PVC barrel with 5.6 feet of freeboard as the primary spillway, and a 120 foot wide earthcut spillway with 2.6 feet of available freeboard as the secondary spillway. A 25 year frequency event for this size drainage area produces a peak runoff of approximately 506 cfs and a 100 year frequency event produces a peak runoff of approximately 915 cfs. The earthcut secondary spillway will have a capacity of approximately 1300 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 15 acre-feet. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 32.5 acre-feet and the annual yield with a 10 percent chance, or 1 out of 10 years, is expected to be 114 acre-feet.

The Hollingsworth-Shaffer Ranch Dam will be located in the SE $\frac{1}{4}$ of Section 12-T4N-R26E on an unnamed tributary to Plum Creek, about 3.0 miles upstream of the confluence of the unnamed tributary and Plum Creek; and about 15 miles upstream of the confluence of Plum Creek and the Bad River. There are no existing Water Permits/Rights filed on the unnamed tributary or Plum Creek between the proposed dam and the Bad River.

Conclusions:

1. Water Permit Application No. 2708-2 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 domestic use should be a qualification on Water Permit Application No. 2708-2.



Timothy G. Schaal, P.E.
Engineer IV

RECEIVED

MAY 31 2013

Form 8

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:

5-30-13

Cost of Printing \$ 31.37

Marylinn Baker
(Signature)

Bookkeeper
(Title)

5-30-13
(Date Signed)

Public Notice

water to maintain
water to the outlet
elevation of
1,888.0 feet mean
sea level. The wa-
ter is for fish and
wildlife propaga-
tion, recreation
and livestock wa-
ter purposes.

Pursuant to
SDCL 46-2A-2,
the Chief Engineer
recommends AP-
PROVAL of Appli-
cation No. 2708-2
because 1) unap-
propriated water is
available, 2) exist-
ing rights will not
be unlawfully im-
paired, 3) it is a
beneficial use of
water, and 4) it is
in the public inter-
est in accordance
with SDCL
46-2A-23, the
Chief Engineer will
act on this appli-
cation, as recom-
mended, unless a
petition is filed op-
posing the appli-
cation or the appli-
cant files a petition
contesting the
Chief Engineer's
recommendation.
If a petition oppos-
ing the application
or contesting the
recommendation
is filed, then a
hearing will be
scheduled and the
Water Manage-
ment Board will
consider this ap-
plication. Notice of
the hearing will be
given to the appli-
cant and any per-
son filing a peti-
tion.

Any person inter-
ested in opposing
or supporting this
application or rec-
ommendation
must file a written
petition with
BOTH the appli-
cant and Chief En-
gineer. The appli-
cant must file a
petition if contest-
ing the Chief Engi-
neer's recommen-
dation. The Chief
Engineer's ad-
dress is "Water
Rights Program,
Foss Building, 523
E Capitol, Pierre
SD 57501 (605
773-3332)" and
the applicant's
mailing address is
given above. A
petition filed by ei-
ther an interested
person or the ap-
plicant must be
filed by June 10,
2013.

The petition may
be informal, but
must include a
statement describ-
ing the petitioner's
interest in the ap-
plication, the peti-
tioner's reasons
for opposing or
supporting the ap-
plication, and the
signature and
mailing address of
the petitioner or
the petitioner's le-
gal counsel, if le-
gal counsel is ob-
tained. Contact
Eric Gronlund at
the above Water

July 5/03
NOTICE OF
APPLICATION
NO. 2708-2 to
Appropriate
Water
Notice is given
that
Hottingsworth-
Shaffer Ranch
Partnership, c/o
Travis Shaffer,
2400 E Dakota
Ave, Pierre SD
57501 has filed
an application for
a water permit to
impound 30
acre-feet of water
from runoff by
constructing a
dam located in the
NW 1/4 SE 1/4
Section 12 with
water impounded
in the N 1/2 SE
1/4 Section 12; all
in T4N-R26E. This
application re-
quests impound-
ment of sufficient



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

May 20, 2013

Capital Journal
Po Box 878
Pierre SD 57501

ATTENTION: Legal Public Notice

Enclosed is a Notice on Application No. 2708-2 to Appropriate Water. Please publish the notice once on May 29, 2013. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352.

The applicant must verify to you that the notice is to be published and arrange for payment. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is Hollingsworth-Shaffer Ranch Partnership, c/o Travis Shaffer, 2400 E Dakota Ave, Pierre SD 57501 (Ph # 605-280-0693).

Please send the Water Rights Program an affidavit or the enclosed Proof of Publication form immediately.

The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
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 20, 2013

Hollingsworth-Shaffer Ranch Partnership
Travis Shaffer
2400 E Dakota Ave
Pierre SD 57501

Dear Mr. Shaffer:

Water Permit Application No. 2708-2 for fish and wildlife and livestock watering 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(s) 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(s) to authorize publication of your Notice and to arrange for payment. Early contact with the paper(s) 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

c: Angela Roman, NRCS Office, 1717 N Lincoln Ave # 104, Pierre SD 57501

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.

Instruction to Newspaper - Publish the Notice on May 29, 2013. The applicant is responsible for payment. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352 or email: Karen.schlaak@state.sd.us.

NOTICE OF APPLICATION NO. 2708-2 to Appropriate Water

Notice is given that Hollingsworth-Shaffer Ranch Partnership, c/o Travis Shaffer, 2400 E Dakota Ave, Pierre SD 57501 has filed an application for a water permit to impound 30 acre-feet of water from runoff by constructing a dam located in the NW 1/4 SE 1/4 Section 12 with water impounded in the N 1/2 SE 1/4 Section 12; all in T4N-R26E. This application requests impoundment of sufficient water to maintain water to the outlet elevation of 1,898.0 feet mean sea level. The water is for fish and wildlife propagation, recreation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2708-2 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on this application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 10, 2013.

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

Published once at the total approximate cost of _____.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

JUN 20 2013

Hollingsworth- Shaffer Ranch Partnership
Travis Shaffer
2400 E Dakota Ave
Pierre SD 57501

Dear Mr. Shaffer:

Enclosed is Water Permit No. 2708-2 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

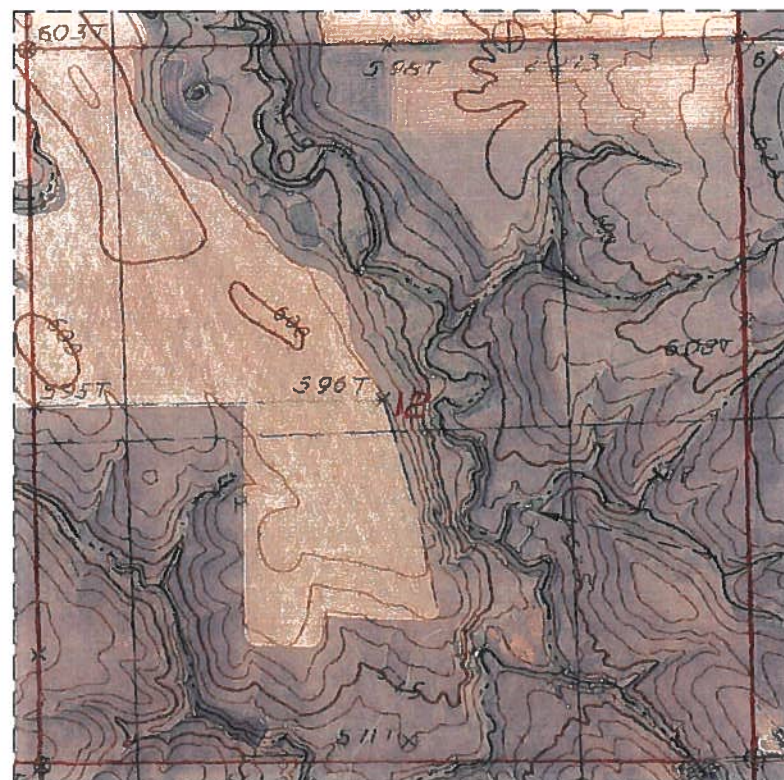
Form 10, *Notice of Completion of Works and Application of Water to Beneficial Use*, is enclosed. Please return this completed form after you have finished the system and have put the water to beneficial use. An investigation can then be scheduled so the water license may be issued, thus completing the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

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

Sincerely,

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

enclosures



SE $\frac{1}{4}$, Section 12, Township 4 North, Range 26W
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.

Contact Information:

Travis Shaffer
605-280-0693

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

SD-4 Stripping
SD-5 Excavation
SD-7S Earthfill - Class S
SD-8 Rock Rip Rap and Bedding
SD-10 Salvaging And Spreading Topsoil
SD-12B Concrete for Minor Structures
SD-13 Steel Reinforcement
SD-14 Wood and Steel Structures
SD-28 Seeding
SD-55 Plastic Pipe
SD-592 Geotextile Fabric Material

For A Full Text Version See
http://www.sd.usda.gov/technical/SD_Engineering.html

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

Hollingsworth-Shaffer Ranch Partnership 378 Pond Stanley County, South Dakota

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY	AS-BUILT
Earthfill Class S - Embankment including 5%	Cu. Yd.	22,312	23,723
Earthfill Class S - Principal Spillway Install	Cu. Yd.	258	258
Earthfill Class S - Core Trench	Cu. Yd.	916	916
Earthfill Class S - Stripping	Cu. Yd.	1,196	1,196
Total Earthfill	Cu. Yd.	24,682	26,093
Principal Spillway - Excavation	Cu. Yd.	258	258
Auxiliary Spillway - Excavation	Cu. Yd.	676	6,139
Seeding (Earthfill and Auxiliary Spillway)	Acre	2.3	
Principal Spillway Pipe			
16" Dia. SDR 25 AWWA C905 PVC Pipe	Lin. Ft.	137	140
36" 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

Seeding was not completed at time of construction inspection 9.25.2013. As built survey completed by Angela Roman, Kevin Paulsen, and Nick Hanna.

Change in Fill quantity for dam is a result of additional survey data collected when staking the site. Change in Excavation quantity for auxiliary spillway was result of a typo.

Original Plans approved by Angela Roman on March 20, 2013

NRCS HAZARD CLASS A
NRCS JOB CLASS III

STATEMENT OF COMPLIANCE

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

Angela Roman 10/18/13
JAA Date

POND WITH PRINCIPAL SPILLWAY PIPE
JOB PLAN 1.0P REV. 1/2012

Date 3/1/13
Designed A. Roman
Drawn A. Roman
Checked DBT
Approved Angela Roman 3/20/13

HOLLINGSWORTH-SHAFFER
378 POND
COVER SHEET

Stanley County, South Dakota

SE 1/4, Sec. 12, T 6 N, R 26E

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File No.
H-SAsbuilts.dwg

Drawing No.
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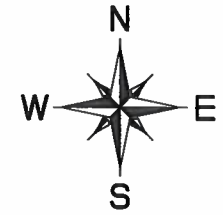
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Sheet 1 of 10

HYDRAULIC DATA		
Drainage Area	389.8	Acres
Annual Runoff Yield (50% Chance)	32.5	Ac. Ft
Time of Concentration	0.83	Hours
Runoff Curve Number	84	
Principal Spillway, <u>2</u> Year - 24 Hour Rainfall	2.1	Inches
Auxiliary Spillway, <u>25</u> Year - 24 Hour Rainfall	4	Inches
Peak Runoff <u>2</u> Year - 24 Hour Rainfall	194.1	CFS
Principal Spillway Discharge	30.8	CFS
Peak Runoff <u>25</u> Year - 24 Hour Rainfall	590.7	CFS
Auxiliary Spillway Discharge	463.4	CFS
Auxiliary Spillway Flow Depth	1.57	Feet

STRUCTURE DATA		
<i>Length of Top of Dam</i>	743	<i>Feet</i>
<i>Water Depth to Crest of Principal Spillway</i>	16	<i>Feet</i>
<i>Height of Downstream Toe to Top of Dam</i>	29.2	<i>Feet</i>
<i>Effective Height</i>	19.9	<i>Feet</i>
<i>Product of Storage X Effective Height</i>	841.8	

POOL DATA			
	ELEV.	AREA	STORAGE
<i>Crest of Principal Spillway</i>	1,898	3.65 Ac.	30 Ac.-Ft
<i>Crest of Auxiliary Spillway</i>	1,901	4.56 Ac.	42.3 Ac.-Ft
<i>Top of Dam</i>	1,903.6	5.3 Ac.	54.8 Ac.-Ft

SEDIMENT YIELD					
<i>Erodibility Area</i>	<i>Gross Rate (A.F./Ac./Yr.)</i>	<i>Drainage Area (Acres)</i>	<i>Delivery Rate (%)</i>	<i>Design Period (Years)</i>	<i>Required Sediment Volume (Ac.-Ft.)</i>
P	0.0011	389.8	24	50	15.9



The map displays a grid of numbered blocks. The top section shows blocks 19 through 36. The middle section shows blocks 1 through 18. The bottom section shows blocks 1 through 18. The map includes major roads like 206 St, 210 St, 211 St, 213 St, and 214 St. A specific location is marked with a circle and labeled 'HAYES' and '19'. The map also shows various landmarks, including a bridge over a river, and a compass rose indicating North.

*Proposed Dam Location**

Pt #	Northing	Easting	Elevation	Descriptor
683	10039.9144	9492.5686	1903.60	CL Dam Station 4+98.06
685	9800.8730	9724.8899	1903.60	CL Dam Station 1+64.72
686	9835.0472	9886.0235	1903.60	CL Dam Station 0+00
1089	10357.5966	9502.1666	1901.00	CL Auxiliary Sta 11+02.67
2	10,000.0000	10,000.0000	1918.2	Base
3199	10422.0219	9451.6051	1901.00	CL Aux Sta. 11+84.57
3432	10446.6743	9404.6889	1901.00	CL Auxiliary Sta. 12+37.50
3473	10258.8255	9530.2076	1901.00	CL Auxiliary Sta. 10+00.0
3927	10277.4499	9431.8037	1903.60	CL Dam Sta. 7+42.99

Date	
Designed	A. Roman 3/19/2013
Drawn	A. Roman 3/19/2013
Checked	DE 3/19/13
Approved	Angela Roman 3/20/13

Adults: A. Roman 10/18/13

PRODUCER Hollingsworth-Shaffer
SE 1/4 SECT. 12 T. 4 North R. 26 East
Stanley COUNTY
Hughes-Stanley CONSERVATION DISTRICT

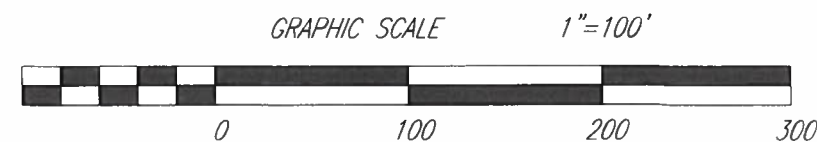
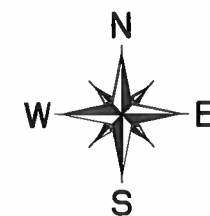
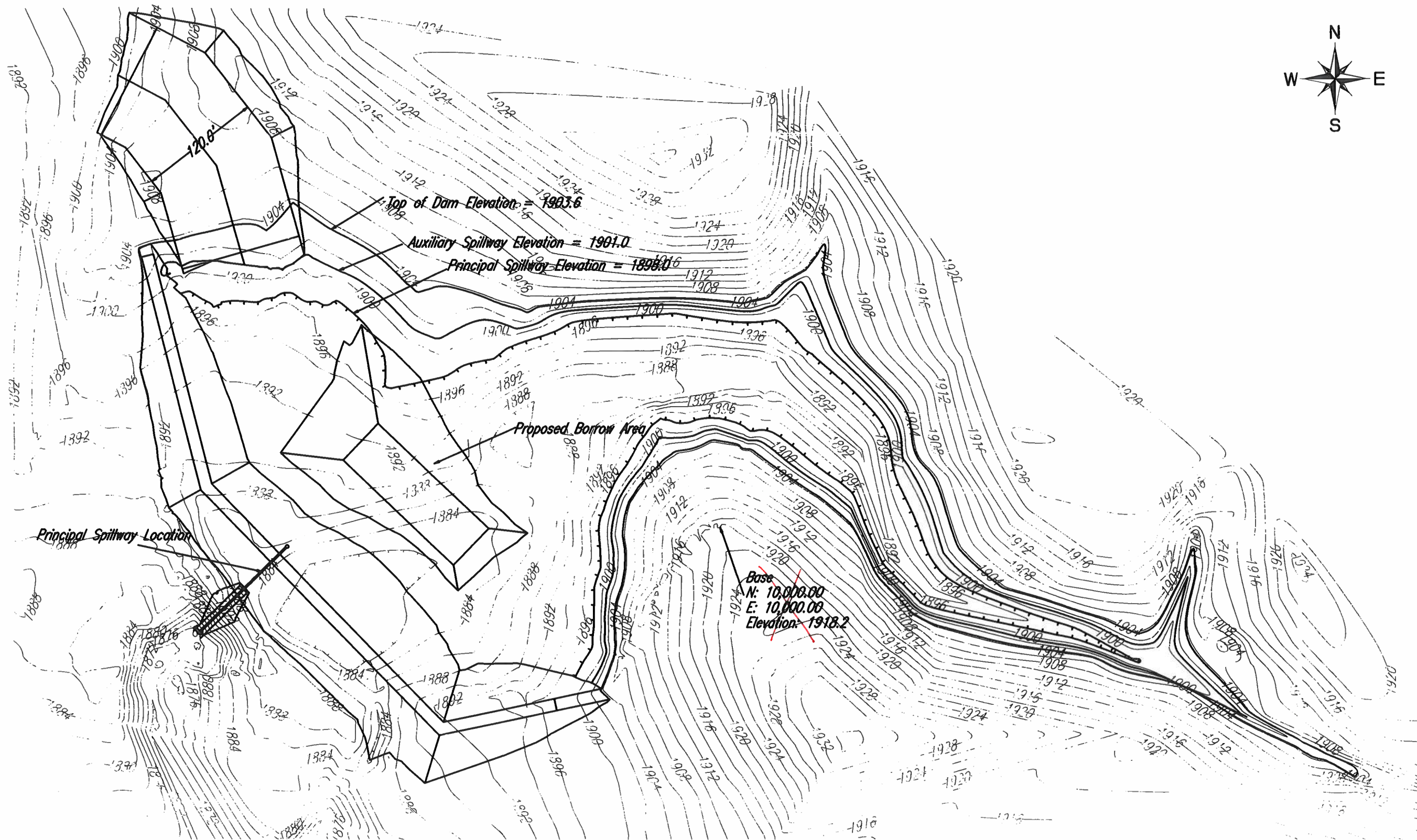
USDA - NRCS
FIELD SUPPORT OFFICE
1717 N. LINCOLN AVE. SUITE 104
PIERRE, SOUTH DAKOTA 57501

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name:
H-S.pro

Drawing No.

3/19/2013 3:19PM
Page 2 of 10



Designed	A. Roman	Date	3/20/2013
Drawn	A. Roman		3/20/2013
Checked	DBE		3/20/2013
Approved	Angela Roman		3/20/2013

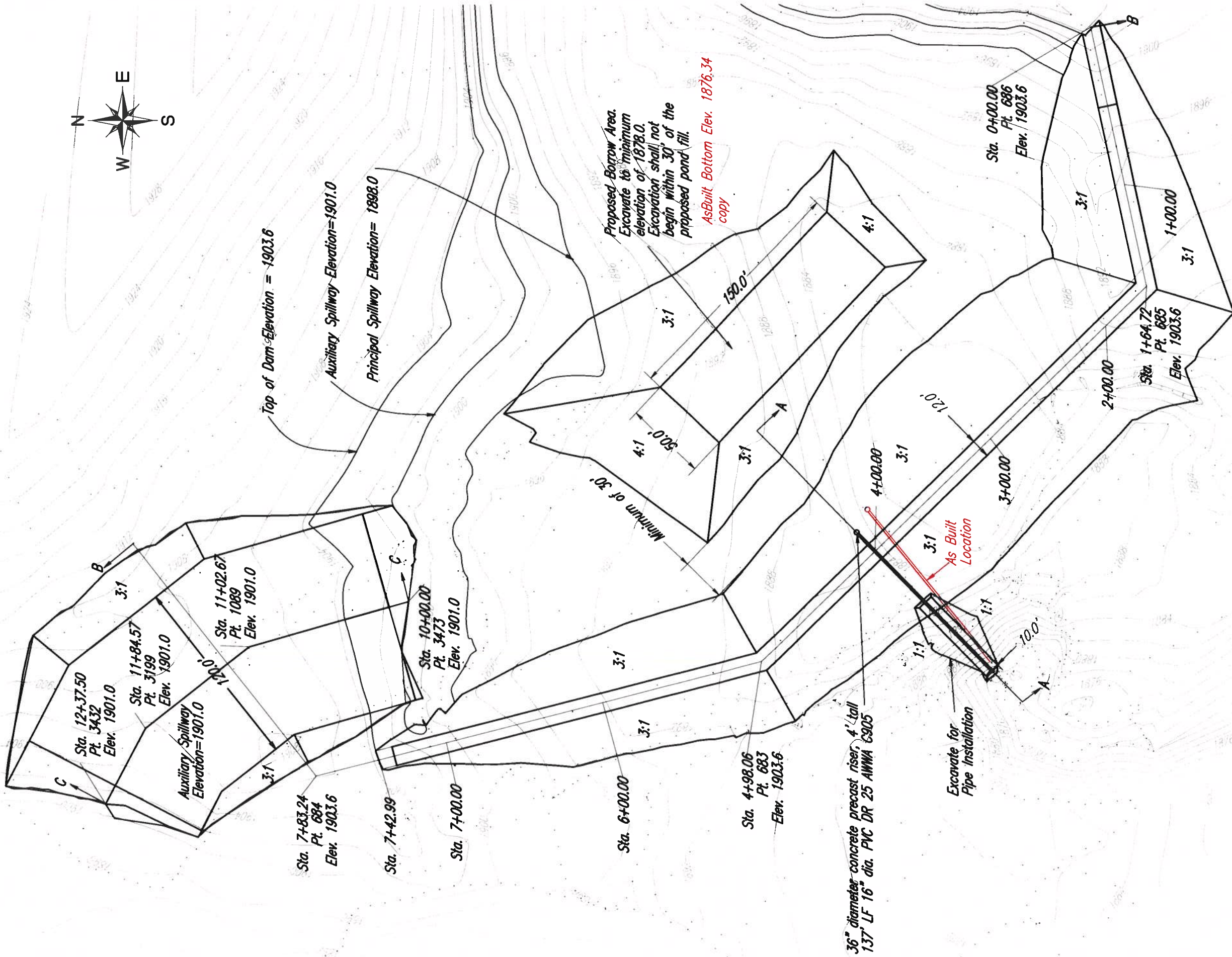
PRODUCER Travis Shaffer
 SE 1/4 SECT. 12 T. 4 North R. 26 East
 Stanley COUNTY
 Hughes-Stanley CONSERVATION DISTRICT

USDA - NRCS
 FIELD SUPPORT OFFICE
 1717 N. LINCOLN AVE. SUITE 104
 PIERRE, SOUTH DAKOTA 57501

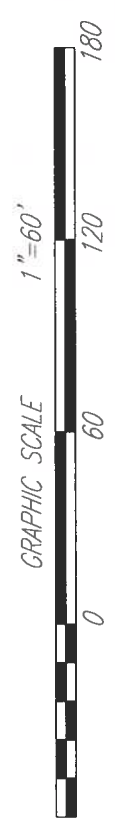
NRCS
 Natural Resources Conservation Service
 United States Department of Agriculture

File Name: H-8.pro
 Drawing No.
 3/20/2013 8:50AM
 Sheet 3 of 10

AsBuilt's Angela Roman 10/18/13

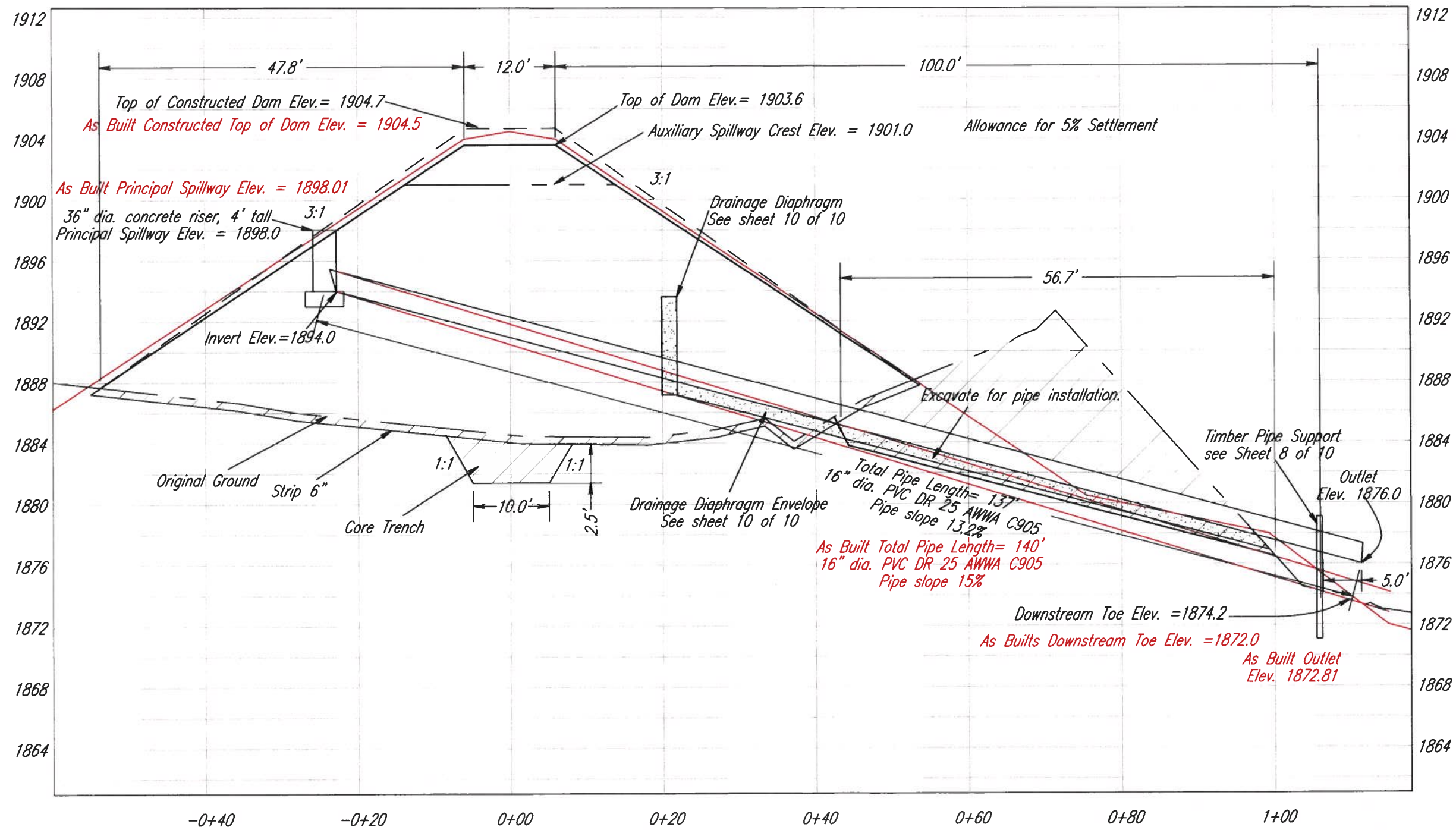


AS BUILT



File Name: H-8.pro Drawing No. 10/18/2013 4:18PM Sheet 4 of 10	NRCS Natural Resources Conservation Service United States Department of Agriculture	USDA - NRCS FIELD SUPPORT OFFICE 1717 N. LINCOLN AVE. SUITE 104 PIERRE, SOUTH DAKOTA 57501	PRODUCER Hollingsworth-Shaffer SE 1/4 SECT. 12 T. 4 North R. 26 East Stanley COUNTY Hughes-Stanley CONSERVATION DISTRICT	Date 10/18/2013 Designed A. Roman Drawn A. Roman Checked DBE Approved Taylor Roman 3/20/13
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Asbuilt by A. Roman 10/18/13

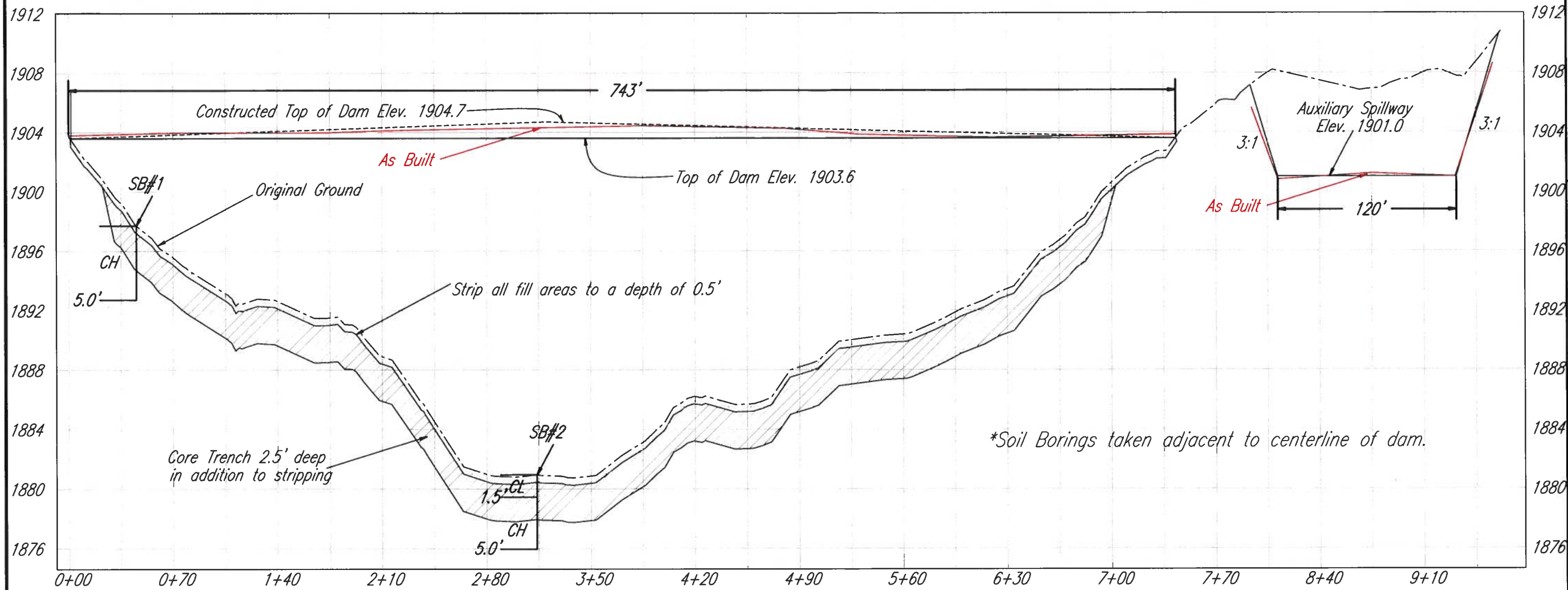


DROP INLET SPILLWAY PROFILE A-A
Horizontal Scale: 1"=15' Vertical Scale: 1" = 7.5'

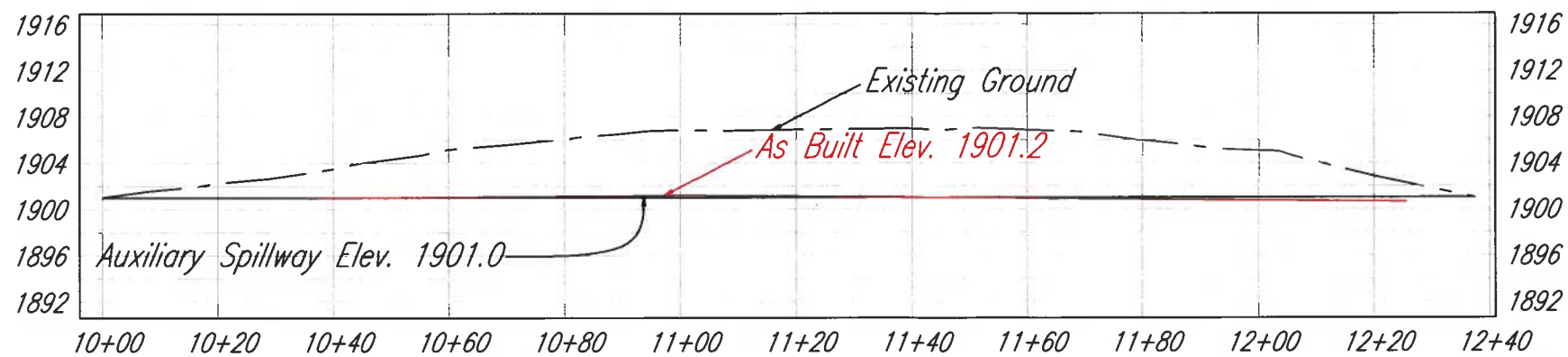
AS BUILT

Date	10/18/2013
Designed	A. Roman
Drawn	A. Roman
Checked	DBE
Approved	Angela Roman 3/20/13
PRODUCER Hollingsworth-Shaffer	
SE 1/4 SECT. 12 T. 4 North R. 26 East	
Stanley COUNTY	
Hughes-Stanley CONSERVATION DISTRICT	
USDA - NRCS	
FIELD SUPPORT OFFICE	
1717 N. LINCOLN AVE. SUITE 104	
PIERRE, SOUTH DAKOTA 57501	
 Natural Resources Conservation Service United States Department of Agriculture	
File Name:	H-4.pro
Drawing No.	
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Sheet	5 of 10

As Builts: A. Roman 10/18/13



PROFILE OF DAM AND CROSS SECTION OF AUXILIARY SPILLWAY B-B
Horizontal Scale: 1"=70' Vertical Scale: 1" = 7'



AUXILIARY SPILLWAY PROFILE C-C
Horizontal Scale: 1"=30' Vertical Scale: 1" = 15'

AS BUILT

Date	10/18/2013
Designed	A. Roman
Drawn	A. Roman
Checked	DBE
Approved	Quaila Roman
PRODUCER Hollingsworth - Shaffer SE 1/4, SECT. 12, T. 4 North R. 26 East Stanley COUNTY Hughes-Stanley CONSERVATION DISTRICT	
USDA - NRCS FIELD SUPPORT OFFICE 1717 N. LINCOLN AVE. SUITE 104 PIERRE, SOUTH DAKOTA 57501	
NRCS Natural Resources Conservation Service United States Department of Agriculture	
File Name:	H-3.pro
Drawing No.	
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Sheet 6 of 10	

AS BUILT A. Roman 10/18/13

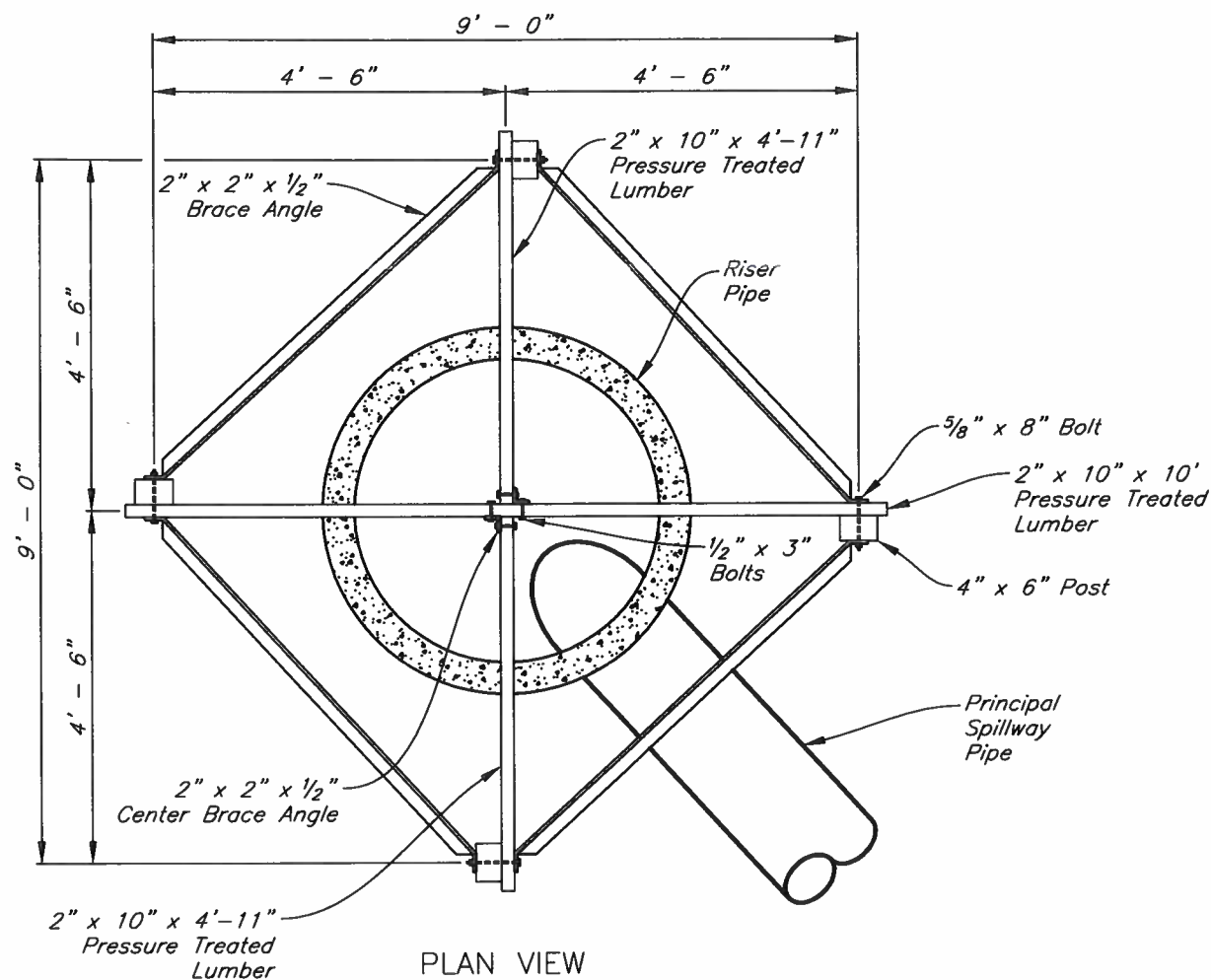


1. *The riser and base is precast reinforced concrete and is manufactured according to ASTM C478 Standard Specification For Precast Reinforced Concrete Manhole Sections.*
2. *Provide a watertight joint between the precast concrete riser and the principal spillway pipe barrel.*
3. *Contact NRCS prior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

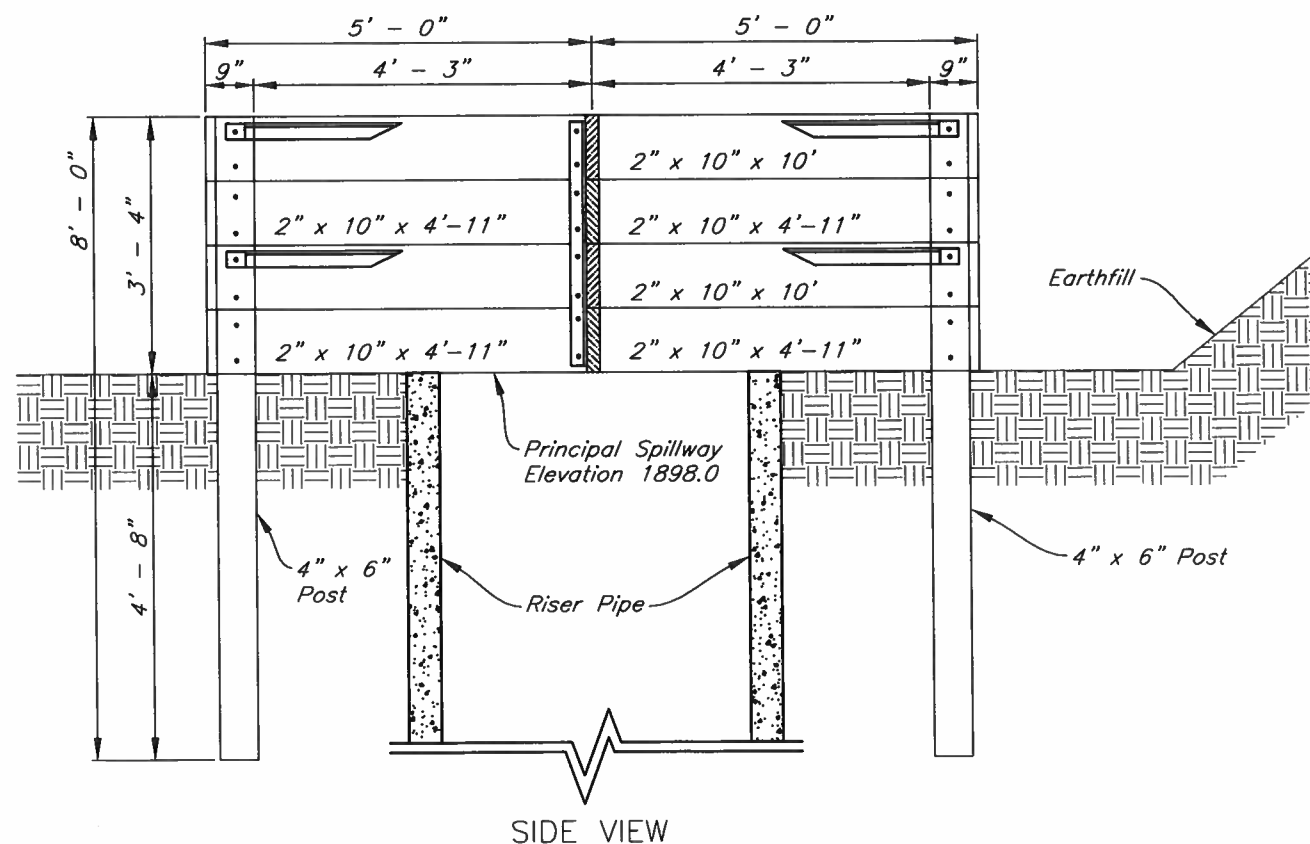


GUIDE TABLE FOR PRECAST RISER AND BASE DIMENSIONS						
(D) RISER DIAMETER	(H) RISER HEIGHT	(T) WALL THICKNESS	(B) BASE DIAMETER	(N) BASE THICKNESS	ESTIMATED WEIGHT	DIA. PIPE BARREL
30"	4'	3.5"	51"	6"	2,600 LBS	10" to 18"
30"	4.5'	3.5"	51"	6"	2,790 LBS	10" to 18"
30"	5'	3.5"	51"	6"	2,980 LBS	10" to 18"
****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



PLAN VIEW



SIDE VIEW

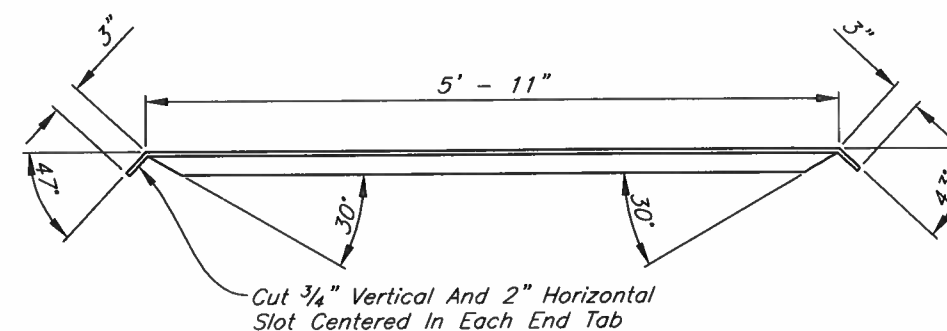
TABLE OF QUANTITIES			
ITEM	LENGTH OR SIZE	UNIT	QUANTITY
4" X 6" Pressure Treated Post	8 Ft	Each	4
2" X 10" Pressure Treated Lumber	10 Ft	Each	4
2" X 10" Pressure Treated Lumber	4' - 11"	Each	8
2" X 2" X 1/4" Steel Angle	6' - 5"	Each	8
2" X 2" X 1/4" Steel Angle	3' - 2"	Each	2
Steel Bolt (with nut and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

CONTRACTOR NOTES

1. Alternative trash rack and baffle may be used with PRIOR approval from NRCS. Submit photos and drawings to local NRCS office to request approval.



PLAN VIEW OF BRACE ANGLE

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

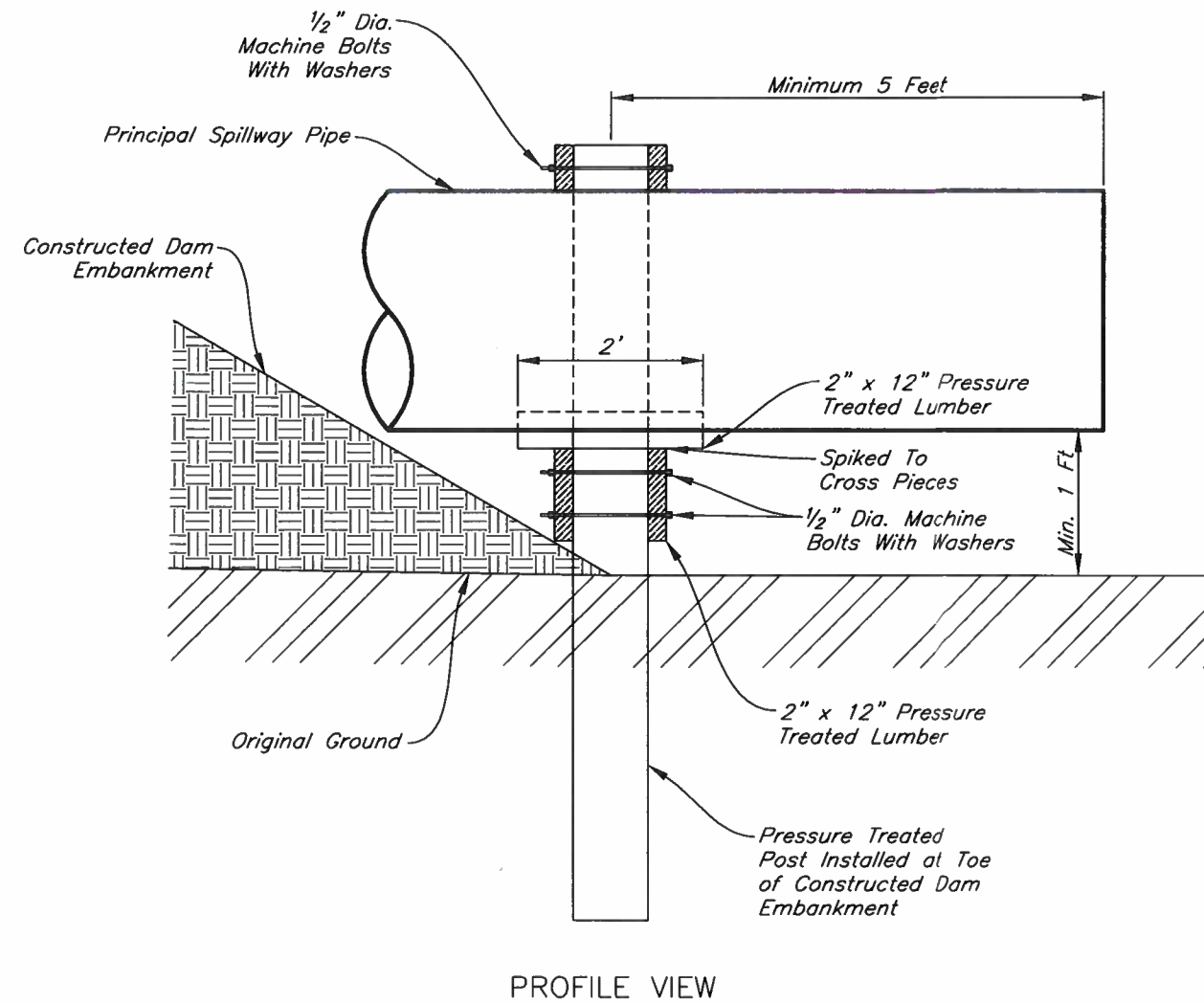
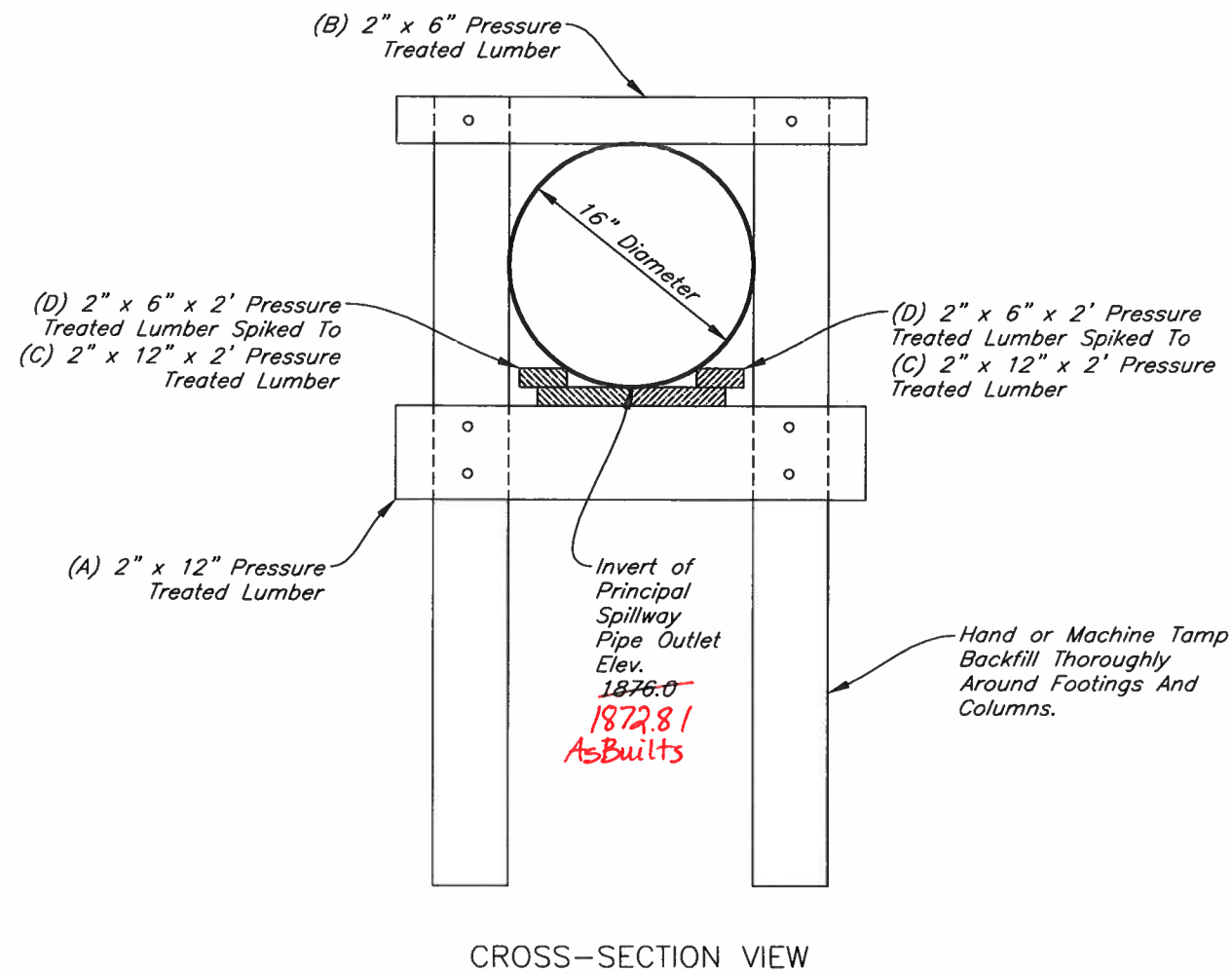
Designed A. Roman 3/1/13
Drawn A. Roman 3/18/13
Checked J. Roman 3/19/13
Approved J. Roman 3/19/13
As Built: A. Roman 10/18/13

HOLLINGSWORTH-SHAFFER
378 POND
TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"

SE 1/4, Sec 12, T 6 N, R 26 E
Stanley County, South Dakota

NRCS
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United States Department of Agriculture

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Drawing No.
3/18/13 6:17 PM
Sheet 8 of 10



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
Designed A. Roman 3/1/13
Drawn A. Roman 3/18/13
Checked J. DRE 3/19/13
Approved Angelita Roman 3/20/13
As Built By: A. Roman 10/18/13

HOLLINGSWORTH-SHAFFER
378 POND
TIMBER PIPE SUPPORT

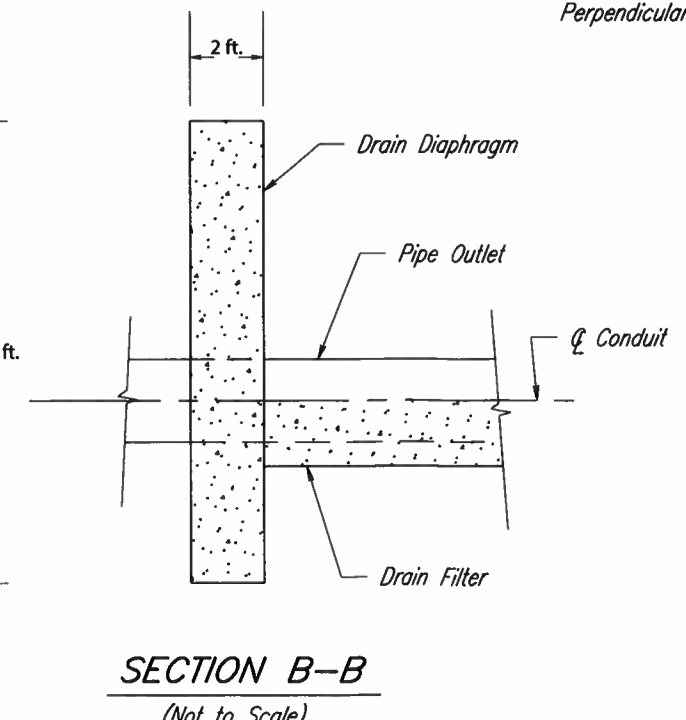
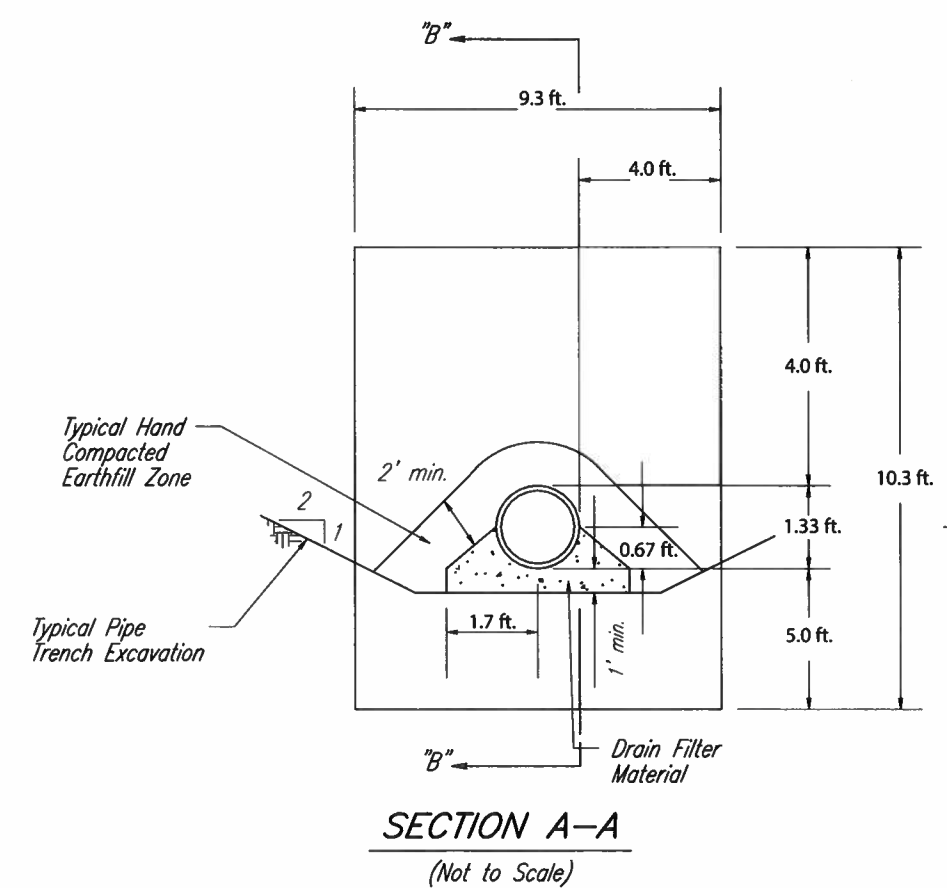
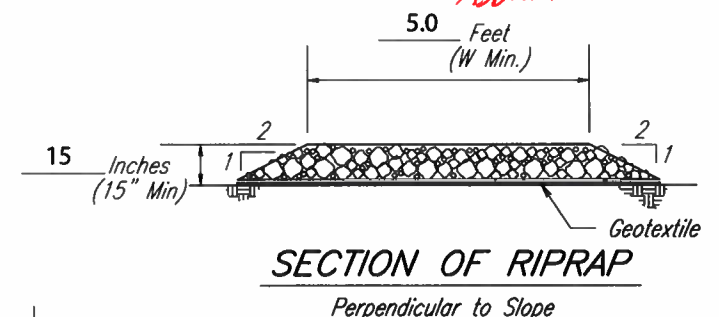
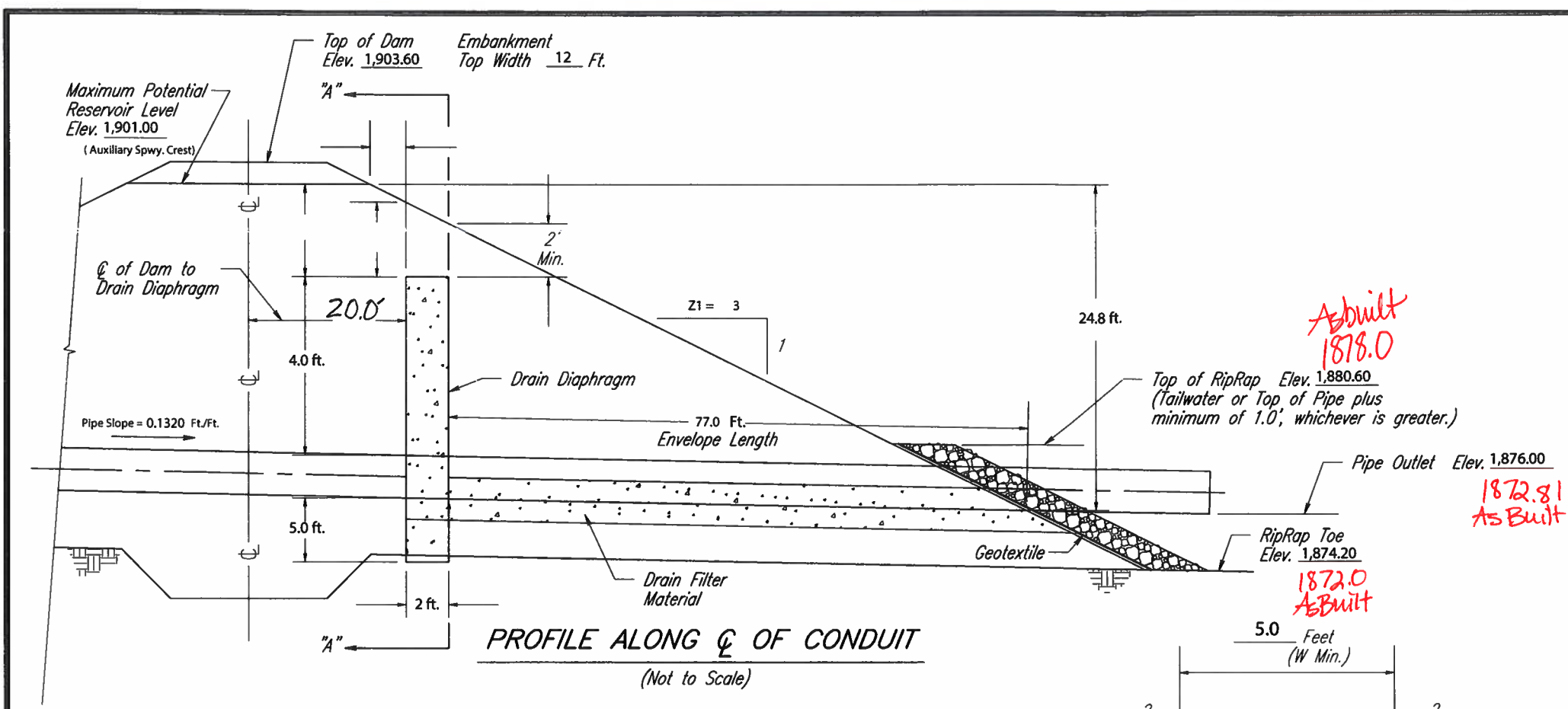
SE 1/4, Sec 12, T 6 N, R 26E Stanley County, South Dakota



File No.
H-S.dwg

Drawing No.
-

3/18/13 6:17 PM
Sheet 9 of 10



SUMMARY OF DESIGN AND DIMENSIONS

DESIGN DATA	
H = 16.4 Feet	Hd = 24.75 Feet
X = 4.0 Feet	D = 16 Inches
R = 5.0 Feet	Y = 4.0 Feet
C = 0.0 Feet	Aggregate Gradation # 1
Embankment Backslope (Z1) = 3.0 Pipe Slope (S) 0.1320 Ft./Ft.	
DIMENSIONS	
W = 9.3 Feet	(Total Width of Drain Diaphragm)
T = 10.3 Feet	(Total Height of Drain Diaphragm)
t = 2 Feet	(Thickness of Single Filter)

ESTIMATED QUANTITIES

Drain Filter Material	19.0 Cubic Yards
Geotextile	22.5 Square Yards
Rock Riprap	7.0 Cubic Yards

DRAIN FILTER MATERIAL GRADATION		ROCK RIPRAP GRADATION		
SIEVE SIZE	PERCENT PASSING	PERCENT SMALLER	WEIGHT RANGE (LBS.)	AVERAGE CUBIC DIMENSION
3/8 in.	100	100	50 lb.	10"
#4	95-100	50-80	30 lb.	7"
#8	80-100	15-50	10 lb.	5"
#16	50-85	0-15	3 lb.	3"
#30	25-60			
#50	2-30			
#100	0-10			

ASTM C-#33
FINE CONCRETE
AGGREGATE GRADATION

- CONSTRUCTION NOTES**
- 1.) 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.
 - 2.) The maximum height of drop of the Riprap onto the Geotextile in the pipe outlet area shall be 3 feet.

- MATERIAL NOTES**
- 1.) The Geotextile shall conform to the Class 1 requirements specified in Table 2 for Nonwoven Geotextiles in Material Specification SD-592.

DRAINAGE DIAPHRAGM DETAILS

JOB PLAN 3.8 (07/2009)

REVISIONS			
DATE	APPROVED	TITLE	
07/31/2009	Jay B. Cobb	State Conservation Engineer	7/21/2009 2:23PM
Sheet 10 of 10			

USDA - NRCS
State Office Engineering Staff
200 Fourth Street SW
Huron, South Dakota 57350

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name: SD\Huron\Drainage Diaphragm\DR_07_004.dwg
Drawing No.

Designed: A. Roman 3/18/13
Drawn: A. Roman 3/18/13
Checked: A. Roman 3/18/13
Approved: J. B. Cobb 3/19/13
ASBui 15: A. Roman 10/18/13

PRODUCER Hollingsworth-Shaffer
SE 1/4 SECTION 12 T 4N R 26E
Stanley COUNTY
Hughes-Stanley CONSERVATION DISTRICT