

WATER PERMIT NO. 7261-3

Name of Applicant: Don Rogers

Address: PO Box 167, Blunt SD 57522

Phone: 605 280-7105

Amount of Water Claimed: 51.7 AF

Total Acres: NA

Source of Water Supply: runoff

Water to be used for: fish & wildlife and livestock

County: Sully

Type of Waste Disposal System: NA

Location: 3 miles northeast of Blunt

PRIORITY

Date Received: 7-26-11

Application/License Fee: \$ 700.00

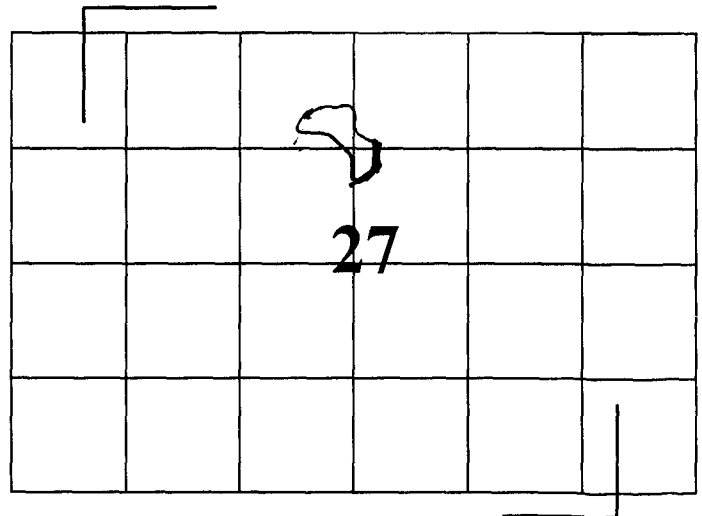
Corrected Application Received:

Period of Annual Use: January 1 – December 31

Remarks:

Diversion Point: SW ¼ NE ¼ Sec 27-T113N-
R76W

Water Impounded: W ½ NE ¼, NE ¼ NW ¼ Sec
27-T113N-R76W



Depth of Well:

Well Driller:

Remarks:

Type of Map: aerial

Prepared by: Angela roman, NRCS

Reviewed and the Number Assigned on: 7-27-11

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

SD EForm - 1585 V3
FORM 2: Application for uses other than irrigation
(type or print)

Mail to: Water Rights Program Joe Foss Building 523 E. Capitol Pierre, SD 57501-3181 (605) 773-3352	No. <u>7261-3</u> (office use only) Hydrologic Unit <u>10140103</u>
	Basin <u>Missouri River</u>
	Newspaper <u>Onida Watchman PO Box 245</u>
	<u>605-258-2604</u> <u>57564</u>

RECEIVED
JUL 26 2011
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.)

- Name of Applicant Don Rogers (check one) ☐ Owner ☐ Tenant/lessee Phone (605) 280-7105
Mailing Address PO Box 167 Blunt State SD 57522
(Street, RR, or Box and City) (Zip Code)
- Amount of water claimed _____ *CFS or _____ **GPM 51.7 ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)
- Source of water supply Runoff from 2,847.6 acres
- Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) County Sully
SW 1/4 NE 1/4 section 27-T113N-R76W Water Impounded: W 1/2 NE 1/4 NE 1/4 NW 1/4
Sec 27 T113N R76W
- County or counties where water will be used Sully
- Annual period during which water is to be used year-round Jan 1 - Dec 31
- 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)

Constructing earth embankment dam, 453.2' in length, 21.3' in height, 12' top width, 20' wave berm, 3:1 side slopes. 9,105 CY of fill. 120' wide auxiliary spillway, and a 36" diameter CMP principal spillway with a drop structure.

STATE OF SOUTH DAKOTA)

County of Sully SS

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

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

Applicant's signature Don Rogers

Subscribed and sworn to before me this 18th day of July 20 11

Notary Public signature

**SOUTH DAKOTA
WATER PERMIT NO. 7261-3**

Date of first receipt of application July 26, 2011.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 7261-3 to Don Rogers, PO Box 167, Blunt SD 57522 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. 7261-3 authorizes impoundment of 51.7 acre-feet of water from runoff by constructing a dam located in the SW 1/4 NE 1/4 Section 27 with water impounded in the W 1/2 NE 1/4, NE 1/4 NW 1/4 Section 27; all in T113N-R76W.
2. The water appropriated shall be used for the purpose of fish and wildlife propagation and livestock water and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date of approval of Permit No. 7261-3 is September 6, 2011.
5. The date from which applicant may claim right is July 26, 2011.
6. One-fifth of the construction is to be completed on or before March 6, 2014.
7. All construction is to be completed on or before September 6, 2016.
8. Water is to be put to beneficial use on or before September 6, 2020.
9. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

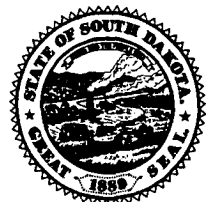
QUALIFICATIONS

1. Water Permit No. 7261-3 authorizes a dam with a storage capacity of 51.7 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: Garland Erbele
Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

SEP 19 2011
date



(type or print in ink)

1. Well Information - Proposed Construction

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

2. Wastewater Disposal System Information

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

3. Dugout Information

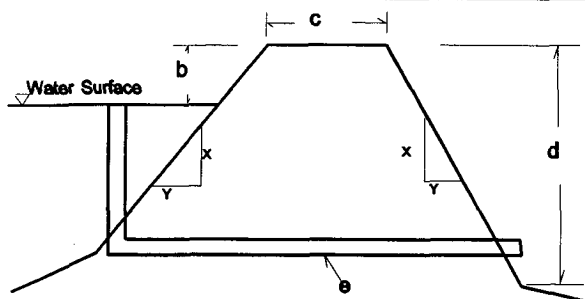
- a) Surface Dimensions _____ Depth _____
- b) Depth to water (ground surface to water level) _____

4. Water Storage Dams

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

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

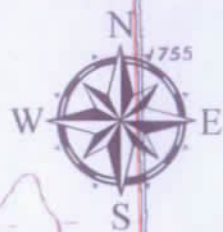
USDA-NRCS
1717 North Lincoln, Suite #104
Pierre, SD 57501



- b) Freeboard _____ 5.0'
- c) Crest Width _____ 12'
- Crest Length _____ 453.2'
- d) Height _____ 21.3'
- e) Primary Outlet Capacity _____ 111.7CFS
 If pipe, diameter _____ 36"
- f) Secondary Spillway Capacity _____ 756.8CFS
 Spillway Width _____ 120'
- g) X & Y Slope _____ 3:1
 Upstream _____ 3:1
 Downstream _____ 3:1
- h) Surface Area of Impoundment _____ 12.62
- i) Storage _____ 51.7 Acre Feet
- j) Drainage Area Above Dam _____ 2,848.6 Acres

Don Rogers
Breach Analysis
A. Roman 7/14/11
1"=1500'

Angela Roman
7/14/11



XS 1
0 Mile

XS 2
.68 Miles

XS 3
1.25 miles

XS 4
1.42 Miles

Minimum Maintenance Road

27
27-113-76

SULLY CO
HUGHES CO

1:18,000

0 550 1,100 2,200 3,300 4,400 Feet

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 7/27, 20 11

RECEIVED OF Donald Rogers PO Box 167 Blunt SD 57522

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

Fee for Application for Permit No. <u>7261-3</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>7261-3</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. **05006**

By

Richard Erbe
Chief Engineer

United States Department of Agriculture



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

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

July 25, 2011

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JUL 26 2011

**WATER RIGHTS
PROGRAM**

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 Sully County for Don Rogers. This dam will require a water rights permit and safety of dams review. Construction is anticipated in the summer of 2011, as soon as possible.

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
Don Rogers-Sully County**

Summary

This dam is located in the NE ¼ of Section 27, T113N, and R76W. This is a multi-purpose dam for livestock water, and wildlife. This is a new construction of the dam. Funding for this project will be provided by the USDA-NRCS (EQIP) and Don Rogers. Upstream of the new proposed dam is one failed/breached dam and one dam in poor structural condition. It is unclear when these two dams were constructed, but it appears the principal spillway failed on one dam and the lack of a principal spillway and growth of a large tree are contributing to the slow failure of the smaller dam. Construction of this new dam includes excavation to allow for combined flood storage of all dams.

Job Description

This site is a Hazard "A" and Job Class IV structure with a drainage area of 2,848 acres. In the event of a breach, cropland and pastureland would be damaged. A minimum maintenance road will also be damaged. The breach analysis was completed assuming failure of the downstream dam that this new dam drains into. The principal spillway of this site is a 36" diameter 16 gage polymer coated helical corrugated metal pipe, with a 60" dia. concrete drop structure. Cathodic protection will also be installed to protect the principal spillway from corrosion.

Basis for Design

Overall design of this structure was governed by the 378 Pond standard. The design is routing the 2yr- 24 hr storm through the principal spillway and a 50 yr- 24hr storm through the emergency spillway. SITES program was used to flood route the design.

General Basic Data

Hydraulic Data Summary		
Drainage Area	2,848 Acres	
Time of Concentration	6.38 hours	
Runoff Curve Number	75	
Principal Spillway, 2 YR 24-hr. Rainfall	2.2 inches	
Emergency Spillway, 50 YR 24-hr. Rainfall	4.5 inches	
Principal Spillway Discharge in ES	11.7 CFS	
Emergency Spillway Discharge	756.8 CFS	
Estimated 25 year sediment storage	28.9 ACFT	
Crest of Normal Pool	12.6 Acres	51.7 ACFT storage
Crest of Emergency Spillway	20.3 Acres	85.0 ACFT storage
Top of Dam	36.0 Acres	167.5 ACFT storage

Soils

The soils were investigated by drilling 4 test holes along the centerline of the dam. Near the bottom of the draw, gravels were located 2.5' to 3.5' below the surface, we continued to drill and found few gravels between 3.5' to 7.5', at 8' we reached good hard clay. Thirty minutes after drilling was 2' from the surface. The banks of the draw, as well as the location of the auxiliary spillway had good CL material. No water was found in any of these holes.

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.

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 IV structure due to the diameter of the principal spillway. Plans were reviewed by Dana Edwards, PE, Area Engineer and Job Approval Authority is exercised by Angela Roman.

Landowner Information

Don Rogers
PO Box 167
Blunt, SD 57522
605-280-7105



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

7/25/11

Date

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WATER RIGHTS
PROGRAM

CONSTRUCTION SPECIFICATIONS

For:

Don Rogers
378-Pond
NE ¼ of Sec. 27-T113N-R76W

Prepared by:

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

Assisting:

Sully County Conservation District

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

1-800-781-7474

CONSTRUCTION SPECIFICATION

SD-4 STRIPPING

1. **Scope**

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

2. **General**

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

3. **Foundation Stripping**

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

4. **Borrow Area Stripping**

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

CONSTRUCTION SPECIFICATION

SD-5 EXCAVATION

1. Scope

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

2. Classification

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

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

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

3. Use of Excavated Materials

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

4. Disposal of Waste Materials

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

5. Excavation Limits

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

7. Borrow Excavation

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

CONSTRUCTION SPECIFICATION

SD-7S EARTHFILL-CLASS S

1. Scope

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

2. Materials

All fill materials shall be obtained from required excavations and designated borrow areas. Selection, blending, placement, and compaction of fill will be subject to approval of the Natural Resources Conservation Service inspector.

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

3. Foundation Preparation

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

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

4. Placement

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

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

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

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

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

5. Control of Moisture Content

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

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

6. Compaction (Class S)

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

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

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

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

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

CONSTRUCTION SPECIFICATION

SD-8 ROCK RIPRAP AND BEDDING

1. Scope

The work shall consist of furnishing and installing loose rock riprap and blankets, including filter layers, bedding, or geotextiles as shown on the drawings.

2. Materials

Rock Riprap - Individual rock fragments shall be dense, hard, durable, and free from cracks, seams, and other defects conducive to accelerated weathering. Except as otherwise specified, rock fragments shall be angular or sub-rounded. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment. ASTN D4992 provides guidance on selecting rock from a source.

Rock that fails to meet the above requirements will be accepted only if similar rock from the same source has been demonstrated to be sound after three years of exposure to conditions similar to conditions where the riprap is to be placed.

The rock shall conform to the grading limits shown on the drawings. Sand, rock fines, and dirt shall be less than five percent of the total weight of the riprap.

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

Not more than 5 percent of the material of the material may be limestone and not more than 15 percent may be flat, elongated particles.

Except as otherwise shown on the drawings, the aggregate shall meet the following gradation requirements after placement.

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

Geotextile - Geotextiles shall conform to the National Engineering Handbook Material Specification 592-Geotextile. The geotextile fabric shall be protected from moisture, dust, dirt, debris, and ultraviolet light prior to installation.

3. Subgrade Preparation

Subgrade surfaces on which riprap, bedding, or geotextile will be placed shall be cut or filled to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

Riprap, bedding, or geotextile shall not be placed until the foundation preparation is completed and the surfaces have been inspected and approved by the Natural Resources Conservation Service inspector.

4. Equipment-placed Rock Riprap

Rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in a manner as to avoid serious displacement of the underlying material. The rock shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogenous with the larger rocks uniformly distributed and firmly in contact one to another and with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to new and existing structures.

5. Hand-placed Rock Riprap

The rock riprap shall be placed on the surface and to the depth specified. It shall be securely bedded with the larger rocks firmly in contact one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rocks. Flat slab rock shall be laid on its vertical edge except where it is laid like paving stone and the thickness of the rock equals the specified depth of the riprap course.

6. Filters, Bedding, or Geotextiles

When the drawings specify filters, bedding, or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate is not required, but the surface of such material shall be furnished reasonably smooth and free of mounds, dips, or windrows.

Where drawings require geotextiles beneath riprap, the geotextile shall be laid on the prepared subgrade surfaces with no folds or ripples. The geotextile fabric should be in direct contact with the subgrade surface. Except as otherwise specified, the fabric should be placed parallel to stream alignments and perpendicular to lake shorelines. Except as otherwise specified, the geotextile splices shall overlap at least 18 inches, or shall be sewn following the geotextile manufacturer's recommendations. Anchoring pins shall be placed as recommended by the geotextile manufacturer except as otherwise specified.

CONSTRUCTION SPECIFICATION

SD-10 SALVAGING AND SPREADING TOPSOIL

1. Scope

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

2. Quality of Topsoil

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

3. Excavation

Topsoil shall be removed after clearing, grubbing and removing vegetation and shall be stockpiled. Objectionable materials shall be removed and buried, or disposed of, at locations approved by the Natural Resources Conservation Service inspector.

4. Spreading

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

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

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

CONSTRUCTION SPECIFICATION
SD-12B CONCRETE FOR MINOR STRUCTURES
(GENERALLY FOR STRUCTURES <10 CU. YD.)

1. Scope

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

2. Materials

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

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

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

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

3. Concrete Mix Design

The contractor or person in charge of construction shall be responsible for designing a concrete mix that will produce 3,000 pounds per square inch compressive strength at 28 days and meet the following requirements:

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

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

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

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

Use of ready mixed concrete meeting this specification is encouraged. Upon request, the vendor must provide the owner and the Natural Resources Conservation Service inspector a signed delivery ticket giving the quantities of concrete, cement, fine aggregate, coarse aggregate, and water contained in the batch.

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

4. Concrete Forms

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

5. Placing Concrete

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

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

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

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

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

6. Curing

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

7. Defective Concrete

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

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

CONSTRUCTION SPECIFICATION

SD-13 STEEL REINFORCEMENT

1. Scope

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

2. Materials

Steel reinforcement shall be free of flaky rust, oil, grease, paint, mill scale, or other deleterious matter.

Steel bar reinforcement (except as otherwise specified) shall be grade 40, 50, or 60 deformed bars conforming to one of the following specifications.

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

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

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

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

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

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

3. Cutting and Bending

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

4. Splicing Bar Reinforcement

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

5. Splicing Welded Wire Fabric

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

6. Placing

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

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

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

CONSTRUCTION SPECIFICATION

SD-15 CORRUGATED METAL PIPE

1. Scope

The work shall consist of furnishing and placing circular, arched, or elliptical corrugated metal pipe and fittings as shown on the drawings.

2. Materials

Corrugated steel pipe shall conform to Material Specification SD-50. Aluminum corrugated pipe shall conform to Material Specification SD-51.

3. Handling the Pipe

The contractor shall furnish equipment as necessary to install the pipe without damaging the pipe or coating. The pipe shall be transported and handled in a manner that will prevent damage to the pipe, coating, or appurtenances.

4. Repair of Damaged Coating

Damage to metallic coating shall be repaired as follows. Clean the damaged surface area by sand blasting, power disk sanding, or wire brushing. Remove all dirt, products of corrosion, and loose and cracked coating. Remove oil and grease material with a solvent. Paint the clean and dry surface using one of the following options.

- a. Zinc dust - zinc oxide primer, ASTM D79 and D520
- b. Zinc dust paint, ASTM 4146

When metallic coating is damaged in any individual area larger than 12 square inches or when more than 0.2 percent of the total surface area of a single pipe section is damaged, that section of pipe will be rejected.

Breaks, scuffs, or weld damage areas in bituminous coatings shall be repaired by a coat of cold-applied bituminous mastic at least 0.05 inch thick. When individual breaks exceed 36 square inches or when the total area of breaks exceeds 0.5 percent of the total surface of an individual pipe section, that section will be rejected.

Breaks, scuffs, or weld damage areas in polymer coatings shall be repaired by application of a polymer material similar to and compatible with the durability, adhesion, and appearance of the original polymer coating, as described in ASTM A849, paragraph 6.8. When individual breaks exceed 36 square inches in area or when the total area of breaks exceeds 0.5 percent of the total surface area of the individual pipe section, that section of pipe will be rejected.

5. Laying and Bedding the Pipe

Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. Pipe shall be installed so no reversal of grade exists between joints except as shown on the drawings. The pipe shall be installed with the outside laps of circumferential joints pointed upstream and with longitudinal laps at the sides near the vertical mid-height of the pipe.

Field welding of corrugated steel pipe is not permitted. Pipe sections shall be joined with specified, fabricator-supplied coupling bands. Couplings shall be installed as recommended by the fabricator.

Perforated pipe shall be installed with the perforations down and oriented symmetrically about a vertical centerline. Perforations shall be clear at the time of installation.

The pipe shall be firmly and uniformly bedded throughout its full length. Except as shown on the drawings, pipe must be laid on moist, compacted foundation, with a two-to-three-inch layer of loose moist soil adjacent to the bottom of the pipe.

6. Earth, Sand or Gravel Backfill

Backfill shall be as shown on the drawings. During backfilling, the pipe shall be loaded sufficiently to prevent displacement.

Except as otherwise specified, backfill around the pipe shall be placed in layers not more than four inches thick before compaction. Each layer of backfill shall be compacted to the density and moisture requirements specified for adjacent fill. Backfill around the pipe shall be brought up uniformly on both sides and shall extend a minimum of two feet over the pipe before large machines travel over the pipe.

7. Concrete Backfill

Where concrete backfill is shown on the drawings, the specified requirements must be met. The pipe must be loaded or anchored sufficiently to prevent displacement during concrete placement. The pipe must not be in contact with other embedded metal items such as steel reinforcement.

Where aluminum or aluminum coated pipe is shown to be embedded in concrete, the pipe surfaces to be in contact with concrete shall be coated with two coats of a bituminous paint of the cutback type.

CONSTRUCTION SPECIFICATION

SD-16 WOOD FABRICATION AND INSTALLATION

1. Scope

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

2. Plywood Material

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

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

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

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

3. Structural Timber and Lumber Material

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

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

Cresote

Pentachlorophenol

Waterborne Preservatives (Arsenicals) treated to 0.4 pounds per cubic foot retention

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

4. Metal Hardware

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

5. Installation

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to close fit. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood.

Bolt holes shall be drilled for snug fit. Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

Instructions for Completing the Seeding Specification (SD-28 Seeding)

The seeding specification follows the Critical Area Planting (342) Standard. If the seeding is completed according to this specification it will meet all the requirements of the Critical Area Planting Standard.

ITEMS

2. General

Three times periods are allowed for the permanent seeding:

Early Spring: Early spring prior to 5/15 – Cool-season species only

Late Summer: Late summer 8/1 to 9/1 – Cool-season species with a cover crop

Dormant: Dormant season seeding 11/1 to spring thaw; cool season species with mulch.

Permanent seeding must be done as soon as possible during the first allowable seeding time period after construction. These seeding dates must be followed unless a variance is given.

Consider the previous two years of herbicide application. Any potential carryover problems should be addressed by delaying construction and seeding, establishing a cover crop, and/or changing species to be planted.

A warm season species may be planted that follows the installation guidelines of the Critical Area Planting Standard. Warm-season species may not be used for practices if velocities exceed 2.5 feet per second (fps).

3. Fertilizer

Fertilizer is optional. The designer may specify fertilization. Do not use manure on areas that will drain directly into a water body or stream. On medium-textured soils the addition of 5 to 10 pounds of zinc per acre may speed up growth.

4. Permanent Seeding

The permanent seeding rates are double the normal full seeding rates as found in Range Technical Note Number 4. Reed canarygrass may be seeded on wet sites. Smooth brome grass is not recommended for designs where the adjacent vegetation is predominantly native, as smooth brome grass is highly invasive.

5. Cover Crops

Cover crops are required for all practices constructed after the early spring seeding period and before September 15 (those designed to be seeded between August 1 to September 1). Cover crops are not recommended to be seeded between September 15 and November 1 since it is likely that most of the seeds will remain in the soil and compete with the planned seeded species.

6. Companion Crops

Companion crops will only be used only for warm-season species seeded in the late spring period (5/15 to 6/15) and with design velocities not more than 2.5 fps. Companion crops are required in this situation when planting into a bare seedbed and the design velocity is less than 2.5 fps. Companion crops shall be seeded at the same time as the permanent seeding.

9. Mulching

Mulching is encouraged but not required for all construction and seeding dates. Mulching is required for all waterways constructed between September 15 and the spring thaw and when seeding into a bare seeded bed during the early spring period and the design velocity is greater than 2.5 fps.

CONSTRUCTION SPECIFICATION SD-28 SEEDING

1. Scope

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

2. General

Permanent Seeding and related operations shall be performed in the following time period:

Early Spring prior to 5/15 or

Late Summer 8/1 to 9/1 or

Dormant 11/1 to Spring Thaw

Permanent seeding must be completed as soon as possible during the first allowable seeding time period after construction. If construction ends between 5/15 and 9/15, a cover crop shall be planted immediately after construction.

3. Fertilizer

Fertilizer is ☐ Required ☒ Not Required

If fertilizer is used it shall be supplied and applied as follows: Apply fertilizer based on the recommendations from a soil test or apply 30 to 40 pounds of actual N and 40 to 60 pounds of P₂O₅ per acre. Ten to 15 tons of manure per acre may be used in lieu of the commercial fertilizer and will also increase organic matter. Five to 10 pounds of zinc per acre may be added to speed up growth on medium-textured soils. Thoroughly mix all fertilizer and/or manure into the upper three to five inches of the soil during final seedbed preparation.

4. Permanent Seeding

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

	Grass	Seeding Rate (PLS/Acre)	
		Drilled	Broadcast
	Smooth Brome ¹	16	20
	Western Wheatgrass	10	12
	Intermediate Wheatgrass	10	12
	Slender Wheatgrass	3	3
	Western Wheatgrass	20	25
	Reed Canarygrass	5	7
	Other, See Attached Seeding Sheet		

¹ Smooth brome¹ is not recommended where the adjacent vegetation is predominantly native, as smooth brome¹ is highly invasive

5. **Cover Crops**

If permanent seeding is not completed during the early spring period, a cover crop meeting the following rates and dates will be planted immediately after construction.

Cover Crop	Seeding rate (lbs./acre)	Spring Dates	Fall Dates
None			

The cover crop will be clipped to 8-10 inches in height or chemically killed during the boot stage to prevent seed formation. Remove or spread excess residues that would interfere with drilling the perennial species.

6. **Companion Crops**

Companion Crops are ☐ Required ☒ Not Required
to be seeded during the permanent seeding period. The companion crops shall be seeded as follows:

Crop	Seeding rate (lbs./acre)
None	

The companion crop should be clipped and removed or mowed before it becomes competitive with the perennial species or sets seed.

7. **Seedbed Preparation**

The area to be seeded shall be made reasonably smooth and firm. Ditches shall be filled to conform to design lines and grades before seedbed preparation is begun. The seedbed will be worked to a depth of three to five inches. Drag or pack to break up large clods and firm the seedbed. Prior to seeding, required fertilizer shall be applied and mixed with the soil surface to a depth of three inches. The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately one-half inch. The contractor shall suspend operations when the soil is too wet.

8. **Sowing Seed**

Except as otherwise specified, seeding shall be performed immediately after seedbed preparation. Seeding shall be drilled or broadcast and incorporated in a manner that will achieve uniform distribution of seed placed at appropriate soil depth. Optimum seeding depths are 1/4 to 3/4 inch.

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

9. **Mulching**

Mulching is ☒ Required ☐ Not Required

Except as otherwise specified, required mulching must be performed as soon as possible after seeding. Mulch shall be applied uniformly as follows. Straw will be applied uniformly at a rate of 3,000 pounds minimum to 4,000 pounds maximum per acre. The straw will be anchored using an anchoring tool (or a farm disk set straight with adequate weight) that has serrated straight disk blades spaced 6-10" apart that punches mulch into the ground with a depth of approximately 2 inches. All anchoring should be at right angles to the slope.

If late summer or dormant seeding dates are used, seed just prior to mulching.

COATED CORRUGATED STEEL PIPE (SD-50)

MATERIAL SPECIFICATION

1. Scope

This specification covers the quality of zinc-coated, aluminum-coated, aluminum-zinc alloy-coated, and polymer-coated corrugated steel pipe and fittings.

2. Pipe

All pipe shall be metallic zinc-coated, aluminum-coated, or aluminum-zinc alloy-coated corrugated steel pipe and fittings conforming to the requirements of ASTM A742, A760, A761, A762, A849, A875, A885, and A929 for the specified type, class, fabrication of pipe and coating, and to the following additional requirements.

When close riveted pipe is specified, the pipe shall be fabricated with circumferential seam rivet spacing that does not exceed 3 inches except that 12 rivets are sufficient to secure circumferential seams in 12-inch pipe. Longitudinal seams that will be within the coverage area of a coupling band shall be connected by flat head rivets or welding.

Where double riveting or double spot welding for pipe less than 42 inches in diameter is required, riveting or welding procedures shall be as specified for pipe 42 inches or greater in diameter.

3. Coatings

Coatings described herein equally refer to the inside and outside pipe surfaces. When coatings in addition to metallic coatings are specified, they shall conform to the requirements of ASTM A742, A760, A761, A762, A849, A875, A885, and A929 for the specified type.

Polymer-coated pipe shall be coated on each side to a minimum thickness of 0.01 inches (10 mils) (ASTM A762 grade 10/10).

4. Coupling Bands

Coupling bands must be provided to connect the pipe sections. The completed pipe joint shall be watertight and have tensile strength equal to the pipe sections. Gaskets must fit without warping, twisting, or bending.

5. Fittings

Fittings shall be steel and coated the same as adjacent pipe.

Welded (and adjacent) surfaces shall be cleaned of flux and weld splatter and coated following ASTM A780.

GEOTEXTILE (SD-592)

MATERIAL SPECIFICATION

1. Scope

This specification covers the quality of geotextile.

2. General Requirements

Geotextiles shall be a minimum of 85 percent by weight polypropylenes, polyesters, polyamides, polyethylene, polyolefins, or polyvinylidenechlorides. They shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile shall be defect free and conform to Table 1 or 2 requirements as applicable to the material specified. The geotextile shall be free of chemical treatments or coatings that reduce its porosity. Geotextiles shall have enhanced resistance to ultraviolet light.

Thread used for sewing shall be high strength polypropylene, polyester, or polyamide, and shall be at least as resistant to ultraviolet light as the geotextile.

3. Classification

Woven - Fabrics formed by interweaving monofilament yarn, creating distinct and measurable openings. The edges of woven fabric shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.

Nonwoven - Fabrics formed by random placement of threads in a mat and bonded by needle punching.

4. Shipping and Storage

Geotextile shall be shipped in rolls wrapped with a cover. Each roll shall be labeled to clearly identify the brand, class, and production run following ASTM D4873.

Table 1. Requirements for Woven Geotextile

Property	Test Method	Class I	Class II&III	Class IV
Tensile strength, lb. ^{1/}	ASTM D4632	200 min.	120 min.	180 min.
Elongation at failure, % ^{1/}	ASTM D4632	<50	<50	<50
Puncture, lb. ^{1/}	ASTM D4833	90 min.	60 min.	60 min.
Ultraviolet light,	ASTM D4355	70 min.	70 min.	70 min.
% residual tensile strength	150-hr. exposure			
Apparent opening size (AOS)	ASTM D4751	As specified, but >.212mm (#70) ^{2/}	As specified, but >.212 mm (#70)	As specified, but >.212mm (#70)
Percent open area (%)	CWO-02215-86 ^{3/}	4.0 min.	4.0 min	1.0 min.
Permeability, permittivity Sec. ⁻¹	ASTM D4491	0.10 min.	0.10 min.	0.10 min.

Table 2. Requirements for Needle-Punched Nonwoven Geotextile

Property	Test Method	Class I	Class II	Class III	Class IV
Tensile Strength, lb. ^{1/}	ASTM D4632	180 min.	120 min.	90 min.	115 min.
Elongation at failure, % ^{1/}	ASTM D4632	≥ 50	≥ 50	≥ 50	≥ 50
Puncture, lb.	ASTM D4833	80 min.	60 min.	40 min.	40 min.
Ultraviolet light,	ASTM D4355	70 min.	70 min.	70 min.	70 min.
% residual tensile strength	150-hr. exposure				
Apparent Opening Size (AOS)	ASTM D4751	As specified max. #40 ^{2/}	As specified max. #40 ^{2/}	As specified max. #40 ^{2/}	As specified max. #40 ^{2/}
Permeability permittivity sec ⁻¹	ASTM D4491	0.70 min.	0.70 min.	0.70 min.	0.70 min.

^{1/} Minimum average roll value (weakest principal direction).

^{2/} US standard sieve size.

^{3/} CWO is a US Army Corps of Engineers reference.

1*****

SITES XEQ 06/17/2011 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2005.1.05 (USER MANUAL - DATED DECEMBER 2005)
 TIME 16:26:17

A. Roman 6/17/11

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

SITES 01/01/2005 Don Rogers 4.449375 H5
 SAVMOV 0 101
 SAVMOV 101 1 1

* New dam, below two failing dams.
 * 60" riser, 5' tall (top to inlet) 36" Corrugated Metal Pipe
 * Auxiliary Spillway = 1628.1
 * Top of Dam = 1631.0
 * PS has 2 YR-24HR routed
 * AS has 50 YR-24HR routed

STRUCTURE Rogers Pond
 1608 0
 1620 2.572165
 1621 2.981403
 1622 3.480188
 1623 4.073569
 1624 7.993208
 1625 10.12666
 1626 12.62222 0
 1627 16.62918 47.14
 1628 20.23024 104.67
 1629 24.50678 108.17
 1630 30.12879 111.57
 1631 36 114.86
 1632 42 118.06
 1633 48 121.17
 1634 54 124.21

ENDTABLE
 WSDATA 5S AC 75 2847.6 16948.4 .86
 PDIRECT 2.2 4.50
 POOLDATA ELEV 1626 1608 1626 1608 1608
 ASDATA 41 300 100 3 .01 2
 ASINSURF 41 .035 .035
 ASINLET 41 0.0 0.0 100 0.0 3
 200 1

ENDTABLE
 ASEXSURF 41 .035
 .65 0
 2
 2 0
 .0075

ENDTABLE
 ASEXIT 41 N 100
 BTMWIDTH FEET 120
 GRAPHICS I
 GO, DESIGN HL TYPE2 24 TYPE2378 24
 SAVMOV 2 101 1
 ENDJOB

1SITES XEQ 06/17/2011 ----- COMMENT PAGE -----
 VER 2005.1.05 Don Rogers WSID =

New dam, below two failing dams.

60" riser, 5' tall (top to inlet) 36" HCorrugated Metal Pipe

Auxiliary Spillway = 1628.1

Top of Dam = 1631.0

PS has 2 YR-24HR routed

AS has 50 YR-24HR routed

***** 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 06/17/2011 Don Rogers WSID=
 VER 2005.1.05 Rogers Pond SUBW= A
 TIME 16:26:17 SITE = S 1 PASS= 1 PART= 1

***** BASIC DATA *****
 CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

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	
2.20	0.00	0.00	4.50	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
75.00	4.45	16948.40	0.86	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
1626.00	1608.00	1626.00	1608.00	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	0.010	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 06/17/2011 Don Rogers WSID=
 VER 2005.1.05 Rogers Pond SUBW= A
 TIME 16:26:17 SITE = S 1 PASS= 1 PART= 2

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

PERM POOL	1626.00 FT	51.7 ACFT	12.62 AC	0.0 CFS
CREST PS	1608.00 FT	0.0 ACFT	0.00 AC	0.0 CFS
SED ACCUM	1626.00 FT	51.7 ACFT	12.62 AC	0.0 CFS
START ELEV	1626.00 FT	51.7 ACFT	12.62 AC	0.0 CFS
NRCS-PSH	D= 24.00 HR	P= 2.20 IN	Q= 0.48 IN	DA= 4.45 SM
	TC= 6.38 HR	CN= 75.00	VOL= 114.9 ACFT	

PEAK = 158.6 CFS, AT 16.4 HRS.

ROUTED RESULT - HYD TYPE	EMAX	VOL-MAX	AMAX	QMAX
NRCS-PSH	1628.01 FT	85.0 ACFT	20.28 AC	104.7 CFS

PS STORAGE 33.3 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 1608.00 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 1626.00 FT, 51.7 ACFT, 0.0 CFS.

DRAWDOWN TIME = 1.58 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. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	1608.00	0.00	0.00	0.00	0.00	0.00
2	1620.00	0.00	0.00	0.00	15.43	2.57
3	1621.00	0.00	0.00	0.00	18.21	2.98
4	1622.00	0.00	0.00	0.00	21.44	3.48
5	1623.00	0.00	0.00	0.00	25.22	4.07
6	1624.00	0.00	0.00	0.00	31.25	7.99
7	1625.00	0.00	0.00	0.00	40.31	10.13
8	1626.00	0.00	0.00	0.00	51.69	12.62
9	1627.00	47.14	47.14	0.00	66.31	16.63
10	1628.00	104.67	104.67	0.00	84.74	20.23
11	1629.00	108.17	108.17	0.00	107.11	24.51
12	1630.00	111.57	111.57	0.00	134.43	30.13
13	1631.00	114.86	114.86	0.00	167.49	36.00
14	1632.00	118.06	118.06	0.00	206.49	42.00
15	1633.00	121.17	121.17	0.00	251.49	48.00
16	1634.00	124.21	124.21	0.00	302.49	54.00

1SITES

XEQ 06/17/2011
VER 2005.1.05
TIME 16:26:17

Don Rogers
Rogers Pond

WSID=
SUBW= A
PART= 3

SITE = S 1 PASS= 1

AUX. CREST 1628.01 FT 85.0 ACFT 20.28 AC 104.7 CFS

PS STORAGE 33.3 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 1626.00 FT 51.7 ACFT 12.62 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 20.0 FEET, PRODUCT= 1700. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = S = USER DEFINED

NRCS-FBH D= 24.00 HR P= 4.50 IN Q= 2.05 IN DA= 4.45 SM
TC= 6.38 HR CN= 75.00 VOL= 486.7 ACFT

PEAK = 761.5 CFS, AT 16.3 HRS.

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	1608.00	0.00	0.00	0.00	0.00	0.00
2	1609.67	0.00	0.00	0.00	0.30	0.36

3	1611.34	0.00	0.00	0.00	1.19	0.71
4	1613.00	0.00	0.00	0.00	2.68	1.07
5	1614.67	0.00	0.00	0.00	4.77	1.43
6	1616.34	0.00	0.00	0.00	7.45	1.79
7	1618.01	0.00	0.00	0.00	10.73	2.14
8	1619.67	0.00	0.00	0.00	14.60	2.50
9	1621.34	0.00	0.00	0.00	19.25	3.15
10	1623.01	0.00	0.00	0.00	25.25	4.11
11	1624.68	0.00	0.00	0.00	37.14	9.44
12	1626.34	16.20	16.20	0.00	56.26	14.00
13	1628.01	104.71	104.71	0.00	84.97	20.28
14	1628.31	127.70	105.76	21.95	91.23	21.56
15	1628.61	177.17	106.81	70.36	97.88	22.84
16	1629.15	363.04	108.68	254.36	110.82	25.34
17	1629.81	707.49	110.92	596.57	128.74	29.05
18	1631.01	1655.86	114.88	1540.98	167.69	36.03
19	1632.50	3241.95	119.62	3122.32	228.37	45.02
20	1634.00	5243.54	124.21	5119.33	302.49	54.00

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX@	VEGETAL COVER FACTOR	MAINT. CODE	ROOTING DEPTH (ft)	REACH LOCATION *
1	200.	300.	0.0	0.035	**	**	**	CREST
2	300.	400.	1.0	0.035	0.65	2	2.0	EXIT !

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

* Upper case indicates a reach of constructed spillway channel.

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

! Reach 2 used in computing exit channel velocities.

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 1628.01 FT.

DRAWDOWN (DDT) TEST 1626.00 FT 51.7 ACFT 12.32 CFS
CONTROL IS 0.000 DETENTION STORAGE

TIME TO DDT TEST DISCHARGE IS 0.60 DAYS - DRAWDOWN CONTINUING.

DRAWDOWN TIME = 0.67 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	1629.84	129.6	29.2	1.83	44.6

^^^^ NOTE -- ACTUAL Hp OF 1.83 RAISED TO MEET MIN. 378 CRITERIA.

PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
DISCHARGE =	111.0	617.8	728.8

CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
-------------------	----------------------	----------------------	----------------

AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	0.93	5.41	0.018	0.025

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
 (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
 Aux. Spillway Discharge = 618. 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.	400.	1.00	0.035	4.48	0.70	0.139

AUXILIARY SPILLWAY DURATION FLOW = 15.3 HOURS
 ATTACK, OE/B = 2.5 ACFT/FT

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

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 4.5 FT/SEC
 EXIT SLOPE = 0.010 FT/FT
 FLOW DEPTH = 1.1 FT

>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS 2.00 FT.
 NEW TOP OF DAM ELEVATION = 1630.01.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	120.0	1630.01	135.4	30.3	2.02	50.4

PEAK - CFS DISCHARGES =	Q-PS 111.7	Q-AUX. 756.8	Q-TOT. 868.5
-------------------------	------------	--------------	--------------

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	1.06	5.78	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 = 1630.84.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	120.0	1630.84	162.2	35.1	2.84	77.3

PEAK - CFS DISCHARGES =	Q-PS 114.3	Q-AUX. 1408.7	Q-TOT. 1523.1
-------------------------	------------	---------------	---------------

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	1.60	7.05	0.016	0.021

Inflow Hyd 1 PSH-Peak = 104.71 CFS at 19.64 hrs., Location Point
 Inflow Hyd 1 FBH-Peak = 728.79 CFS at 17.10 hrs., Location Point
 HYDOUT 1

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

Don Rogers

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	4.45	75.	6.38	4.45	378NR	S	

PASS NO.	DIA./ WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
1	0.0	1628.0	120.0	2.8	1630.8	0.	0.	4.5	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 2005.1.05 ,01/01/2005
 FILES

INPUT = S:\PierreFSO\engineering\Angela\Don Rogers Pond\SITES\Final.D2C
 OUTPUT = S:\PierreFSO\engineering\Angela\Don Rogers Pond\SITES\Final.OUT
 DATED 06/17/2011 16:26:17

GRAPHICS FILES GENERATED

OPTION "L" = S:\PierreFSO\engineering\Angela\Don Rogers Pond\SITES\Final.DRG DATED 06/
OPTION "P" = S:\PierreFSO\engineering\Angela\Don Rogers Pond\SITES\Final.DHY DATED 06/
OPTION "E" = S:\PierreFSO\engineering\Angela\Don Rogers Pond\SITES\Final.DEM DATED 06/

Project Name: Don Rogers

Computed by: A. Roman

Date: 6/15/2011

Checked by: A. Roman

Date: 6/17/11

Input Data			Outflow, CFS					Structure Outflow, CFS	Controlling Factor
Riser Type & Diameter (in)			Elev	HW Ft	Weir	Inlet Orifice	Barrel Orifice	Full Pipe	
Length of Weir Obstruction (ft)	Circular	60	1626.0	0.0	0.00	0.00	63.67	131.53	0.00
			1626.1	0.1	1.49	29.90	64.58	132.05	1.49
Principal Spillway Crest Elev (ft)		0.5	1626.2	0.2	4.22	42.28	65.47	132.56	4.22
Invert of Barrel Elevation (ft)		6	1626.3	0.3	7.75	51.78	66.35	133.08	7.75
Barrel Orifice Coefficient (C)		1626	1626.4	0.4	11.93	59.79	67.21	133.59	11.93
Pipe Diameter (in)		1621	1626.5	0.5	16.67	66.85	68.07	134.10	16.67
Pipe Length (ft)		0.6	1626.6	0.6	21.91	73.23	68.92	134.60	21.91
Entrance Coefficient 'Ke'		36	1626.7	0.7	27.61	79.10	69.75	135.11	27.61
Mannings 'n'-value		101	1626.8	0.8	33.73	84.56	70.58	135.61	33.73
Elbow Elev (if None, leave 'BLANK')		1	1626.9	0.9	40.25	89.69	71.39	136.11	40.25
Length of Outlet ('BLANK' if none)		0.009	1627.0	1.0	47.14	94.54	72.20	136.61	47.14
Outlet Type	Canilever	1613.5	1627.1	1.1	54.39	99.16	73.00	137.11	54.39
Outlet Elevation (ft)		40	1627.2	1.2	61.97	103.57	73.79	137.60	61.97
Tailwater Elev (if unknown, leave 'Blank')			1627.3	1.3	69.88	107.79	74.57	138.10	69.88
Auxiliary Spillway Elev (ft)		1611.5	1627.4	1.4	78.10	111.86	75.34	138.59	75.34
Maximum Headwater Elev (ft)		1628.1	1627.5	1.5	86.61	115.79	76.10	139.08	76.10
Elev Increment After Full Pipe Flow		0.5	1627.6	1.6	95.41	119.59	76.86	139.57	76.86
			1627.7	1.7	104.50	123.27	77.61	140.06	77.61
			1627.8	1.8	113.85	126.84	78.35	140.54	78.35
			1627.9	1.9	123.47	130.32	79.09	141.03	79.09
			1628.0	2.0	133.35	133.70	79.82	141.51	79.82
			1628.1	2.1	143.47	137.00	80.54	141.99	80.54
			1628.2	2.2	153.84	140.23	81.26	142.47	81.26
			1628.3	2.3	164.45	143.38	81.97	142.95	81.97
			1628.4	2.4	175.29	146.46	82.67	143.42	82.67
			1628.5	2.5	186.36	149.48	83.37	143.90	83.37
			1628.6	2.6	197.65	152.44	84.06	144.37	84.06
			1628.7	2.7	209.18	155.35	84.75	144.84	84.75
			1628.8	2.8	220.89	158.20	85.43	145.31	85.43
			1628.9	2.9	232.83	161.00	86.10	145.78	86.10
			1629.0	3.0	244.97	163.75	86.77	146.24	86.77
			1629.1	3.1	257.32	166.46	87.44	146.71	87.44
			1629.2	3.2	269.87	169.12	88.10	147.17	88.10
			1629.3	3.3	282.62	171.74	88.75	147.63	88.75
			1629.4	3.4	295.56	174.33	89.40	148.09	89.40
			1629.5	3.5	308.70	176.87	90.05	148.55	90.05
			1629.6	3.6	322.02	179.38	90.69	149.01	90.69
			1629.7	3.7	335.53	181.85	91.33	149.47	91.33
			1629.8	3.8	349.23	184.30	91.96	149.92	91.96
			1629.9	3.9	363.10	186.71	92.59	150.38	92.59
			1630.0	4.0	377.16	189.08	93.21	150.83	93.21
			1630.1	4.1	391.39	191.43	93.83	151.28	93.83
			1630.2	4.2	405.79	193.75	94.44	151.73	94.44
			1630.3	4.3	420.37	196.05	95.05	152.18	95.05
			1630.4	4.4	435.12	198.31	95.66	152.62	95.66
			1630.5	4.5	450.04	200.55	96.27	153.07	96.27
			1630.6	4.6	465.12	202.77	96.87	153.51	96.87
			1630.7	4.7	480.37	204.96	97.46	153.96	97.46
			1630.8	4.8	495.79	207.13	98.05	154.40	98.05
			1630.9	4.9	511.36	209.28	98.64	154.84	98.64
			1631.0	5.0	527.09	211.40	99.23	155.28	99.23
			1631.1	5.1	542.99	213.51	99.81	155.72	99.81
			1631.2	5.2	559.03	215.59	100.39	156.16	100.39
			1631.3	5.3	575.24	217.65	100.96	156.59	100.96
			1631.4	5.4	591.59	219.70	101.54	157.02	101.54
			1631.5	5.5	608.10	221.72	102.11	157.46	102.11
			1631.6	5.6	624.76	223.73	102.67	157.89	102.67
			1631.7	5.7	641.57	225.72	103.23	158.32	103.23
			1631.8	5.8	658.53	227.69	103.79	158.75	103.79
			1631.9	5.9	675.63	229.64	104.35	159.18	104.35
			1632.0	6.0	692.88	231.58	104.90	159.61	104.90
			1632.1	6.1	710.28	233.50	105.45	160.03	105.45
			1632.2	6.2	727.81	235.41	106.00	160.46	106.00
			1632.3	6.3	745.49	237.30	106.55	160.88	106.55
			1632.4	6.4	763.31	239.17	107.09	161.30	107.09
			1632.5	6.5	781.27	241.04	107.63	161.72	107.63
			1632.6	6.6	799.37	242.88	108.17	162.15	108.17

Basic Output

Full Pipe Flow - Max. Outflow (cfs):	0.00
Full Pipe Flow - Max. Velocity (fps):	0.00
Useable Weir Length (Ft):	15.21
Riser Area (Sq Ft):	19.63
Barrel Area (Sq Ft):	7.07
Kp:	0.003466
Friction Slope (HW at the A.S. Crest):	0.02183
Pipe Slope:	0.12389
Outlet Elbow Angle (deg):	4.0
Maximum Barrel Invert Elevation for avoiding Barrel Orifice Control:	1609.20
Km:	0.01200
Tailwater Elev Used For Full Pipe Flow:	1613.3

Notes & Warnings

NOTE: Pipe slope computed to be greater than
friction slope - a 2D riser might improve flow
characteristics.

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

Project Name: Don Rogers

Computed by: A.Roman

Date: 6/17/2011

Checked by: A.Roman

Date: 6/17/11

laHoodInlet.xls Ver 1.10

				Outflow, CFS			Structure Outflow, CFS	Controlling Factor
	Elev	HW Ft	Weir	Slug Flow	Full Pipe			
Input Data								
	1621.0	0.0	0.00	0.00	75.76	0.00	Weir Flow	
	1621.1	0.1	0.42	0.00	76.25	0.42	Weir Flow	
	1621.2	0.2	0.83	0.00	76.73	0.83	Weir Flow	
	1621.3	0.3	1.25	0.00	77.22	1.25	Weir Flow	
Principal Spillway Crest Elev (ft)	1621	1621.4	0.4	1.66	0.00	77.70	1.66	Weir Flow
		1621.5	0.5	2.08	0.00	78.18	2.08	Weir Flow
Inside Wall - Type	Smooth	1621.6	0.6	2.49	0.00	78.65	2.49	Weir Flow
Pipe Diameter (in)	36	1621.7	0.7	3.27	0.00	79.13	3.27	Weir Flow
Pipe Length (ft)	101	1621.8	0.8	4.05	0.00	79.60	4.05	Weir Flow
Entrance Coefficient 'Ke'	1	1621.9	0.9	4.83	0.00	80.06	4.83	Weir Flow
Mannings 'n-value'	0.023	1622.0	1.0	5.61	0.00	80.53	5.61	Weir Flow
Elbow Elev (if None, Leave 'BLANK')	1613.5	1622.1	1.1	6.39	0.00	80.99	6.39	Weir Flow
Length of Outlet ('BLANK' if none)	40	1622.2	1.2	7.17	0.00	81.45	7.17	Weir Flow
Outlet Type	Cantilever	1622.3	1.3	8.16	0.00	81.90	8.16	Weir Flow
Outlet Elevation (ft)	1611.5	1622.4	1.4	9.15	0.00	82.36	9.15	Weir Flow
Tailwater Elev (if unknown, leave 'Blank')		1622.5	1.5	10.13	0.00	82.81	10.13	Weir Flow
Auxiliary Spillway Elev (ft)	1628.1	1622.6	1.6	11.33	0.00	83.26	11.33	Weir Flow
Maximum Headwater Elev (ft)	1640	1622.7	1.7	12.52	0.00	83.70	12.52	Weir Flow
Elev Increment After Full Pipe Flow	1	1622.8	1.8	13.72	0.00	84.15	13.72	Weir Flow
		1622.9	1.9	15.48	0.00	84.59	15.48	Weir Flow
Basic Output								
Full Pipe Flow - Max. Outflow (cfs):	141.07	1623.0	2.0	17.25	0.00	85.03	17.25	Weir Flow
Full Pipe Flow - Max. Velocity (fps):	19.96	1623.1	2.1	19.02	0.00	85.47	19.02	Weir Flow
		1623.2	2.2	20.78	0.00	85.90	20.78	Weir Flow
		1623.3	2.3	22.55	0.00	86.33	22.55	Weir Flow
		1623.4	2.4	24.32	0.00	86.76	24.32	Weir Flow
Barrel Area (Sq Ft):	7.07	1623.5	2.5	25.98	0.00	87.19	25.98	Weir Flow
Kp:	0.022638	1623.6	2.6	27.64	0.00	87.62	27.64	Weir Flow
Friction Slope (HW at the A.S. Crest):	0.07816	1623.7	2.7	29.31	0.00	88.04	29.31	Weir Flow
Pipe Slope:	0.12389	1623.8	2.8	30.97	0.00	88.46	30.97	Weir Flow
Outlet Elbow Angle (deg):	4.0	1623.9	2.9	32.63	0.00	88.89	32.63	Weir Flow
		1624.0	3.0	34.29	0.00	89.30	34.29	Weir Flow
		1624.1	3.1	35.85	0.00	89.72	35.85	Weir Flow
Km:	0.03067	1624.2	3.2	37.41	10.39	90.13	37.41	Weir Flow
Tailwater Elev Used For Full Pipe Flow:	1613.3	1624.3	3.3	38.97	31.18	90.55	38.97	Weir Flow
		1624.4	3.4	40.53	51.96	90.96	51.96	Slug Flow
		1624.5	3.5	42.09	72.75	91.37	72.75	Slug Flow
Notes & Warnings								
Note: Verify that the pipe inside wall type is correct.		1624.6	3.6	43.65	93.53	91.77	91.77	Full Pipe Flow
		1625.0	4.0	48.84	176.67	93.38	93.38	Full Pipe Flow
		1626.0	5.0	61.83	384.52	97.29	97.29	Full Pipe Flow
		1627.0	6.0			101.05	101.05	Full Pipe Flow
		1628.0	7.0			104.67	104.67	Full Pipe Flow
		1629.0	8.0			108.17	108.17	Full Pipe Flow
		1630.0	9.0			111.57	111.57	Full Pipe Flow
		1631.0	10.0			114.86	114.86	Full Pipe Flow
		1632.0	11.0			118.06	118.06	Full Pipe Flow
		1633.0	12.0			121.17	121.17	Full Pipe Flow
		1634.0	13.0			124.21	124.21	Full Pipe Flow
		1635.0	14.0			127.18	127.18	Full Pipe Flow
		1636.0	15.0			130.07	130.07	Full Pipe Flow
		1637.0	16.0			132.91	132.91	Full Pipe Flow
		1638.0	17.0			135.68	135.68	Full Pipe Flow
		1639.0	18.0			138.40	138.40	Full Pipe Flow
		1640.0	19.0			141.07	141.07	Full Pipe Flow

Buoyancy or Flotation of Riser

Project: Don Rogers
 Location: Sully County
 By: Angela Roman

Date: 6/17/2011

A. Roman 6/17/11

Riser Inside Diameter 60 inches
 Riser Height 60 inches
 Wall Thickness 6 inches

Base Diameter 96 inches OK
 Base Thickness 8 inches

63.5

Unit Weight of Soil 120 lbs/ft³
 Unit Weight of Concrete 150 lbs/ft³

Design Factor of Safety 1.5

Volume Displaced:	Riser	141.3 ft ³
	Base	33.5 ft ³
Total Volume Displaced		174.8 ft ³

Volume of Concrete:	Riser	43.2 ft ³
	Base	33.5 ft ³
Total Volume of Concrete		76.7 ft ³

Weight of Concrete	10970 lbs
(Riser and Base-less pipe hole)	

Volume of Soil on Base	109.9 ft ³
Weight of Soil on Base	13188 lbs
Buoyant weight of Soil	6330 lbs

Downward Forces	17301 lbs
Upward Forces	10907 lbs

Factor of Safety: 1.6 > 1.5

Design Is OK For Bouyancy

Cathodic Protection Calculations

Reference: EFM, Amend. IA41, April 1995

By: A. Roman
Date: 7/18/2011

Reviewed: A. Roman
Date: 7/18/11

Design Life 35 years

Affected Area:

Barrel			Riser		
type	Polymer coated galvanized CMP		type	No Riser	
inside diameter	36	in	inside diameter	78	in
length in fill	102	ft	length in fill	11	ft
wall thickness	0.064	in	wall thickness	0.064	in
corrugation	0.5		corrugation	0.5	
dev. width factor	1.08		dev. width factor	1.08	
Area	1056.34	sq ft	Area	0.00	sq ft

Antiseep Collar			Drawdown		
number	0		inside diameter	8	in
height	9	ft	length in fill	32	ft
width	9	ft	wall thickness	0.064	in
Area	0.00	sq ft	corrugation	0.5	
			dev. width factor	1.08	
Total Area	1056.34	sq ft	Area	0.00	sq ft

Current Required:

Resistivity of backfill material around pipe	958	ohm-cm
Current, I ₁		mA
Current, I ₂	132.32	mA
Current, I ₃		mA
Current, I ₄		mA
Total, I _T	132.32	mA

Anode Selection:

type	50 lb Std Mag - 10" x 18"
------	---------------------------

Current Output

Soil resistivity in anode bed location	958	ohm-cm
Current, I _m	57.41	mA

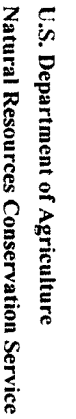
Number of Anodes Required

Use	3
-----	---

Expected Life

	40.9 years
--	------------

Cathodic Protection Required	
Number of Anodes:	3
Type:	Standard Potential Magnesium
Weight, lbs:	50
Size:	10" x 18"



EARTHWORK COMPUTATION SHEET

SD-ENG-32

11/99 Rev
Sheet 3 of 4

Owner: Don Rogers

County: Hughes

Field Office: Pierre

Practice: CORE TRENCH

Computations By: Angela Roman

Date: 15-Jul-11

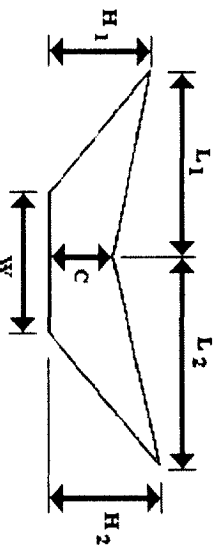
Legal Description: 27-113-76

Checked By: A. Roman

Date: 7-15-11

[illegible]

CORE TRENCH (yd³) = 1,179.3



Annual Yield and Sediment Storage

Project: Don Rogers
 Calculations By: Angela Roman
 Checked By: *AK* 7/14/11

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

Input Data
 Isogram # = 2
 Curve Number = 75
 Contributing Acres = 2848
 % chance = 50
 runoff = 0.35 inches

$\frac{\text{Contributing Acres} \times \text{Inches of Runoff}}{12} = 83.1 \text{ ACFT}$

Storage at Principal Spillway = 51.7 ACFT

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

Input Data
 Erodibility Area = J
 Gross Rate = 0.0029 >75% cultivated
 Drainage Area = 2848
 Delivery Rate = Median-Minimum- fields are primarily no till and some grass
 Design Life = 25

Gross Rate * Drainage Area * Delivery Rate * Years = 38.9 ACFT

Available Sediment Storage = 44.7 years

REF:
 EFM 2-83 Method A

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

7/25/2011

Client:
 County: SULLY
 Practice:
 Calculated By:
 Checked By: _____

State: SD
 Date: 1/4/2011
 Date: _____

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

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr rainfall (in)	1.80	2.20	3.00	3.50	4.00	4.50	5.10
Ia/P Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Used	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Runoff (in)							
(ac-ft)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unit Peak Discharge (cfs/acre/in)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peak Discharge (cfs)							

DRAINAGE DIAPHRAGM LOCATOR

A. Roman 6/22/11

Data Input	
Elev. Invert	1621
Pipe slope (ft/ft)	0.1279
Top of Fill	1631
SS ratio	3
Dist from invert to ds edge top dam	29.42
pipe diam (ft)	3
dist from pipe CL to top diaphragm	10.5
Diaphragm thickness (ft)	2

(This solver button doesn't work

X (max dist from invert to U/S diaph.) 32.7

(PLAY WITH THIS UNTIL b16 AND b17
ARE EQUAL)

theta 18.43495

1/2 of top of fill to top Diaphragm 1.155115

1.000576

perp dist from to diaph to backslope 1.15445 Adjust X so that these are equal

Elevation of top of Diaphragm 1628.69

Rogers_fetch.txt

Effective fetch (TR-56) Version 2.0

CAD file name = S:\PierreFSO\engineering\Angela\Don Rogers Pond\Rogers.dwg

CAD layer name = 1.Dsgn.Tr56.RunA

Elevation of pool polyline = 1626.00

Trial run name = RunA

ALPHA	COS(ALPHA)	XALPHA	XALPHA x COS(ALPHA)
-42	0.743	100.285	74.526
-36	0.809	112.877	91.319
-30	0.866	126.925	109.920
-24	0.914	148.552	135.709
-18	0.951	174.384	165.849
-12	0.978	201.678	197.270
-6	0.995	281.322	279.781
0	1.000	362.324	362.324
6	0.995	385.119	383.009
12	0.978	440.537	430.911
18	0.951	435.398	414.088
24	0.914	452.086	413.001
30	0.866	452.029	391.468
36	0.809	488.342	395.077
42	0.743	541.973	402.764

Effective Fetch (FT) = 314.340

Wave Height (FT) (50 MPH wind) = 0.585

Effective fetch (TR-56) Version 2.0

CAD file name = S:\PierreFSO\engineering\Angela\Don Rogers Pond\Rogers.dwg

CAD layer name = 1.Dsgn.Tr56.RunB

Elevation of pool polyline = 1626.00

Trial run name = RunB

ALPHA	COS(ALPHA)	XALPHA	XALPHA x COS(ALPHA)
-42	0.743	417.279	310.099
-36	0.809	358.902	290.358
-30	0.866	389.548	337.359
-24	0.914	286.799	262.004
-18	0.951	253.269	240.873
-12	0.978	231.556	226.496
-6	0.995	190.673	189.628
0	1.000	168.078	168.078
6	0.995	149.817	148.996
12	0.978	128.336	125.532
18	0.951	111.739	106.270
24	0.914	100.566	91.871
30	0.866	89.555	77.557
36	0.809	75.975	61.465
42	0.743	64.968	48.281

Effective Fetch (FT) = 198.718

Wave Height (FT) (50 MPH wind) = 0.471

Effective fetch (TR-56) Version 2.0

CAD file name = S:\PierreFSO\engineering\Angela\Don Rogers Pond\Rogers.dwg

CAD layer name = 1.Dsgn.Tr56.RunC

Elevation of pool polyline = 1626.00

Trial run name = RunC

ALPHA	COS(ALPHA)	XALPHA	XALPHA x COS(ALPHA)
-42	0.743	268.823	199.774
-36	0.809	331.051	267.826
-30	0.866	367.667	318.409
-24	0.914	407.577	372.340

		Rogers_fetch.txt	
-18	0.951	447.734	425.820
-12	0.978	486.720	476.084
-6	0.995	502.193	499.442
0	1.000	546.287	546.287
6	0.995	609.486	606.147
12	0.978	166.028	162.400
18	0.951	127.922	121.661
24	0.914	106.156	96.978
30	0.866	82.419	71.377
36	0.809	48.892	39.554
42	0.743	32.931	24.473

Effective Fetch (FT) = 312.974

Wave Height (FT) (50 MPH Wind) = 0.584

Stage Storage Table - 1

Project: Don Rogers

Basin Desc: <Enter Basin Description>

Contour Elevation	Area (sq. ft)	Contour Acres	Depth (ft)	Avg. El (cu. ft)	Avg. End (cu. ft)	Volume Conic (cu. ft)	Incremental (cu. ft)	Cumulative Volume Conic (cu. ft)
1608	76.13	0.001747704	N/A				N/A	
1609	402.85	0.009248163			1		239.49	
1610	844.56	0.01938843			1		623.71	
1611	6,830.74	0.156812213			1		3837.65	
1612	12,808.31	0.294038338			1		9819.53	
1613	20,572.10	0.472270432			1		16690.21	
1614	30,781.69	0.706650367			1		25676.9	
1615	41,554.64	0.953963269			1		36168.16	
1616	55,519.66	1.274556015			1		48537.15	
1617	70,549.94	1.619603765			1		63034.8	
1618	85,757.38	1.968718549			1		78153.66	
1619	97,937.71	2.24834045			1		91847.54	
1620	111,724.13	2.564833104			1		104830.9	
1621	129,513.83	2.973228421			1		120619	
1622	151,209.47	3.471291781			1		140361.7	
1623	177,034.72	4.064157943			1		164122.1	
1624	347,727.13	7.982716483			1		262380.9	
1625	441,117.63	10.12666736			1		394422.4	
1626	549,824.05	12.62222337			1		495470.8	
1627	724,367.47	16.62918893			1		637095.8	
1628	881,229.63	20.23024862			1		802798.6	
1629	1,067,515.70	24.50678834			1		974372.7	
1630	1,312,410.16	30.12879155			1		1189963	

Incremental Cumulative

Volume

Volume

0	N/A	0
239.49	218.04	218.04
863.2	610.23	828.27
4700.85	3359.06	4187.33
14520.37	9664.23	13851.55
31210.58	16537.64	30389.19
56887.48	25506.05	55895.23
93055.64	36033.71	91928.95
141592.8	48368.86	140297.8
204627.6	62884.94	203182.7
282781.3	78030.07	281212.8
374628.8	91780.17	372993
479459.7	104755.3	477748.3
600078.7	120509.5	598257.8
740440.3	140221.7	738479.5
904562.4	163952.5	902432
1166943	257624.8	1160057
1561366	393497.8	1553555
2056837	494474.1	2048029
2693932	635093.9	2683122
3496731	801518.4	3484641
4471104	972885.3	4457526
5661066	1187857	5645384

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project: S:\PierreFSO\engineering\Angela\Don Rogers Pond\Rogers.pro
Report Generated: Wednesday, June 15, 2011 3:42:06 PM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors:	Excavation	1.0000	Fill	1.0000
First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points	
POINTS	1,467	DAM	91	
Excavation Volume (Cu. Yd.)		Fill Volume (Cu. Yd.)		
0.0		9,104.1		

Net Difference: 9,104.1 Cu. Yd. Borrow

Area = 35,182.88 sqft
0.8077 Acres

DOCUMENTATION FOR HAZARD CLASSIFICATION

Producer: **Don Rogers** Name of Site
County: **Sully**
Field #: Watershed
Location
1/4 Section: **NE** Section: **27** Township: **113N** Range: **76W**
Latitude: Longitude

Dam in Series: **Yes**

Explain: **One failed and another failing dam directly up stream. Analysis completed accounting for all dams and watersheds.**

Dam and Reservoir Data

Assumed Job Class	IV
Assumed Hazard Class	A
Centerline Elevation Channel Bottom*	1698
Centerline Elevation Flood Plain*	
Centerline Elevation Top of Dam*	1719
Centerline Elevation Auxiliary Spillway Crest*	1716.1
*Elevation is based on Mean Sea Level Datum	

Max. Depth of Water within Reservoir **16 Ft.**

Storage

Storage Below Principal Spillway	51.7 Ac.-Ft.
Storage between Principal Spillway and Auxiliary Spillway	33.3 Ac.-Ft.
Storage between Auxiliary Spillway and Top of Dam	82.5 Ac.-Ft.
Other	Ac.-Ft.
Total Storage to Top of Dam	167.5 Ac.-Ft.

Downstream Conditions

1. Valley Conditions Downstream of Structure	Parallel
Approximate Slope of Channel	
2. Stream Channel Size	
Depth	2 Ft.
Bottom Width	18 Ft.
Top Width	40 Ft.
3. Valley Characteristics	
Width	400 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:			☒	☐
Minimum Maintenance road			☐	☒
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: Lightly traveled county minimum maintenance road. Located 1 mile down stream. Water depth at intersection of minimum maintenance road and channel is 8.38'. There is no culvert, road follows topography.				

Location:

Is Dam located within five miles of urban development?

Yes

Describe Potential Development:

Located 4 1/2 miles north of Blunt, SD (population 370). Potential development is unlikely, in a rural area.

Rational For Determining Hazard Class:

Construction along this drainage way is unlikely. Minimum maintenance road to be affected has alternative travel routes.

Method Used for Evaluation of Impact Area

Visual Assessment

Further Evaluation Needed

No

Attached: Breach Routings ☒

Maps ☒

Other supporting documents:

Simple Dam Break

Actual Hazard Class*

A

Final Job Class

VI

Hazard Analysis by:

Angela Roman

Date:

7/14/11

Approved by

Angela Roman

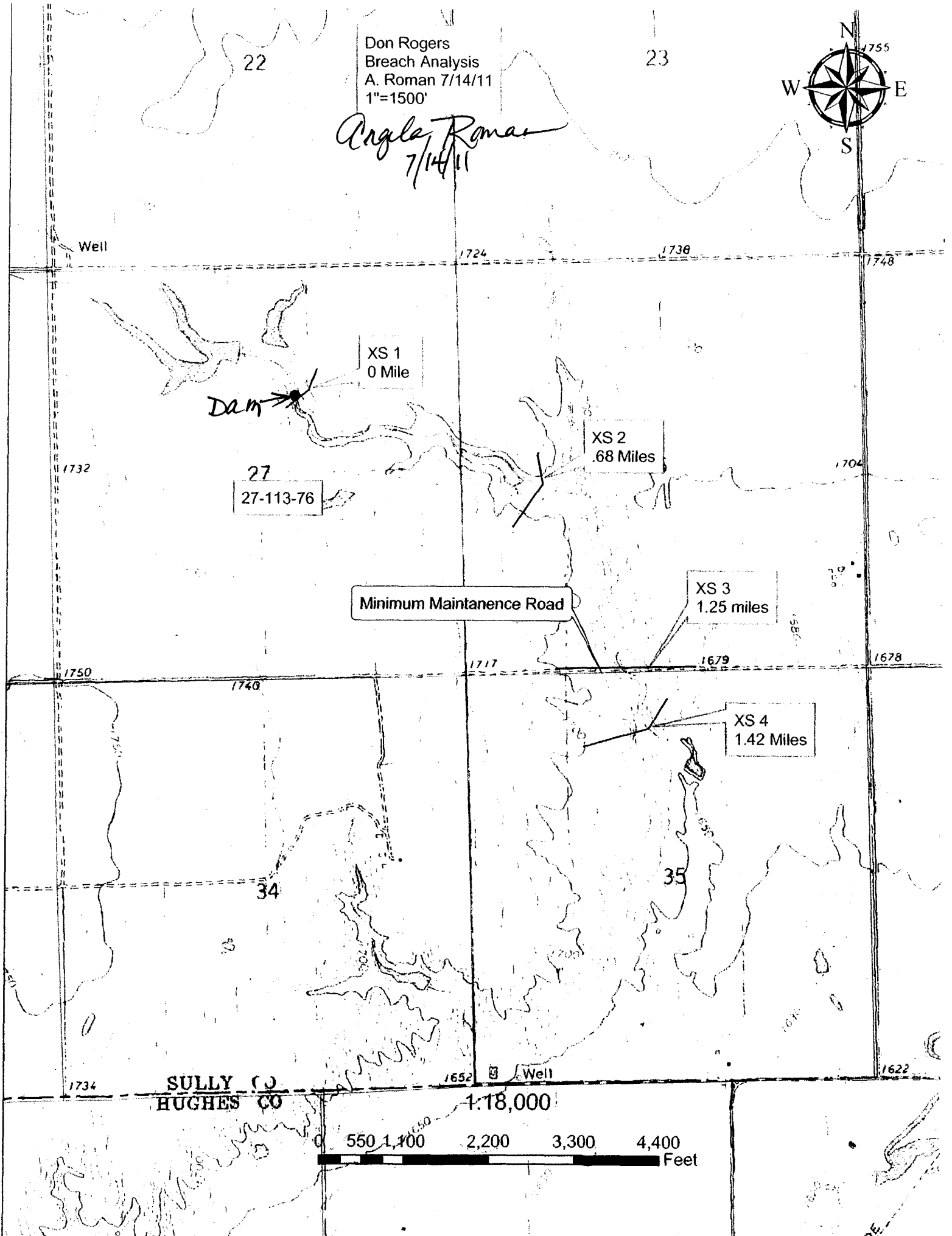
Date:

7/18/11

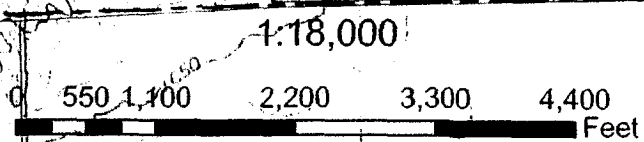
*Definition of Hazard Classification in National Engineering Manual 520.21 and SD Amendment 19

Don Rogers
Breach Analysis
A. Roman 7/14/11
1"=1500'

Angela Roman
7/14/11



SULLY CO
HUGHES CO



BOTH DAMS

SIMPLIFIED DAMBREAK MODEL (SMPDBK) VERSION: 9/91
 BY D.L. FREAD, J.M. LEWIS, & J.N. WETMORE - PHONE: (301) 427-7640
 NWS HYDROLOGIC RESEARCH LAB W/OH3, 1325 EAST-WEST HIGHWAY,
 SILVER SPRING, MD 20910

THIS RUN IS ASSUMING THE DAM DOWN STREAM WOULD FAIL AS WELL. ESTIMATING 107 ac-ft
 AT DOWNSTREAM DAM, IN ADDITION TO NEW DAM'S 168 ac ft.

A. Roman 7/15/11

	Don Rogers						
	Trib to Medicine Creek						
	IBC	ISH	JNK	IDAM	IPLT	IREC	
	1	0	0	0	1	0	
	HDE	BME	VOL	SA	BW	TFM	QO
C4	1719.0	1698.0	275.	36.0	82.8	22.8	1.
C5	NS= 4	NCS= 5	CMS=.50	DISTTN= 1.25			
	X-S NO. 1						
C6-1	D= .00	FLD=	2.00				
C7-1	HS= 1698.00	BS=	5.	BSS=	0.	CM=	.050
C7-2	HS= 1700.00	BS=	41.	BSS=	0.	CM=	.050
C7-3	HS= 1710.00	BS=	172.	BSS=	0.	CM=	.050
C7-4	HS= 1720.00	BS=	354.	BSS=	0.	CM=	.050
C7-5	HS= 1730.00	BS=	1517.	BSS=	0.	CM=	.050
	X-S NO. 2						
C6-2	D= .68	FLD=	2.00				
C7-1	HS= 1678.00	BS=	5.	BSS=	0.	CM=	.050
C7-2	HS= 1680.00	BS=	218.	BSS=	0.	CM=	.050
C7-3	HS= 1690.00	BS=	356.	BSS=	0.	CM=	.050
C7-4	HS= 1700.00	BS=	566.	BSS=	0.	CM=	.050
C7-5	HS= 1710.00	BS=	1065.	BSS=	0.	CM=	.050
	X-S NO. 3						
C6-3	D= 1.25	FLD=	2.00				
C7-1	HS= 1659.00	BS=	5.	BSS=	0.	CM=	.050
C7-2	HS= 1670.00	BS=	390.	BSS=	0.	CM=	.050
C7-3	HS= 1680.00	BS=	750.	BSS=	0.	CM=	.050
C7-4	HS= 1690.00	BS=	4040.	BSS=	0.	CM=	.050
C7-5	HS= 1700.00	BS=	4050.	BSS=	0.	CM=	.050
	X-S NO. 4						
C6-4	D= 1.42	FLD=	2.00				
C7-1	HS= 1655.00	BS=	5.	BSS=	0.	CM=	.050
C7-2	HS= 1660.00	BS=	234.	BSS=	0.	CM=	.050
C7-3	HS= 1670.00	BS=	280.	BSS=	0.	CM=	.050
C7-4	HS= 1680.00	BS=	410.	BSS=	0.	CM=	.050
C7-5	HS= 1690.00	BS=	925.	BSS=	0.	CM=	.050

***** W A R N I N G *****

ORIGINAL BREACH WIDTH (82.8) WAS CHANGED TO(55.2) BECAUSE IT WAS WIDER
 THAN 1.5*(THE 2ND CHANNEL WIDTH) OF THE 1ST CROSS SECTION. THIS CONSTRAINT
 CAN BE REMOVED BY ENTERING BW AS A NEGATIVE VALUE OR BY ENLARGING THE LOWER
 PORTION OF THE 1ST CROSS SECTION OR BY RAISING THE BOTTOM BREACH ELEVATION
 TO MORE NEARLY CONFORM WITH THE NATURAL TOPOGRAPHY OF THE 1ST SECTION.

***** DISTANCE TO PRIMARY POINT OF INTEREST MOVED TO THE CROSS SECTION
 ***** CLOSEST TO THIS LOCATION (MI 1.25)

BOTHDAMS

THE DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	EARTH	
DAM BREACH ELEVATION (HDE)		1719.00 FT
FINAL BREACH ELEVATION (BME)		1698.00 FT
VOLUME OF RESERVOIR (VOL)		275. ACRE-FT
SURFACE AREA OF RESERVOIR (SA)		36.00 ACRES
FINAL BREACH WIDTH (BW)		55.21 FT
TIME OF DAM FAILURE (TFM)		22.81 MINUTES
NON-BREACH FLOW (QO)		1.00 CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)		1.25 MILES
DEAD STORAGE EQUIV. MANN. N (CMS)		.50

CROSS SECTION NO. 1

FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1698.0	1700.0	1710.0	1720.0	1730.0
TWIDTHS(FT) (BS)	5.0	41.0	172.0	354.0	1517.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.050	.050	.050	.050	.050

CROSS SECTION NO. 2

REACH LENGTH (D) .68 MI
FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1678.0	1680.0	1690.0	1700.0	1710.0
TWIDTHS(FT) (BS)	5.0	218.0	356.0	566.0	1065.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.050	.050	.050	.050	.050

CROSS SECTION NO. 3

REACH LENGTH (D) 1.25 MI
FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1659.0	1670.0	1680.0	1690.0	1700.0
TWIDTHS(FT) (BS)	5.0	390.0	750.0	4040.0	4050.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.050	.050	.050	.050	.050

CROSS SECTION NO. 4

REACH LENGTH (D) 1.42 MI
FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1655.0	1660.0	1670.0	1680.0	1690.0
TWIDTHS(FT) (BS)	5.0	234.0	280.0	410.0	925.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.050	.050	.050	.050	.050

AN ASTERISK (*) BESIDE A PARAMETER IMPLIES THAT A DEFAULT VALUE WAS COMPUTED

NAME OF DAM: Don Rogers

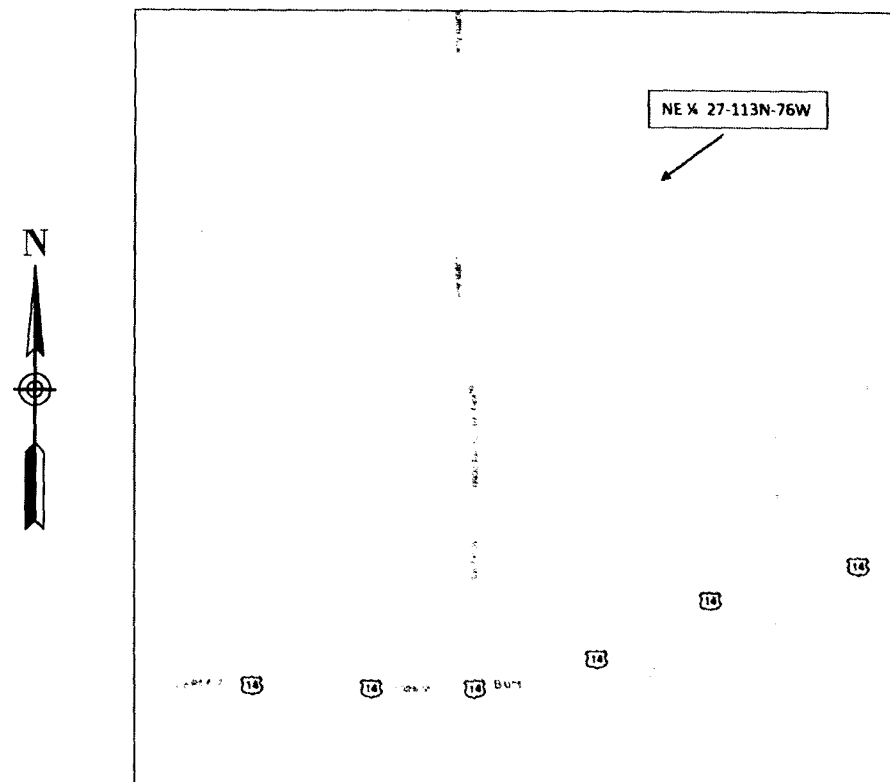
NAME OF RIVER: Trib to Medicine Cre

RVR MILE FROM DAM	MAX FLOW (CFS)	MAX ELEV (FT-MSL)	MAX DEPTH (FT)	TIME(HR) MAX DEPTH	TIME(HR) FLOOD	TIME(HR) DEFLOOD	FLOOD DEPTH(FT)
-------------------	----------------	-------------------	----------------	--------------------	----------------	------------------	-----------------

BOTH DAMS							
*****	*****	*****	*****	*****	*****	*****	*****
.00	10796.	1710.90	12.90	.38	.00	.61	2.00
.68	8813.	1684.36	6.36	.51	.15	.86	2.00
1.25	8242.	1667.38	8.38	.58	.21	1.00	2.00
1.42	7983.	1662.84	7.84	.69	.32	1.12	2.00

ANALYSIS IS COMPLETE

DON ROGERS 378 POND
NE 1/4, SEC. 27, T113N, R76W
SULLY COUNTY, SOUTH DAKOTA



LOCATION MAP

Landowner Information

Don Rogers
PO Box 167
Blunt, SD 57522
605-280-7105

GENERAL NOTES

1. If cultural resources are discovered during construction, discontinue construction and notify the local Natural Resources Conservation Service office.
2. According to South Dakota state law, "No excavator may begin any excavation without first notifying the One-Call Notification Center of the proposed excavation" at (800) 781-7474.
3. The landowner is responsible for complying with all federal, state, and local laws.
4. A preconstruction meeting is required between NRCS, the Landowner, and the contractor.

CONSTRUCTION NOTES

1. Clear and grub the entire area within the work limits.
2. All borrow 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 or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
4. 6 inches topsoil will be incorporated into the earthfill neat line & grade surface and meet SD Construction Specification SD-7S
5. All areas top-dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD-28.

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY	"AS-BUILT" QUANTITY
Earthfill Class S - Embankment	Cu. Yd.	9,105	
Earthfill Class S - Core Trench	Cu. Yd.	1180	
Earthfill Class S - Stripping	Cu. Yd.	652	
Earthfill Class S - 5% Settlement	Cu. Yd.	456	
Total Earthfill	Cu. Yd.	11,393	
Excavation - Auxiliary Spillway	Cu Yd.	4,013	
Topsoil Auxiliary Spillway	Cu. Yd.	1,232	
Seeding (Earthfill And Auxiliary Spillway)	Acre	2.3	
Cathodic Protection System	Each	1	
Principal Spillway Pipe			
16 gage 36" Dia. 2 3/4" x 1/2" Polymer Coated Helical Corrugated Metal Pipe	Lin. Ft.	102	
60" Dia., 5' tall precast Concrete Riser And Base	Each	1	
Trash Rack And Baffle	Each	1	
Drainage Diaphragm			
Rock Rip Rap	Cu. Yd.	9.7	
Drain Fill	Cu. Yd.	41.4	
Geotextile fabric	Sq. Yd.	28.8	
Timber Pipe Support	Each	1	

SD CONSTRUCTION AND
MATERIAL SPECIFICATIONS

SD-4 Stripping
SD-5 Excavation
SD-7S Earthfill - Class S
SD-8 Rock Riprap And Bedding
SD-10 Salvaging And Spreading Topsoil
SD-12B Concrete For Minor Structures
SD-13 Steel Reinforcement
SD-15 Corrugated Metal Pipe
SD-16 Wood Fabrication and Installation
SD-28 Seeding
SD-31 Cathodic Protection
SD-50 Coated Corrugated Steel Pipe
SD-592 Geotextile
For A Full Text Version See
http://www.sd.usda.gov/technical/SD_Engineering.html

INDEX OF DRAWINGS

1. Cover Sheet
2. Plan View and Design Data
3. Detail Plan View
4. Pipe Cross-Section View
5. Dam Profile View
6. Precast Concrete Riser Detail
7. Trash Rack and Baffle Detail
8. Timber Pipe Support Detail
9. Drainage Diaphragm Detail
10. Cathodic Protection

STATEMENT OF COMPLIANCE

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

JAA

Date

NRCS HAZARD CLASS A
NRCS JOB CLASS IV

DON ROGERS
378 POND
COVER SHEET



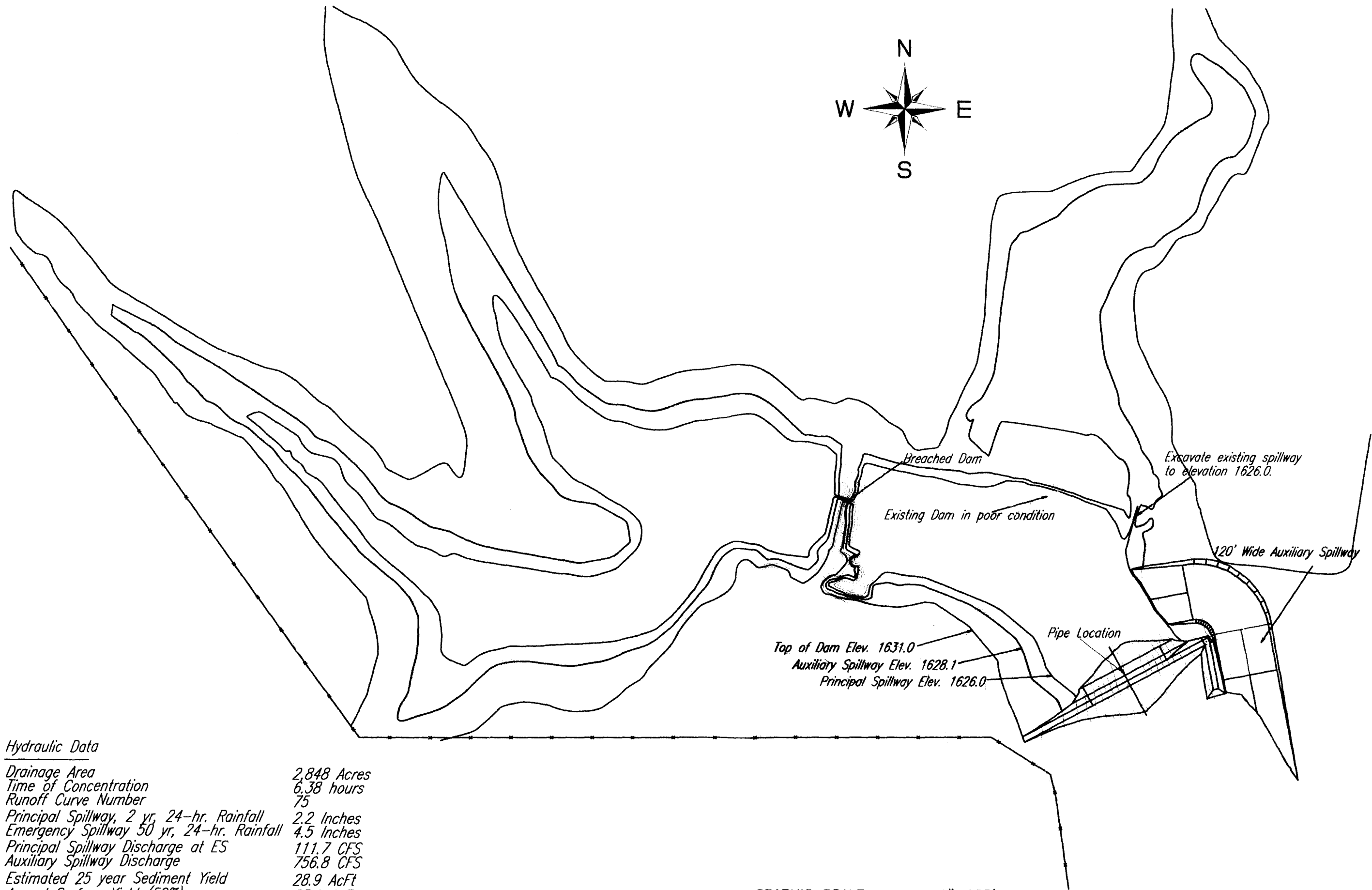
File No.
Rogers.dwg

Drawing No.

7/26/11 9:52 AM
Sheet 1 of 10

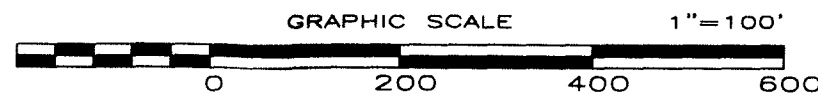
Designed Angela Roman 5/23/11
Drawn Angela Roman 5/23/11
Checked J. Edwards 7/25/11
Approved Angela Roman 7/25/11

NE 1/4, Sec. 27, T113N, R76W Sully County, South Dakota



Hydraulic Data

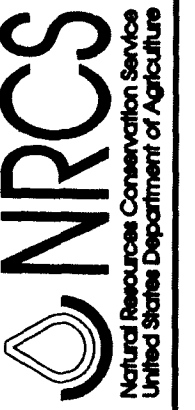
Drainage Area	2,848 Acres
Time of Concentration	6.38 hours
Runoff Curve Number	75
Principal Spillway, 2 yr, 24-hr. Rainfall	2.2 Inches
Emergency Spillway 50 yr, 24-hr. Rainfall	4.5 Inches
Principal Spillway Discharge at ES	111.7 CFS
Auxiliary Spillway Discharge	756.8 CFS
Estimated 25 year Sediment Yield	28.9 AcFt
Annual Surface Yield (50%)	83.1 AcFt
Crest of Normal Pool	12.6 Acres 51.7 AcFt
Crest of Auxiliary Spillway	20.3 Acres 85.0 AcFt
Top of Dam	36.0 Acres 167.5 AcFt

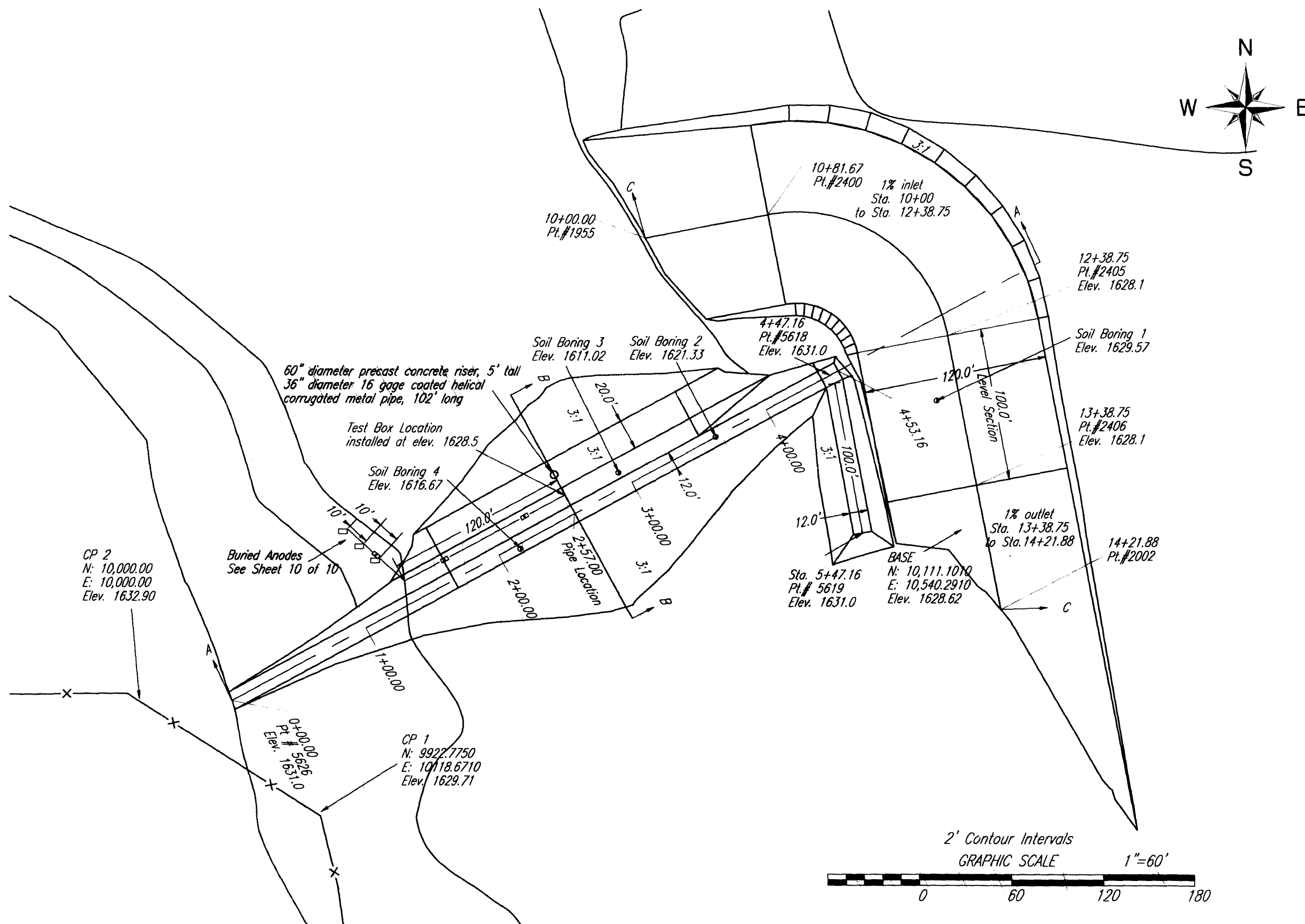


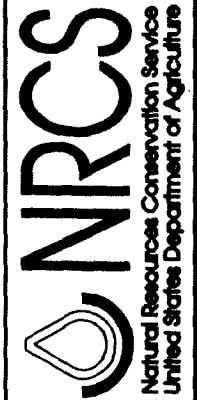
Designed	A. Roman	Date	7/25/2011
Drawn	A. Roman		7/25/2011
Checked	<i>[Signature]</i>		7/25/11
Approved	<i>[Signature]</i>		7/25/11

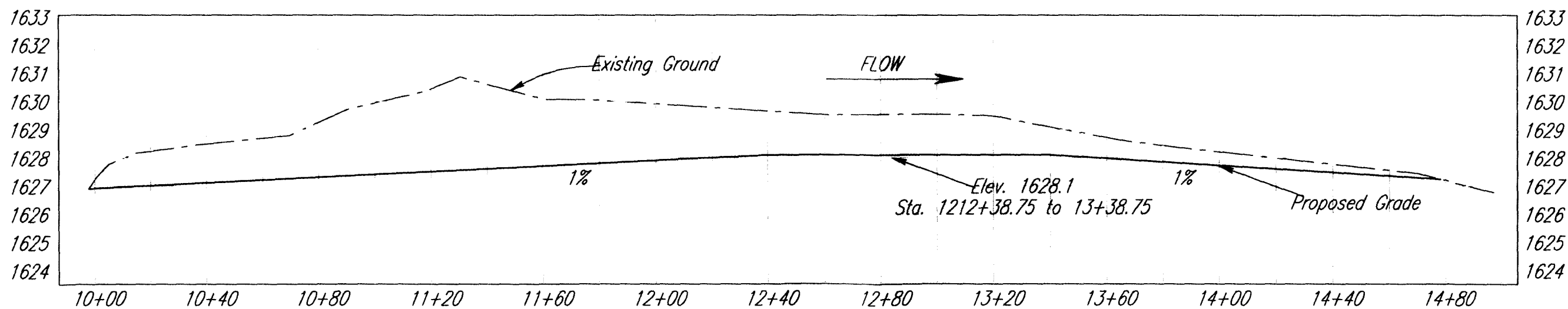
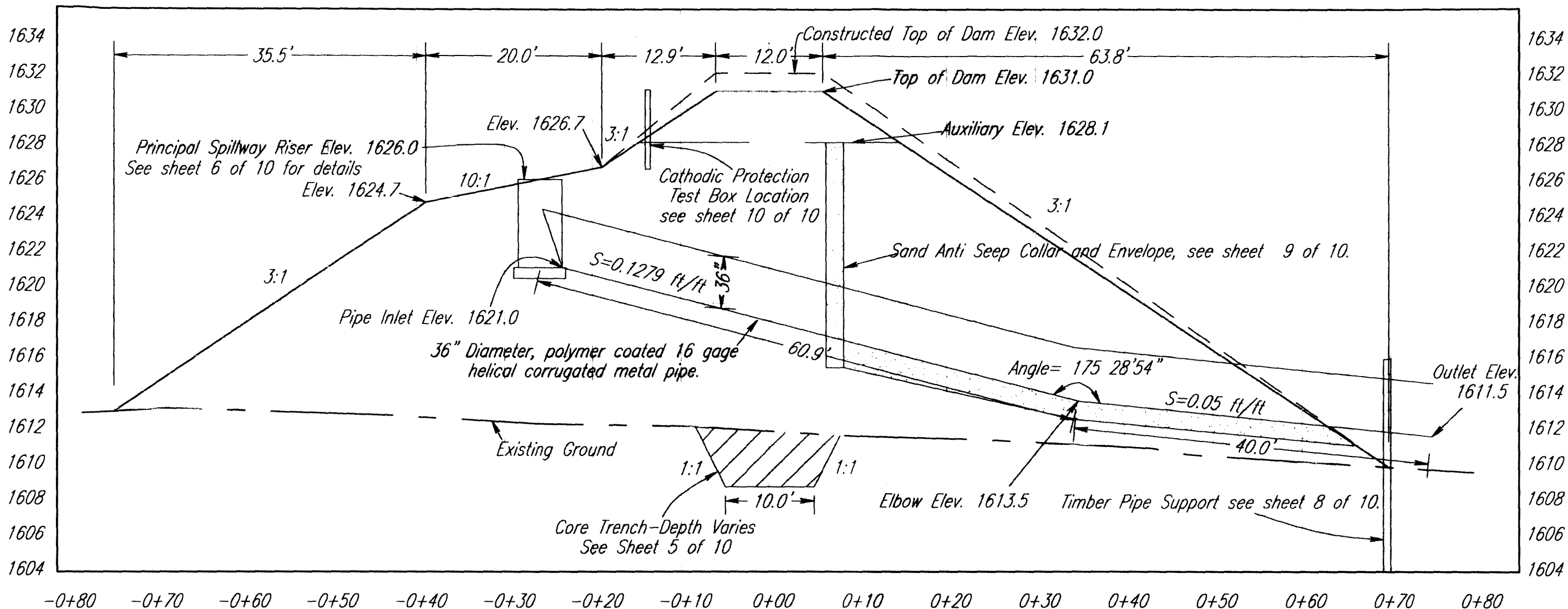
PRODUCER Don Rogers
 NE 1/4 SECT. 22 T. 113 North R. 76 West
 Sully COUNTY
 Sully County CONSERVATION DISTRICT

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: Rogers Drawing No.: 7/26/2011 9:11AM Sheet 3 of 10	
USDA - NRCS FIELD SUPPORT OFFICE 1717 N. LINCOLN AVE. SUITE 104 PIERRE, SOUTH DAKOTA 57501	
PRODUCER Don Rogers NE 1/4 SECT. 27 T.113N R. 76 West Sully COUNTY Sully County CONSERVATION DISTRICT	Date 7/25/2011 Designed A. Roman Drawn A. Roman Checked D. Edwards Approved Angela Roman



Date 7/25/2011
Designed A. Roman
Drawn A. Roman
Checked S. Roman
Approved Angelle Roman 7/25/11

PRODUCER Don Rogers
NE 1/4 SECT. 27 T.113 North R. 76 West
Sully COUNTY
Sully County CONSERVATION DISTRICT

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

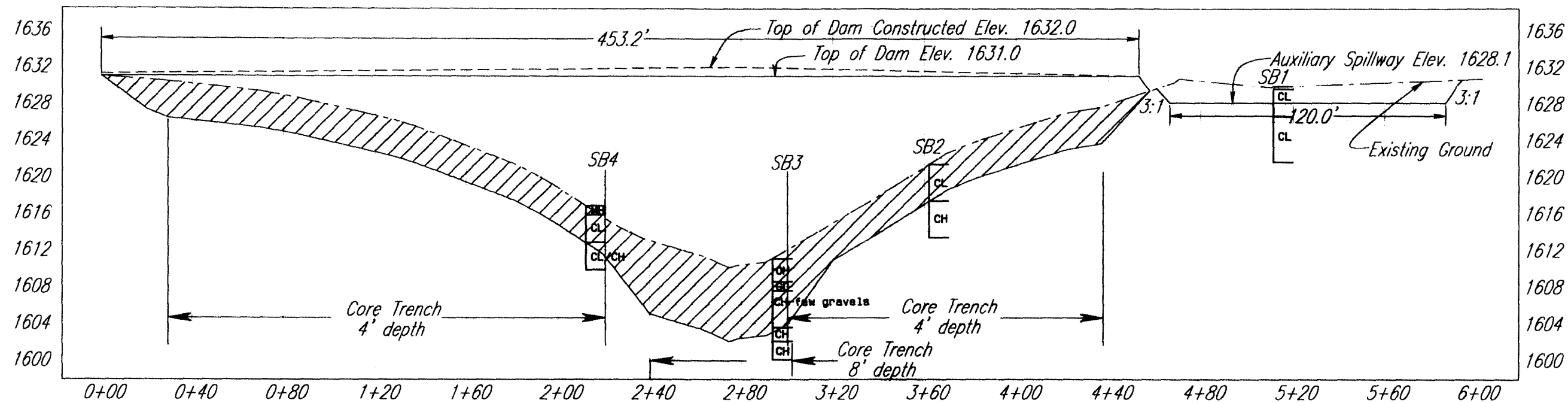
NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name: Roman

Drawing No.

7/25/2011 11:48AM

Sheet 4 of 10



Section B-B Cross Section of Dam at Pipe
Vertical Scale: 1" = 12' Horizontal Scale: 1" = 50'

Control Points				
Pt #	Northing	Easting	Elevation	Descriptor
7029	9922.7750	10118.6710	1629.71	CP1-rebar under 1x2 stakes along fence
6162	10000.0000	10000.0000	1632.90	CP2-rebar under 1x2 stakes along fence
BASE	10111.1010	10540.2910	1628.62	BM-rebar under 1x2 stakes located in outlet of Aux. Spillway

Auxiliary Spillway				
Pt #	Northing	Easting	Elevation	Descriptor
1955	10302.2557	10333.0103	1626.50	Auxiliary Spillway Sta. 10+00.00
2002	10058.6466	10565.0038	1628.10	Auxiliary Spillway Sta. 14+21.88
2400	10317.7194	10413.2059	1626.50	Auxiliary Spillway Sta. 10+81.67
2405	10238.4620	10530.3309	1628.10	Auxiliary Spillway Sta. 12+38.75
2406	10140.2707	10549.2646	1628.10	Auxiliary Spillway Sta. 13+38.75
5619	10108.7265	10474.9338	1631.00	5+47.16 CL Dike
5626	9998.3240	10060.8540	1631.00	2396-CL
5627	10212.2630	10453.5190	1631.00	5618-CL

Dam				
Pt #	Northing	Easting	Elevation	Descriptor
2396	9998.3235	10060.8540	1631.00	0+00 Start Dam
5618	10212.2626	10453.5188	1631.00	4+47.16 CL Dam
5619	10108.7265	10474.9338	1631.00	5+47.16 CL Dike

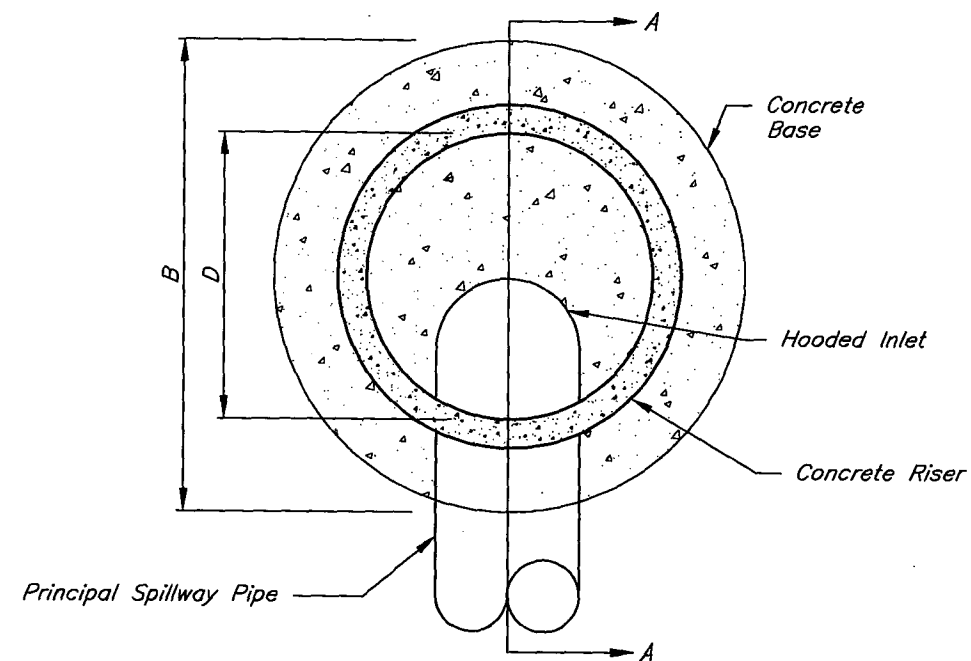
Date 7/25/2011
Designed A. Roman
Drawn A. Roman
Checked E. Roman
Approved Angela Roman

PRODUCER Don Rogers
NE 1/4 SECT. 27 T. 113 North R. 26 West
Sully COUNTY
Sully County CONSERVATION DISTRICT

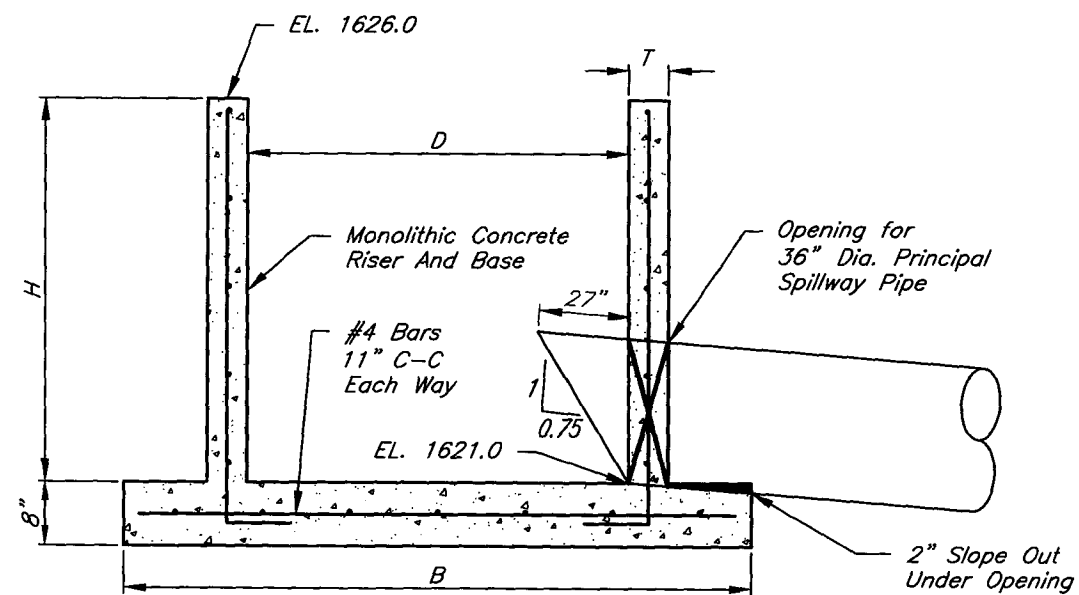
USDA - NRCS
FIELD SUPPORT OFFICE
1717 N. LINCOLN AVE. SUITE 104
PIERRE, SOUTH DAKOTA 57501

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

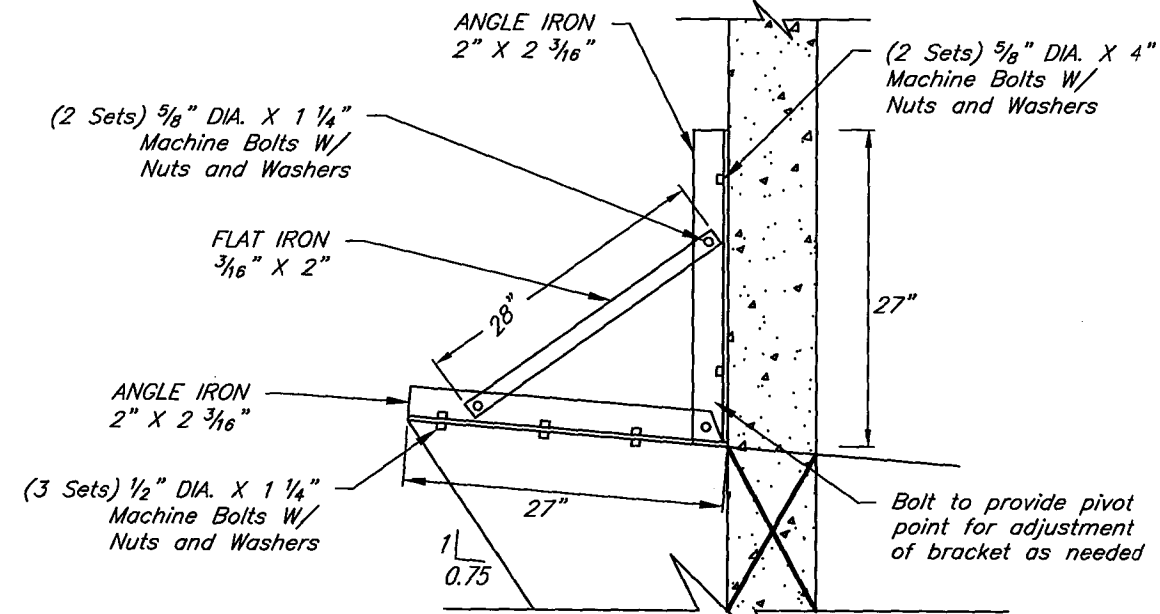
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7/25/2011 0:43PM
Sheet 6 of 10



PLAN VIEW PRECAST RISER AND BASE



SECTION VIEW A-A



SUPPORT BRACKET DETAIL

REQUIRED PRECAST RISER AND BASE DIMENSIONS						
(D) RISER DIAMETER	(H) RISER HEIGHT	(T) WALL THICKNESS	(B) BASE DIAMETER	BASE THICKNESS	PIPE DIAMETER	PIPE MATERIAL
60"	5'	6"	96"	8"	36"	CMP

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.

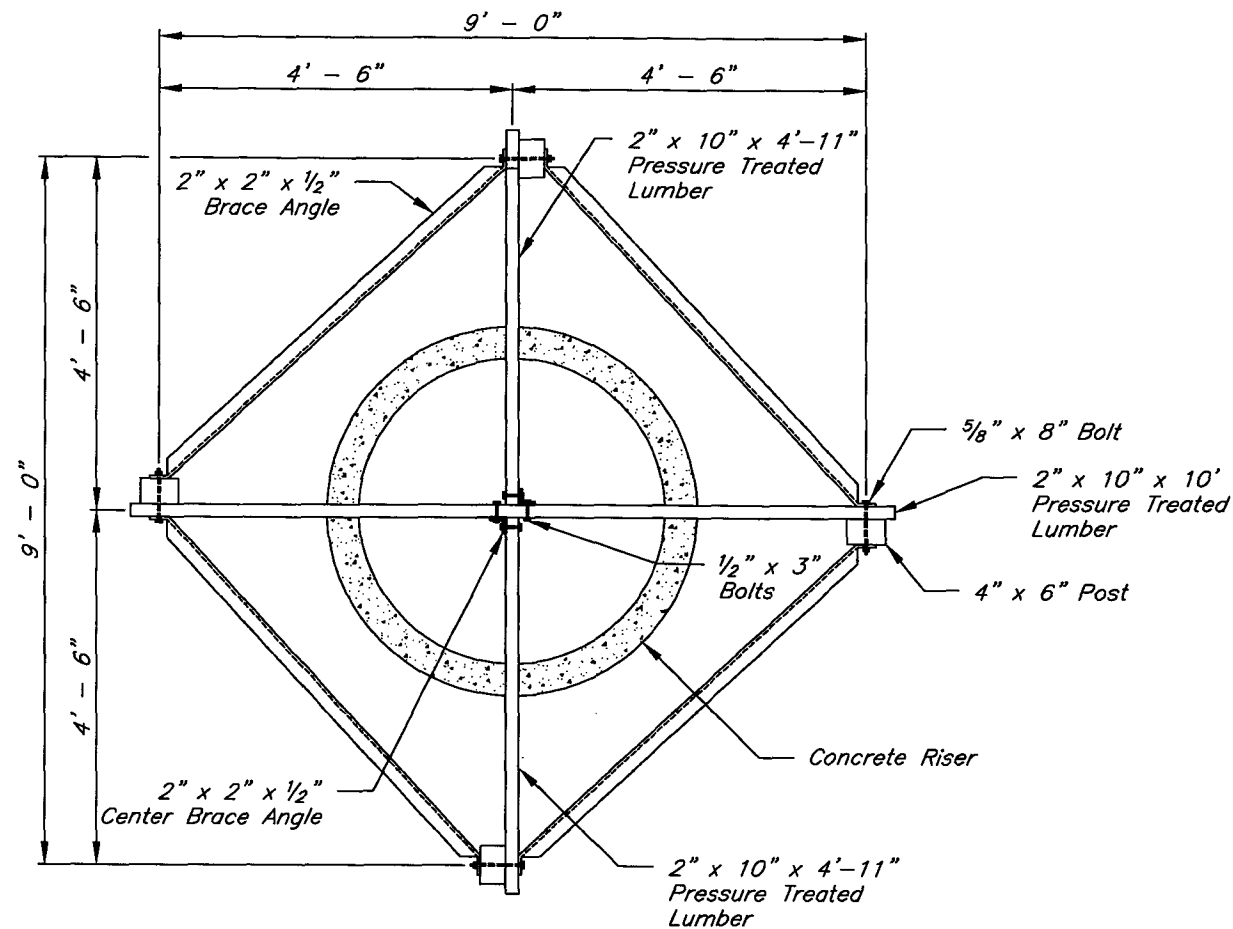
Date 5/23/11
 Designed Angela Roman
 Drawn Angela Roman
 Checked J. Edwards
 Approved Angela Roman
 5/23/11
 7/15/11

DON ROGERS
 378 POND
 PRECAST CONCRETE RISER AND HOODED INLET COMBINATION
 NW 1/4, Sec. 27, T113N, R76W

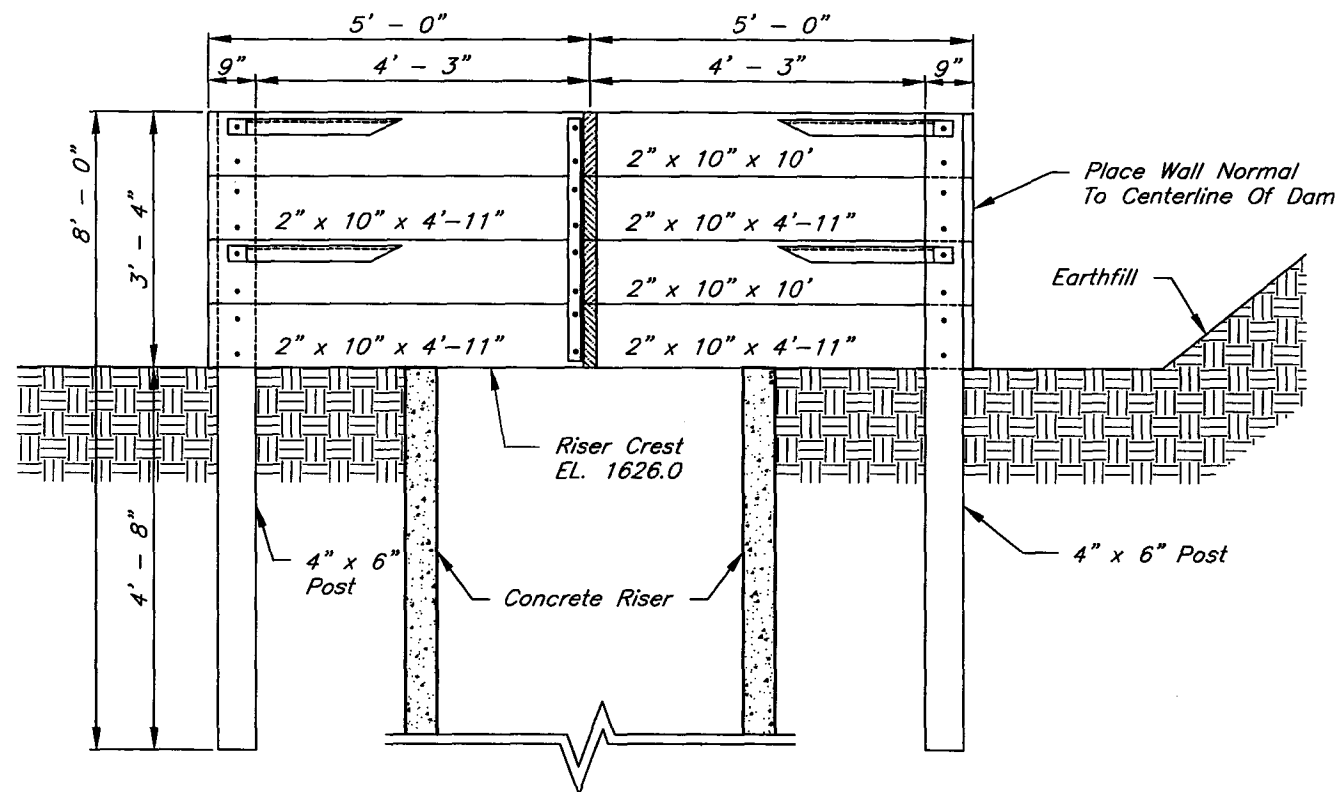
NRCS
 Natural Resources Conservation Service
 United States Department of Agriculture

File No. Rogers.dwg
 Drawing No. -
 7/14/11 3:10 PM
 Sheet 6 of 10

PRECAST CONCRETE RISER AND HOODED INLET COMBINATION



PLAN VIEW

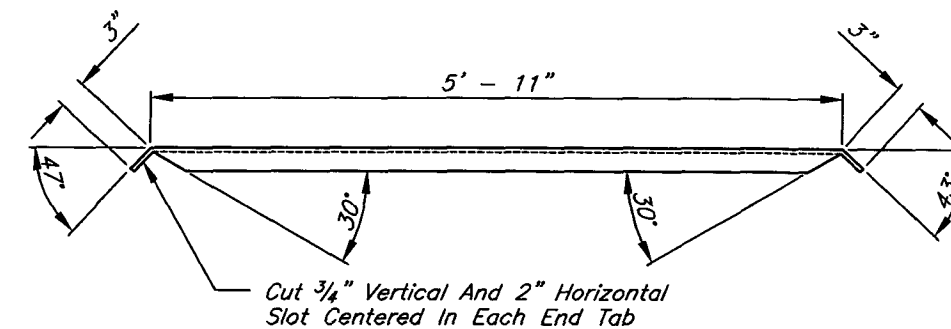


SIDE VIEW

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 bottom board.
4. All nuts, bolts, and washers shall be galvanized.



PLAN VIEW OF BRACE ANGLE

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

Date: 5/23/11
 Designed: Angela Roman
 Drawn: Angela Roman
 Checked: Angela Roman
 Approved: Angela Roman

DON ROGERS
 378 POND
 TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"

NW 1/4, Sec. 27, T113N, R76W

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 Natural Resources Conservation Service
 United States Department of Agriculture

File No.
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 Drawing No.
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 Sheet 7 of 10

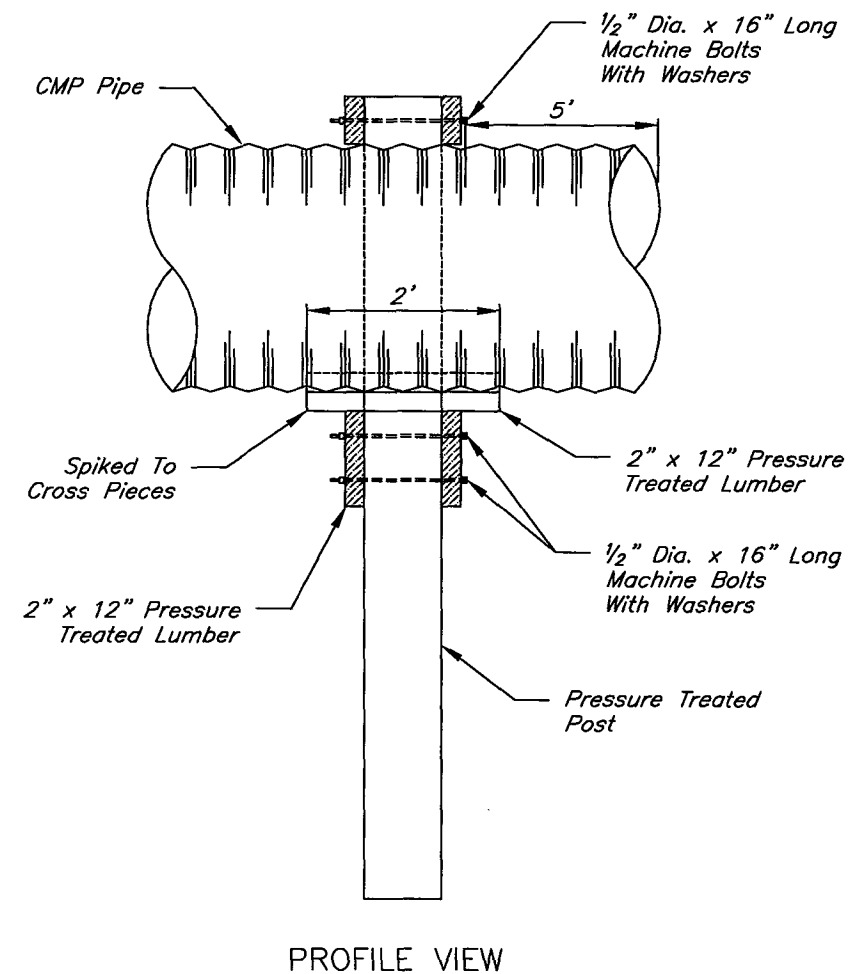
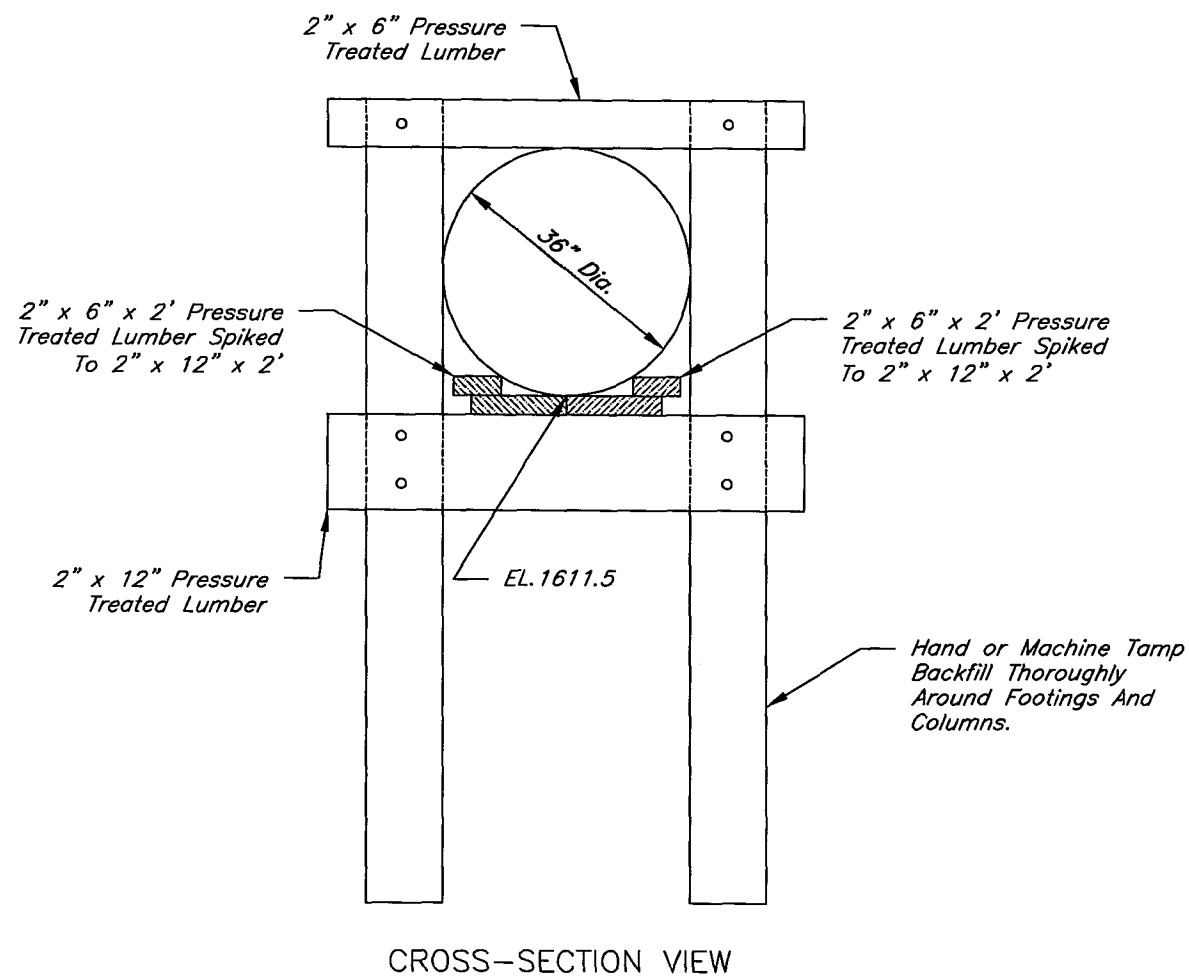


TABLE OF QUANTITIES			
ITEM	LENGTH	UNIT	QUANTITY
8" Dia. Pressure Treated Post **	12 Ft	Each	2
2" X 12" Pressure Treated Lumber	5 Ft	Each	2
2" X 6" Pressure Treated Lumber	5 Ft	Each	2
2" X 12" Pressure Treated Lumber	2 Ft	Each	2
2" X 6" Pressure Treated Lumber	2 Ft	Each	2
1/2" Dia. Machine Bolts With Nuts	14 In.	Sets	6
1/2" Dia. Washers		Each	12

CONSTRUCTION NOTES

1. All nuts, bolts, and washers shall be galvanized.
2. All lumber and posts shall be pressure treated to 0.4 pounds per cubic foot retention with one of the following: creosote, pentachlorophenol, or waterborne preservatives (arsenicals).
3. 5' of pipe shall extend downstream from location of timber pipe support.
4. Pipe supports shall be installed below frost line.

Date 5/23/11
 Designed Angela Roman
 Drawn Angela Roman
 Checked 7/15/11
 Approved 7/15/11

DON ROGERS
 378 POND
 TIMBER PIPE SUPPORT FOR CMP PIPE

NW 1/4, Sec. 27, T113N, R76W

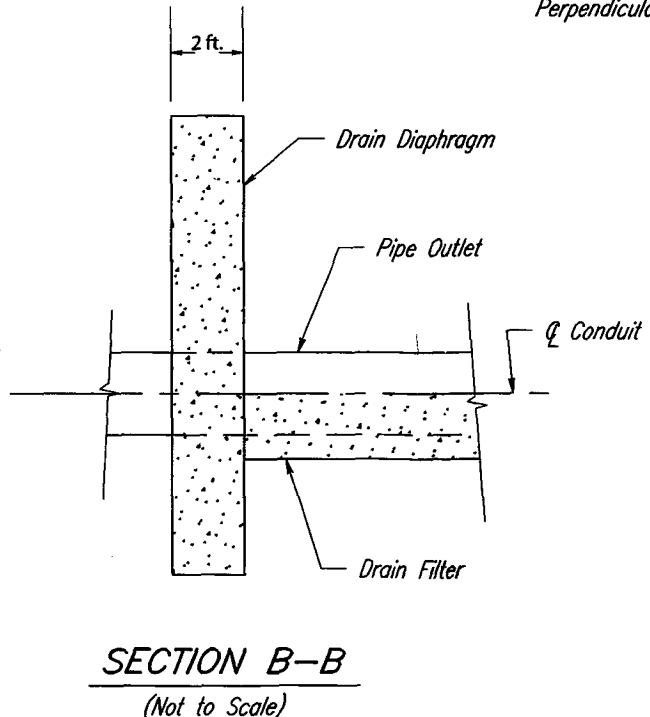
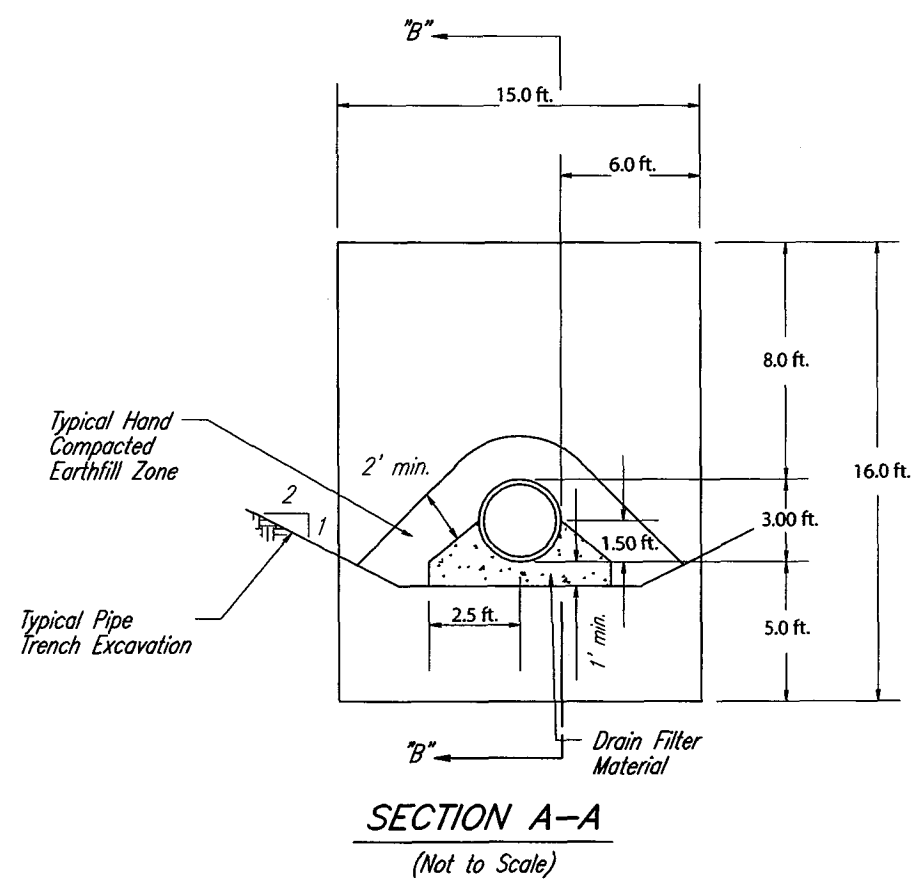
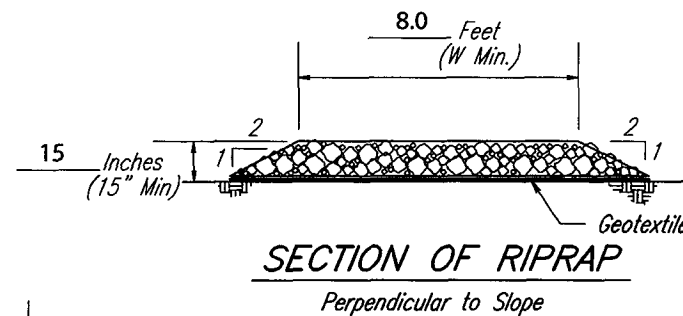
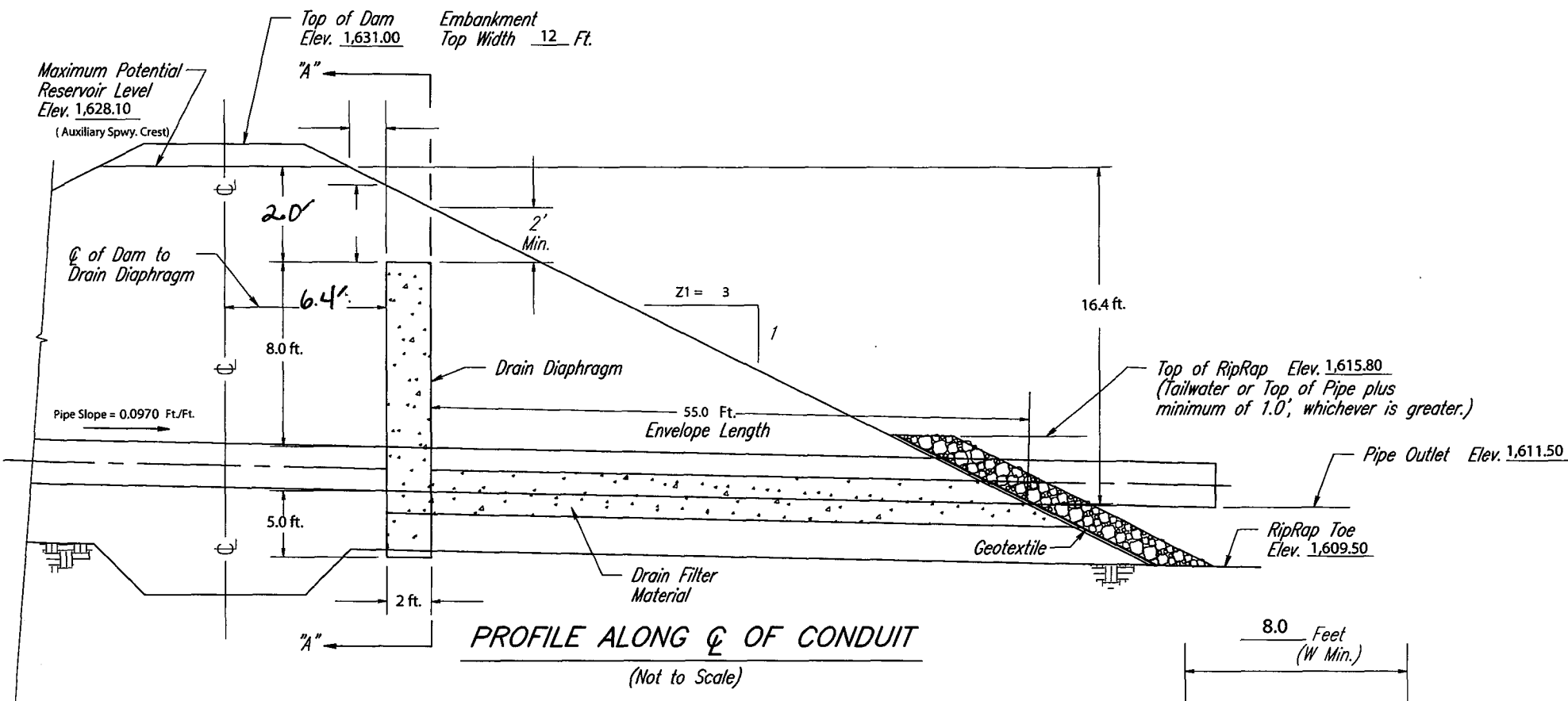
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 United States Department of Agriculture

File No.
Rogers.dwg

Drawing No.

7/14/11 3:10 PM
 Sheet 8 of 10

TIMBER PIPE SUPPORT FOR CMP PIPE



SUMMARY OF DESIGN AND DIMENSIONS

DESIGN DATA	
H = 16.4 Feet	Hd = 16.35 Feet
X = 6.0 Feet	D = 36 Inches
R = 5.0 Feet	Y = 8.0 Feet
C = 0.0970 Feet	Aggregate Gradation # 1
Embankment Backslope (Z1) = 3.0 Pipe Slope (S) 0.0970 Ft./Ft.	
DIMENSIONS	
W = 15.0 Feet	(Total Width of Drain Diaphragm)
T = 16.0 Feet	(Total Height of Drain Diaphragm)
t = 2 Feet	(Thickness of Single Filter)

ESTIMATED QUANTITIES

Drain Filter Material	41.4 Cubic Yards
Geotextile	28.8 Square Yards
Rock Riprap	9.7 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
07/31/2009	Jay B. Cobb	State Conservation Engineer

Designed: A. Roman 6/22/10
 Drawn: A. Roman 6/22/10
 Checked: A. Roman 6/22/10
 Approved: A. Roman 6/22/10

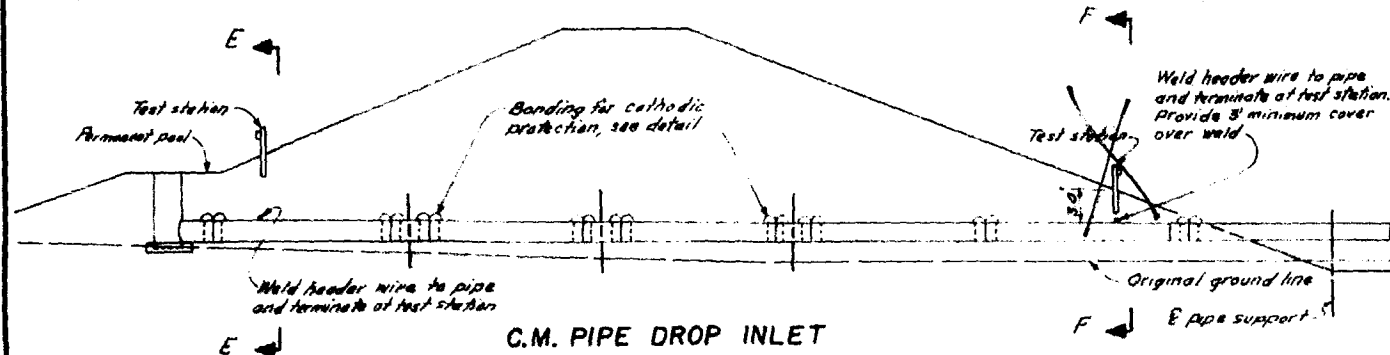
PRODUCER: Don Rogers
 SECTION: 27 7113N R. 76W
 COUNTY: Sully COUNTY
 DISTRICT: Sully County CONSERVATION DISTRICT

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

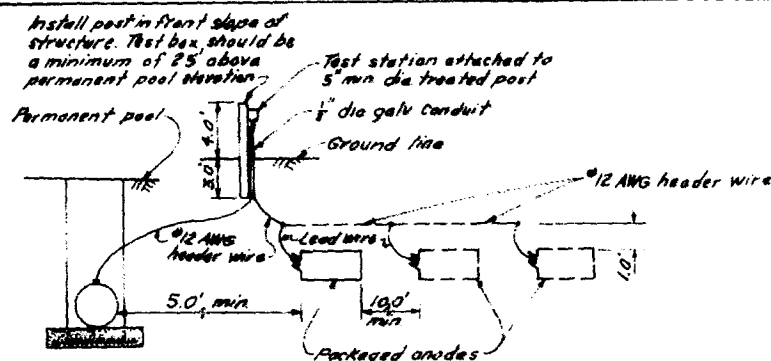
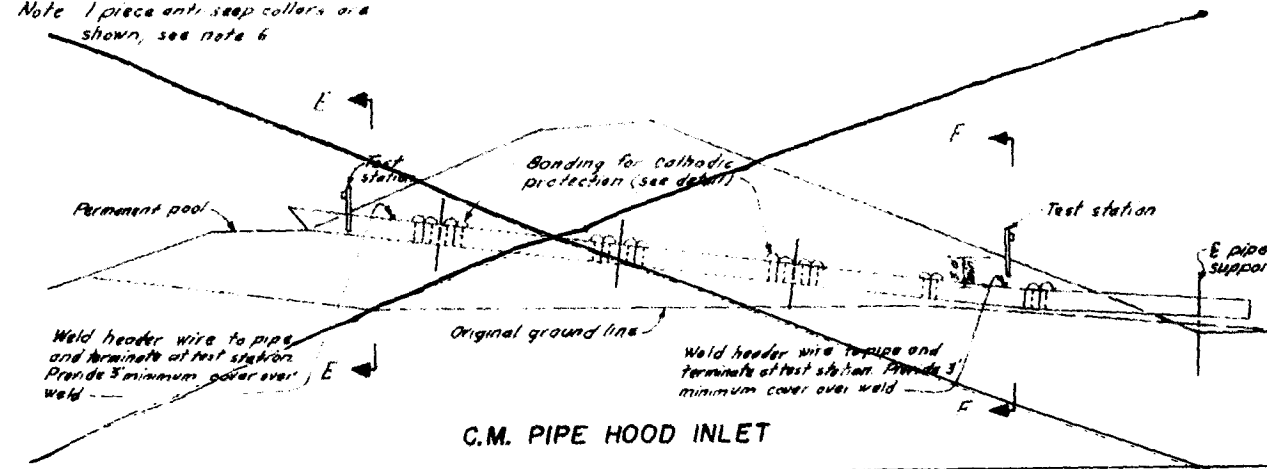
NRCS
 Natural Resources Conservation Service
 United States Department of Agriculture

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 Drawing No.:
 Date: 7/21/2009 2:23PM
 Sheet 9 of 90

Note: 1 piece anti-seep collars are shown, see note 6.



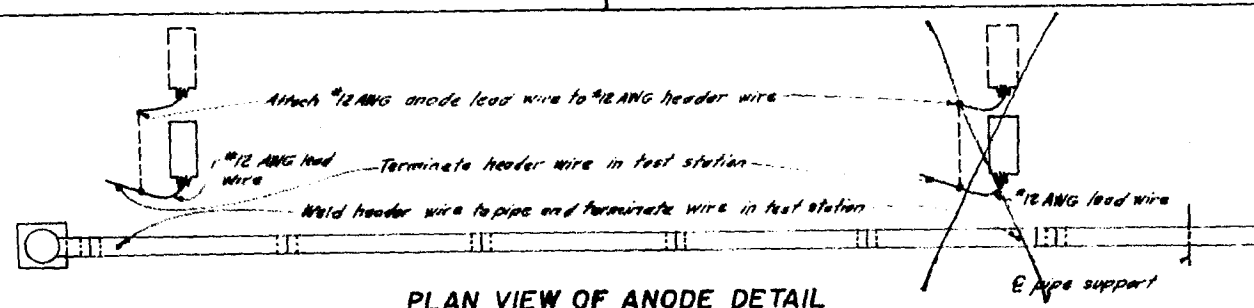
Note: 1 piece anti-seep collars are shown, see note 6.



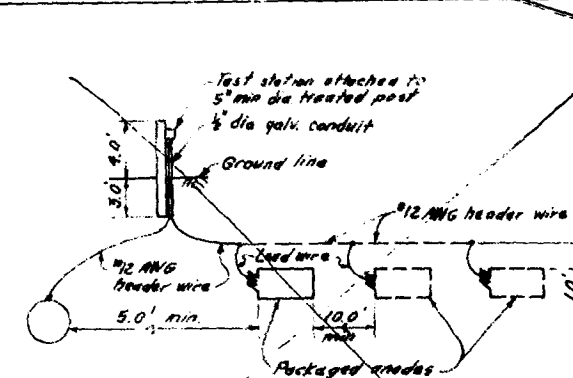
PACKAGED MAGNESIUM ANODES REQUIRED (Upstream)

SIZE	NO REQ'D
50 lb	3

SECTION E-E



PLAN VIEW OF ANODE DETAIL



PACKAGED MAGNESIUM ANODES REQUIRED (Downstream)

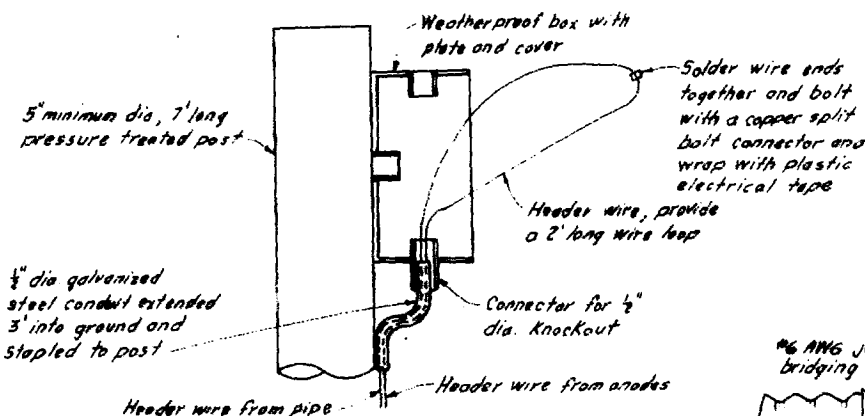
SIZE	NO REQ'D

SECTION F-F

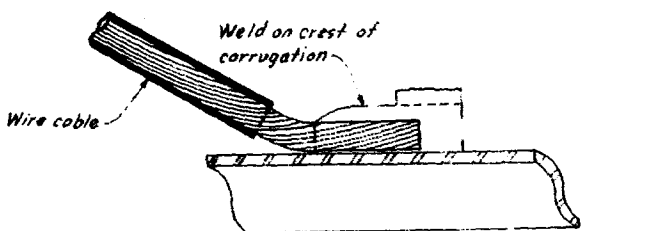
TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY
5" DIA, 7' LONG PRESSURE TREATED POST	EACH	1
1/2" DIA, 6' LONG GALV STEEL CONDUIT	EACH	1
WEATHERPROOF BOX	EACH	1
PACKAGED MAGNESIUM ANODES	EACH	3
1/2" DIA JOINT BRIDGING CABLE	LN FT.	180
12 AWG HEADER WIRE	LN FT.	180

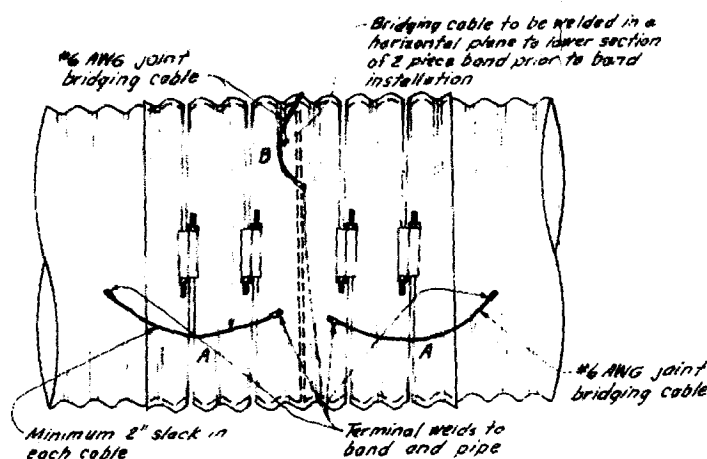
50lb Standard Magnesium Anodes (packaged) 10"x18"



DETAIL OF ANODE TEST STATION



DETAIL OF CABLE WELD CONNECTION



PLAN VIEW CABLE FOR C.M. PIPE AND COUPLING BAND

NOTES:

1. LOCATE ANODES IN NATURAL SOIL WITHIN 200' OF TEST STATION AS DIRECTED BY THE ENGINEER.
2. PIPE WELD CONNECTION AREAS SHALL BE ROUGHENED AND CLEANED TO EXPOSE THE BASE METAL TO PROVIDE GOOD CONDUCTIVITY.
3. TERMINAL WELDS ON BANDS SHALL BE PLACED OUTSIDE OF BAND LAP AREA TO AVOID INTERFERENCE WITH LAP.
4. AFTER WELDING, ALL EXPOSED METAL SHALL BE COATED AS SPECIFIED FOR PATCHING DAMAGED PIPE COATING.
5. THE POWDER WELDING CARTRIDGE SHALL BE EQUAL TO OR BETTER THAN CADWELD CARTRIDGE CA 15+.
6. WHEN TWO PIECE ANTI-SEEP COLLARS ARE USED, WELD A LENGTH OF BRIDGING CABLE TO UPPER AND LOWER PIECES AND FROM PIPE TO COLLAR.
7. BACKFILL AROUND ANODE WITH WELL TAMPED, MOIST CL MATERIAL.
8. MINIMUM TRENCH WIDTH FOR ANODES SHALL BE 2'.
9. ANODE MAY BE LOCATED EITHER DOWNSTREAM OR UPSTREAM OR BOTH LOCATIONS.
10. CROSS OUT VIEWS NOT APPLICABLE.

JOINT BRIDGING CABLE LENGTHS

JOINT DRILLING CABLE LENGTHS				
PIPE DIAMETER	CABLES			
	A		B	
LENGTH	QUANTITY	LENGTH	QUANTITY	
12	2-0	2	1-0	1
15	2-0	2	1-3	1
18	2-0	2	1-6	1
21	2-0	2	1-9	1
24	2-0	2	2-0	1
30	2-0	2	2-6	1
36	2-0	2	3-0	1
42	2-0	2	3-6	1
48	2-0	2	4-0	1
54	2-0	2	4-6	1
60	2-0	2	5-3	1

* B CABLES ARE NOT REQUIRED WITH ONE PIECE BANDS

CATHODIC PROTECTION SYSTEM

OPERATOR: Don Rogers

CONSERVATION DISTRICT: Sully

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by: A. Roman

Drawn by: A. Roman

Traced by: D. Edwards

Checked by: D. Edwards

Approved by: A. Roman

Date: 7/29/11

Sheet: 10

Drawing No: 10

JOB PLAN NO. 3.6

Water Permit Application # 7261-3
Don Rogers

Top of Dam Elev. - 1631
2nd Spillway Elev. - 1628.1
P. Spillway Elev. - 1626
Dis Emb. Top Elev. - 1609.7

Cat. 3 - Low Hazard Dam
Ht. = 21.3 ft

Normal Storage Capacity - 51.7 A.-Ft
Int. Storage Capacity - 85
Max Storage Capacity - 167.5

Int. Capacity x Est. Ht. = $85 \times 20 = 1700 < 3000 \therefore 25 \text{ yr}$
Minimum Spillway Design

From USGS WRI 98-4055 "Tech for Est Peak Flows ... in SO"
Region B DA = 2848 Ac = 4.45 mi² P_{II} = 0.75

$$Q_{25} = 148 CA^{.584} P_{II}^{.730}$$

$$= 148 (4.45)^{.584} (0.75)^{.730}$$

$$= 148 (2.3913) (.8106)$$

$$= \underline{288 \text{ cfs}}$$

$$Q_{100} = 275 CA^{.625} P_{II}^{.742}$$

$$= 275 (4.45)^{.625} (0.75)^{.742}$$

$$= 275 (2.5423) (.8078)$$

$$= \underline{565 \text{ cfs}}$$

Secondary Spillway Capacity

$$Q = CLH^{3/2} \quad C = 2.6$$

$$= 2.6 (120)^{1.5} (2.9)^{1.5} \quad L = 120 \quad H = 2.9$$

$$= \underline{1540 \text{ cfs}}$$

Section 74:02:08:09

1. Topo Map - OK
2. Dam Axis Profile - OK
3. Dam Max X-Sec - OK
4. Area Capacity - OK
5. Outlet Details - OK
6. Spillway Routing - OK
7. Spillway Details - OK
8. Specs - std. NRCS - OK
9. EPP - N/A cat. 2

NRCS Annual Yield

$$DA = 2848 \quad CN = 75 \quad ISO = 2$$

$$80\% \text{ chance} = 0.13$$

$$0.13 \times 2848^{1/2} = \underline{31 \text{ A.-Ft}}$$

$$50\% \text{ chance} = 0.35$$

$$0.35 \times 2848^{1/2} = \underline{83 \text{ A.-Ft}}$$

$$10\% \text{ chance} = 1.8$$

$$1.8 \times 2848^{1/2} = \underline{427 \text{ A.-Ft}}$$



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

August 9, 2011

Don Rogers
PO Box 167
Blunt, SD 57522

Dear Mr. Rogers:

We have reviewed the plans and specifications for your dam project located in the SW $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 27-T113N-R76W, in Sully County. The plans and specifications for the project 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. 7261-3 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 Rogers Dam will be classified as a small size Category 3, Low Hazard dam with a dam height of 21.3 feet and a normal storage capacity of 51.7 acre-feet and a maximum storage capacity of 167.5 acre-feet.

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

Sincerely,

Timothy G. Schaal, P.E.
Natural Resources Engineering Specialist
for Garland Erbele, 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
www.state.sd.us/denr

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 7261-3, Don Rogers**

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. 7261-3, Don Rogers, PO Box 167, Blunt SD 57522.

The Chief Engineer is recommending APPROVAL of Application No. 7261-3 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. 7261-3 authorizes a dam with a storage capacity of 51.7 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.

Garland Erbele, Chief Engineer
August 9, 2011

REPORT ON
WATER PERMIT APPLICATION NO. 7261-3
Don Rogers
August 4, 2011

Water Permit Application No. 7261-3 has been filed by Don Rogers to impound 51.7 acre-feet of water from runoff by constructing a dam located in the SW ¼ NE ¼ of Section 27-T113N-R76W, in Sully County. The application also requests impoundment of sufficient water to maintain water to the outlet elevation. The water will be used for fish and wildlife propagation and livestock water purposes.

Discussion:

The dam will be classified as a small size, Category 3, Low Hazard dam. The dam has been designed by the Natural Resources Conservation Service (NRCS). The plans and specifications have been reviewed and will be approved; however, construction of the dam can not begin until Water Permit Application No. 7261-3 is approved.

The dam will be 21.3 feet high with a normal storage capacity of 51.7 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 167.5 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 2848 acres or 4.45 square miles. The dam is designed to have a 60 inch diameter concrete riser with a 36 inch diameter CMP barrel with 5.0 feet of freeboard as the primary spillway, and a 120 foot wide earthcut secondary spillway with 2.9 feet of freeboard. A 25 year frequency event produces a peak runoff of approximately 288 cfs and a 100 year frequency event produces a peak runoff of approximately 565 cfs. The earthcut spillway will have a capacity of approximately 1540 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 31 acre-feet; the annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 83 acre-feet; and the annual yield with a 10 percent chance, or 1 out of 10 years, is expected to be 427 acre-feet.

The Rogers Dam will be located in the SW ¼ NE ¼ of Section 27-T113N-R76W on an unnamed tributary to Medicine Knoll Creek, about two miles upstream of the confluence of the unnamed tributary and Medicine Knoll Creek. There are no existing Water Permits/Rights filed on the unnamed tributary between the proposed dam and Medicine Knoll Creek. There is an existing dam about one-half mile downstream of the proposed dam on the applicant's property.

Conclusions:

1. Water Permit Application No. 7261-3 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. 7261-3.



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

RECEIVED

SEP - 8 2011

AFFIDAVIT OF PUBLICATION

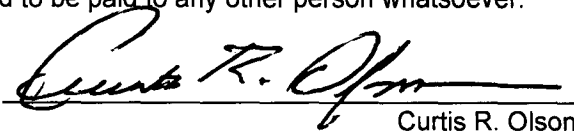
WATER RIGHTS
PROGRAM

STATE OF SOUTH DAKOTA)
COUNTY OF SULLY)

Curtis R. Olson of said County and State, being first duly sworn on his oath, says that the **ONIDA WATCHMAN** is a weekly newspaper of general circulation, published in the English language in the City of Onida, in said County and State, by said Curtis R. Olson, and has been admitted to the United States mail under the second class mailing privilege at all times hereinafter mentioned, and that all of said times has had more than 200 bona fide paid subscribers; that I, the undersigned, am the publisher of said newspaper, in charge of the legal/display advertising department thereof, and have personal knowledge of all the facts stated in the affidavit; and that the advertisement headed:

**NOTICE OF APPLICATION NO. 7261-3 TO
APPROPRIATE WATER**

A printed copy of which is hereto attached, was printed and published in said newspaper for **TWO** successive issues, the first publication made **2011** the **18th** day of **AUGUST**, and the last publication on **2011** the **25th** day of **AUGUST**, and that **\$41.27** being the full amount of the fee for publication of the annexed notice insured solely to the benefit of the publisher of said newspaper; that no arrangements or understanding for a revision thereof has been made with any person, and that no part thereof has been agreed to be paid to any other person whatsoever.

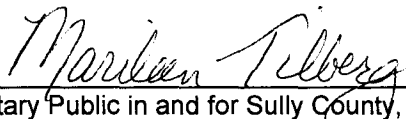

Curtis R. Olson

Subscribed and Sworn to me this

1st Day of September, 2011

(SEAL)

My commission expires April 24, 2016


Notary Public in and for Sully County, South Dakota

**NOTICE OF
APPLICATION NO.
7261-3 to Appropriate
Water**

Notice is given that Don Rogers, PO Box 167, Blunt SD 57522 has filed an application for a water permit to impound 51.7 acre-feet of water from runoff by constructing a dam located in the SW 1/4 NE 1/4 Section 27 with water impounded in the W 1/2 NE 1/4, NE 1/4 NW 1/4 Section 27; all in T113N-R76W. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends **APPROVAL** of Application No. 7261-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on 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 September 6, 2011.

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 twice at the total approximate cost of \$41.27.

33-34



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

August 9, 2011

Onida Watchman
PO Box 245
Onida SD 57564

ATTENTION: Legal Public Notice

Enclosed is a Notice on Application No. 7261-3 to Appropriate Water to be published twice. Please publish the first notice on August 18, 2011 with the second publication 7 days later. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352.

The applicant must verify to you that the notice is to be published, before you make the first publication. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is Don Rogers, PO Box 167, Blunt SD 57522 (Ph # 605-280-7105).

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

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

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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

No. 7261-3

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

Date _____

We are in receipt of your letter of August 9, 2011 enclosing Notice to Appropriate Water by Application No. 7261-3 which was first published in our issue of _____. **ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.**

Name

Newspaper



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

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

August 9, 2011

Don Rogers
PO Box 167
Blunt SD 57522

Dear Mr. Rogers:

Water Permit Application No. 7261-3 for fish & wildlife propagation use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Publisher of the Onida Watchman printed at Onida SD (Ph # 605-258-2604). You will need to contact the newspaper and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Chief Engineer and report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

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

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352
eric.gronlund@state.sd.us

enclosures

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

Instruction to Newspaper - Publish first Notice on August 18, 2011 with the second publication 7 days later. 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. 7261-3 to Appropriate Water

Notice is given that Don Rogers, PO Box 167, Blunt SD 57522 has filed an application for a water permit to impound 51.7 acre-feet of water from runoff by constructing a dam located in the SW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 27 with water impounded in the W $\frac{1}{2}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$ Section 27; all in T113N-R76W. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 7261-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on 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.

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Published twice 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
www.state.sd.us/denr

SEP 13 2011

Don Rogers
PO Box 167
Blunt SD 57522

Dear Mr. Rogers:

Enclosed is Water Permit No. 7261-3 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

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

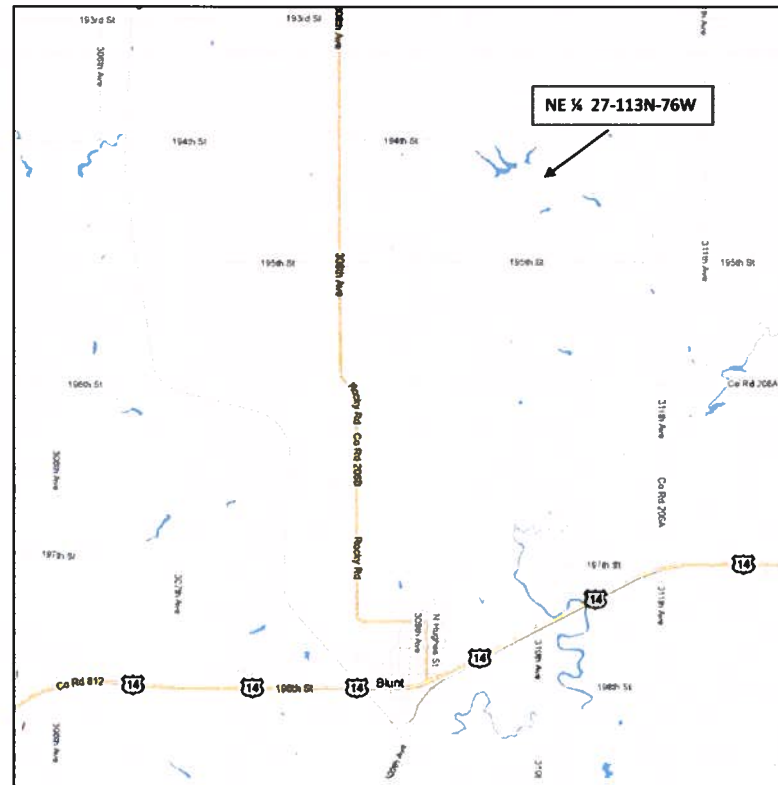
An informational sheet *Common Water Right Questions?* is also enclosed. This sheet is intended to answer some of the questions associated with obtaining and keeping a water right.

Sincerely,

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

enclosures

DON ROGERS 378 POND
NE 1/4, SEC. 27, T113N, R76W
SULLY COUNTY, SOUTH DAKOTA



LOCATION MAP

Landowner Information

Don Rogers
PO Box 167
Blunt, SD 57522
605-280-7105

GENERAL NOTES

1. If cultural resources are discovered during construction, discontinue construction and notify the local Natural Resources Conservation Service office.
2. According to South Dakota state law, "No excavator may begin any excavation without first notifying the One-Call Notification Center of the proposed excavation" at (800) 781-7474.
3. The landowner is responsible for complying with all federal, state, and local laws.
4. A preconstruction meeting is required between NRCS, the Landowner, and the contractor.

CONSTRUCTION NOTES

1. Clear and grub the entire area within the work limits.
2. All borrow 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 or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
4. 6 inches topsoil will be incorporated into the earthfill neat line & grade surface and meet SD Construction Specification SD-7S
5. All areas top-dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD-28.

TABLE OF QUANTITIES			
ITEM	UNIT	QUANTITY	"AS-BUILT" QUANTITY
Earthfill Class S - Embankment	Cu. Yd.	9,105	9,105
Earthfill Class S - Core Trench	Cu. Yd.	1180	1180
Earthfill Class S - Stripping	Cu. Yd.	652	652
Earthfill Class S - 5% Settlement	Cu. Yd.	456	456
Total Earthfill	Cu. Yd.	11,393	11,393
Excavation - Auxiliary Spillway	Cu Yd.	4,013	4,013
Topsoil Auxiliary Spillway	Cu. Yd.	1,232	1232
Seeding (Earthfill And Auxiliary Spillway)	Acre	2.3	not completed at time of survey
Cathodic Protection System	Each	1	1
Principal Spillway Pipe			
16 gage 36" Dia. 2 3/4" x 1/2" Polymer Coated Helical Corrugated Metal Pipe	Lin. Ft.	102	102
60" Dia., 5' tall precast Concrete Riser And Base AsBuilt: Steel CMP 60" Riser	Each	1	1
Trash Rack And Baffle	Each	1	1
Drainage Diaphragm			
Rock Rip Rap	Cu. Yd.	9.7	9.7
Drain Fill	Cu. Yd	41.4	41.4
Geotextile fabric	Sq. Yd.	28.8	28.8
Timber Pipe Support	Each	1	1

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

SD-4 Stripping
SD-5 Excavation
SD-7S Earthfill - Class S
SD-8 Rock Riprap And Bedding
SD-10 Salvaging And Spreading Topsoil
SD-12B Concrete For Minor Structures
SD-13 Steel Reinforcement
SD-15 Corrugated Metal Pipe
SD-16 Wood Fabrication and Installation
SD-28 Seeding
SD-31 Cathodic Protection
SD-50 Coated Corrugated Steel Pipe
SD-592 Geotextile
For A Full Text Version See
http://www.sd.usda.gov/technical/SD_Engineering.html

NRCS HAZARD CLASS A
NRCS JOB CLASS IV

INDEX OF DRAWINGS

1. Cover Sheet
2. Plan View and Design Data
3. Detail Plan View
4. Pipe Cross-Section View
5. Dam Profile View
6. Precast Concrete Riser Detail
7. Trash Rack and Baffle Detail
8. Timber Pipe Support Detail
9. Drainage Diaphragm Detail
10. Cathodic Protection

STATEMENT OF COMPLIANCE

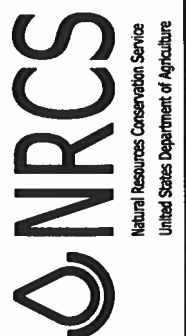
Construction (was) (was not) completed in accordance with approved construction plans and specifications.

JAA

Date

Designed Angela Roman 5/23/11
Drawn Angela Roman 5/23/11
Checked AsBuilt 7/9/12
Approved Angela Roman 7/9/12

DON ROGERS
378 POND
COVER SHEET



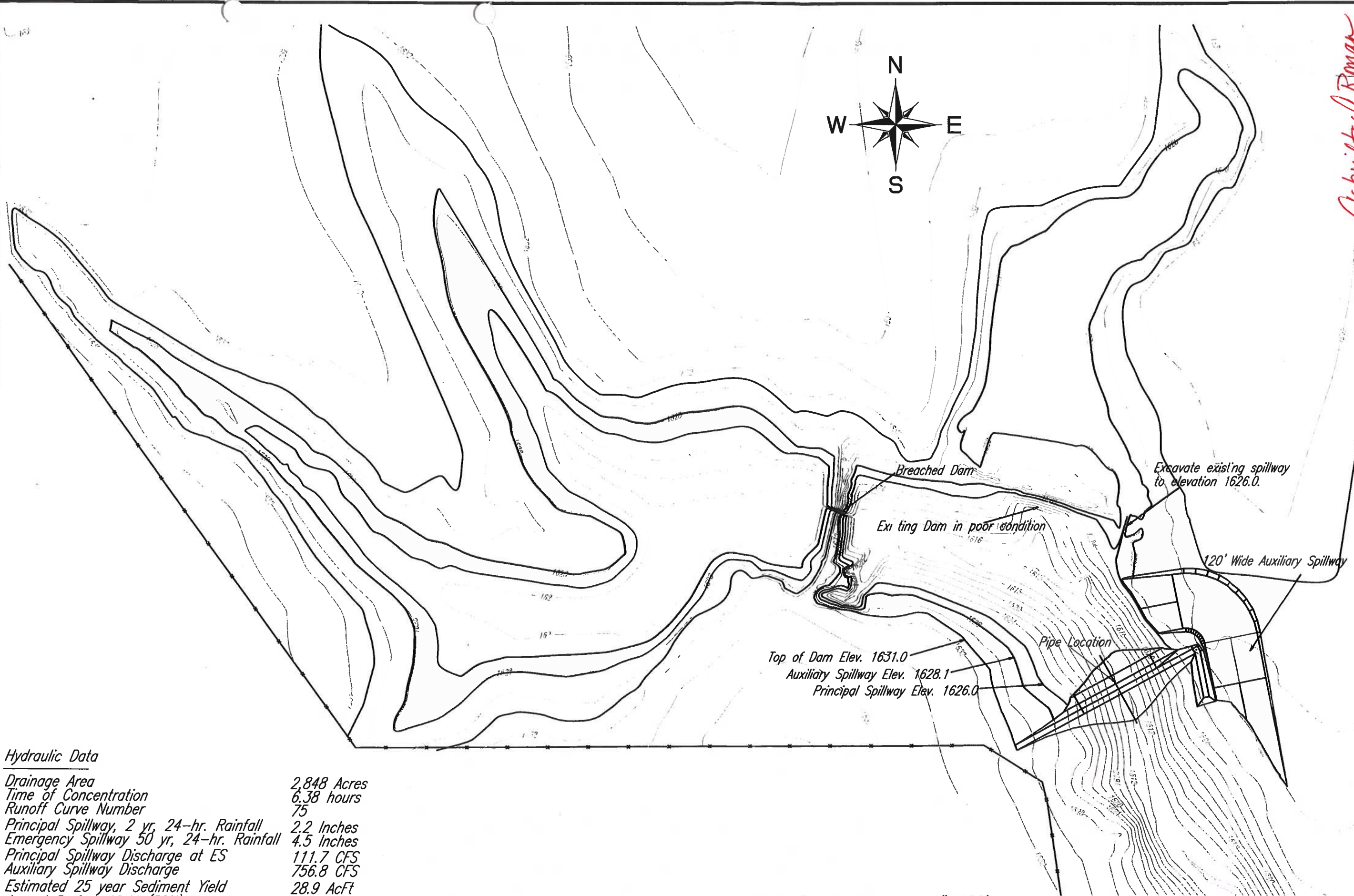
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Rogers.dwg

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Sheet 1 of 10

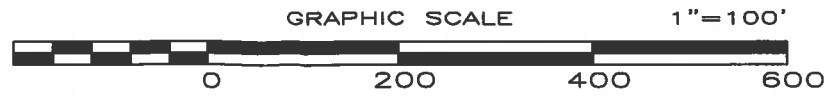
NE 1/4, Sec. 27, T113N, R76W

Sully County, South Dakota



Hydraulic Data

Drainage Area	2,848 Acres
Time of Concentration	6.38 hours
Runoff Curve Number	75
Principal Spillway, 2 yr, 24-hr. Rainfall	2.2 Inches
Emergency Spillway 50 yr, 24-hr. Rainfall	4.5 Inches
Principal Spillway Discharge at ES	111.7 CFS
Auxiliary Spillway Discharge	756.8 CFS
Estimated 25 year Sediment Yield	28.9 AcFt
Annual Surface Yield (50%)	83.1 AcFt
Crest of Normal Pool	12.6 Acres 51.7 AcFt
Crest of Auxiliary Spillway	20.3 Acres 85.0 AcFt
Top of Dam	36.0 Acres 167.5 AcFt

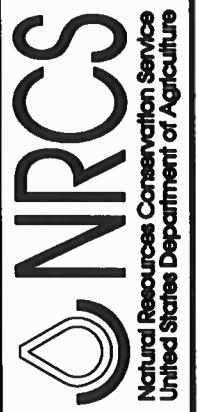


Asbuilt: A. Roman

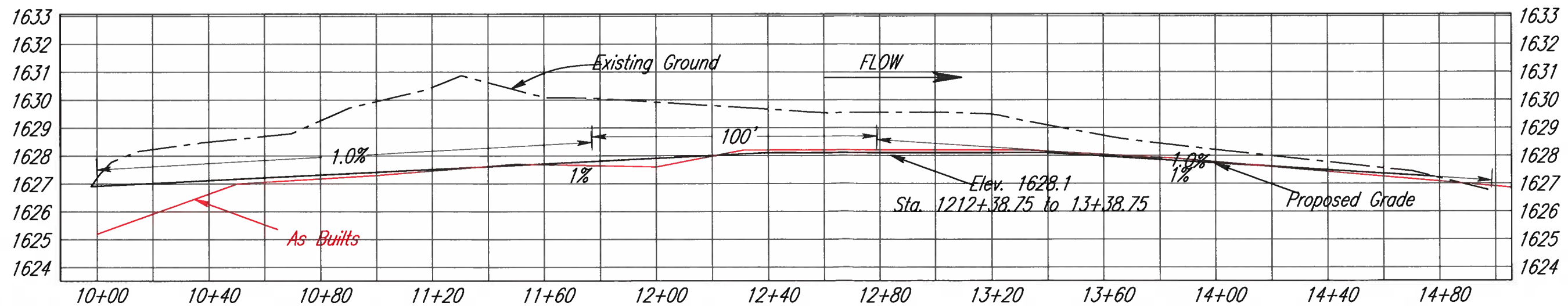
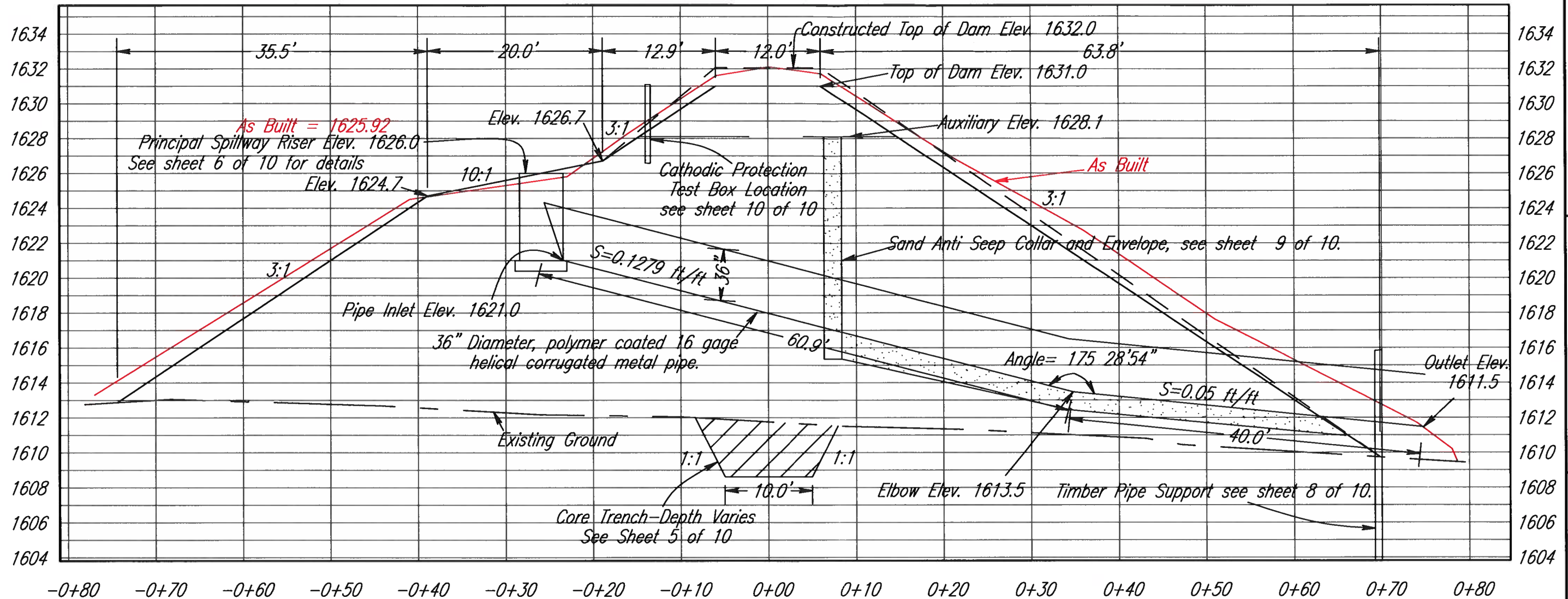
Designed	A. Roman	Date	7/25/2011
Drawn	A. Roman		7/25/2011
Checked	<i>D. Edwards</i>		7/25/11
Approved	<i>Angela Roman</i>		7/25/11

PRODUCER Don Rogers
NE 1/4 SECT. 27 T. 113 North R. 76 West
Sully COUNTY
Sully County CONSERVATION DISTRICT

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



File Name: Rogers
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Sheet 2 of 10



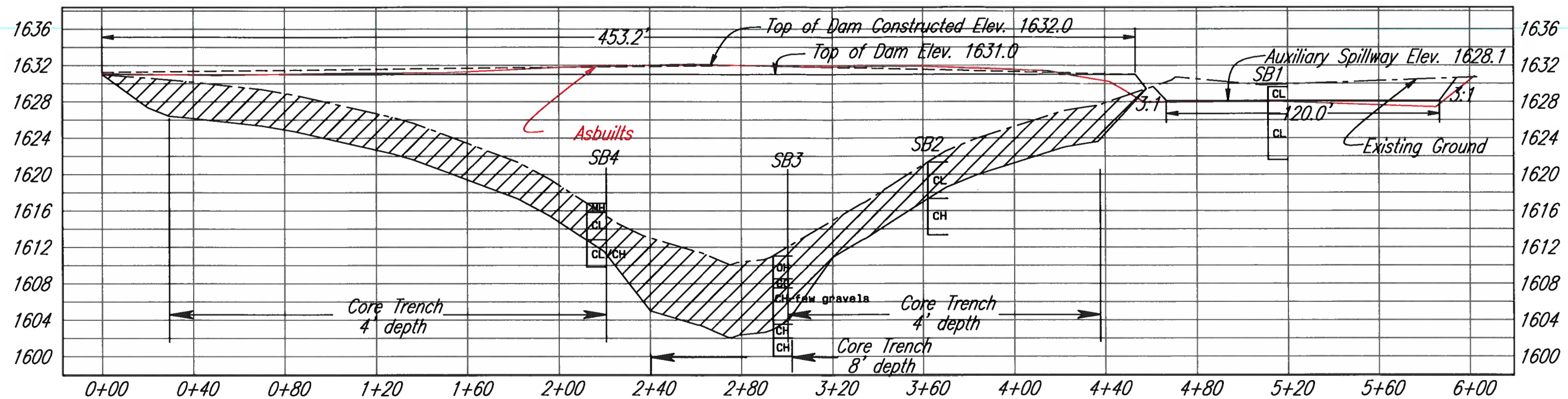
Date 7/9/2012
Designed A. Roman
Drawn A. Roman
Checked As Builts
Approved Angelle Roman 7/16/12

PRODUCER Don Rogers
NE 1/4 SECT. 27 T. 113 North R. 76 West
Sully COUNTY
Sully County 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: Rogers
Drawing No.
7/9/2012 9:27AM
Sheet 4 of 10



Section B-B Cross Section of Dam at Pipe
Vertical Scale: 1"= 12' Horizontal Scale: 1"=50'

Control Points				
Pt #	Northing	Easting	Elevation	Descriptor
7029	9922.7750	10118.6710	1629.71	CP1-rebar under 1x2 stakes along fence
6162	10000.0000	10000.0000	1632.90	CP2-rebar under 1x2 stakes along fence
BASE	10111.1010	10540.2910	1628.62	BM-rebar under 1x2 stakes located in outlet of Aux. Spillway

Auxiliary Spillway				
Pt #	Northing	Easting	Elevation	Descriptor
1955	10302.2557	10333.0103	1626.50	Auxiliary Spillway Sta. 10+00.00
2002	10058.6466	10565.0038	1628.10	Auxiliary Spillway Sta. 14+21.88
2400	10317.7194	10413.2059	1626.50	Auxiliary Spillway Sta. 10+81.67
2405	10238.4620	10530.3309	1628.10	Auxiliary Spillway Sta. 12+38.75
2406	10140.2707	10549.2646	1628.10	Auxiliary Spillway Sta. 13+38.75
5619	10108.7265	10474.9338	1631.00	5+47.16 CL Dike
5626	9998.3240	10060.8540	1631.00	2396-CL
5627	10212.2630	10453.5190	1631.00	5618-CL

Dam				
Pt #	Northing	Easting	Elevation	Descriptor
2396	9998.3235	10060.8540	1631.00	0+00 Start Dam
5618	10212.2626	10453.5188	1631.00	4+47.16 CL Dam
5619	10108.7265	10474.9338	1631.00	5+47.16 CL Dike

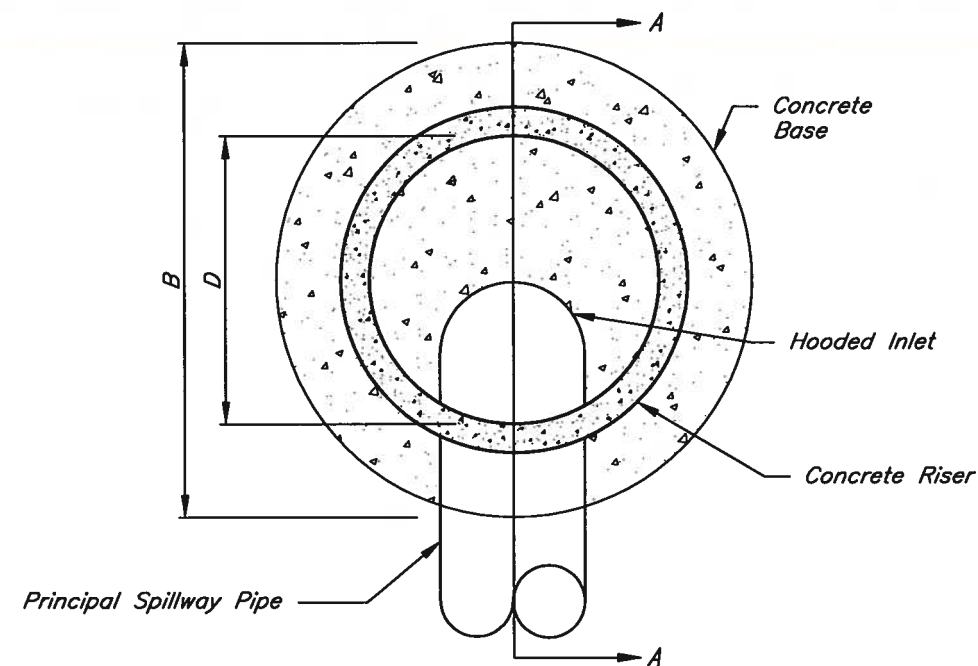
Date	7/9/2012
Designed	A. Roman
Drawn	A. Roman
Checked	Asbuilts
Approved	Angela Roman 7/9/12

PRODUCER	Don Rogers
NE 1/4 SECT. 27	T. 113 North R. 76 West
Sully County	DAKOTA
Sully County	CONSERVATION DISTRICT

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

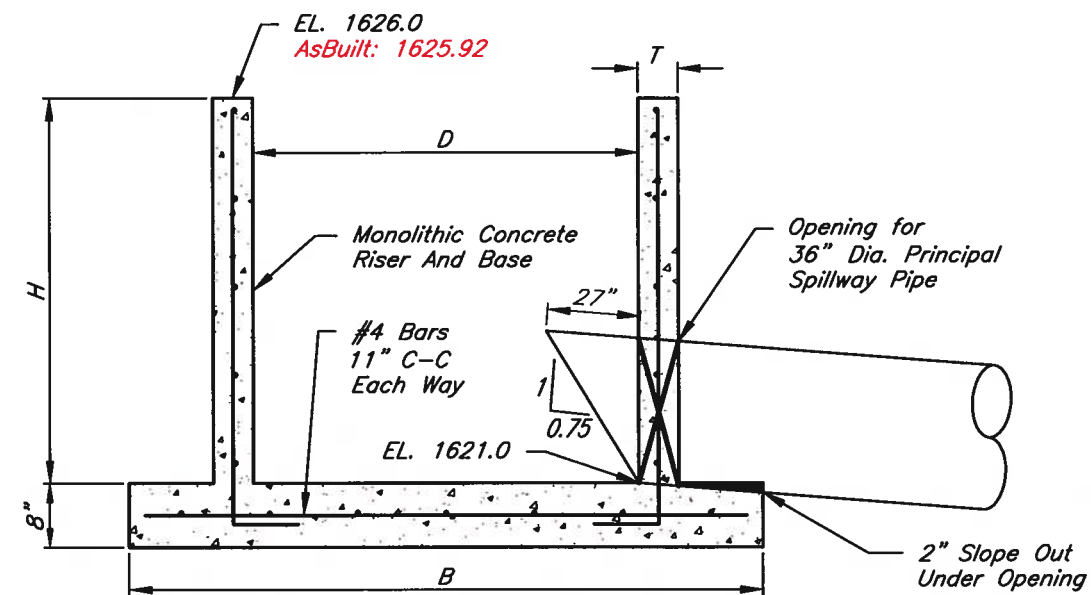
NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name	Rogers
Drawing No.	
7/9/2012 9:29AM	
Sheet 5 of 10	

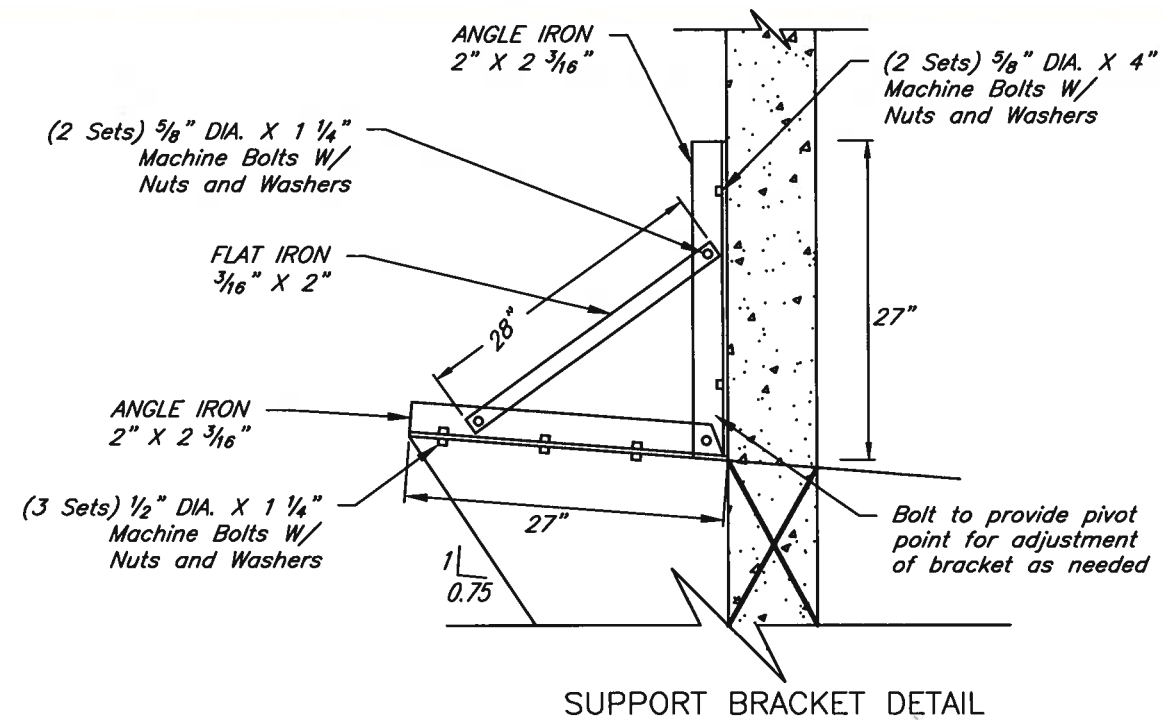


PLAN VIEW PRECAST RISER AND BASE

CMP Steel Riser approved for construction at request of contractor.



SECTION VIEW A-A



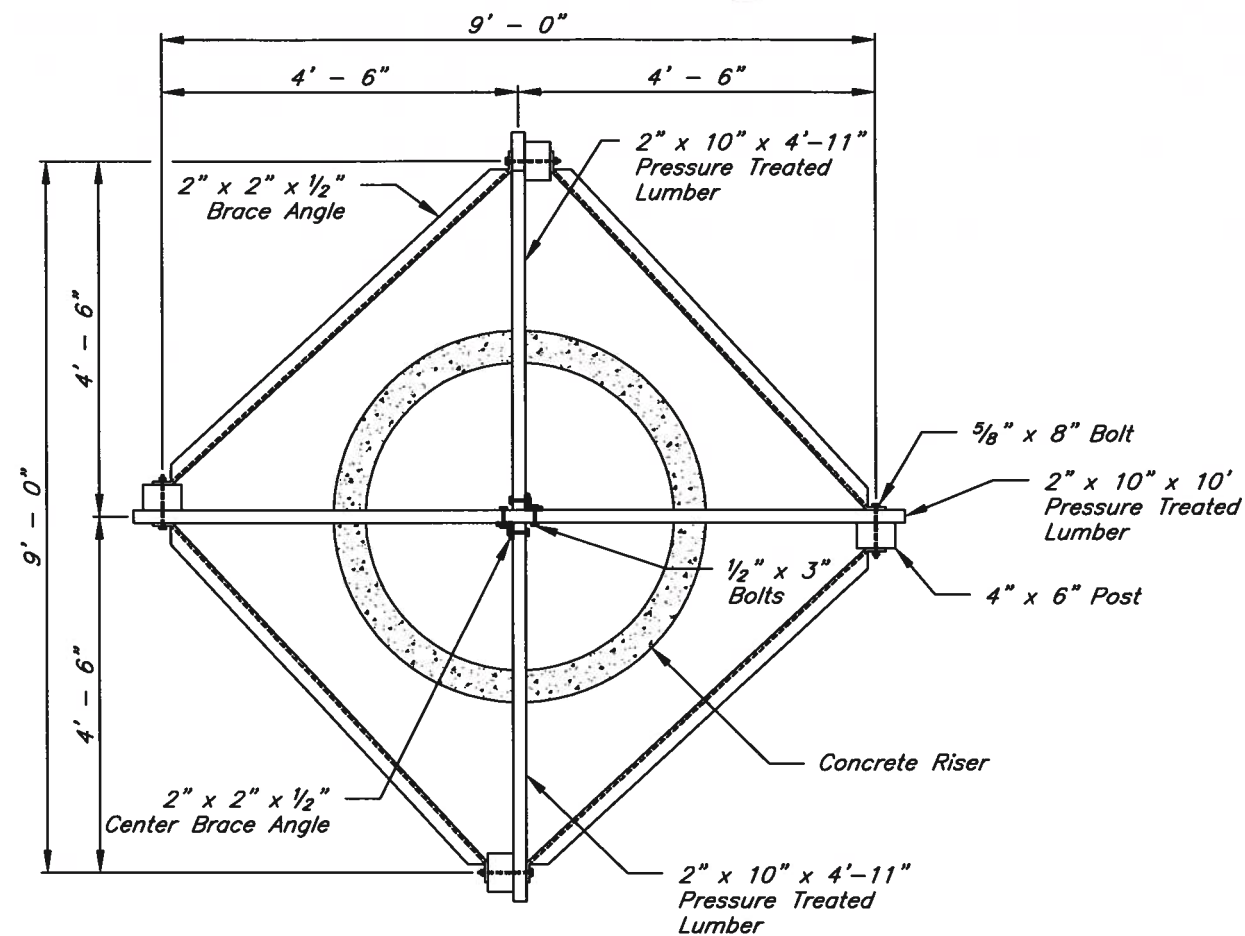
SUPPORT BRACKET DETAIL

REQUIRED PRECAST RISER AND BASE DIMENSIONS

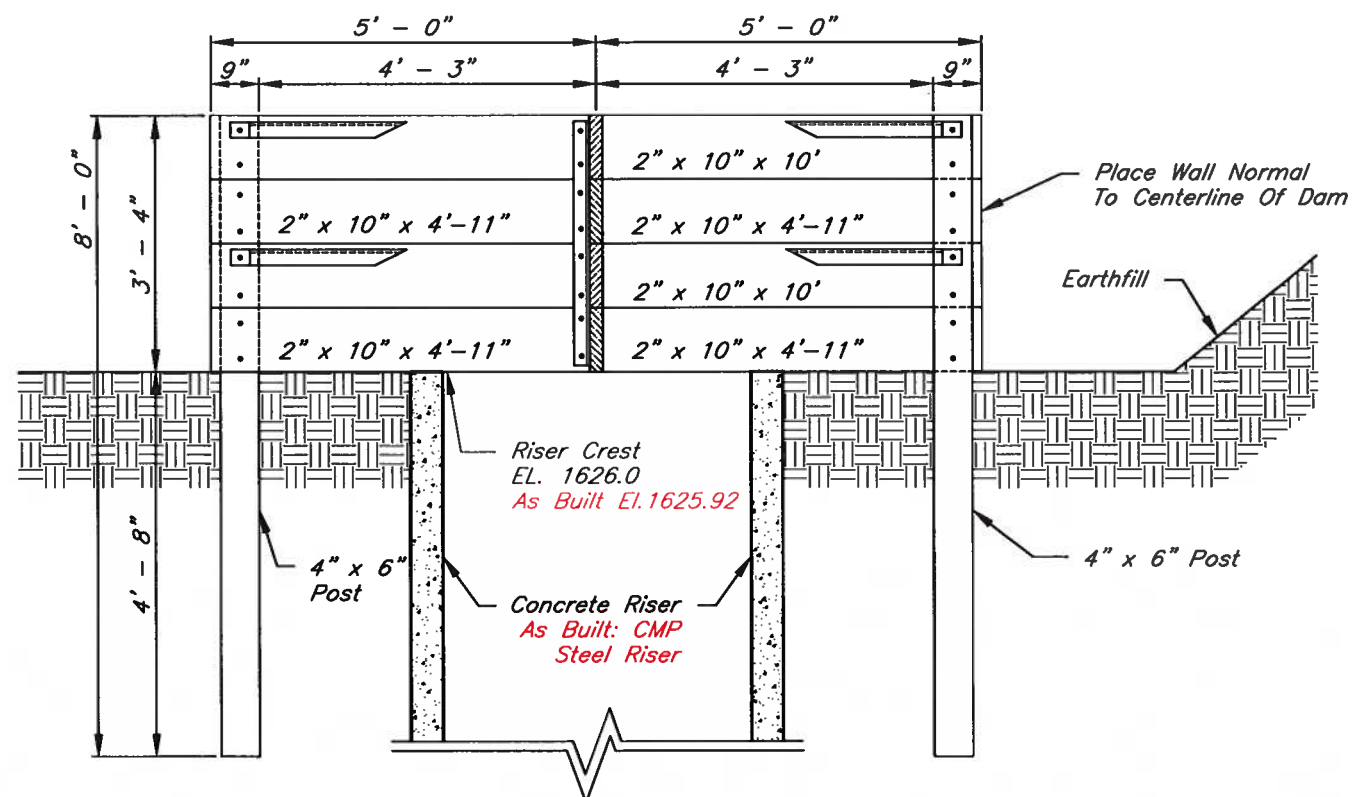
(D) RISER DIAMETER	(H) RISER HEIGHT	(T) WALL THICKNESS	(B) BASE DIAMETER	BASE THICKNESS	PIPE DIAMETER	PIPE MATERIAL
60"	5'	6"	96"	8"	36"	CMP

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.



PLAN VIEW

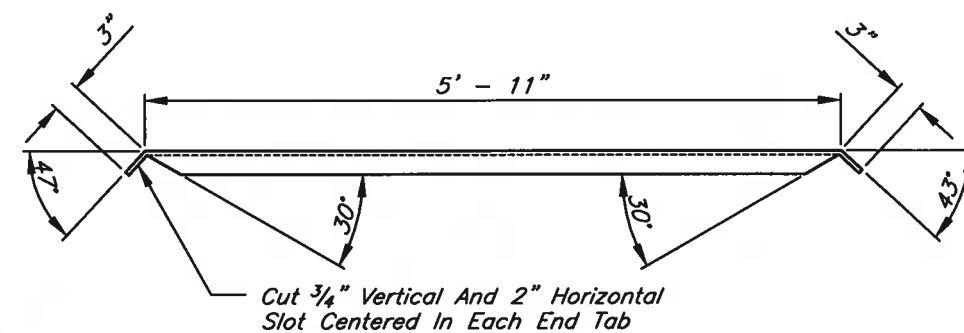


SIDE VIEW

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 bottom board.
4. All nuts, bolts, and washers shall be galvanized.



PLAN VIEW OF BRACE ANGLE

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

Date: 5/23/11
 Designed: Angela Roman
 Drawn: Angela Roman
 Checked: As built
 Approved: A. Roman 7/19/12

DON ROGERS
 378 POND
 TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"

NRCS
 Natural Resources Conservation Service
 United States Department of Agriculture

File No.
 Rogers.dwg

Drawing No.
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7/26/11 10:34 AM
 Sheet 7 of 10

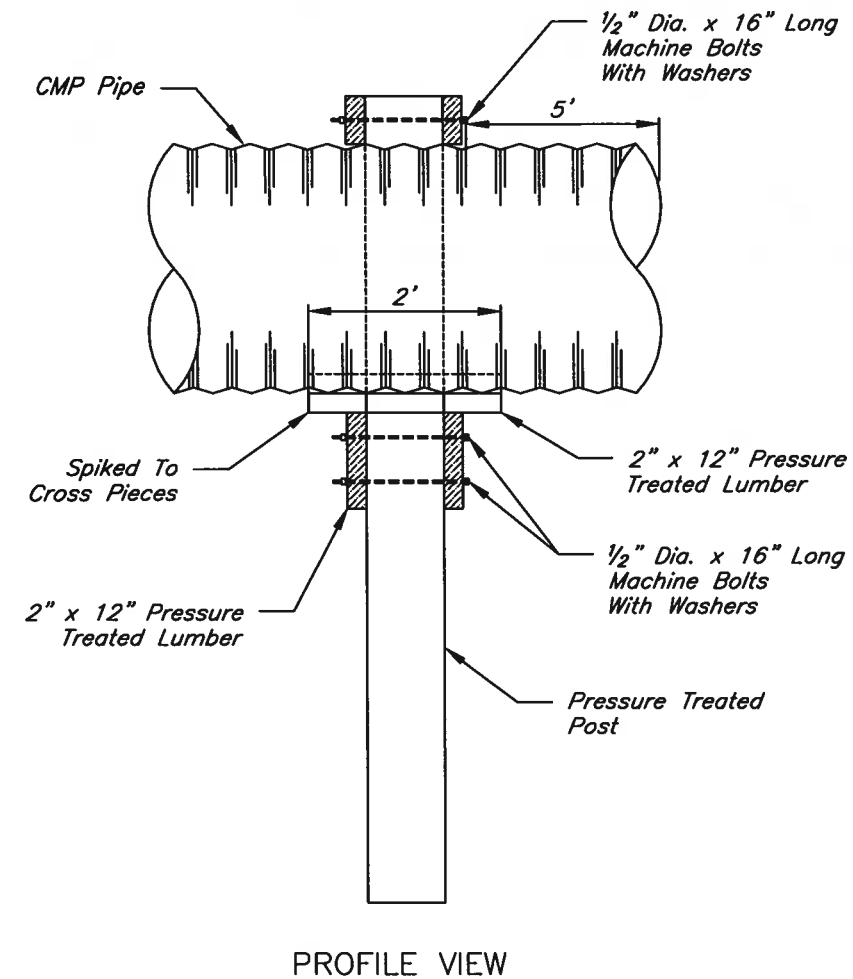
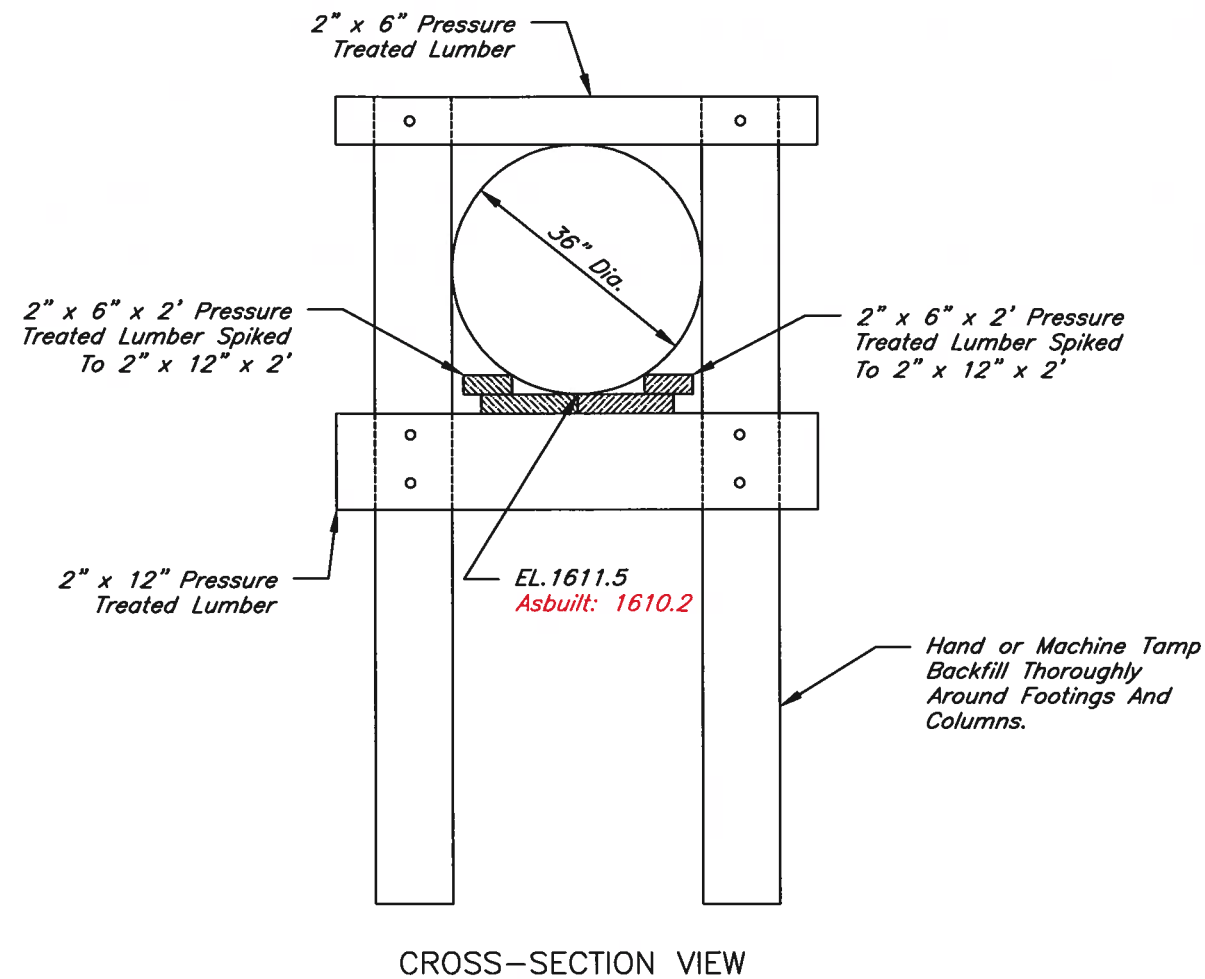


TABLE OF QUANTITIES			
ITEM	LENGTH	UNIT	QUANTITY
8" Dia. Pressure Treated Post **	12 Ft	Each	2
2" X 12" Pressure Treated Lumber	5 Ft	Each	2
2" X 6" Pressure Treated Lumber	5 Ft	Each	2
2" X 12" Pressure Treated Lumber	2 Ft	Each	2
2" X 6" Pressure Treated Lumber	2 Ft	Each	2
1/2" Dia. Machine Bolts With Nuts	14 In.	Sets	6
1/2" Dia. Washers		Each	12

CONSTRUCTION NOTES

1. All nuts, bolts, and washers shall be galvanized.
2. All lumber and posts shall be pressure treated to 0.4 pounds per cubic foot retention with one of the following: creosote, pentachlorophenol, or waterborne preservatives (arsenicals).
3. 5' of pipe shall extend downstream from location of timber pipe support.
4. Pipe supports shall be installed below frost line.

TIMBER PIPE SUPPORT FOR CMP PIPE

Designed Angela Roman 5/23/11

Drawn Angela Roman 5/23/11

Checked Asbuilt

Approved Angela Roman 7/12/11

DON ROGERS

378 POND

TIMBER PIPE SUPPORT FOR CMP PIPE

NE 1/4, Sec. 27, T113N, R76W

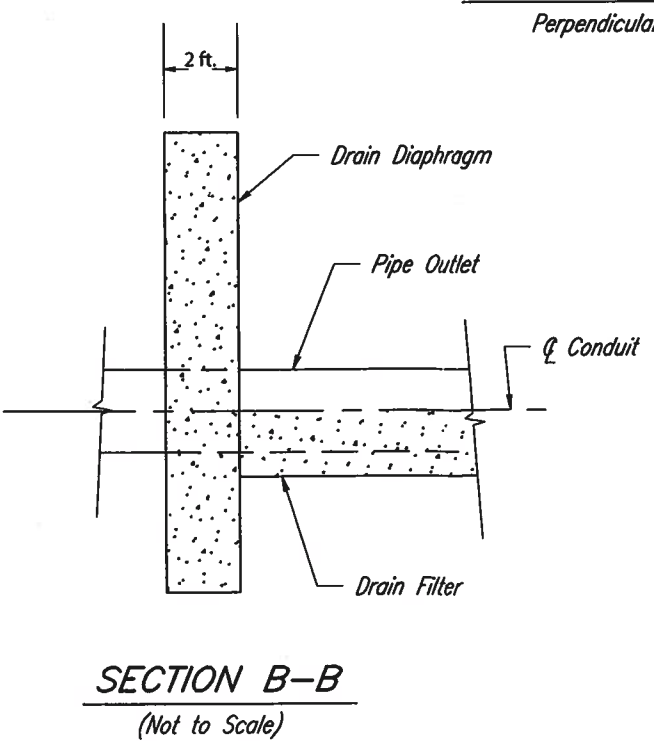
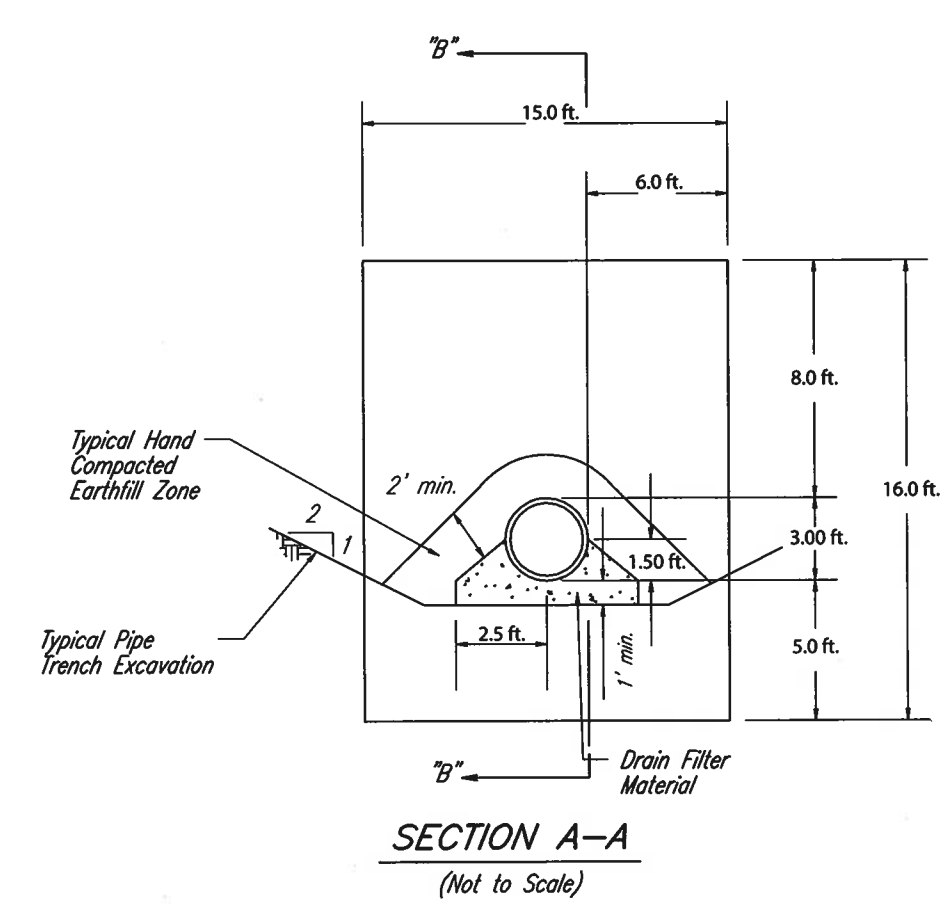
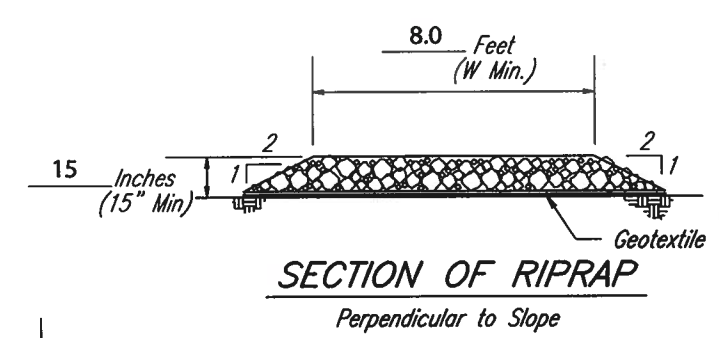
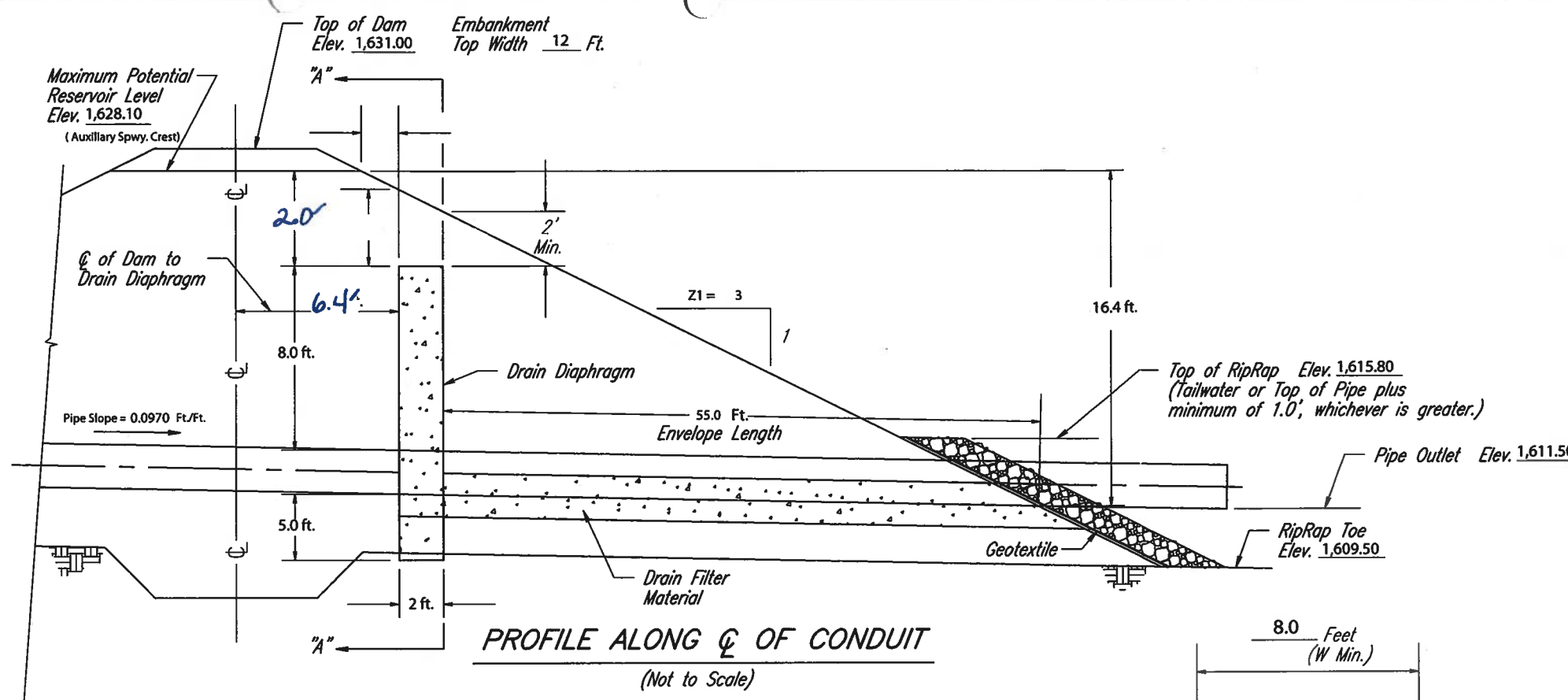
Sully County, South Dakota

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File No.
Rogers.dwg

Drawing No.
-

7/26/11 10:34 AM
Sheet 8 of 10



SUMMARY OF DESIGN AND DIMENSIONS

DESIGN DATA	
H = 16.4 Feet	Hd = 16.35 Feet
X = 6.0 Feet	D = 36 Inches
R = 5.0 Feet	Y = 8.0 Feet
C = Feet	Aggregate Gradation #1
Embankment Backslope (Z1) = 3.0 Pipe Slope (S) 0.0970 Ft./Ft.	

DIMENSIONS	
W = 15.0 Feet	(Total Width of Drain Diaphragm)
T = 16.0 Feet	(Total Height of Drain Diaphragm)
t = 2 Feet	(Thickness of Single Filter)

ESTIMATED QUANTITIES

Drain Filter Material	41.4 Cubic Yards
Geotextile	28.8 Square Yards
Rock Riprap	9.7 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	
07/21/2009	Jay B. Cobb	State Conservation Engineer	7/21/2009 2:23PM

Sheet 9 of 90

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

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

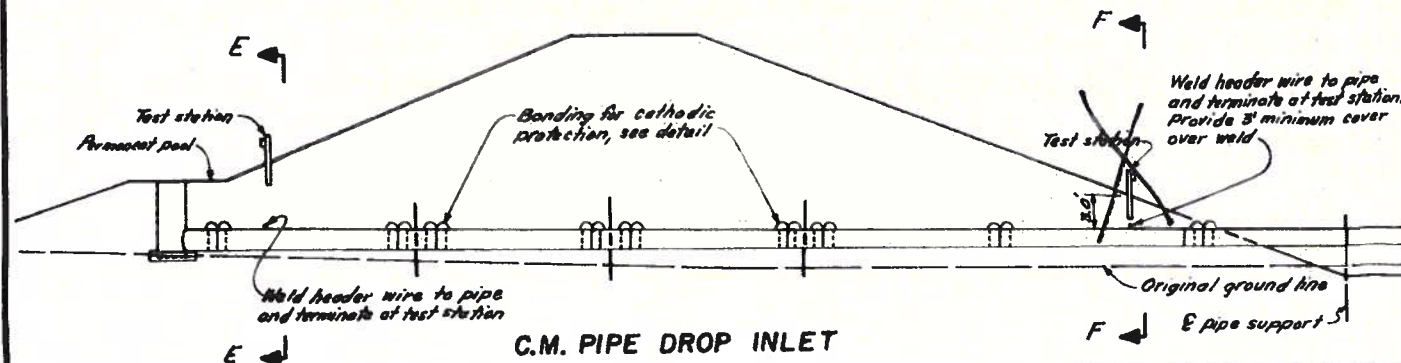
File Name: SubPlan Drainage Diaphragm.dwg
Drawing No.

Designed: A. Roman 6/22/10
Drawn: A. Roman 6/22/10
Checked: A. Roman 6/22/10
Approved: A. Roman 6/22/10

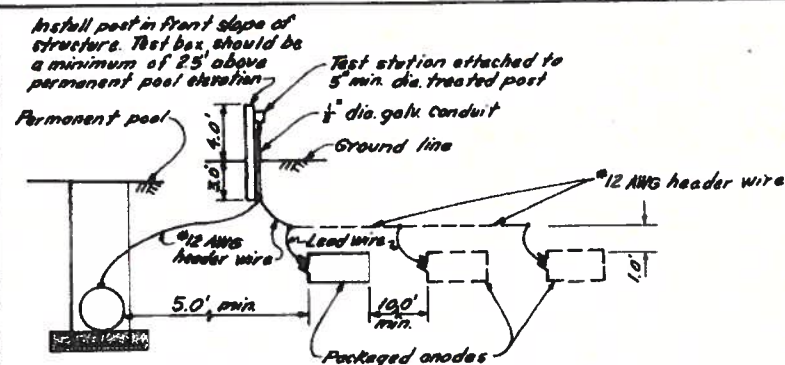
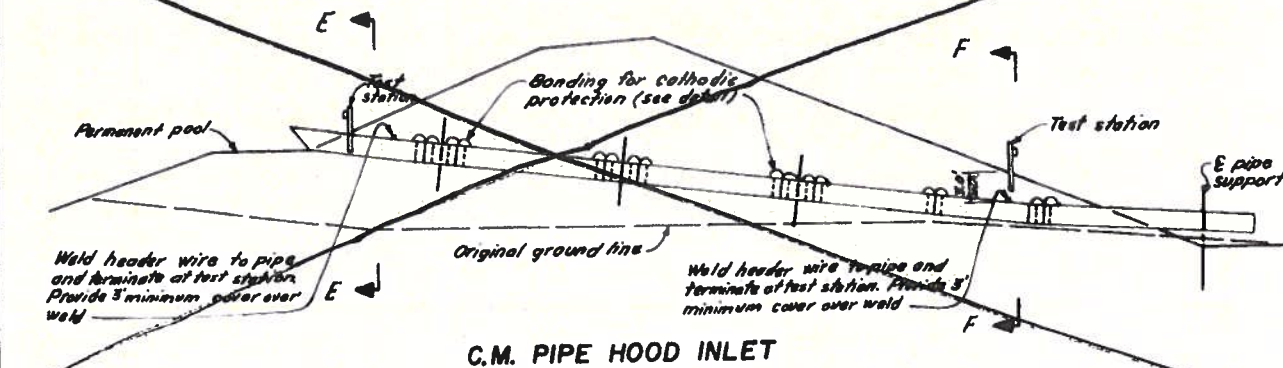
PRODUCER: Don Rogers
SECTION 27 113N 76W
Sully COUNTY
Sully County CONSERVATION DISTRICT

Asbuilt: A. Roman 7/19/12

Note: 1 piece anti-seep collars are shown, see note 6.



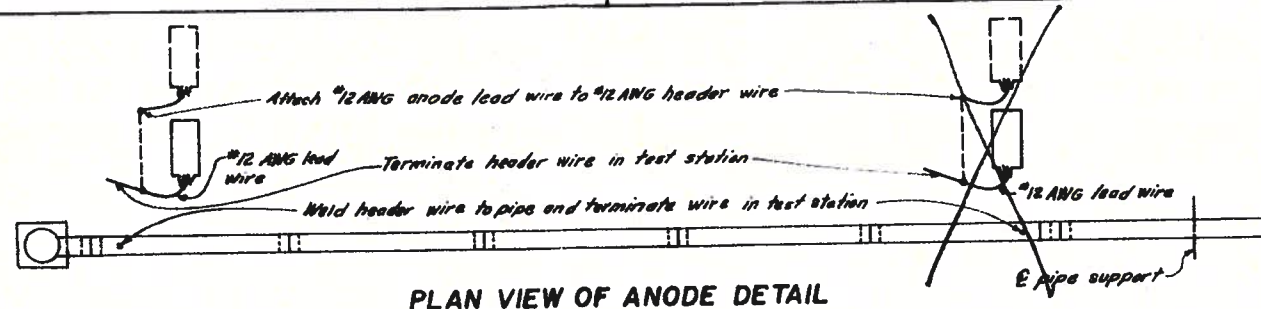
Note: 1 piece anti-seep collars are shown, see note 6.



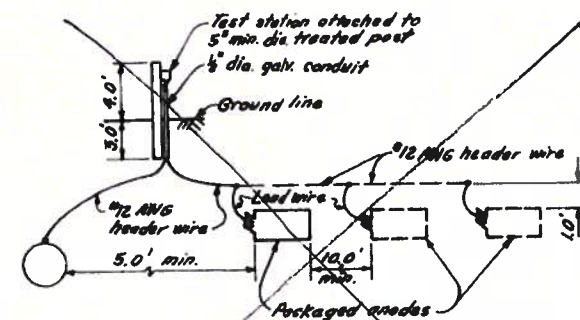
PACKAGED MAGNESIUM ANODES REQUIRED (Upstream)

SIZE	NO. REQ'D
50 lb	3

SECTION E-E



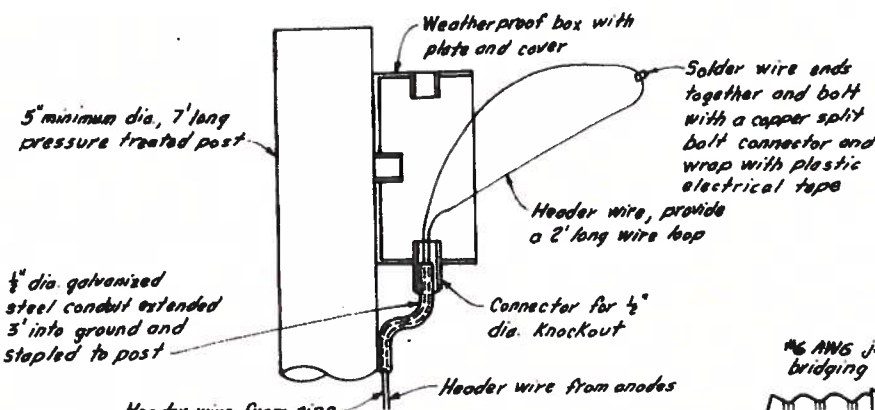
PLAN VIEW OF ANODE DETAIL



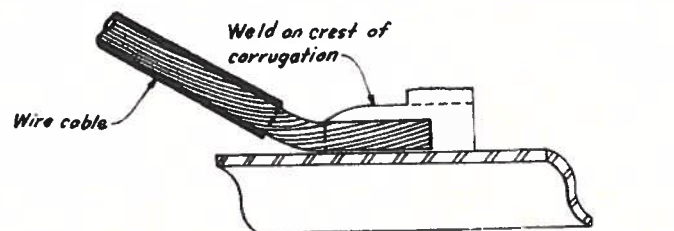
PACKAGED MAGNESIUM ANODES REQUIRED (Downstream)

SIZE	NO. REQ'D

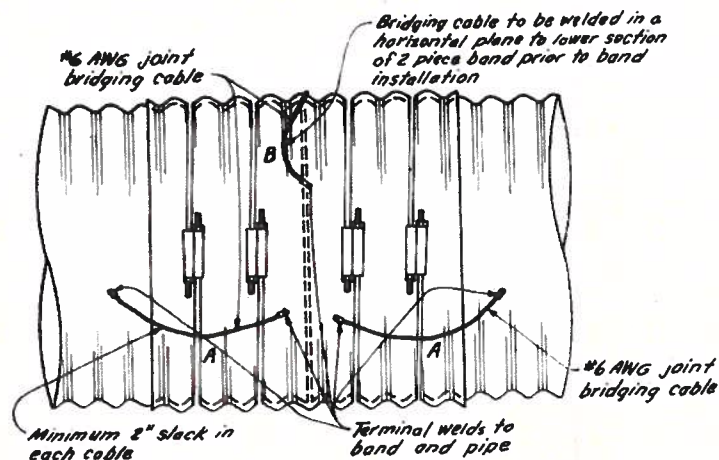
SECTION F-F



DETAIL OF ANODE TEST STATION



DETAIL OF CABLE WELD CONNECTION



PLAN VIEW CABLE FOR C.M. PIPE AND COUPLING BAND

ITEM	UNIT	QUANTITY
6" DIA., 7' LONG PRESSURE TREATED POST	EACH	1
1/2" DIA., 6' LONG GALV. STEEL CONDUIT	EACH	1
WEATHERPROOF BOX	EACH	1
PACKAGED MAGNESIUM ANODES	EACH	3
16 AWG JOINT BRIDGING CABLE	LIN. FT.	180
12 AWG HEADER WIRE	LIN. FT.	180

50lb Standard Magnesium Anodes (packaged) 10"x18"

Asbuilts:
Connection through pipe tested & verified.
Connection from anodes to pipe tested & verified.
A. Roman

NOTES:

1. LOCATE ANODES IN NATURAL SOIL WITHIN 200' OF TEST STATION AS DIRECTED BY THE ENGINEER.
2. PIPE WELD CONNECTION AREAS SHALL BE ROUGHENED AND CLEANED TO EXPOSE THE BASE METAL TO PROVIDE GOOD CONDUCTIVITY.
3. TERMINAL WELDS ON BANDS SHALL BE PLACED OUTSIDE OF BAND LAP AREA TO AVOID INTERFERENCE WITH LAP.
4. AFTER WELDING, ALL EXPOSED METAL SHALL BE COATED AS SPECIFIED FOR PATCHING DAMAGED PIPE COATING.
5. THE POWDER WELDING CARTRIDGE SHALL BE EQUAL TO OR BETTER THAN CADWELD CARTRIDGE CA 15 +.
6. WHEN TWO PIECE ANTI-SEEP COLLARS ARE USED, WELD A LENGTH OF BRIDGING CABLE TO UPPER AND LOWER PIECES AND FROM PIPE TO COLLAR.
7. BACKFILL AROUND ANODE WITH WELL TAMPED, MOIST CL MATERIAL.
8. MINIMUM TRENCH WIDTH FOR ANODES SHALL BE 2'.
9. ANODE MAY BE LOCATED EITHER DOWNSTREAM OR UPSTREAM OR BOTH LOCATIONS.
10. CROSS OUT VIEWS NOT APPLICABLE.

JOINT BRIDGING CABLE LENGTHS

JOINT BRIDGING CABLE LENGTHS				
PIPE DIAMETER	CABLES			
	A		B*	
LENGTH	QUANTITY	LENGTH	QUANTITY	
12	2-0	2	1-0	1
15	2-0	2	1-3	1
18	2-0	2	1-6	1
21	2-0	2	1-9	1
24	2-0	2	2-0	1
30	2-0	2	2-6	1
36	2-0	2	3-0	1
42	2-0	2	3-6	1
48	2-0	2	4-0	1
54	2-0	2	4-6	1
60	2-0	2	5-3	1

* B CABLES ARE NOT REQUIRED WITH ONE PIECE BANDS

CATHODIC PROTECTION SYSTEM

OPERATOR: Don Rogers

CONSERVATION DISTRICT: Sully

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by: A. Roman
Drawn by: A. Roman
Traced by: D. Edwards 7/6/12
Checked by: [Signature]

Date: 7/9/12
Approved by: A. Roman
Title: [Signature]
Scale: 0
Drawing No: 10

Asbuilts: A. Roman 7/9/12