

WATER PERMIT NO. 7157-3

Name of Applicant: **Glenn Mayer**

Address: **606 S Merrill St, Chamberlain SD 57325** Phone: **605 730-1281**

Amount of Water Claimed: **51.3 AF** Total Acres: **NA**

Source of Water Supply: **runoff**

Water to be used for: **livestock and fwp** County: **Buffalo**

Type of Waste Disposal System: **NA**

Location: **15 miles northeast of Pukwana**

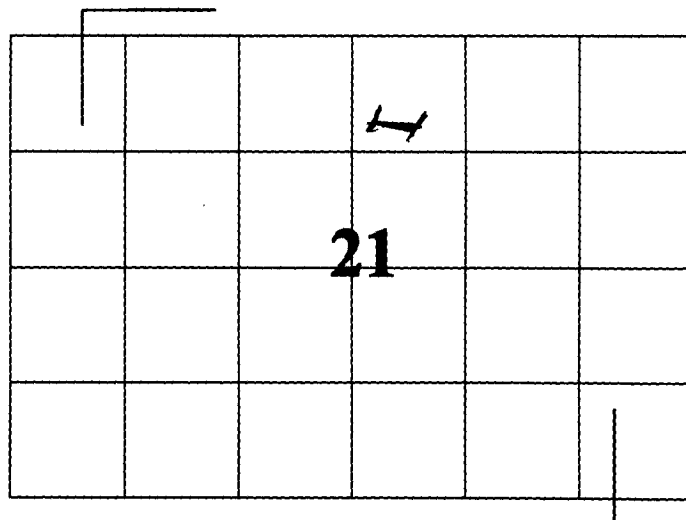
PRIORITY Date Received: **8-18-09** Application/License Fee: **\$700**

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

Remarks:

Diversion Point: **NW ¼ NE ¼ Sec 21-T106N-R69W**

Land to be Irrigated: **W ½ NE ¼, E ½ NW ¼ Sec 21-T106N-R69W**



Depth of Well: **NA**

Well Driller: **NA**

Remarks:

Type of Map: **aerial**

Prepared by: **Angela Roman, NRCS**

Reviewed and the Number Assigned on: **8-18-09**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

Mail to: Water Rights Program Joe Foss Building 523 E. Capitol Pierre, SD 57501-3181 (605) 773-3352	No. <u>7157-3</u> (office use only) Hydrologic Unit <u>10140105</u>
	Basin <u>Missouri River</u>
	Newspaper <u>Central Dak Times PO Box 125</u>
	<u>605 - 234-0266 Chamberlain 57325</u>

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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 Glenn Mayer Phone (605) 730-1281
(check one) ☒ Owner ☐ Tenant/lessee
Mailing Address 606 South Merrill Street Chamberlain State SD 57325
(Street, RR, or Box and City) (Zip Code)
- Amount of water claimed *CFS or **GPM 51.3 ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)
- Source of water supply Drainage area of 603 acres (runoff)
- Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) County Buffalo
No Diversion Dam located in NW 1/4 NE 21-106-69
Water impounded W 1/2 NE 1/4, E 1/2 NW 1/4 Sec 21 T 106N R 69W
- County or counties where water will be used Buffalo
- 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)
Construct an earthen water storage dam.

STATE OF SOUTH DAKOTA) SS
County of Brule)

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, Glenn Mayer, 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 Glenn Mayer

Subscribed and sworn to before me this 23rd day of July 20 09

Gene A. Schaub
Notary Public signature

My Commission Expires 10-23-09

**SOUTH DAKOTA
WATER PERMIT NO. 7157-3**

Date of first receipt of application August 18, 2009.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 7157-3 to Glenn Mayer, 606 S Merrill St, Chamberlain SD 57325 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. 7157-3 authorizes impoundment 51.3 acre-feet of water from runoff by constructing a dam located in the NW ¼ NE ¼ Section 21 with water impounded in the W ½ NE ¼, E ½ NW ¼ Section 21; all in T106N-R69W.
2. The water appropriated shall be used for fish and wildlife propagation and livestock water purposes and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date of approval of Permit No. 7157-3 is September 21, 2009.
5. The date from which applicant may claim right is August 18, 2009.
6. One-fifth of the construction is to be completed on or before March 21, 2011.
7. All construction is to be completed on or before September 21, 2014.
8. Water is to be put to beneficial use on or before September 21, 2018.
9. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

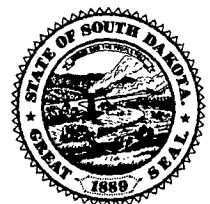
QUALIFICATIONS

1. Water Permit No. 7157-3 authorizes a dam with a storage capacity of 51.3 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 24 2009
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

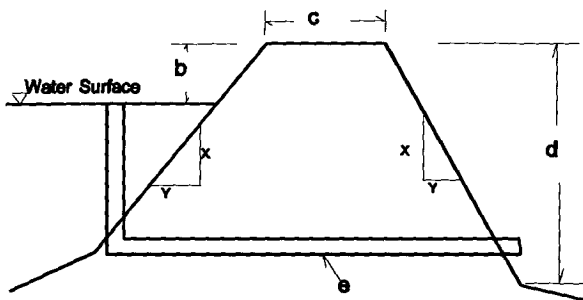
- a) Surface Dimensions _____ Depth _____
- b) Depth to water (ground surface to water level) _____

4. Water Storage Dams

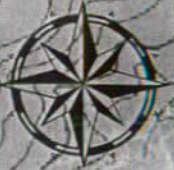
If the proposed water use system contains one or more storage dams, please furnish the information requested below for each dam. The locations of the dams need to be shown on the map submitted with the application.

- 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 N. Lincoln Suite #104
Pierre, SD 57501



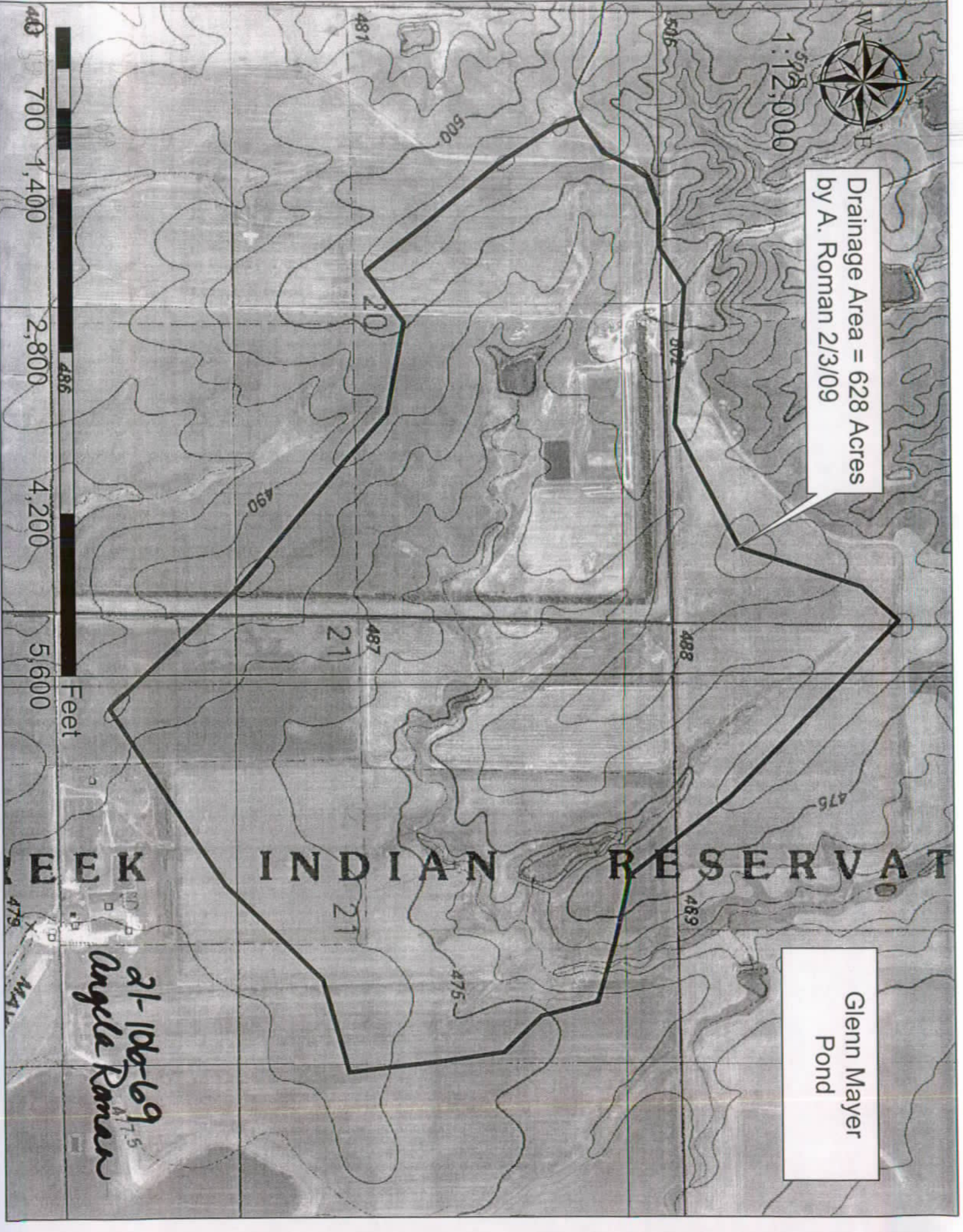
- b) Freeboard _____ 5'
- c) Crest Width _____ 15'
- Crest Length _____ 474'
- d) Height _____ 18.5'
- e) Primary Outlet Capacity _____ 21 cfs
If pipe, diameter _____ 15"
- f) Secondary Spillway Capacity _____ 247cfs
Spillway Width _____ 60'
- g) X & Y Slope _____
Upstream _____ 3:1
Downstream _____ 3:1
- h) Surface Area of Impoundment _____ 11.6acres
- i) Storage _____ 51.3 _____ Acre Feet
- j) Drainage Area Above Dam _____ 603.0 _____ Acres



1:12,000

Drainage Area = 628 Acres
by A. Roman 2/3/09

Glenn Mayer
Pond



0 700 1,400

2,800

4,200

5,600

Feet

EEK

INDIAN

RESERVAT

21-106-69
Angela Roman

Glenn Mayer Pond
Buffalo County, South Dakota
NE 1/4 Section 21 T106N R69W
Simple Dam Break Breach Analysis
A. Roman, 8/17/09
1:12,000 scale

1.3 miles x-section

.9 miles x-section

.4 miles x-section

.03 miles x-section

Proposed Pond Location

Approximate Water line Elevation at pipe

Shelby
o43099h2

Pukwana NE
o43099h1

INDIAN RESERVATION

Crow



Sec 17
T106N
R69W

Sec 16
T106N
R69W

Sec 15
T106N
R69W

Sec 20
T106N
R69W

Sec 29
T106N
R69W

Sec 21
T106N
R69W

Sec 28
T106N
R69W

Sec 22
T106N
R69W

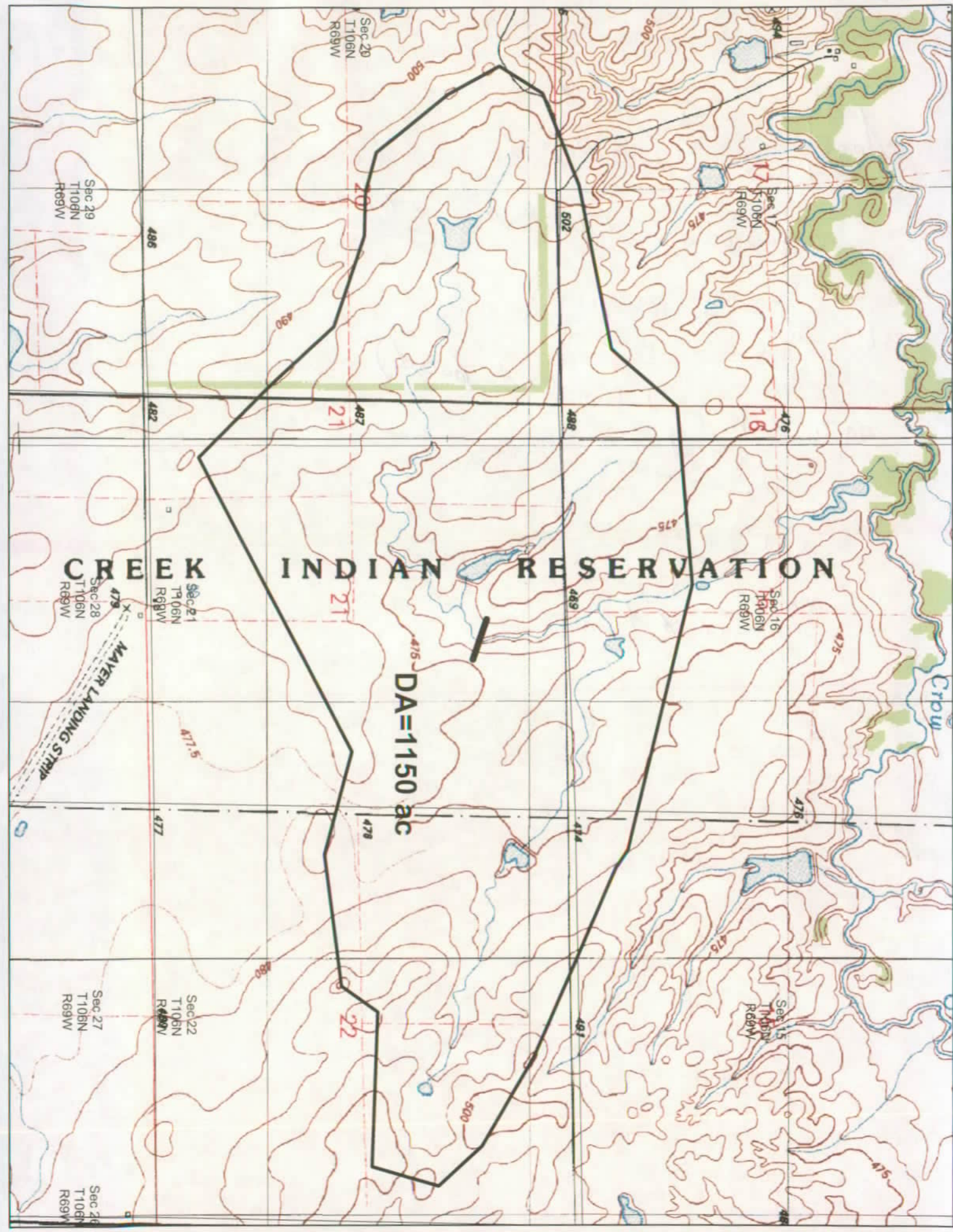
Sec 27
T106N
R69W

Sec 25
T106N
R69W

CREEK INDIAN RESERVATION

DA=1150 ac

CREEK



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 8/19, 2009

RECEIVED OF Glenn J Mayer ~~606~~ S Merrill St Chamberlain SD 57325

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

Fee for Application for Permit No. <u>7157-3</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>7157-3</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. 04159

By Leland Erbe 24
Chief Engineer

United States Department of Agriculture



Natural Resources Conservation Service
Field Support Office
1717 North Lincoln Avenue, Suite #104
Pierre, SD 57501-1258

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

August 17, 2009

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

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Mr. Tim Schaal,

Attached are plans, specifications and design data for a dam in Buffalo County for Glenn Mayer. This dam will require a water rights permit and safety of dams review. Construction is anticipated as soon as approval is received.

Please don't hesitate to 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

United States Department of Agriculture



Natural Resources Conservation Service
Field Support Office
1717 North Lincoln Avenue, Suite #104
Pierre, SD 57501-1258

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

August 17, 2009

Mr. Glenn Mayer
606 South Merrill Street
Chamberlain, SD 57325

Dear Mr. Mayer:

The USDA Natural Resources Conservation Service (NRCS) has designed a livestock dam for you in the NE ¼ of Section 21, Township 106 North, and Range 69 West, located on an unnamed tributary to Crow Creek in Buffalo County. Due to the storage capacity below the elevation of the emergency spillway (81.2 acre-feet), it falls within the size category in which potential downstream damage should be considered in the unlikely event the dam should fail. Under the Dam Safety Act, we are required to analyze damage potential on all such dams. This does not reflect on the adequacy of the design or construction.

A general evaluation was made of the area below the dam that could be flooded should a sudden failure occur. The evaluation indicated that the flooded area would only affect fences, pastures, and valley cropland. Therefore, it was assigned a class (A) or low hazard rating. The design of the dam was based on this classification.

If future development should occur downstream of the dam or should another dam be built upstream, the hazard classification could change abruptly. You need to be aware of this in order to alert future developers of the hazard that could occur. This is your responsibility.

If you would like a more detailed analysis or in the event of future development in the area downstream of the dam, NRCS is ready to assist you in evaluating the potential impact area on the downstream development should there be a sudden failure of the dam.

I am sending a copy of this letter and attached map to the South Dakota Department of Environment and Natural Resources which is the state agency responsible for dam safety and to the Brule-Buffalo County Conservation District.

If you have any questions on this matter, please do not hesitate to contact me.

Sincerely,

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

ANGELA ROMAN-Agricultural Engineer
Attachment

cc: Department of Environment and Natural Resources, Joe Foss Building, 523 E Capitol,
Pierre, SD 57501
Chairperson, Brule-Buffalo County Conservation District, 1717 N. Lincoln Ave, Suite 103, Pierre,
SD 57501

The Natural Resources Conservation Service provides leadership in a partnership effort to help people
conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

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U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION PLANS AND SPECIFICATIONS

378 Embankment Pond

for

Glenn Mayer

Section: 21

County: Buffalo

Township: 106N

Range: 69W

Prepared By:

Pierre Field Support Office

Designed By: A. Roman

Brule-Buffalo Conservation District, South Dakota

CONSTRUCTION SPECIFICATION

SD-2 CLEARING AND GRUBBING

1. Scope

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

2. Protection of Existing Vegetation

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

3. Marking

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

4. Clearing and Grubbing

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

5. Disposal

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

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

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 recompacted as new earthfill is placed.

5. Control of Moisture Content

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

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

6. Compaction (Class S)

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

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

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

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

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

Construction Specification 61C—Rock Riprap

1. Scope

The work shall consist of the construction of rock riprap revetments and blankets, including filter or bedding where specified.

2. Material

Rock riprap shall conform to the requirements of Material Specification 523, Rock for Riprap, or if so specified, shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits.

At least 30 days before rock is delivered from other than designated sources, the contractor shall designate in writing the source from which rock material will be obtained and provide information satisfactory to the contracting officer that the material meets contract requirements. The contractor shall provide the contracting officer's technical representative (COTR) free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in section 8.

Rock from approved sources shall be excavated, selected, and processed to meet the specified quality and grading requirements at the time the rock is installed.

When specified in section 8 or requested by the contracting officer, a gradation quality control check shall be made by the contractor and be subject to inspection by the COTR. The test shall be performed at the worksite in accordance to ASTM D 5519 Test Method B Size, Size-Range Grading, on a test pile of representative rock. The weight or size of the test pile shall be large enough to ensure a representative gradation of rock from the source and to provide test results within a 5 percent accuracy.

Based on a specific gravity of 2.65 (typical of limestone and dolomite) and assuming the individual rock is shaped midway between a sphere and a cube, typical size/weight relationships are:

Sieve size of rock	Approx. weight of rock	Weight of test pile
16 inches	300 pounds	6,000 pounds
11 inches	100 pounds	2,000 pounds
6 inches	15 pounds	300 pounds

The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to be rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.

Filter or bedding aggregates when required shall conform to Material Specification 521, Aggregates for Drainfill and Filters, unless otherwise specified. Geotextiles shall conform to Material Specification 592, Geotextile.

3. Subgrade preparation

The subgrade surface on which the rock riprap, filter, bedding, or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved material and shall conform to the requirements of the specified class of earthfill.

Rock riprap, filter, bedding, or geotextile shall not be placed until the foundation preparation is completed and the subgrade surface has been inspected and approved.

4. Equipment-placed rock riprap

The 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 such a manner as to avoid serious displacement of the underlying material. The rock for riprap shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another 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 any new and existing structures.

5. Hand placed rock riprap

The rock riprap shall be placed by hand 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 rock. 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. Filter or bedding

When the contract specifies filter, 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 finished reasonably smooth and free of mounds, dips, or windrows.

7. Measurement and payment

For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap and filter or bedding aggregate is measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment is made at the contract unit price for each type of rock riprap, filter, or bedding. Such payment is considered full compensation for completion of the work.

Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 8.

~~No separate~~ payment is made for testing the gradation of the test pile. Compensation for testing is included in the appropriate bid item for riprap.

8. Items of work and construction details

Items of work to be performed in conformance with this specification and construction details are:

a. Riprap

- (1) This item consists of furnishing and placing the rock riprap, complete in place, for outlet of the drain, as shown on the drawings.
- (2) Rock riprap shall conform to the requirements of Material Specification 523, Rock for Riprap, Rock Type 1.
- (3) The riprap may be equipment placed.
- (4) All rock materials shall be graded to meet the following requirements:

<u>Stone Weight</u> <u>Pounds</u>	<u>Minimum %</u> <u>Larger Than</u>	<u>Maximum %</u> <u>Larger than</u>
50	0	0
30	20	50
10	50	85
3	85	100

- (5) Payment will constitute full compensation for related Subsidiary Item:

Contractor Quality Control.

Construction Specification 24A—Drainfill

1. Scope

The work consists of furnishing, placing, and compacting drainfill required in the construction of structure drainage systems.

2. Material

Drainfill material shall conform to the requirements of Material Specification 521, Aggregates for Drainfill and Filters. A minimum of 30 days before delivery of materials to the site, the contractor shall inform the engineer in writing of the source(s) from which drainfill material will be obtained. The contractor shall provide the engineer free access to the source(s) for the purpose of obtaining samples for testing.

3. Base preparation

Foundation surface and trenches shall be clean and free of organic matter, loose soil, foreign substance, and standing water when the drainfill is placed. Earth surfaces upon or against which drainfill will be placed shall not be scarified.

4. Placement

Drainfill shall not be placed until the subgrade has been inspected and approved by the engineer. Drainfill shall not be placed over or around pipe or drain tile until the installation of the pipe or tile has been inspected and approved.

Drainfill shall be placed uniformly in layers not to exceed 12 inches thick before compaction. When compaction is accomplished by manually controlled equipment, the layers shall not exceed 8 inches thick. The material shall be placed to avoid segregation of particle sizes and to ensure the continuity and integrity of all zones. No foreign material shall be allowed to become intermixed with or otherwise contaminate the drainfill.

Traffic shall not be permitted to cross over drains at random. Equipment cross-overs shall be maintained, and the number and location of such crossovers shall be established and approved before the beginning of drainfill placement. Each crossover shall be cleaned of all contaminating material and shall be inspected and approved by the engineer before the placement of additional drainfill material.

Any damage to the foundation surface or the trench sides or bottom occurring during placement of drainfill shall be repaired before drainfill placement is continued.

The upper surface of drainfill constructed concurrently with adjacent zones of earthfill shall be maintained at a minimum elevation of 1 foot above the upper surface of adjacent earthfill.

Drainfill over and/or around pipe or drain tile shall be placed to avoid any displacement in line or grade of the pipe or tile.

Drainfill shall not be placed adjacent to structures until the concrete has attained the strength specified in section 9 of this specification. The strength shall be determined by compression testing of concrete test cylinders cast and field cured at the project site in accordance with ASTM Method C 31 for determining when a structure may be placed into service.

When the required strength of the concrete is not specified as described above, placement of drainfill adjacent to concrete structures shall not be commenced until the following item intervals have elapsed following placement of the concrete:

Structure type	Time interval (days)
Vertical or near-vertical wall with earth loading on one side only (retaining walls and counterforts)	14
Walls backfilled on both sides simultaneously	7
Conduits and galleries, cast-in-place (with inside forms in place)	7
(inside forms removed)	14
Conduits, precast, cradled	2
Conduits, precast, bedded	1
Cantilever outlet bents backfilled on both sides simultaneously	3

5. Control of moisture

The moisture content of drainfill material shall be controlled as specified in section 9 of this specification. When additional water is required, it shall be applied in a manner to avoid excessive wetting to adjacent earthfill. Except as specified in section 9 of this specification, control of moisture content will not be required.

6. Compaction

Drainfill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction—For drainfill materials with more than 70 percent passing the 3/4 inch sieve, each layer of drainfill shall be compacted to a minimum dry density of not less than the density specified in section 9 of this specification as determined by ASTM D 698. For drainfill materials with 70 percent or less passing the 3/4 inch sieve, each layer of drainfill shall be compacted to a relative density of not less than 70 percent as determined by ASTM D 4254.

Class I compaction—Each layer of drainfill shall be compacted by a minimum of two passes over the entire surface with a steel-drum vibrating roller weighing at least 5 tons and exerting a vertical vibrating force of not less than 20,000 pounds at a minimum frequency of 1,200 times per minute, or by an approved equivalent method.

Class II compaction—Each layer of drainfill shall be compacted by one of the following methods or by an approved equivalent method. (A pass is defined as at least one complete coverage of the roller wheel, tire, or drum over the entire surface for each layer.)

- a. A minimum of two passes over the entire surface with a pneumatic-tired roller exerting a minimum pressure of 75 pounds per square inch.
- b. A minimum of four passes over the entire surface with the track of a crawler-type tractor weighing at least 20 tons.
- c. Controlled movement of the hauling equipment so that the entire surface is traversed by not less than one tread track of the loaded hauling equipment.

Class III compaction—No compaction will be required beyond that resulting from the placing and spreading operations.

When compaction other than Class III compaction is specified, material placed in trenches or other locations inaccessible to heavy equipment shall be compacted by manually controlled pneumatic or vibrating tampers as specified in section 9 of this specification.

Heavy equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from cranes, hoists, or similar equipment will not be permitted.

7. Testing

The contractor shall conduct such tests as necessary to verify that the drainfill material and the inplace drainfill meets the specification requirements.

The engineer shall be granted access to perform such tests as are required to verify that the drainfill materials and the drainfill in place meets the requirements of the specifications. These tests are not intended to provide the contractor with information needed to assure that the materials and workmanship meet the specification requirements. These verification tests will not relieve the contractor of the responsibility of performing required tests for that purpose.

8. Measurement and payment

For items of work for which specific unit prices are established in the contract, the volume of drainfill within the neat lines shown on the drawings are measured and computed to the nearest cubic yard. Where the engineer directs placement of drainfill outside the neat lines to replace unsuitable foundation material, the volume of such drainfill is included. The volume included is only to the extent that the unsuitable condition is not a result of the contractor's improper construction operation in the determination of the engineer.

Payment for drainfill is made at the contract unit price for each type of drainfill, complete in place. Except as otherwise specified in section 9 of this specification, such payment will constitute full compensation for all labor, equipment, material, and all other items necessary and incidental to the performance of the work.

Compensation for any item of work described in the contract, but not included in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 9 of this specification.

9. Items of work and construction details

Items of work to be performed in conformance with this specification and construction details are:

b. Drainfill, Coarse Type

- (1) This item consists of providing and installing the coarse aggregate used as an outlet to the drain, as shown on the drawings.
- (2) The material shall be graded as follows:

<u>U.S. Sieve Designation</u>	<u>Percent Passing Sieve</u>
1 1/2" (37.5 mm)	100
1" (25 mm)	95-100
1/2" (12.5 mm)	25-800
#4 (4.75 mm)	0 to 20
#8 (2.36 mm)	0 to 5

- (3) Crushed limestone aggregate shall meet the gradation requirements of Material Specification 521, section 2.
- (4) Compaction shall be Class III.
- (5) Payment will constitute full compensation for the following related Subsidiary Items: Excavation, Drainage System; Earthfill, Backfill of Drainage System Excavation; and Contractor Quality Control.

b. Drainfill, Fine Type

- (1) This item shall consist of providing and installing the fine aggregate used in the foundation trench drain, drainage diaphragm, and diaphragm outlet as shown on the drawings.
- (2) The material shall be graded as follows:

<u>U.S. Sieve Designation</u>	<u>Percent Passing Sieve</u>
3/8	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 100	0-10

- (3) Compaction shall be Class III except for the drainfill in the drainage diaphragm which shall be Class II

- (4) An approved equivalent method of compacting drainfill for Class II compaction shall be:
 - (a) Each layer of drainfill shall be saturated prior to compaction. Water used shall be clean from injurious amounts of sediment, organic matter or other deleterious substances.
 - (b) Each layer shall be compacted by 2 passes of a hand directed vibratory compactor over the entire layer surface.
 - (c) Compaction shall be accomplished while the drainfill is wet from step (a) above.
 - (d) Layer thickness shall not exceed 12 inches after compaction.
- (5) Payment will constitute full compensation for the following related Subsidiary Items: Excavation, Drainage System; Earthfill, Backfill of Drain Excavation; Drainfill, Backfill of Overexcavated Drain Trench; and Contractor Quality Control.

c. Subsidiary Item, Drainfill, Backfill of Overexcavated Drain Trench

- (1) This item shall consist of the backfilling of any excavation for the foundation drainage system below the top of the drain which extends beyond the neat lines of the drain as shown on the drawings. This includes overexcavation of the drain trench and sloughing of material from the sides of the trench.
- (2) Backfill material shall be fine drainfill as defined for Drainfill, Fine Type (paragraph b., above). Backfilling with compacted earthfill will not be permitted.
- (3) Placement and compaction of backfill material shall be as defined for Drainfill, Fine Type.
- (4) No separate payment will be made for Drainfill, Backfill of Overexcavated Drain Trench. Compensation for this item will be included in the payment for the following Bid Item: Drainfill, Fine Type.

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-19 PVC DRAIN FOR SEDIMENT BASIN (CNMS)

1. Scope

The work shall consist of furnishing and installing polyvinyl chloride (PVC) plastic pipe, fittings, and appurtenances as shown on the drawings. This specification covers sediment basin drains. It is not applicable to water supply, sewer, or drain lines.

2. Material

Pipe shall have a minimum 160 pounds per square inch (PSI) pressure rating, shall meet ASTM D1785 or D2241, and shall be defect free. Pipe compound shall meet ASTM D1784, Class 12454-B.

Fittings and appurtenances shall be made of the same material as the pipe and be designed for use with the pipe at a minimum pressure rating of 160 PSI, except as otherwise specified.

Solvent cement for pipe joints shall meet ASTM D2564.

Rubber gasket joints shall conform to ASTM D3139.

3. Trench Construction

The trench bottom must provide uniform support for the pipe at specified lines and grades. Clods, rocks, and other hard objects that may contact the pipe must be removed. Where rocks and other hard objects cannot be completely removed, the trench bottom must be undercut four inches minimum and backfilled to grade with compacted fine-grained soil.

4. Pipe Placement

Pipe must be installed to specified lines and grades without blocking, distortion or damage. The pipe must be uniformly supported on firm stable soil (or other specified bedding) over its entire length.

5. Backfill

All backfill recommendations of the pipe manufacturer shall be met. Vehicles or construction equipment shall not cross the pipe until earth cover over the pipe exceeds two feet.

Initial backfill to six inches above top of pipe is required. Except as otherwise specified, earth haunching and initial backfill shall consist of soil that is free of rocks, hard clods, or other objects more than one inch in diameter. Earth fill shall be worked and compacted under the haunches of the pipe to provide continuous support in layers not more than six inches thick. Care shall be taken to insure the pipe is not deformed, damaged, or displaced.

Final backfill shall consist of remaining backfill from top of initial backfill to ground surface, including mounding for settlement. Final backfill shall be free of debris, rocks, or other objects three inches nominal diameter or larger. Final backfill shall be placed in approximately uniform, void free, compacted layers.

6. Protection from Ultraviolet Light

Portions of pipe that will be permanently exposed to sunlight must be primed with PVC solvent and painted with two coats of high quality exterior latex paint.

7. Measurement and Payment

The quantity of each pipe item will be measured to the nearest foot by measurement of laid length along invert centerline. Payment for each pipe item will be made at the contract unit price. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe complete in place.

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 grass 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 brome grass is not recommended where the adjacent vegetation is predominantly native, as smooth brome grass 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
Millet	10-15	May 15-Aug. 15	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 $\frac{1}{4}$ to $\frac{3}{4}$ 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.

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.

PLASTIC PIPE (SD-55)

MATERIAL SPECIFICATION

1. Scope

This specification covers the quality of Poly Vinyl Chloride (PVC), Polyethylene (PE), High Density Polyethylene (HDPE), and Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe, fittings, and joint materials.

2. Material

The pipe and fittings shall be free of visible cracks, holes, foreign inclusions, or other defects, and shall have dimensions measured as prescribed in ASTM D2122. Joints and fittings shall be as described in the pipe AWWA or ASTM specification and shall be compatible with and have pressure ratings at least equal to the specified pipe. Rubber gaskets for pipe joints shall conform to ASTM F477 Elastomeric Seals (Gaskets for Joining Plastic Pipe). Except as otherwise specified, pipe must conform to the following specifications.

Poly vinyl chloride (PVC) Pipe

Plastic pipe - Schedule 40, 80, or 120	ASTM D1785 or D2466
Pressure rated pipe - SDR Series	AWWA C900 or ASTM D2241
Plastic drain, waste, and vent pipe and fittings	ASTM D2665
Composite sewer pipe	ASTM D2680
Type PSM PVC sewer pipe and fittings	ASTM F3034
Large-diameter gravity sewer pipe and fittings	ASTM F679
Smooth-wall Underdrain Systems for Highway, Airport, and Similar Drainage	ASTM F758
Type PS-46 gravity flow sewer pipe and fittings	ASTM F789
Profile gravity sewer pipe and fittings based on controlled inside diameter	ASTM F794
Corrugated sewer pipe with a smooth interior and fittings	ASTM F949
Pressure pipe, 4-inch through 12-inch for water distribution	AWWA C900
Water transmission pipe, nominal diameters 14-inch through 36-inch	AWWA C905

Polyethylene (PE) pipe

Schedule 40	ASTM D2104
SDR-PR based on controlled inside diameter	ASTM D2239
Schedules 40 and 80 based on outside diameter	ASTM D2447
SDR-PR based on controlled outside diameter	ASTM D3035

High density polyethylene (HDPE) pipe

Plastic pipe and fittings	ASTM D3350
SDR-PR based on controlled outside diameter	ASTM F714
Plastic moldings and extrusion compounds	ASTM D1248
Heat joining polyolefin pipe and fittings	ASTM D2657

Acrylonitrile-butadiene-styrene (ABS) pipe

Plastic pipe, schedules 40 and 80	ASTM D1527
Plastic pipe, SDR-PR	ASTM D2282
Schedule 40 plastic drain, waste, and vent pipe	ASTM D2661
Composite sewer pipe	ASTM D2680
Sewer pipe and fittings	ASTM 2751

3. Perforations

Except as otherwise specified, perforations of perforated pipe shall meet the following requirements:

- a. Perforations may be circular or slots, but must be free of materials that reduce effective openings.
- b. Circular perforations shall be 3/16 to 5/16 inch diameter holes arranged in rows parallel to the axis of the pipe. Center-to-center perforation spacing along rows shall not exceed 2.5 inches. Perforations may appear at the ends of short and random lengths. Rows shall be arranged in equal groups at equal distance from pipe bottom vertical centerline. Lowermost rows shall be separated by 60 to 125 degrees. Uppermost rows shall be separated by an arc of 166 degrees or less. Other rows shall be uniformly spaced.

- c. Slot perforations shall be located within two rows, with one row in each of the lower quadrants of the pipe. Slots shall be no wider than 1/8 inch and spaced no more than 1.5 inches apart.
- d. Row numbers and minimum openings must be as follows.

Perforations			
Nominal pipe size, inch	Minimum number of rows		Minimum opening/foot, square inches
	circular	slot	
3 to 4	2	2	0.22
6 to 10	4	2	0.44
12 or larger	6	2	0.66

4. Potable use pipeline

Pipelines specified for use to carry potable water shall meet requirements of the National Sanitation Foundation (NSF).

RECEIVED**AUG 18 2009****Design Report
Glenn Mayer
Buffalo County****Summary** WATER RIGHTS
PROGRAM

This is a new construction of an earth embankment pond. Funding for this project will be provided by the NRCS through the WHIP program.

Job Description

This site is a Hazard "A" and Job Class IV structure with a drainage area of 631 acres. In the event of a breach, cropland and pastureland could be damaged. The principal spillway of this site is a 15" diameter PVC pipe, with a 30" dia. drop structure.

The pond will have 9,806 CY of fill for the dam, 51 CY of fill for the emergency spillway berm, 472 CY of fill and excavation for the core trench, 733 CY of fill and excavation for stripping the footprint of the dam fill, and 462 CY of top soiling and excavation for the emergency spillway. The core trench quantity is figured on a core trench with a 3' depth, 10' width and 1:1 side slopes. A soil investigation was completed and good clay was found, refer to soils reports.

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 25yr-24hr storm through the emergency spillway. SITES program was used to flood route the design.

General Basic Data

Hydraulic Data Summary	
Drainage Area	631 Acres
Time of Concentration	1.66 hours
Runoff Curve Number	83
Principal Spillway, 2 YR 24-hr. Rainfall	2.3 inches
Emergency Spillway, 25 YR 24-hr. Rainfall	4.2 inches
Principal Spillway Discharge in ES	21 CFS
Emergency Spillway Discharge	247 CFS
Estimated 25 year sediment storage	5.5 ACFT
Estimated Sediment Yield Below Crest	4.4 ACFT
Estimated Sediment Yield Above Crest	1.1 ACFT
Crest of Normal Pool	11.6 Acres 51.3 ACFT storage
Crest of Emergency Spillway	16.2 Acres 81.2 ACFT storage
Top of Dam	20.5 Acres 114.7 ACFT storage

Angela Roman
Agricultural Engineer
Date:

Angela Roman 8/14/09

OPERATION AND MAINTENANCE PLAN

POND CODE 378

Landowner/Operator _____ Glenn Mayer _____

Job Location _____ NE ¼ Sec. 21 T106 R69 _____ GPS _____

Prepared by _____ A. Roman _____ Date _____ 8/14/09 _____

Operation and Maintenance Items

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

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

Other _____

Watershed.txt

Wednesday, May 20 2009

Field number 1 rcn is 83

Field number 1 area is 631.4 Acres

The Longest Flow Length is 9497.8 Feet

The Average Slope for the watershed is 3.07 %

Client: Glenn Mayer
 County: BUFFALO
 Practice: WHIP pond
 Calculated By: A. Roman
 Checked By: _____

State: SD

Date: 6/5/2009

Date: _____

Drainage Area: 632 Acres (user entered value)
 Curve Number: 83 (user entered value)
 Watershed Length: 9498 Feet
 Watershed Slope: 3.07 Percent
 Time of Concentration: 1.66 Hours (calculated value)
 Rainfall Type: II

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr rainfall (in)	1.90	2.30	3.10	3.60	4.20	4.80	5.30
Ia/P Ratio	0.22	0.18	0.13	0.11	0.10	0.09	0.08
Used	0.22	0.18	0.13	0.11	0.10	0.10	0.10
Runoff (in)	0.63	0.91	1.53	1.94	2.46	2.99	3.45
(ac-ft)	33.18	47.93	80.58	102.17	129.56	157.47	181.70
Unit Peak Discharge (cfs/acre/in)	0.359	0.373	0.390	0.396	0.401	0.401	0.401
Peak Discharge (cfs)	142	214	376	487	624	759	874

Annual Yield and Sediment Storage

Project: Glenn Mayer
Calculations By: Angela Roman
Checked By: A.Roman 8/11/09

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

Input Data Isogram # = 212 Curve Number = 33 Contributing Acres = 53.1 % chance = 50 runoff = 1.15 inches	$\frac{\text{Contributing Acres} \times \text{Inches of Runoff}}{12} = 60.5 \text{ ACFT}$ Storage at Prinicipal Spillway = 51.8 ACFT
--	---

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

Input Data Erodibility Area = Gross Rate = 0.004 25%-50% Cultivated Drainage Area = 53 Delivery Rate = 9 Median Design Life = 50	 $\text{Gross Rate} \times \text{Drainage Area} \times \text{Delivery Rate} \times \text{Years} = 17.5 \text{ ACFT}$ $\text{Available Sediment Storage} = 288.9 \text{ years}$
---	--

REF:
 EFM 2-83 Method A

Structural Design of Solid Wall, Plastic Pipe

Version 1.0 (1/30/06)

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

By: Jon Weidemann 7/27/09 Checked by: Angela Roman 8/11/09

Proposed Pipe

Description	15" PVC SDR 26
D _o	15 in
SDR or SDR?	SDR 26
wall thickness, t	0.588 in Table 52C-15
E _{long}	140,000 psi Page 52-12
E _{short}	400,000 psi Page 52B-25
allow comp stress, σ	2000 psi (from table 52C-1)

Loads

SOIL		WHEEL	
depth of soil cover, h	10.4 ft	Load class	Field Equipment
unit weight of soil, γ _s	125 psf	Load, P _L	10,000 lb
water ht. above pipe, h _w	0 ft	Do-t < 2.67h x 12 ?	N/A (b14>2, use Eq. 52-22)
P _s	1300 psf	Impact factor, I _f	1
W _s	1625 lb/ft	W _L	38 lb/ft
		P _w	30 psf
VACUUM		Total Load	1,330 psf
P _v	0 psf	P _s + P _w + P _v	
U _i	13.824 in		
W _v	0.0 lb/ft		

1. Wall Crushing (solid wall pipe)

Thrust in pipe wall, T _{pw}	831 lb/ft	
Required wall area, A _{pw}	0.035 in ² /in	Proposed Pipe okay for wall crushing
Thickness, t	0.588 in	

2. Deflection (solid wall pipe)

Deflection Lag Factor, D _L	1.5	(varies from 1.0 to 1.5)
Bedding Constant, K	0.1	(generally 0.1)
Modulus of soil reaction, E'	200	(see table 52-2)

Using Eq. 52-29 for SDR pipe

Deflection (% ΔX / D)	4.70 %	Proposed Pipe okay for deflection
Maximum deflection	5.0 %	

3. Wall Buckling

Use E _{long} or E _{short} ?	E _{long}	
E =	140,000 psi	
Factor of Safety, FS	2.5	h / (Do/12) > 2
R _w	1.0 ft	
Coeff of elastic support, B'	0.665	
Moment of Inertia, I _{pw}	0.017 in ⁴ / in	
Modulus of soil reaction, E'	200 psi	
Allowable buckling, q _a	21.87 psi	
Reduction factor, C	0.66	
Adj. allow. Buckling, q _a C	14.37 psi	
q _a C	2,069 psf	
Total pressure, P	1,330 psf	Proposed Pipe okay for wall buckling

4. Strain (solid wall pipe)

Max strain, flexure, e _f	0.0060	
Max strain, hoop strain, e _h	0.0003	
e _h due to external load?	Yes	
Max combined strain, e	0.0057	e = e _f - e _h
Allowable strain, e _{all}	0.05	Proposed Pipe okay for strain

1*****
 SITES XEQ 06/11/2009 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2005.1.3 (USER MANUAL - DATED OCTOBER 2007)
 TIME 14:01:07

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

SITES 01/01/2005 0.9859375 H5
 SAVMOV 0 101
 SAVMOV 101 1 1
 STRUCTURE

1485	.0990	
1486	.3879	
1487	.8116	
1488	1.3550	
1489	1.8781	
1490	2.7139	
1491	3.4522	
1492	4.3503	
1493	5.5290	
1494	6.7894	
1495	8.3118	
1496	9.8666	
1497	11.5810	0
1498	13.5575	19.13
1500	18.0384	20.69
1501	20.5	21.43

ENDTABLE
 WSDATA 5A1 AC 83 631 9497.8 3.07
 PDIRECT 2.3 4.30
 POOLDATA ELEV 1497 1485 1497 1483.7 1483.7
 ASDATA 41 300 100 3 .01 2
 ASINSURF 41 5.6 .035 C
 ASINLET 41 0.0 0.0 140 0.0 3
 240 10

ENDTABLE
 ASEXSURF 41 .035
 .67 0
 2
 2.0 0
 .0075

ENDTABLE
 ASEXIT 41 N 100
 BTMWIDTH FEET 60
 GRAPHICS I
 GO,DESIGN HL TYPE2 24 TYPE2378 24
 SAVMOV 2 101 1
 ENDJOB

***** 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 06/11/2009
VER 2005.1.3
TIME 14:01:07
SITE = S 1 PASS= 1
WSID= SUBW= A PART= 1

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

STORM DISTRIBUTION-PSH 24 HOUR TYPE II RAINFALL DISTRIBUTION

STORM DISTRIBUTION AUX. -24 HOUR TYPE II RAINFALL DISTRIBUTION

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	P-SD	P-FB	
2.30	0.00	0.00	4.30	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
83.00	0.99	9497.80	3.07	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
1497.00	1485.00	1497.00	1483.70	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 Ci	SIDE SLOPE	EXIT N	EXIT SLOPE	ACTUAL AUX?
5.600	3.00	0.035	0.010	NO
BTM WIDTH - BW1	BW2	BW3	BW4	BW5
ft 60.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----
XEQ 06/11/2009
VER 2005.1.3
TIME 14:01:07
SITE = S 1 PASS= 1
WSID= SUBW= A PART= 2

PERM POOL	1497.00 FT	51.3 ACFT	11.58 AC	0.0 CFS
CREST PS	1485.00 FT	0.0 ACFT	0.10 AC	0.0 CFS
SED ACCUM	1497.00 FT	51.3 ACFT	11.58 AC	0.0 CFS
START ELEV	1497.00 FT	51.3 ACFT	11.58 AC	0.0 CFS
NRCS-PSH	D= 24.00 HR TC= 1.66 HR	P= 2.30 IN CN= 83.00	Q= 0.91 IN VOL= 47.7 ACFT	DA= 0.99 SM

PEAK = 208.3 CFS, AT 13.1 HRS.

ROUTED RESULT - HYD TYPE	EMAX	VOL-MAX	AMAX	QMAX
NRCS-PSH	1499.17 FT	81.2 ACFT	16.17 AC	20.0 CFS

PS STORAGE 29.9 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST	1485.00 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 1497.00 FT, 51.3 ACFT, 0.0 CFS.

DRAWDOWN TIME = 2.69 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	1485.00	0.00	0.00	0.00	0.00	0.10
2	1486.00	0.00	0.00	0.00	0.24	0.39
3	1487.00	0.00	0.00	0.00	0.84	0.81
4	1488.00	0.00	0.00	0.00	1.93	1.36
5	1489.00	0.00	0.00	0.00	3.54	1.88
6	1490.00	0.00	0.00	0.00	5.84	2.71
7	1491.00	0.00	0.00	0.00	8.92	3.45
8	1492.00	0.00	0.00	0.00	12.82	4.35
9	1493.00	0.00	0.00	0.00	17.76	5.53
10	1494.00	0.00	0.00	0.00	23.92	6.79
11	1495.00	0.00	0.00	0.00	31.47	8.31
12	1496.00	0.00	0.00	0.00	40.56	9.87
13	1497.00	0.00	0.00	0.00	51.29	11.58
14	1498.00	19.13	19.13	0.00	63.86	13.56
15	1500.00	20.69	20.69	0.00	95.45	18.04
16	1501.00	21.43	21.43	0.00	114.72	20.50

1SITES -----
 XEQ 06/11/2009
 VER 2005.1.3
 TIME 14:01:07 SITE = S 1 PASS= 1 PART= 3
 WSID=
 SUBW= A

AUX. CREST 1499.17 FT 81.2 ACFT 16.17 AC 20.0 CFS
 PS STORAGE 29.9 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.
 START ELEV 1497.00 FT 51.3 ACFT 11.59 AC 0.0 CFS
 EFFECTIVE HEIGHT(H)= 15.5 FEET, PRODUCT= 1256. (H * STORAGE AT CREST AUX.).
 INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.
 NRCS-FBH D= 24.00 HR P= 4.30 IN Q= 2.55 IN DA= 0.99 SM
 TC= 1.66 HR CN= 83.00 VOL= 134.0 ACFT
 PEAK = 613.1 CFS, AT 13.0 HRS.

***** WARNING - UPSTREAM END OF CREST 160. IS UPSTREAM OF THE
 FIRST GROUND POINT 200. STATION.

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

RATING TABLE NUMBER 2						
	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	1485.00	0.00	0.00	0.00	0.00	0.10
2	1486.18	0.00	0.00	0.00	0.32	0.46
3	1487.36	0.00	0.00	0.00	1.17	1.01
4	1488.54	0.00	0.00	0.00	2.74	1.64
5	1489.72	0.00	0.00	0.00	5.12	2.48
6	1490.90	0.00	0.00	0.00	8.59	3.38
7	1492.08	0.00	0.00	0.00	13.19	4.45
8	1493.26	0.00	0.00	0.00	19.27	5.86
9	1494.45	0.00	0.00	0.00	27.10	7.47
10	1495.63	0.00	0.00	0.00	36.98	9.29
11	1496.81	0.00	0.00	0.00	49.08	11.25
12	1497.99	18.89	18.89	0.00	63.68	13.53
13	1499.17	20.04	20.04	0.00	81.22	16.17
14	1499.26	21.38	20.11	1.26	82.71	16.38
15	1499.35	22.64	20.18	2.46	84.22	16.58
16	1499.52	25.11	20.31	4.80	86.98	16.95
17	1499.72	28.04	20.47	7.57	90.45	17.41
18	1500.08	46.63	20.75	25.88	96.97	18.25
19	1500.54	125.44	21.09	104.34	105.59	19.37
20	1501.00	259.46	21.43	238.03	114.72	20.50

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX@	VEGETAL COVER FACTOR	MAINT. CODE	ROOTING DEPTH (ft)	REACH LOCATION *
1	160.	300.	0.0	5.6	**	**	**	CREST
2	300.	400.	1.0	0.035	0.67	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 1499.17 FT.

DRAWDOWN (DDT) TEST 1497.00 FT 51.3 ACFT 2.85 CFS
CONTROL IS 0.000 DETENTION STORAGE

TIME TO DDT TEST DISCHARGE IS 1.19 DAYS - DRAWDOWN CONTINUING.

DRAWDOWN TIME = 1.19 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	60.0	1500.97	114.1	20.4	1.80	32.9

^^^^ NOTE -- ACTUAL Hp OF 1.80 RAISED TO MEET MIN. 378 CRITERIA.

PEAK - CFS DISCHARGE =	Q-PS 21.4	Q-AUX. 229.0	Q-TOT. 250.4
---------------------------	--------------	-----------------	-----------------

AUXILIARY SPILLWAY ---	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
	0.76	4.85	0.020	0.027

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

Aux. Spillway Discharge = 229. cfs; Bottom Width = 60. 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	3.92	0.58	0.115

AUXILIARY SPILLWAY DURATION FLOW = 18.2 HOURS
ATTACK, OE/B = 1.2 ACFT/FT

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

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 3.9 FT/SEC
 EXIT SLOPE = 0.010 FT/FT
 FLOW DEPTH = 0.9 FT

***** WARNING - USER SUPPLIED RATING CURVE DID NOT MEET CRITERIA FOR
 MINIMUM FLOW THROUGH AUXILIARY SPILLWAY (235.35 CFS).

>>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS 2.00 FT.
 NEW TOP OF DAM ELEVATION = 1501.17.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	60.0	1501.17	118.1	20.9	2.00	36.9

^^^^ NOTE -- ACTUAL Hp OF 1.99 RAISED TO MEET MIN. 378 CRITERIA.

PEAK - CFS DISCHARGES =	Q-PS 21.6	Q-AUX. 287.1	Q-TOT. 308.6
----------------------------	--------------	-----------------	-----------------

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	0.88	5.21	0.019	0.026

>>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED
 FOR THIS PASS. NEW TOP OF DAM ELEVATION = 1501.97.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	60.0	1501.97	134.1	22.7	2.73	52.8

PEAK - CFS DISCHARGES =	Q-PS 22.2	Q-AUX. 521.1	Q-TOT. 543.3
----------------------------	--------------	-----------------	-----------------

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	1.30	6.28	0.017	0.022

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION (1501.00) BY 0.90 FT.

Inflow Hyd 1 PSH-Peak = 19.99 CFS at 18.96 hrs., Location Point
 Inflow Hyd 1 FBH-Peak = 250.41 CFS at 14.16 hrs., Location Point
 HYDOUT 1

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

0 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

2 HYDROGRAPHS ROUTED AT LOWEST SITE.

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

SITES.....COMPUTATIONS COMPLETE

>>>	SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
	S 1	A	0.99	83.	1.66	0.99	378NR	A1	
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	1499.2	60.0	2.8	1502.0	0.	0.	3.9	MIN. AUX.

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

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.3 ,01/01/2005
FILES

INPUT = C:\home\angela.roman\SITES\Mayer\Sites15w30riser60.D2C
OUTPUT = C:\home\angela.roman\SITES\Mayer\Sites15w30riser60.OUT
DATED 06/11/2009 14:01:07

GRAPHICS FILES GENERATED

OPTION "L" = C:\home\angela.roman\SITES\Mayer\Sites15w30riser60.DRG DATED 06/11/2009 1.
OPTION "P" = C:\home\angela.roman\SITES\Mayer\Sites15w30riser60.DHY DATED 06/11/2009 1.
OPTION "E" = C:\home\angela.roman\SITES\Mayer\Sites15w30riser60.DEM DATED 06/11/2009 1.

DROP Inlet

Project Name: Glenn Mayer

Computed by: A. Roman

Date: 6/4/2009

Checked by: _____

Date: _____

laDropInlet.xls Ver 1.02

Computed by: A. Roman			Outflow, CFS							
Date: 6/4/2009					Weir	Inlet Orifice	Barrel Orifice	Full Pipe	Structure Outflow, CFS	Controlling Factor
Checked by: _____			Elev	HW Ft						
Date: _____										
Input Data			1497.0	0.0	0.00	0.00	10.86	18.30	0.00	Weir Flow
Riser Type & Diameter (in)	Circular	30	1497.1	0.1	0.72	7.47	11.01	18.38	0.72	Weir Flow
Length of Weir Obstruction(ft)		0.5	1497.2	0.2	2.04	10.57	11.17	18.47	2.04	Weir Flow
		6	1497.3	0.3	3.75	12.95	11.33	18.55	3.75	Weir Flow
Principal Spillway Crest Elev (ft)		1497	1497.4	0.4	5.77	14.95	11.48	18.64	5.77	Weir Flow
Invert of Barrel Elevation (ft)		1493	1497.5	0.5	8.06	16.71	11.63	18.72	8.06	Weir Flow
Barrel Orifice Coefficient (C)		0.6	1497.6	0.6	10.60	18.31	11.78	18.80	10.60	Weir Flow
Pipe Diameter (in)		15	1497.7	0.7	13.35	19.77	11.93	18.88	11.93	Barrel Orifice
Pipe Length (ft)		100	1497.8	0.8	16.31	21.14	12.07	18.97	12.07	Barrel Orifice
Entrance Coefficient 'Ke'		1	1497.9	0.9	19.46	22.42	12.22	19.05	12.22	Barrel Orifice
Mannings 'n-value'		0.009	1498.0	1.0	22.80	23.64	12.36	19.13	12.36	Barrel Orifice
Elbow Elev (if None, Leave 'BLANK')			1498.1	1.1	26.30	24.79	12.50	19.21	12.50	Barrel Orifice
Length of Outlet ('BLANK' if none)			1498.2	1.2	29.97	25.89	12.64	19.29	12.64	Barrel Orifice
Outlet Type	Cantilever		1498.3	1.3	33.79	26.95	12.78	19.37	12.78	Barrel Orifice
Outlet Elevation (ft)		1485.5	1498.4	1.4	37.76	27.97	12.91	19.45	12.91	Barrel Orifice
Tailwater Elev (if unknown, leave 'Blank')			1498.5	1.5	41.88	28.95	13.05	19.53	13.05	Barrel Orifice
Auxiliary Spillway Elev (ft)		1499.2	1498.6	1.6	46.14	29.90	13.18	19.61	13.18	Barrel Orifice
Maximum Headwater Elev (ft)		1502	1498.7	1.7	50.53	30.82	13.31	19.69	13.31	Barrel Orifice
Elev Increment After Full Pipe Flow		0.5	1498.8	1.8	55.05	31.71	13.44	19.77	13.44	Barrel Orifice
			1498.9	1.9	59.71	32.58	13.57	19.85	13.57	Barrel Orifice
Basic Output			1499.0	2.0	64.48	33.43	13.70	19.93	13.70	Barrel Orifice
Full Pipe Flow - Max. Outflow (cfs):	0.00		1499.1	2.1	69.38	34.25	13.83	20.01	13.83	Barrel Orifice
Full Pipe Flow - Max. Velocity (fps):	0.00		1499.2	2.2	74.39	35.06	13.95	20.08	13.95	Barrel Orifice
Useable Weir Length (Ft):	7.35		1499.3	2.3	79.52	35.84	14.08	20.16	14.08	Barrel Orifice
Riser Area (Sq Ft):	4.91		1499.4	2.4	84.76	36.62	14.20	20.24	14.20	Barrel Orifice
Barrel Area (Sq Ft):	1.23		1499.5	2.5	90.11	37.37	14.32	20.31	14.32	Barrel Orifice
Kp:	0.011138		1499.6	2.6	95.57	38.11	14.44	20.39	14.44	Barrel Orifice
Friction Slope (HW at the A.S. Crest):	0.04632		1499.7	2.7	101.14	38.84	14.56	20.47	14.56	Barrel Orifice
Pipe Slope:	0.07521		1499.8	2.8	106.81	39.55	14.68	20.54	14.68	Barrel Orifice
Outlet Elbow Angle (deg):	0.0		1499.9	2.9	112.59	40.25	14.80	20.62	14.80	Barrel Orifice
Maximum Barrel Invert Elevation for avoiding Barrel Orifice Control:	1486.88		1500.0	3.0	118.46	40.94	14.92	20.69	14.92	Barrel Orifice
Km:	0.00000		1500.1	3.1	124.43	41.61	15.04	20.77	15.04	Barrel Orifice
Tailwater Elev Used For Full Pipe Flow:	1486.25		1500.2	3.2	130.50	42.28	15.15	20.84	15.15	Barrel Orifice
			1500.3	3.3	136.66	42.94	15.27	20.92	15.27	Barrel Orifice
			1500.4	3.4	142.92	43.58	15.38	20.99	15.38	Barrel Orifice
Notes & Warnings			1500.5	3.5	149.27	44.22	15.49	21.07	15.49	Barrel Orifice
NOTE: Pipe slope computed to be greater than friction slope - a 5D riser can eliminate flow problems NOTE: Barrel Orifice control can be eliminated by increasing the riser depth.			1500.6	3.6	155.72	44.85	15.61	21.14	15.61	Barrel Orifice
			1500.7	3.7	162.25	45.46	15.72	21.21	15.72	Barrel Orifice
			1500.8	3.8	168.87	46.07	15.83	21.29	15.83	Barrel Orifice
			1500.9	3.9	175.58	46.68	15.94	21.36	15.94	Barrel Orifice
			1501.0	4.0	182.38	47.27	16.05	21.43	16.05	Barrel Orifice
			1501.1	4.1	189.26	47.86	16.16	21.51	16.16	Barrel Orifice
			1501.2	4.2	196.23	48.44	16.26	21.58	16.26	Barrel Orifice
			1501.3	4.3	203.28	49.01	16.37	21.65	16.37	Barrel Orifice
			1501.4	4.4	210.41	49.58	16.48	21.72	16.48	Barrel Orifice
			1501.5	4.5	217.62	50.14	16.58	21.79	16.58	Barrel Orifice
			1501.6	4.6	224.92	50.69	16.69	21.87	16.69	Barrel Orifice
			1501.7	4.7	232.29	51.24	16.79	21.94	16.79	Barrel Orifice
			1501.8	4.8	239.74	51.78	16.89	22.01	16.89	Barrel Orifice
			1501.9	4.9	247.27	52.32	17.00	22.08	17.00	Barrel Orifice
			1502.0	5.0	254.88	52.85	17.10	22.15	17.10	Barrel Orifice

Project Name: Glenn Mayer

laHoodInlet.xls Ver 1.10

Computed by: A.Roman

Date: 8/14/2009

Checked by: _____

Date: _____

				Outflow, CFS			Structure Outflow, CFS	Controlling Factor
	Elev	HW Ft		Weir	Slug Flow	Full Pipe		
Input Data	1493.0	0.0		0.00	0.00	14.50	0.00	Weir Flow
	1493.1	0.1		0.11	0.00	14.61	0.11	Weir Flow
	1493.2	0.2		0.22	0.00	14.71	0.22	Weir Flow
	1493.3	0.3		0.38	0.00	14.82	0.38	Weir Flow
Principal Spillway Crest Elev (ft)	1493							
	1493.4	0.4		0.59	0.00	14.92	0.59	Weir Flow
	1493.5	0.5		0.80	0.00	15.03	0.80	Weir Flow
Inside Wall - Type	Smooth							
	1493.6	0.6		1.07	0.00	15.13	1.07	Weir Flow
Pipe Diameter (in)	15							
	1493.7	0.7		1.38	0.00	15.23	1.38	Weir Flow
Pipe Length (ft)	100							
	1493.8	0.8		1.77	0.00	15.33	1.77	Weir Flow
Entrance Coefficient 'Ke'	1							
	1493.9	0.9		2.25	0.00	15.44	2.25	Weir Flow
Mannings 'n-value'	0.009							
	1494.0	1.0		2.73	0.00	15.54	2.73	Weir Flow
Elbow Elev (if None, Leave 'BLANK')								
	1494.1	1.1		3.17	0.00	15.64	3.17	Weir Flow
Length of Outlet ('BLANK' if none)								
	1494.2	1.2		3.62	0.00	15.74	3.62	Weir Flow
Outlet Type	Cantilever							
	1494.3	1.3		4.05	0.00	15.83	4.05	Weir Flow
Outlet Elevation (ft)	1485.5							
	1494.4	1.4		4.47	4.89	15.93	4.89	Slug Flow
Tailwater Elev (if unknown, leave 'Blank')								
	1494.5	1.5		4.89	10.48	16.03	10.48	Slug Flow
Auxiliary Spillway Elev (ft)	1499.2							
	1494.6	1.6		5.24	16.07	16.13	16.07	Slug Flow
Maximum Headwater Elev (ft)	1502							
	1494.7	1.7		5.59	21.66	16.22	16.22	Full Pipe Flow
Elev Increment After Full Pipe Flow	0.5							
	1495.0	2.0		6.64	38.43	16.51	16.51	Full Pipe Flow
	1495.5	2.5				16.97	16.97	Full Pipe Flow
	1496.0	3.0				17.43	17.43	Full Pipe Flow
Basic Output								
Full Pipe Flow - Max. Outflow (cfs):	22.15					17.87	17.87	Full Pipe Flow
Full Pipe Flow - Max. Velocity (fps):	18.05					18.30	18.30	Full Pipe Flow
						18.72	18.72	Full Pipe Flow
						19.13	19.13	Full Pipe Flow
						19.53	19.53	Full Pipe Flow
Barrel Area (Sq Ft):	1.23					19.93	19.93	Full Pipe Flow
Kp: 0.011138						20.31	20.31	Full Pipe Flow
Friction Slope (HW at the A.S. Crest):	0.04632					20.69	20.69	Full Pipe Flow
Pipe Slope: 0.07521						21.07	21.07	Full Pipe Flow
Outlet Elbow Angle (deg): 0.0						21.43	21.43	Full Pipe Flow
						21.79	21.79	Full Pipe Flow
						22.15	22.15	Full Pipe Flow
Km: 0.00000								
Tailwater Elev Used For Full Pipe Flow: 1486.25								

Notes & Warnings

DRILLING LOG DOCUMENTATION

Cooperator	Glenn Mayer	County	Buffalo	Date	8/12/09
Practice	378 Pond	Cons. District	Brule-Buffalo	Hole No.	SB#1
Farm	Tract	Field	NE 1/4 Sec 21	T 106	R 69
Investigator	Paulsen, Roman	Hole El.	1488.6	Sampled	auger
		Drilling Location	South of Dam in Draw (Borrow Area)		

[illegible]

Notes:

Location In Section (x)		Agricultural Waste Management Field Handbook, Chapter 10													
		Unified Symbols and Group Names		Table 10D-3 (1161 test results)				Table 10D-2							
				Soil Group	Median K, cm/s	Median K, ft/d	Class	Unified	Perm Group I	Perm Group II	Perm Group III	Perm Group IV	In Perm Group		
		GW = Well graded gravel, gravel-sand mix, few fines	I	7.2x10-4	2.0	CH	N	N	S	U					
		GP = Poorly graded gravel, gravel-sand mix, few fines	I	3.5x10-4	1.0	MH	N	S	U	S					A=Always
		GC = Clayey gravel, gravel-sand-clay mix				CL	N	S	U	S					
		GM = Silty gravel, gravel-sand-silt mix				ML	N	S	U	S	N				N=Never
		SW = Well graded sand, gravelly sand with few fines					N	A	N	N					S=Sometimes
		SP = Poorly graded sand, gravelly sand with few fines													
		SC = Clayey sand, sand-clay mix													U=Usually
		SM = Silty sand, sand-silt mix													
		CL = Lean inorganic clay, low to medium plastic LL < 50													
		CH = Fat inorganic clay, gravelly/sandy/silty clay LL > 50													
		CL-ML = Silty Clay													
		OL = Organic silts and organic silty clays, low plasticity													
		OH = Organic silt/clay, medium to high plasticity													
		ML = Inorganic silt, very fine sand, low plastic LL < 50													
		MH = Inorganic silt, fine sand or silty soils LL > 50													

Location In Section (x)



Z

Cooperator	Glenn Mayer	County	Buffalo	Date	8/12/09
Practice	378 Pond	Cons. District	Brule-Buffalo	Hole No.	SB#2
Farm	Tract	Field	NE 1/4 Sec 21	T 106	R 69
Investigator	Paulsen, Roman	Hole El.	1495.7	Drilling Location	East Side Slope of Dam
		Sampled	auger		
		Soil Name	Promise		

Notes:

[illegible]

Cooperator	Glenn Mayer	County	Buffalo	Date	8/12/09
Practice	378 Pond	Cons. District	Brule-Buffalo	Hole No.	SB#3
Farm	Tract	Field	NE 1/4 Sec 21	T 106	R 69
Investigator	Paulsen, Roman	Hole El.	1493.2	Sampled	auger
		Drilling Location	West Side Slope of Dam		

Notes:

Unified Symbols and Group Names		Agricultural Waste Management Field Handbook, Chapter 10							
		Table 10D-3 (11G1 test results)			Table 10D-2				
		Soil Group	Median K, cm/s	Median K, ft/d	Unified Class	Perm Group			In Perm Group
						I	II	III	IV
GW	= Well graded gravel, gravel-sand mix, few fines	I	7.2x10-4	2.0	CH	N	S	U	
GP	= Poorly graded gravel, gravel-sand mix, few fines	I	3.5x10-4	1.0	MH	N	S	U	A=Always
GC	= Clayey gravel, gravel-sand-clay mix				CL	N	S	U	S
GM	= Silty gravel, gravel-sand-silt mix				ML	N	U	S	N
SW	= Well graded sand, gravelly sand with few fines	II	4.8x10-6	0.014	CL-ML	N	A	N	N
SP	= Poorly graded sand, gravelly sand with few fines	II	1.5x10-6	0.004	GC	N	S	U	S
SC	= Clayey sand, sand-clay mix				GM	S	U	S	S
SM	= Silty sand, sand-silt mix	III	8.8x10-7	0.0025	GW	A	N	N	N
CL	= Lean inorganic clay, low to medium plastic LL < 50	III	2.1x10-7	0.0006	SM	S	S	S	S
CH	= Fat inorganic clay, gravelly/sandy/silty clay LL > 50	IV	4.9x10-7	0.0014	SC	N	N	U	S
CL-ML	= Silty Clay	IV	3.5x10-8	0.0001	SW	A	N	N	N
OL	= Organic silts and organic silty clays, low plasticity				SP	A	N	N	N
OH	= Organic silt/clay, medium to high plasticity				GP	A	N	N	N
ML	= Inorganic silt, very fine sand, low plastic LL < 50								
MH	= Inorganic silt, fine sand or silty soils LL > 50								

Location In Section (x)



Z

RECEIVED

AUG 18 2009

SD-ENG-57
1/07

DOCUMENTATION FOR HAZARD CLASSIFICATION
WATER RIGHTS PROGRAM

Producer: **Glenn Mayer** Name of Site: **Glenn Mayer Pond**
County: **Buffalo**
Field #: Watershed:
Location
1/4 Section: **NE** Section: **21** Township: **109** Range: **69**
Latitude: Longitude:

Dam in Series: **No**
Explain:

Dam and Reservoir Data

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

IV
A
1525.6
na
1543.6
1540.8

Max. Depth of Water within Reservoir

12 Ft.

Storage

Storage Below Principal Spillway
Storage between Principal Spillway and Auxiliary Spillway
Storage between Auxiliary Spillway and Top of Dam
Other
Total Storage to Top of Dam

51.3 Ac.-Ft.
29.9 Ac.-Ft.
33.5 Ac.-Ft.
 Ac.-Ft.
114.7 Ac.-Ft.

Downstream Conditions

1. Valley Conditions Downstream of Structure

Approximate Slope of Channel

Parallel

1%

2. Stream Channel Size

Depth

4 Ft.

Bottom Width

20 Ft.

Top Width

150 Ft.

3. Valley Characteristics

Width

500 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				
Township or County Paved Road, D<2'			☐	☒
Other, Describe:			☐	☒
			☐	☒
Bridges: Describe type and opening size				
			☐	☒
Railroads:				
Major Railroad, Describe:			☐	☒
Buildings and Utilities:				
Farm Building(s)			☐	☒
Public, Industrial or Commercial Buildings			☐	☒
Rel. Import. Utility serving mult. rural users			☐	☒
			☐	☒
Describe:				

Location:

Is Dam located within five miles of urban development?

No

Describe Potential Development:

Located in rural area SW of Gann Valley, SD. Highly unlikely to be developed.

Rational For Determining Hazard Class:

Site is located 8 miles from nearest community. Development in this area is unlikely. Access is through an undeveloped section line. There are no roads between site and Crow Creek.

Method Used for Evaluation of Impact Area

Visual Assessment

Further Evaluation Needed

No

Attached: Breach Routings ☒

Maps ☒

Other supporting documents:

Actual Hazard Class*

A

Final Job Class

VI

Hazard Analysis by:

A. Roman

Date:

8/14/09

Approved by

A. Roman

Date:

8/14/09

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

MAYEROUT

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

Glenn Mayer							
Unnamed							
	IBC	ISH	JNK	IDAM	IPLT	IREC	
	1	0	0	0	1	0	
	HDE	BME	VOL	SA	BW	TFM	QO
C4	1543.6	1525.6	115.	20.5	64.0	16.5	1.
C5	NS= 4	NCS= 4	CMS=.50	DISTTN= 1.00			
	X-S NO.	1					
C6-1	D= .03	FLD=	2.00				
C7-1	HS= 1525.20	BS=	102.	BSS=	0.	CM=	.060
C7-2	HS= 1533.40	BS=	260.	BSS=	0.	CM=	.060
C7-3	HS= 1541.60	BS=	442.	BSS=	0.	CM=	.060
C7-4	HS= 1549.80	BS=	800.	BSS=	0.	CM=	.060
	X-S NO.	2					
C6-2	D= .40	FLD=	2.00				
C7-1	HS= 1518.60	BS=	108.	BSS=	0.	CM=	.060
C7-2	HS= 1525.20	BS=	312.	BSS=	0.	CM=	.060
C7-3	HS= 1533.40	BS=	608.	BSS=	0.	CM=	.060
C7-4	HS= 1541.60	BS=	980.	BSS=	0.	CM=	.060
	X-S NO.	3					
C6-3	D= .90	FLD=	2.00				
C7-1	HS= 1492.40	BS=	120.	BSS=	0.	CM=	.060
C7-2	HS= 1508.80	BS=	205.	BSS=	0.	CM=	.060
C7-3	HS= 1517.00	BS=	430.	BSS=	0.	CM=	.060
C7-4	HS= 1525.20	BS=	665.	BSS=	0.	CM=	.060
	X-S NO.	4					
C6-4	D= 1.30	FLD=	2.00				
C7-1	HS= 1476.00	BS=	10.	BSS=	0.	CM=	.060
C7-2	HS= 1492.40	BS=	202.	BSS=	0.	CM=	.060
C7-3	HS= 1500.60	BS=	1228.	BSS=	0.	CM=	.060
C7-4	HS= 1508.80	BS=	2193.	BSS=	0.	CM=	.060

***** DISTANCE TO PRIMARY POINT OF INTEREST MOVED TO THE CROSS SECTION
 ***** CLOSEST TO THIS LOCATION (MI .90)

THE DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	EARTH
DAM BREACH ELEVATION (HDE)	1543.60 FT
FINAL BREACH ELEVATION (BME)	1525.60 FT
VOLUME OF RESERVOIR (VOL)	115. ACRE-FT
SURFACE AREA OF RESERVOIR (SA)	20.50 ACRES
FINAL BREACH WIDTH (BW)	64.04 FT
TIME OF DAM FAILURE (TFM)	16.49 MINUTES
NON-BREACH FLOW (QO)	1.00 CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)	.90 MILES
DEAD STORAGE EQUIV. MANN. N (CMS)	.50

CROSS SECTION NO. 1
 FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1525.2	1533.4	1541.6	1549.8
----------------	--------	--------	--------	--------

Page 1

		MAYEROUT			
TWIDTHS(FT) (BS)	102.0	260.0	442.0	800.0	
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	
MANNING N (CM)	.060	.060	.060	.060	

CROSS SECTION NO. 2
 REACH LENGTH (D) .40 MI
 FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1518.6	1525.2	1533.4	1541.6
TWIDTHS(FT) (BS)	108.0	312.0	608.0	980.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.060	.060	.060	.060

CROSS SECTION NO. 3
 REACH LENGTH (D) .90 MI
 FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1492.4	1508.8	1517.0	1525.2
TWIDTHS(FT) (BS)	120.0	205.0	430.0	665.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.060	.060	.060	.060

CROSS SECTION NO. 4
 REACH LENGTH (D) 1.30 MI
 FLOOD DEPTH (FLD) 2.00 FT

ELEV.(FT) (HS)	1476.0	1492.4	1500.6	1508.8
TWIDTHS(FT) (BS)	10.0	202.0	1228.0	2193.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.060	.060	.060	.060

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

NAME OF DAM: Glenn Mayer

NAME OF RIVER: Unnamed

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)
*****	*****	*****	*****	*****	*****	*****	*****
.03	9824.	1534.36	9.16	.27	.02	.28	2.00
.40	6819.	1525.22	6.62	.40	.15	.52	2.00
.90	6751.	1499.18	6.78	.45	.21	.57	2.00
1.30	6684.	1487.43	11.43	.51	.24	.65	2.00

ANALYSIS IS COMPLETE

Dam Located in NE 1/4 Sec. 21 T106N R69W

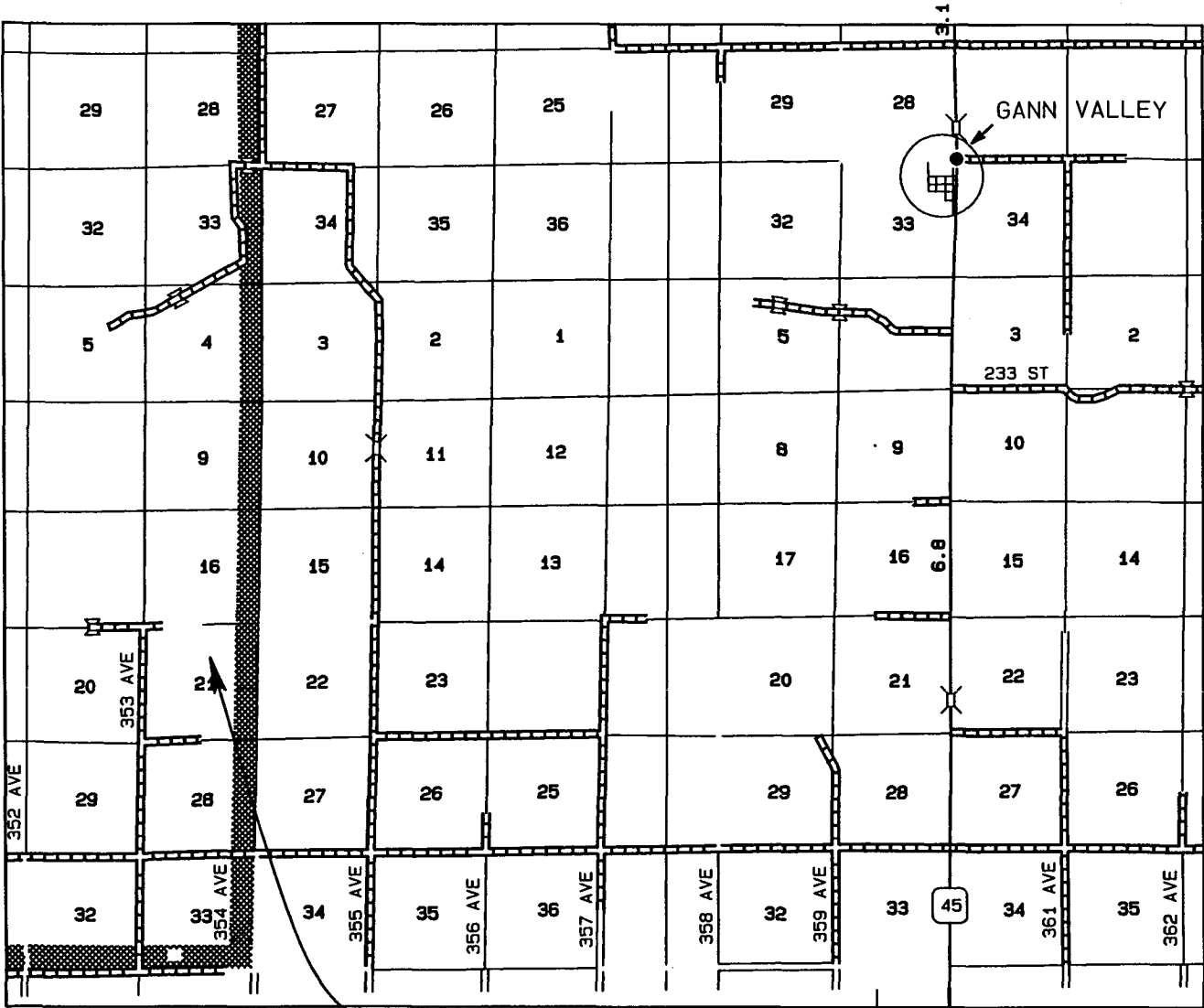


TABLE OF QUANTITIES

Excavation			
Stripping	Cu. Yd.	733	
Core Trench	Cu. Yd.	472	
Spillway	Cu. Yd.	2,052	
Earthfill Class S	Cu. Yd.	9,856	
Topsoil	Sq. Yd.	2,100	
Seeding	Acre	1.4	
30" dia. x 4' deep concrete drop structure	Each	1	
15" dia. PVC SDR 26 min.	LF	94	
Rock Riprap	Cu. Yd.	11	
Geotextile Cloth	Sq. Yd.	31	
Fine Drainfill	Cu. Yd.	9	
Trash Rack	Each	1	
Pipe Outlet Structure	Each	1	

Construction Specifications

Clearing and Grubbing	SD-2
Stripping	SD-4
Excavation	SD-5
Earth Fill, Class S	SD-7
Rock Riprap	SD-61C
Drainfill	SD-24A
Salvaging and Spreading Topsoil	SD-10
Concrete for Minor Structures	SD-12B
Steel Reinforcement	SD-13
PVC Pipe	SD-19
Wood Fabrication and Installation	SD-16
Seeding	SD-28
Geotextile Material Spec	SD-682
Plastic Pipe Material	SD-55

Hydraulic Data

Drainage Area	631 Acres	
Time of Concentration	1.66 Hours	
Runoff Curve Number	83	
Principal Spillway, 2 yr, 24-hr. Rainfall	2.3 Inches	
Emergency Spillway, 25 yr, 24-hr. Rainfall	4.2 Inches	
Principal Spillway Discharge at ES	21.0 CFS	
Emergency Spillway Discharge	247 CFS	
Estimated 25 year Sediment Yield	6.5 AcFt	
Estimated Sediment Yield Below Crest	4.4 AcFt	
Estimated Sediment Yield Above Crest	1.1 AcFt	
Crest of Normal Pool	11.80 Acres	51.3 AcFt
Crest of Emergency Spillway	16.20 Acres	81.2 AcFt
Top of Dam	20.50 Acres	114.7 AcFt

RECEIVED

AUG 18 2009

WATER RIGHTS PROGRAM

Hazard Class A
Job Class IV

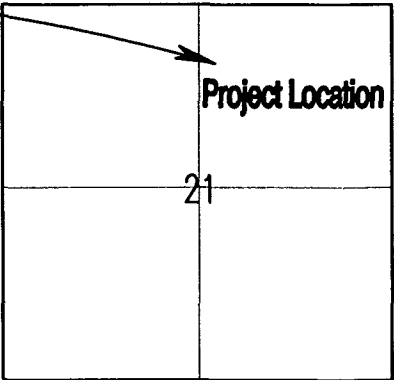
PLAN NOTES:

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

According to State Law, no excavator may begin any excavation without first notifying the One-Call Notification Center of the proposed excavation. 1-800-781-7474

Sheet Index

- 1 Cover
- 2 Plan
- 3 General Layout
- 4 Cross Section of Dam
- 5 Profile of Dam
- 6 Concrete Riser
- 7 Drainage Diaphragm
- 8 Trash Rack
- 9 Timber Pipe Support



Contact Information

Glenn Mayer
606 South Merrill St.
Chamberlain, SD 57325
(605)-730-1281

Date 8/14/2009
Designed A. Roman
Drawn J. Weidemann
Checked J. Weidemann
Approved A. Roman

PRODUCER Glenn Mayer
NE 1/4 SEC. 21 T.106 North R. 69 West
Buffalo COUNTY
Brule-Brule 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:
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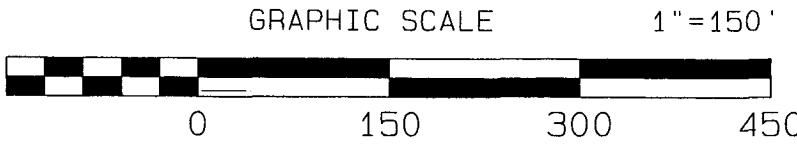
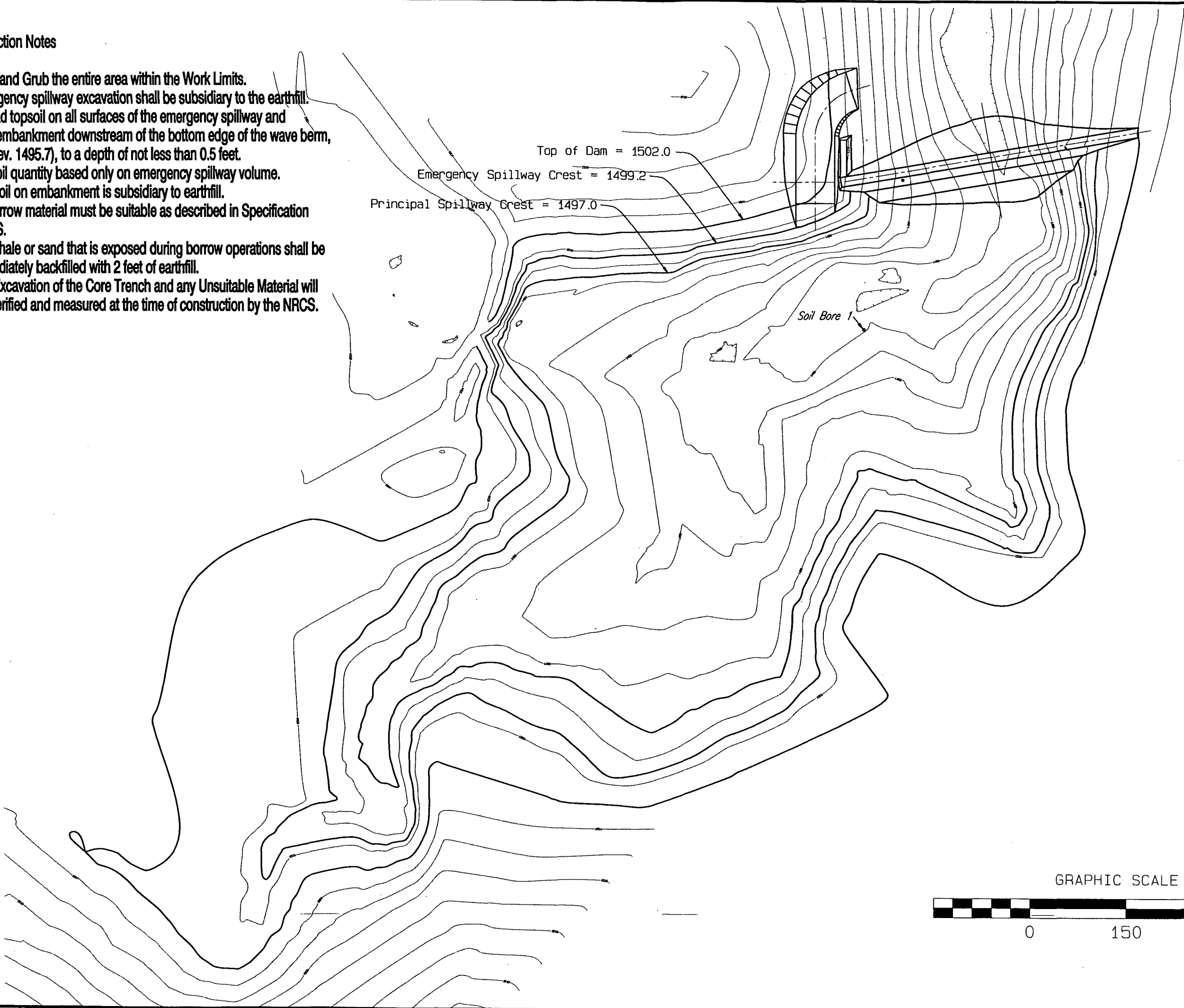
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Sheet 1 of 9

REVISIONS		
DATE	APPROVED	BY

Construction Notes

1. Clear and Grub the entire area within the Work Limits.
2. Emergency spillway excavation shall be subsidiary to the earthfill.
3. Spread topsoil on all surfaces of the emergency spillway and dam embankment downstream of the bottom edge of the wave berm, (@ elev. 1495.7), to a depth of not less than 0.5 feet.
4. Topsoil quantity based only on emergency spillway volume.
Topsoil on embankment is subsidiary to earthfill.
5. All borrow material must be suitable as described in Specification SD-7S.
6. Any shale or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of earthfill.
7. The Excavation of the Core Trench and any Unsuitable Material will be verified and measured at the time of construction by the NRCS.



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Sheet 2 of 9

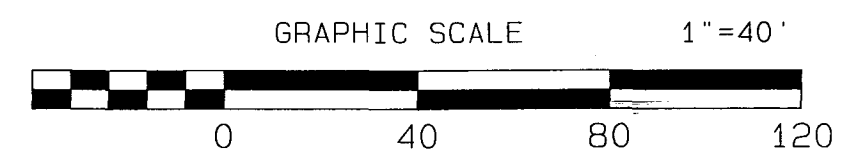
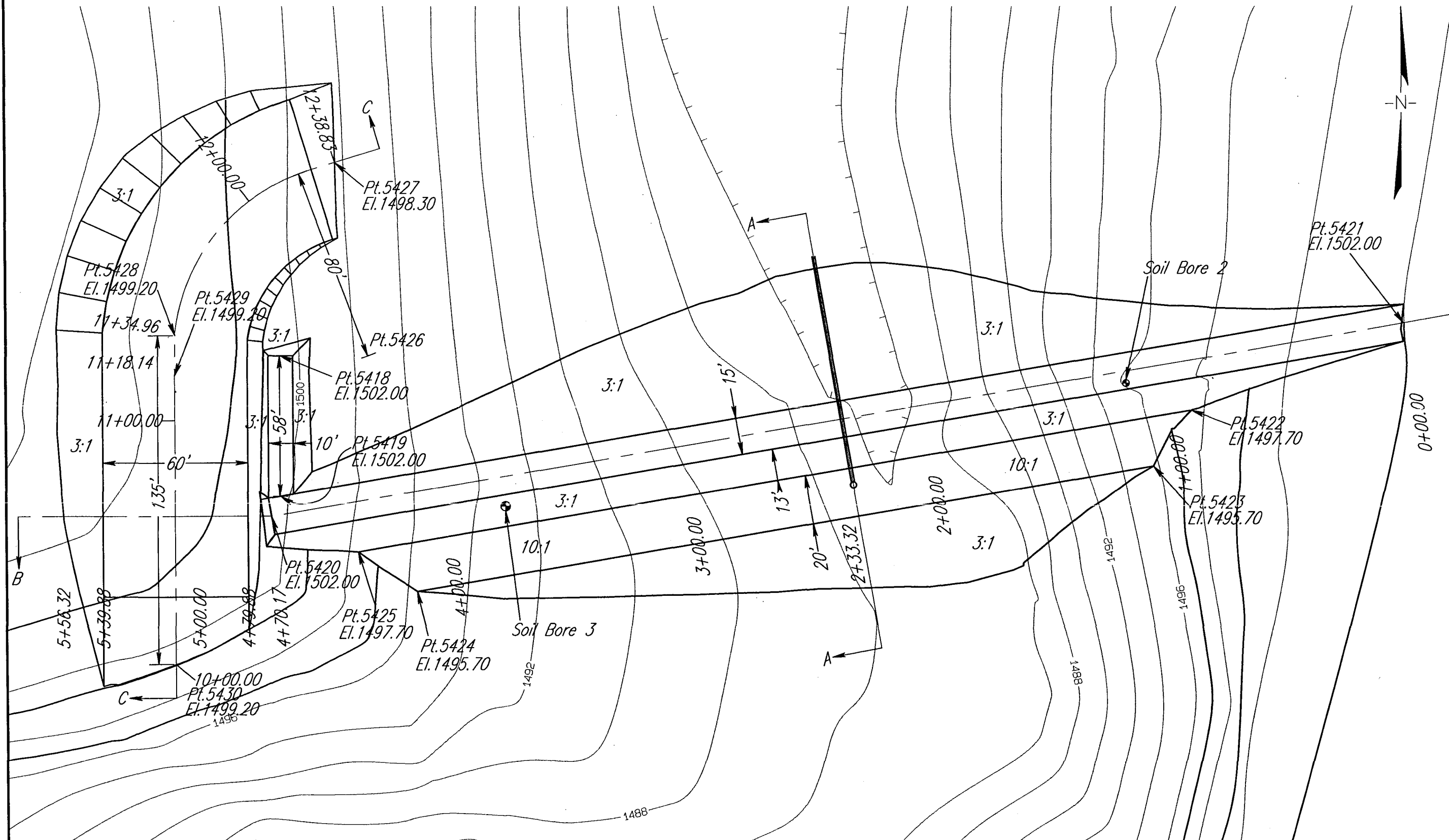


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PIERRE, SOUTH DAKOTA 57501

PRODUCER Glenn Mayer
NE 1/4 SECT. 21 T.106 North R. 69 West
Buffalo COUNTY
Brule-Buffalo CONSERVATION DISTRICT

Date	8/14/2009
Designed	A. Roman
Drawn	J. Weidemann
Checked	J. Roman
Approved	J. Roman



REVISIONS		
DATE	APPROVED	FILE



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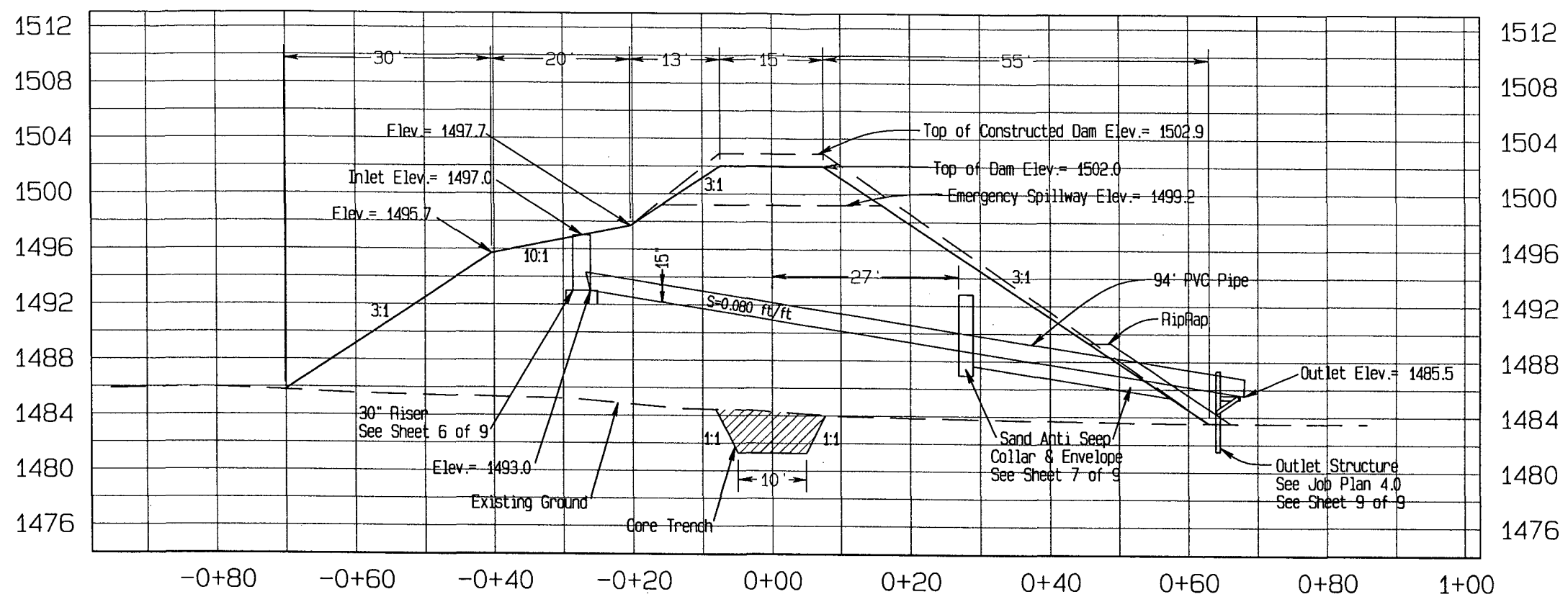
PRODUCER Glenn Mayer
NE 1/4 SECT. 21 T.106 North R. 69 West
Buffalo COUNTY
Brule-Buffalo CONSERVATION DISTRICT

Date 8/14/2009
Designed A. Roman
Drawn J. Weidemann
Checked A. Roman
Approved A. Roman

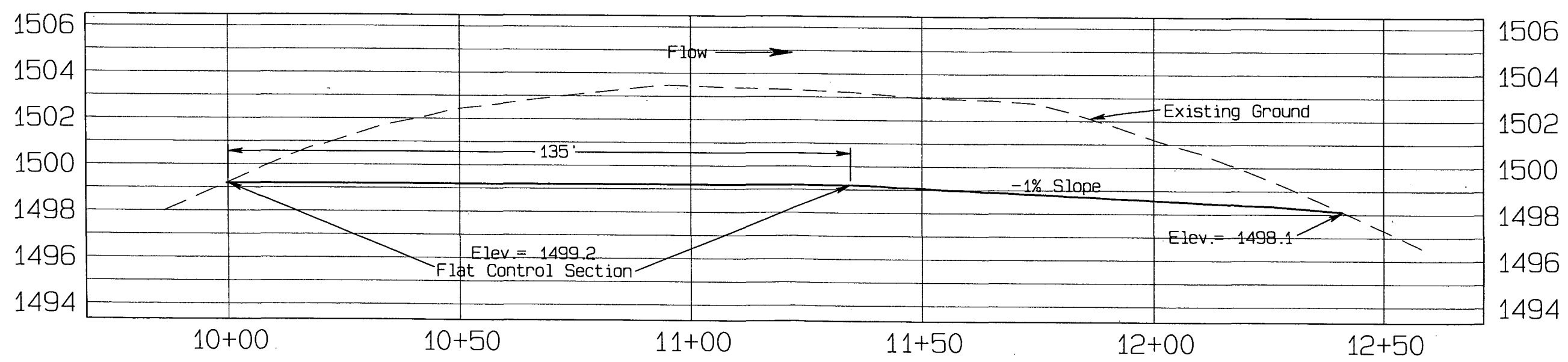
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Sheet 3 of 9



CROSS SECTION OF DAM A-A
 Vertical Scale: 1"=10'; Horizontal Scale: 1"=20'



EMERGENCY SPILLWAY PROFILE SECTION C-C
 Vertical Scale: 1"=5'; Horizontal Scale: 1"=25'

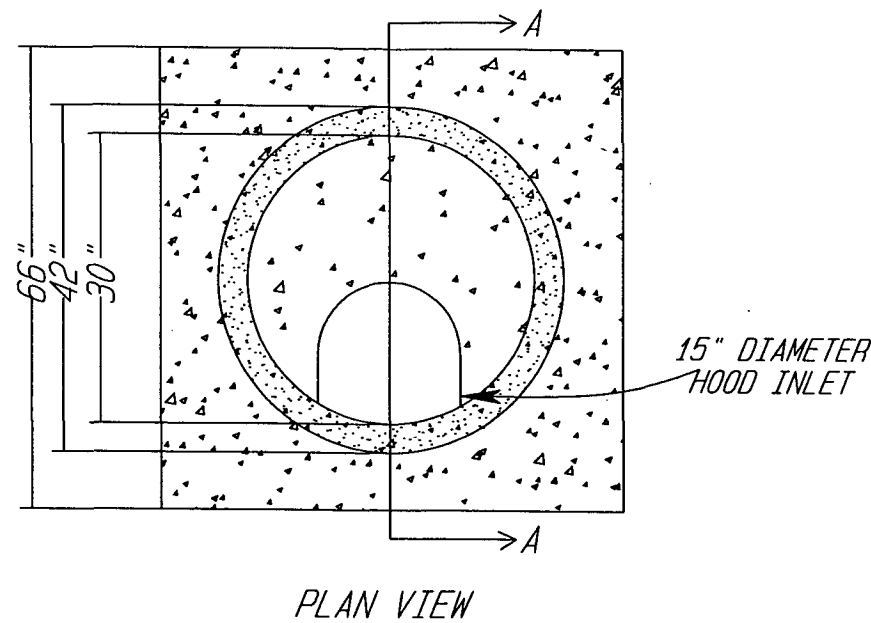
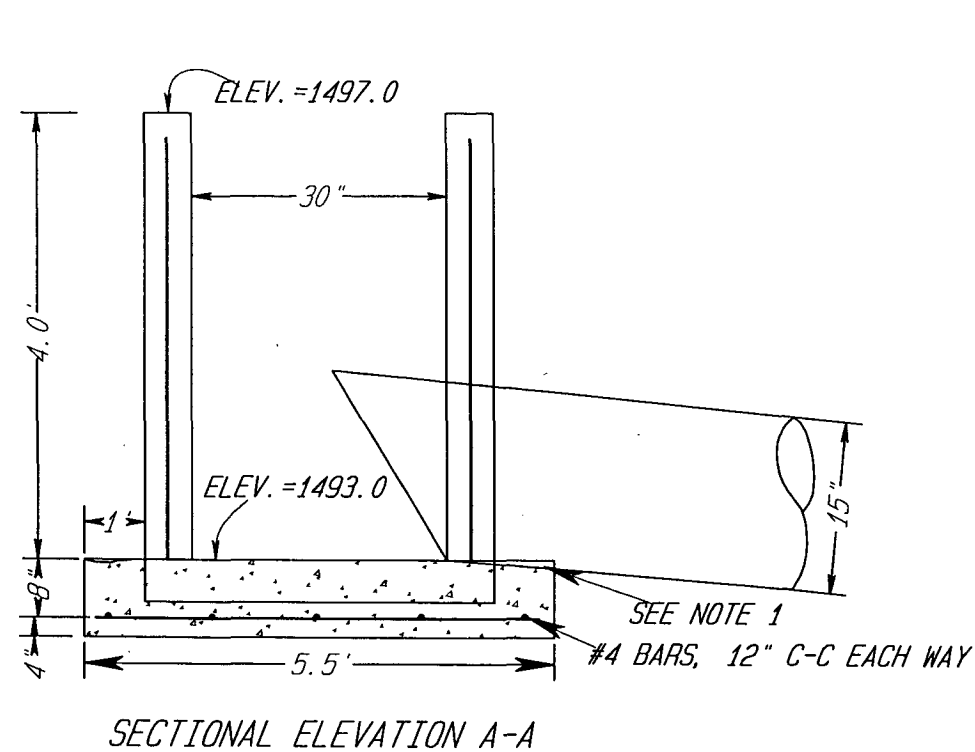
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PRODUCER Glenn Mayer
NE 1/4 SECT. 21 T. 106 North R. 69 West
 Buffalo COUNTY
 Brule-Brule CONSERVATION DISTRICT

Date 8/14/2009
Designed A. Roman
Drawn J. Weidemann
Checked J. Roman
Approved J. Roman

File Name: 8/14/2009 11:46AM
 Drawing No. 4 of 9



- Note 1) BOTTOM OF PIPE NEEDS TO BE EMBEDDED IN CONCRETE FLOOR TO ACHIEVE DESIGN INVERT ELEVATION SO RISER WILL DRAIN
- Note 2) CONCRETE AROUND PIPE NEEDS TO BE VIBRATED TO INSURE A GOOD SEAL AROUND PIPE.
- Note 3) DROP STRUCTURE TO BE PRECAST REINFORCED CONCRETE.
- Note 4) BASE FOR CONCRETE RISER WILL REQUIRE 1.2 CY CONCRETE.

Coordinate Table				
Pt #	Northing	Easting	Elevation	Descriptor
1149	10634.3630	10101.0530	1496.42	bm2
base1	10000.0000	10000.0000	1500.00	base

Coordinate Table				
Pt #	Northing	Easting	Elevation	Descriptor
5418	10645.6937	9755.1615	1502.00	0+58 CL End of Berm
5419	10587.9118	9755.1615	1502.00	0+00 C Start of Berm
5420	10579.7079	9751.4789	1502.00	Sta. 4+70.17 CL West End of Dam
5421	10658.8233	10214.9404	1502.00	Sta. 0+00 CL East End of Dam
5422	10623.2173	10127.5916	1497.70	Top of wave berm-east
5423	10600.2958	10112.1721	1495.70	Bottom of wave berm-west
5424	10548.9040	9811.1166	1495.70	Bottom of wave berm-west
5425	10565.0503	9786.8463	1497.70	Top of wave berm-west
5426	10645.6539	9791.4883		Radius Point 80' to CL of Emg
5427	10725.1183	9777.8906	1498.30	Sta. 12+37.06 CL outlet of Emg
5428	10654.0056	9711.9254	1499.20	Sta. 11+33.26 CL Emg
5429	10637.1967	9711.7615	1499.20	Sta. 11+16.45 CL Emg
5430	10519.0761	9711.7789	1499.20	Sta. 10+00 CL Start of Emg

Date 8/14/2009
Designed A. Roman
Drawn J. Weidemann
Checked J. Roman
Approved J. Roman

PRODUCER Glenn Mayer
NE 1/4 SECT. 21 T.106 North R. 69 West
Buffalo COUNTY
Brule-Buffalo CONSERVATION DISTRICT

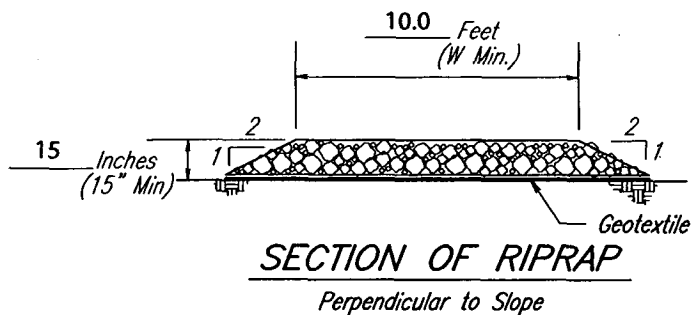
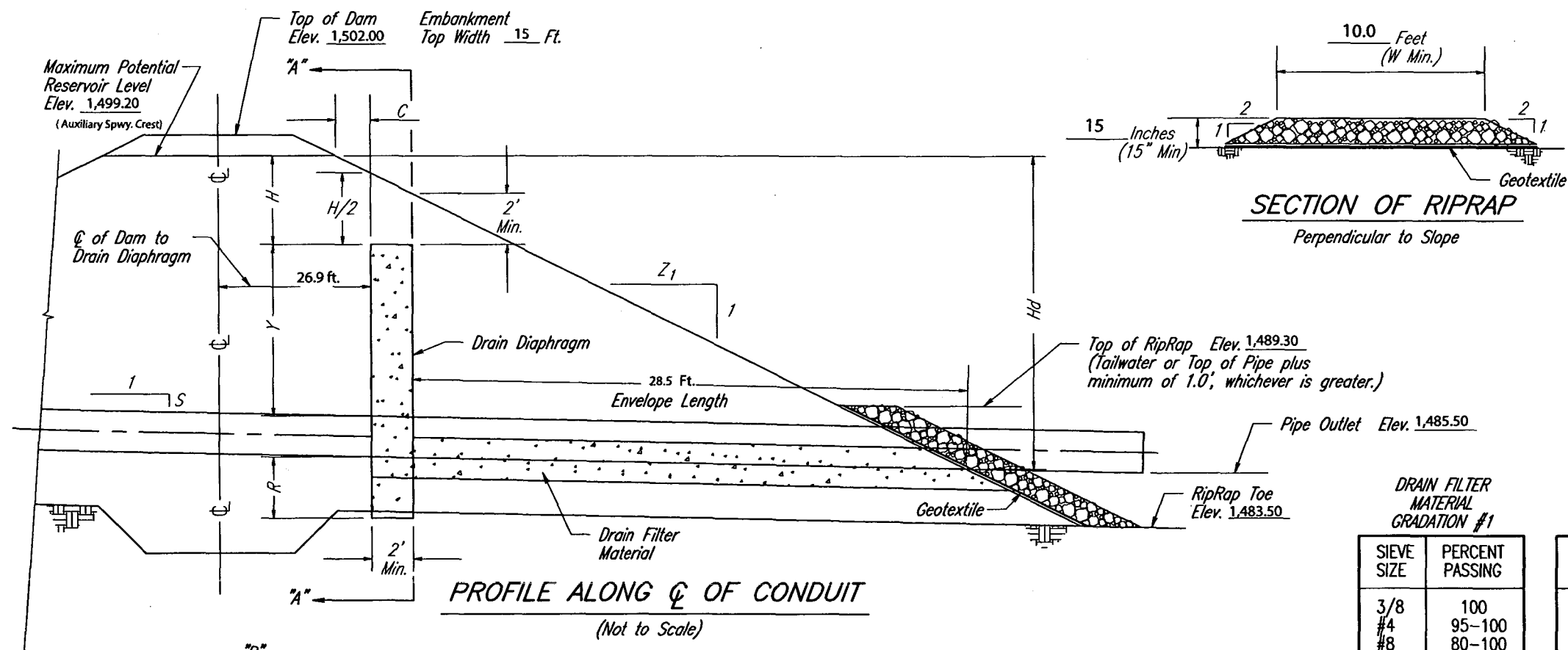
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PIERRE, SOUTH DAKOTA 57501

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DATE	APPROVED	FILE
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Sheet 6 of 9		



*SUMMARY OF DESIGN
AND DIMENSIONS*

DESIGN DATA

H = <u>6.3</u> Feet	Hd = <u>13.45</u> Feet
X = <u>4.0</u> Feet	D = <u>15</u> Inches
R = <u>2.0</u> Feet	Y = <u>4.0</u> Feet
C = _____ Feet	Aggregate Gradation # <u>1</u>
Embankment	
Backslope (Z1) = <u>3</u> Pipe Slope (S) <u>0.0800</u> Ft./Ft.	

DIMENSIONS

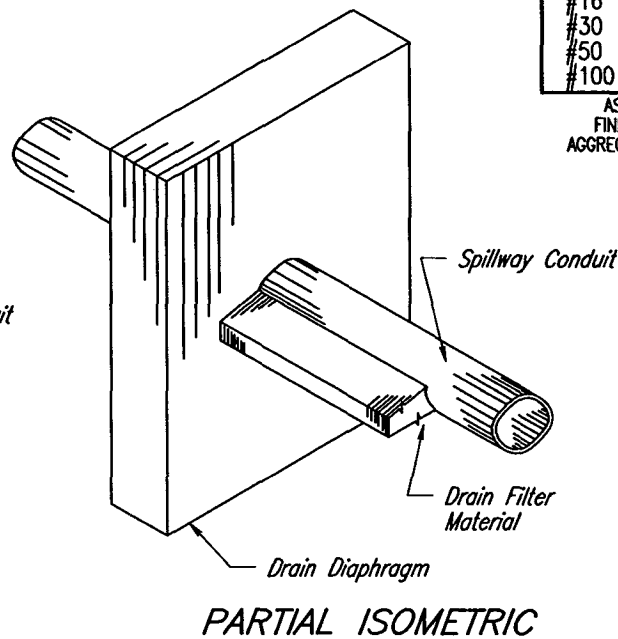
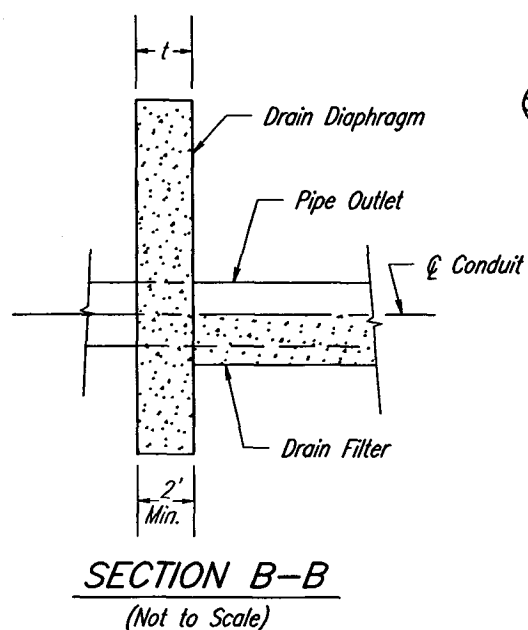
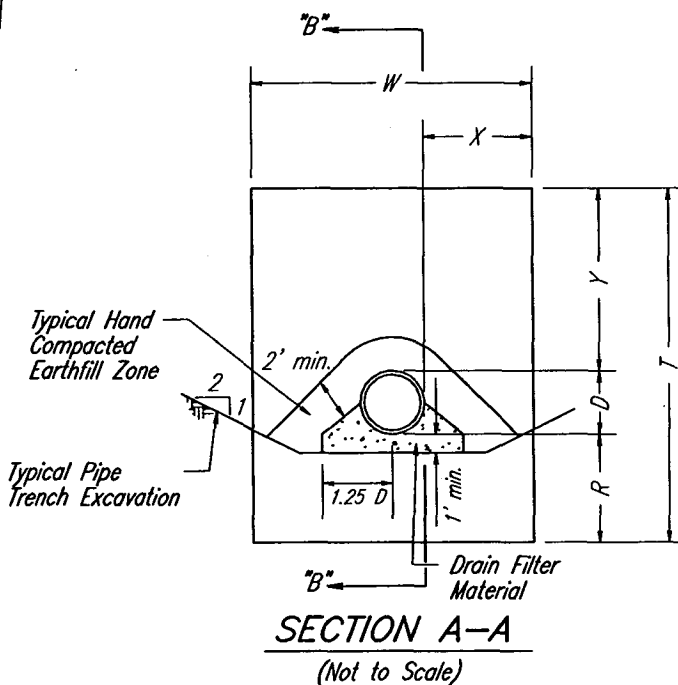
W = <u>9.3</u> Feet	(Total Width of Drain Diaphragm)
T = <u>7.3</u> Feet	(Total Height of Drain Diaphragm)
t = <u>2</u> Feet	(Thickness of Single Filter)

ESTIMATED QUANTITIES		
Drain Filter Material	9.0	Cubic Yards
Geotextile	30.6	Square Yards
Rock Riprap	10.6	Cubic Yards

DRAIN FILTER MATERIAL GRADATION #1	
SIEVE SIZE	PERCENT PASSING
3/8	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	5-30
#100	0-10
ASTM C-33 FINE CONCRETE AGGREGATE GRADATION	

DRAIN FILTER MATERIAL GRADATION #2	
SIEVE SIZE	PERCENT PASSING
#4	100
#8	95-100
#16	70-100
#30	40-75
#50	10-35
#100	2-15
#200	0-5
ASTM C-144 MASONRY MORTAR 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.) No compaction of the Drain Filter Material extending from the Diaphragm to the D.S. embankment face is required beyond that resulting from the placing and spreading operations.
- 2.) The Drainage Diaphragm and envelope will be installed by placing Drain Filter Material in 15 inch thick lifts prior to compaction. 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 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 is necessary.
- 3.) 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.
- 2.) Select Drain Filter Material Gradation #1 for base soils classified as CL and Gradation #2 for base soils classified as CH under the Unified Soil Classification System.

DRAINAGE DIAPHRAGM DETAILS

DEFINITIONS	
D = Outside diameter of circular conduit.	R = 1.5' or 1.0' beyond excavation, not to extend beyond a bedrock surface.
H = Vertical distance between the Top of Diaphragm and the Maximum Potential Reservoir Level.	Hd = Vertical distance from Maximum Potential Reservoir Level to Conduit Invert at D.S. face of Embankment Slope.
X = Use the smaller of 3 X D or 5 feet beyond any excavation made to install conduit.	S = Slope of Conduit in feet of fall per horizontal foot.
Y = Vertical distance from Top of Conduit to Top of Diaphragm	
Y = 3 X D or no higher than Maximum Potential Reservoir Level	
C = Horizontal distance from D.S. face of Embankment at Maximum Potential Reservoir Level to U.S. face of Diaphragm.	
$C = Hd \times Z_1 - \frac{((1.5 \times D) + (Hd / 2))}{(1 / Z_1) - (S / 2)} > 0 \text{ (Maximum)}$	

GUIDE PLAN 3.8 (07/2009)

REVISIONS		
DATE	APPROVED	TITLE
8/14/09	Jay B. Dale	State Conservation Engineer

Designed	A. Roman	8/14/09
Drawn	JRW	8/14/09
Checked	A. Roman	8/14/09
Approved	A. Roman	8/14/09

PRODUCER	Glenn Mayer
SECTION	21
PROJECT	106 N. 69 W.
COUNTY	Buffalo
DISTRICT	Brule-Buffalo 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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Sheet	1 of 1

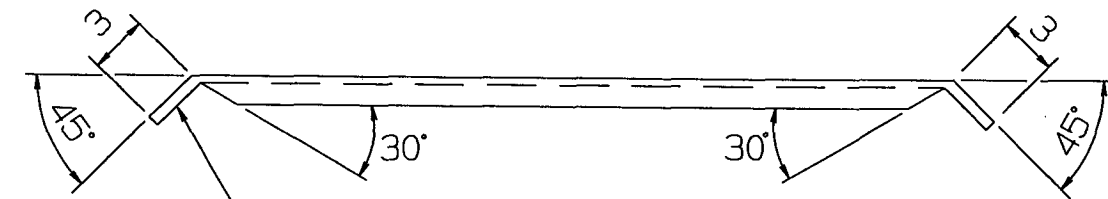
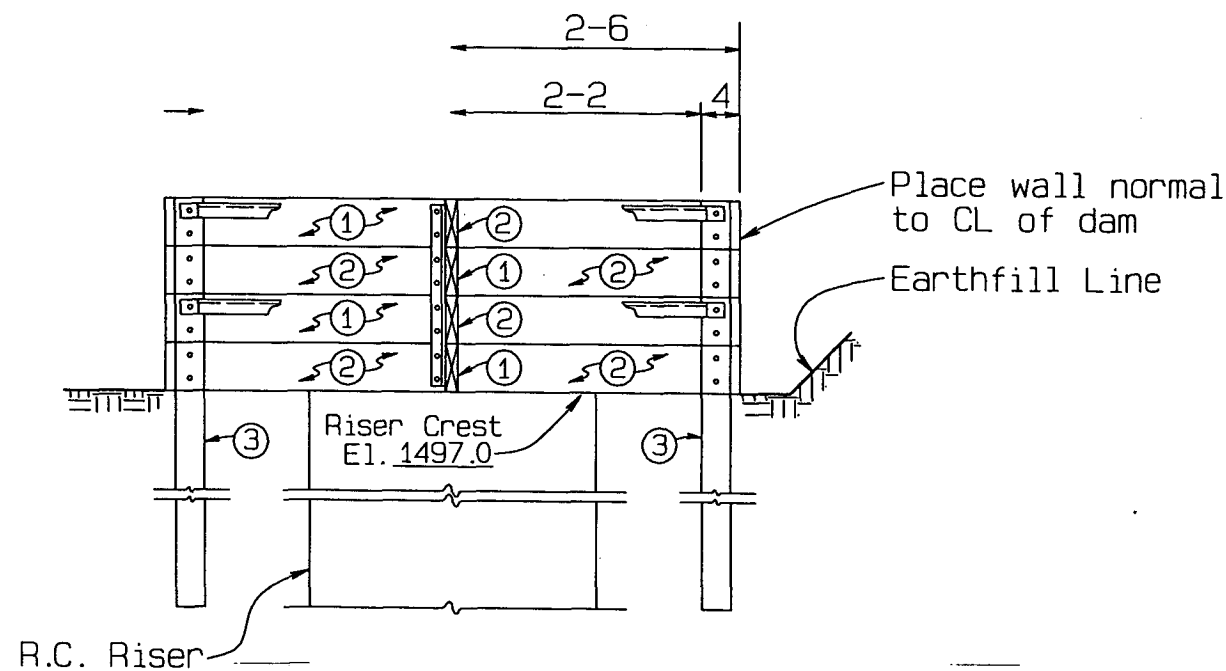
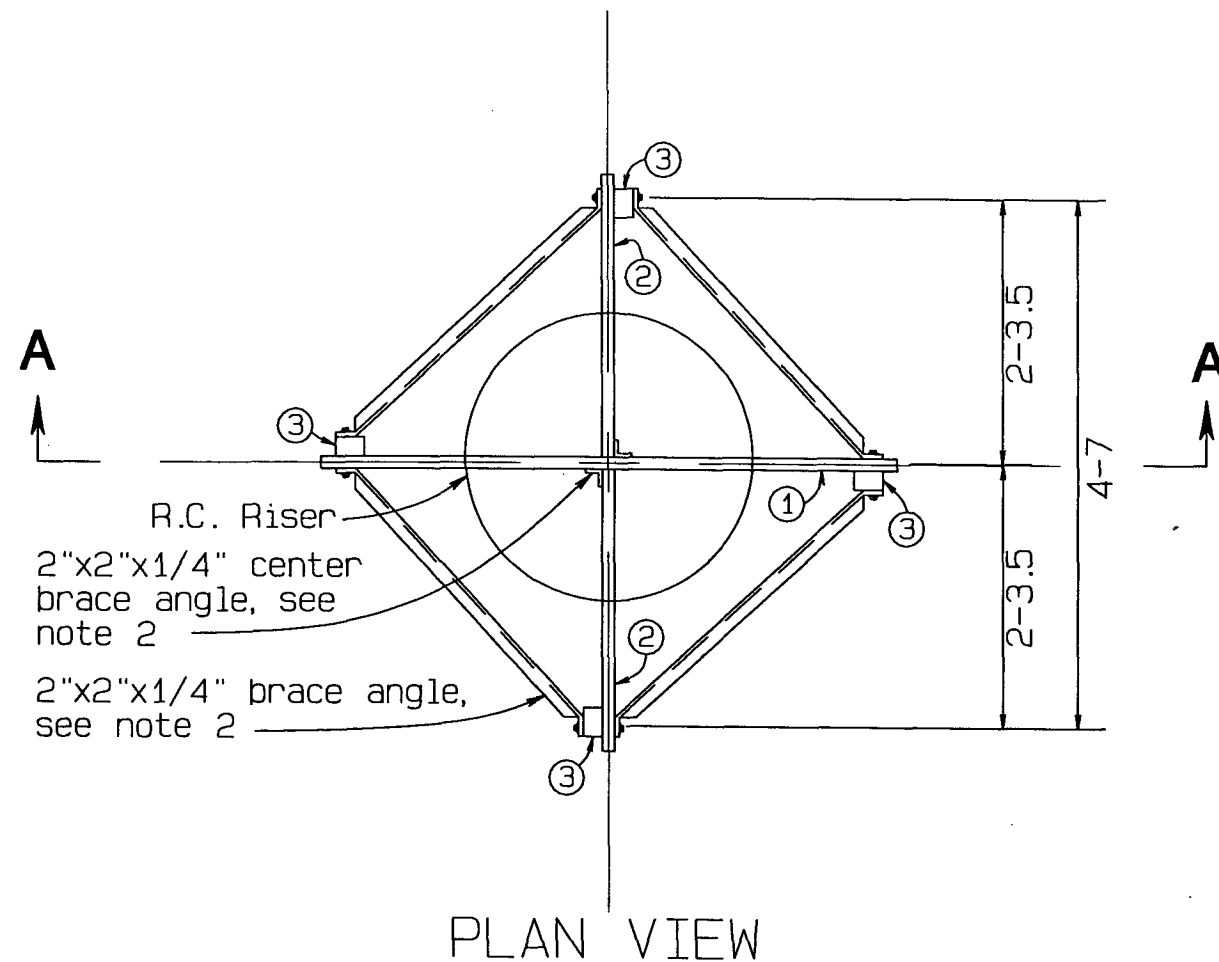


TABLE OF QUANTITIES

ITEM	MARK	NO. REQ'D.
2"x10"x5' Pressure Treated Lumber	1	4
2"x10"x2'-5" Pressure Treated Lumber	2	8
4"x4"x8' Pressure Treated Post	3	4
2"x2"x1/4"x3'-3" Steel Angle		8
2"x2"x1/4"x3'-2" Steel Angle		2
5/8"x8" Steel Bolts, Nuts, 2 Washers		32
1/2"x3" Steel Bolts, Nuts, 2 Washers		32

NOTES:

- To 4" x 4" posts (4 required) bolt 2" x 10" boards using two 5/8" x 8" bolts per 2" x 10" board. Do not place bolts closer than 1 1/2" from edge of board.
- For center brace angles drill 8 - 9/16" holes 5/8" from outer edge of each leg of each angle and centered 5 1/4" apart along the leg.
- Attach brace angles to top bolt on top 2" x 10" board and to top bolt on next to bottom board.

TRASH RACK AND BAFFLE
FOR 30" DIA. RISER

Date 8/14/2009
Designed A. Roman
Drawn J. Weidmann
Checked J. Roman
Approved J. Roman

PRODUCER Glenn Mayer
NE 1/4 SECT. 21 T. 106 North R. 69 West
Buffalo COUNTY
Brule-Buffalo CONSERVATION DISTRICT

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PIERRE, SOUTH DAKOTA 57501

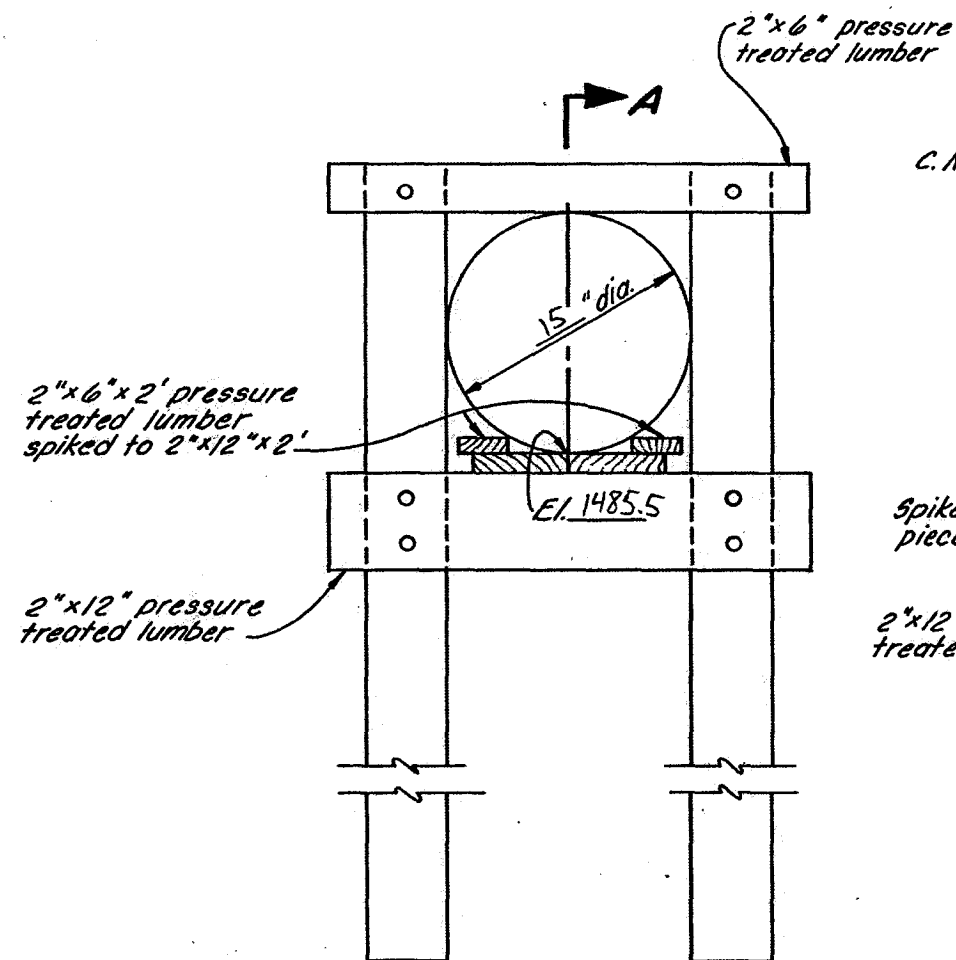
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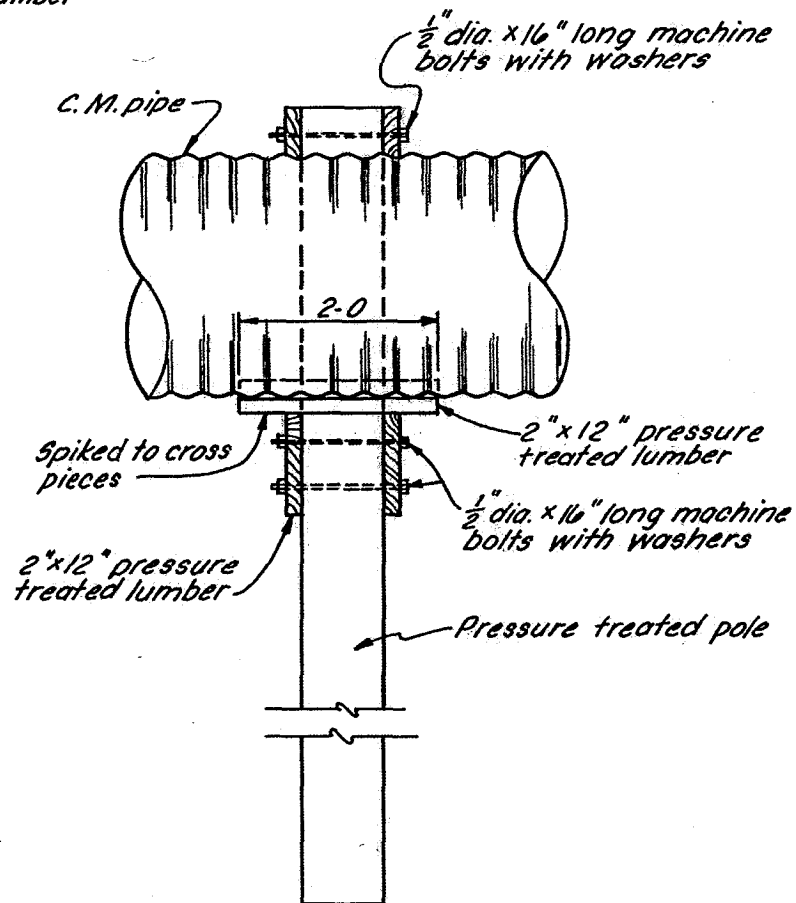
Drawing No.

REVISIONS		
DATE	APPROVED	TITLE
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Sheet 8 of 9



ELEVATION



SECTIONAL ELEVATION A-A

NOTES:

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

TABLE OF QUANTITIES

ITEM	LENGTH FOR 15" DIA. PVC PIPE	UNIT	QUANTITY
PRESSURE TREATED POLE 6" DIA.	8-0	EACH	2
2" X 12" PRESSURE TREATED LUMBER	4-0	EACH	2
2" X 6" PRESSURE TREATED LUMBER	4-0	EACH	2
2" X 12" PRESSURE TREATED LUMBER	2-0	EACH	2
2" X 6" PRESSURE TREATED LUMBER	2-0	EACH	2
1/2" DIA. MACHINE BOLTS WITH NUTS	1-4	EACH	6
1/2" DIA. WASHERS		EACH	12

REFERENCE: GUIDE PLAN NO. 4.0

JOB PLAN NO. 4.0

TIMBER PIPE SUPPORT

OPERATOR: Glenn Mayer

CONSERVATION DISTRICT: Brule-Buffalo

**U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE**

Designed A. Roman Date 8-14-09 Approved by A. Roman
 Drawn J. Weidemann Title AE 8/14/09
 Traced _____
 Checked J. Weidemann 8-14-09
 Sheet No. 9 of 9 Drawing No. _____

5, N-29,073.4a

P&S Review

Water Permit Application No 7157-3
Glenn Mayer

Top of Dam Elev. - 1502
2nd Spillway Elev. - 1499.2
P. Spillway Elev. - 1497
DIS Emb. Toe Elev. - 1483.5

Cat. 3 - Low Hazard Dam

Ht. = 18.5 ft

Normal Storage Capacity - 51.3 Ac-Ft
Int. Storage Capacity - 81.2
Max. Storage Capacity - 114.7

Int Capacity x Efl. Ht. = $81.2 \times 15.5 = 1259 < 3000 \therefore 25\text{yr}$
Minimum Spillway Capacity

From USGS WRI 98-4055 "Tech for Est Peak Flows ... in SD"
Region 13 DA = 631 Ac = 0.99 mi.² P_{II} = 0.85

$$\begin{aligned} Q_{25} &= 148 CA^{.584} P_{II}^{.730} \\ &= 148 (0.99)^{.584} (0.85)^{.730} \\ &= 148 (.9941) (.8881) \\ &= \underline{130 \text{ cfs}} \end{aligned}$$

$$\begin{aligned} Q_{100} &= 275 CA^{.625} P_{II}^{.742} \\ &= 275 (0.99)^{.625} (0.85)^{.742} \\ &= 275 (.9937) (.8864) \\ &= \underline{242 \text{ cfs}} \end{aligned}$$

Secondary Spillway Capacity

$$\begin{aligned} Q &= C L H^{3/2} \quad C = 2.6 \\ &= 2.6 (60) (2.8)^{1.5} \quad L = 60 \quad H = 2.8 \\ &= \underline{730 \text{ cfs}} \end{aligned}$$

NRCS Annual Yield
DA = 631 Ac - CN = 83 ISO = 2

Section 74:02:08:09

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

$$\begin{aligned} 80\% \text{ chance} &= 0.4 \\ 0.4 \times 63^{1/2} &= \underline{21 \text{ Ac-Ft}} \end{aligned}$$

$$\begin{aligned} 50\% \text{ chance} &= 1.1 \\ 1.1 \times 63^{1/2} &= \underline{58 \text{ Ac-Ft}} \end{aligned}$$

$$\begin{aligned} 10\% \text{ chance} &= 3.7 \\ 3.7 \times 63^{1/2} &= \underline{195 \text{ Ac-Ft.}} \end{aligned}$$



**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 27, 2009

Glenn Mayer
606 S. Merrill St.
Chamberlain, SD 57325

Dear Mr. Mayer:

We have reviewed the plans and specifications for your dam project located in the NW ¼ NE ¼ of Sec. 21-T106N-R69W, in Buffalo County. The plans and specifications for your dam are approved. Approval of the plans and specifications does not authorize construction of the dam. The construction of the dam may not begin until Water Permit No. 7157-3 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 Mayer Dam will be classified as a small size Category 3, Low Hazard dam with a dam height of 18.5 feet and a normal storage capacity of 51.3 acre-feet and a maximum storage capacity of 115 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. 7157-3, Glenn Mayer**

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. 7157-3, Glenn Mayer, 606 S. Merrill Street, Chamberlain SD 57325.

The Chief Engineer is recommending APPROVAL of Application No. 7157-3 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. 7157-3 authorizes a dam with a storage capacity of 51.3 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 27, 2009

REPORT ON
WATER PERMIT APPLICATION No. 7157-3
Glenn Mayer
August 24, 2009

Water Permit Application No. 7157-3 has been filed by Glenn Mayer to impound 51.3 acre-feet of water from runoff by constructing a dam located in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 21-T106N-R69W, in Buffalo 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 production 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. 7157-3 is approved.

The dam will be 18.5 feet high with a normal storage capacity of 51.3 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 115 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.

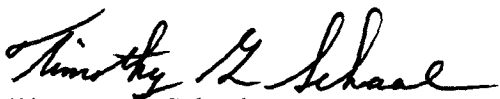
The dam has a drainage area of 631 acres or 0.99 square miles. The dam is designed to have a 30 inch diameter PVC riser with a 15 inch diameter PVC barrel with 5.0 feet of freeboard as the primary spillway, and a 60 foot wide earthcut secondary spillway with 2.8 feet of freeboard. A 25 year frequency event produces a peak runoff of approximately 130 cfs and a 100 year frequency event produces a peak runoff of approximately 242 cfs. The earthcut spillway will have a capacity of approximately 730 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 21 acre-feet. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 58 acre-feet and the annual yield with a 10 percent chance, or 1 out of 10 years, is expected to be 195 acre-feet.

The Mayer Dam will be located in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 21-T106N-R69W on an unnamed tributary to Crow Creek, about one mile upstream of the confluence of the unnamed tributary and Crow Creek. There are no existing Water Permits/Rights filed on the unnamed tributary between the proposed dam and Crow Creek.

Conclusions:

1. Water Permit Application No. 7157-3 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. 7157-3.



Timothy G. Schaal, P.E.

Natural Resources Engineering Specialist

AFFIDAVIT OF PUBLICATION

State of South Dakota

ss

County of Brule

Debi Ruiz of said county, being, first duly sworn, on oath, says: That she is the publisher of *Central Dakota Times*, a weekly newspaper, published in the City of Chamberlain, in said County of Brule, and State of South Dakota; that she has full and personal knowledge of the facts herein stated; that said newspaper is a legal newspaper as defined in SDCL 17-2-2.1 through 17-2-2.4 inclusive; that said newspaper has been published within the said County of Brule and State of South Dakota, for at least one year next prior* to the first publication of the attached public notice, and that the Notice of Application

No. 7157-3 To Appropriate
Water

a printed copy of which, taken from the paper in which the same was published, and which is hereto attached and made a part of this affidavit, was published in said newspaper for two successive week(s) to wit:

Sept 2, 2009; Sept 9, 2009;
_____, 20____; _____, 20____;
_____, 20____; _____, 20____;

That the full amount of the fee charged for the publication of the attached public notice inures to the sole benefit of the publisher or publishers; that no agreement or understanding for the division thereof has been made with any other person, and that no part thereof has been agreed to be paid to any person whomsoever; that the fees charged for the publication thereof are:

\$39.51

Signed: Debi Ruiz

Subscribed and sworn to before me this 10th day
of September, 2009.

Janet L. Petrak
Notary Public in and for the County of Brule,
South Dakota



My commission expires June 5, 2010.

RECEIVED

SEP 11 2009

WATER RIGHTS
PROGRAM

NOTICE OF APPLICATION NO. 7157-3 TO APPROPRIATE WATER

Notice is hereby given that Glenn Mayer, 606 South Merrill Street, Chamberlain, SD 57325, has filed an application for a water permit to impound 51.3 acre-feet of water from runoff by constructing a dam located in the NW1/4NE1/4 Section 21 with water impounded in the W1/2NE1/4, E1/2NW1/4 Section 21; all in T106N-R69W. This application requests impoundment of sufficient water to maintain water to the outlet elevation. The water is for fish and wildlife propagation and livestock watering purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 7157-3 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 East 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 Sept. 21, 2009.

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, September 2, 2009, and September 9, 2009, at the total approximate cost of \$39.51.)

(September 2/September 9)



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 27, 2009

Central Dakota Times
PO Box 125
Chamberlain SD 57325

ATTENTION: Legal Public Notice

Enclosed is a Notice on Application No. 7157-3 to Appropriate Water to be published twice. Please publish the first notice on September 2, 2009 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 Glenn Mayer, 606 S Merrill St., Chamberlain SD 57325. (Ph # 605-730-1281).

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. 7157-3

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

Date _____

We are in receipt of your letter of August 27, 2009 enclosing Notice to Appropriate Water by Application No. 7157-3 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 27, 2009

Glenn Mayer
606 S Merrill St
Chamberlain SD 57325

Dear Mr. Mayer:

Water Permit Application No. 7157-3 for fish and wildlife and livestock water use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Publisher of the Central Dakota Times printed at Chamberlain SD (Ph # 605-234-0266). You will need to contact the newspaper and authorize publication of this notice. For your information, a copy of the notice, the recommendations of the Chief Engineer and reports on the applications are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

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

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

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 September 2, 2009 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. 7157-3 to Appropriate Water

Notice is given that Glenn Mayer, 606 S Merrill St, Chamberlain SD 57325 has filed an application for a water permit to impound 51.3 acre-feet of water from runoff by constructing a dam located in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 21 with water impounded in the W $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$ Section 21; all in T106N-R69W. 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. 7157-3 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 21, 2009.

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 _____.



**DEPARTMENT of ENVIRONMENT
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SEP 24 2009

Glenn Mayer
606 S Merrill St
Chamberlain SD 57325

Dear Mr. Mayer:

Enclosed is Water Permit No. 7157-3 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

Permit No. 7157-3
Missouri River - Water District

Contact Person & Address: **Glenn Mayer, 606 S Merrill St, Chamberlain SD** **605-730-1281**

Report Of Examination Of Works

On, **May 18, 2015**, I made a thorough examination of the water use system constructed by **Glenn Mayer** holder of Permit No. **7157-3**, bearing the priority of **August 18, 2009** authorizing the storage of **51.3 acre feet** of the waters of **surface runoff** for **fish and wildlife and livestock water** purposes, in **Buffalo** County.

The system is in the following condition **good**. The point of diversion is located **from the NE corner of Sec 21 T106N-R69W; 940 ft S & 2190 ft W** with latitude of **43.97467688** and a longitude of **-99.11564047** as determined using **GPS**. The works are capable of storing **51.3 acre feet** which is to be used for **fish and wildlife and livestock water**. Water has been put to beneficial use and the license should be issued for **51.3 acre feet**.

Review of Permit Qualifications And Regulations:

- 1) Special qualifications to permit being abided by **yes**
- 2) All structures, wells and lands on map **yes**
- 3) Exceptions to compliance are: **none**

Report On the Specifics of the System

DAM INFORMATION:

- | | |
|---|---|
| 1) Height to crest <u>19</u> feet | 2) Height to primary spillway <u>13</u> feet |
| 3) Height to secondary spillway <u>15</u> ft | 4) Crest width <u>15</u> feet |
| 5) Crest length <u>450</u> feet | 6) Spillway length <u>215</u> feet |
| 7) Spillway width <u>60</u> feet | 8) Approx. storage <u>51.3</u> ac-ft |
| 9) Approx. storage to crest <u>115</u> ac-ft | 10) Date constructed: <u>2011</u> |
| 11) Outlet tubes: | |
| a) diameter <u>15</u> inches | b) type <u>PVC</u> |
| c) valved <u>no</u> | d) valve type <u>NA</u> |
| e) location on structure <u>Eastern 1/3</u> | |
| 12) Category of Dam <u>3</u> | 13) Inspection Sheet Completed <u>no</u> |

Comments : #

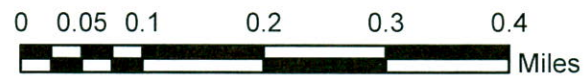


Mark D. Rath
Natural Resources Engineer III
DENR, Water Rights Program

7-6-15

Date

7157-3



Mark D Rath
Natural Resource Engineer
May 20, 2015



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

AUG 27 2015

7157-3

Glenn Mayer
606 S Merrill St
Chamberlain SD 57325

Dear Mr. Mayer:

Enclosed is Water License No. 7157-3. This is the final water right document completing your process of obtaining a Water Right. Included with your license is a map prepared by the staff engineer who conducted the field investigation.

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

Sincerely,

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

enclosures

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 7157-3

(1) Glenn Mayer, 606 S Merrill St., Chamberlain SD 57325 made Application No. 7157-3, August 18, 2009 for a water permit to impound 51.3 acre feet of water from runoff, Buffalo County, South Dakota for fish and wildlife propagation and livestock watering purposes. Permit No. 7157-3, with a priority date of August 18, 2009 was approved September 21, 2009 and issued to the applicant for impoundment of water with construction of the described storage dam to be completed on or before September 21, 2014 and for the application to beneficial use of said water on or before September 21, 2018.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to construction of the storage dam and is entitled to impound 51.3 acre feet of water for beneficial use.

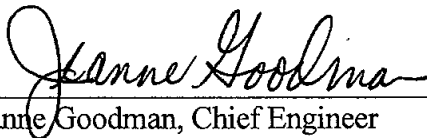
The storage dam is located (spillway): 940 feet south and 2,190 feet west of the NE corner of Section 21, T106N, R69W (NW ¼ NE ¼).

(3) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use.

(4) Pursuant to South Dakota Water Law 46-5-30.1 Glenn Mayer, 606 S Merrill St., Chamberlain SD 57325 the holder and/or owner of Water Right No. 7157-3 is issued a license to appropriate water, the right to impound 51.3 acre feet of water from runoff with a priority date of August 18, 2009 from the location specified in (2) of this license for fish and wildlife propagation and livestock watering purposes.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 7157-3 and subject to the following qualifications:

- Water Permit No. 7157-3 authorizes a dam with a storage capacity of 51.3 acre feet of water and sufficient water annually to maintain the water level to the outlet elevation.
- Low flows as needed for downstream domestic use, including livestock water and prior water rights must be bypassed.



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

AUG 27 2015

date





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

7157-3
7157A-3

DEC 08 2016

Glenn Mayer
606 S Merrill St
Chamberlain SD 57325

Dear Mr. Mayer:

Enclosed are Water Permit and Water License No. 7157A-3. The permit authorizes the addition of recreational use which was not covered under Water Right No. 7157-3. This water license incorporates the two permits together under one document to reflect all the beneficial uses.

The application was submitted with a fee of \$700.00. The application /license fee for Permit No. 7157A-3 is \$300.00. Therefore, \$400.00 will be refunded to you. The refund check should be received within a couple of weeks.

As long as you use the water beneficially, as stated in the Water License, the State Water Laws provide that you have a continuing right to use the water. If you have any questions, please contact our office.

Sincerely,

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

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