Attachment 6

DRAFT

2017

Bridge Improvement Grant (BIG) Procedure

South Dakota

Department of Transportation

Office of Local Government Assistance

9/22/16

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I. Objective:

In 2015, the South Dakota Legislature created the Bridge Improvement Grant (BIG) fund that provides $7 million for local government bridges derived from an increase in license plate fees. In addition, the DOT adds $2 million in state funds, for a total of $9 million annually available in the bridge grant program until 2019 when DOT will add another $6 million annually. The objective of these procedures is to define how these bridge projects will be prioritized and selected and these funds obligated to Local Public Agencies (LPAs) for highway bridge preservation, replacement, or rehabilitation projects on both federal aid On-System and Off-System routes. Funding for this program is not intended to be used for expansion of infrastructure with creation of new routes on new alignments.

II. Definitions

ADT - Value of average daily traffic contained in the National Bridge Inventory (NBI Item 29).

Bid Ready – All plan design, review, certifications, and permits are completed and submitted with application. Project is ready for bid letting following award of BIG funding. For projects to be let by DOT, LPA must request with Army Corp. of Engineers a transfer of the 404 permit to DOT.

Bridge - As defined in the National Bridge Inspection Standards (NBIS): A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening. Refer to Figure II-1.

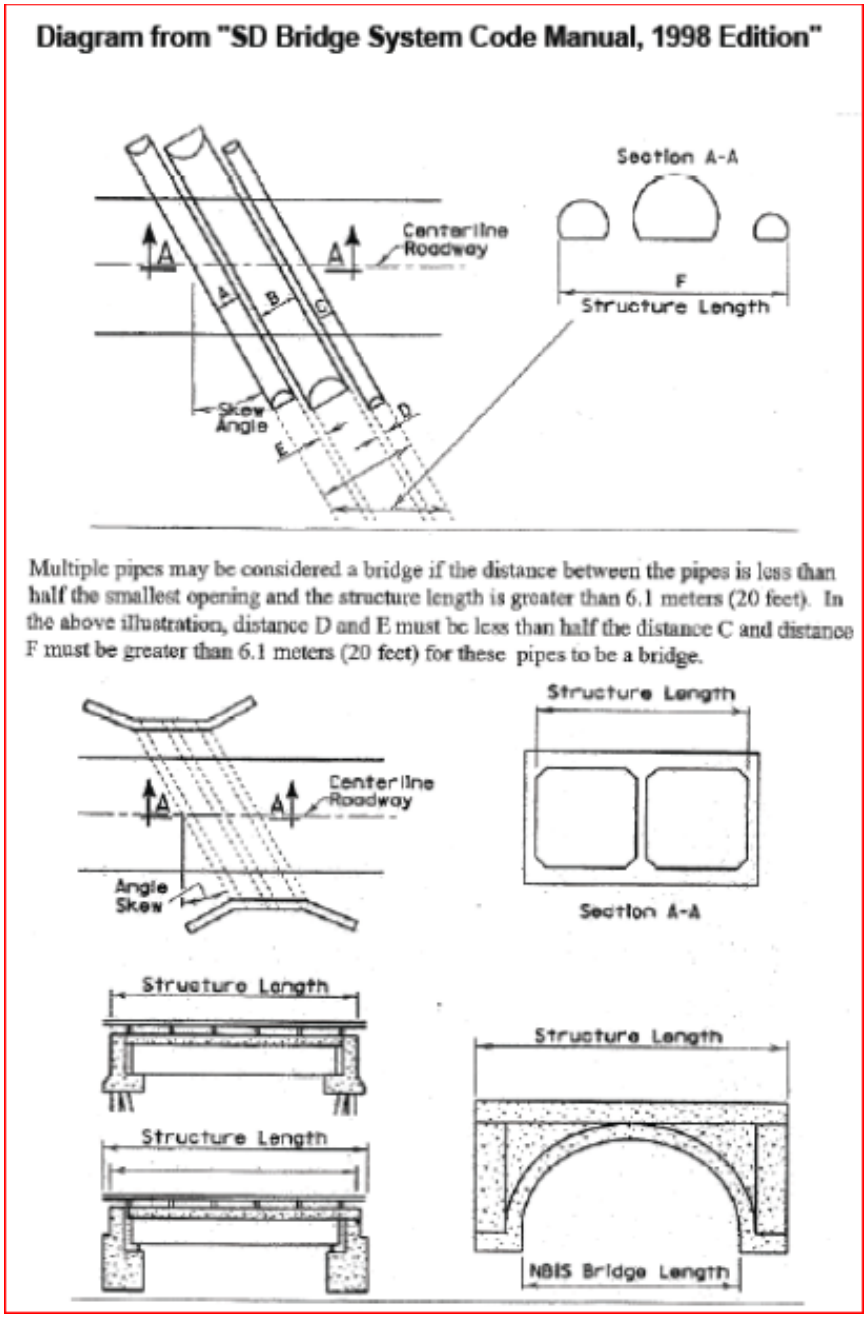
Bridge Improvement Grant (BIG) – Grant available to LPA's for preliminary engineering, bridge preservation, structure replacement or major rehabilitation.

Bridge Preservation – Actions or strategies that prevent, delay or reduce deterioration of bridges or bridge elements, restore the function of existing bridges, keep bridges in good condition and extend their life. Preservation actions may be preventive or condition-driven.

Culvert Condition – Condition rating of culvert – Based on the data in NBI item 62.

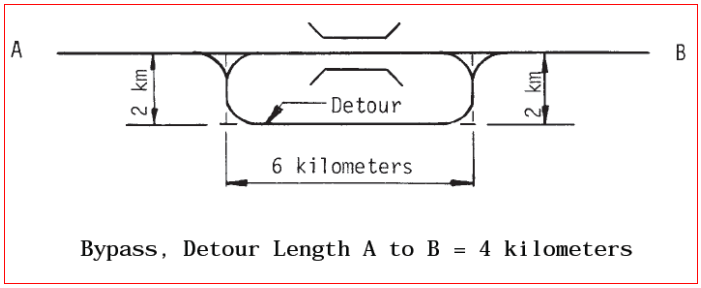
Deck Condition – Condition rating of the part of the structure that carries traffic – Based on the data in the NBI item 58.

Figure II-1

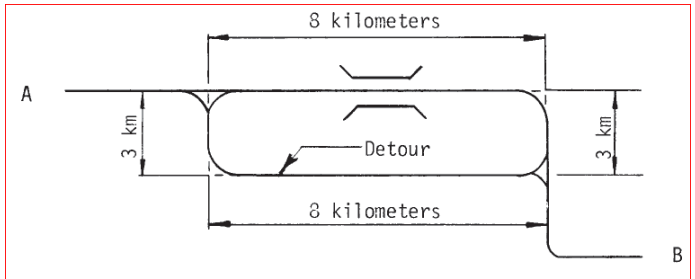


Detour Length - Minimum additional length of travel required if the bridge in question was closed. Detour route shall not include bridges posted at less than legal loads or not allow non-permitted height or width loads to pass. User impact will be based on actual length as reported in the NBI. Refer to Figure II-2 for examples:

Figure II-2



Bypass, Detour Length A to B = 4 kilometers



Bypass, Detour Length A to B = 0 kilometers

Engineers Cost – A cost estimate of all eligible items to be included with the BIG application. This amount as reviewed and approved by SDDOT will establish the maximum limiting amount of the grant that will be awarded.

Federal-aid System – A public highway eligible for assistance from the Federal Highway Administration other than a highway functionally classified as a local road or rural minor collector.

Full Maintenance Road – A road on the South Dakota Non State Public Road Inventory that has not been designated as a Minimum Maintenance Road or a No Maintenance Road.

Fracture Critical – Failure of any one main structural member may cause a significant portion or the entire bridge to collapse. As reported in the NBI.

Minimum Maintenance Road – A road that has been designated by a board of county commissioners or a township board as a minimum maintenance road if the board determines that the road or segment of the road is used only occasionally or intermittently for passenger and commercial travel.

National Bridge Inventory (NBI) – A database, compiled by the Federal Highway Administration, with information on all bridges and tunnels in the United States that have roads passing above or below. If LPA's find discrepancies with the data, they should work with their consulting engineer and DOT to correct the information recorded in the NBI.

No Maintenance Road – A road that has been designated by a township board as a no maintenance section line if the segment has been unimproved and is not maintained for vehicle travel. A No Maintenance Road is also a road or any segment of road that has designated by a township board as a no maintenance road if the board determines that the road or segment of the road is unsafe for vehicle travel.

Off-System - Public Roads, other than those on a Federal-aid System.

On-System - Public Roads, on a Federal-aid System. NBI Item 26.

PE-BIG– Subgrant available for LPA to perform preliminary engineering work, including preservation/rehabilitation/replacement investigation studies, surveys, bridge hydrologic/ hydraulic (H/H) studies, including the type, location and size recommendation, etc.

Posted – Bridge is signed for less than legal loads. NBI item 70.

Preservation BIG– Grant for minor repair/rehabilitation and preservation work valued at less than financial limits as set in Section III of this procedure. Examples are scour projects, fatigue retrofits, waterproofing joints, painting, safety upgrade rail/barrier, or deck treatments (Concrete Overlays, Epoxy Seals, Asphalt & Membrane overlays, and Epoxy Chip Seals). The primary function of these treatments is to preserve the structure elements and extend the service life of the structure.

Rehabilitation Projects – Major repair/rehabilitation work or combination of minor preservation work valued greater than financial limits to be classified as rehabilitation/replacement work as set in Section III of this procedure.

Replacement Projects – Total replacement of the structure.

Scour Critical – Foundation may be or has the potential to become unstable due to hydraulic undermining. NBI appraisal item 113 (Scour) having a value of 3 or less or having unknown foundations.

Structurally Deficient – Condition of one or more major component includes a significant defect. As reported in the NBI.

Substructure Condition – Condition rating of the part of the structure that supports the superstructure (piers, bents, abutments) – Based on the data in the NBI item 60.

Sufficiency Rating - A method of evaluating bridge data to obtain a numeric value which is indicative of a bridge's sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent a perfect bridge and zero percent would represent a completely failed bridge. The value shall be as derived from the equations found in FHWA's "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges".

Superstructure Condition – Condition rating of the part of the structure that supports traffic (deck, slab, girders) – Based on the data in the NBI item 59.

Wheel Tax – Imposition of a tax by County ordinance as authorized in South Dakota Codified Law 32-5A. County rate evaluated will be based on the tax imposed to vehicles over 6000 lbs GVWT.

III. Funding Responsibilities

Federal Funding - Federal funds will be made available to perform all LPA bridge inspections at 80 percent of eligible costs. The local match for bridge NBIS inspections will come from the LPA. No state cash funds are to be used for LPA bridge inspections.

State Bridge Improvement Grant (BIG) Funds - Funding will be made available for eligible On and Off-System LPA bridges for preliminary engineering, preservation, rehabilitation, or replacement as detailed within this Procedure; the program size (i.e. available funds) will be determined by the Director of Planning & Engineering prior to each selection process. Authorized work will be funded at 80 percent of eligible costs through the BIG fund.

Local Funding Responsibilities – The LPA will be responsible for 20 percent of eligible costs and for 100 percent of non-eligible costs, including costs that exceed the grant amount. Right of Way Costs, utility relocations, roadway surfacing, fencing, aesthetics, , off-site environmental mitigation costs, LPA staff wages and expenses, and any costs incurred prior to notice of award date will be considered non-eligible. Final determination of eligible costs will be determined prior to any work being performed. All parties must agree to responsibilities in writing.

Limiting Amounts - Minimum grant costs, including engineering, of $30,000 for preservation projects and $100,000 for rehabilitation or replacement projects are established as eligibility criteria for access to BIG Funds. Funding dedicated to LPA bridges through this program will also have a capped maximum total award amount of $4,000,000 in grants to any one LPA in a three year period. Any costs outside of these limits will be classified as non-eligible and shall be the responsibility of the LPA to fund. The limiting amounts may be adjusted by the Director of Planning & Engineering prior to each selection process. Refer to Table III-1.

Table III-1

	Grant Amount	Local Match	Total	Limits
PE-BIG	80% Approved Design Hours	20% Approved Design Hours	100% Approved Design Hours	<326 hours – small drainage areas (unnamed tributaries/creeks) <501 hours – medium drainage areas (named creeks/rivers) <801 hours – large drainage areas (navigable rivers)
Preservation BIG	$30,000	$7,500	$37,500	Minimum
BIG Rehab/Repl.	$100,000	$25,000	$125,000	Minimum
	$4,000,000	Maximum in a 3yr. Period		

IV. Qualification Criteria

SDDOT will provide a preliminary screening of all bridges to ensure they meet the minimum qualifications. Note that this is only a screening tool and does not guarantee selection. Any application that does not meet the minimum qualifications will be rejected without additional ranking. SDDOT may verify accuracy of the data within the NBI for the qualified bridges. Structures owned by cities and towns are eligible for BIG funding. Structures owned by private individuals, development groups, Federal Agencies, SD Game Fish and Parks, or Tribes are not eligible.

In order to be eligible for a BIG grant, County owned structures must be listed as a “need” in that County’s Highway and Bridge Improvement Plan as approved by SDDOT. The County must also have a wheel tax.

The following Qualification Criteria will establish the requirements for identifying eligibility for bridges to be considered for each selection process:

A. All Projects:

1. **Bridge Function –** Bridge must serve multiple residences, farms, ranches or a multi-lot development. Roadway cannot be located on a “No Maintenance” or a “Minimum Maintenance Road”, terminate into a field entrance, a driveway, single residence, farm, or ranch.

2. **NBIS (National Bridge Inspection Standards) -** LPA must be in full compliance with Federal and State inspection requirements including but not limited to posting of load restrictions.
3. **County Highway and Bridge Improvement Plan** – County (Cities excluded) must have a SDDOT approved transportation plan and bridge must be in the County's 5-year plan.
4. **Wheel Tax** - County (Cities excluded) in which the bridge is located has an active wheel tax imposed on the residents of the county for vehicles > 6000 pounds Gross Vehicle Weight.
5. **Structure Status** – No structure can be under contract or advertised for bid for any type of improvement at time of grant award.

B. PE-BIG

1. **Cost of Project –** Total costs, including engineering, fall within the requirements as established in Section III of this procedure.

C. Preservation BIG

1. **Cost of Project –** Total costs, including engineering, fall within the requirements as established in Section III of this procedure.
2. **Extends Service Life –** Project is projected to extend the service life by at least 10 years.
3. **For Bridge Deck Overlays –** Qualifying criteria as per Table IV-1.

Table IV-1

		Qualifying Criteria
#New Epoxy Chip Seals	Structure Age	No restriction
	Deck Condition	Element Condition State 1 or 2**
New Concrete Overlay	Structure Age	Built in or after 1964*
	Deck Condition	Element Condition State 1 or 2**
	Structure Type	No simple spans*
	Deck Thickness	$\geq$ 6.75"
Existing Concrete Overlay (Replacement 2nd or 3rd Overlays)	*Overlay Age	20 or more years
	Overlay Condition	Element Condition State 3 to 5**
	Substrate (Deck/Slab)	Element Condition State 1 or 2

Structures submitted for new Rigid Concrete Overlays must also be checked for impact on Load Capacity prior to being added to the program

* These are general guidelines. Structures outside of these parameters can be considered if they are in good condition and/or joints can be eliminated (eliminate simple spans). **Overlay Age is a general guide only as Overlay and Substrate Condition are the critical factors.**

** American Association of State Highway Transportation Officials (AASHTO) Element Condition States

This system has also been used to seal badly cracked concrete overlays and new slabs/decks with epoxy coated resteel that have a significant cracking problem, too extensive for individual crack repair.

D. **Major Rehabilitation and Replacement BIG**

1. **Cost of project –** Total costs, including Engineering, as established in Section III of this procedure.

Table IV-2

Measure	Criteria
Sufficiency Rating	60 or less
Structurally Deficient	NBI Condition Rating of 4 or less for Deck, Superstructure, Substructure, or Culvert

2. **Evaluation –** Must meet all criteria shown in Table IV-2. All structures must be evaluated for potential rehabilitation prior to any consideration for replacement. The condition, age, structure type, scour criticality, and potential preservation or rehabilitation alternatives shall be reviewed for each structure. The feasibility of those alternatives and the economics of replacement versus rehabilitation shall be considered. When the rehabilitation costs are in the range of 60% or more of the replacement costs, replacement becomes a viable option.
3. **General Maintenance –** The LPA must show proof of general maintenance on the structure (provide history of all work performed, charge of materials, no reoccurring items on maintenance report on inspection forms, etc.). Record keeping for

maintenance of each structure shall be provided with the application, with data beginning in calendar year 2016 (at a minimum) and carry through the current application period.

V. Selection Process

The SDDOT will conduct the BIG selection process annually. It will be initiated in August, and be completed by April of the following year to allow inclusion of successful projects in the corresponding annual State Transportation Improvement Plan (STIP). Preservation BIG and PE-BIG may be awarded on a more frequent basis with final award of all projects to be determined by the South Dakota Transportation Commission. Successful candidates will be required to enter into an individual project agreement between all applicable parties.

1. **Preliminary Engineering Bridge Improvement Grant (PE-BIG)**
   a) Any structure that meets Section IV criteria of this procedure will be eligible for a PE-BIG grant.
   b) LPA will complete and submit application to SDDOT for eligible bridges.
   c) Recommendation of award of PE-BIG grant will be based on available funding, scoring process as detailed in Section VI, LPA's level of priority, and SDDOT review of structure condition.
2. **Preservation BIG Grant**
   a) Structure's preservation needs as determined by LPA's Bridge Inspection Engineer may be submitted by application from the LPA for the Preservation category.
   b) LPA will complete and submit application to SDDOT for eligible bridges.
   c) Applications should include all pertinent information including maps, photos, inspection reports, and information relating to the preservation treatments being recommended so that adequate information is available for the ranking process.
   d) Recommendation of award of preservation projects will be based on available funding, scoring process as detailed in Section VI, LPA's level of priority, and SDDOT review of project feasibility and constructability and whether the proposed project addresses structural deficiencies.

3. Bridge Improvement Grant (BIG) Rehabilitation/Replacement

a) LPA will complete and submit application to SDDOT to compete for grants for eligible bridges.

b) LPA will include the Type, Size, and Location (TS&L) report (see Appendix B), and a detailed engineer's cost estimate showing design costs, construction costs, and construction engineering costs, with the application.

c) DOT will use current inventory condition reports at the time of application deadline for the ranking process in Section VI.

d) Recommendation of award of BIG grant will be based on ranking process as detailed in Section VI, available funding, LPA's level of priority, and SDDOT review of structure condition and anticipated treatment effectiveness or feasibility of project as proposed.

VI. Ranking Criteria

The following Ranking Criteria will be used to rank the competing qualified bridges: City points will be prorated to a 100 point system in order to align with the county projects.

1. **Bridge Condition (50 points maximum)**

   a) **Posting** (27 points maximum) - As defined by the NBI Item 70. (See Table VI-1)

Table VI-1

Bridge Inventory Code	Relationship of Operating Rating to Maximum Legal Load	Ranking Points
5	NO POSTING REQUIRED	0
4	0.1 TO 9.9% BELOW	6
3	10.0 TO 19.9% BELOW	12
2	20.0 TO 29.9% BELOW	18
1	30.0 TO 39.9% BELOW	24
0	> 39.9% BELOW	27

   b) **Substructure Condition** (6 points maximum) – As defined by the NBI Item 60. (See Table VI-2)

   c) **Superstructure Condition** (6 points maximum) – As defined by the NBI Item 59. (See Table VI-2)

Table VI-2

Bridge Inventory Code	Ranking Points
>5	0
5	1
4	2
3	3
2	4
1	5
0	6

   d) **Culvert Condition** (12 points maximum) **–** As defined by the NBI Item 62. Points awarded at two times the value as shown in Table VI-2.

   e) **Fracture Critical** (5 points or zero points) - Points awarded if structure is determined to be Fracture Critical.

f) **Scour Critical** (5 points or zero points) - Points awarded if structure is determined to be Scour Critical.

g) **Sufficiency Rating** (1 point maximum) – (100-SR)/100.

2. **User Impact** (20 points maximum) - User Impact will be a variable that measures the impact on the users and will be calculated by multiplying the ADT by the Detour Length from the NBI data. If detour length in the NBI is listed as "99" (indicates greater than 100 miles, or is a dead end), further investigation by SDDOT is required to ensure that an appropriate detour length is used. The points will be assigned based on the following formulas with the maximum value for user impact capped at 20 points:

   User Impact (On-System) = ADT x Detour Length (miles) / 350

   User Impact (Off-System) = ADT x Detour Length (miles) / 100

3. **Local Planning** (30 points maximum for Counties/ 20 points for Cities)

   a) **Wheel Tax** (10 points maximum) (See Table VI-3)

Table VI-3

Assessment / Wheel	Points
$5	10
$4-$4.99	Actual $ Amount x 2
$3-$3.99	Actual $ Amount x 2
$2-2.99	Actual $ Amount x 2
$1-1.99	Actual $ Amount x 2
$0-$0.99	0

   b) **Bid Ready (10 points or zero points)** – Project design complete in DOT format (rehabilitation/replacement projects) and includes final review plans, certifications, and permits submitted with application. Project is ready for bid letting (by the Department for rehabilitation/replacement projects and by the LPA for preservation projects) at time of application submittal.

   c) **LPA Financial Commitment**– **(10 points maximum)**– Additional points for any increased local match beyond the required 20% as shown in Table VI-4.

Table VI-4

SDDOT Share (%)	LPA Share (%)	Points
80	20	0.00
79	21	0.33
78	22	0.67
77	23	1.00
76	24	1.33
75	25	1.67
74	26	2.00
73	27	2.33
72	28	2.67
71	29	3.00
70	30	3.33
69	31	3.67
68	32	4.00
67	33	4.33
66	34	4.67
65	35	5.00
64	36	5.33
63	37	5.67
62	38	6.00
61	39	6.33
60	40	6.67
59	41	7.00
58	42	7.33
57	43	7.67
56	44	8.00
55	45	8.33
54	46	8.67
53	47	9.00
52	48	9.33
51	49	9.67
50 or less	50 or more	10.00

VII. Project Development Requirements Following Grant Award

Selection of a professional engineer (PE) will be from the current SDDOT Consultant Retainer List from the applicable category (See Appendixes) and copies of all contracts are required to be on file with SDDOT. The LPA will acquire any necessary right of way

according to the Uniform Act. The LPA will also coordinate utility notification and relocation (if applicable). The LPA will be responsible for any coordination regarding FEMA floodplain impacts. The SDDOT will review and approve all plans prior to advertisement for bids.

The following descriptions of duties are general guidelines and any deviations must be requested in writing for the Secretary's approval. .

A. For Preliminary Engineering Studies

1. The LPA will:
    i. Select a professional engineer (PE) from SDDOT Consultant Retainer List for Local Government or State Bridge Design,
    ii. Participate in all planning, scoping, and inspection meetings, and
    iii. Review and comment on TS&L Report
2. The SDDOT will:
    i. Hire the LPA selected consulting firm for preliminary engineering,
    ii. Invite LPA to all planning, scoping, and inspection meetings,
    iii. Submit draft TS&L to LPA for review and comment, and
    iv. Review TS&L Report.

B. For All Bridge Preservation Treatments

1. The LPA will:
    i. Select and hire a professional engineer (PE) from SDDOT Consultant Retainer Lists for Local Government or State Bridge Design,
    ii. Comply with terms as established in the SDDOT Consultant Retainer Contract (See Appendices), including but not limited to requiring the consultant to submit plans, design calculations, and load ratings to SDDOT for review,
    iii. Obtain bid documents, plans, design calculations, scour analyses, load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota,
    iv. Coordinate environmental clearance with Corps of Engineers (COE), if

applicable

v. Obtain all necessary permits (COE 404, DOT, Federal Lands, BIA, Tribal, Municipal, etc.),

vi. Ensure incorporation of construction engineering and testing requirements in the bid documents,

vii. Advertise the project for bids and conduct bid letting,

viii. Obtain SDDOT concurrence in bid,

ix. Enter into a construction contract,

x. Issue the contractor a Notice to Proceed,

xi. Select a construction engineer (CE) and enter into an agreement for CE services unless CE is to be done by SDDOT, and

xii. Provide SDDOT as-built plans and notification of completion of project.

2. The SDDOT will:

i. Conduct an initial environmental review and provide guidance to the LPA,

ii. Conduct a plan review of final plans, applicable design calculations, and scour analyses; load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota, costs estimates, and bid documents as applicable to the project,

iii. Review and approve negotiated (not signed by the engineer or executed by the LPA) construction engineering agreement,

iv. Review and approve quality assurance and testing plan for construction testing and inspection, and

v. Conduct a final inspection.

C. For Off-System Bridge Rehabilitation/Replacements

1. The LPA will:

a) Select and hire a professional engineer (PE) from SDDOT Consultant Retainer List for Local Government or State Bridge Design,

b) Provide ROW acquisition and ROW certification,
c) Provide utility notification, relocation if needed, and utility certification,
d) Coordinate with FEMA for any needed FEMA floodplain map revisions,
e) Provide any needed wetland mitigation sites,
f) Obtain all necessary permits (COE 404, DOT, Federal Lands, BIA, Tribal, Municipal, etc.),
g) Comply with terms as established in the SDDOT Consultant Retainer Contract (See Appendix A), including but not limited to requiring the consultant to submit foundation investigation and recommendations, plans, design calculations, and load ratings to SDDOT for review,
h) Address all SDDOT review comments in writing,
i) Obtain bid documents, plans, design calculations, scour analyses, load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota,
j) Advertise the project for bids, and conduct bid letting,
k) Obtain SDDOT concurrence in the bid,
l) Enter into a construction contract,
m) Issue the contractor a Notice to Proceed,
n) Select a construction engineer (CE) and enter into an agreement for CE services,
o) Notify SDDOT of completion of project.

2. The SDDOT will:
   a) Conduct a 70% plan review for structural and scour review,
   b) Conduct a plan review of final plans, design calculations, scour analyses, load rating and analyses for the bridge inspection file (3 South Dakota trucks & 4 special haul vehicles (SU4-7) and notional rating load), and specifications sealed and signed by a professional engineer licensed in the State of South Dakota, costs estimates, and bid documents as applicable to the project,
   c) Review and approve negotiated (not signed by the engineer or executed by the

LPA) construction engineering agreement,

d) Review Shop plans of prefabricated products (if applicable),

e) Review and approve quality assurance and testing plan for construction testing and inspection, and

f) Conduct a final inspection.

D. For On-System Bridge Rehabilitation/Replacements

1. The LPA will:
   i. Select a professional engineer (PE) from SDDOT Consultant Retainer List for Local Government or State Bridge Design,
   ii. Provide ROW acquisition and ROW certification,
   iii. Provide utility notification, relocation if needed, and utility certification,
   iv. Coordinate with FEMA for any needed FEMA floodplain map revisions,
   v. Provide any needed environmental mitigation sites,
   vi. The LPA shall review final plans.

2. The SDDOT will:
   i. Hire the LPA selected consulting firm for design engineering,
   ii. Conduct environmental clearance with all coordinating agencies,
   iii. Conduct the foundation investigation,
   iv. Obtain all necessary permits (COE 404, DOT, Federal Lands, BIA, Tribal, Municipal, etc.),
   v. Advertise the project for bids, and conduct bid letting,
   vi. Enter into a construction contract,
   vii. Issue the contractor a Notice to Proceed,
   viii. Perform construction engineering (CE) services,
   ix. Notify LPA of completion of work.

   Note: 2i, 2ii, 2iii, and 2iv will need to be conducted by LPA for a bid ready application and will require a request of transfer of permits in the name of LPA to DOT.

VIII. Reimbursement Process

For BIG funding for Preliminary Engineering Grants and On-System Major Rehabilitation/Replacement Projects, SDDOT will bill the LPA for their 20% cost share monthly or quarterly depending on volume of work being performed.

For Preservation Projects and Off-System Major Rehabilitation/Replacement Projects, the LPA shall provide a copy of engineering firm and contractor pay estimates along with weekly progress reports. Submittals must be received on a quarterly basis at a minimum, but may be submitted more frequently. The SDDOT will reimburse the LPA for 80% of the pay estimates for eligible items, up to a capped amount, if applicable. All Construction Change Orders will need to be submitted to SDDOT for review and approval.

IX. Sign

Each BIG grant structure project will be signed with signs as shown in Appendices. The cost for furnishing and installing the signs will be a part of the BIG expenses.

X. Application Submittal

All applications will be emailed to: Wade Dahl at wade.dahl@state.sd.us

If applications are deposited on the state ftp site, email notification must be sent to Wade Dahl.

XI. Dispute Resolution

The SDDOT Local Government Engineer is responsible for managing the program and making decisions not specifically addressed in this procedure.

Appendix A – Survey and Hydraulic Work Order Requirements, Type, Size, and Location (TS&L) Report, Foundation Investigation (Bridges) or Undercut Recommendation (Boxes/Pipe)

Examples Include:

- Preliminary Survey/Hydraulics Executive Summary
- Plan/Profile Sketches and Gradelines
- Drainage Data Sheet and Contour Map
- Photo Documentation and Record Search

Bridge Improvement Grant
Work Order Requirements for Survey and Hydraulics

SCOPE OF SERVICES TEMPLATE – Survey & Hydraulics

1. **Field survey for completion of the Drainage Data Sheet and Contour Map.** The information required for placement on these sheets is listed below. An example is attached containing the required information.
   - ☐ Stationing from south to north or west to east.
   - ☐ Beginning and ending stations of the current structure.
   - ☐ Proposed and inplace gradelines.
   - ☐ Stream profile. (Including a table of stations and elevations for each shot taken.)
   - ☐ Sea level datum is required. Stations, elevations, and offsets from and descriptions of permanent objects will be required for project benchmarks. (The High Accuracy Reference Network (HARN) map and the County Bench Mark map for the State of South Dakota can be found at the following web site – www.state.sd.us/dot/pe/roaddesign/survey.htm)
   - ☐ Include an electronic file containing the plan/profile of the inplace gradeline at the structure.
   - ☐ Landowners with their addresses, phone numbers, and location of property.
   - ☐ Utilities with their addresses, phone numbers, and locations along the project.

2. **Field survey as necessary for preparation of construction plans.** Required information is listed below.
   - ☐ Establishment of transit points, land ties and benchmarks as well as cross sections and topography. (Stations, elevations, and offsets from permanent objects will be required for project benchmarks.)
   - ☐ Project limits as established by consultation with the County Highway Superintendent.
   - ☐ Additional legal survey as required for preparation of right-of-way plats.
   - ☐ The geometrics of horizontal and vertical alignment in accordance with the Local Roads Plan design standards.
   - ☐ Survey notes are to be retained on file with the Consultant for subsequent use in the preparation of construction plans and are to be available to the County upon request.

   It is anticipated that this item will permit the issuance of a separate work order (after the Type, Size and Location (TS&L) Inspection) for the development of construction plans with no further survey needed.

3. **Photo Documentation and Record Search of the Structure as defined in Attachment #2.**

4. **Preliminary Survey/Hydraulics Executive Summary Cover Letter, Preliminary Hydraulic Data Sheet, Plan/Profile Sketches (Preliminary Hydraulic Layouts) and gradelines, Electronic Copy of HEC-RAS File, Draft Hydraulic Design Report in accordance with the newest version of the South Dakota Drainage Manual, and cost estimates for existing and all proposed structure alternatives. (More than one feasible alternative is required. This includes options on different alignments if applicable.)** The newest version of the South Dakota Drainage Manual is available at the following location: http://www.sddot.com/business/design/forms/drainage/. Guidance and examples can be found in Chapter 6 of the manual. The current preliminary hydraulic data sheet to be used can be found at the following internet location: *ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc.* Directions for filling out the form can be found at the same location. All items will be submitted to the Local Government Assistance Office for distribution to SDDOT personnel for review for compliance with minimum required State and Federal standards. Necessary revisions shall be provided in writing by the SDDOT and shall be forwarded to the Consultant by the Local Government Assistance (LGA) Office. Necessary revisions shall be completed by the consultant and the Revised Draft Hydraulic Design Report submitted within 2 weeks of receipt of revisions from LGA. The Consultant is wholly responsible for the accuracy of the design calculations and the independent check design calculations.

   Note for Box Culverts/Pipe Options and Plans: The Corps now requires all culverts/pipe where aquatic organism transport is present to have a flow line sunk 1'. If a box/pipe is included in the options, it should be clearly noted that the flowline has been sunk to the required 1'. If the selected structure is a box culvert or pipe, project plans and the final hydraulic data sheet should show that the box or pipe has been sunk to the required 1'.

5. **Conduct TS&L inspection, assistance in the selection of the type, size and location of the replacement structure, and preparation of TS&L summary letter (See Examples #1 & #2 following the attachments).**

The county or city (owner) shall be in attendance and advance notice given the Local Government Assistance Office so if time allows, a staff member can attend.

6. **Report of Foundation Investigation.** Conduct field investigation and provide design recommendations according to AASHTO LRFD Bridge Design Specifications Section 10. Report shall include boring information, lab results, and design recommendations. See **Examples #3 and #4, following the attachments**, for reports that are typically developed by SDDOT Geotechnical Engineering Activity.

7. **For Structure Chosen at TS&L: Final Hydraulic Design Report, Final Hydraulic Data Sheet (use the current data sheet found at the following internet location: ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc,) HEC RAS model with existing and proposed conditions, and if the structure selected is a bridge, Scour Memo summarizing hydraulic scour calculation, Scour Calculation, and Berm Slope Protection Recommendations (if applicable.)**

Please refer to the checklist in **Attachment #1** for the TS&L Packet of items that shall be submitted to the Local Government Assistance Office.

Attachment #3 contains applicable excerpts from the Current SDDOT Consultant Retainer, DOT-900 AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES.

Attachment #1
Bridge Improvement Grant
Checklist for Survey and Hydraulics Work Order TS&L Packet

These items must be submitted to DOT/Local Government Assistance.
If any of these items are missing, the full packet will be returned for completion and resubmission to this office.

Project Number _____ **County** _____ **PCN** _____

☐ **Survey Sheets and Contour Map including the following information:**

- ☐ Stationing from south to north or west to east
- ☐ Beginning and ending stations of the existing structure
- ☐ Beginning and ending stations of proposed structures
- ☐ Proposed and existing gradelines
- ☐ Stream profile and cross sections (Downstream to upstream direction including a table showing stations and elevations for each shot taken)
- ☐ Elevation and location of buildings and other structures
- ☐ Survey information using sea level datum and showing station, elevation, offset, and physical description of each project benchmark
- ☐ Landowner names, addresses, phone numbers, and legal descriptions of their property
- ☐ Utility names, addresses, phone numbers, and locations along the project

☐ **Photo Documentation and Historical Record Search of the Structure (including list of files or repositories searched) as defined in Attachment #2. (In the event that nothing is found, a letter indicating lack of findings, along with files or repositories searched, shall be submitted to the SDDOT/Local Government Assistance Office.)**

☐ **Preliminary Survey/Hydraulics Executive Summary Cover Letter (example can be found on last page of this appendix.)**

☐ **Preliminary Hydraulic Data Sheet (use current data sheet found at: ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc) including the following information:**

- ☐ Calculated flows
- ☐ Inplace conditions (Ordinary High Water Elevation, HW_{100}, Vmax, OTfr)
- ☐ Proposed conditions for each option (HW_2, HW_{23}, HW_{100}, Vmax Qot, OTfr, ELovertop)
- ☐ Ordinary High Water Elevation Shown on Cross-Sections (vegetation elevation on stream banks – approx. 2–year flow)
- ☐ Observed High Water Elevation (identifiable high water mark)

☐ **Electronic copy of HEC-RAS model of existing and proposed conditions**

☐ **Plan and profile sketches (preliminary hydraulic layout sheets) for the existing structure and proposed gradelines for each option (More than one feasible alternative is required. This includes options on different alignments if applicable.)**

- ☐ **Cost Estimates (including design and construction engineering and construction costs for each option)**
- ☐ **Revised Draft Hydraulic Report**

- ☐ **TS&L Summary Letter**
- ☐ **Report of Foundation Investigation (see Examples 3 and 4 in this appendix)**
- ☐ **For Structure Chosen at TS&L**
  - ☐ **Final Hydraulic Design Report**
  - ☐ **Final Hydraulic Data Sheet (use current data sheet found at: ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc)**
  - ☐ **HEC RAS model with existing and proposed conditions**
  - ☐ **Scour memo, scour calculations, and berm slope protection recommendations (Bridges Only)**

Attachment #2
Local Government Assistance
Photo Documentation and Record Search of the Structure

The information defined below will satisfy one of the requirements of the State Historic Preservation Society in clearing the structure for removal.

Photo Documentation of the Structure

- ☐ **Site map and photo log of all photos**
- ☐ **Photos will be taken of: *(at minimum)***
  - Full views of the structure's primary elevations
  - Close-ups of any decorative, character-defining or structural features
  - General views of the bridge and its environment
- ☐ **Photos will be labeled as follows:**
  - Photo Number - from photo log and site map
  - Name and Address of property – if property does not have legal address then please note either the Universal Transverse Mercator (UTM) or the legal location down to the quarter section.
  - Month and Year of photograph
  - Description of view, including camera direction (cardinal direction – N, S, E, W)
- ☐ **Photos will be submitted in one of the following formats:**
  - Digital Photographs
    - At least 2000 X 3000 pixels at 300 dpi
    - Saved as TIFFs submitted on CDs
  - 35mm Black and White Photographs
    - 35mm black/white film printed on black/white photographic paper
    - Both prints and negatives submitted

Historical Record Search of the Structure

- ☐ **Any or all of the following are needed:**
  - Reports – maintenance or otherwise indicating modifications to the original structure – what was done and why
  - Any Photographs of the original structure (not inspection photos; not photos referenced in this work order)
  - Original Drawings
  - Original Plans
  - Any other documentation

- ☐ **Names of Files or Repositories (courthouse, county historical society, etc.) Searched**

If possible, provide the original copy of this information. If not, submit the information in the following format. High quality clear Xerox copies of any reports, drawings, or plans; and photographs scanned at 600 dpi, saved as TIFFs, and submitted on a CD.

If these documents are not otherwise restricted through state or federal law; submit them to the SDDOT/Local Government Office for submission to the South Dakota State Historical Society for public use and reproduction. <u>In the event that nothing is found, a letter indicating lack of findings, along with files or repositories searched, shall be submitted to the SDDOT/Local Government Assistance Office.</u>

Attachment #3
Bridge Improvement Grant
Excerpts from Current DOT-900 (09/2016)
AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES
(SDDOT Consultant Retainer)

FURNISHING OF DOCUMENTS (DOT-900, 09/2016, Section B.3.)

Except where otherwise specifically provided, the CONSULTANT will furnish to the DEPARTMENT all documents, reports, exhibits, electronic files, and other presentations for all phases of the work performed under the terms of this Agreement.

The CONSULTANT will furnish to the DEPARTMENT all design and check design computations. All documents furnished, including all original drawings, software generated electronic files, design computations, and check design computations, will become and remain the property of the DEPARTMENT and may be used by the DEPARTMENT without restriction for any public purpose.

The CONSULTANT will provide survey documents for bench levels and for the checking of bench levels on standard loose-leaf transit field book sheets. The CONSULTANT will provide all other data collected in an electronic format and will include the following files: FWD file, DGN file, DTM file, ALG file, and the RAW data file. The FWD file, DGN file, DTM file, and ALG file, will be compatible with the DEPARTMENT'S current version of InRoads. The RAW data file will be in ASCII format and will include the following information: point number, northing, easting, description, and any pertinent notes corresponding to a particular point.

The CONSULTANT, as requested by the DEPARTMENT, will submit construction documents, either electronic or paper format, and said documents will become and remain the DEPARTMENT'S property.

The CONSULTANT will return all data furnished to the CONSULTANT by the DEPARTMENT to the DEPARTMENT.

Compliance with all of the foregoing will be considered to be within the purview of this Agreement and will not constitute a basis for additional or extra compensation.

GENERAL REQUIREMENTS (DOT-900, 09/2016, Section C.3.)

b. Survey for roadway and hydraulic design will be in accordance with the edition of the Department of Transportation Survey Manual currently in place at the time of execution of the Work Order.

c. Wetland delineation will be in conformance with the US Army Corps of Engineers Wetland Delineation Manual and Regional Supplements. Wetland mitigation plans will include construction plans, performance criteria, and a five (5) year monitoring plan.

d. Hydrologic/Hydraulic design will be in accordance with the edition of the South Dakota Drainage Manual (and its revisions) currently in place at the time of execution of the Work Order.

ROADWAY DESIGN (DOT-900, 09/2016, Section C.4.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. Roadway design will be in accordance with the edition of the Department of Transportation Road Design Manual (and its revisions) currently in place at the time of execution of the Work Order and the American Association of State Highway and Transportation Officials (AASHTO) Specifications, "A Policy on Geometric Design of Highways and Streets" (2011 or the version in place at the time of execution of the Work Order), and Interims, or the Local Roads Plan.

b. The CONSULTANT will complete and furnish to the DEPARTMENT, at the time the plans are delivered to the DEPARTMENT, a DEPARTMENT provided checklist. This checklist will provide certification that a separate check has been performed, all review revisions have been made, and the plans are correct and complete.

c. The CONSULTANT will furnish basic design criteria in the Scope Summary Report and in the Scope of Services.

d. The CONSULTANT may obtain standard drawings of roadway appurtenances from the DEPARTMENT'S Office of Road Design.

e. The CONSULTANT will contact the DEPARTMENT'S Office of Bridge Design, if a DEPARTMENT structure's drainage area is greater than 1,000 acres. For these structures, the DEPARTMENT'S Office of Bridge Design will make a hydraulics recommendation, or will concur on the hydraulics requirement if hydraulics is part of the work order scope.

f. The DEPARTMENT will furnish basic surfacing design criteria, such as type, thickness, and width of pavement.

g. The DEPARTMENT will furnish material recommendations.

STRUCTURE DESIGN (DOT-900, 09/2016, Section C.5.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. Prior to initiating design, the CONSULTANT will be required to submit the QC/QA plan/procedure to be followed for structure design to the DEPARTMENT for approval. The CONSULTANT may not begin structure design work until the QC/QA plan/procedure is approved and documented. If the CONSULTANT has a prior approved structure design QC/QA plan/procedure document on file with the OBD, and no changes to that document are anticipated for the current contract, the CONSULTANT will not need to resubmit a structure design QC/QA plan/procedure document.

b. The CONSULTANT will design bridges, box culverts, and miscellaneous highway structures in accordance with the edition of the "AASHTO LRFD Bridge Design Specifications," currently in place at the time of execution of the Work Order except as modified by the DEPARTMENT'S design practices. Prior to beginning design work, the DEPARTMENT will supply the CONSULTANT with a copy of design practices along with examples of standard detailing procedures and typical plans.

c. The CONSULTANT will design highway structures for a vehicular live loading of HL-93. Additional design criteria may be included in the Scope of Work.

d. The CONSULTANT will load rate each structure, including culverts that are bridge length, in accordance with the edition of the AASHTO "Manual for Bridge Evaluation" with latest Interim Revisions using the LRFR method currently in place at the time of execution of the Work Order. The CONSULTANT will perform an HL-93 Design Load Rating for each structure. The CONSULTANT will analyze the AASHTO HS20 vehicle for Inventory and Operating Ratings. The CONSULTANT will also perform a Legal Load Rating for South Dakota legal trucks, the notional rating load, and the four specialized hauling vehicles. The CONSULTANT will submit a copy of the rating analyses to the DEPARTMENT along with the Final Plans for bid letting purposes. The Bridge Management Engineer from the DEPARTMENT'S Office of Bridge Design will review load ratings. Load ratings must be above the Legal Loads. The CONSULTANT will provide a separate summary table of all load ratings to be included in the Bridge Inspection file.

e. The CONSULTANT will provide the DEPARTMENT a hard copy of design computations, independent check design computations, and load ratings, including computer output if applicable, with the final review set of drawings.

f. The CONSULTANT will review shop plans for fabricated items, and will forward marked-up shop plans to the DEPARTMENT. The DEPARTMENT must authorize any fabrication.

PLANS, SPECIFICATIONS, AND ESTIMATES, GENERAL (DOT-900, 09/2016, Section C.8.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. When complete plans, supplemental specifications, or special provisions are prepared, these will become the property of the DEPARTMENT, County, or City.

b. The CONSULTANT will furnish and deliver to the DEPARTMENT original drawings of all sheets comprising the set of plans, together with all reports, drawings, computer files, studies, memoranda, and other data pertaining thereto.

c. The CONSULTANT will furnish to the DEPARTMENT an electronic MS Word file of all special specifications.

d. The CONSULTANT will prepare plans in conformance with the DEPARTMENT'S customary practices. The CONSULTANT will use standard format for notes, tables, and rates of materials.

e. The CONSULTANT will prepare plans on sheets 11" x 17" or 8 ½" x 11" in size, under the guidance of the Road Design Manual's Chapter 18 – Plans Assembly: www.sddot.com/business/design/forms/roaddesign/Default.aspx or as directed by the DEPARTMENT. The CONSULTANT will follow the specific section of the Road Design Manual's Chapter 18 as it relates to plans produced by consultants in order to provide accurate electronic plans and bid items for the DEPARTMENT'S electronic bidding system. The CONSULTANT will utilize the DEPARTMENT'S web site: http://www.sddot.com/business/design/Default.aspx for Plan Preparation (i.e. Road Design Manual, CADD Procedure Manual, and User Guide for Electronic Plan Review), Downloadable Files (i.e. Form Letters, Microstation and InRoad files, and Plan Notes) and other information as necessary to design and prepare plans. The CONSULTANT will follow the properties and procedures set up for the DEPARTMENT'S electronic plans as set forth in document located at the following web site address: http://www.sddot.com/business/design/docs/cadd/ElectronicPlans.pdf. Electronic plans will be used for bidding purposes and must contain a watermark on each sheet stating "For Bidding Purposes Only." Refer to Paragraph 12 below for details on the set of plans to be used for construction.

f. The CONSULTANT will prepare plans with sufficient precision to permit the convenient layout in the field for construction and for other purposes. The plans will also provide for the production of an accurate estimate of quantities for the work to be performed in the construction of the project.

g. The CONSULTANT will furnish such other pertinent information and data with respect to the plans and designs as the DEPARTMENT may request.

h. The DEPARTMENT will require all persons designing, detailing, and checking structure plans to legibly place their names or initials on each plan sheet in the spaces provided for this purpose.

i. The DEPARTMENT will designate the basic premises and criteria for the design. The CONSULTANT will develop plans in accordance with the DEPARTMENT'S standard specifications for roadway and bridge construction.

j. As part of the work embraced in the preparation of plans, the CONSULTANT will prepare and furnish to the DEPARTMENT special provisions in standard DEPARTMENT format, for items of work included in the plans which are not covered by the standard specifications, plan notes, or DEPARTMENT-approved special provisions.

k. The CONSULTANT will ensure scales, lettering, and the general delineation of the plans mirror the DEPARTMENT format and provide readily legible reproductions.

l. The CONSULTANT will ensure each plan sheet bears the South Dakota registered professional seal and endorsement of the CONSULTANT as per the requirements of the South Dakota Board of Technical Professions.

m. The CONSULTANT will use software acceptable to the DEPARTMENT as agreed to in the Work Order.

Note: The DEPARTMENT'S standard software programs are the Bentley Civil Products (InRoads Suite), MicroStation, AASHTOWare products, Adobe Acrobat, Bluebeam, and the Microsoft Office Suite. The DEPARTMENT may require other software on Work Orders.

CONSTRUCTION ENGINEERING TECHNICAL REQUIREMENTS (DOT-900, 09/2016, Section D.)

1. **CONSULTANT'S RESPONSIBILITIES**. The CONSULTANT will be responsible to the DEPARTMENT, and will complete all work to the DEPARTMENT'S satisfaction.

   Subject to availability, the CONSULTANT will provide personnel for the areas of expertise necessary to satisfactorily complete the work specified in the Work Order and this Agreement. The DEPARTMENT will notify the CONSULTANT as to the proper medium that will be used for recording purposes of field data. The CONSULTANT will submit reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order. The responsibilities for these areas are described in **Exhibit 4**, CONSTRUCTION ENGINEERING CONSULTANT RESPONSIBILITIES.

EXHIBIT 4 (DOT-900, 09/2016)

CONSULTANT CONSTRUCTION OVERSITE RESPONSIBILITIES

GENERAL

The CONSULTANT will:

1. Be knowledgeable of the requirements of the project plans and specifications, the DEPARTMENT'S Survey Manual, Road Design Manual, South Dakota Drainage Manual, and CADD Procedures Manual.

2. Assure project personnel are knowledgeable of their duties and responsibilities.

3. Assure project personnel are knowledgeable of the DEPARTMENT'S Materials Manual.

4. Oversee day to day activities to ensure the project is constructed in accordance with plans and specifications.

5. Ensure all documentation and reports are accurate and kept current.

6. Prepare and electronically submit Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Pay Estimate, and Final Construction Change Order, all on the current version of the DEPARTMENT'S Construction Management System. The CONSULTANT will submit these reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order.

7. Require all individuals providing acceptance testing and independent assurance testing of construction materials or acceptance inspection to record all data/results electronically on the current version of the DEPARTMENT'S Construction Management System, or as instructed by the DEPARTMENT.

8. Require all individuals providing acceptance testing and independent assurance testing of materials or acceptance inspection to meet the requirements of the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual.

9. Ensure testing equipment identified in the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual is calibrated and documented according to the designated frequencies and procedures designated in the Manual.

10. Perform other duties assigned by the DEPARTMENT as defined in this Agreement.

The CONSULTANT'S PROJECT ENGINEER will:

1. Assist with conducting the pre-construction meeting.

2. Prepare Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Estimate, and Final Construction Change Order electronically on the current version of the DEPARTMENT'S Construction Management System.

3. Handle EEO and Labor Compliance activities.

4. Ensure that subcontractors working on the project are approved by the DEPARTMENT.

The CONSULTANT'S INSPECTOR will:

1. Assure the asphalt or concrete plant is properly calibrated.

2. Perform scale accuracy checks.

3. Ensure construction activities remain inside the acquired right-of-way or easement as specified on the plans unless approved by the DEPARTMENT.

The CONSULTANT'S SURVEY PARTY CHIEF will:

1. Record field notes for slope stakes, blue tops, paving grades, pipe, structure layout, and other items of the same sort in electronic format, FWD files, DGN files, DTM files, ALG files, and RAW files compatible to the current version of InRoads being used by the DEPARTMENT.

2. Set centerline, offset lines, bluetops, slope stakes, pipe stakes, structure stakes, and other items of the same sort by electronic or manual means.

3. Run bench levels within acceptable tolerances of the DEPARTMENT'S Survey Manual and maintain field notes on standard loose-leaf transit field book sheets.

4. Obtain necessary topographic data within acceptable tolerances of the DEPARTMENT'S Survey Manual.

5. Supervise and assure the survey crew is knowledgeable as to its duties and responsibilities.

The CONSULTANT'S TEST PERSON AND EQUIPMENT will:

1. Be knowledgeable of the requirements of the project plans and specifications.

2. Sample and test materials for acceptance as specified by the DEPARTMENT'S Materials Manual. Perform material tests for QC/QA projects in accordance with QC/QA manual and have the proper QC/QA certification.

3. Recognize and have the ability to take corrective action for calibration of testing equipment.

ABC ENGINEERING
Street Address
City, State, ZIP
PHONE / FAX

EXAMPLE 1

Bridge TS&L Letter Template

Items to be customized for the specific project and conditions are in blue font. Guidance notes are highlighted.

DATE

ADDRESS BLOCK

RE: BR_ ###(00), COUNTY **OR** CITY, PCN
STRUCTURE NUMBER, LOCATION

Dear NAME:

A Type, Size, and Location inspection was held on DATE, for the above referenced project. The following personnel were in attendance:

ATTENDEE NAMES, TITLES

The following items were discussed and agreed upon by the inspection participants:

The most feasible structure for this site is a 63' 1 span precast channel bridge with a 24' deck (22' clear width) and a 30° LHF skew. The substructure shall consist of steel pile abutments. (Also note bent type if known – such as 2-column bents, etc.) The bridge location will be shown on the Final Hydraulic Data Sheet and will be centered at approximately station 10+00. T101 rail will be shown in the plans. Approach rail will **OR** will not be needed. Fence anchor eyes will **OR** will not be provided.

The Contractor will remove and dispose of the existing structure. The Contractor shall also salvage the beams, wood planks, and railing for the County **OR** City, which shall be noted in the plans for bidding purposes. Remaining materials shall be disposed of by the Contractor. The abutments and bents shall be removed to 1' below flowline.

The road will be closed during construction with no detour necessary. **OR** An onsite detour on the DIRECTION side of the structure will be shown in the plan.

Project limits will run from approximately 100' north to 100' south of the structure. The current grade shall be maintained. The typical section will include a crown slope of 0.03 ft/ft, 4:1 inslopes, 5:1 backslopes, and a standard 10' ditch at 20:1. The approach subgrade shall taper from the structure to match the new subgrade and will provide for a WIDTH finished roadway top. The surfacing will consist of gravel **OR** asphalt, which will be furnished and installed by the County **OR** City. All design data for the project will meet or exceed SPEED MPH.

No channel change and no channel cleanout will be necessary at this site. **OR** No channel change will be necessary at this site. Some channel cleanout of trees and/or brush will be necessary to the northeast and southeast.

The Consultant will provide erosion protection recommendations with the Final Hydraulic Data Sheet. The southwest bank will need to be built up and protected with riprap. (Note location of any out-of-the-ordinary need for riprap and reason why.)

Specific project notes for this project are attached. (ADD ANY PROJECT SPECIFIC NOTES AS ATTACHMENT TO THIS MEMO.)

The Contractor will be responsible for traffic control, topsoiling, and seeding.

The County **OR** City will be responsible for the following items without Grant Participation:

1) Right of way and temporary and permanent easements
2) Coordination of any utility adjustments
3) Furnish and install final surfacing
4) Furnish and install temporary and/or permanent fencing
5) Furnish and install new permanent signing
6) Remove silt fence in permanently seeded areas

The SDDOT Geotechnical Engineering Activity is requested to provide foundation and backfill recommendations by DATE (12-18 months from letter date).

The Consultant will provide the name, address, and phone number of adjacent landowners. Utility Company contact information is also needed in the plans for any utilities that exist within the project area. The DOT Local Government Office (DOT LET) **OR** the County **OR** City (LOCALLY LET) will initiate the 404 permit and other related environmental clearances, and will provide the Consultant with materials recommendations if needed.

The Consultant will outline the two archeological sites on the roadway plan sheet. These sites are located within ¼ mile of the structure and cannot be disturbed. Notes stating this shall be placed in the plans and are located with the other project specific notes. THIS ONLY APPLIES IF SHPO STATES THAT SITES HAVE BEEN FOUND AND MUST BE AVOIDED. TAILOR AS NECESSARY OR DELETE IF NOT NEEDED.

The estimated letting date will be in the fall/spring of YEAR, with an overall completion date of ------. **OR** with the Area Engineer to specify an overall completion date at the time that plans are submitted to Bid Letting by this office. It shall be noted in the proposal, as submitted by this office, that a 45, 60 or 90 working **OR** calendar day maximum amount of time for construction of the project will be allowed. It has been determined by Game, Fish & Parks that an April 1 – June 30 seasonal limitation applies to in-stream work. THIS ONLY APPLIES IF THE GF&P LETTER SPECIFIES IT **AND** THE SITE IS **NOT** A TOPEKA SHINER SITE. **OR** This site is a Topeka Shiner site.

If there are any questions or comments please contact me at NUMBER.

Sincerely,

NAME
TITLE

CC: COUNTY/CITY – CONTACT NAME
LGA – CONTACT NAME

ABC ENGINEERING
Street Address
City, State, ZIP
PHONE / FAX

EXAMPLE 2

Box Culvert/Pipe TS&L Letter Template

Items to be customized for the specific project and conditions are in blue font. Guidance notes are highlighted.

DATE

ADDRESS BLOCK

RE: BR_ ###(00), COUNTY, PCN
STRUCTURE NUMBER, LOCATION

Dear NAME:

A Type, Size, and Location meeting was held on DATE, for the above referenced project. The following personnel were in attendance:

ATTENDEE NAMES, TITLES

The following items were discussed and agreed upon by the inspection participants:

The most feasible structure for this site is a 5 barrel 12' X 5' cast-in-place **OR** precast RCBC with a 0° RHF OR LHF skew, and 0° flared wingwalls at the inlet & 0° flared wingwalls at the outlet. Cutoff wall is to be extended 6" below the recommended outlet protection. The new structure will be centered at approximately sta. 10+07. Fence anchor eyes will **OR** will not be required at this site. The box opening will be outside of the 10' clear zone. (The thickness of the bottom slab shall be the same or greater than the thickness of the top slab.)

REMOVE IF NOT NEEDED – The Corps now requires all culverts/pipe where aquatic organism transport is present to have a flow line sunk 1'. Project plans and the final hydraulic data sheet should show that the box or pipe has been sunk to the required 1'. As aquatic organism transport is present at this location, the flowline of the box culvert **OR** pipe and riprap must be submerged a minimum of 1'. This needs to be documented both on the final hydraulic data sheet and on the structure, general drawing plan sheet.

The Contractor shall remove and dispose of the in-place structure. EXTRA ITEMS AS NEEDED - The Contractor shall also salvage the beams, wood planks, and railing for the County, which shall be noted in the plans for bidding purposes. The Contractor will dispose of items not salvaged. The bent and abutments shall be removed to the bottom of the undercut.

The project limits shall be from approximately 150' south to 150' north of the structure. The road will be closed with no detour necessary. Only local traffic will be allowed access. **OR** An onsite detour on the DIRECTION side of the structure will be shown in the plan.

The typical section will include a crown slope of 0.03 ft/ft, 4:1 inslopes, 5:1 backslopes, and a standard 10' ditch at 20:1. The approach subgrade will taper into the existing and provide for a WIDTH finished roadway top (2- WIDTH' lanes and 2- WIDTH' shoulders.) The surfacing will consist of gravel OR asphalt, which will be furnished and installed by the County **OR** City. All design data for the project will meet or exceed SPEED MPH.

The Consultant will provide inlet and outlet recommendations on the Final Hydraulic Data Sheet. The inlet & outlet protection shall be riprap. (Any extra riprap needed? If so, where and why?)

No channel change and no channel cleanout will be necessary at this site. **OR** No channel change will be necessary at this site. Some channel cleanout of trees and/or brush will be necessary. A temporary diversion channel will be installed south of the structure.

The Contractor will be responsible for traffic control, topsoil stripping, and seeding.

The County **OR** City will be responsible for the following items without Grant Participation:

1) Right of way and temporary and permanent easements
2) Coordination of any utility adjustments
3) Furnish and install final surfacing
4) Furnish and install temporary and/or permanent fencing
5) Furnish and install new permanent signing
6) Remove silt fence in permanently seeded areas

The SDDOT Geotechnical Engineering Activity Office is requested to provide undercut recommendations by DATE (6 months from letter).

The Consultant will provide names, addresses, and phone numbers of the adjacent landowners. Utility Company contact information is also needed in the plans for any utilities that exist within the project area. The DOT Local Government Office (DOT LET) **OR** the County **OR** City (LOCALLY LET) will initiate the 404 permit and other related environmental clearances, and will provide the consultant with materials recommendations.

The Consultant will outline the two archeological sites on the roadway plan sheet. These sites are located within ¼ mile of the structure and cannot be disturbed. Notes stating this shall be placed in the plans and are located with the other project specific notes. THIS ONLY APPLIES IF SHPO STATES THAT SITES HAVE BEEN FOUND AND MUST BE AVOIDED. TAILOR AS NECESSARY OR DELETE IF NOT NEEDED.

The estimated letting date will be in the fall/spring of YEAR, with an overall completion date of ------. **OR** with the Area Engineer to specify an overall completion date at the time that plans are submitted to Bid Letting by this office. It shall be noted in the proposal, as submitted by this office, that a 30, 45, 60 working **OR** calendar day maximum amount of time for construction of the project will be allowed. It has been determined by Game, Fish & Parks that an April 1 – June 30 seasonal limitation applies to in-stream work. THIS ONLY APPLIES IF THE GF&P LETTER SPECIFIES IT **AND** THE SITE IS **NOT** A TOPEKA SHINER SITE.

If there are any questions or comments please contact me at NUMBER.

Sincerely,

NAME
TITLE

cc: COUNTY/CITY – CONTACT NAME
LGA – CONTACT NAME

EXAMPLE 3

REPORT OF FOUNDATION INVESTIGATION

PROJECT: BRO 8048(03) Mellette County PCN 02DY

LOCATION: Structure No. 48-102-010, 18.9 miles North & 0.8 miles West of Cedar Butte over the White River.

METHOD OF INVESTIGATION:

All soundings are made according to the Standard South Dakota Subsurface Investigation Techniques and AASHTO Specifications. Auger holes are drilled with a 4-1/2 inch continuous flight auger. Penetration and Push Test holes are drilled with a 6-5/8 inch continuous hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples. Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil. Corings with the SDDOT drive rig are performed by using a California retractable plug sampler, which is driven with a 490 pound hammer. The drill stem is P.K. rod, which is 2-7/8 inch O.D., and 2 inch nominal diameter cores are obtained. All laboratory tests are performed in accordance with standard AASHTO or SDDOT laboratory procedures.

RECOMMENDATIONS:

Abutments:

I. Steel HP10 X 42 Piling

A. A LRFD maximum factored pile bearing resistance of 77 tons can be used for design.

B. The anticipated tip elevations are:

Station	Elevation
22+06	1910
25+27	1892

C. The nominal pile bearing resistance shall be 192 tons verified by the SDDOT's Modified ENR formula.

Bents:

I. Drilled Shafts

A. A LRFD maximum factored resistance value of 2,800 psf can be used for design below elevation 1912 ft. or maximum scour whichever is lower.

B. Permanent casings will be required to elevation 1915 ft.

C. The point of fixity within the bedrock can be assumed to be the elevation 1912 ft.

DISCUSSION:

The proposed structure location is underlain by brown sand-silt (alluvium) overlying brown silt-sand with gravel (alluvium). The alluvial sediments rest upon gray silt-clay (Pierre Shale). The D50 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 0.06 mm, 1.0 mm, and 0.004 mm. The D95 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 1.0 mm, 6.0 mm, and 0.06 mm.

Steel HP10X42 piling along with the anticipated tip elevations, are listed in the recommendations for use in the abutments. Drilled Shafts are listed in the recommendations for use at the bents.

The piling were evaluated for drivability and group effects at the LRFD Strength Limit State. Settlement of the substructure units and horizontal movement of the abutment piling were evaluated at the LRFD Service Limit State.

Drivability –

A drivability analysis was performed for the steel HP10X42 piling using the wave equation analysis program (GRLWEAP). A group of pile hammers that were evaluated and found to produce acceptable driving stresses is listed later in this report for inclusion in the plans.

Pile Group Effects:

Axial Loading –
Abutments
For a single row of piling, AASHTO requires the center-to-center pile spacing to be at least 30" or 2.5 times the width of the pile, whichever is greater. Therefore, for the steel HP10x42 piling at the abutment the center-to-center spacing shall be at least 30".

Settlement –
The steel pile tips will be founded in the Pierre Shale. Unconfined compression test results of the Pierre Shale exceed the proposed bridge loadings. Past experience for piling driven into hard shale soil bedrocks has shown little, if any, settlement has occurred. Therefore, 1/4 inch or less of total settlement can be used to design the substructure units.

Horizontal Movement –
AASHTO states that if the center-to-center spacing of the piling in the substructure unit is greater than 5 times the width of the pile then group effects can be ignored. Therefore, if the designed spacing is greater than 5 times the pile width a group efficiency factor of 1.0 can be used with no reduction in pile loading required. If this minimum pile spacing is not met a reduction factor will need to be calculated according to the AASHTO code.

Horizontal movement at the substructure units can be calculated using the following soil parameters:

Sand-silt (alluvium); phi angle = 24 degrees, cohesion = 50 psf, wet unit weight = 118 pcf
Silt-sand with gravel (alluvium); phi angle = 32 degrees, cohesion = 0 psf, wet unit weight = 130 pcf
Silt-clay (Pierre Shale); phi angle = 18 degrees, cohesion = 1,000 psf, wet unit weight = 130 pcf

For the drilled shafts, a LRFD maximum factored resistance value (skin friction) of 2,800 psf is recommended below elevation 1912 for the bents or maximum scour whichever is lower. The point of fixity within the bedrock can be assumed to be 1912 for the bents.

Each drilled shaft shall have a minimum of 3 access tubes for a shaft diameter of 3.0' and less. The number of access tubes needed shall be increased by 1 for each foot increase in shaft diameter above the 3.0'. The access tubes shall be furnished and installed according to the South Dakota Department of Transportation's 2004 Standard Specifications for Roads and Bridges. These access tubes shall be equally spaced in the shaft reinforcement prior to placing the reinforcement cage.

A representative of the CONSULTING FIRM (NAME AND NUMBER) shall be present during drilling operations to confirm the elevations provided in this report and to observe the placement of the drilled shafts. In addition to the notes below, contact the CONSULTANT REPRESENTATIVE for the most current drilled shaft construction notes to be included in the plans.

<u>The following notes shall be placed in the plans</u>:

A drivability analysis was performed using the wave equation analysis program (GRLWEAP). The pile hammers listed below were evaluated and found to produce acceptable driving stresses. Pile hammers not listed will require evaluation and approval prior to use from the CONSULTANT REPRESENTATIVE NAME AND PHONE NUMBER.

Hammers need to be sized according to site specific soil parameters and structure design requirements. The following list of hammers is owned and readily available by contractors that do work in SD. Select and specify in the report which hammers are acceptable for use on individual projects.

ICE 180	Delmag D12-42	FEC 1500	Delmag D16-32	Delmag D19-32
Delmag D19-42	MVE M-19	ICE 42S	MKT DE 42/35	APE D19-42
Delmag D25-32	Delmag D30-32	SPI D30	Delmag D46-32	

Hole Number	T2	
Station	21+93	
Depth	9.0	ft
Soil Color	Brown	
Classification	Sand-Clay	
Strength (Q_u)	855.3	psf
Dry Density	83.6	pcf
Wet Density	95.6	pcf
Moisture	14.8	%
Pass No. 10	84.4	%
Pass No. 40	76.2	%
Pass No. 200	61.9	%
Sand Content	22.6	%
Silt Content	23.8	%
Clay Content	38.8	%

Hole Number	T3	
Station	23+02	
Depth	9.7	ft
Soil Color	Brown	
Classification	Silt	
Strength (Q_u)	——	psf
Dry Density	81.7	pcf
Wet Density	91.8	pcf
Moisture	12.3	%
Pass No. 10	99.9	%
Pass No. 40	97.1	%
Pass No. 200	55.1	%
Sand Content	44.8	%
Silt Content	45.1	%
Clay Content	10.0	%

Hole Number	T3	
Station	23+02	
Depth	17.0	ft
Soil Color	Brown	
Classification	Sand	
Strength (Q_u)	——	psf
Dry Density	97.8	pcf
Wet Density	107.0	pcf
Moisture	9.4	%
Pass No. 10	95.2	%
Pass No. 40	74.9	%
Pass No. 200	9.9	%
Sand Content	85.3	%
Silt Content	9.9	%
Clay Content	0.0	%

Hole Number	T11	
Station	21+87	
Depth	23.8	ft
Soil Color	Gray	
Classification	Clay	
Strength (Q_u)	33.490	psf
Dry Density	116.9	pcf
Wet Density	136.6	pcf
Moisture	16.8	%
Pass No. 10	99.8	%
Pass No. 40	99.7	%
Pass No. 200	96.9	%
Sand Content	3.8	%
Silt Content	41.1	%
Clay Content	55.9	%

Hole Number	T12	
Station	25+89	
Depth	37.8	ft
Soil Color	Gray	
Classification	Clay	
Strength (Q_u)	43.240	psf
Dry Density	112.5	pcf
Wet Density	133.3	pcf
Moisture	18.5	%
Pass No. 10	99.8	%
Pass No. 40	99.8	%
Pass No. 200	99.5	%
Sand Content	0.5	%
Silt Content	39.6	%
Clay Content	59.9	%

Pierre Shale is a marine shale with a textural classification that varies from silt-clay to clay-silt. Color varies from buff gray to black. The formation may contain concretion zones that are normally thin but occasionally are massive. These zones may be considered hard and dense. Thin zones may be present that are cemented resulting in claystone or siltstone seams. Bentonite zones may be encountered but are normally less than one half inch thick. Nonweathered Pierre Shale is considered to be "Soft Rock".

STATE OF S.D.	PROJECT	SHEET NO.	TOTAL SHEETS

Plotting Date: 03/26/2013

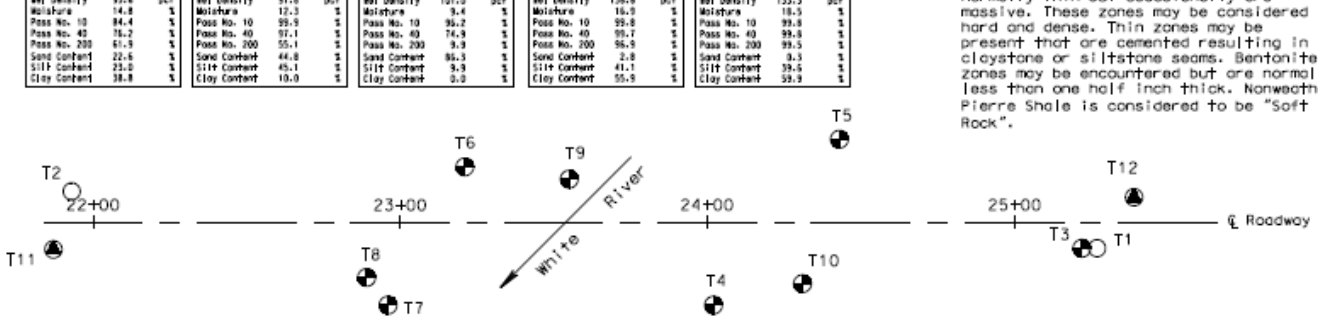
The Geotechnical Engineering Activity has on file all of the boring logs for this project. These logs and additional results of laboratory test, if any, are available for review at the Central Office in Pierre.

LEGEND

- Auger Test
- Drive Test
- Water
- Caved
- Penetration Test
- Sample Zone

Drive test are conducted by dropping a 490 pound hammer 30 inches to drive a 2 7/8 inch drill stem with attached retractable plug sampler for taking samples and to measure the resistance to penetration of the soil.

Auger holes are drilled with a 4 1/2 inch diameter continuous flight auger. Penetration and Push Test holes are drilled with a 6 5/8 inch diameter hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples.

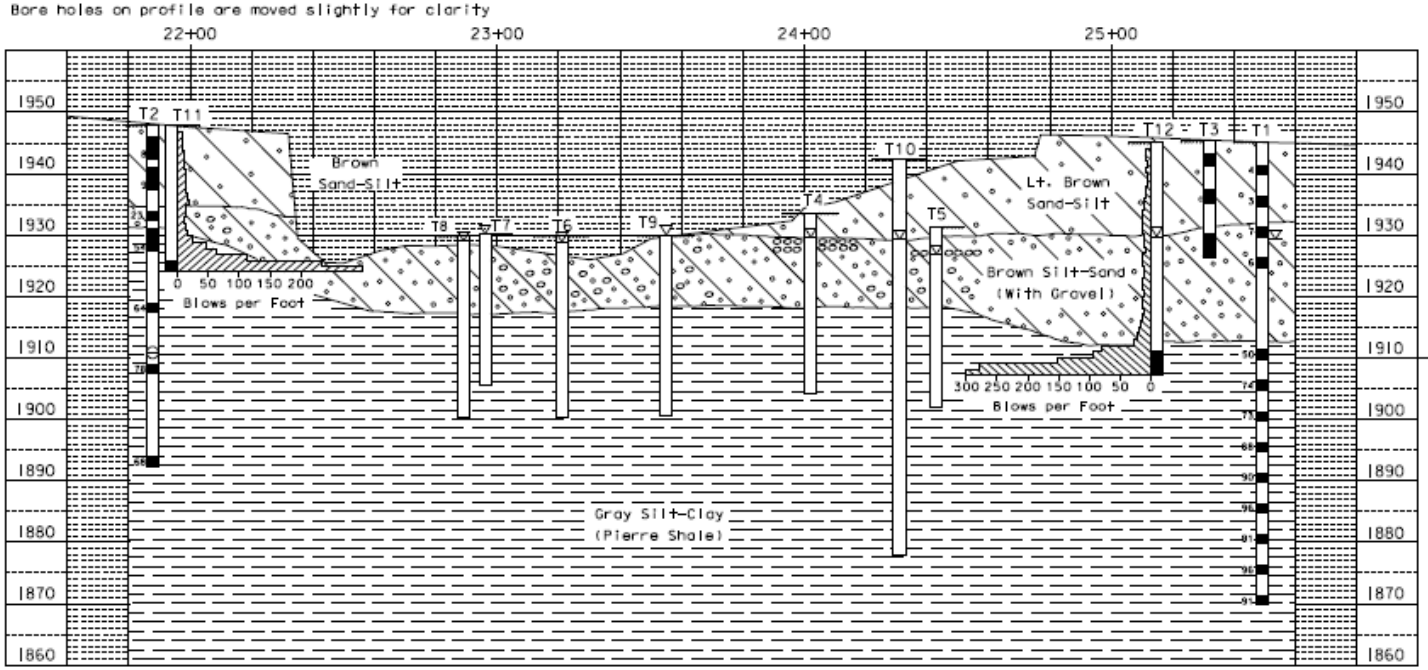


* Values represent uncorrected "N" values from Penetration Test.

Sample Zone 48 Blows Per Foot

Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil.

Bore holes on profile are moved slightly for clarity



GROUND WATER ELEVATIONS

as of December 2012

T1	(Caved) 1931.3
T2	(Caved) 1910.9
T3	Dry
T4	1929.7
T5	1926.9
T6	1928.9
T7	1930.2
T8	1929.1
T9	1930.0
T10	1929.3
T11	Dry
T12	1929.8

MEASURED SKIN FRICTION

	Elev	psf
T11	1924.0	2.193
T12	1907.3	1.214

BRO 8048(03) MELLETTE COUNTY PCN 02DY
18.9 MILES N. AND 0.8 MILES W. OF CEDAR BUTTE
SECTION 28 TOWNSHIP 45 N. RANGE 31 W.
OVER WHITE RIVER
STR. NO. 48-102-010

SITE PLAN & SUBSURFACE PROFILE

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	NN	JW	BRIDGE ENGINEER

PLOT SCALE - 1:20

PLOTTED FROM - TRPR18174

FILE - ...\SUBSURFACE PROFILE\02DY.DGN

RECOMMENDATIONS

EXAMPLE 4

Re: BRO 8027(29), Gregory County, PCN 00QR
Str. No. 27-030-081, located 2.0 West & 0.1 South of the Jct of SD44/SD47
RCBC Undercut Recommendation

Soils maps of the area indicate the soils at the location of the proposed structure have the following characteristics.

Station 16+86 (Str. No. 27-030-081)

CLASSIFICATION: A-7
Clay & Silty Clay
AVERAGE LIQUID LIMIT: 66
SHRINK-SWELL POTENTIAL: High to Very High
FROST ACTION POTENTIAL: Low
CORROSIVITY: High for steel, Low to Moderate for concrete

RECOMMENDATIONS:

Provide 24 inches of undercut and backfill.

DISCUSSION:

The project consists of replacing an existing single span 22' steel stringer bridge with a 2 barrel 13' x 6' cast-in-place RCBC. The proposed box culvert will be in the same location as the existing bridge location. The existing surfacing on the road is gravel and will be resurfaced with gravel upon completion. Minimal grading at the proposed box culvert location is anticipated, therefore, the material shall be compacted using the Ordinary Compaction Method.

A subsurface investigation was conducted for the proposed RCBC. The subsurface investigation consisted of placing a boring near both the proposed inlet and outlet ends of the structure and logging the material to 3 feet below the flow line. Samples were collected from below the flow line for soils classification. A dynamic cone penetrometer was used at both the inlet and outlet ends to identify the change in relative density of the subsurface material below flow line.

Subsurface soils at the proposed site consist of brown silt-clay to 3' below the existing flow line.

The 2' undercut depth is recommended to remove the low strength soils with high shrink-swell potential from below the box culvert.

The following paragraphs shall be placed in the plans:

Compaction of earth embankment and box culvert backfill material shall be governed by the Ordinary Compaction Method.

Any questions about the recommendations or the subsurface conditions can be directed to the CONSULTANT CONTACT NAME AND PHONE NUMBER.

ABC ENGINEERING
Street Address
City, State, ZIP
PHONE / FAX

Example of Preliminary Survey/Hydraulics Executive Summary Cover Letter

DATE

ADDRESS BLOCK

RE: BR_ ###(00), COUNTY, PCN
STRUCTURE NUMBER, LOCATION

Dear NAME:

In accordance with the requirements of the Department of Transportation, we have considered three appropriate and feasible structure types for the referenced project. Alternatives include an 82'-0" single span berm type bridge (45M prestressed girders assumed), a 4-10'x10'x80' reinforced concrete box culvert with 30º flared wings at the inlet and 0º at the outlet and a 4-11'x10'x80' precast concrete box culvert with precast sloped end sections (0º flared wings). The 4 barrel precast box was assumed to be comprised of 2-double cell structures. All structures are proposed to be built at a normal skew to roadway. The box culverts flowline was assumed to be lowered 12" below stream flowline as called for in the US Army Corps of Engineers 2012 Regional Conditions for aquatic organisms.

We propose 700 ft. of grading on this project to provide for a 55 mph design speed sag-type vertical curve. We assumed a 30 ft. clear roadway bridge and a 26 ft. top of surfacing width in determining culvert lengths and hydraulics.

The 45M section girder and 82'-0" bridge would provide for approximately 1.2 ft. of freeboard for the 100-year runoff event, match the 25-year headwater of the existing bridge and reduce the 100-year headwater from existing conditions by 2.1 ft. Both culvert options raised the 25-year headwater by 0.1 ft. when compared to existing and raised the 100-year headwater by 0.3 ft. over existing. The proposed bridge centerline is being shifted south from existing to better align the south bridge berm with the existing channel bank. The centerlines of both boxes were shifted slightly to better align with the creek.

Enclosed are the Preliminary Hydraulic Data Sheet and Layout, plan and profile sheets for the three options, Drainage Data Sheet, contour map with cross sections, a CD with photos, Historical Records Search and Drainage Memo.

Please let us know if there are any questions or if further information is required.

Sincerely,
ABC ENGINEERING

NAME
TITLE

Enclosures
cc: File

HYDRAULIC DATA SHEET

County _____ Project No. _____ PCN _____ Sec. _____ Township _____ Range _____
Station 23+41.8 Over North Branch of CREEK Drainage Area 52.3 Sq. Mi. Direction of Flow East
Preliminary X Final _____ Q-Design Yr. Frequency 25-year Observed H.W. Elev 1283.1
STRUCTURE NO. ##-###-### LOCATION LOCATION

Cross Section	Qd. cfs	W.W. Area sq.ft.	V fps	So. ft./ft.	Bottom Structure	Bottom Ch.	H.W. ft.	dn ft.	C.L. FL Elev.	D.H.W. Elev. Culv. Inlet	D.H.W. Elev. Bridge	Ch Ch	Degree Skew
Trapezoid 2:1 S:S	1979	335	5.9	.0018		Natural		8.1	1273.18*		1281.8	No**	0º
Rectangle II	1979	330	6.0	.0018	4B=40'		8.7	8.3	1273.18*	1281.9		No**	0º
Rectangle III	1979	360	5.5	.0018	4B=44'		8.7	8.3	1273.18*	1281.9		No**	0º

Type: I. Berm Type Bridge II. RCBC w/30º Flared Wing walls at Inlet and 0º Flared at Outlet III. Precast CBC with 0º Flared Wing walls at Inlet and Outlet

Size: I. 82.0 ft. (single span with 45 M Section) II. 4-10'x10' (effective opening 4-10'x9') III. 4-11'x10' (effective opening 4-11'x9')

Proposed Location I. Center at Sta. 23+26, berm toes located at Sta. 23+12± (elev. 1274.0) & Sta. 23+40 ± (Elev. 1274.0) II. Center at Sta. 23+37 III. Center at Sta. 23+37

Notes or Remarks: Discharges were obtained from Methods Outlined in Water Resources Report 98-4055 for ungaged sites near a gaging station on the same stream. Stream gage # 06478260 for years of record from 1956-1978. Q_2 = 91 cfs; Q_{25} = 1979 cfs; Q_{100} = 4997 cfs; Q_{500} = 11,811 cfs. Structure width and flowline elevation for the box culvert options meet the criteria called for in the US Army Corp. of Engineers 2012 Regional Conditions for aquatic organisms.

INPLACE CONDITIONS: Q_2 Elev. = 1275.0, HW_{25} = 1281.8, HW_{100} = 1286.9 *** Overtop Freq. = Q_{85} = 4500 cfs, V_{max} = V_{85} = 9.1 fps

PROPOSED CONDITIONS: I. Q_2 Elev. = 1274.9, V_2 = 2.8 fps, HW_{100} = 1284.8, ***Overtop Freq. = Q_{274} = 8000 cfs, V_{max} = V_{100} = 11.7 fps II. Q_2 Elev. = 1274.4, (Q_2 Depth =1.1 ft. and V_2 = 2.1 fps at culvert outlet), HW_{100} = 1287.2, ***Overtop Freq. = Q_{185} = 6450 cfs, V_{max} = V_{100} = 13.9 fps III. Q_2 Elev. = 1274.4, (Q_2 Depth =1.1 ft. and V_2 = 1.9 fps at culvert outlet), HW_{100} = 1287.2, ***Overtop Freq. = Q_{180} = 6400 cfs, V_{max} = V_{100} = 12.6 fps

Additional Remarks:

*Elevation of the Stream flowline at the centerline of the proposed roadway. The box culvert flowline has been lowered 12" below stream flowline and this embedded depth is assumed to not convey any water.

**Minor channel shaping will be required at channel inlet and outlet.

***The existing roadway overtops at Elev. 1286.23 near Sta. 23+75 and the proposed gradeline overtops at Elev. 1290.8 at Sta. 23+50.

Δ Hutchinson County is participating in NFIP.

♦ The area is not mapped and is considered NSFHA (No Special Flood Hazard Area)

PRELIMINARY _X__ FINAL ____ SCOUR RECOMMENDATIONS: I. Riprap will be required on both bridge berms. Foundation Report has not been received. Contraction Scour for proposed bridge is estimated at 6.0 ft. for the 100 year event. Scour estimate is based on assumed D_{50} = .2mm. II & III. Provide 33 in. thick Class B riprap on newly graded 2:1 bank slopes from elev. 1280.0 down to culvert Flowline and across channel at outlet. Extend riprap 18.0 ft. downstream of wings. Provide Type B drainage fabric beneath all riprap. Natural Stream bed material will not need to be placed over riprap and culvert invert.

Vertical Datum Used: NAVD 88: X NGVD 29: _____ Unknown: _____
Topeka Shiner Stream: Yes X No _____
Community Participating in NFIP Program: Yes X Δ No _____
Site in Identified NFIP Floodplain: Yes _____ No X ♦

Prepared by: *Signature*
Date: DATE
Checked by: *Signature*
Date: DATE

PRELIMINARY HYDRAULIC DATA LAYOUT

To Define the Minimum Channel Configuration at Bridge

Project BR _ #### (00)

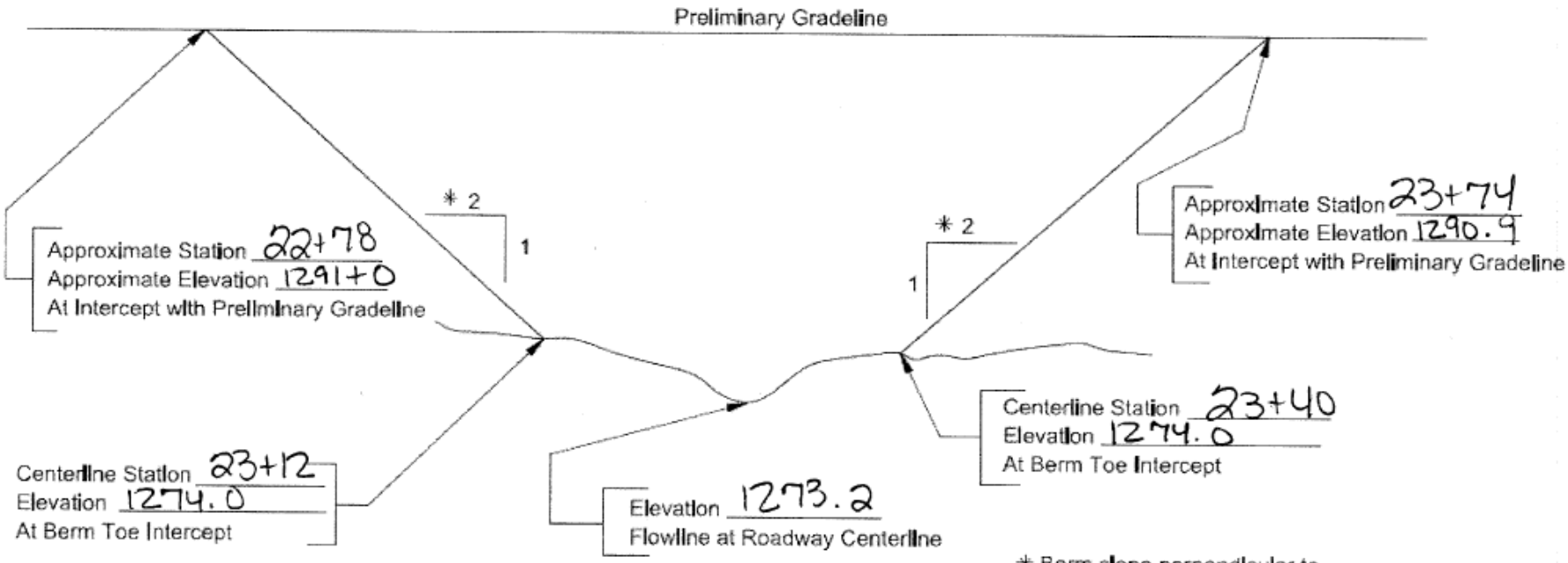
County

PCN

Station 23+26

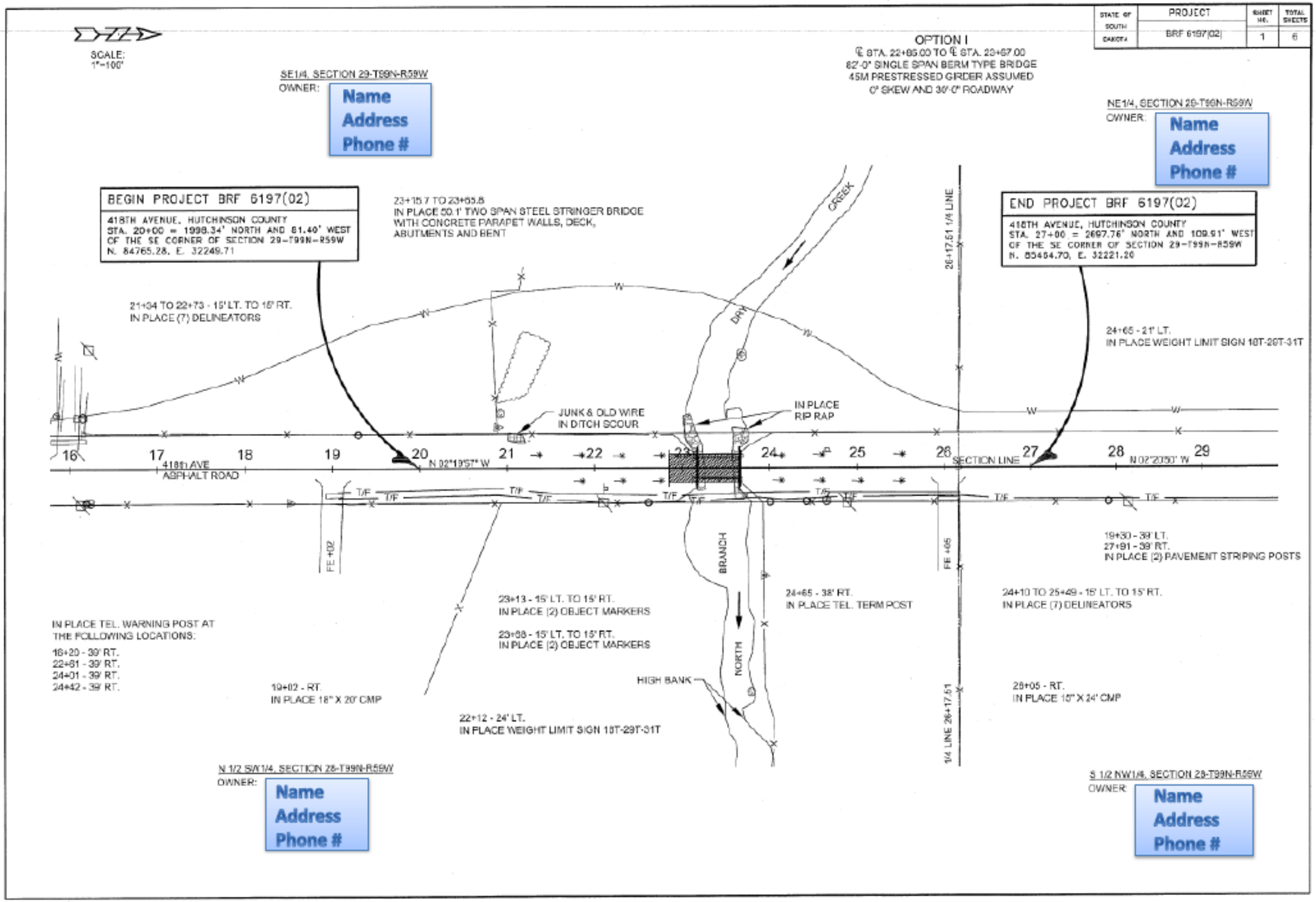
Skew 0°

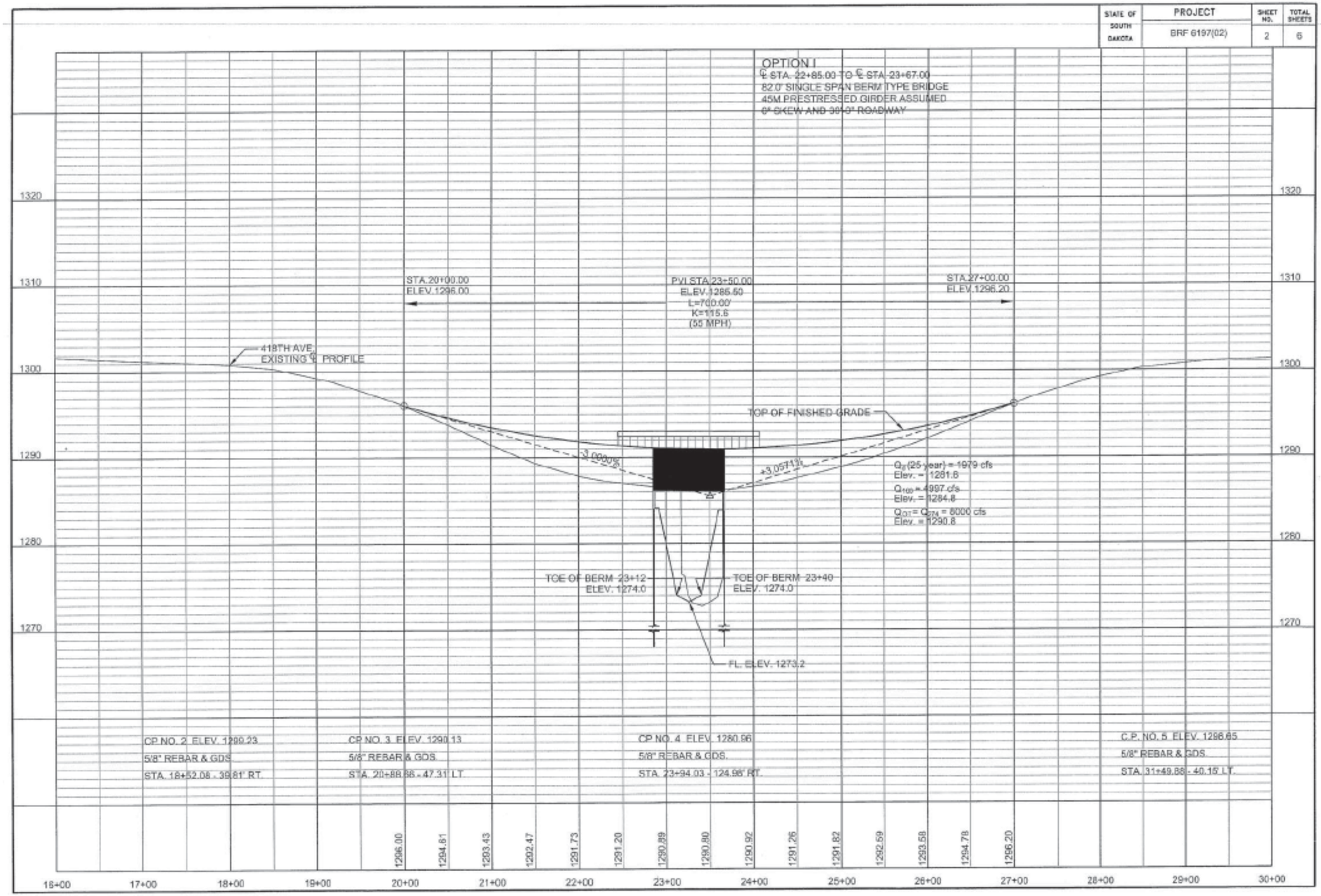
Date Prepared DATE



* Berm slope perpendicular to channel centerline. If bridge is skewed, berm slope must be adjusted to meet skew.

This idealized drawing is not to scale.
See project roadway profile for more details.


STATE OF SOUTH DAKOTA
PROJECT
BRF 6197(02)
SHEET NO.
1
TOTAL SHEETS
6
SCALE:
1"=100'
OPTION I
℄ STA. 22+85.00 TO ℄ STA. 23+67.00
62'-0" SINGLE SPAN BERM TYPE BRIDGE
45M PRESTRESSED GIRDER ASSUMED
0° SKEW AND 30'-0" ROADWAY
SE1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
NE1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
BEGIN PROJECT BRF 6197(02)
418TH AVENUE, HUTCHINSON COUNTY
STA. 20+00 = 1998.34' NORTH AND 81.40' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 84765.28, E. 32249.71
END PROJECT BRF 6197(02)
418TH AVENUE, HUTCHINSON COUNTY
STA. 27+00 = 2697.76' NORTH AND 109.91' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 85454.70, E. 32221.20
23+15.7 TO 23+65.8
IN PLACE 50.1' TWO SPAN STEEL STRINGER BRIDGE
WITH CONCRETE PARAPET WALLS, DECK,
ABUTMENTS AND BENT
21+34 TO 22+73 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS
24+65 - 21' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T
JUNK & OLD WIRE
IN DITCH SCOUR
IN PLACE
RIP RAP
CREEK
BRY
26+17.51 1/4 LINE
16
17
18
19
20
N 02°19'57" W
21
22
23
24
25
26
SECTION LINE
27
28
N 02°20'50" W
29
418th AVE
ASPHALT ROAD
T/F
FE +02
FE +05
BRANCH
NORTH
19+30 - 39' LT.
27+91 - 39' RT.
IN PLACE (2) PAVEMENT STRIPING POSTS
23+13 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS
23+68 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS
24+65 - 38' RT.
IN PLACE TEL. TERM POST
24+10 TO 25+49 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS
IN PLACE TEL. WARNING POST AT
THE FOLLOWING LOCATIONS:
16+20 - 39' RT.
22+81 - 39' RT.
24+01 - 39' RT.
24+42 - 39' RT.
19+02 - RT.
IN PLACE 18" X 20' CMP
HIGH BANK
22+12 - 24' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T
26+05 - RT.
IN PLACE 15" X 24' CMP
1/4 LINE 26+17.51
N 1/2 SW1/4, SECTION 28-T99N-R59W
OWNER:
Name
Address
Phone #
S 1/2 NW1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #


STATE OF SOUTH DAKOTA
PROJECT
BRF 6197(02)
SHEET NO.
2
TOTAL SHEETS
6
OPTION I
℄ STA. 22+85.00 TO ℄ STA. 23+67.00
82.0' SINGLE SPAN BERM TYPE BRIDGE
45M PRESTRESSED GIRDER ASSUMED
0° SKEW AND 30'-0" ROADWAY
STA.20+00.00
ELEV.1296.00
PVI STA 23+50.00
ELEV.1285.50
L=700.00'
K=115.6
(55 MPH)
STA.27+00.00
ELEV.1296.20
418TH AVE.
EXISTING ℄ PROFILE
TOP OF FINISHED GRADE
-3.000%
+3.057143%
Q25 (25 year) = 1979 cfs
Elev. = 1281.6
Q100 = 4997 cfs
Elev. = 1284.8
Q0.1 = Q0.4 = 8000 cfs
Elev. = 1290.8
TOE OF BERM 23+12
ELEV. 1274.0
TOE OF BERM 23+40
ELEV. 1274.0
FL. ELEV. 1273.2
CP NO. 2 ELEV. 1299.23
5/8" REBAR & GDS
STA. 18+52.08 - 39.81' RT.
CP NO. 3 ELEV. 1290.13
5/8" REBAR & GDS
STA. 20+88.86 - 47.31' LT.
CP NO. 4 ELEV. 1280.96
5/8" REBAR & GDS.
STA. 23+94.03 - 124.98' RT.
C.P. NO. 5 ELEV. 1296.65
5/8" REBAR & GDS.
STA. 31+49.88 - 40.15' LT.
1320
1310
1300
1290
1280
1270
1296.00
1294.61
1293.43
1292.47
1291.73
1291.20
1290.89
1290.80
1290.92
1291.26
1291.82
1292.59
1293.58
1294.78
1296.20
16+00
17+00
18+00
19+00
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22+00
23+00
24+00
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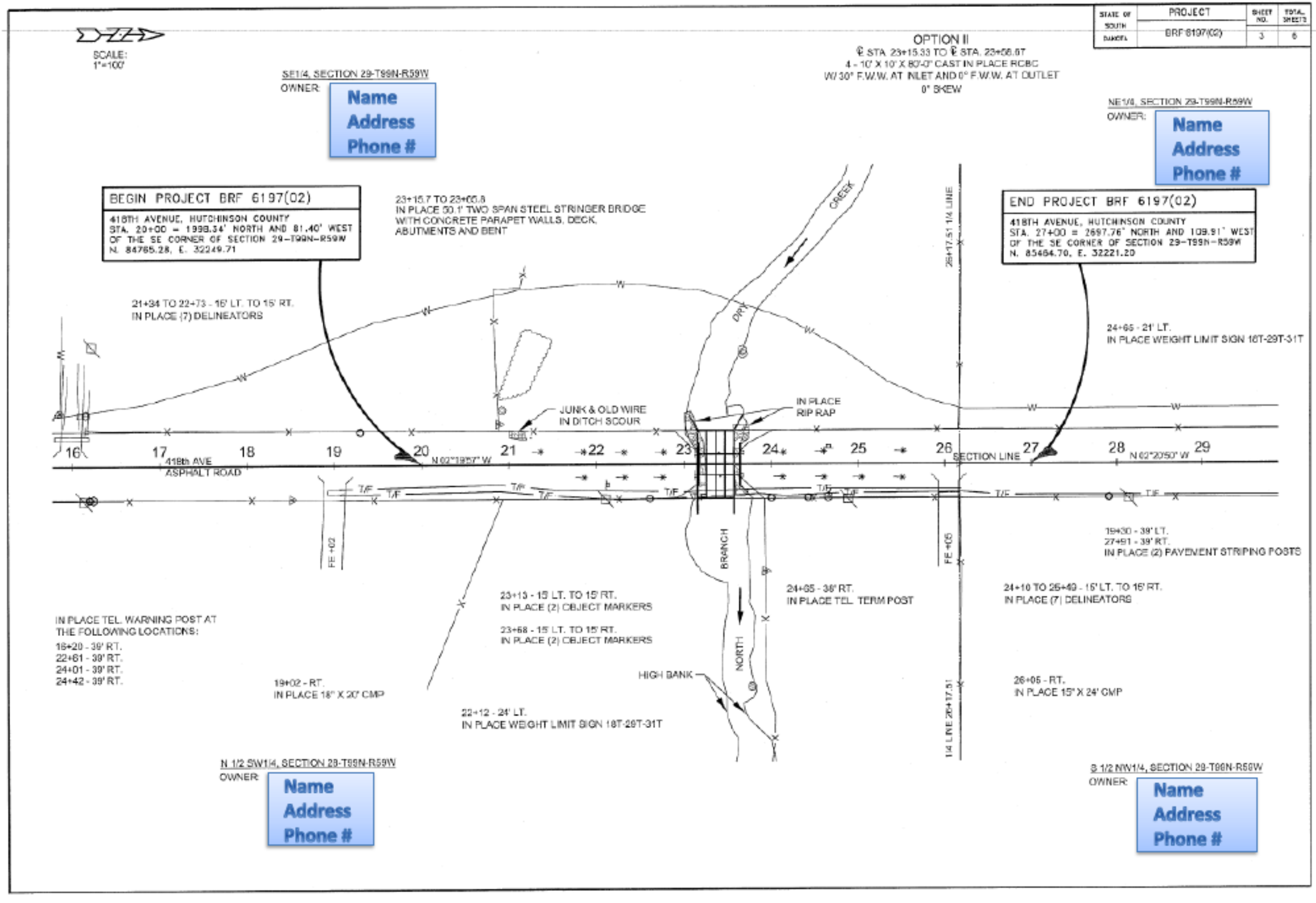
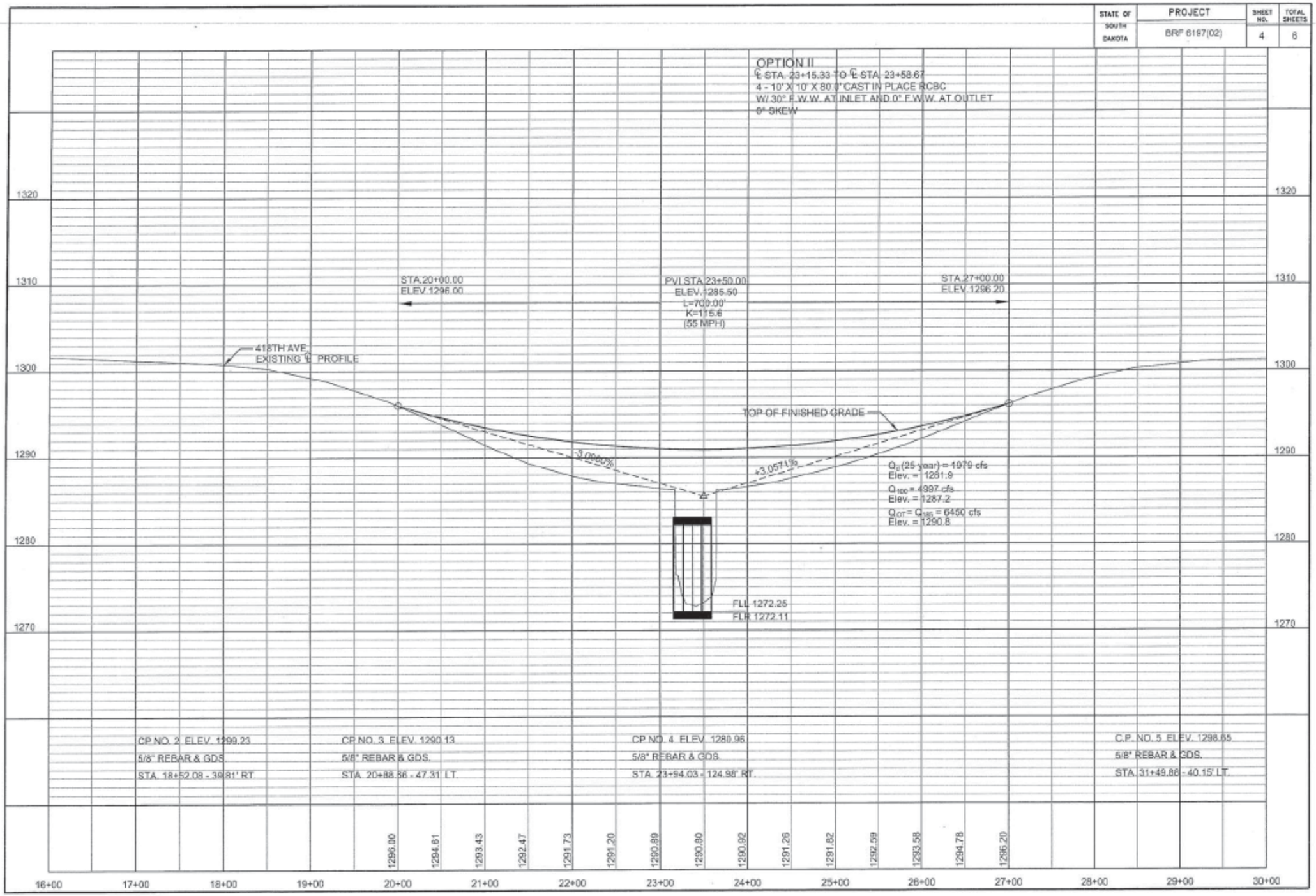
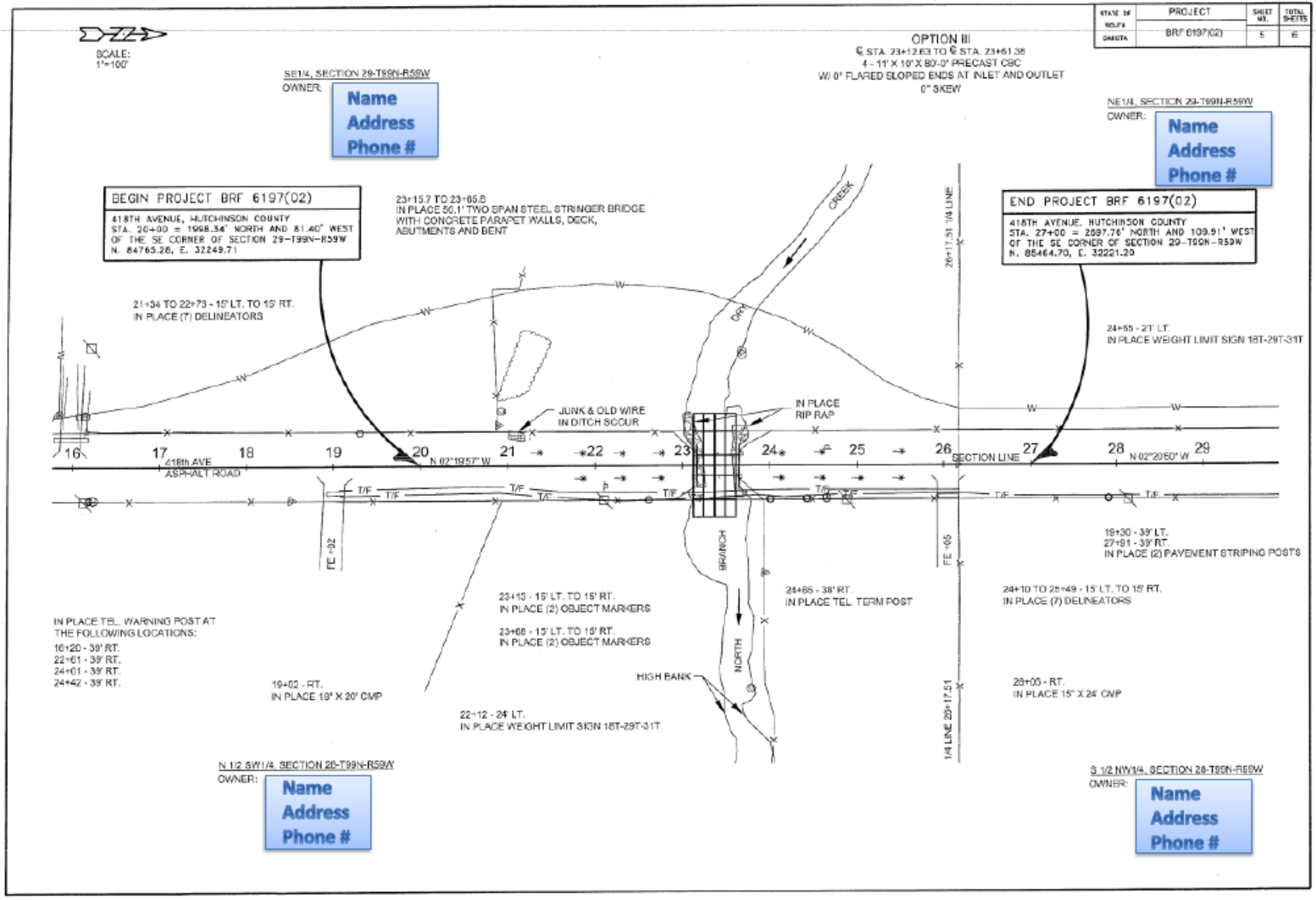
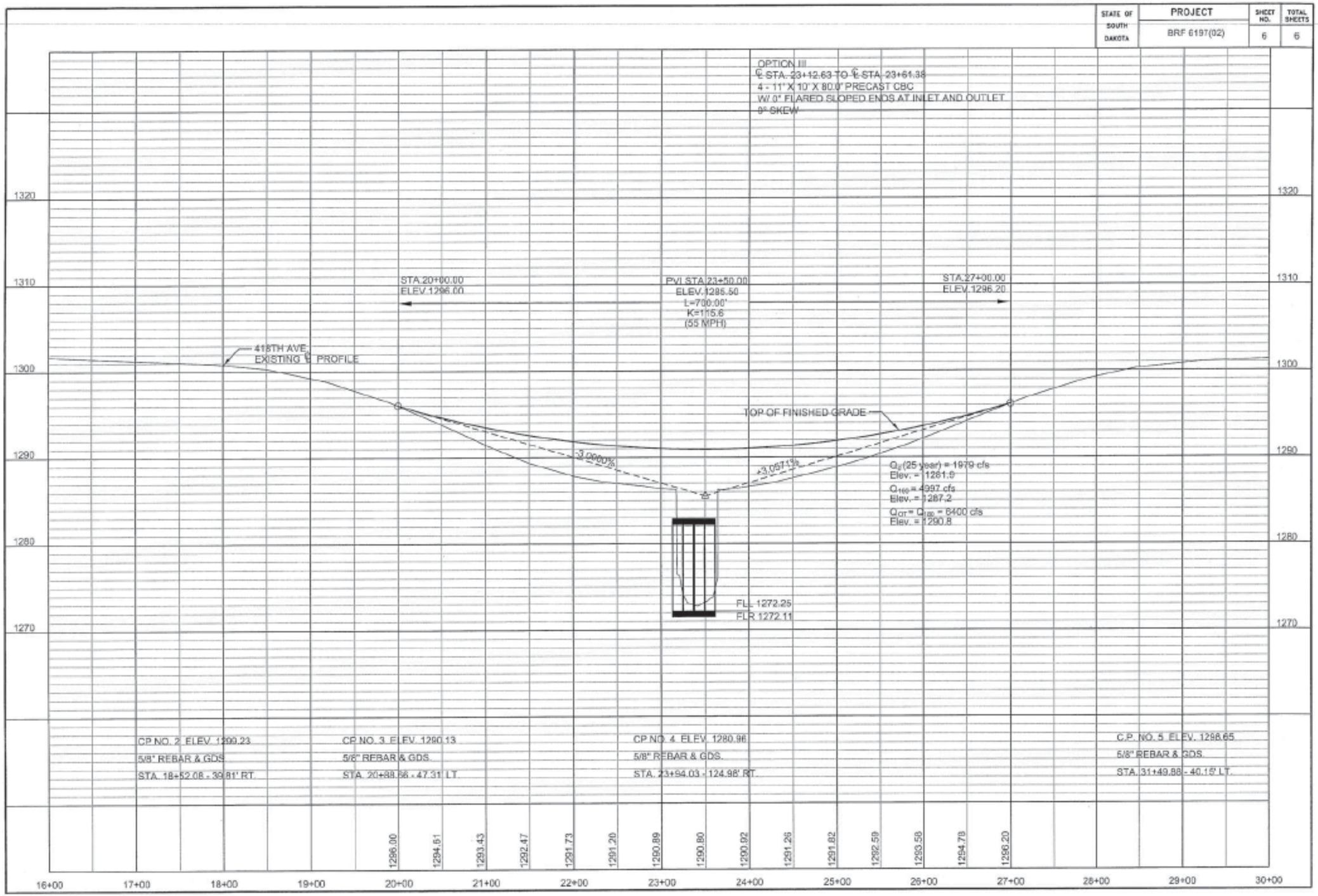
26+00
27+00
28+00
29+00
30+00


STATE OF SOUTH DAKOTA
PROJECT
BRF 6197(02)
SHEET NO. 3
TOTAL SHEETS 6
SCALE: 1"=100'
OPTION II
℄ STA. 23+15.33 TO ℄ STA. 23+66.67
4 - 10' X 10' X 80'-0" CAST IN PLACE RCBC
W/ 30° F.W.W. AT INLET AND 0° F.W.W. AT OUTLET
0° SKEW
SE1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
NE1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
BEGIN PROJECT BRF 6197(02)
418TH AVENUE, HUTCHINSON COUNTY
STA. 20+00 = 1998.34' NORTH AND 81.40' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 84765.28, E. 32249.71
23+15.7 TO 23+66.8
IN PLACE 50.1' TWO SPAN STEEL STRINGER BRIDGE
WITH CONCRETE PARAPET WALLS, DECK,
ABUTMENTS AND BENT
END PROJECT BRF 6197(02)
418TH AVENUE, HUTCHINSON COUNTY
STA. 27+00 = 2697.76' NORTH AND 109.91' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 85464.70, E. 32221.20
21+34 TO 22+73 - 16' LT. TO 15' RT.
IN PLACE (7) DELINEATORS
24+65 - 21' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T
JUNK & OLD WIRE
IN DITCH SCOUR
IN PLACE
RIP RAP
CREEK
DRY
25+17.51 1/4 LINE
16
17
418th AVE
ASPHALT ROAD
18
19
20
N 02°19'57" W
21
22
23
24
25
26
SECTION LINE
27
28
N 02°20'50" W
29
T/F
FE +02
BRANCH
NORTH
FE +05
19+30 - 39' LT.
27+91 - 39' RT.
IN PLACE (2) PAVEMENT STRIPING POSTS
23+13 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS
23+68 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS
24+65 - 36' RT.
IN PLACE TEL. TERM POST
24+10 TO 25+49 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS
IN PLACE TEL. WARNING POST AT
THE FOLLOWING LOCATIONS:
18+20 - 39' RT.
22+61 - 39' RT.
24+01 - 39' RT.
24+42 - 39' RT.
19+02 - RT.
IN PLACE 18" X 20' CMP
HIGH BANK
22+12 - 24' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T
26+05 - RT.
IN PLACE 15" X 24' CMP
1/4 LINE 26+17.51
N 1/2 SW1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
S 1/2 NW1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #


STATE OF SOUTH DAKOTA
PROJECT
BRF 6197(02)
SHEET NO.
4
TOTAL SHEETS
8
OPTION II
℄ STA. 23+15.33 TO ℄ STA. 23+58.67
4 - 10' X 10' X 80.0' CAST IN PLACE RCBC
W/ 30° F.W.W. AT INLET AND 0° F.W.W. AT OUTLET
0° SKEW
STA.20+00.00
ELEV.1296.00
PVI STA.23+50.00
ELEV.1285.50
L=700.00'
K=115.6
(55 MPH)
STA.27+00.00
ELEV.1296.20
418TH AVE.
EXISTING ℄ PROFILE
TOP OF FINISHED GRADE
-3.0000%
+3.0571%
Q25 (25 year) = 1979 cfs
Elev. = 1281.9
Q100 = 4997 cfs
Elev. = 1287.2
QOT = Q100 = 6450 cfs
Elev. = 1290.8
FLL 1272.25
FLR 1272.11
1320
1310
1300
1290
1280
1270
CP NO. 2 ELEV. 1299.23
5/8" REBAR & GDS.
STA. 18+52.08 - 39.81' RT.
CP NO. 3 ELEV. 1290.13
5/8" REBAR & GDS.
STA. 20+88.86 - 47.31' LT.
CP NO. 4 ELEV. 1280.95
5/8" REBAR & GDS.
STA. 23+94.03 - 124.98' RT.
C.P. NO. 5 ELEV. 1298.65
5/8" REBAR & GDS.
STA. 31+49.88 - 40.15' LT.
1296.00
1294.61
1293.43
1292.47
1291.73
1291.20
1290.89
1290.80
1290.92
1291.26
1291.82
1292.59
1293.58
1294.78
1296.20
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00


STATE OF SOUTH DAKOTA
PROJECT
BRF 6197(02)
SHEET NO. 5
TOTAL SHEETS 6
SCALE: 1"=100'
OPTION III
℄ STA. 23+12.63 TO ℄ STA. 23+61.38
4 - 11' X 10' X 80'-0" PRECAST CBC
W/ 0° FLARED SLOPED ENDS AT INLET AND OUTLET
0° SKEW
SE1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
NE1/4, SECTION 29-T99N-R59W
OWNER:
Name
Address
Phone #
BEGIN PROJECT BRF 6197(02)
418TH AVENUE, HUTCHINSON COUNTY
STA. 20+00 = 1998.34' NORTH AND 81.40' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 84765.28, E. 32249.71
23+15.7 TO 23+65.8
IN PLACE 50.1' TWO SPAN STEEL STRINGER BRIDGE
WITH CONCRETE PARAPET WALLS, DECK,
ABUTMENTS AND BENT
END PROJECT BRF 6197(02)
418TH AVENUE, HUTCHINSON COUNTY
STA. 27+00 = 2697.76' NORTH AND 109.91' WEST
OF THE SE CORNER OF SECTION 29-T99N-R59W
N. 85464.70, E. 32221.20
21+34 TO 22+73 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS
24+55 - 21' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T
CREEK
DRY
26+17.51 1/4 LINE
JUNK & OLD WIRE
IN DITCH SCOUR
IN PLACE
RIP RAP
16
17
418th AVE
ASPHALT ROAD
18
19
20
N 02°19'57" W
21
22
23
24
25
26
SECTION LINE
27
28
N 02°20'50" W
29
T/F
FE +02
BRIDGE
FE +05
19+30 - 39' LT.
27+91 - 39' RT.
IN PLACE (2) PAVEMENT STRIPING POSTS
23+13 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS
23+68 - 15' LT. TO 15' RT.
IN PLACE (2) OBJECT MARKERS
24+65 - 38' RT.
IN PLACE TEL. TERM POST
24+10 TO 25+49 - 15' LT. TO 15' RT.
IN PLACE (7) DELINEATORS
IN PLACE TEL. WARNING POST AT
THE FOLLOWING LOCATIONS:
16+20 - 39' RT.
22+61 - 39' RT.
24+01 - 39' RT.
24+42 - 39' RT.
NORTH
HIGH BANK
19+02 - RT.
IN PLACE 18" X 20' CMP
22+12 - 24' LT.
IN PLACE WEIGHT LIMIT SIGN 18T-29T-31T
1/4 LINE 26+17.51
26+05 - RT.
IN PLACE 15" X 24' CMP
N 1/2 SW1/4, SECTION 28-T99N-R59W
OWNER:
Name
Address
Phone #
S 1/2 NW1/4, SECTION 28-T99N-R59W
OWNER:
Name
Address
Phone #


STATE OF SOUTH DAKOTA
PROJECT
BRF 6197(02)
SHEET NO.
6
TOTAL SHEETS
6
OPTION III
℄ STA. 23+12.63 TO ℄ STA. 23+61.38
4 - 11' X 10' X 80.0' PRECAST CBC
W/ 0° FLARED SLOPED ENDS AT INLET AND OUTLET
0° SKEW
1320
1310
1300
1290
1280
1270
STA.20+00.00
ELEV.1296.00
PVI STA.23+50.00
ELEV.1285.50
L=700.00'
K=115.6
(55 MPH)
STA.27+00.00
ELEV.1296.20
418TH AVE
EXISTING ℄ PROFILE
TOP OF FINISHED GRADE
-3.000%
+3.057142%
Q25 (25 year) = 1979 cfs
Elev. = 1281.9
Q100 = 4997 cfs
Elev. = 1287.2
QOT = Q100 = 6400 cfs
Elev. = 1290.8
FL 1272.25
FLR 1272.11
CP NO. 2 ELEV. 1299.23
5/8" REBAR & GDS
STA. 18+52.08 - 39.81' RT.
CP NO. 3 ELEV. 1290.13
5/8" REBAR & GDS.
STA. 20+88.56 - 47.31' LT.
CP NO. 4 ELEV. 1280.96
5/8" REBAR & GDS.
STA. 23+94.03 - 124.98' RT.
C.P. NO. 5 ELEV. 1298.65
5/8" REBAR & GDS.
STA. 31+49.88 - 40.15' LT.
1296.00
1294.61
1293.43
1292.47
1291.73
1291.20
1290.89
1290.80
1290.92
1291.26
1291.82
1292.59
1293.58
1294.78
1296.20
16+00
17+00
18+00
19+00
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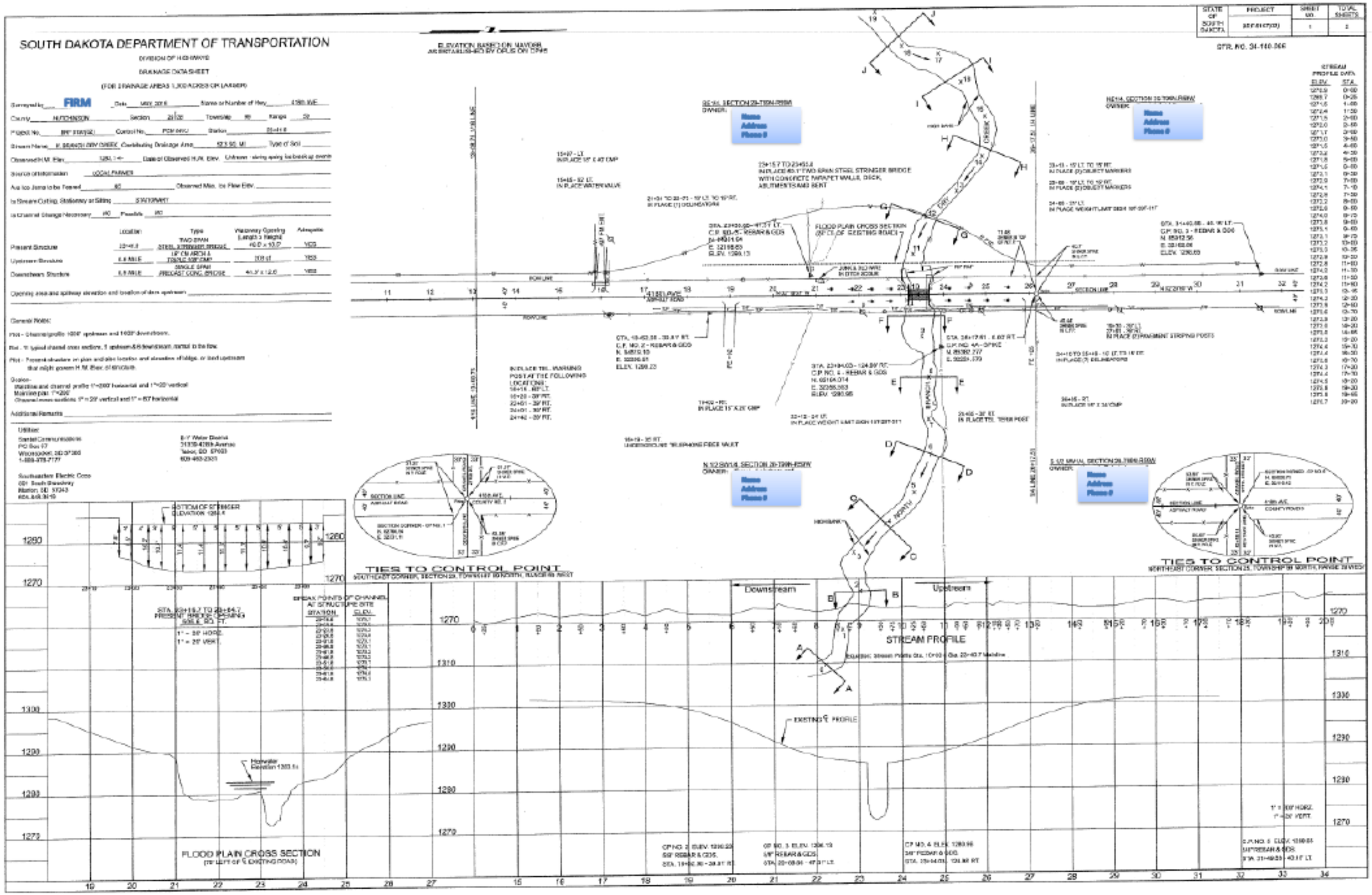
27+00
28+00
29+00
30+00


SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION
DRAINAGE DATA SHEET
FLOOD PLAIN CROSS SECTION
TIES TO CONTROL POINT
STREAM PROFILE
EXISTING ℄ PROFILE
Downstream
Upstream

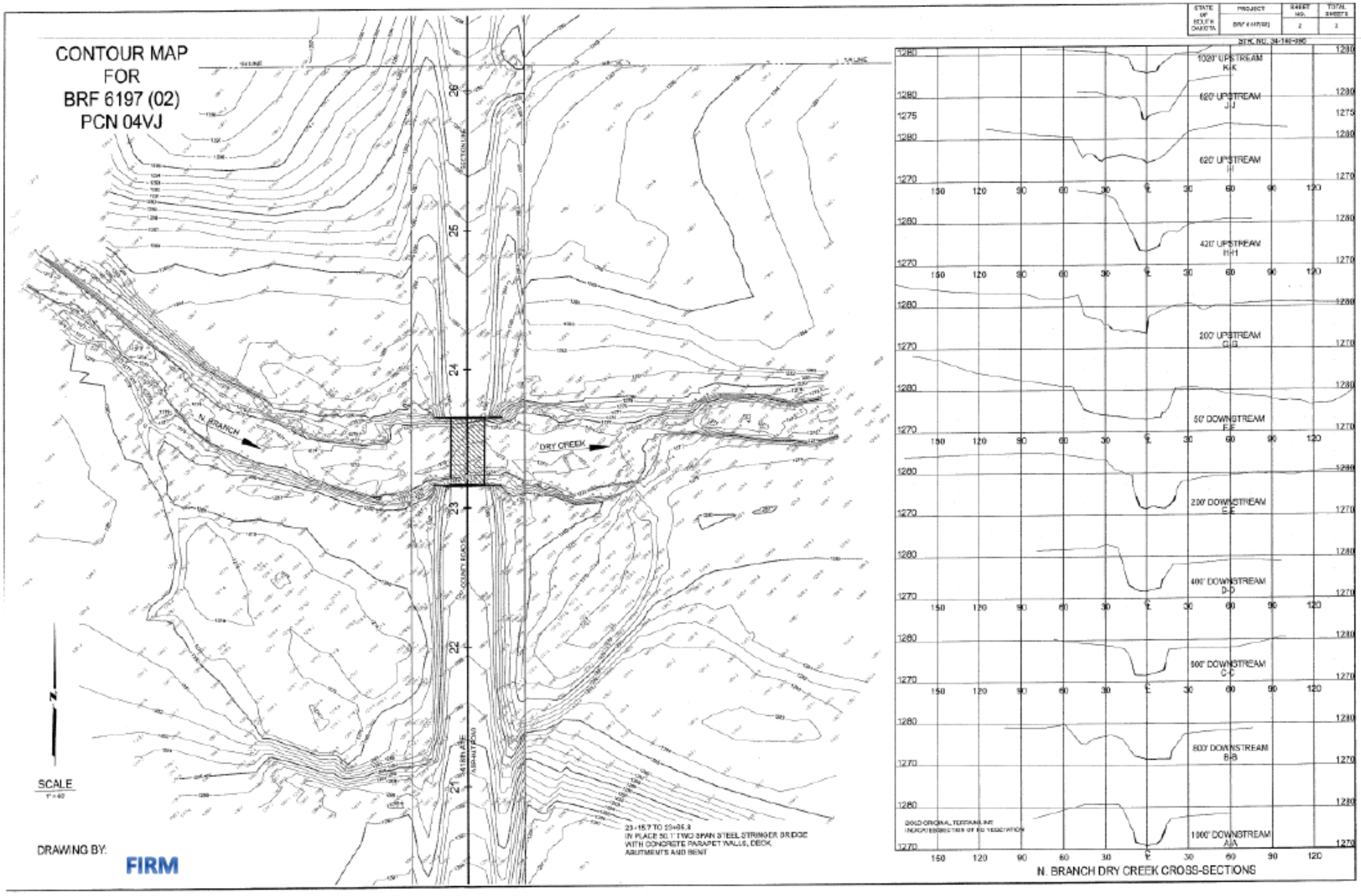

CONTOUR MAP
FOR
BRF 6197 (02)
PCN 04VJ
N. BRANCH
DRY CREEK
SCALE
DRAWING BY:
FIRM
23+15.7 TO 23+95.3
IN PLACE 50.1' TWO SPAN STEEL STRINGER BRIDGE
WITH CONCRETE PARAPET WALLS, DECK,
ABUTMENTS AND BENT
1020' UPSTREAM
KK
620' UPSTREAM
JJ
620' UPSTREAM
II
420' UPSTREAM
HH
200' UPSTREAM
GG
50' DOWNSTREAM
FF
200' DOWNSTREAM
EE
400' DOWNSTREAM
DD
600' DOWNSTREAM
CC
800' DOWNSTREAM
BB
1000' DOWNSTREAM
AA
N. BRANCH DRY CREEK CROSS-SECTIONS

Photo Documentation and Record Search for Hutchinson County Structure No. 34-140-096

The offices and individuals contacted include:

Hutchinson County Assessor	Tony Dewald	No Information
Hutchinson County Auditor	Diane Murtha	No Information
Hutchinson County Highway Superintendent	Joel Baumiller	Inspections Reports (We already had)
Hutchinson County Register of Deeds	Unknown	No Information
Hutchinson County Treasurer	Tamara Miller	No Information
Heritage Hall Museum (in Freeman)	Kelsey Ortman	No Information
Heritage Hall Archives (in Freeman)	Kelsey Ortman	No Information

The Hutchinson County Assessor, Tony Dewald, was contacted on May 25th, 2015 by Diane Murtha. Murtha reported that Dewald had not found any information regarding the structure.

The Hutchinson County Auditor, Diane Murtha, was contacted on May 6th, 2015 by email. Murtha noted that she had not found any information regarding the structure. She also noted that she had talked to the Department of Equalization and the Register of Deeds, neither of which could provide information about the structure.

The Hutchinson County Highway Superintendent, Joel Baumiller, was contacted on May 6th, 2015 by email. Baumiller then responded by phone that same day and was not able to provide information other than the inspection reports that we (FIRM¶) already had. The reports provided the approximated date of completion of the structure (1935) as well as information specific to the construction and condition of the structure. The inspection report is attached.

The Hutchinson County Register of Deeds, Unknown, was contacted on May 25th, 2015 by Diane Murtha. Murtha reported that the Register of Deeds had not found any information regarding the structure.

The Hutchinson County Treasurer, Tamara Miller, was contacted on May 6th, 2015 by email. Miller has not yet responded.

The Heritage Hall Museum and Heritage Hall Archives, run by Kelsey Ortman, were contacted on May 25th, 2015 by email. Ortman reported that she had not found any information regarding the structure.

The State Historic Preservation Office's CRGRID was also used to find any historic survey's conducted on the structure. It revealed the structure was Surveyed in 2004. The survey summary and report are attached.

SOUTH DAKOTA STATE HISTORIC PRESERVATION OFFICE

RECORD SEARCH SUMMARY - BRIDGE 04-16-2015

SOUTH DAKOTA STATE HISTORICAL SOCIETY

SHPO ID	Bridge Name	UTM Zone	UTM Easting	UTM Northing	Date Built
HT00001571	34-140-096	14	594245.0000	4801719.0000	1935

Survey Date	Street	City	County	Location Description	TWP
6/25/2004 12:00:00 AM	418 AVE	Parkston	HT	8E 2.6S PARKSTON	99N

Rng	Sec	Quarter1	Quarter2	DOE	Nomination Status
59W	28	NW	SW	NR Eligible	

SOUTH DAKOTA STATE HISTORIC PRESERVATION OFFICE

HISTORIC SITES SURVEY BRIDGE FORM 04-16-2015

SOUTH DAKOTA STATE HISTORICAL SOCIETY

SHPOID	SiteID	BridgeID
HT00001571	48635	2211

SITE INFORMATION

***Survey Date:** 6/25/2004 12:00:00 AM

***Surveyor:** Jennie Goff / Renewable Technologies, Inc.

***Property Address:** 418 AVE

***County:** HT

***City:** Parkston

***Quarter1:** NW

***Quarter2:** SW

***Township:** 99N

***Range:** 59W

***Section:** 28

Acres:

Quadname: Parkston SE (1968)

Legal Description: North Branch of Dry Creek

Location Description: 8E 2.6S PARKSTON

Owner Code1:

Owner Code2:

Owner Code3:

Owner Name:

Owner Address:

Owner City:

Owner State:

Owner Zip:

HISTORIC SIGNIFICANCE

***DOE:** NR Eligible

***DOE Date:** 6/25/2004 12:00:00 AM

Nomination Status:

Listed Date:

Ref Num:

Period:

Category:

Historic District Rating:

Register Name: 34-140-096

Multiple Property Name

SignificanceLevel1:

SignificanceLevel2:

NR Criteria 1:

NR Criteria 2:

NR Criteria 3: C

NR Criteria 4:

Significance Notes : This bridge retains historic integrity, although it has minor condition problems due to collison damage. It is a good example of pre-World War II steel stringer bridge construction in South Dakota, reflecting both the history and technology of such projects. Bridge 34-140-096 is eligible for listing in the National Register of Historic Places under criterion C, as an example of the steel stringer type for the Depression period.

* = REQUIRED FIELD

SOUTH DAKOTA STATE HISTORIC PRESERVATION OFFICE

HISTORIC SITES SURVEY BRIDGE FORM 04-16-2015

SOUTH DAKOTA STATE HISTORICAL SOCIETY

BRIDGE DETAILS

***Bridge Name:** 34-140-096

Other Name:

***Date Built:** 1935

Significant Person:

Structural System:

Type: Stringer

Length: 50

Style: No Style

Number Of Spans: 2

Materials: Steel

ApproachSpanType: N/A

Occupied:

***UTM Zone:** 14

Accessible:

***UTM Easting:** 594245.0000

***UTM Northing:** 4801719.0000

Restricted: N

Altered/Moved Notes:

Physical Notes: This structure is a two span steel stringer bridge that carries 418th Avenue (paved) over the North Branch of Dry Creek. It is located in rural Hutchinson County about 8.5 miles southeast of Parkston in a region of cultivated fields and rolling grassland. The superstructure consists of 12 steel I-beam stringers supporting a concrete deck. Precast concrete balustrade rails with elliptical openings flank the bridge. A short portion of the south end of the west rail has been damaged by a vehicle collision. Abutments, backwalls, and wingwalls are solid concrete. The intermediate pier is open concrete, consisting of two rectangular (in cross section) vertical posts with a solid, cantilevered cap. Recessed panels bearing the date "1935" are found on the insides of the curbs. Other than the moderate rail damage, the structure remains essentially as-built.

Link to National Register Nomination:

No National Register Nomination Available

* = REQUIRED FIELD

Appendix B – Structure Design Work Order Requirements

Bridge Improvement Grant
Work Order Requirements for Structure Design

SCOPE OF SERVICES TEMPLATE – Design

1. **Preparation of sketches of the structure as selected during the TS&L.** Within four (4) weeks of the notice to proceed date, the Consultant shall submit general drawing sheets, a riprap layout, and plan/profile of the selected option to the Local Government Assistance Office for review.

2. **Survey and plans for the above referenced project as described in the TS&L letter and Final Hydraulics Data Sheet, design calculations, independent design check, and load ratings.** Review plans (100% complete) are to be submitted in PDF format. Specifications shall follow the most current edition of the Standard Specification for Roads and Bridges. South Dakota Department of Transportation Bid Items, Standard plates and plan notes, from the SDDOT website, must be used in development of the **11" x 17" Non Section Method** plan set.

   The consultant shall provide design calculations, independent check, and load ratings for the structure as set forth in the Master Retainer Contract. In addition, load ratings for the Special Hauling Vehicles specified in **Attachment #2** shall also be submitted. The Consultant is wholly responsible for the accuracy and safe keeping of the design calculations and the independent design check.

3. **Incorporation into the plans of any changes that may be requested in the SDDOT plan review comments or provide written explanation for items not changes.**

4. **Review of shop fabrication drawings as may be required and submittal of the approved shop drawings to the Consultant.** This item is to be completed within two (2) weeks of receipt of shop or fabrication drawings from the contractor and shall be noted accordingly in the plans.

7. **Provide Quality Assurance / Quality Control Testing Plan based on SDDOT Materials Manual.** This document must be reviewed by the SDDOT prior to the notice to proceed being issued to the contractor. See **Appendix D** for requirements.

Please refer to the checklist in **Attachment #1** for the items required to be submitted to the Local Government Assistance Office.

Attachment #3 contains applicable excerpts from the Current SDDOT Consultant Retainer, DOT-900 AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES.

Attachment #1
Local Government Assistance
Checklist for Structure Design Work Order

These items must be submitted to DOT/Local Government Assistance.
If any of these items are missing, the full packet will be returned for completion and resubmission to this office.

Project Number _____ **County** _____ **PCN** _____

- ☐ **Plan/profile, general drawing sketches, and riprap layout as selected during the TS&L**
- ☐ **Review Plans (100% complete & ready for review) in PDF Format**
- ☐ **Design calculations, independent design check, and load ratings**

To be submitted after plan review is complete

- ☐ **Memo Addressing Plan Review Comments**
- ☐ **Final Plans – Electronic PDF file of the engineered, stamped set of plans**
- ☐ **Quality Assurance / Quality Control Testing Plan**

Attachment #2

Bridge Improvement Grant

Load Rating Requirements for the Special Hauling Vehicles

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION**: Load Rating of Specialized Hauling Vehicles

Date: November 15, 2013

/s/ Original Signed by
From: Joseph S. Krolak
Acting Director, Office of Bridge Technology

In Reply Refer To:
HIBT-10

To: Federal Lands Highway Division Engineers
Division Administrators

The purpose of this memorandum is to clarify FHWA's position on the analysis of *Specialized Hauling Vehicles* (SHVs) as defined in the AASHTO Manual for Bridge Evaluation (MBE) during bridge load rating and posting to comply with the requirements of the *National Bridge Inspection Standards* (NBIS). The intent of the load rating and posting provisions of the NBIS is to insure that all bridges are appropriately evaluated to determine their safe live load carrying capacity considering all unrestricted legal loads, including State routine permits, and that bridges are appropriately posted if required, in accordance with the MBE.

The SHVs are closely-spaced multi-axle single unit trucks introduced by the trucking industry in the last decade. Examples include dump trucks, construction vehicles, solid waste trucks and other hauling trucks. SHVs generally comply with Bridge Formula B and are for this reason considered legal in all States, if a States' laws do not explicitly exclude the use of such vehicles.

NCHRP Project 12-63 (Report 575, 2007) studied the developments in truck configurations and State legal loads and found that AASHTO Type 3, 3-S2 and 3-3 legal vehicles are not representative of all legal loads, specifically SHVs. As a result, legal load models for SHVs were developed and adopted by AASHTO in 2005 , recognizing that there is an immediate need to incorporate SHVs into a State's load rating process, if SHVs operate within a State. The SHV load models in the MBE include SU4, SU5, SU6 and SU7 representing four- to seven-axle SHVs respectively, and a Notional Rating Load (NRL) model that envelopes the four single unit load models and serves as a screening load. If the load rating factor for the NRL model is 1.0 or greater, then there is no need to rate for the single-unit SU4, SU5, SU6 and SU7 loads. However, if the load rating factor for the NRL is less than 1.0, then the single-unit SU4, SU5, SU6 and SU7 loads need to be considered during load rating and posting.

The SHVs create higher force effects, and thus result in lower load ratings for certain bridges, especially those with a shorter span or shorter loading length such as transverse floor beams, when compared to AASHTO Type 3, 3-S2 and 3-3 legal loads and HS20 design load. Therefore, SHVs, i.e., SU4, SU5, SU6 and SU7 or NRL, are to be included in rating and posting analyses in accordance with Article 6A.2.3 and Article 6B.9.2 of the 1st Edition of the MBE (Article 6B.7.2 of the 2nd Edition of the MBE), unless one of the following two conditions is met:

Condition A: The State verifies that State laws preclude SHV use; or

Condition B: The State has its own rating vehicle models for legal loads and verifies that the State legal load models envelope the *applicable* AASHTO SHV loading models specified in Appendix D6A and Figure 6B.9.2-2 of the 1st Edition of the MBE (Figure 6B.7.2-2 of the 2nd Edition of the MBE), and the State legal load models have been included in rating/posting analyses of all bridges. The SHV types, e.g. six- or seven-axle SHVs, precluded by State laws need not be considered.

The SHV load models apply to Allowable Stress Rating, Load Factor Rating, and Load and Resistance Factor Rating in accordance with Section 6A and 6B of the MBE.

The FHWA recognizes that there are bridges in the inventory that have not been rated for SHVs and that it is not feasible to include SHVs in the ratings for the entire inventory at once. FHWA is establishing the following timelines for rating bridges for SHVs, if neither Condition A or B is met:

Group 1: Bridges with the shortest span not greater than 200 feet should be re-rated after their next NBIS inspection, but no later than December 31, 2017, that were last rated by:

a) either Allowable Stress Rating (ASR) or Load Factor Rating (LFR) method and have an operating rating for the AASHTO Routine Commercial Vehicle either Type 3, Type 3S2, or Type 3-3 less than 33 tons (English), 47 tons (English), or 52 tons (English) respectively; or
b) Load and Resistance Factor Rating (LRFR) method and have a legal load rating factor for the AASHTO Routine Commercial Vehicle, either Type 3, Type 3S2 or Type 3-3, less than 1.3.

Group 2: Rate those bridges not in Group 1 no later than December 31, 2022.

For either group, if a re-rating is warranted due to changes of structural condition, loadings, or configuration, or other requirements, the re-rating should include SHVs.

The selection of load rating method should comply with FHWA's Policy Memorandum *Bridge Load Ratings for the National Bridge Inventory*, dated October 30, 2006.

A State may utilize an alternative approach in lieu of the above to address the load rating for SHVs for bridges in their inventory; however, the approach must be reviewed and formally accepted by FHWA.

The timeline presented above will be incorporated into the review of Metric 13 under the National Bridge Inspection Program (NBIP); specifically, it is expected that all bridges meeting Group 1 criteria be load rated for SHVs by the end of 2017. Please work with your State to assist them in developing appropriate actions to meet those timelines. If your State is currently developing or implementing a Plan of Corrective Actions (PCA) for load rating bridges, the PCA should be reviewed and modified as necessary to take into account the rating of SHVs for those bridges and these timelines.

We request that you share this memorandum with your State or Federal agency partner. All questions that cannot be resolved at the Division Office level should be directed to Lubin Gao at lubin.gao@dot.gov or at 202-366-4604.

Attachment #3
Bridge Improvement Grant
Excerpts from Current DOT-900 (09/2016)
AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES
(SDDOT Consultant Retainer)

FURNISHING OF DOCUMENTS (DOT-900, 09/2016, Section B.3.)

Except where otherwise specifically provided, the CONSULTANT will furnish to the DEPARTMENT all documents, reports, exhibits, electronic files, and other presentations for all phases of the work performed under the terms of this Agreement.

The CONSULTANT will furnish to the DEPARTMENT all design and check design computations. All documents furnished, including all original drawings, software generated electronic files, design computations, and check design computations, will become and remain the property of the DEPARTMENT and may be used by the DEPARTMENT without restriction for any public purpose.

The CONSULTANT will provide survey documents for bench levels and for the checking of bench levels on standard loose-leaf transit field book sheets. The CONSULTANT will provide all other data collected in an electronic format and will include the following files: FWD file, DGN file, DTM file, ALG file, and the RAW data file. The FWD file, DGN file, DTM file, and ALG file, will be compatible with the DEPARTMENT'S current version of InRoads. The RAW data file will be in ASCII format and will include the following information: point number, northing, easting, description, and any pertinent notes corresponding to a particular point.

The CONSULTANT, as requested by the DEPARTMENT, will submit construction documents, either electronic or paper format, and said documents will become and remain the DEPARTMENT'S property.

The CONSULTANT will return all data furnished to the CONSULTANT by the DEPARTMENT to the DEPARTMENT.

Compliance with all of the foregoing will be considered to be within the purview of this Agreement and will not constitute a basis for additional or extra compensation.

GENERAL REQUIREMENTS (DOT-900, 09/2016, Section C.3.)

b. Survey for roadway and hydraulic design will be in accordance with the edition of the Department of Transportation Survey Manual currently in place at the time of execution of the Work Order.

c. Wetland delineation will be in conformance with the US Army Corps of Engineers Wetland Delineation Manual and Regional Supplements. Wetland mitigation plans will include construction plans, performance criteria, and a five (5) year monitoring plan.

d. Hydrologic/Hydraulic design will be in accordance with the edition of the South Dakota Drainage Manual (and its revisions) currently in place at the time of execution of the Work Order.

ROADWAY DESIGN (DOT-900, 09/2016, Section C.4.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. Roadway design will be in accordance with the edition of the Department of Transportation Road Design Manual (and its revisions) currently in place at the time of execution of the Work Order and the American Association of State Highway and Transportation Officials (AASHTO) Specifications, "A Policy on Geometric Design of Highways and Streets" (2011 or the version in place at the time of execution of the Work Order), and Interims, or the Local Roads Plan.

b. The CONSULTANT will complete and furnish to the DEPARTMENT, at the time the plans are delivered to the DEPARTMENT, a DEPARTMENT provided checklist. This checklist will provide

certification that a separate check has been performed, all review revisions have been made, and the plans are correct and complete.

c. The CONSULTANT will furnish basic design criteria in the Scope Summary Report and in the Scope of Services.

d. The CONSULTANT may obtain standard drawings of roadway appurtenances from the DEPARTMENT'S Office of Road Design.

e. The CONSULTANT will contact the DEPARTMENT'S Office of Bridge Design, if a DEPARTMENT structure's drainage area is greater than 1,000 acres. For these structures, the DEPARTMENT'S Office of Bridge Design will make a hydraulics recommendation, or will concur on the hydraulics requirement if hydraulics is part of the work order scope.

f. The DEPARTMENT will furnish basic surfacing design criteria, such as type, thickness, and width of pavement.

g. The DEPARTMENT will furnish material recommendations.

STRUCTURE DESIGN (DOT-900, 09/2016, Section C.5.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. Prior to initiating design, the CONSULTANT will be required to submit the QC/QA plan/procedure to be followed for structure design to the DEPARTMENT for approval. The CONSULTANT may not begin structure design work until the QC/QA plan/procedure is approved and documented. If the CONSULTANT has a prior approved structure design QC/QA plan/procedure document on file with the OBD, and no changes to that document are anticipated for the current contract, the CONSULTANT will not need to resubmit a structure design QC/QA plan/procedure document.

b. The CONSULTANT will design bridges, box culverts, and miscellaneous highway structures in accordance with the edition of the "AASHTO LRFD Bridge Design Specifications," currently in place at the time of execution of the Work Order except as modified by the DEPARTMENT'S design practices. Prior to beginning design work, the DEPARTMENT will supply the CONSULTANT with a copy of design practices along with examples of standard detailing procedures and typical plans.

c. The CONSULTANT will design highway structures for a vehicular live loading of HL-93. Additional design criteria may be included in the Scope of Work.

d. The CONSULTANT will load rate each structure, including culverts that are bridge length, in accordance with the edition of the AASHTO "Manual for Bridge Evaluation" with latest Interim Revisions using the LRFR method currently in place at the time of execution of the Work Order. The CONSULTANT will perform an HL-93 Design Load Rating for each structure. The CONSULTANT will analyze the AASHTO HS20 vehicle for Inventory and Operating Ratings. The CONSULTANT will also perform a Legal Load Rating for South Dakota legal trucks, the notional rating load, and the four specialized hauling vehicles. The CONSULTANT will submit a copy of the rating analyses to the DEPARTMENT along with the Final Plans for bid letting purposes. The Bridge Management Engineer from the DEPARTMENT'S Office of Bridge Design will review load ratings. Load ratings must be above the Legal Loads. The CONSULTANT will provide a separate summary table of all load ratings to be included in the Bridge Inspection file.

e. The CONSULTANT will provide the DEPARTMENT a hard copy of design computations, independent check design computations, and load ratings, including computer output if applicable, with the final review set of drawings.

f. The CONSULTANT will review shop plans for fabricated items, and will forward marked-up shop plans to the DEPARTMENT. The DEPARTMENT must authorize any fabrication.

PLANS, SPECIFICATIONS, AND ESTIMATES, GENERAL (DOT-900, 09/2016, Section C.8.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. When complete plans, supplemental specifications, or special provisions are prepared, these will become the property of the DEPARTMENT, County, or City.

b. The CONSULTANT will furnish and deliver to the DEPARTMENT original drawings of all sheets comprising the set of plans, together with all reports, drawings, computer files, studies, memoranda, and other data pertaining thereto.

c. The CONSULTANT will furnish to the DEPARTMENT an electronic MS Word file of all special specifications.

d. The CONSULTANT will prepare plans in conformance with the DEPARTMENT'S customary practices. The CONSULTANT will use standard format for notes, tables, and rates of materials.

e. The CONSULTANT will prepare plans on sheets 11" x 17" or 8 ½" x 11" in size, under the guidance of the Road Design Manual's Chapter 18 – Plans Assembly: www.sddot.com/business/design/forms/roaddesign/Default.aspx or as directed by the DEPARTMENT. The CONSULTANT will follow the specific section of the Road Design Manual's Chapter 18 as it relates to plans produced by consultants in order to provide accurate electronic plans and bid items for the DEPARTMENT'S electronic bidding system. The CONSULTANT will utilize the DEPARTMENT'S web site: http://www.sddot.com/business/design/Default.aspx for Plan Preparation (i.e. Road Design Manual, CADD Procedure Manual, and User Guide for Electronic Plan Review), Downloadable Files (i.e. Form Letters, Microstation and InRoad files, and Plan Notes) and other information as necessary to design and prepare plans. The CONSULTANT will follow the properties and procedures set up for the DEPARTMENT'S electronic plans as set forth in document located at the following web site address: http://www.sddot.com/business/design/docs/cadd/ElectronicPlans.pdf. Electronic plans will be used for bidding purposes and must contain a watermark on each sheet stating "For Bidding Purposes Only." Refer to Paragraph 12 below for details on the set of plans to be used for construction.

f. The CONSULTANT will prepare plans with sufficient precision to permit the convenient layout in the field for construction and for other purposes. The plans will also provide for the production of an accurate estimate of quantities for the work to be performed in the construction of the project.

g. The CONSULTANT will furnish such other pertinent information and data with respect to the plans and designs as the DEPARTMENT may request.

h. The DEPARTMENT will require all persons designing, detailing, and checking structure plans to legibly place their names or initials on each plan sheet in the spaces provided for this purpose.

i. The DEPARTMENT will designate the basic premises and criteria for the design. The CONSULTANT will develop plans in accordance with the DEPARTMENT'S standard specifications for roadway and bridge construction.

j. As part of the work embraced in the preparation of plans, the CONSULTANT will prepare and furnish to the DEPARTMENT special provisions in standard DEPARTMENT format, for items of work included in the plans which are not covered by the standard specifications, plan notes, or DEPARTMENT-approved special provisions.

k. The CONSULTANT will ensure scales, lettering, and the general delineation of the plans mirror the DEPARTMENT format and provide readily legible reproductions.

l. The CONSULTANT will ensure each plan sheet bears the South Dakota registered professional seal and endorsement of the CONSULTANT as per the requirements of the South Dakota Board of Technical Professions.

m. The CONSULTANT will use software acceptable to the DEPARTMENT as agreed to in the Work Order.

Note: The DEPARTMENT'S standard software programs are the Bentley Civil Products (InRoads Suite), MicroStation, AASHTOWare products, Adobe Acrobat, Bluebeam, and the Microsoft Office Suite. The DEPARTMENT may require other software on Work Orders.

CONSTRUCTION ENGINEERING TECHNICAL REQUIREMENTS (DOT-900, 09/2016, Section D.)

1. **CONSULTANT'S RESPONSIBILITIES**. The CONSULTANT will be responsible to the DEPARTMENT, and will complete all work to the DEPARTMENT'S satisfaction.

   Subject to availability, the CONSULTANT will provide personnel for the areas of expertise necessary to satisfactorily complete the work specified in the Work Order and this Agreement. The DEPARTMENT will notify the CONSULTANT as to the proper medium that will be used for recording purposes of field data. The CONSULTANT will submit reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order. The responsibilities for these areas are described in **Exhibit 4**, CONSTRUCTION ENGINEERING CONSULTANT RESPONSIBILITIES.

EXHIBIT 4 (DOT-900, 09/2016)

CONSULTANT CONSTRUCTION OVERSITE RESPONSIBILITIES

GENERAL

The CONSULTANT will:

1. Be knowledgeable of the requirements of the project plans and specifications, the DEPARTMENT'S Survey Manual, Road Design Manual, South Dakota Drainage Manual, and CADD Procedures Manual.

2. Assure project personnel are knowledgeable of their duties and responsibilities.

3. Assure project personnel are knowledgeable of the DEPARTMENT'S Materials Manual.

4. Oversee day to day activities to ensure the project is constructed in accordance with plans and specifications.

5. Ensure all documentation and reports are accurate and kept current.

6. Prepare and electronically submit Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Pay Estimate, and Final Construction Change Order, all on the current version of the DEPARTMENT'S Construction Management System. The CONSULTANT will submit these reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order.

7. Require all individuals providing acceptance testing and independent assurance testing of construction materials or acceptance inspection to record all data/results electronically on the current version of the DEPARTMENT'S Construction Management System, or as instructed by the DEPARTMENT.

8. Require all individuals providing acceptance testing and independent assurance testing of materials or acceptance inspection to meet the requirements of the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual.

9. Ensure testing equipment identified in the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual is calibrated and documented according to the designated frequencies and procedures designated in the Manual.

10. Perform other duties assigned by the DEPARTMENT as defined in this Agreement.

The CONSULTANT'S PROJECT ENGINEER will:

1. Assist with conducting the pre-construction meeting.

2. Prepare Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Estimate, and Final Construction Change Order electronically on the current version of the DEPARTMENT'S Construction Management System.

3. Handle EEO and Labor Compliance activities.

4. Ensure that subcontractors working on the project are approved by the DEPARTMENT.

The CONSULTANT'S INSPECTOR will:

1. Assure the asphalt or concrete plant is properly calibrated.

2. Perform scale accuracy checks.

3. Ensure construction activities remain inside the acquired right-of-way or easement as specified on the plans unless approved by the DEPARTMENT.

The CONSULTANT'S SURVEY PARTY CHIEF will:

1. Record field notes for slope stakes, blue tops, paving grades, pipe, structure layout, and other items of the same sort in electronic format, FWD files, DGN files, DTM files, ALG files, and RAW files compatible to the current version of InRoads being used by the DEPARTMENT.

2. Set centerline, offset lines, bluetops, slope stakes, pipe stakes, structure stakes, and other items of the same sort by electronic or manual means.

3. Run bench levels within acceptable tolerances of the DEPARTMENT'S Survey Manual and maintain field notes on standard loose-leaf transit field book sheets.

4. Obtain necessary topographic data within acceptable tolerances of the DEPARTMENT'S Survey Manual.

5. Supervise and assure the survey crew is knowledgeable as to its duties and responsibilities.

The CONSULTANT'S TEST PERSON AND EQUIPMENT will:

1. Be knowledgeable of the requirements of the project plans and specifications.

2. Sample and test materials for acceptance as specified by the DEPARTMENT'S Materials Manual. Perform material tests for QC/QA projects in accordance with QC/QA manual and have the proper QC/QA certification.

3. Recognize and have the ability to take corrective action for calibration of testing equipment.

Appendix C – Structure Rehabilitation Work Order Requirements

Bridge Improvement Grant
Work Order Requirements for Structure Rehabilitation

Note: Not all rehabilitation work will require hydraulic analysis or foundation investigation. For this reason, several of the related items below have been marked "*if needed*." If the Subject project does not require hydraulic analysis and/or foundation investigation, simply do not include these items in the breakdown of estimated costs.

SCOPE OF SERVICES TEMPLATE – Structure Rehabilitation

1. **Field survey for completion of the Drainage Data Sheet and Contour Map.** The information required for placement on these sheets is listed below. An example is attached containing the required information.
   - ☐ Stationing from south to north or west to east.
   - ☐ Beginning and ending stations of the current structure.
   - ☐ Proposed and inplace gradelines.
   - ☐ Stream profile. (Including a table of stations and elevations for each shot taken.)
   - ☐ Sea level datum is required. Stations, elevations, and offsets from and descriptions of permanent objects will be required for project benchmarks. (The High Accuracy Reference Network (HARN) map and the County Bench Mark map for the State of South Dakota can be found at the following web site – www.state.sd.us/dot/pe/roaddesign/survey.htm)
   - ☐ Include an electronic file containing the plan/profile of the inplace gradeline at the structure.
   - ☐ Landowners with their addresses, phone numbers, and location of property.
   - ☐ Utilities with their addresses, phone numbers, and locations along the project.

2. **Field survey as necessary for preparation of construction plans.** Required information is listed below.
   - ☐ Establishment of transit points, land ties and benchmarks as well as cross sections and topography. (Stations, elevations, and offsets from permanent objects will be required for project benchmarks.)
   - ☐ Project limits as established by consultation with the County Highway Superintendent.
   - ☐ Additional legal survey as required for preparation of right-of-way plats.
   - ☐ The geometrics of horizontal and vertical alignment in accordance with the Local Roads Plan design standards.
   - ☐ Survey notes are to be retained on file with the Consultant for subsequent use in the preparation of construction plans and are to be available to the County upon request.

3. **(*If needed*.) Preliminary Survey/Hydraulics Executive Summary Cover Letter, Preliminary Hydraulic Data Sheet, Plan/Profile Sketches (Preliminary Hydraulic Layouts) and gradelines, Electronic Copy of HEC-RAS File, Draft Hydraulic Design Report in accordance with the newest version of the South Dakota Drainage Manual, and cost estimates for existing and all proposed structure alternatives. (More than one feasible alternative is required. This includes options on different alignments if applicable.)** The newest version of the South Dakota Drainage Manual is available at the following location: http://www.sddot.com/business/design/forms/drainage/. Guidance and examples can be found in Chapter 6 of the manual. The current preliminary hydraulic data sheet to be used can be found at the following internet location: *ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc.* Directions for filling out the form can be found at the same location. All items will be submitted to the Local Government Assistance Office for distribution to SDDOT personnel for review for compliance with minimum required State and Federal standards. Necessary revisions shall be provided in writing by the SDDOT and shall be forwarded to the Consultant by the Local Government Assistance (LGA) Office. Necessary revisions shall be completed by the consultant and the Revised Draft Hydraulic Design Report submitted within 2 weeks of receipt of revisions from LGA. The Consultant is wholly responsible for the accuracy of the design calculations and the independent check design calculations.

4. **Conduct TS&L inspection, assistance in the selection of the type of rehabilitation, and preparation of TS&L summary letter.** The county or city (owner) shall be in attendance and advance notice given the Local Government Assistance Office so if time allows, a staff member can attend.

5. **(*If needed*.) Report of Foundation Investigation.** Conduct field investigation and provide design recommendations according to AASHTO LRFD Bridge Design Specifications Section 10. Report shall include boring information, lab results, and design recommendations. See **Examples #1 and #2, following the attachments**, for reports that are typically developed by SDDOT Geotechnical Engineering Activity.

6. **(*If needed*.) For Structure Option: Final Hydraulic Design Report, Final Hydraulic Data Sheet (use the current data sheet found at the following internet location: ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc,) HEC RAS model with existing and proposed conditions and if the bridge scour protection is needed, Scour Memo summarizing hydraulic scour calculation, Scour Calculation, and Berm Slope Protection Recommendations (if applicable.)**

7. **Survey and plans for the above referenced project as described in the TS&L letter and Final Hydraulics Data Sheet, design calculations, independent design check, and load ratings.** Review plans (100% complete) are to be submitted in PDF format. Specifications shall follow the most current edition of the Standard Specification for Roads and Bridges. South Dakota Department of Transportation Bid Items, Standard plates and plan notes, from the SDDOT website, must be used in development of the **11" x 17" Non Section Method** plan set.

   If applicable to the type of rehabilitation, the consultant shall provide design calculations, independent check, and load ratings for the structure as set forth in the Master Retainer Contract. In addition, load ratings for the Special Hauling Vehicles specified in **Attachment #3** shall also be submitted. The Consultant is wholly responsible for the accuracy and safe keeping of the design calculations and the independent design check.

8. **Incorporation into the plans of any changes that may be requested in the SDDOT plan review comments or provide written explanation for items not changes.**

9. **Review of shop fabrication drawings as may be required and submittal of the approved shop drawings to the Consultant.** This item is to be completed within two (2) weeks of receipt of shop or fabrication drawings from the contractor and shall be noted accordingly in the plans.

10. **Provide Quality Assurance / Quality Control Testing Plan based on SDDOT Materials Manual.** This document must be reviewed by the SDDOT prior to the notice to proceed being issued to the contractor. See **Appendix D** for requirements.

Please refer to the checklist in **Attachment #1** for the TS&L Packet of items that shall be submitted to the Local Government Assistance Office.

Attachment #2 contains applicable excerpts from the Current SDDOT Consultant Retainer, DOT-900 AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES.

Attachment #1
Bridge Improvement Grant
Checklist for Structure Rehabilitation Work Order

These items must be submitted to DOT/Local Government Assistance.
If any of these items are missing, the full packet will be returned for completion and resubmission to this office.

Project Number _____ **County** _____ **PCN** _____

CROSS OFF ANY NON-APPLICABLE ITEMS

☐ **Survey Sheets and Contour Map including the following information:**

- ☐ Stationing from south to north or west to east
- ☐ Beginning and ending stations of the existing structure
- ☐ Beginning and ending stations of proposed structures
- ☐ Proposed and existing gradelines
- ☐ Stream profile and cross sections (Downstream to upstream direction including a table showing stations and elevations for each shot taken)
- ☐ Elevation and location of buildings and other structures
- ☐ Survey information using sea level datum and showing station, elevation, offset, and physical description of each project benchmark
- ☐ Landowner names, addresses, phone numbers, and legal descriptions of their property
- ☐ Utility names, addresses, phone numbers, and locations along the project

☐ **Preliminary Survey/Hydraulics Executive Summary Cover Letter (example can be found on last page of this appendix.)**

☐ **Preliminary Hydraulic Data Sheet (use current data sheet found at: ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc) including the following information:**

- ☐ Calculated flows
- ☐ Inplace conditions (Ordinary High Water Elevation, HW_{100}, Vmax, OTfr)
- ☐ Proposed conditions for each option (HW_2, HW_{23}, HW_{100}, Vmax Qot, OTfr, ELovertop)
- ☐ Ordinary High Water Elevation Shown on Cross-Sections (vegetation elevation on stream banks – approx. 2–year flow)
- ☐ Observed High Water Elevation (identifiable high water mark)

☐ **Electronic copy of HEC-RAS model of existing and proposed conditions**

☐ **Plan and profile sketches (preliminary hydraulic layout sheets) for the existing structure and proposed gradelines for each option (More than one feasible alternative is required. This includes options on different alignments if applicable.)**

☐ **Cost Estimates (including design and construction engineering and construction costs for each option.)**

☐ **Revised Draft Hydraulic Report**

- ☐ **TS&L Summary Letter**
- ☐ **Report of Foundation Investigation (see Examples 3 and 4 in this appendix)**
- ☐ **For Structure Chosen at TS&L**
  - ☐ **Final Hydraulic Design Report**
  - ☐ **Final Hydraulic Data Sheet (use current data sheet found at: ftp://ftp.state.sd.us Folder Path – DOT/LGA/Forms/Hydraulic Data Sheet – Current.doc)**
  - ☐ **HEC RAS model with existing and proposed conditions**
  - ☐ **Scour memo, scour calculations, and berm slope protection recommendations (Bridges Only)**
- ☐ **Plan/profile, general drawing sketches, and riprap layout as selected during the TS&L**
- ☐ **Review Plans (100% complete & ready for review) in PDF Format**
- ☐ **Design calculations, independent design check, and load ratings**

To be submitted after plan review is complete

- ☐ **Memo Addressing Plan Review Comments**
- ☐ **Final Plans – Electronic PDF file of the engineered, stamped set of plans**
- ☐ **Quality Assurance / Quality Control Testing Plan**

Attachment #2
Bridge Improvement Grant
Excerpts from Current DOT-900 (09/2016)
AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES
(SDDOT Consultant Retainer)

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Compliance with all of the foregoing will be considered to be within the purview of this Agreement and will not constitute a basis for additional or extra compensation.

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b. The CONSULTANT will complete and furnish to the DEPARTMENT, at the time the plans are delivered to the DEPARTMENT, a DEPARTMENT provided checklist. This checklist will provide certification that a separate check has been performed, all review revisions have been made, and the plans are correct and complete.

c. The CONSULTANT will furnish basic design criteria in the Scope Summary Report and in the Scope of Services.

d. The CONSULTANT may obtain standard drawings of roadway appurtenances from the DEPARTMENT'S Office of Road Design.

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f. The DEPARTMENT will furnish basic surfacing design criteria, such as type, thickness, and width of pavement.

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c. The CONSULTANT will design highway structures for a vehicular live loading of HL-93. Additional design criteria may be included in the Scope of Work.

d. The CONSULTANT will load rate each structure, including culverts that are bridge length, in accordance with the edition of the AASHTO "Manual for Bridge Evaluation" with latest Interim Revisions using the LRFR method currently in place at the time of execution of the Work Order. The CONSULTANT will perform an HL-93 Design Load Rating for each structure. The CONSULTANT will analyze the AASHTO HS20 vehicle for Inventory and Operating Ratings. The CONSULTANT will also perform a Legal Load Rating for South Dakota legal trucks, the notional rating load, and the four specialized hauling vehicles. The CONSULTANT will submit a copy of the rating analyses to the DEPARTMENT along with the Final Plans for bid letting purposes. The Bridge Management Engineer from the DEPARTMENT'S Office of Bridge Design will review load ratings. Load ratings must be above the Legal Loads. The CONSULTANT will provide a separate summary table of all load ratings to be included in the Bridge Inspection file.

e. The CONSULTANT will provide the DEPARTMENT a hard copy of design computations, independent check design computations, and load ratings, including computer output if applicable, with the final review set of drawings.

f. The CONSULTANT will review shop plans for fabricated items, and will forward marked-up shop plans to the DEPARTMENT. The DEPARTMENT must authorize any fabrication.

PLANS, SPECIFICATIONS, AND ESTIMATES, GENERAL (DOT-900, 09/2016, Section C.8.)

Unless otherwise modified by the Work Order, the CONSULTANT will meet the following requirements:

a. When complete plans, supplemental specifications, or special provisions are prepared, these will become the property of the DEPARTMENT, County, or City.

b. The CONSULTANT will furnish and deliver to the DEPARTMENT original drawings of all sheets comprising the set of plans, together with all reports, drawings, computer files, studies, memoranda, and other data pertaining thereto.

c. The CONSULTANT will furnish to the DEPARTMENT an electronic MS Word file of all special specifications.

d. The CONSULTANT will prepare plans in conformance with the DEPARTMENT'S customary practices. The CONSULTANT will use standard format for notes, tables, and rates of materials.

e. The CONSULTANT will prepare plans on sheets 11" x 17" or 8 ½" x 11" in size, under the guidance of the Road Design Manual's Chapter 18 – Plans Assembly: www.sddot.com/business/design/forms/roaddesign/Default.aspx or as directed by the DEPARTMENT. The CONSULTANT will follow the specific section of the Road Design Manual's Chapter 18 as it relates to plans produced by consultants in order to provide accurate electronic plans and bid items for the DEPARTMENT'S electronic bidding system. The CONSULTANT will utilize the DEPARTMENT'S web site: http://www.sddot.com/business/design/Default.aspx for Plan Preparation (i.e. Road Design Manual, CADD Procedure Manual, and User Guide for Electronic Plan Review), Downloadable Files (i.e. Form Letters, Microstation and InRoad files, and Plan Notes) and other information as necessary to design and prepare plans. The CONSULTANT will follow the properties and procedures set up for the DEPARTMENT'S electronic plans as set forth in document located at the following web site address: http://www.sddot.com/business/design/docs/cadd/ElectronicPlans.pdf. Electronic plans will be used for bidding purposes and must contain a watermark on each sheet stating "For Bidding Purposes Only." Refer to Paragraph 12 below for details on the set of plans to be used for construction.

f. The CONSULTANT will prepare plans with sufficient precision to permit the convenient layout in the field for construction and for other purposes. The plans will also provide for the production of an accurate estimate of quantities for the work to be performed in the construction of the project.

g. The CONSULTANT will furnish such other pertinent information and data with respect to the plans and designs as the DEPARTMENT may request.

h. The DEPARTMENT will require all persons designing, detailing, and checking structure plans to legibly place their names or initials on each plan sheet in the spaces provided for this purpose.

i. The DEPARTMENT will designate the basic premises and criteria for the design. The CONSULTANT will develop plans in accordance with the DEPARTMENT'S standard specifications for roadway and bridge construction.

j. As part of the work embraced in the preparation of plans, the CONSULTANT will prepare and furnish to the DEPARTMENT special provisions in standard DEPARTMENT format, for items of work included in the plans which are not covered by the standard specifications, plan notes, or DEPARTMENT-approved special provisions.

k. The CONSULTANT will ensure scales, lettering, and the general delineation of the plans mirror the DEPARTMENT format and provide readily legible reproductions.

l. The CONSULTANT will ensure each plan sheet bears the South Dakota registered professional seal and endorsement of the CONSULTANT as per the requirements of the South Dakota Board of Technical Professions.

m. The CONSULTANT will use software acceptable to the DEPARTMENT as agreed to in the Work Order.

Note: The DEPARTMENT'S standard software programs are the Bentley Civil Products (InRoads Suite), MicroStation, AASHTOWare products, Adobe Acrobat, Bluebeam, and the Microsoft Office Suite. The DEPARTMENT may require other software on Work Orders.

CONSTRUCTION ENGINEERING TECHNICAL REQUIREMENTS (DOT-900, 09/2016, Section D.)

1. **CONSULTANT'S RESPONSIBILITIES**. The CONSULTANT will be responsible to the DEPARTMENT, and will complete all work to the DEPARTMENT'S satisfaction.

   Subject to availability, the CONSULTANT will provide personnel for the areas of expertise necessary to satisfactorily complete the work specified in the Work Order and this Agreement. The DEPARTMENT will notify the CONSULTANT as to the proper medium that will be used for recording purposes of field data. The CONSULTANT will submit reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order. The responsibilities for these areas are described in **Exhibit 4**, CONSTRUCTION ENGINEERING CONSULTANT RESPONSIBILITIES.

EXHIBIT 4 (DOT-900, 09/2016)

CONSULTANT CONSTRUCTION OVERSITE RESPONSIBILITIES

GENERAL

The CONSULTANT will:

1. Be knowledgeable of the requirements of the project plans and specifications, the DEPARTMENT'S Survey Manual, Road Design Manual, South Dakota Drainage Manual, and CADD Procedures Manual.

2. Assure project personnel are knowledgeable of their duties and responsibilities.

3. Assure project personnel are knowledgeable of the DEPARTMENT'S Materials Manual.

4. Oversee day to day activities to ensure the project is constructed in accordance with plans and specifications.

5. Ensure all documentation and reports are accurate and kept current.

6. Prepare and electronically submit Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Pay Estimate, and Final Construction Change Order, all on the current version of the DEPARTMENT'S Construction Management System. The CONSULTANT will submit these reports in a timely manner as directed by the DEPARTMENT'S Office issuing the Work Order.

7. Require all individuals providing acceptance testing and independent assurance testing of construction materials or acceptance inspection to record all data/results electronically on the current version of the DEPARTMENT'S Construction Management System, or as instructed by the DEPARTMENT.

8. Require all individuals providing acceptance testing and independent assurance testing of materials or acceptance inspection to meet the requirements of the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual.

9. Ensure testing equipment identified in the DEPARTMENT'S Materials Testing and Inspection Certification Program Manual is calibrated and documented according to the designated frequencies and procedures designated in the Manual.

10. Perform other duties assigned by the DEPARTMENT as defined in this Agreement.

The CONSULTANT'S PROJECT ENGINEER will:

1. Assist with conducting the pre-construction meeting.

2. Prepare Biweekly Progress Reports, Construction Change Orders, Progress Pay Estimates, Final Estimate, and Final Construction Change Order electronically on the current version of the DEPARTMENT'S Construction Management System.

3. Handle EEO and Labor Compliance activities.

4. Ensure that subcontractors working on the project are approved by the DEPARTMENT.

The CONSULTANT'S INSPECTOR will:

1. Assure the asphalt or concrete plant is properly calibrated.

2. Perform scale accuracy checks.

3. Ensure construction activities remain inside the acquired right-of-way or easement as specified on the plans unless approved by the DEPARTMENT.

The CONSULTANT'S SURVEY PARTY CHIEF will:

1. Record field notes for slope stakes, blue tops, paving grades, pipe, structure layout, and other items of the same sort in electronic format, FWD files, DGN files, DTM files, ALG files, and RAW files compatible to the current version of InRoads being used by the DEPARTMENT.

2. Set centerline, offset lines, bluetops, slope stakes, pipe stakes, structure stakes, and other items of the same sort by electronic or manual means.

3. Run bench levels within acceptable tolerances of the DEPARTMENT'S Survey Manual and maintain field notes on standard loose-leaf transit field book sheets.

4. Obtain necessary topographic data within acceptable tolerances of the DEPARTMENT'S Survey Manual.

5. Supervise and assure the survey crew is knowledgeable as to its duties and responsibilities.

The CONSULTANT'S TEST PERSON AND EQUIPMENT will:

1. Be knowledgeable of the requirements of the project plans and specifications.

2. Sample and test materials for acceptance as specified by the DEPARTMENT'S Materials Manual. Perform material tests for QC/QA projects in accordance with QC/QA manual and have the proper QC/QA certification.

Recognize and have the ability to take corrective action for calibration of testing equipment.

Attachment #3

Bridge Improvement Grant

Load Rating Requirements for the Special Hauling Vehicles

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION**: Load Rating of Specialized Hauling Vehicles

Date: November 15, 2013

/s/ Original Signed by
From: Joseph S. Krolak
Acting Director, Office of Bridge Technology

In Reply Refer To:
HIBT-10

To: Federal Lands Highway Division Engineers
Division Administrators

The purpose of this memorandum is to clarify FHWA's position on the analysis of *Specialized Hauling Vehicles* (SHVs) as defined in the AASHTO Manual for Bridge Evaluation (MBE) during bridge load rating and posting to comply with the requirements of the *National Bridge Inspection Standards* (NBIS). The intent of the load rating and posting provisions of the NBIS is to insure that all bridges are appropriately evaluated to determine their safe live load carrying capacity considering all unrestricted legal loads, including State routine permits, and that bridges are appropriately posted if required, in accordance with the MBE.

The SHVs are closely-spaced multi-axle single unit trucks introduced by the trucking industry in the last decade. Examples include dump trucks, construction vehicles, solid waste trucks and other hauling trucks. SHVs generally comply with Bridge Formula B and are for this reason considered legal in all States, if a States' laws do not explicitly exclude the use of such vehicles.

NCHRP Project 12-63 (Report 575, 2007) studied the developments in truck configurations and State legal loads and found that AASHTO Type 3, 3-S2 and 3-3 legal vehicles are not representative of all legal loads, specifically SHVs. As a result, legal load models for SHVs were developed and adopted by AASHTO in 2005 , recognizing that there is an immediate need to incorporate SHVs into a State's load rating process, if SHVs operate within a State. The SHV load models in the MBE include SU4, SU5, SU6 and SU7 representing four- to seven-axle SHVs respectively, and a Notional Rating Load (NRL) model that envelopes the four single unit load models and serves as a screening load. If the load rating factor for the NRL model is 1.0 or greater, then there is no need to rate for the single-unit SU4, SU5, SU6 and SU7 loads. However, if the load rating factor for the NRL is less than 1.0, then the single-unit SU4, SU5, SU6 and SU7 loads need to be considered during load rating and posting.

The SHVs create higher force effects, and thus result in lower load ratings for certain bridges, especially those with a shorter span or shorter loading length such as transverse floor beams, when compared to AASHTO Type 3, 3-S2 and 3-3 legal loads and HS20 design load. Therefore, SHVs, i.e., SU4, SU5, SU6 and SU7 or NRL, are to be included in rating and posting analyses in accordance with Article 6A.2.3 and Article 6B.9.2 of the 1st Edition of the MBE (Article 6B.7.2 of the 2nd Edition of the MBE), unless one of the following two conditions is met:

Condition A: The State verifies that State laws preclude SHV use; or

Condition B: The State has its own rating vehicle models for legal loads and verifies that the State legal load models envelope the *applicable* AASHTO SHV loading models specified in Appendix D6A and Figure 6B.9.2-2 of the 1st Edition of the MBE (Figure 6B.7.2-2 of the 2nd Edition of the MBE), and the State legal load models have been included in rating/posting analyses of all bridges. The SHV types, e.g. six- or seven-axle SHVs, precluded by State laws need not be considered.

The SHV load models apply to Allowable Stress Rating, Load Factor Rating, and Load and Resistance Factor Rating in accordance with Section 6A and 6B of the MBE.

The FHWA recognizes that there are bridges in the inventory that have not been rated for SHVs and that it is not feasible to include SHVs in the ratings for the entire inventory at once. FHWA is establishing the following timelines for rating bridges for SHVs, if neither Condition A or B is met:

Group 1: Bridges with the shortest span not greater than 200 feet should be re-rated after their next NBIS inspection, but no later than December 31, 2017, that were last rated by:

a) either Allowable Stress Rating (ASR) or Load Factor Rating (LFR) method and have an operating rating for the AASHTO Routine Commercial Vehicle either Type 3, Type 3S2, or Type 3-3 less than 33 tons (English), 47 tons (English), or 52 tons (English) respectively; or
b) Load and Resistance Factor Rating (LRFR) method and have a legal load rating factor for the AASHTO Routine Commercial Vehicle, either Type 3, Type 3S2 or Type 3-3, less than 1.3.

Group 2: Rate those bridges not in Group 1 no later than December 31, 2022.

For either group, if a re-rating is warranted due to changes of structural condition, loadings, or configuration, or other requirements, the re-rating should include SHVs.

The selection of load rating method should comply with FHWA's Policy Memorandum *Bridge Load Ratings for the National Bridge Inventory*, dated October 30, 2006.

A State may utilize an alternative approach in lieu of the above to address the load rating for SHVs for bridges in their inventory; however, the approach must be reviewed and formally accepted by FHWA.

The timeline presented above will be incorporated into the review of Metric 13 under the National Bridge Inspection Program (NBIP); specifically, it is expected that all bridges meeting Group 1 criteria be load rated for SHVs by the end of 2017. Please work with your State to assist them in developing appropriate actions to meet those timelines. If your State is currently developing or implementing a Plan of Corrective Actions (PCA) for load rating bridges, the PCA should be reviewed and modified as necessary to take into account the rating of SHVs for those bridges and these timelines.

We request that you share this memorandum with your State or Federal agency partner. All questions that cannot be resolved at the Division Office level should be directed to Lubin Gao at lubin.gao@dot.gov or at 202-366-4604.

EXAMPLE 1

REPORT OF FOUNDATION INVESTIGATION

PROJECT: BRO 8048(03) Mellette County PCN 02DY

LOCATION: Structure No. 48-102-010, 18.9 miles North & 0.8 miles West of Cedar Butte over the White River.

METHOD OF INVESTIGATION:

All soundings are made according to the Standard South Dakota Subsurface Investigation Techniques and AASHTO Specifications. Auger holes are drilled with a 4-1/2 inch continuous flight auger. Penetration and Push Test holes are drilled with a 6-5/8 inch continuous hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples. Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil. Corings with the SDDOT drive rig are performed by using a California retractable plug sampler, which is driven with a 490 pound hammer. The drill stem is P.K. rod, which is 2-7/8 inch O.D., and 2 inch nominal diameter cores are obtained. All laboratory tests are performed in accordance with standard AASHTO or SDDOT laboratory procedures.

RECOMMENDATIONS:

Abutments:

I. Steel HP10 X 42 Piling

A. A LRFD maximum factored pile bearing resistance of 77 tons can be used for design.

B. The anticipated tip elevations are:

Station	Elevation
22+06	1910
25+27	1892

C. The nominal pile bearing resistance shall be 192 tons verified by the SDDOT's Modified ENR formula.

Bents:

I. Drilled Shafts

A. A LRFD maximum factored resistance value of 2,800 psf can be used for design below elevation 1912 ft. or maximum scour whichever is lower.

B. Permanent casings will be required to elevation 1915 ft.

C. The point of fixity within the bedrock can be assumed to be the elevation 1912 ft.

DISCUSSION:

The proposed structure location is underlain by brown sand-silt (alluvium) overlying brown silt-sand with gravel (alluvium). The alluvial sediments rest upon gray silt-clay (Pierre Shale). The D50 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 0.06 mm, 1.0 mm, and 0.004 mm. The D95 of the brown sand-silt, brown silt-sand with gravel, and gray silt-clay (Pierre Shale) can be assumed to be 1.0 mm, 6.0 mm, and 0.06 mm.

Steel HP10X42 piling along with the anticipated tip elevations, are listed in the recommendations for use in the abutments. Drilled Shafts are listed in the recommendations for use at the bents.

The piling were evaluated for drivability and group effects at the LRFD Strength Limit State. Settlement of the substructure units and horizontal movement of the abutment piling were evaluated at the LRFD Service Limit State.

Drivability –

A drivability analysis was performed for the steel HP10X42 piling using the wave equation analysis program (GRLWEAP). A group of pile hammers that were evaluated and found to produce acceptable driving stresses is listed later in this report for inclusion in the plans.

Pile Group Effects:

Axial Loading –
Abutments
For a single row of piling, AASHTO requires the center-to-center pile spacing to be at least 30" or 2.5 times the width of the pile, whichever is greater. Therefore, for the steel HP10x42 piling at the abutment the center-to-center spacing shall be at least 30".

Settlement –
The steel pile tips will be founded in the Pierre Shale. Unconfined compression test results of the Pierre Shale exceed the proposed bridge loadings. Past experience for piling driven into hard shale soil bedrocks has shown little, if any, settlement has occurred. Therefore, 1/4 inch or less of total settlement can be used to design the substructure units.

Horizontal Movement –
AASHTO states that if the center-to-center spacing of the piling in the substructure unit is greater than 5 times the width of the pile then group effects can be ignored. Therefore, if the designed spacing is greater than 5 times the pile width a group efficiency factor of 1.0 can be used with no reduction in pile loading required. If this minimum pile spacing is not met a reduction factor will need to be calculated according to the AASHTO code.

Horizontal movement at the substructure units can be calculated using the following soil parameters:

Sand-silt (alluvium); phi angle = 24 degrees, cohesion = 50 psf, wet unit weight = 118 pcf
Silt-sand with gravel (alluvium); phi angle = 32 degrees, cohesion = 0 psf, wet unit weight = 130 pcf
Silt-clay (Pierre Shale); phi angle = 18 degrees, cohesion = 1,000 psf, wet unit weight = 130 pcf

For the drilled shafts, a LRFD maximum factored resistance value (skin friction) of 2,800 psf is recommended below elevation 1912 for the bents or maximum scour whichever is lower. The point of fixity within the bedrock can be assumed to be 1912 for the bents.

Each drilled shaft shall have a minimum of 3 access tubes for a shaft diameter of 3.0' and less. The number of access tubes needed shall be increased by 1 for each foot increase in shaft diameter above the 3.0'. The access tubes shall be furnished and installed according to the South Dakota Department of Transportation's 2004 Standard Specifications for Roads and Bridges. These access tubes shall be equally spaced in the shaft reinforcement prior to placing the reinforcement cage.

A representative of the CONSULTING FIRM (NAME AND NUMBER) shall be present during drilling operations to confirm the elevations provided in this report and to observe the placement of the drilled shafts. In addition to the notes below, contact the CONSULTANT REPRESENTATIVE for the most current drilled shaft construction notes to be included in the plans.

<u>The following notes shall be placed in the plans</u>:

A drivability analysis was performed using the wave equation analysis program (GRLWEAP). The pile hammers listed below were evaluated and found to produce acceptable driving stresses. Pile hammers not listed will require evaluation and approval prior to use from the CONSULTANT REPRESENTATIVE NAME AND PHONE NUMBER.

Hammers need to be sized according to site specific soil parameters and structure design requirements. The following list of hammers is owned and readily available by contractors that do work in SD. Select and specify in the report which hammers are acceptable for use on individual projects.

ICE 180	Delmag D12-42	FEC 1500	Delmag D16-32	Delmag D19-32
Delmag D19-42	MVE M-19	ICE 42S	MKT DE 42/35	APE D19-42
Delmag D25-32	Delmag D30-32	SPI D30	Delmag D46-32	

Hole Number	T2	
Station	21+93	
Depth	9.0	ft
Soil Color	Brown	
Classification	Sand-Clay	
Strength (Q_u)	855.3	psf
Dry Density	83.6	pcf
Wet Density	95.6	pcf
Moisture	14.8	%
Pass No. 10	84.4	%
Pass No. 40	76.2	%
Pass No. 200	61.9	%
Sand Content	22.6	%
Silt Content	23.8	%
Clay Content	38.8	%

Hole Number	T3	
Station	25+02	
Depth	9.7	ft
Soil Color	Brown	
Classification	Silt	
Strength (Q_u)	——	psf
Dry Density	81.7	pcf
Wet Density	91.8	pcf
Moisture	12.3	%
Pass No. 10	99.9	%
Pass No. 40	97.1	%
Pass No. 200	55.1	%
Sand Content	44.8	%
Silt Content	45.1	%
Clay Content	10.0	%

Hole Number	T3	
Station	25+02	
Depth	17.0	ft
Soil Color	Brown	
Classification	Sand	
Strength (Q_u)	——	psf
Dry Density	97.8	pcf
Wet Density	107.0	pcf
Moisture	9.4	%
Pass No. 10	95.2	%
Pass No. 40	74.9	%
Pass No. 200	9.9	%
Sand Content	85.3	%
Silt Content	5.9	%
Clay Content	8.8	%

Hole Number	T11	
Station	21+87	
Depth	23.8	ft
Soil Color	Gray	
Classification	Clay	
Strength (Q_u)	33.490	psf
Dry Density	116.9	pcf
Wet Density	136.6	pcf
Moisture	16.8	%
Pass No. 10	99.8	%
Pass No. 40	99.7	%
Pass No. 200	96.9	%
Sand Content	3.8	%
Silt Content	41.1	%
Clay Content	55.9	%

Hole Number	T12	
Station	25+89	
Depth	37.8	ft
Soil Color	Gray	
Classification	Clay	
Strength (Q_u)	43.240	psf
Dry Density	112.5	pcf
Wet Density	133.3	pcf
Moisture	18.5	%
Pass No. 10	99.8	%
Pass No. 40	99.8	%
Pass No. 200	99.5	%
Sand Content	0.5	%
Silt Content	39.6	%
Clay Content	59.9	%

Pierre Shale is a marine shale with a textural classification that varies from silt-clay to clay-silt. Color varies from buff gray to black. The formation may contain concretion zones that are normally thin but occasionally are massive. These zones may be considered hard and dense. Thin zones may be present that are cemented resulting in claystone or siltstone seams. Bentonite zones may be encountered but are normally less than one half inch thick. Nonweathered Pierre Shale is considered to be "Soft Rock".

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.			

Plotting Date: 03/26/2013

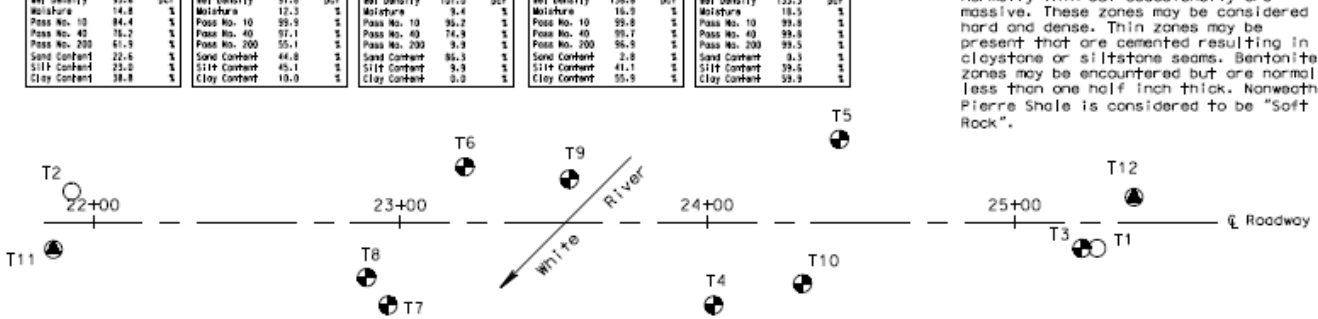
The Geotechnical Engineering Activity has on file all of the boring logs for this project. These logs and additional results of laboratory test, if any, are available for review at the Central Office in Pierre.

LEGEND

- Auger Test
- Drive Test
- Water
- Caved
- Penetration Test
- Sample Zone

Drive test are conducted by dropping a 490 pound hammer 30 inches to drive a 2 7/8 inch drill stem with attached retractable plug sampler for taking samples and to measure the resistance to penetration of the soil.

Auger holes are drilled with a 4 1/2 inch diameter continuous flight auger. Penetration and Push Test holes are drilled with a 6 5/8 inch diameter hollow stem auger. Push core samples are obtained by hydraulically ramming a 2 foot long lined split spoon sampler into the soil to obtain 2 inch nominal diameter soil samples.

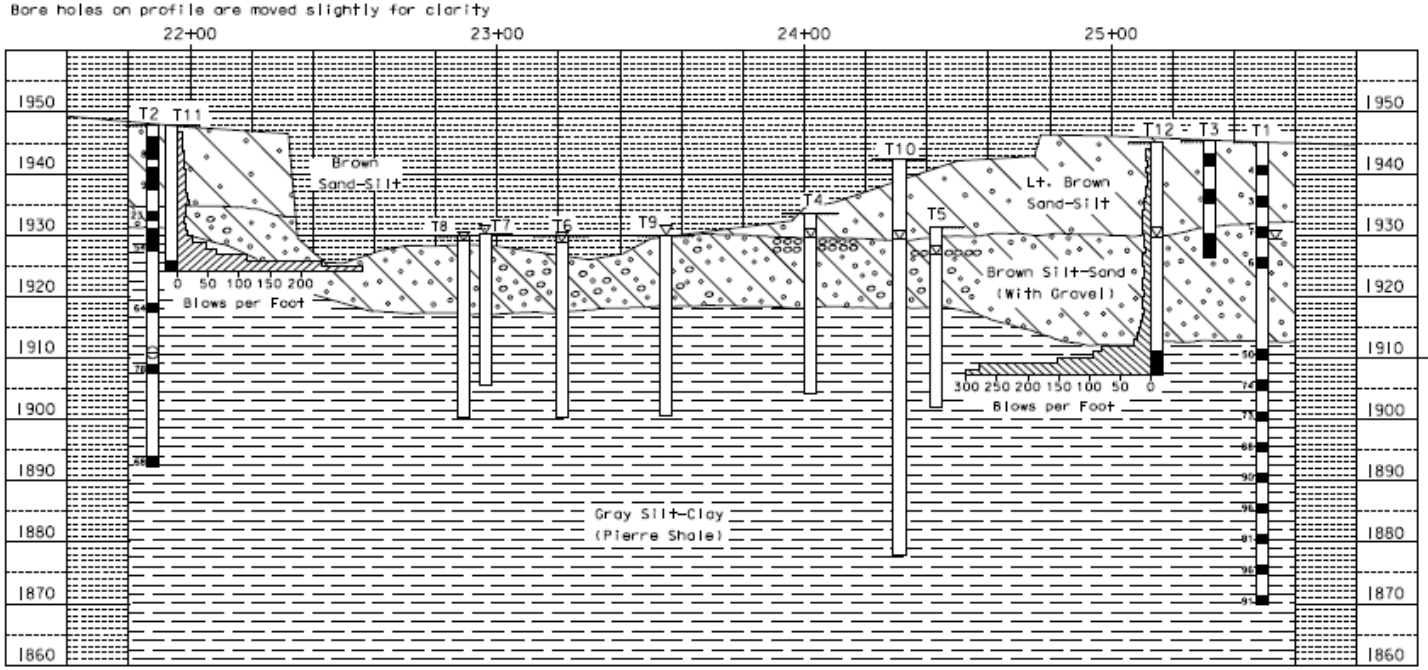


* Values represent uncorrected "N" values from Penetration Test.

Sample Zone 48 Blows Per Foot

Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil.

Bore holes on profile are moved slightly for clarity



GROUND WATER ELEVATIONS

as of December 2012

T1	(Caved) 1931.3
T2	(Caved) 1910.9
T3	Dry
T4	1929.7
T5	1926.9
T6	1928.9
T7	1930.2
T8	1929.1
T9	1930.0
T10	1929.3
T11	Dry
T12	1929.8

MEASURED SKIN FRICTION

	Elev	psf
T11	1924.0	2.193
T12	1907.3	1.214

BRO 8048(03) MELLETTE COUNTY PCN 02DY
18.9 MILES N. AND 0.8 MILES W. OF CEDAR BUTTE
SECTION 28 TOWNSHIP 45 N. RANGE 31 W.
OVER WHITE RIVER
STR. NO. 48-102-010

SITE PLAN & SUBSURFACE PROFILE

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	NN	JW	BRIDGE ENGINEER

PLOT SCALE - 1:20

PLOTTED FROM - TRPR18174

FILE - ...\SUBSURFACE PROFILE\02DY.DGN

RECOMMENDATIONS

EXAMPLE 2

Re: BRO 8027(29), Gregory County, PCN 00QR
Str. No. 27-030-081, located 2.0 West & 0.1 South of the Jct of SD44/SD47
RCBC Undercut Recommendation

Soils maps of the area indicate the soils at the location of the proposed structure have the following characteristics.

Station 16+86 (Str. No. 27-030-081)

CLASSIFICATION: A-7
Clay & Silty Clay
AVERAGE LIQUID LIMIT: 66
SHRINK-SWELL POTENTIAL: High to Very High
FROST ACTION POTENTIAL: Low
CORROSIVITY: High for steel, Low to Moderate for concrete

RECOMMENDATIONS:

Provide 24 inches of undercut and backfill.

DISCUSSION:

The project consists of replacing an existing single span 22' steel stringer bridge with a 2 barrel 13' x 6' cast-in-place RCBC. The proposed box culvert will be in the same location as the existing bridge location. The existing surfacing on the road is gravel and will be resurfaced with gravel upon completion. Minimal grading at the proposed box culvert location is anticipated, therefore, the material shall be compacted using the Ordinary Compaction Method.

A subsurface investigation was conducted for the proposed RCBC. The subsurface investigation consisted of placing a boring near both the proposed inlet and outlet ends of the structure and logging the material to 3 feet below the flow line. Samples were collected from below the flow line for soils classification. A dynamic cone penetrometer was used at both the inlet and outlet ends to identify the change in relative density of the subsurface material below flow line.

Subsurface soils at the proposed site consist of brown silt-clay to 3' below the existing flow line.

The 2' undercut depth is recommended to remove the low strength soils with high shrink-swell potential from below the box culvert.

The following paragraphs shall be placed in the plans:

Compaction of earth embankment and box culvert backfill material shall be governed by the Ordinary Compaction Method.

Any questions about the recommendations or the subsurface conditions can be directed to the CONSULTANT CONTACT NAME AND PHONE NUMBER.

Appendix D - Construction Management Plan

Use and Limitation: The Consultant shall use this document as a guide in preparing a construction management plan to be included in the bid documents for their specific project. Consultants are cautioned that the provision of this suggested sample construction management plan is not an implied or explicit guarantee of grant obligation compliance. The Consultant is solely responsible for the preparation and submittal of compliant construction management plan in accordance with the grant conditions.

Construction Management Plan

[Date]

[Location]

[Project Number]
[PCN Number]

Prepared For
[ ]

Prepared By
[ ]

PROJECT INFORMATION

This Construction Management Plan (CMP) details the measures and procedures required to assure compliance with the quality assurance and acceptance provisions of the Bridge Improvement Grant construction contract for Project No. *[ ] with* ***[County or City name], South Dakota***. The work to be accomplished in this project consists of:

PROJECT SPONSOR:	***[Name & contact information for sponsor]***
CONTRACT ADMINISTRATION:	***[Name of firm Responsible for Const. Observation & QA testing]***
	[Name of QA firm] – Field tests
	[Name & contact info for QA lab] – Lab tests

RESPONSIBILITIES

Project Manager/Engineer

The Project Manager / Engineer, on behalf of the sponsor is the person with overall responsibility for contract administration of this project. The Project Manager / Engineer has the authority to take the necessary actions to monitor compliance with the contract documents.

Construction Observer

The responsibilities of the Construction Observer shall include monitoring all aspects of the job, sampling materials for acceptance, conducting tests on embankment and excavation areas, reviewing and analyzing all test results, assuring that work is within specification limits, advising the Contractor's Superintendent and Project Engineer of nonconformance and possible corrective actions, and measuring quantities for payment.

Quality Acceptance Laboratory

[As appropriate, clarify which firm is responsible for what QA duties], testing lab duties shall include sampling materials for acceptance and conducting tests on: [embankment, excavation, subbase, base, rip rap, class A45 concrete, pile, PCC]. (If responsibilities for testing of materials are split between different organizations, list which firm is responsible for which QA tests.)

[QA Lab name] personnel assigned to construction testing have received certified training from the [Name of appropriate certifications] (e.g. Troxler Nuclear Equipment Seminar and the American Concrete Institute (ACI)).

All QA testing shall be performed by an (ASTM C1077 and D3666) accredited laboratory and a copy of the current accreditation shall be supplied to the Engineer and Owner, for approval, prior to submitting test results.

QUALITY ASSURANCE INSPECTION PROCEDURES

1. Quality Assurance Tests: A list of tests and certifications required by the contract specifications can be found in the attached Appendix A. The list includes the referenced specification section and testing requirements. All parties will be informed of their responsibilities. This information will be reviewed at the preconstruction conference and monitored throughout the project.
2. Submittals: The Engineer shall maintain a file containing certifications and submittals required by contract as provided by the contractor, as well as approvals from the Engineer.
3. [Names of firm(s) responsible for QA test reports] will provide acceptance test reports to the [Owner / Engineer] as soon as the results are available, electronically. Typed copies shall be made available within [one] working day [delivered via electronic mail].
4. Material Test Reports: Material test results shall be verbally made available to the [Owner / Engineer] within [one hour] after the test report is completed and typed copies shall be made available within one working day [delivered via electronic mail].

   - Calibration check on equipment used to determine the noncompliance item, if applicable.
   - Confirmation of noncompliance through retesting and/or follow-up observations.
   - If a solution to the nonconformance issue is not reached in a reasonable time frame, additional qualified contractor personnel will be contacted to assist in identifying and correcting the problem.
   - If a severe nonconformance problem is detected and a reasonable solution cannot be implemented in a reasonable time frame, the Construction Superintendent will consult with the Project Engineer and the work will be suspended.
   - The work will not begin again until the Construction Superintendent and Project Engineer concur that a solution to the problem has been found and successfully implemented.

5. Test Reports Which Require Corrective Actions: Should test results or observations indicate noncompliance with the project contract, plans, or specifications, the following communication and follow-up action will be implemented, as applicable:

   - Verbal notification to the sponsor, Construction Superintendent, work area foreman and/or plant operator.

- On restarting the work, the nonconforming testing element or observation will be monitored at an appropriate higher frequency for a reasonable amount of time, e.g. double the testing frequency listed.
- After the area in noncompliance has been repaired, acceptance retesting will resume. The test reports will include the failed test number for tracking.

6. Daily Reports: The project manager or his representative will maintain a daily diary summarizing pertinent construction items. Items recorded shall include (as a minimum):
   a) Date
   b) Weather Conditions
   c) Brief Summary of Work Performed
   d) Number of workers on site
   e) Type and Amount of Major Equipment being utilized
   f) Running total of working/calendar days used on project
   g) Significant Directives/Communication with contractor (e.g. regarding construction procedures or material quality)
   h) Summary of QA tests performed that day
   i) Arrival / Departure Time of On Site Inspection Staff
7. B i - Weekly Reports: A summary of bi-weekly construction status shall be prepared and submitted to [owner] every [list day, e.g. Friday]. Report shall include summary of work completed in that 2 week period, summary of QA test results, discussion of any controversial issues that came up, and work anticipated during next reporting period. A sample report is included in Appendix B.
8. The resident observer and acceptance testing lab personnel shall maintain all acceptance test reports and provide copies to the owner/engineer as soon as results are available.
9. [Name of firm responsible for final construction report] will prepare a final project construction material testing and acceptance report that includes a summary of: all acceptance tests results, quantity of materials, and all bi-weekly reports. (Actual test reports will be available upon request). This will be submitted to the SDDOT with the final pay application.

Include listing of all QC/QA tests and certifications required by the contract specifications.

Recommend including the following information in your listing:

- Material
- Specification
- Specification reference section
- Test Required
- Minimum Testing Frequency
- Test Requirements
- Notes

Material	Specification	Spec Section	Test Required	Min. Test Frequency	Requirements	Notes

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION
BI-Weekly Progress Report No. _____

Project No. _____ PCN _____ Period Ending _____ 20 ____
County _____ Contract Time _____
Type of Work _____ Working Days This Period _____
Prime Contractor _____ Working Days to Date _____
Percent Complete _____

WORK IN PROGRESS THIS PERIOD

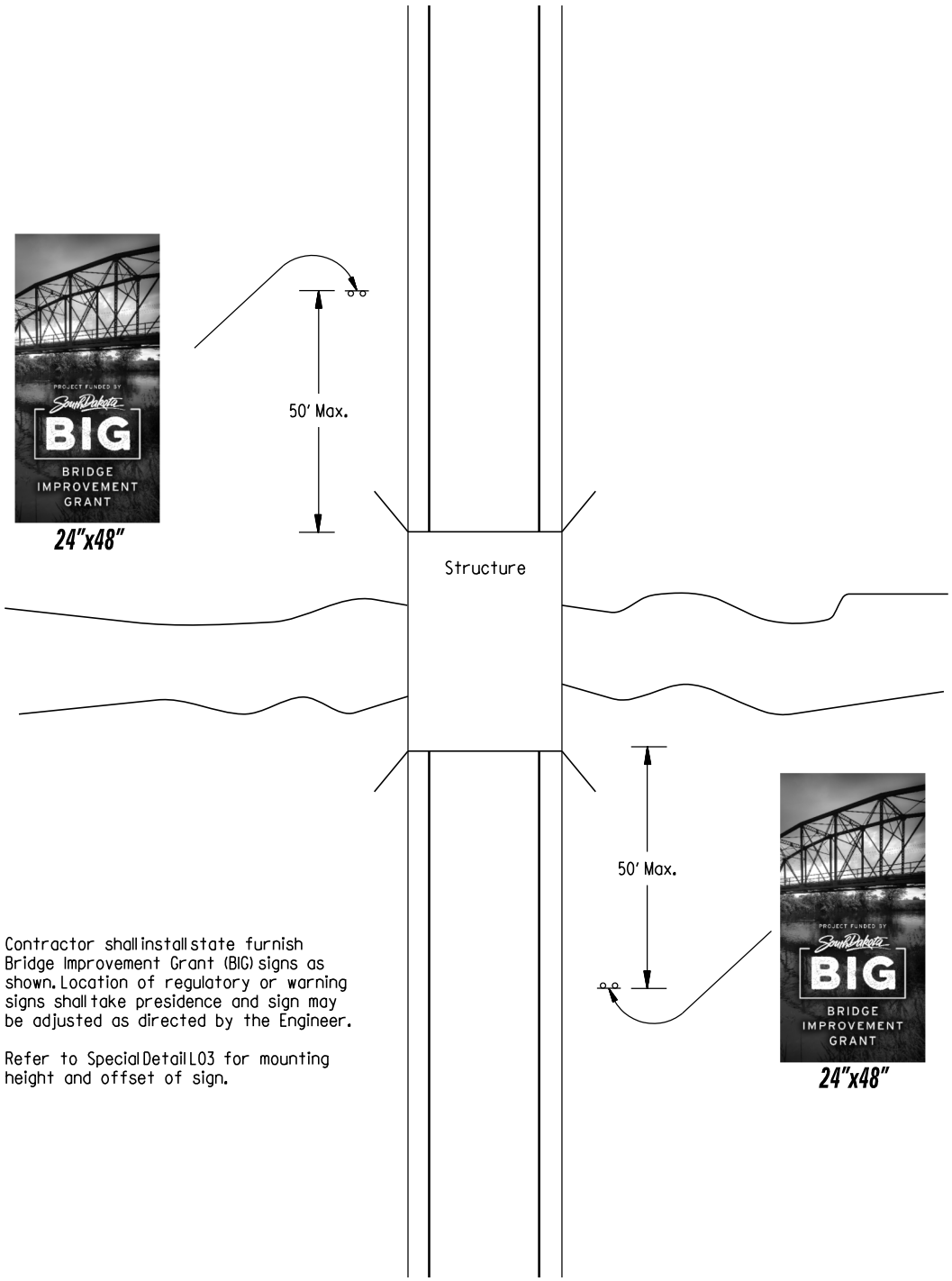
General Comments _____

Contractor Working (Indicate after each: 1-1st Week; 2-2nd Week; 3-Both Weeks **E if contractor/sub is Exempt - i.e. 1E,2E)**

Work Started: _____
Work Suspended: _____
Work Resumed: _____
Field Work Completed: _____

Day	Date	Working Day No.	Weather and Comments	Temperature	
				High	Low
Sunday					
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					

_____
Prepared by



Contractor shall install state furnish Bridge Improvement Grant (BIG) signs as shown. Location of regulatory or warning signs shall take presidence and sign may be adjusted as directed by the Engineer.

Refer to Special Detail L03 for mounting height and offset of sign.

September 22, 2016

	SDDOT	GUIDES FOR TRAFFIC CONTROL DEVICES BRIDGE IMPROVEMENT GRANT TYPICAL SIGNING	SPECIAL DETAIL L72 Sheet 1 of 1

BIG Procedure Appendix E-1