



MINNEHAHA COUNTY HIGHWAY DEPARTMENT CULVERT REPLACEMENT REQUEST FORM

Instructions & Background Information

(This page to be completed by Township personnel)

The purpose of this form is to provide a means of collecting the information necessary for our engineers to recommend an appropriate size for culverts when Townships request assistance. This form also includes some narrative on permitting requirements and installation procedures and recommendations. Abiding by these guidelines assures long term performance of the culvert with minimal maintenance through proper installation which should provide the longest life possible for the new culvert.

Before using this form, it is assumed the need to replace any culvert is obvious and the existing culvert has failed or failure is imminent. These procedures and guidelines over-ride and replace the culvert purchasing policy established by the Minnehaha County Highway Department on March 28th, 2005.

The County has a fixed budget for culvert replacements for Townships each calendar year. Once the limit is reached that year (in 2014 the limit was reached in June), the request will be entered into a waiting list for the following year. Requests will be addressed on a *first-come, first-served* basis. Therefore, requests should be made as early as possible. Ample time for permitting approvals must also be considered.

Eligible Size and Type for County Purchase: It has been established over time and through common practice that Minnehaha County will purchase corrugated metal pipes (CMP) of 54 inches in diameter (or equivalent in the case of arch pipes) and larger for the Townships to install at their cost (SDCL 31-14-27 states the 16 square foot of culvert opening as a threshold). Any culvert 53 inches in diameter and less is not eligible for County financial assistance; however, assistance to appropriately size a culvert 53 inches and smaller will be provided at the Township's request using this form. In general, financial assistance to purchase culverts for township is for corrugated metal pipe only (CMP), irrespective of the material type of the existing culvert. Under special circumstances, the County *may* cost participate in the purchase of concrete culverts including box culverts; however, if equivalent performance can be achieved using CMP, the County's limit of financial assistance will be based on the cost of the CMP culvert replacement and will be assessed individually.

By submitting this form, there is no guarantee that the culvert will be replaced within the year of application. We will make every attempt to comply with your request within the boundaries and guidance contained herein. Special emergencies will be handled on a case-by-case basis. All culverts ordered by MCHD through this policy shall be purchased through the annual materials contract vendor. It is recommended to include flared ends when room allows. There is no fee to process this form.

**Assume up to 3 weeks between placing the pipe order and delivery.
Permit approvals must be secured by the Township prior to installation.**

DATE of APPLICATION: _____ **APPROX. DATE OF INSTALLATION** _____

TOWNSHIP: _____ **LOCATION:** _____

CONTACT INFO: _____, _____, _____
Name phone email

EXISTING CULVERT INFORMATION:

Material (metal or concrete): _____ Shape (round, arch, box) _____ No. of Barrels _____

Size (inches) _____ (If arch, state span x rise. If box, state internal height x width) Existing Length (ft) _____

Cover over existing pipe (inches) _____ (measured from top of upstream end to top of roadway)

Distance and direction to where roadway over-topping occurs (nearest low point of roadway) _____

Should flared ends be included with the purchase of the new culvert? (Recommended) YES _____ NO _____

Please fill out this page completely prior to mailing to:
Pipe Replacement Request, Minnehaha County Highway Department, 2124 E 60th Street N, Sioux Falls, SD 57104
OR,
by emailing the completed form to jmaras@minnehahacounty.gov

County Procedures

(This page to be completed by County personnel)

A simplified method will be used by County Engineers to establish the recommended pipe size using the Manning's "n" values for pipe friction and the Darcy-Weisbach equations. The pipe is assumed to flow full with no head pressure. A full detailed hydraulic model including entrance and exit losses, head water pressure, headwater vs. tail water controlled flow, out fall condition, hydraulic jump and Froude number, etc., will not be conducted. If the Township prefers this type of detailed analysis, there are local consultants available for hire at the Township's expense.

To determine the size of the contributing basin of the watershed upstream of the pipe, StreamStats will be used. StreamStats is a Web-based Geographic Information System (GIS) provided by the U.S. Geological Survey (USGS) Department that allows users to easily obtain streamflow statistics, drainage-basin characteristics, and other information for user-selected sites on streams. South Dakota StreamStats incorporates statewide regression equations for estimating instantaneous peak flows with annual exceedance probabilities of 50, 20, 10, 4, 2, 1, and 0.2 percent. These peak flows have recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years, respectively. These peak flow rates are determined via Sando, Steven K., 1998, *Techniques for estimating peak-flow magnitude and frequency relations for South Dakota Streams*: U.S. Geological Survey Water-Resources Investigations Report 98-4055. Go to <http://water.usgs.gov/osw/streamstats/ssonline.html> to use StreamStats.

It is the County's policy to provide a culvert that passes the peak flow generated from the annual 10% -chance storm event for a bridge or culvert on a Township road. This design flow is more commonly referred to as the 10-year storm event or Q_{10} (a storm event that has a 10% chance of occurring in any given year). If the Q_{10} is less than the existing pipe's capacity, County personnel will review the upstream and downstream area including the upstream and downstream pipe size opening(s) in order to determine the best, overall practical solution. If the Township desires to have installed a larger pipe versus what is recommended, it is the Township's responsibility to pay for the difference in cost for the larger culvert. If this is the case, potential downstream impacts due to increased flows should be closely examined by the Township.

The below information constitutes the County's recommended new culvert size based on the 10-year storm event. The attached schematic is a graphic representation of how the new culvert should be installed. The following pages also contain germane information regarding recommended installation practices and permitting requirements for the US Army's Corps of Engineers permit to be in compliance with Section 404 of the *Clean Water Act*. When two barrels are to be installed, exterior spacing must exceed 50% of the largest culvert.

Minimum cover above pipe is 12 inches, 24 inches preferred (as measured from top of pipe to top of finished grade of road)

Watershed Contributing area: _____ acres and/or _____ square miles

Required Countersink Depth for Aquatic Organisms _____ as per 2012 Nationwide Permit, Regional Conditions, US Army Corps of Engineers, Omaha

Drainage Area	Culvert Countersink depth below Stream Grade Line
≤ 100 acres	not required
100 to 640 acres	0.5 feet
> 640 acres	1.0 feet
Pipe D ≥ 8 feet	20% of pipe D
Box Culvert	1.0 feet

Existing Longitudinal Pipe Slope = _____%

Peak Flows from StreamStats

Q_2 _____ cfs
 Q_5 _____ cfs
 Q_{10} _____ cfs
 Q_{25} _____ cfs
 Q_{50} _____ cfs
 Q_{100} _____ cfs
 Q_{500} _____ cfs

Calculated **Existing** Pipe Q_{full} _____ cfs

Recommended Pipe Data

Diameter D: _____ ft
 Manning's "n" _____
 Slope S _____ ft/ft
 Full Flow Q _____ cfs
 Velocity v _____ ft/sec

Velocity should be greater than 3 ft/sec to be self cleaning. If $v > 5$ fps, rip-rap should be considered, if $v > 7$ fps rip-rap is required.

RECOMMENDED CULVERT REPLACEMENT and PIPE ORDER INFORMATION:

Material (metal or concrete) _____ Shape (round, arch, box) _____ No. of Barrels _____ Gage _____

Size (inches) _____ (If arch - span x rise. If box - internal height x width)

Length of pipe (ft) _____

\$/ FT x _____

Pipe Cost = _____

Flared Ends Cost + _____

TOTAL ORDER COST = _____

Include Flared Ends? YES _____ NO _____

If YES, the length of each flared end is _____ which is **not** included in the length pipe order.

Supporting Documentation and Section 404 Permitting Guidance

MCHD encourages all Townships to coordinate with the US Army Corps of Engineers Regulatory Office for all culvert replacements draining more than 100 acres calling 605-224-8531. The best time to contact them would be after county staff has recommended an appropriate pipe size. They may request photos of the culverts and upstream and downstream views from the culverts. Most culvert replacement projects will qualify for a simplified permitting process within Section 404 of the Clean Water Act as a Nationwide permit. One can expect this permit to take between 30 and 60 days to process but some may take as much as 90 days or more if there are wetlands and historical and archaeological resources involved. The MCHD is not qualified to address historical and archeological resources nor make wetland determinations. If the stream contains Topeka Shiners, expect a more thorough and longer permitting process. A probability map showing potential streams containing Shiners is included at the end of this packet.

To obtain a Section 404 permit, the appropriate form may be found at <http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/ObtainPermit.aspx>. Instructions in how to complete this form are also available from this website as well as additional guidance.

After the form is completed, submit it to:

US Army Corps of Engineers
South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, SD 57501

The information regarding depth of bury requirements can be found at https://www.nao.usace.army.mil/Portals/31/docs/regulatory/2021NWP/NAO_FINAL_Regional_Conditions_16NWPs_15Mar2021.pdf. Special attention should be given to the information contained on the bottom half of Page 3 regarding "Counterresinking Pipes and Culverts". This guidance must be adhered to in order to be in compliance with the Nationwide Permit stipulations.

Construction and Installation Recommendations:

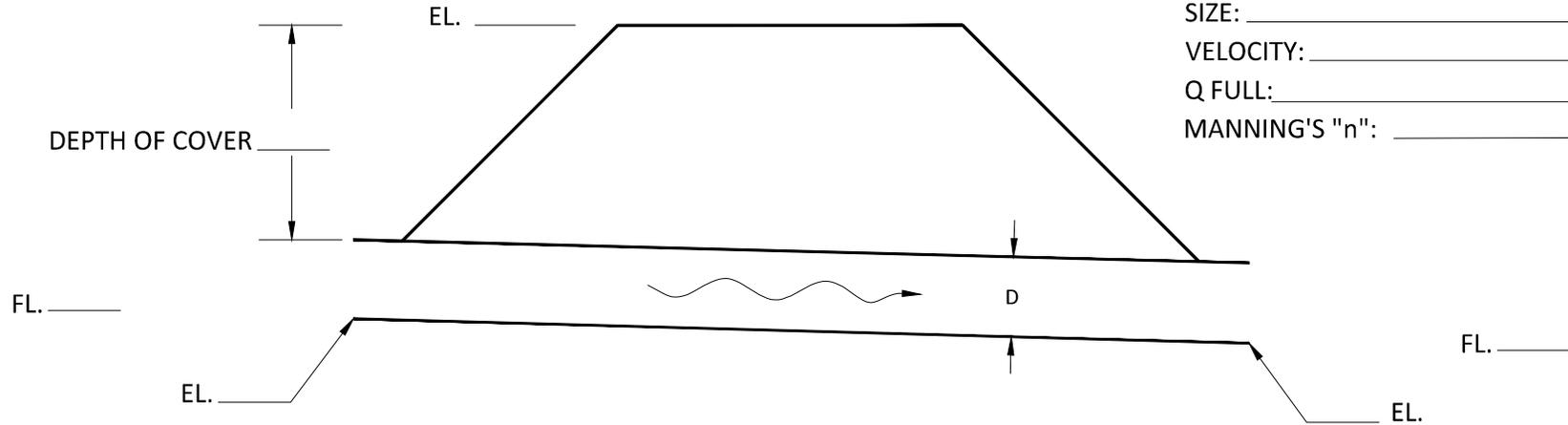
- 1) Culvert ends should be located outside of the clear zone. For most township roads having less than 500 AADT, the clear zone is 10 feet as measured from the outside edge of the driving lane, or 20 to 22 feet from centerline. Therefore, at a minimum, the total length of the culvert including the flared ends is 40 feet (skewed pipes will be longer).
- 2) 24 inches of cover on culverts is recommended as the minimum amount.
- 3) When soliciting contract work, a reputable contractor should include within their work and scope of services:
 - a. Compaction of subgrade prior to installation of bedding material.
 - b. Provide and compact gravel bedding (pea rock or sand) to spring line of pipe. See attached **BEDDING AND BACKFILL** detail.
 - c. Compaction of native backfill around pipe (***note that spacing of culverts shall not be less than 2 feet and/or ½ the diameter of the largest culvert, whichever is greater.***)
 - d. Furnish and install rip rap on top of erosion control fabric with the fabric keyed into soil. The use of soil nails is also helpful. The flow line of the top of rip rap shall not be higher than flow line of channel. See attached **RIPRAP** apron detail.
 - e. Use appropriate erosion and sediment prevention (wattles, silt fence, etc.) to prevent sediments from entering the stream.
 - f. Top soil and seed all disturbed areas. Erosion control fabrics or mulch are highly recommended on slopes steeper than 4:1.
- 4) All applicable standard specifications and installation requirements as found in the *SDDOT Standard Specifications of Roads and Bridges* should be adhered to. Standardized drawings can be found at <https://dot.sd.gov/doing-business/engineering/design-services/standard-plates> under the 450 series related to Pipe Culverts and 734 series related to Erosion Control and Water Pollution Control.

This list of recommendations is no way intended to serve as a set of complete construction standards, specifications, and/or contractor requirements but is intended to serve as a minimum guide. Any other requirements levied by permitting agencies shall be adhered to. It is the responsibility of the Township that compliance with specific permit requirements is achieved.

If you have questions about this form, or any part of this process, please contact Jacob Maras at 605-367-4316.

EXISTING CONDITIONS

TECHNICIAN: _____
DATE: _____
ROUTE: _____
MRM: _____
PIPE MATERIAL: _____
SIZE: _____
VELOCITY: _____
Q FULL: _____
MANNING'S "n": _____



COMMENTS:

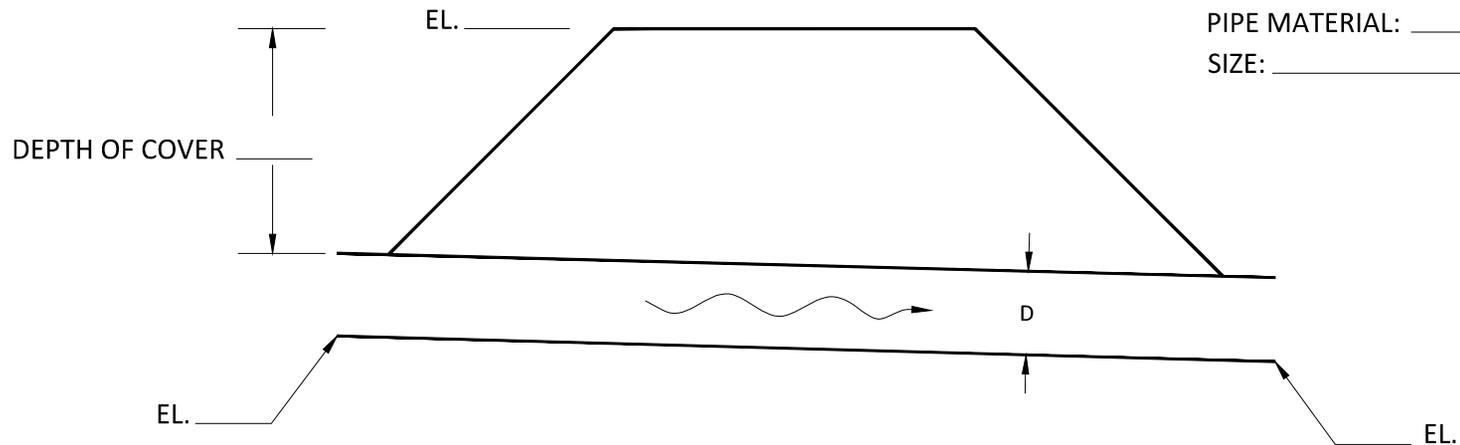
FLARED ENDS: _____

RIP RAP: _____

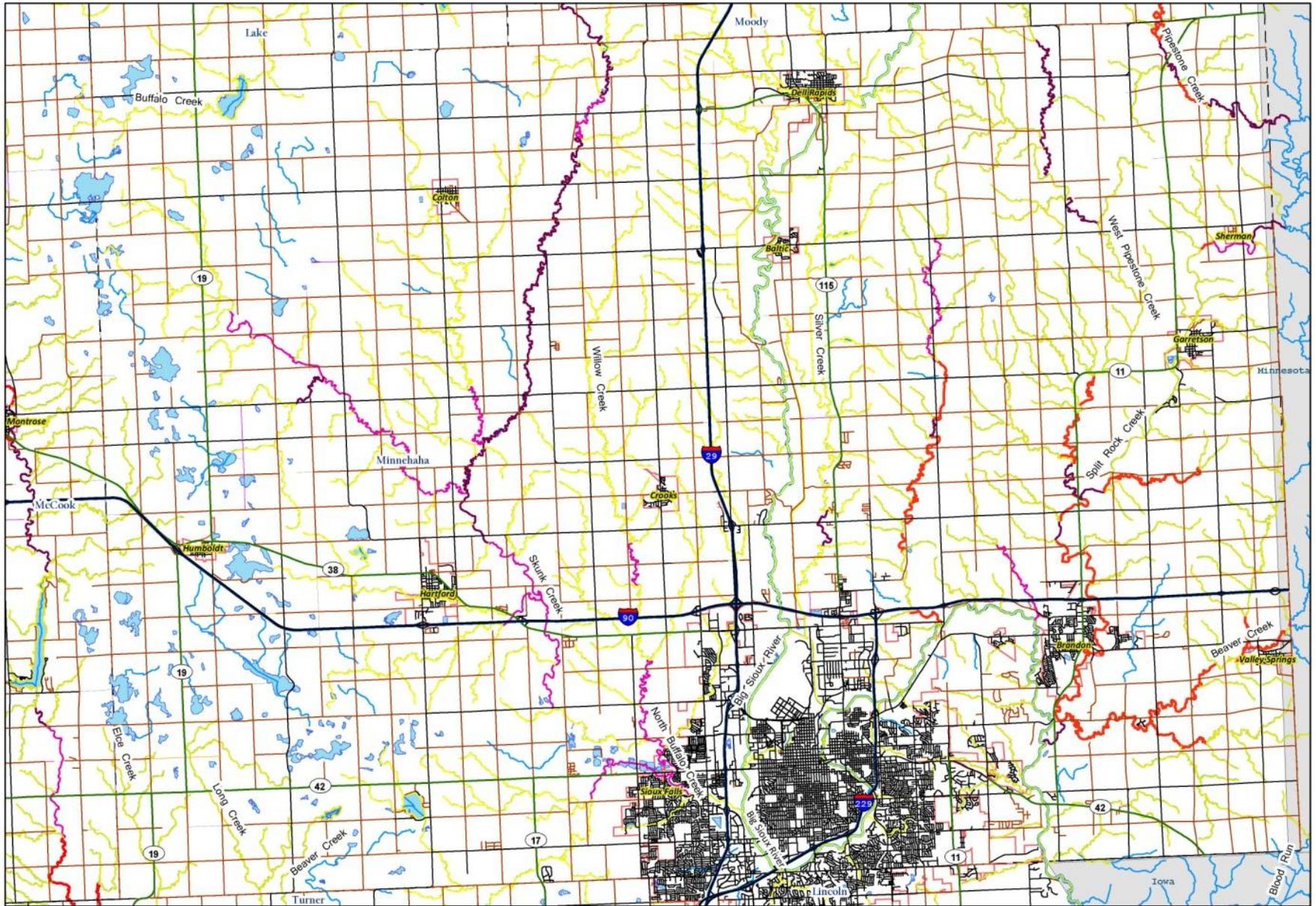
SCOUR HOLES: _____

PROPOSED CONDITIONS

DESIGNER: _____
DATE: _____
PIPE MATERIAL: _____
SIZE: _____

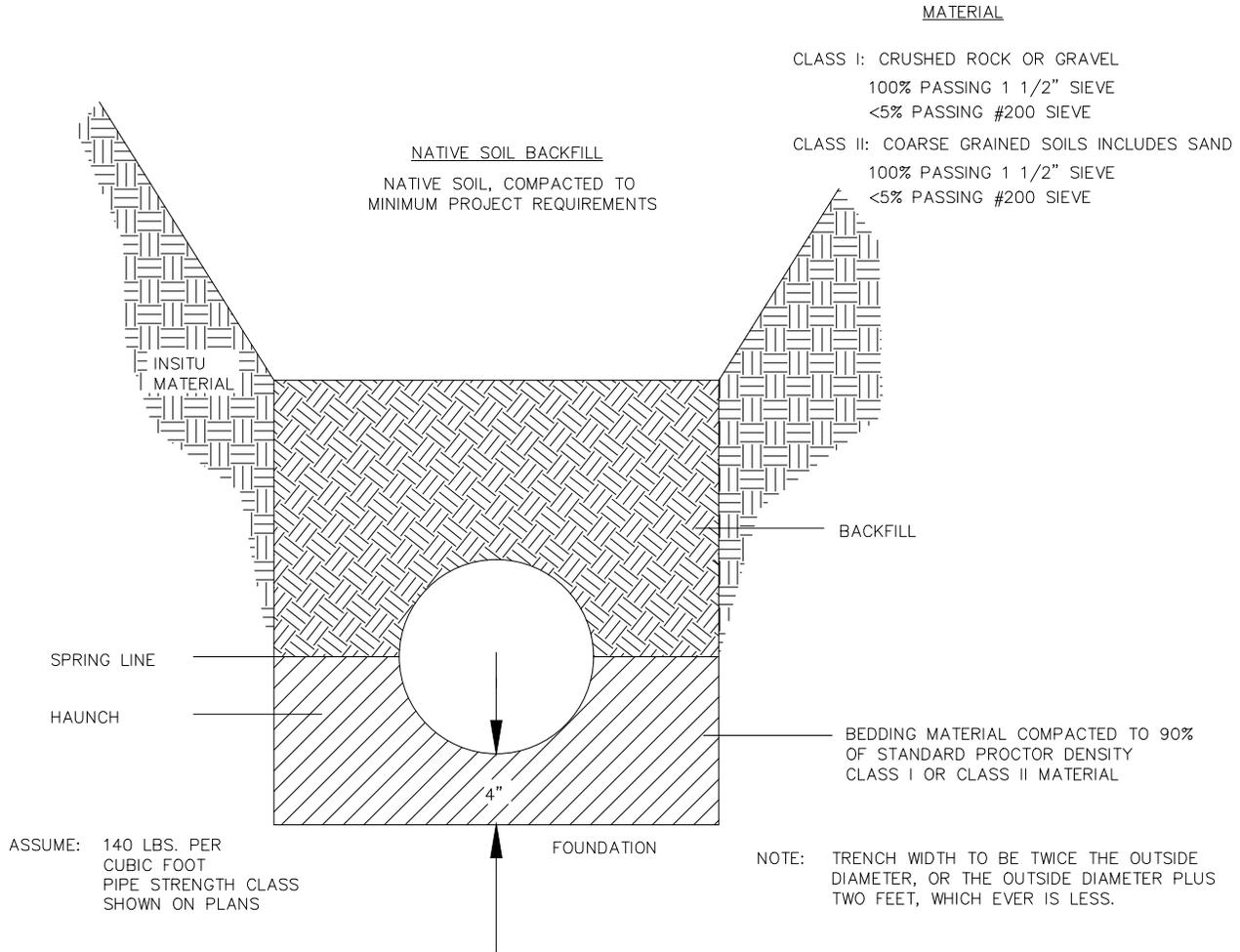


Streams with a probability of Topeka shiner presence in Minnehaha County, SD



- Legend**
Topeka Shiner:
- Low probability
 - Moderate1
 - Moderate2
 - High probability
 - Very unlikely

FOR 12" THRU 84" DIAMETER PIPE TYPE B INSTALLATION



QUANTITY ESTIMATE TABLE
FOR BEDDING MATERIAL

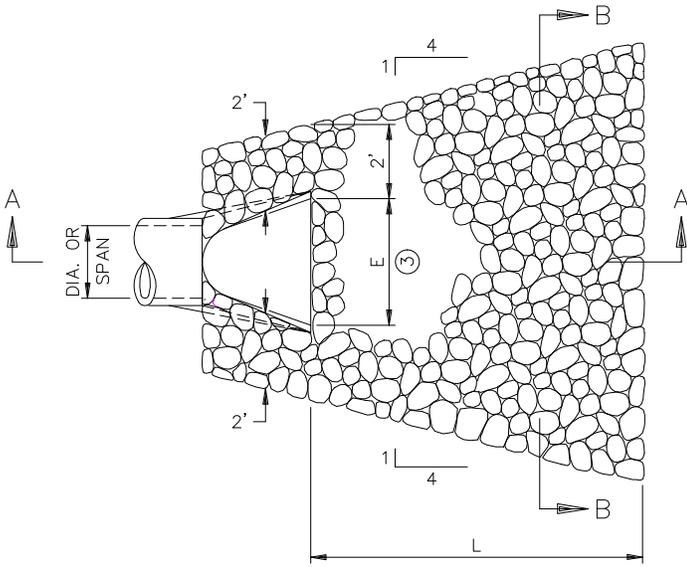
12"	0.14 TON/L.F.
15"	0.19 TON/L.F.
18"	0.25 TON/L.F.
21"	0.29 TON/L.F.
24"	0.33 TON/L.F.
27"	0.36 TON/L.F.
30"	0.40 TON/L.F.
33"	0.44 TON/L.F.
36"	0.48 TON/L.F.
42"	0.57 TON/L.F.
48"	0.67 TON/L.F.
54"	0.77 TON/L.F.
60"	0.88 TON/L.F.
66"	0.98 TON/L.F.
72"	1.10 TON/L.F.
78"	1.24 TON/L.F.
84"	1.35 TON/L.F.

TABLE OF QUANTITIES
RIPRAP AT RCP OUTLETS

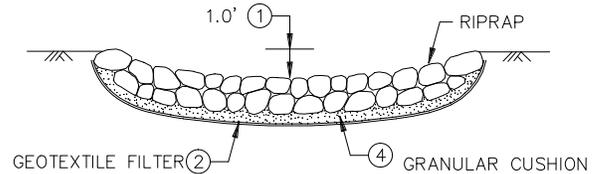
DIA. OF ROUND PIPE (IN.)	L (FT.)	CLASS II d ₅₀ = 6"			CLASS III d ₅₀ = 9"			CLASS IV d ₅₀ = 12"		
		GEO-TEXTILE FILTER (SQ.YD.)	GRANULAR FILTER UNDER APRON (CU.YD.)	12" DEPTH RIPRAP (CU.YD.)	GEO-TEXTILE FILTER (SQ.YD.)	GRANULAR FILTER UNDER APRON (CU.YD.)	18" DEPTH RIPRAP (CU.YD.)	GEO-TEXTILE FILTER (SQ.YD.)	GRANULAR FILTER UNDER APRON (CU.YD.)	24" DEPTH RIPRAP (CU.YD.)
12	8	16.9	0.2	3.0	19.6	0.3	4.4	22.6	0.3	5.9
15	8	18.0	0.2	3.2	20.8	0.3	4.8	23.9	0.4	6.4
18	10	22.4	0.3	4.3	25.6	0.4	6.4	29.0	0.5	8.5
21	10	24.1	0.4	4.7	27.4	0.6	7.1	30.9	0.7	9.4
24	12	29.7	0.5	6.2	33.4	0.8	9.2	37.3	1.0	12.3
27	12	31.4	0.6	6.6	35.2	0.9	9.9	39.2	1.2	13.2
30	14	37.4	0.8	8.2	41.6	1.1	12.3	46.0	1.5	16.4
36	16	45.9	1.1	10.6	50.5	1.6	15.8	55.4	2.1	21.1
42	18	52.8	1.2	12.5	57.8	1.7	18.7	63.0	2.3	24.9
48	20	61.1	1.5	14.8	66.5	2.2	22.2	72.0	2.9	29.6

TABLE OF QUANTITIES
RIPRAP AT RCP-A OUTLETS

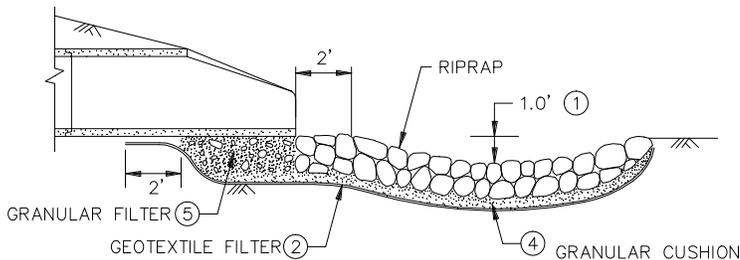
SPAN OF PIPE ARCH (IN.)	L (FT.)	CLASS II d ₅₀ = 6"			CLASS III d ₅₀ = 9"			CLASS IV d ₅₀ = 12"		
		GEO-TEXTILE FILTER (SQ.YD.)	GRANUL UNDER APRON (CU.YD.)	12" DEPTH RIPRAP (CU.YD.)	GEO-TEXTILE FILTER (SQ.YD.)	GRANUL UNDER APRON (CU.YD.)	18" DEPTH RIPRAP (CU.YD.)	GEO-TEXTILE FILTER (SQ.YD.)	GRANUL UNDER APRON (CU.YD.)	24" DEPTH RIPRAP (CU.YD.)
22	10	22.4	0.3	4.1	25.6	0.4	6.1	29.0	0.5	8.1
28	12	29.5	0.5	5.7	33.2	0.7	8.5	37.1	0.9	11.3
36	14	37.3	0.8	7.5	41.5	1.1	11.2	45.8	1.5	14.9
43	16	45.9	1.1	9.5	50.5	1.6	14.3	55.3	2.1	19.0
51	18	52.5	1.2	11.3	57.5	1.7	16.9	62.7	2.3	22.5
58	20	59.9	1.3	13.2	65.2	1.9	19.8	70.7	2.5	26.4



PLAN



SECTION B-B



SECTION A-A

NOTES:

REQUIREMENTS FOR GEOTEXTILE TYPE, RIPRAP SIZE AND THICKNESS WILL BE DESIGNATED IN THE PLANS.

PIPE SIZES LARGER THAN THOSE SHOWN REQUIRE A SPECIAL DESIGN.

- ① FOR PIPES GREATER THAN OR EQUAL TO 30", USE 1.5'.
- ② GEOTEXTILE FILTER, SPEC. 3733, SHALL COVER THE BOTTOM AND SIDES OF THE AREA EXCAVATED FOR THE RIPRAP, GRANULAR FILTER MATERIALS.
- ③ DIMENSION E IS GIVEN ON STANDARD PLATES 3100 AND 3110.
- ④ GRANULAR FILTER, SPEC. 3601, MAY BE USED AS A CUSHION LAYER. PLACE FILTER PER SPEC. 2511. THE CUSHION LAYER IS INCIDENTAL.
- ⑤ GRANULAR FILTER OR RIPRAP, SPEC. 3601, TO EXTEND UNDER ENTIRE OPEN PORTION OF PIPE APRON. DEPTH OF MATERIAL UNDER APRON SHALL MATCH RIPRAP DEPTH. WHEN USING RIPRAP INCREASE RIPRAP QUANTITY ACCORDINGLY AND PLACE A 3" LAYER OF 1.5" CRUSHED ROCK UNDER THE APRON TO AID IN GRADING FOR APRON PLACEMENT. CRUSHED ROCK IS INCIDENTAL.