DESIGN DATA				
Traffic	Average Daily			Max. Hr.
Current 2014	Pass: 1800	Trucks: 835	Total: 2635	265
Forecast 2034	Pass: 2685	Trucks: 1370	Total: 4055	410
Clear Zone Dist. 32 Feet		Design Speed: 75 MPH		
Minimum Sight Dist. for Stopping: 820 Feet		Bridges:		
Full Control of Access, No Point of Access Other Than at Interchange Ramps				
Pavement Design Life (years)				
Design Accumulated One-way ESALs:				

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	20549	1	1

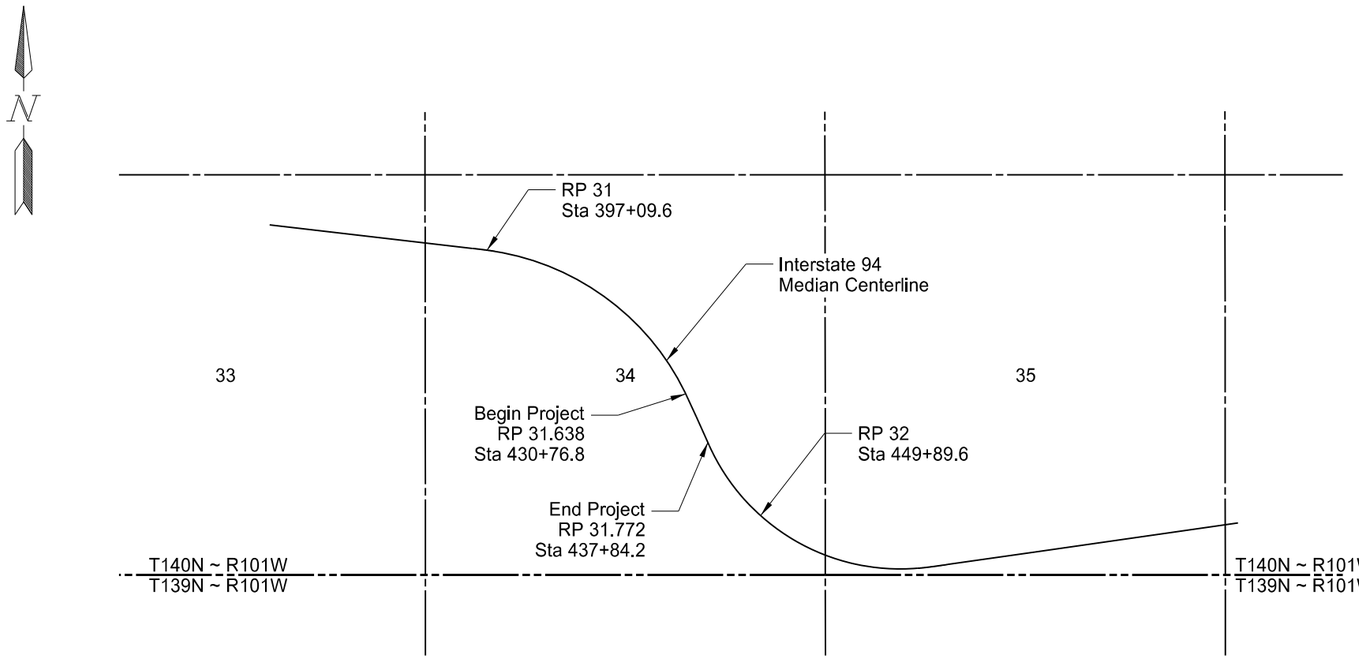
JOB # 14
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

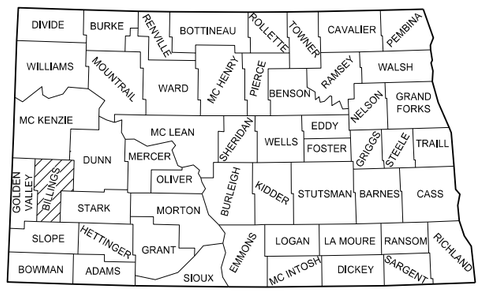
SER-5-094(107)030

GOVERNING SPECIFICATIONS:
2014 Standard Specifications adopted by the North Dakota Department of Transportation and the Supplemental Specifications effective on the date the project is advertised.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SER-5-094(107)030	0.134	0.134

Billings County
RP31 Slide Repair
Ground Anchors, Drilled Shafts, Grading & Incidentals





STATE COUNTY MAP

DESIGNERS

Paul Macklin

David Vara

Jordan Gerber

APPROVED DATE 02/11/15

Ron Horner /s/ for
OFFICE OF PROJECT DEVELOPMENT
ND DEPARTMENT OF TRANSPORTATION

I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of ND.

APPROVED DATE 02/09/15

Gregrory Robert Fischer /s/
SHANNON & WILSON, INC.

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	2	1

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Standard No.	Description
D-101-1, 2, 3	NDDOT Abbreviations
D-101-10	NDDOT Utility Company and Organization Abbreviations
D-101-20, 21	Line Styles
D-101-30, 31, 32	Symbols
D-255-02	Erosion and Siltation Control – Erosion Control Blanket Installation
D-256-01	Erosion and Siltation Controls
D-261-01	Erosion Control Fiber Roll Placement Details
D-704-5	Contractor Sign Detail
D-704-7, 8	Breakaway Systems for Construction Zone Signs
D-704-9, 10, 11	Construction Sign Details
D-704-13	Barricade and Channelizing Device Details
D-704-14	Construction Sign Punching and Mounting Details
D-704-20	Terminal and Seal Coat Sign Layouts
D-704-35	Sign Layout for One Lane Closure – Interstate System

LIST OF SPECIAL PROVISIONS (SP)

SP #	Description
SP 3(14)	Temporary Erosion and Sediment Best Management Practices
SP 115(14)	Crosshole Sonic Log Tests
SP 116(14)	Drilled Shaft
SP 118(14)	Ground Anchor
SP 119(14)	Horizontal Drains
SP 120(14)	Instrumentation
SP 134(14)	Sediment Collection Bag

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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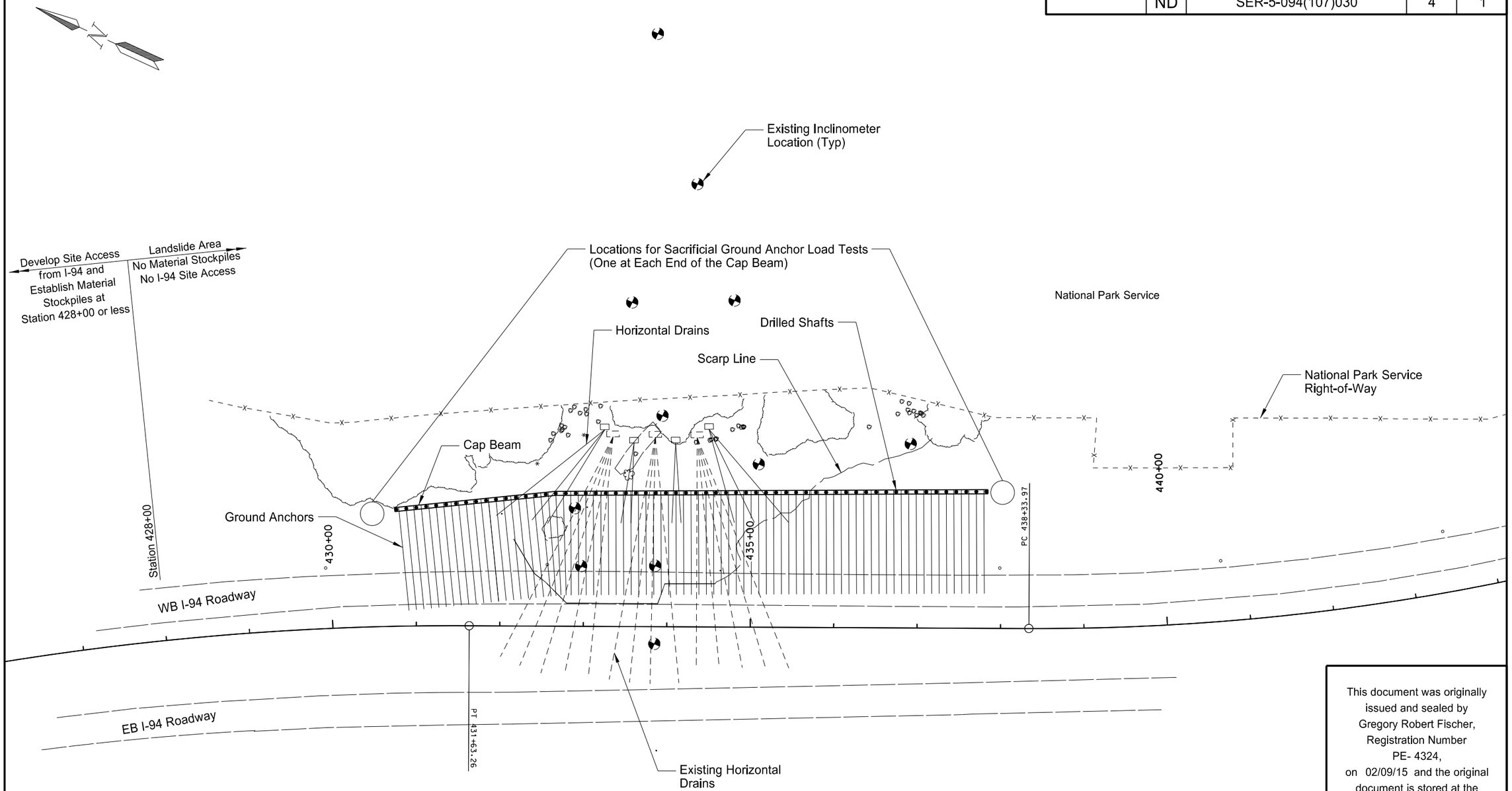

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I-94 PAINTED CANYON LANDSLIDE REPAIR

SCOPE OF WORK

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	6	1

NOTES

100-P01 PROTECTION OF INCLINOMETER TUBES: The contractor will exercise care in the construction operations to protect the inclinometer tubes as much as possible.

200-010 SHRINKAGE: 25 percent additional volume is included for shrinkage in earth embankment.

210-P01 CLASS 1 EXCAVATION: The common excavation, embankment, borrow and water is included in the bid item “Class 1 Excavation”.

220-P01 STOCKPILE SITE: The stockpile site limits include the work area and the staging area.

256-P01 REMOVE AND REPLACE RIPRAP: Prior to excavating the first drilled shaft, remove the existing riprap at the outlets of the existing horizontal drains to expose the ends of the horizontal drains. Install a tee, threaded plug and flexible pipe onto the exposed end of the horizontal drains. Direct the flexible pipe into the sediment collection bags. After the new horizontal drains are in place, the riprap will be replaced at the outlets. All costs associated with removing and replacing riprap and installing the tee, threaded plug and flexible pipe are included in the bid item “Remove and Replace Riprap”. Payment for the bid item “Remove and Replace Riprap” will be paid at plan quantity.

261-P01 STOCKPILE SITE EROSION CONTROL: An additional 0.5 acres of Seeding Class II, 0.5 acres of Straw Mulch and 600 lf of Fiber Rolls 12in has been included in the quantities for stockpile site erosion control.

602-P01 CAP BEAM CONCRETE COLOR: The color pigments will meet the requirements of ASTM C979, Specification for Pigments for Integrally Colored Concrete. The pigment color will be Solomon color 385 bark, Davis color 160 canyon or approved equal. The color will be added by weight, at a ratio recommended by the manufacturer, directly into the mixer along with the aggregate, cement and water while the mixer is operating at mixing speed. Continue mixing for five to ten minutes or from 50 to 100 revolutions until the color appears uniformly distributed in the mix. This work will be included in the unit price bid for Class AAE-3 Concrete.

602-P02 SECONDARY GROUND ANCHOR LOCATIONS: All unused secondary ground anchor blockouts in the cap beam will be filled with Class AAE-3 concrete, flush with cap beam and will have the pigment color previously stated. The additional concrete will be paid at the unit price for “”Class AAE-3 Concrete”.

704-P01 TRAFFIC CONTROL: Provide traffic control consisting of a temporary lane closure. Traffic control device quantities are based on the following list. Provide additional devices at no cost to the Department.

1. Standard D-704-20, Layout G; and
2. Standard D-704-35.

ENVIRONMENTAL COMMITMENTS

ENVIRONMENTAL COMMITMENTS (EC): The North Dakota Department of Transportation and the Federal Highway Administration have made environmental commitments to secure approval of this project. The environmental commitments are as follows:

Wetland Number	Cowardin Classification	Wetland Type	Wetland Size (acres)	Wetland Feature	USACE Jurisdictional Wetlands	Impacts to Wetlands	
						Temp.	Perm.
There are a number of adjacent wetlands within the project limits; however, no impacts are anticipated within the limits of construction.							
TOTALS:				**0.00**		**0.00**	**0.00**

*A wetland Jurisdictional Determination was issued by the USACE on 11/04/2014; NWO-2014-2181-BIS.

EC-1: Construction activity occurring on this project is taking place adjacent to Theodore Roosevelt National Park. At no time shall construction equipment or activity encroach on Park property. Precautions and measures shall be in place at all times to ensure no impacts to the Park.

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ESTIMATE OF QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	TOTAL
103	0100	CONTRACT BOND	L SUM	1
201	0330	CLEARING & GRUBBING	L SUM	1
210	0101	CLASS 1 EXCAVATION	L SUM	1
220	0100	PREPARE STOCKPILE SITE	L SUM	1
220	0200	RESTORE STOCKPILE SITE	L SUM	1
251	0200	SEEDING CLASS II	ACRE	3.0
251	2000	TEMPORARY COVER CROP	ACRE	2.5
253	0101	STRAW MULCH	ACRE	5.5
256	0701	REMOVE AND REPLACE RIPRAP	CY	75
260	0200	SILT FENCE SUPPORTED	LF	780
260	0201	REMOVE SILT FENCE SUPPORTED	LF	780
261	0112	FIBER ROLLS 12IN	LF	2,920
261	0113	REMOVE FIBER ROLLS 12IN	LF	770
265	0100	STABILIZED CONSTRUCTION ACCESS	EA	1
265	0101	REMOVE STABILIZED CONSTRUCTION ACCESS	EA	1
602	0130	CLASS AAE-3 CONCRETE	CY	350.9
612	0115	REINFORCING STEEL-GRADE 60	LBS	45,713
702	0100	MOBILIZATION	L SUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	837
704	1052	TYPE III BARRICADE	EA	3
704	1060	DELINEATOR DRUMS	EA	44
704	1067	TUBULAR MARKERS	EA	32
704	1087	SEQUENCING ARROW PANEL - TYPE C	EA	1
708	5652	ECB TYPE 3	SY	62
714	7005	PIPE PVC 1.5IN SLOTTED DRAIN	LF	970
920	0900	SEDIMENT COLLECTION BAG	EA	30
930	3990	4.0FT DIAMETER DRILLED SHAFT	LF	4,200
930	4150	GROUND ANCHOR	LF	11,060
930	4155	SACRIFICIAL GROUND ANCHOR LOAD TEST	EA	2
930	4200	INSTRUMENTATION-INCLINOMETER	LF	290
930	4205	INSTRUMENTATION-LOAD CELL	EA	4
930	4210	INSTRUMENTATION-STRAIN GAUGE	EA	8
930	4250	CROSSHOLE SONIC LOG TEST	EA	10

I-94 Median Centerline Sta. 430+78.75 = Drilled Shaft Alignment Sta. 4+94.00
I-94 Median Centerline Sta. 437+82.19 = Drilled Shaft Alignment Sta. 12+02.00

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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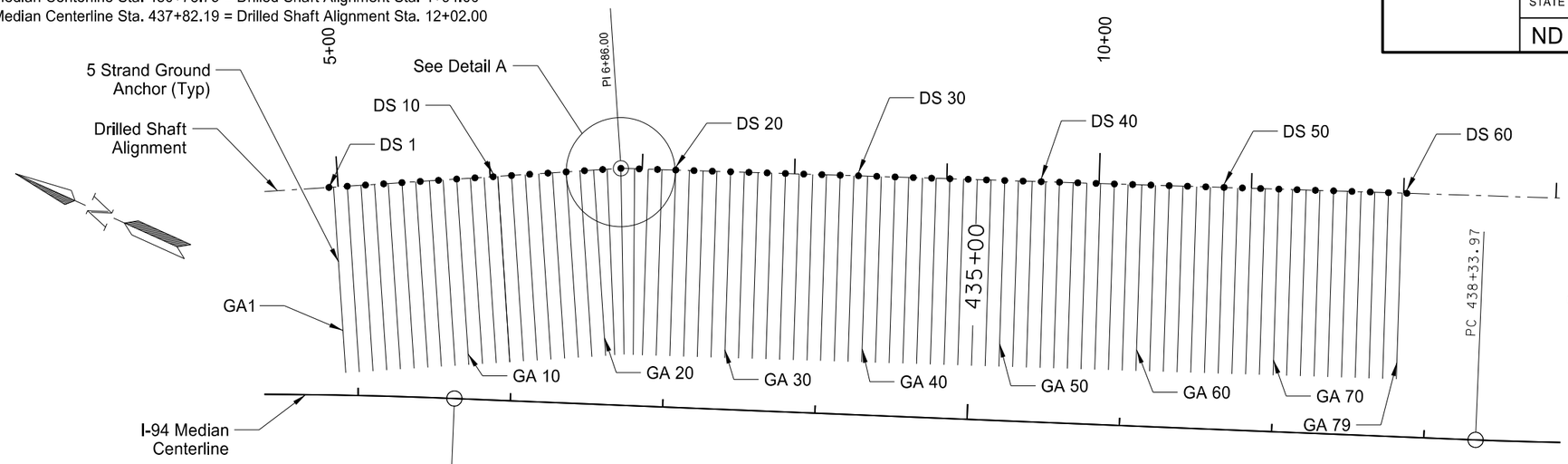
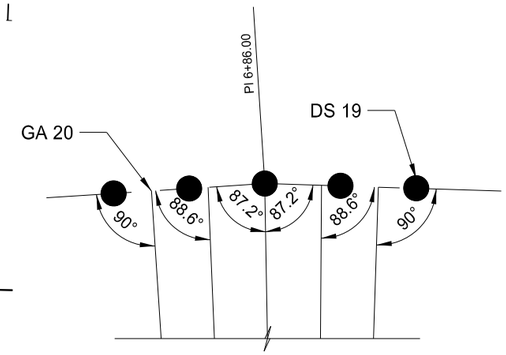


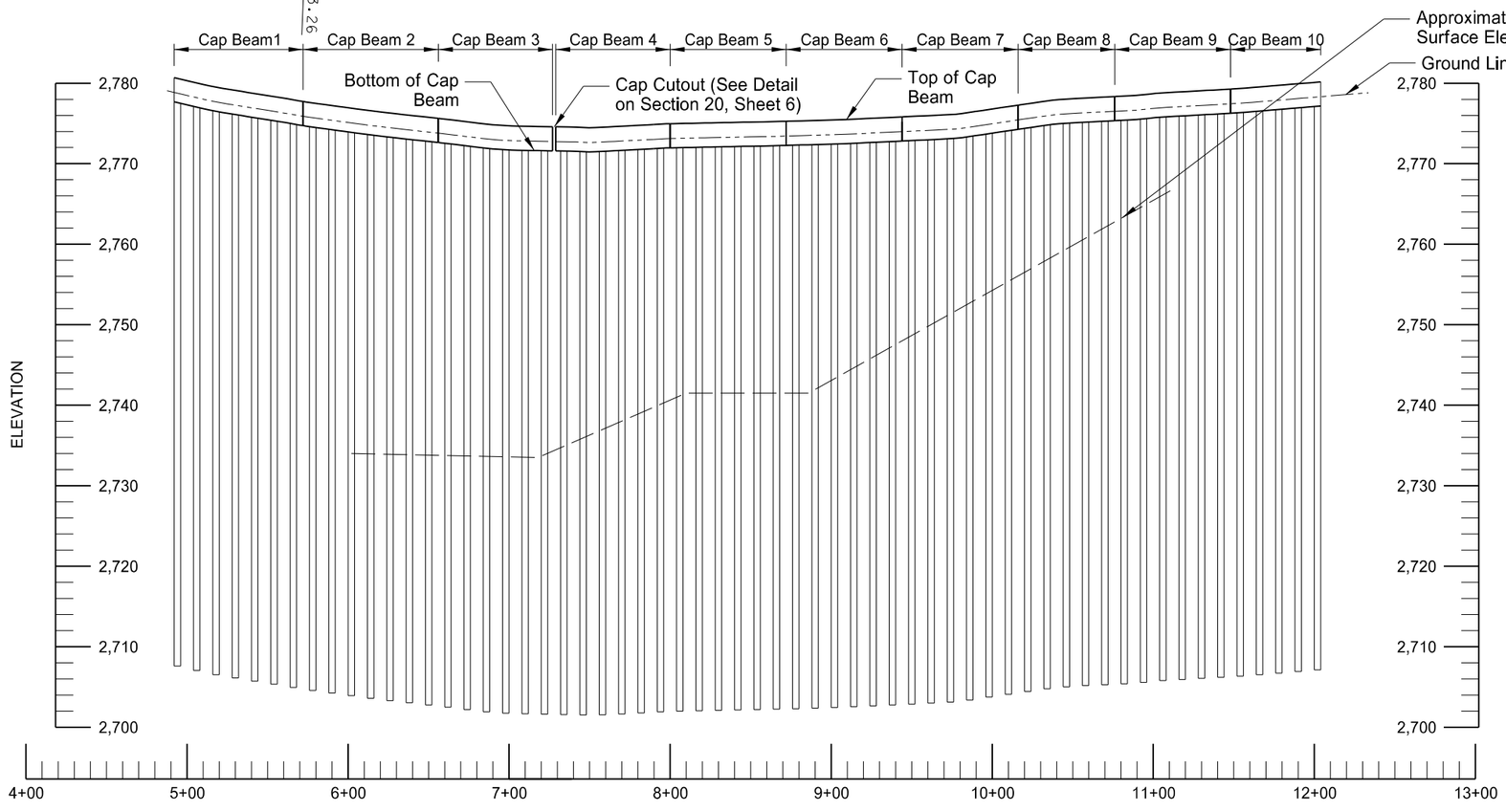
DRILLED SHAFT AND GROUND ANCHOR PLAN

NOTES:

1. Ground Anchors 21, 22 & 23 will be skewed as shown in Detail A.
2. Ground Anchor 22 will be inclined at 15°.



DETAIL A



DRILLED SHAFT ALIGNMENT STATION

NOTE:
See Section 82, Sheet 1 for drilled shaft location and alignment

DESIGN STRENGTHS:

f'c = 4,000 psi ~ Class AAE-3 Concrete
f'c = 4,000 psi ~ Class AA-5 Concrete
fy = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design

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I-94 PAINTED CANYON LANDSLIDE REPAIR

DRILLED SHAFT LAYOUT AND ELEVATION

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	20	2

DRILLED SHAFT

Shaft No.	Station	Comment	Bottom of Cap	Top of Cap	Shaft No.	Station	Comment	Bottom of Cap	Top of Cap	Shaft No.	Station	Comment	Bottom of Cap	Top of Cap
DS 1	4+94		2779.7	2782.7	DS 21	7+34	IN	2773.9	2776.9	DS 41	9+74		2775.6	2778.6
DS 2	5+06		2779.2	2782.2	DS 22	7+46	IN	2773.9	2776.9	DS 42	9+86		2775.9	2778.9
DS 3	5+18		2778.7	2781.7	DS 23	7+58		2774.0	2777.0	DS 43	9+98		2776.3	2779.3
DS 4	5+30		2778.3	2781.3	DS 24	7+70		2774.1	2777.1	DS 44	10+10		2776.7	2779.7
DS 5	5+42		2777.9	2780.9	DS 25	7+82		2774.2	2777.2	DS 45	10+22		2777.0	2780.0
DS 6	5+54		2777.5	2780.5	DS 26	7+94		2774.4	2777.4	DS 46	10+34		2777.3	2780.3
DS 7	5+66		2777.1	2780.1	DS 27	8+06		2774.4	2777.4	DS 47	10+46		2777.5	2780.5
DS 8	5+78		2776.8	2779.8	DS 28	8+18		2774.5	2777.5	DS 48	10+58		2777.6	2780.6
DS 9	5+90		2776.5	2779.5	DS 29	8+30		2774.5	2777.5	DS 49	10+70		2777.7	2780.7
DS 10	6+02		2776.1	2779.1	DS 30	8+42		2774.6	2777.6	DS 50	10+82		2777.9	2780.9
DS 11	6+14		2775.8	2778.8	DS 31	8+54		2774.6	2777.6	DS 51	10+94		2778.1	2781.1
DS 12	6+26		2775.6	2778.6	DS 32	8+66		2774.7	2777.7	DS 52	11+06		2778.3	2781.3
DS 13	6+38	IN	2775.3	2778.3	DS 33	8+78		2774.7	2777.7	DS 53	11+18		2778.4	2781.4
DS 14	6+50		2775.0	2778.0	DS 34	8+90		2774.8	2777.8	DS 54	11+30		2778.5	2781.5
DS 15	6+62		2774.8	2777.8	DS 35	9+02		2774.9	2777.9	DS 55	11+42		2778.7	2781.7
DS 16	6+74		2774.5	2777.5	DS 36	9+14		2775.0	2778.0	DS 56	11+54		2778.8	2781.8
DS 17	6+86		2774.2	2777.2	DS 37	9+26	IN	2775.1	2778.1	DS 57	11+66		2779.0	2782.0
DS 18	6+98		2774.1	2777.1	DS 38	9+38		2775.2	2778.2	DS 58	11+78		2779.2	2782.2
DS 19	7+10		2774.0	2777.0	DS 39	9+50		2775.3	2778.3	DS 59	11+90		2779.4	2782.4
DS 20	7+22		2774.0	2777.0	DS 40	9+62		2775.4	2778.4	DS 60	12+02		2779.6	2782.6

PRIMARY GROUND ANCHOR

Anchor No.	Station	Comment	Anchor No.	Station	Comment	Anchor No.	Station	Comment	Anchor No.	Station	Comment
GA 1	4+97		GA 21	6+77		GA 41	8+57		GA 61	10+37	
GA 2	5+06		GA 22	6+86		GA 42	8+66		GA 62	10+46	
GA 3	5+15		GA 23	6+95		*GA 43	8+75		GA 63	10+55	P
GA 4	5+24		GA 24	7+04		GA 44	8+84		GA 64	10+64	
GA 5	5+33		GA 25	7+13		GA 45	8+93		*GA 65	10+73	
GA 6	5+42		GA 26	7+22		GA 46	9+02		GA 66	10+82	
GA 7	5+51		*GA 27	7+31	P/LC/SG	GA 47	9+11		GA 67	10+91	
GA 8	5+60		GA 28	7+40		GA 48	9+20	P/LC/SG	GA 68	11+00	
*GA 9	5+69		GA 29	7+49	EC/LC/SG	GA 49	9+29		GA 69	11+09	
GA 10	5+78		GA 30	7+58		GA 50	9+38		GA 70	11+18	
GA 11	5+87		GA 31	7+67		*GA 51	9+47		GA 71	11+27	
GA 12	5+96		GA 32	7+76		GA 52	9+56		GA 72	11+36	
GA 13	6+05		GA 33	7+85		GA 53	9+65		*GA 73	11+45	
GA 14	6+14		GA 34	7+94		GA 54	9+74		GA 74	11+54	
GA 15	6+23		*GA 35	8+03		GA 55	9+83		GA 75	11+63	
GA 16	6+32		GA 36	8+12		GA 56	9+92		GA 76	11+72	
GA 17	6+41		GA 37	8+21		GA 57	10+01		GA 77	11+81	
GA 18	6+50	EC/LC/SG	GA 38	8+30		GA 58	10+10		GA 78	11+90	
*GA 19	6+59		GA 39	8+39		*GA 59	10+19		GA 79	11+99	
GA 20	6+68		GA 40	8+48		GA 60	10+28				

SECONDARY GROUND ANCHOR

Anchor No.	Station	Comment	Anchor No.	Station	Comment
SGA1	5+01.50		SGA21	8+61.50	
SGA2	5+19.50		SGA22	8+79.50	
SGA3	5+37.50		SGA23	8+97.50	
SGA4	5+55.50		SGA24	9+15.50	
*SGA5	5+73.50		SGA25	9+33.50	
SGA6	5+91.50		SGA26	9+51.50	
SGA7	6+09.50		SGA27	9+69.50	
SGA8	6+27.50		SGA28	9+87.50	
SGA9	6+45.50		SGA29	10+05.50	
SGA10	6+63.50		SGA30	10+23.50	
SGA11	6+81.50		SGA31	10+41.50	
SGA12	6+99.50		SGA32	10+59.50	
SGA13	7+17.50		*SGA33	10+77.50	
SGA14	7+35.50		SGA34	10+95.50	
SGA15	7+53.50		SGA35	11+13.50	
SGA16	7+71.50		SGA36	11+31.50	
SGA17	7+89.50		*SGA37	11+49.50	
SGA18	8+07.50		SGA38	11+67.50	
SGA19	8+25.50		SGA39	11+85.50	
SGA20	8+43.50		SGA40	11+94.50	

NOTES:

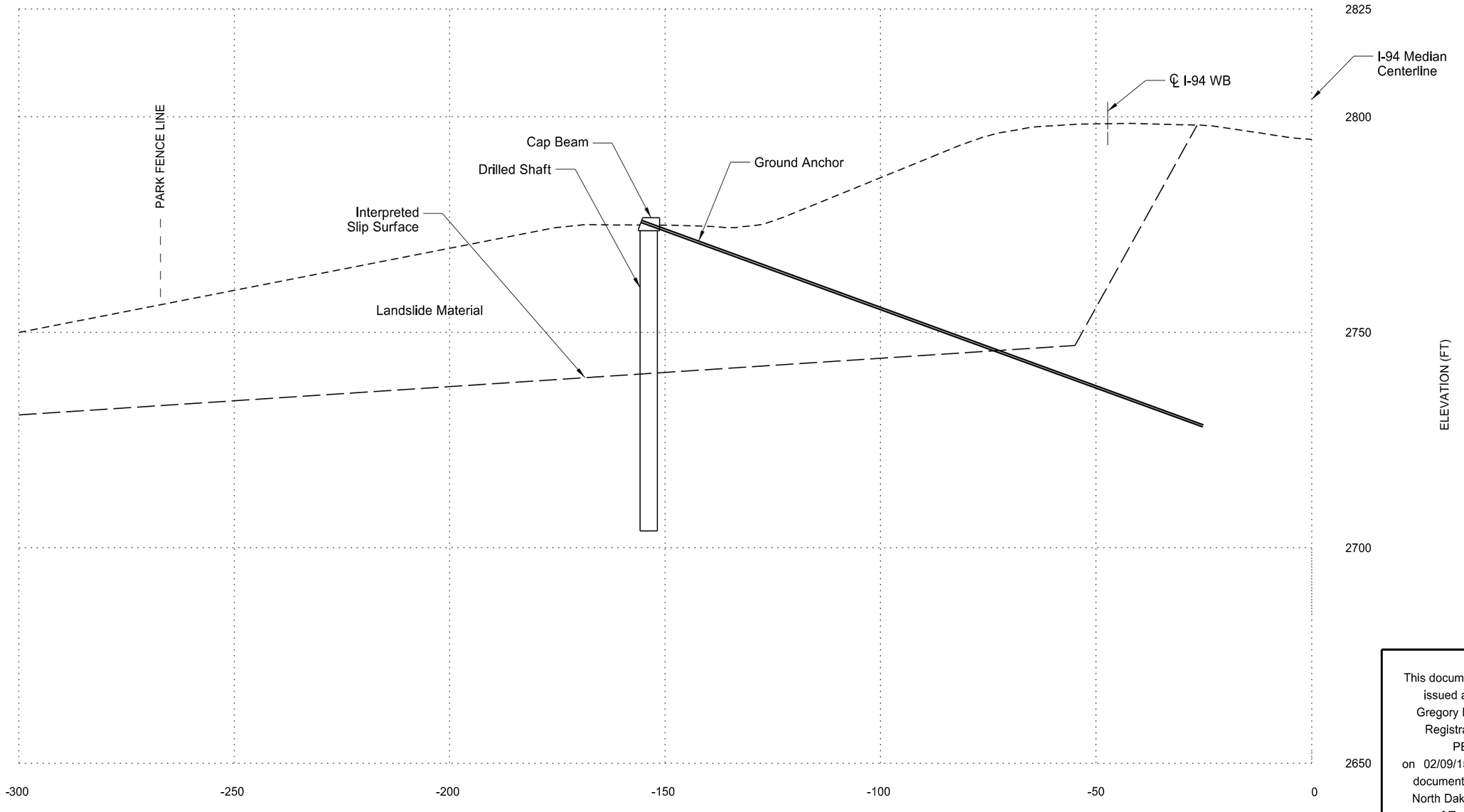
1. All drilled shafts will be constructed to an elevation of 70-feet below the bottom of cap elevation.
2. IN = Inclinometer
   LC = Load Cell
   SG = Strain Gage
   P = Performance Test
   EC = Extended Creep Test
3. Include Crosshole Sonic Log Access tubes in accordance with SP 115(14).
4. Do not commence with any drilled shaft and ground anchor work between Station 6+55 to Station 10+20 until July 13, 2015.
5. Do not lock off on ground anchors with an * in the tables above until the interior ground anchor is locked off.

QUANTITIES	
INSTRUMENTATION-INCLINOMETER	290 LF
INSTRUMENTATION-LOAD CELL	4 EA
INSTRUMENTATION-STRAIN GAUGE	8 EA

I-94 PAINTED CANYON LANDSLIDE REPAIR

DRILLED SHAFT AND GROUND ANCHOR TABLES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	20	3



TYPICAL SECTION @ STA 433+05

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I-94 PAINTED CANYON LANDSLIDE REPAIR

TYPICAL CROSS SECTION

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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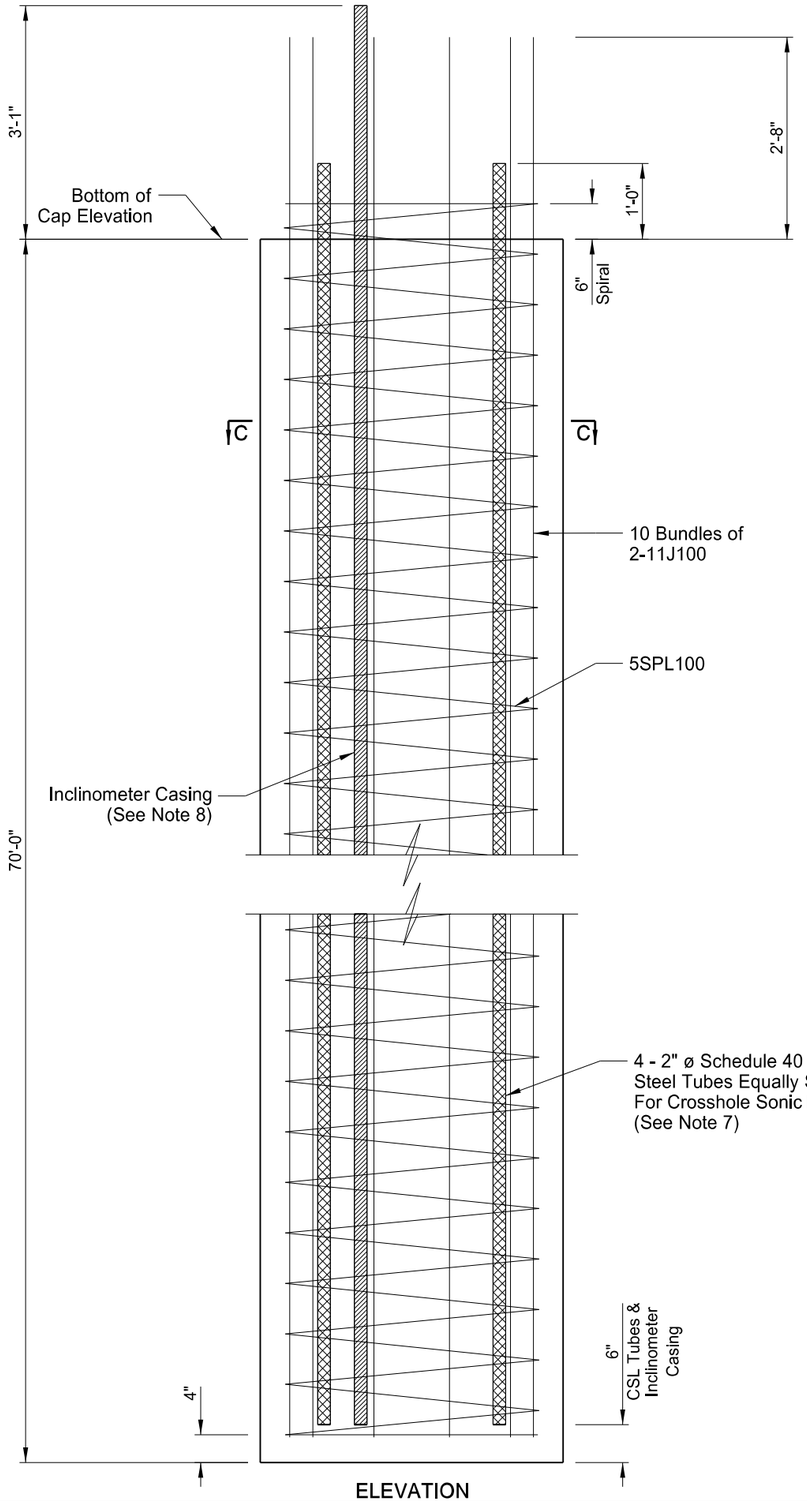
BAR LIST - (PER SHAFT)

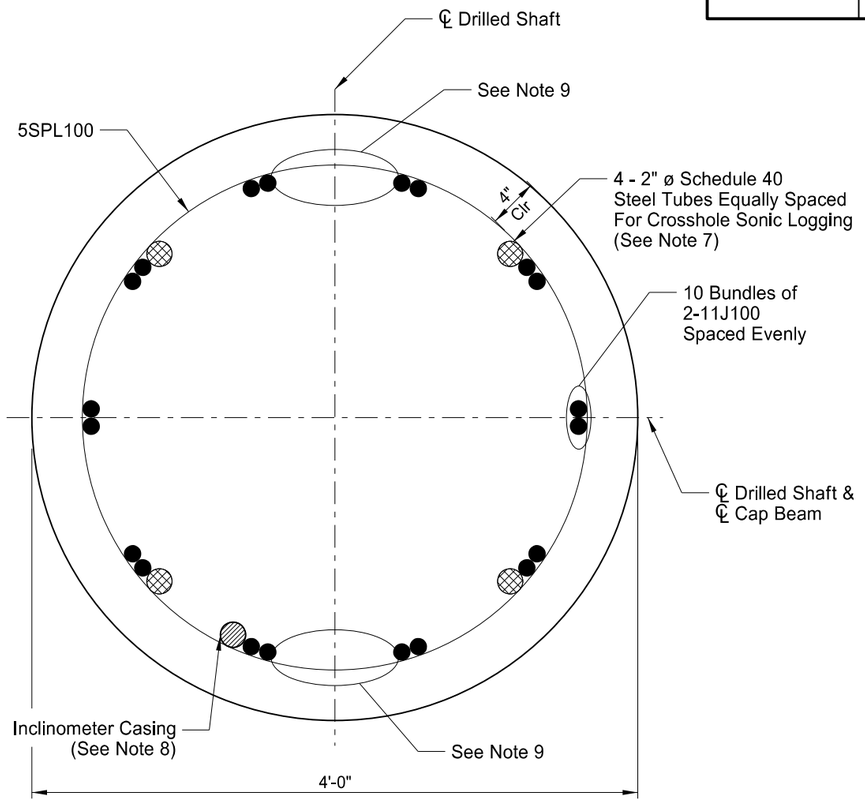
SIZE	MARK	NO.	LENGTH	WEIGHT (LBS)
11	J100	20	75'-3"	7,996
5	SPL100	1	1,139'-3"	1,188

ESTIMATED MATERIAL QUANTITIES (PER SHAFT)

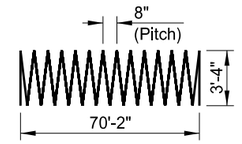
REINFORCING STEEL (LBS)	CONCRETE (CY)
9,184	32.6



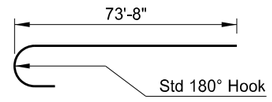
ELEVATION



C-C



5SPL100



11J100

NOTES:

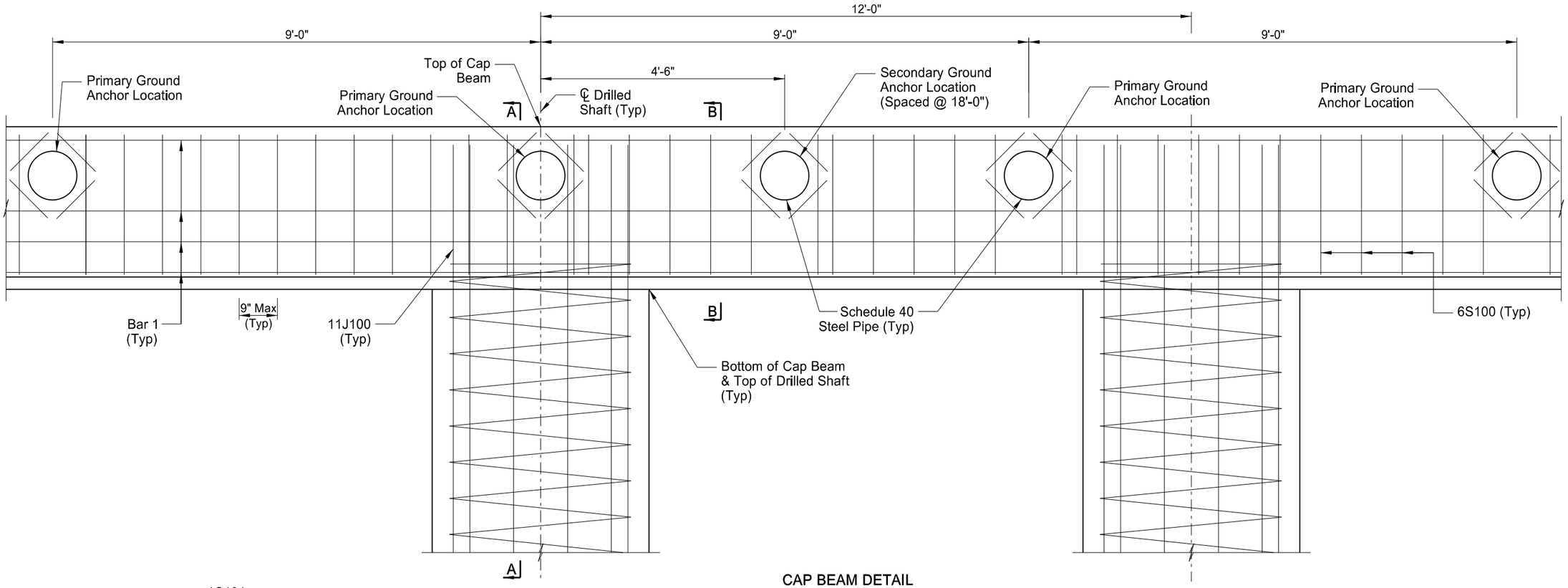
1. All dimensions are out to out of bars.
2. The Contractor will use either a lap splice or an approved coupler to achieve the length for the 11J100 bar. If a lap splice is used, minimum lap length is 8'-5".
3. All lap splices or mechanical couplers in bundles will be staggered a minimum of 10'-0"
4. Vertical and spiral reinforcement quantities assume continuous reinforcement without splices. Payment will be made based on this quantitiy and no additional payment will be made for lap splices or mechanical couplers
5. The coupler will be an approved mechanical connector capable of developing 125% of the specified yield strength of the reinforcing steel.
6. The estimated quantities shown are for information purposes only. All materials including concrete, reinforcing bars and couplers and all labor required to build the drilled shafts will be included in the pay item "4.0' ø Drilled Shaft".
7. Include Crosshole Sonic Log Access tubes in accordance with SP 115(14).
8. Inclinometer casing is installed only on Drilled Shafts 13, 21, 22 & 37.
9. Move 11J100 bars to allow room for schedule 40 steel pipe.

QUANTITIES	
4' ø DRILLED SHAFT	4,200 LF
CROSS HOLE SONIC LOG TEST	10 EA

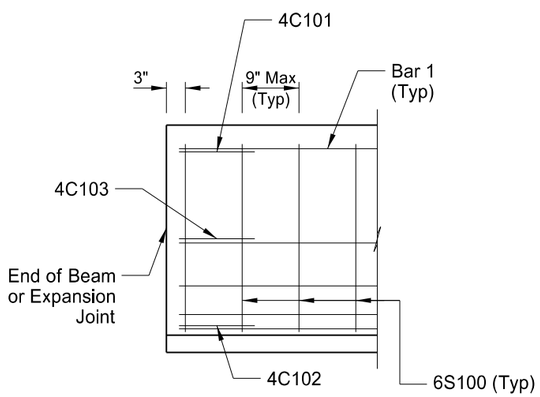
I-94 PAINTED CANYON LANDSLIDE REPAIR

DRILLED SHAFT DETAILS

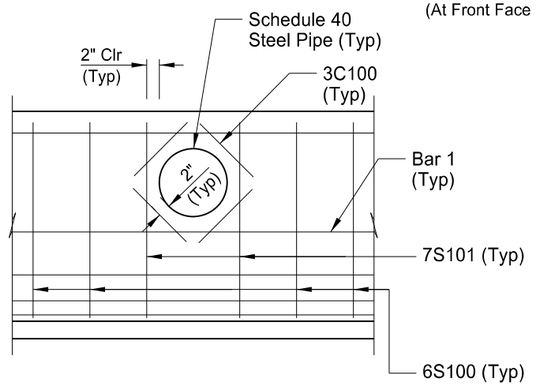
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	20	5



CAP BEAM DETAIL
(At Front Face of Cap Beam)



CAP BEAM END DETAIL



CAP BEAM GROUND ANCHOR DETAIL

NOTES:

1. Size schedule 40 steel pipe to accomodate drill tooling.
2. See Section 20, Sheet 6 for Sections A-A and B-B.
3. Secondary ground anchor location is available as a contingency.
4. Rotate horizontal leg of 11J100 to avoid ground anchor locations.

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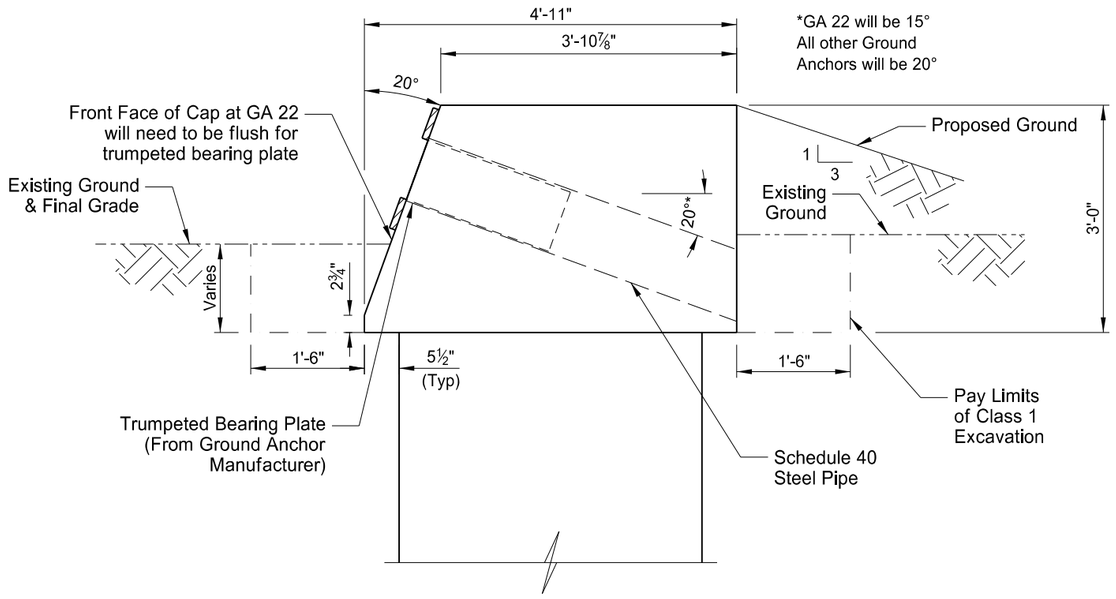
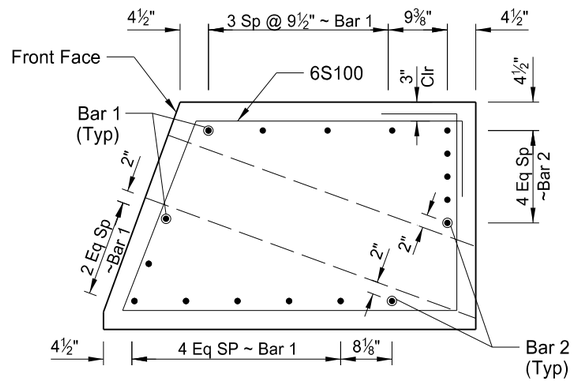
I-94 PAINTED CANYON LANDSLIDE REPAIR

CAP BEAM DETAILS

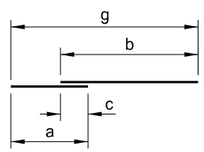
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	20	6



A-A

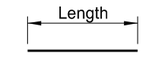


B-B



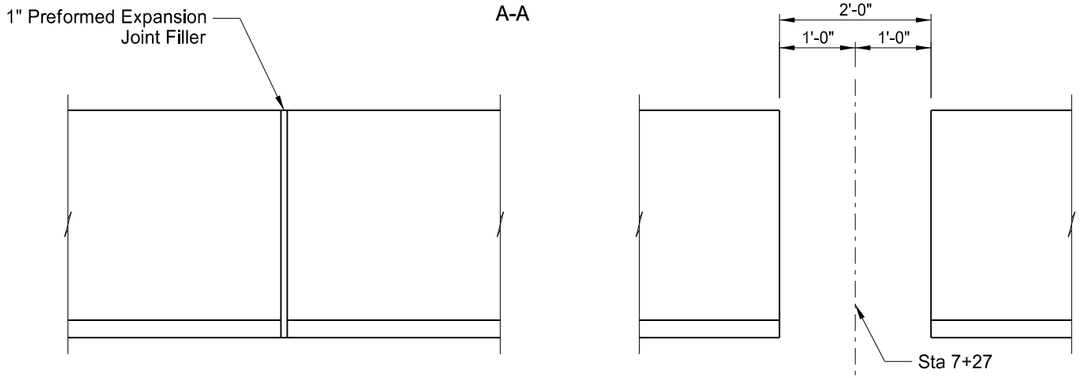
c = Lap Splice (typ)
Total Length per Set = a + b

AA



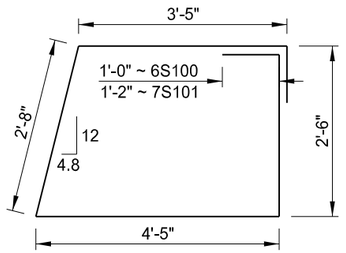
A

BAR LIST - CAP BEAM			
SIZE	MARK	NO.	LENGTH
5	A100	11	59'-7"
8	A101	6	59'-7"
5	A102	11	55'-7"
8	A103	6	55'-7"
5	AA100	11	81'-10"
8	AA101	6	84'-7"
5	AA102	11	85'-10"
8	AA103	6	88'-7"
5	AA104	11	71'-10"
8	AA105	6	74'-7"
5	AA106	55	73'-10"
8	AA107	30	76'-7
3	C100	476	9'-0"
4	C101	20	5'-5"
4	C102	20	6'-5"
4	C103	20	5'-11"
6	S100	717	15'-0"
7	S101	238	15'-4"

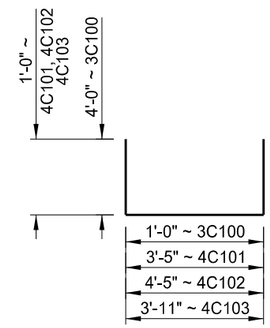


EXPANSION JOINT DETAIL

CAP CUTOUT
(Install at Sta 7+27)



6S100 & 7S101



3C100, 4C101,
4C102 & 4C103

DETAILING DIMENSIONS				
MARK	a	b	c	g
AA100	21'-10"	60'-0"	2'-2"	79'-8"
AA101	24'-7"	60'-0"	4'-11"	79'-8"
AA102	25'-10"	60'-0"	2'-2"	83'-8"
AA103	28'-7"	60'-0"	4'-11"	83'-8"
AA104	11'-10"	60'-0"	2'-2"	69'-8"
AA105	14'-7"	60'-0"	4'-11"	69'-8"
AA106	13'-10"	60'-0"	2'-2"	71'-8"
AA107	16'-7"	60'-0"	4'-11"	71'-8"

CAP BEAM REINFORCEMENT DETAILS									
CAP BEAM	BEGIN	END	CAP LENGTH	NO. OF 6S100 BARS	NO. OF 7S101 BARS	BAR 1 MARK	BAR 2 MARK	CONCRETE (CY)	REINFORCING STEEL (LBS)
1	4+92	5+72	80'-0"	81	26	5AA100	8AA101	39.5	5,133
2	5+72	6+56	84'-0"	85	28	5AA102	8AA103	41.5	5,410
3	6+56	7+26	70'-0"	70	24	5AA104	8AA105	34.6	4,534
4	7+28	8+00	72'-0"	73	24	5AA106	8AA107	35.6	4,657
5	8+00	8+72	72'-0"	73	24	5AA106	8AA107	35.6	4,657
6	8+72	9+44	72'-0"	73	24	5AA106	8AA107	35.6	4,657
7	9+44	10+16	72'-0"	73	24	5AA106	8AA107	35.6	4,657
8	10+16	10+76	60'-0"	61	20	5A100	8A101	29.6	3,798
9	10+76	11+48	72'-0"	73	24	5AA106	8AA107	35.6	4,657
10	11+48	12+04	56'-0"	55	20	5A102	8A103	27.7	3,553

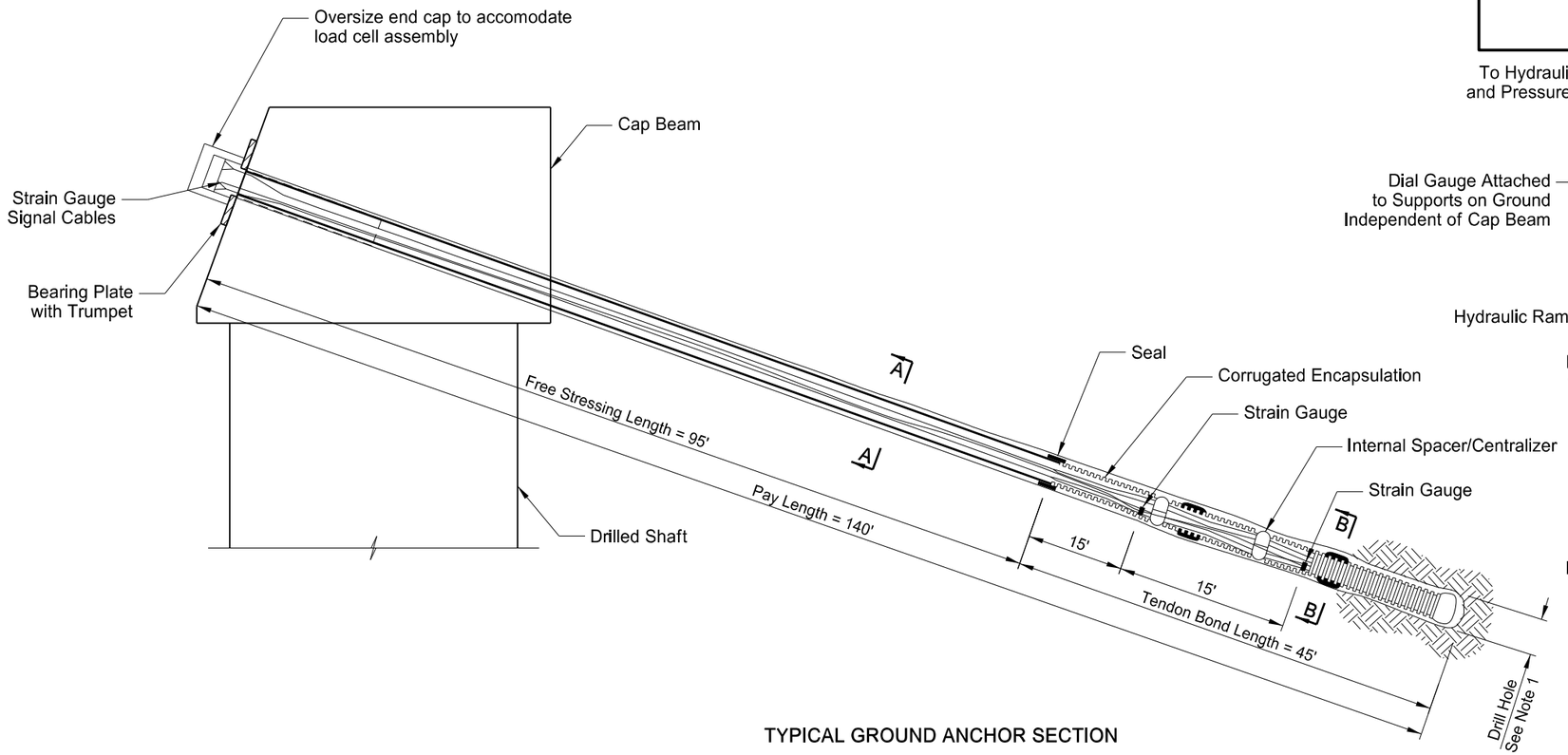
EXPANSION JOINT LOCATIONS	
5+72	9+44
6+56	10+16
8+00	10+76
8+72	11+48

QUANTITIES	(CAP BEAM)
CLASS AAE-3 CONCRETE	350.9 CY
REINFORCING STEEL-GRADE 60	45,713 LB

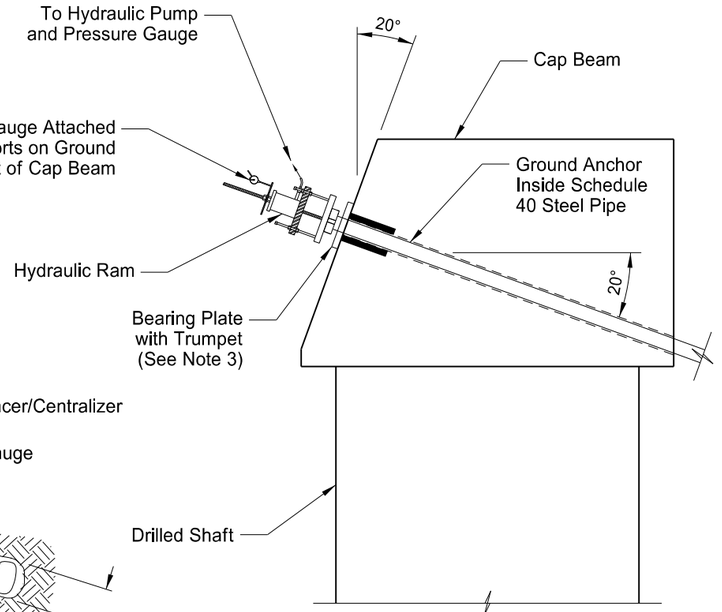
I-94 PAINTED CANYON LANDSLIDE REPAIR

CAP BEAM DETAILS

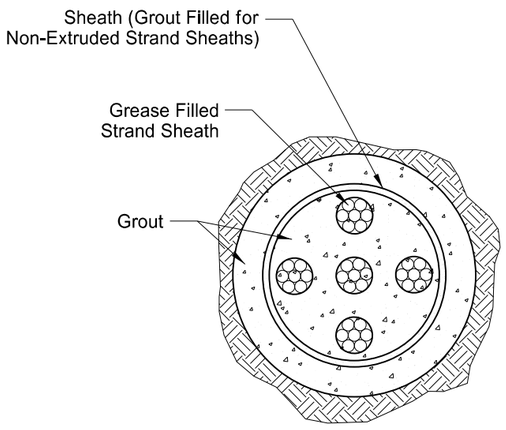
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	20	7



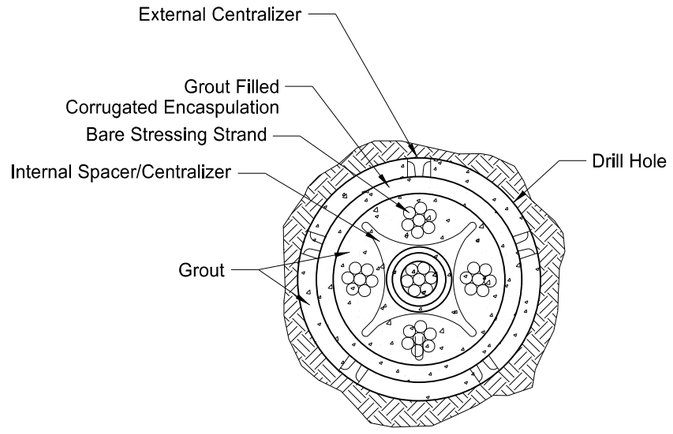
TYPICAL GROUND ANCHOR SECTION



TYPICAL GROUND ANCHOR STRESSING ASSEMBLY



A-A



B-B

NOTES

1. Contractor to determine the drill hole diameter necessary to achieve the specified bond and grout cover requirements.
2. Factored Design Load = 191 kips
   Lock-off Load = 146.5 kips
3. Bearing plate will have minimum dimensions of 10" x 10". Contractor to determine trumpted bearing plate size and thickness.
4. Install Strain Gauges in the Tendon Bond Zone at the third points.
5. See Section 20, Sheet 2 for ground anchors designated for instrumentation.
6. Conduct 3 performance tests and 2 extended creep tests on ground anchors indicated on Section 20, Sheet 2 and proof test remaining 74 anchors.

QUANTITIES	
GROUND ANCHOR	11,060 LF

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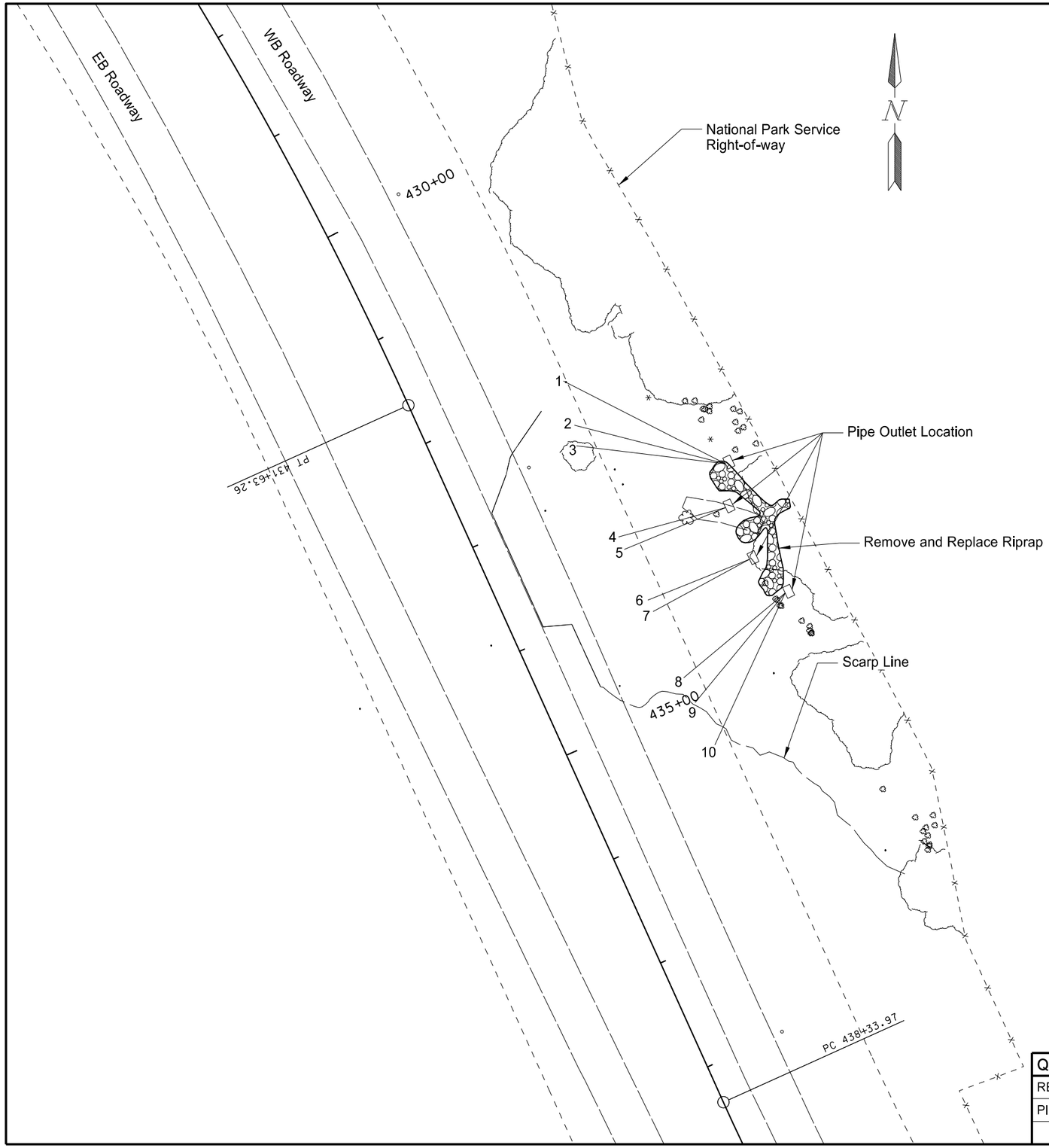
I-94 PAINTED CANYON LANDSLIDE REPAIR

GROUND ANCHOR DETAILS

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	20	8



Pipe	Outlet Elevation	Termination Elevation	Max Grade	Length
1	2757.00	2760.00	2.61%	115'
2	2757.00	2760.00	2.61%	115'
3	2757.00	2760.00	3.00%	100'
4	2755.50	2760.00	5.63%	80'
5	2755.50	2760.00	5.63%	80'
6	2755.50	2760.00	5.63%	80'
7	2755.50	2760.00	5.63%	80'
8	2757.00	2760.00	3.16%	95'
9	2757.00	2760.00	3.00%	100'
10	2757.00	2760.00	2.40%	125'

Pipe	Approx. Outlet Station	Approx. Outlet Offset	Approx. Termination Station	Approx. Termination Offset
1	7+45	76' Lt.	6+56	3' Lt.
2	7+45	76' Lt.	6+67	12' Rt.
3	7+45	76' Lt.	6+96	16' Rt.
4	7+80	60' Lt.	7+64	16' Rt.
5	7+80	60' Lt.	7+74	16' Rt.
6	8+30	60' Lt.	8+25	16' Rt.
7	8+30	60' Lt.	8+36	16' Rt.
8	8+70	76' Lt.	9+00	16' Rt.
9	8+70	76' Lt.	9+16	16' Rt.
10	8+70	76' Lt.	9+59	16' Rt.

QUANTITIES	
REMOVE AND REPLACE RIPRAP	75 CY
PIPE PVC 1.5IN SLOTTED DRAIN	970 LF

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I-94 PAINTED CANYON LANDSLIDE REPAIR

PROPOSED HORIZONTAL DRAIN LAYOUT

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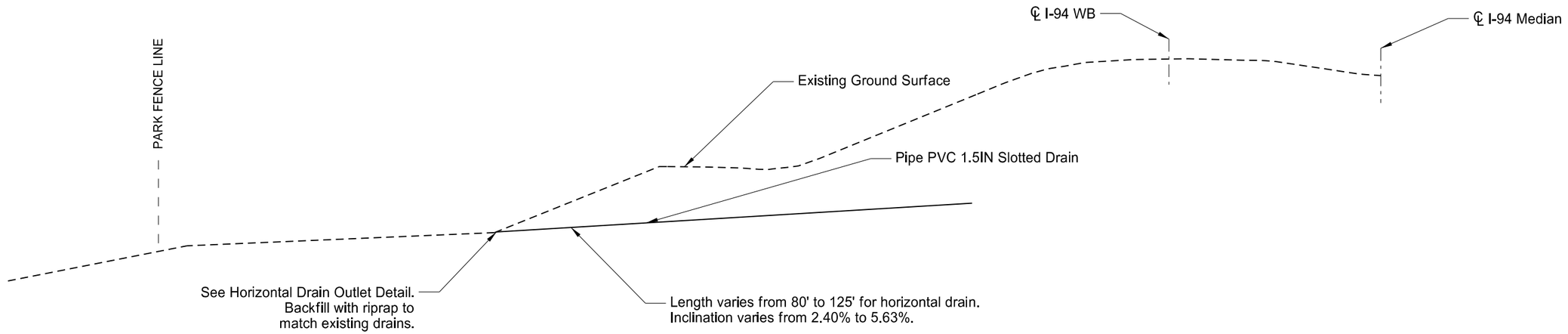
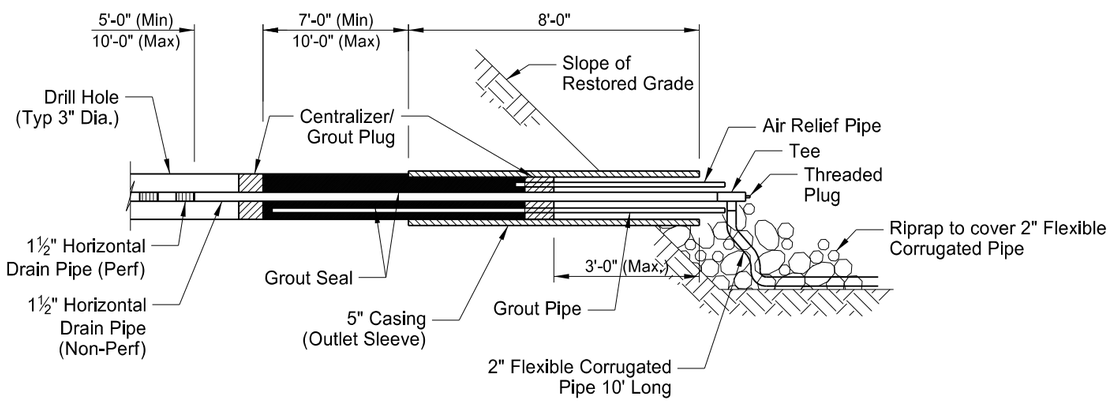
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	20	9



HORIZONTAL DRAIN TYPICAL SECITON

Drilled Shaft Alignment Sta. 6+38 to Sta. 9+65
I-94 Median Centerline Sta. 432+23.68 to Sta. 435+52.80



HORIZONTAL DRAIN OUTLET DETAIL

NOTE:

Reference SP 119(14) for additional information on the Horizontal Drains

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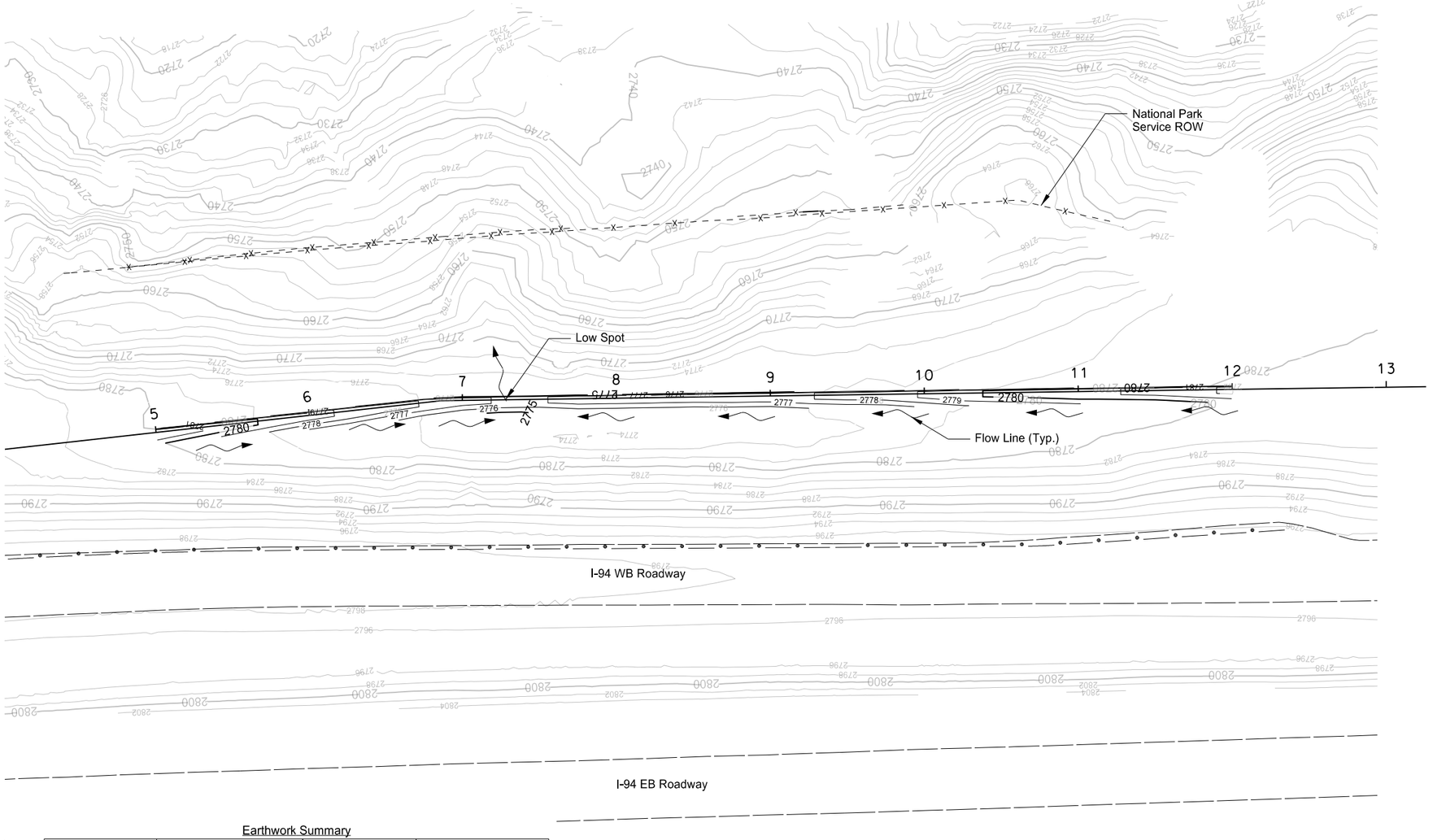
I-94 PAINTED CANYON LANDSLIDE REPAIR

PROPOSED HORIZONTAL DRAIN DETAILS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	70	1



Earthwork Summary

Location	Common Excavation	Embankment	Barrow-Excavation
	(CY)	(CY)	(CY)
	A	B	C=B-A
Sta 4+94 to 12+02	56	183	127

Water = 5MGal

All earthwork and water to be incidental to "Class I Excavation"

Topsoil Summary - Drilled Shaft Area*

Location	Topsoil Removed	Topsoil	Excess Topsoil
	(CY)	(CY)	(CY)
	A	B	C=A-B
Sta 4+94 to 12+02	144	74	70

All topsoil removal and placement to be incidental to "Prepare Stockpile Site" and "Restore Stockpile Site"

*Topsoil summary only includes topsoil for cap beam installation. Additional topsoil removal may be required.

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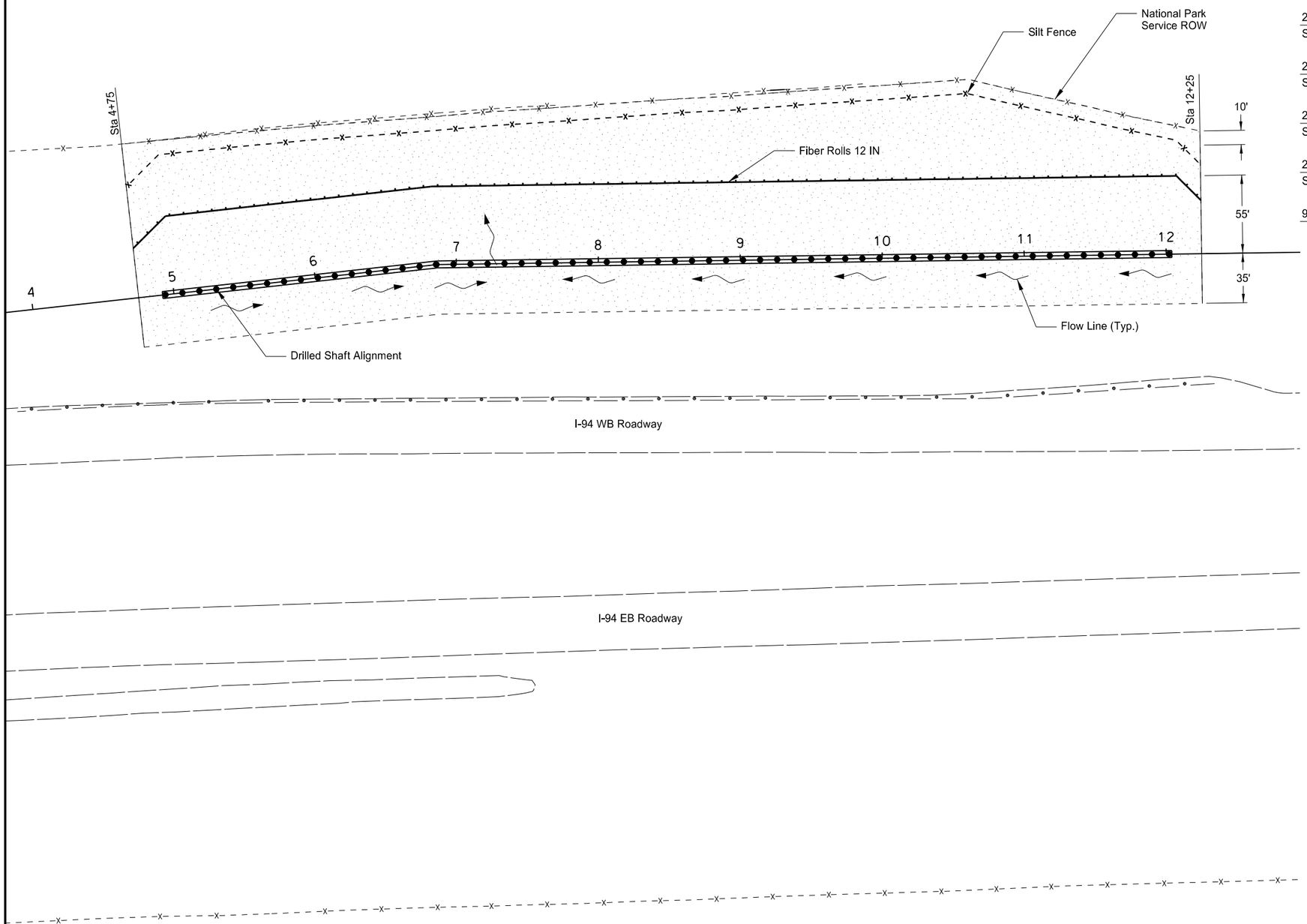
I-94 PAINTED CANYON LANDSLIDE REPAIR

Proposed Contours

Sta 4+75 to 12+25

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	76	1

Note: Sediment collection bag special provision for additional erosion control measures.



251 2000 TEMPORARY COVER CROP		
Sta 4+75 to 12+25	2.5	ACRE
253 0101 STRAW MULCH		
Sta 4+75 to 12+25	2.5	ACRE
260 0200 SILT FENCE SUPPORTED		
Sta 4+75 to 12+25, Lt	780	LF
260 0201 REMOVE SILT FENCE SUPPORTED		
Sta 4+75 to 12+25, Lt	780	LF
261 0112 FIBER ROLLS 12IN		
Sta 4+75 to 12+25, Lt	770	LF
261 0113 REMOVE FIBER ROLLS 12IN		
Sta 4+75 to 12+25, Lt	770	LF
920 0900 SEDIMENT COLLECTION BAGS		
	30	EA

Temporary Cover Crop and Straw Mulch

Fiber Roll 12IN

Silt Fence Supported

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I-94 PAINTED CANYON LANDSLIDE REPAIR

Temporary Erosion Control

Sta 4+75 to 12+25

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	77	1

251 0200 SEEDING CLASS II

Sta 4+75 to 12+25	2.5	ACRE

253 0101 STRAW MULCH

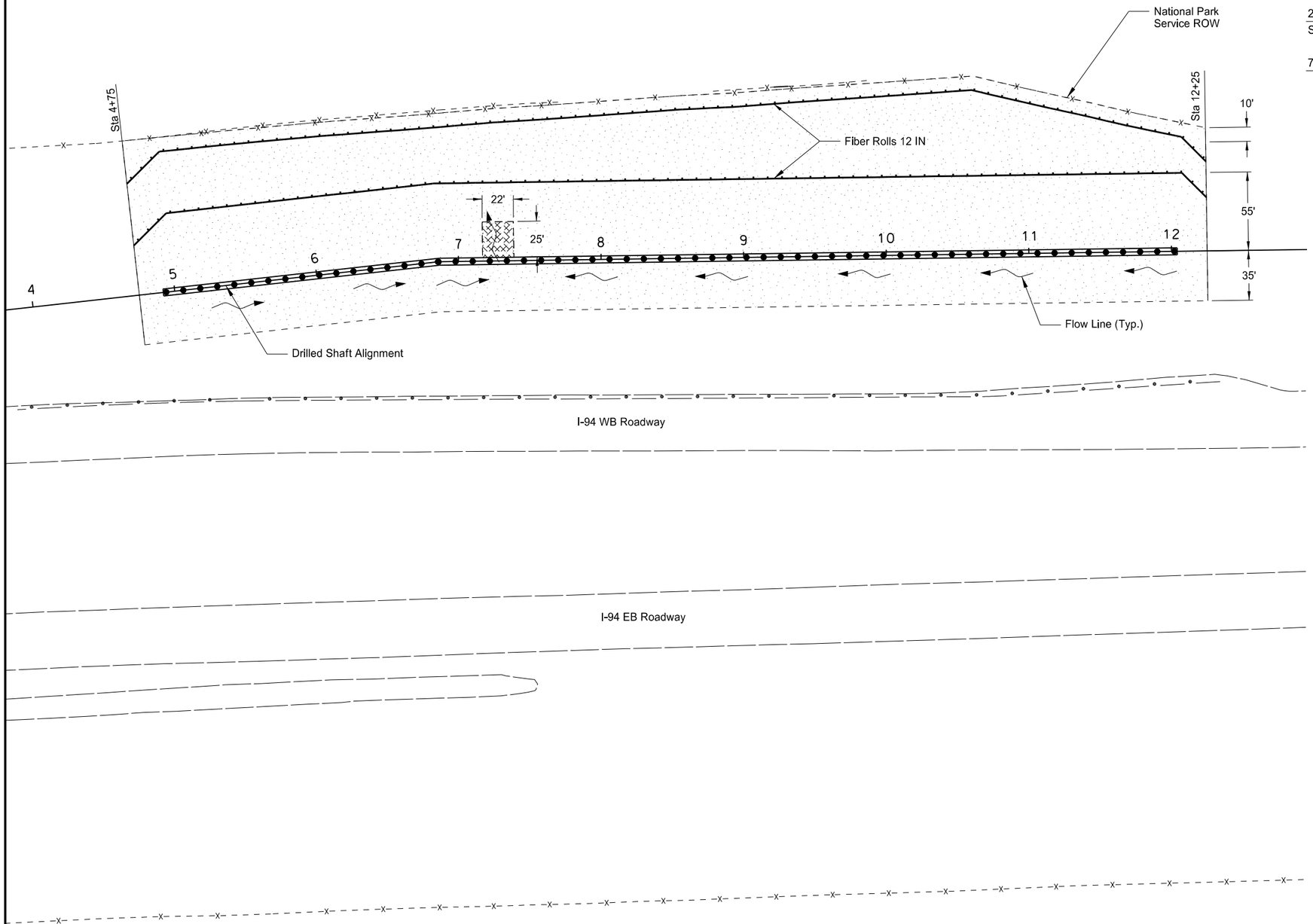
Sta 4+75 to 12+25	2.5	ACRE

261 0112 FIBER ROLLS 12IN

Sta 4+75 to 12+25, Lt	1550	LF

708 5652 ECB TYPE 3

	62	SY



Erosion Control Blanket

Seeding Class II and Straw Mulch

Fiber Roll 12IN

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I-94 PAINTED CANYON LANDSLIDE REPAIR

Permanent Erosion Control

Sta 4+75 to 12+25

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - Interstate 94 RP 30 - Dickinson District

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
TS	395+14.43	463,970.34	1,239,138.76
SC	398+14.43	463,931.30	1,239,436.19
PI SCS400	415+86.33	463,730.97	1,241,196.80
PT	431+63.26	461,978.01	1,241,989.50
PC	438+33.97	461,366.87	1,242,265.86
PI SCS401	459+15.94	459,469.85	1,243,123.70
CS	472+35.96	459,747.17	1,245,016.69
ST	475+69.29	459,787.71	1,245,347.49

CURVE DATA

ARC DEFINITION	
SCS400	SCS401
PI Sta = 415+86.33	PI Sta = 459+15.94
Delta = 59° 01' 58.51" RT	Delta = 73° 48' 06.19" LT
D_c = 1° 41' 13.99"	D_c = 2° 04' 04.99"
R = 3,395.87'	R = 2,770.52'
L = 3,348.83'	L = 3,401.99'
$L_{s\,in}$ = 300.00'	$L_{s\,in}$ = 0.00'
$L_{s\,out}$ = 0.00'	$L_{s\,out}$ = 333.33'
S_c = 2° 31' 50.99"	S_c = 3° 26' 48.18"
Y_s = 4.42'	Y_s = 6.68'
X_s = 299.94'	X_s = 333.21'
T_s = 2071.91'	T_s = 2246.39'

US PUBLIC LAND SURVEY DATA

DESC.	SEC-TWP-RGE	NORTHING	EASTING

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET
CONTROL POINT DESCRIPTION					
GPS 1	460418.06	1247851.35	2755.10	N/A	N/A
Rebar Set at Painted Woods Interchange WB On-Ramp					

NOTES: Sheet 1 of 1

Date Survey Completed 10/31/2014

☐ Assumed Coordinates

☒ All coordinates on this sheet are Billings County ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(CORS), South Zone Combination Factor (1/cf) = 1.0001915367

All coordinates and measurements on this document derived from the International Foot definition.

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

☒ NAVD-88
☐ NGVD-29

☐ GEOID 09 ☐ _____
☒ GEOID 12A

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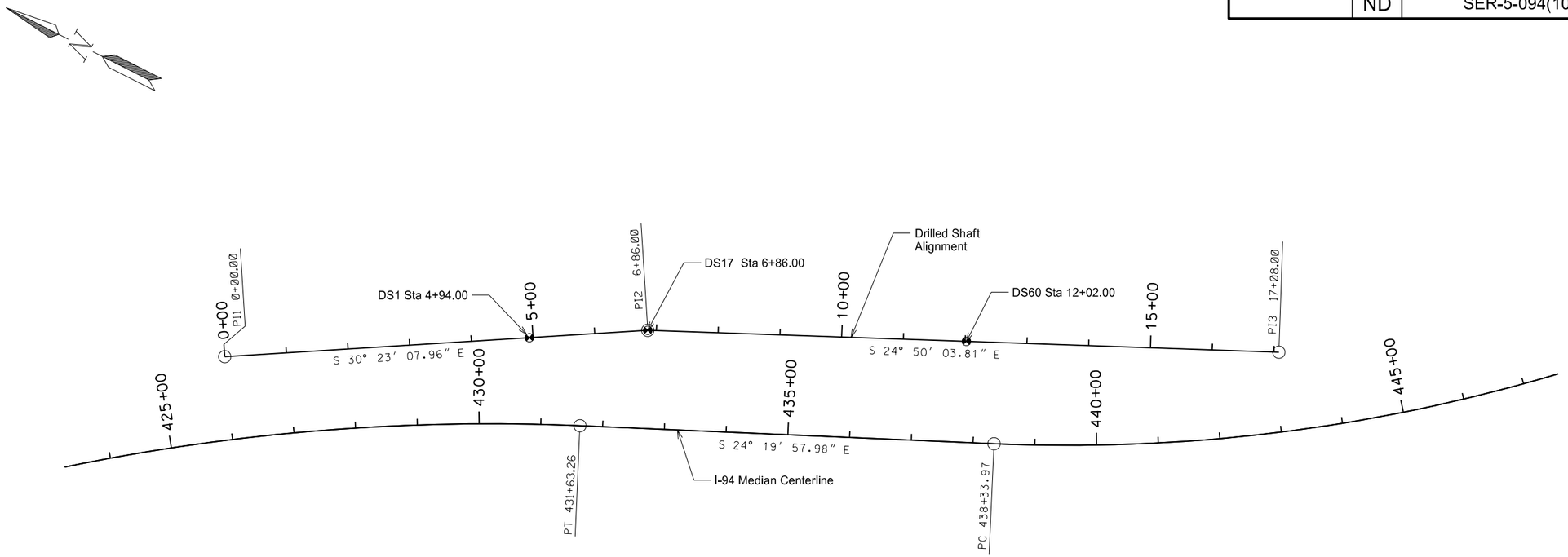
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	82	1



Point	North	East	Station	Description
DS1	462115.3529	1242079.7142	4+94.00	Drilled Shaft Center
DS2	462105.0012	1242085.7840	5+06.00	Drilled Shaft Center
DS3	462094.6495	1242091.8538	5+18.00	Drilled Shaft Center
DS4	462084.2978	1242097.9236	5+30.00	Drilled Shaft Center
DS5	462073.9461	1242103.9934	5+42.00	Drilled Shaft Center
DS6	462063.5944	1242110.0632	5+54.00	Drilled Shaft Center
DS7	462053.2427	1242116.1330	5+66.00	Drilled Shaft Center
DS8	462042.8910	1242122.2028	5+78.00	Drilled Shaft Center
DS9	462032.5393	1242128.2726	5+90.00	Drilled Shaft Center
DS10	462022.1877	1242134.3423	6+02.00	Drilled Shaft Center
DS11	462011.8360	1242140.4121	6+14.00	Drilled Shaft Center
DS12	462001.4843	1242146.4819	6+26.00	Drilled Shaft Center
DS13	461991.1326	1242152.5517	6+38.00	Drilled Shaft Center
DS14	461980.7809	1242158.6215	6+50.00	Drilled Shaft Center
DS15	461970.4292	1242164.6913	6+62.00	Drilled Shaft Center
DS16	461960.0775	1242170.7611	6+74.00	Drilled Shaft Center
DS17	461949.7258	1242176.8309	6+86.00	Drilled Shaft Center
DS18	461938.8355	1242181.8709	6+98.00	Drilled Shaft Center
DS19	461927.9452	1242186.9108	7+10.00	Drilled Shaft Center
DS20	461917.0549	1242191.9508	7+22.00	Drilled Shaft Center
DS21	461906.1646	1242196.9908	7+34.00	Drilled Shaft Center
DS22	461895.2742	1242202.0307	7+46.00	Drilled Shaft Center
DS23	461884.3839	1242207.0707	7+58.00	Drilled Shaft Center
DS24	461873.4936	1242212.1106	7+70.00	Drilled Shaft Center
DS25	461862.6033	1242217.1506	7+82.00	Drilled Shaft Center
DS26	461851.7130	1242222.1906	7+94.00	Drilled Shaft Center
DS27	461840.8227	1242227.2305	8+06.00	Drilled Shaft Center
DS28	461829.9324	1242232.2705	8+18.00	Drilled Shaft Center
DS29	461819.0421	1242237.3105	8+30.00	Drilled Shaft Center
DS30	461808.1518	1242242.3504	8+42.00	Drilled Shaft Center

Point	North	East	Station	Description
DS31	461797.2615	1242247.3904	8+54.00	Drilled Shaft Center
DS32	461786.3712	1242252.4303	8+66.00	Drilled Shaft Center
DS33	461775.4809	1242257.4703	8+78.00	Drilled Shaft Center
DS34	461764.5906	1242262.5103	8+90.00	Drilled Shaft Center
DS35	461753.7003	1242267.5502	9+02.00	Drilled Shaft Center
DS36	461742.8100	1242272.5902	9+14.00	Drilled Shaft Center
DS37	461731.9196	1242277.6302	9+26.00	Drilled Shaft Center
DS38	461721.0293	1242282.6701	9+38.00	Drilled Shaft Center
DS39	461710.1390	1242287.7101	9+50.00	Drilled Shaft Center
DS40	461699.2487	1242292.7500	9+62.00	Drilled Shaft Center
DS41	461688.3584	1242297.7900	9+74.00	Drilled Shaft Center
DS42	461677.4681	1242302.8300	9+86.00	Drilled Shaft Center
DS43	461666.5778	1242307.8699	9+98.00	Drilled Shaft Center
DS44	461655.6875	1242312.9099	10+10.00	Drilled Shaft Center
DS45	461644.7972	1242317.9499	10+22.00	Drilled Shaft Center
DS46	461633.9069	1242322.9898	10+34.00	Drilled Shaft Center
DS47	461623.0166	1242328.0298	10+46.00	Drilled Shaft Center
DS48	461612.1263	1242333.0697	10+58.00	Drilled Shaft Center
DS49	461601.2360	1242338.1097	10+70.00	Drilled Shaft Center
DS50	461590.3457	1242343.1497	10+82.00	Drilled Shaft Center
DS51	461579.4554	1242348.1896	10+94.00	Drilled Shaft Center
DS52	461568.5651	1242353.2296	11+06.00	Drilled Shaft Center
DS53	461557.6747	1242358.2696	11+18.00	Drilled Shaft Center
DS54	461546.7844	1242363.3095	11+30.00	Drilled Shaft Center
DS55	461535.8941	1242368.3495	11+42.00	Drilled Shaft Center
DS56	461525.0038	1242373.3894	11+54.00	Drilled Shaft Center
DS57	461514.1135	1242378.4294	11+66.00	Drilled Shaft Center
DS58	461503.2232	1242383.4694	11+78.00	Drilled Shaft Center
DS59	461492.3329	1242388.5093	11+90.00	Drilled Shaft Center
DS60	461481.4426	1242393.5493	12+02.00	Drilled Shaft Center

Point	North	East	Station
PI1	462541.4977	1241829.8410	0+00.00
PI2	461949.7258	1242176.8309	6+86.00
PI3	461022.2347	1242606.0677	17+08.00

Chain SURVEY contains:
PI1 PI2 PI3

Beginning chain SURVEY description

==========

Point PI1 N 462,541.4977 E 1,241,829.8410 Sta 0+00.00

Course from PI1 to PI2 S 30° 23' 07.96" E Dist 686.0000

Point PI2 N 461,949.7258 E 1,242,176.8309 Sta 6+86.00

Course from PI2 to PI3 S 24° 50' 03.81" E Dist 1,022.0000

Point PI3 N 461,022.2347 E 1,242,606.0677 Sta 17+08.00

==========

Ending chain SURVEY description

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I-94 PAINTED CANYON LANDSLIDE REPAIR

DRILLED SHAFT LOCATION AND ALIGNMENT

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SER-5-094(107)030	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)		6	
G20-1-60	**60"x24"**	**ROAD WORK NEXT __ MILES**	**2**	**34**	**68**
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)		26	
G20-2-48	**48"x24"**	**END ROAD WORK**	**2**	**19**	**38**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-10-108	**108"x48"**	**CONTRACTOR SIGN**	**1**	**64**	**64**
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		37	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		30	
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**2**	**59**	**118**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR ARROW RIGHT or LEFT		23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)		7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)		7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)		7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)		7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-1a-18	18"x18"	STOP and SLOW PADDLE Back to Back		5	
R1-2-60	60"x60"	YIELD		29	
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**4**	**39**	**156**
R2-1a-24	24"x18"	MINIMUM FEE $80 (Mounted on Speed Limit post)		10	
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT		35	
R4-1-48	**48"x60"**	**DO NOT PASS**	**2**	**39**	**78**
R4-7-48	48"x60"	KEEP RIGHT SYMBOL		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT		13	
R7-1-12	12"x18"	NO PARKING		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	48"x30"	ROAD CLOSED		28	
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC		31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		35	
W1-4-48	48"x48"	RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	48"x24"	LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD SYMBOL		35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**2**	**35**	**70**
W4-2-48	**48"x48"**	**RIGHT or LEFT LANE TRANSITION SYMBOL**	**2**	**35**	**70**
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	**48"x48"**	**THRU TRAFFIC RIGHT LANE**	**1**	**35**	**35**
W5-9-48	**48"x48"**	**ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW**	**1**	**35**	**35**
W6-3-48	48"x48"	TWO WAY TRAFFIC SYMBOL		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER STRIPE		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT.		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT.		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE SYMBOL		35	
W13-1-24	24"x24"	__ MPH ADVISORY SPEED PLATE (Mounted on warning sign post)		11	
W13-4-48	48"x60"	RAMP ARROW		39	
W14-3-48	48"x36"	NO PASSING ZONE		23	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**1**	**35**	**35**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT.		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.		35	
W20-5-48	**48"x48"**	**RIGHT or LEFT LANE CLOSED AHEAD or __ FT.**	**2**	**35**	**70**
W20-7a-48	48"x48"	FLAGGING SYMBOL		35	
W20-7k-24	24"x18"	__ FEET (Mounted on warning sign post)		10	
W20-8-48	48"x48"	STREET CLOSED		35	
W20-51-48	48"x48"	EQUIPMENT WORKING		35	
W20-52-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1a-48	48"x48"	WORKERS SYMBOL		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT.		35	
W21-6a-48	48"x48"	SURVEY CREW AHEAD		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT.		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	

SPECIAL SIGNS

SPEC & CODE

704-1000	TRAFFIC CONTROL SIGNS	TOTAL UNITS	837

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH	
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1051	TYPE II BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**3**
704-1060	**DELINEATOR DRUMS**	**EACH**	**44**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**32**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	**SEQUENCING ARROW PANEL - TYPE C**	**EACH**	**1**
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH	
704-1095	TYPE B FLASHERS	EACH	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	
762-1500	OBLITERATION OF PVMT MK	SF	
772-2110	FLASHING BEACON - POST MOUNTED	EACH	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

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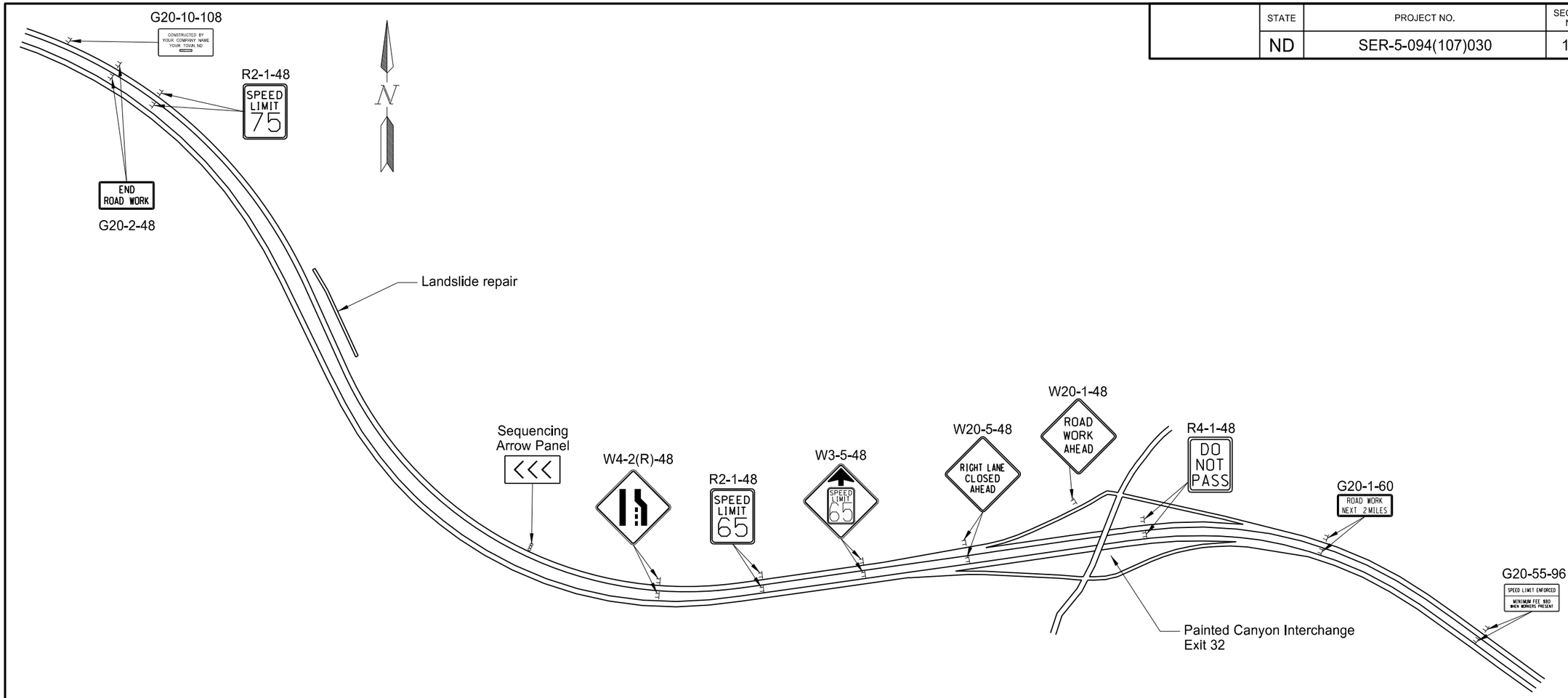
Traffic Control Devices List

I-94 PAINTED CANYON LANDSLIDE REPAIR

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	100	2



Note: Space signs and provide delineator drums, tubular markers, and barricades in accordance with Standard Drawings 704-5, 704-20 (Layout G) and 704-35

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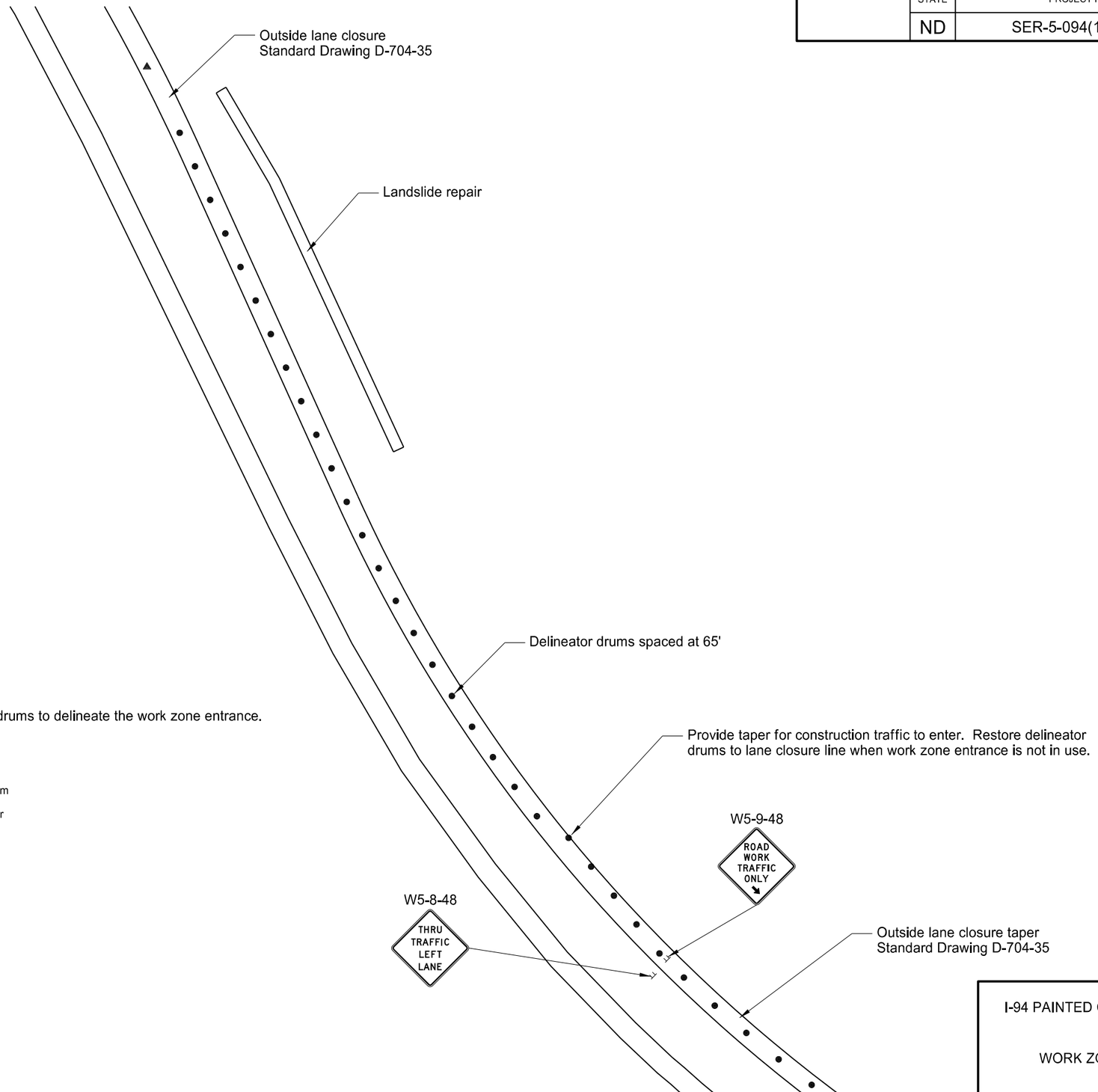
I-94 PAINTED CANYON LANDSLIDE REPAIR

WORK ZONE LANE CLOSURE

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	100	3



Note: Provide signs and delineator drums to delineate the work zone entrance.

KEY

- ● Delineator Drum
- ▲ Tubular Marker

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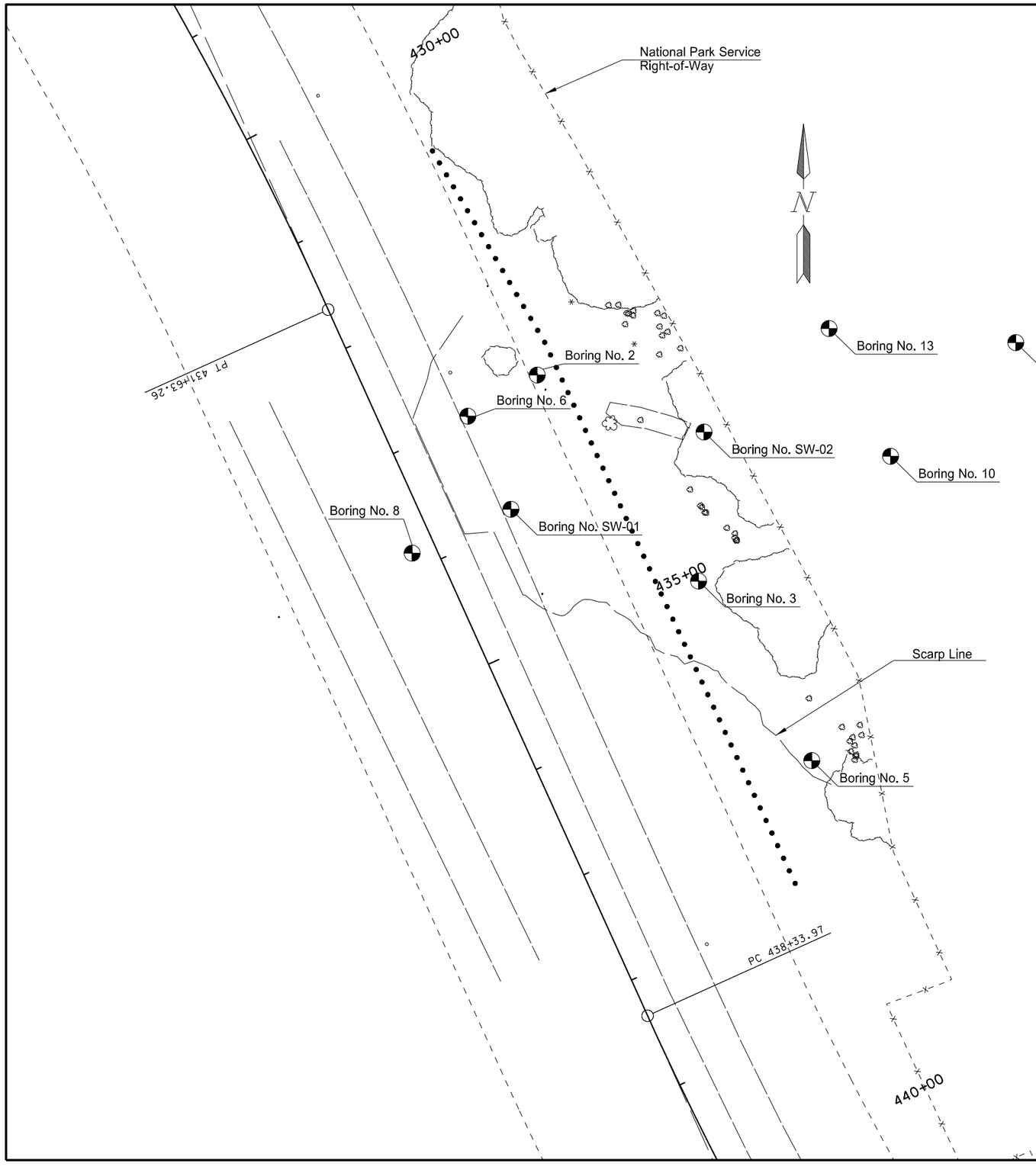
I-94 PAINTED CANYON LANDSLIDE REPAIR

WORK ZONE ENTRANCE DETAIL

2/6/2015 10:47:41 AM 553 N:\NDD20148\Design\100WZ_002_WZTC.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	175	1



NOTES:

1. Schematic logs of borings in the National Park are not provided in the plans.
2. Refer to Geotechnical Data Report dated December 29, 2014 for supplemental information on the subsurface conditions.
3. Use the subsurface data provided in these plans and in the Geotechnical Data Report in compliance with Section 102.06 "Supplemental Information" of the Standard Specifications.
4. Each boring shown contains an inclinometer. Avoid damaging inclinometers.

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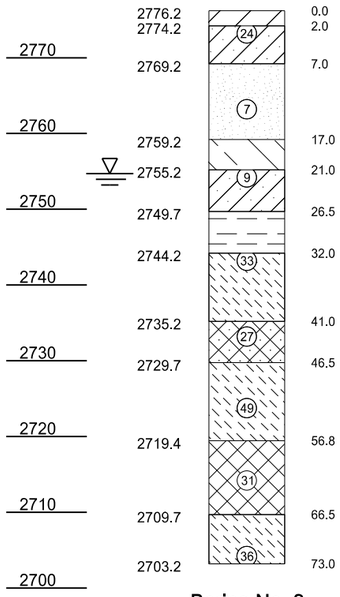
I-94 PAINTED CANYON LANDSLIDE REPAIR

BORING LOCATIONS

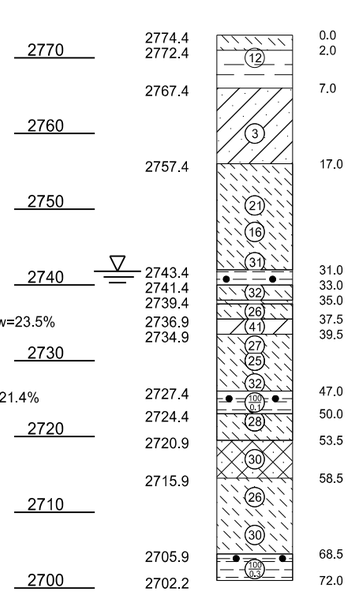
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	175	2



0.0	BRN LM, w=6.1%
2.0	BRN SNDY LM, *c=3000 psf, w=7.1%
7.0	BRN/TAN SND, w=5.5% BRN/TAN SND, *c=875 psf, w=8.6%
17.0	BRN CLY LM, w=29.4%
21.0	DRK/GRY SNDY LM, *c=1125 psf, w=11.8%
26.5	BLK SLTY LM, γ_d=106.5 pcf, w=19.6%
32.0	GRY CLY, *c=4125 psf, w=76.8%
41.0	BLK CLY, w=23.2% GRY CLY, q_u=6818.5 psf, c=3409.2 psf, γ_d=103.7 pcf, w=23.5% GRY SLTY CLY LM, w=19.2%
46.5	GRY CLY, q_u=16716 psf, c=8358 psf, γ_d=107.0 pcf, w=21.4% GRY CLY, *c=6125 psf, w=19.3%
56.8	SLTY CLY LM, γ_d=99.8 pcf, w=24.4% SLTY CLY LM, *c=3875 psf, w=18.7%
66.5	GRY CLY, γ_d=102.9 pcf, w=24.6% GRY CLY, *c=4500 psf, w=22.4%
73.0	

Boring No. 2
Sta 432+89.20
141.7' LT

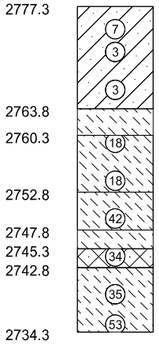
Drilled on: 7/28/08



0.0	BRN CLY, w=14.9%
2.0	BRN SLTY LM, *c=1500 psf, w=23.6%
7.0	DRK BRN SNDY LM, w=10.2%
17.0	DRK BRN SNDY LM, *ø=28° w=14.1%
31.0	GRY CLY, q_u=4542 psf, c=2271 psf, γ_d=100.5 pcf, w=24.1% GRY CLY, *c=2625 psf, w=26.0% GRY CLY, q_u=4435 psf, c=2271 psf, γ_d=91.5 pcf, w=30.6% GRY CLY, *c=2000 psf, w=27.4% GRY CLY, q_u=1577 psf, c=599 psf, γ_d=95.8 pcf, w=28.8% GRY CLY, *c=3875 psf, w=20.7%
33.0	GRY CLY Coal Mix, *ø=40.7°, γ_d=107.3 pcf, w=19.7%
35.0	GRY CLY, *c=4000 psf, w=14.5% GRY CLY LM, w=17.6%
37.5	GRY CLY, *c=3250 psf, w=23.8%
39.5	GRY LM, *c=5125 psf, w=26.1% GRY CLY, *c=3375 psf, w=20.6% GRY CLY, *c=3125 psf, w=24.6%
47.0	GRY CLY, *c=4000 psf, w=20.0% BLK\GRY CLY Coal Mix, *c=7500 psf, w=39.9%
50.0	GRY CLY, *c=3500 psf, w=26.3%
53.5	GRY SLTY CLY, *c=3750 psf, w=19.9%
58.5	GRY CLY, *c=3250 psf, w=21.7%
68.5	GRY CLY, *c=3750 psf, w=24.5%
72.0	BRN SNDY CLY Coal Mix, *c=7500 psf, w=65.6%

Boring No. 3
Sta 435+09
195' LT

Drilled on: 7/10/10



0.0	BRN SNDY LM, w=6.4% BRN SNDY LM, *c=875 psf, w=7.4%
13.5	BRN SNDY LM, *c=375 psf, w=7.7%
17.0	BRN SNDY LM, *ø=28°, w=23.4%
24.5	BRN BLK CLY, c=2347 psf, γ_d=90.5 pcf, w=33.4% BRN GRY CLY, *c=2250 psf, w=26.8%
29.5	BRN GRY CLY, c=8136 psf, γ_d=95.8 pcf, w=28.8% BRN GRY CLY, *c=2250 psf, w=27.7%
32.0	GRY CLY, c=3290 psf, γ_d=108.6 pcf, w=22.3% GRY CLY, *c=5250 psf, w=24.8%
34.5	BLK GRY CLY, c=4766 psf, γ_d=100.9 pcf, w=31.3% GRY SLTY CLY, *c=4250 psf, w=19.8%
43.0	GRY CLY, c=2275 psf, γ_d=111.6 pcf, w=18.9% GRY CLY, *c=4375 psf, w=19.6% GRY CLY, q_u=16675 psf, c=8335 psf, γ_d=118.2 pcf, w=15.1% GRY CLY, *c=6625 psf, w=16.0%

Boring No. 5
Sta 436+91
220' LT

Drilled on: 9/7/11

NOTES:

1. The encircled numbers indicate the number of blows delivered by a 140 lb. automatic hammer from a height of 30" to drive a 2" o.d. split-barrel sampler 1'-0".
2. Station references are for the I-94 Median Centerline.
3. The boring data shown is for owner's design and estimating purposes only. The boring logs are only representative of the exact location from which the samples were taken and interpretation between sample locations is discouraged. The owner assumes no responsibility if the soil conditions encountered during construction differ from those shown.

q_u=Unconfined Compressive Strength (psf)
w=Moisture Content (%)
ø=Friction Angle (deg)
c=Cohesion (psf)
γ_d=Dry Density (pcf)
*=These cohesive values and friction angles are estimated from blow counts

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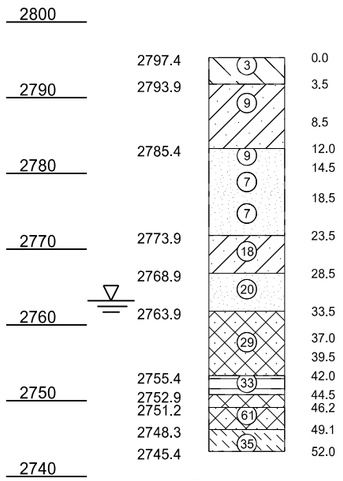
I-94 PAINTED CANYON LANDSLIDE REPAIR

BORING LOGS

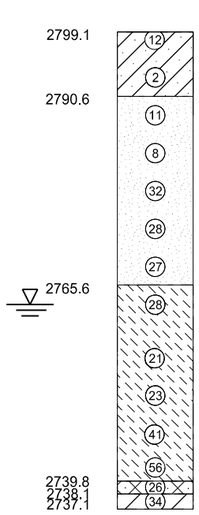
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	175	3



0.0	BRN CLY LM, *c=375 psf, w=15.2%
3.5	BRN TAN SNDY LM, *c=1125 psf, w=16.1%
8.5	BRN SNDY LM, w=11.2%
12.0	BRN SND, ø=30°, w=6.3%
14.5	BRN SND, ø=29°, w=7.2%
18.5	BRN TAN SND, ø=29°, w=9.0%
23.5	BRN TAN SNDY LM, *c=2250 psf, w=8.4%
28.5	BRN SND, *c=2500 psf, w=25.6%
33.5	GRY SLTY CLY, q_u=6972.5 psf, c=3486.2 psf, γ_d=103.8 pcf, w=23.9%
37.0	DRK GRY SLTY CLY, *c=3625 psf, w=23.4%
39.5	GRY SLTY CLY, q_u=2521.1 psf, c=1260.7 psf, γ_d=102.4 pcf, w=24.6%
42.0	GRY SLTY LM, *c=4125 psf, w=23.1%
44.5	GRY SLTY CLY LM, w=44.5%
46.2	GRY SLTY CLY, *c=7625 psf, w=24.9%
49.1	GRY CLY, *c=4375 psf, w=21.7%
52.0	

Boring No. 6
Sta 432+97
71' LT

Drilled on: 9/7/11



0.0	BRN TAN SNDY LM, *c=1500 psf, w=5.6%
3.5	BRN SNDY LM, *c=250 psf, w=12.1%
8.5	BRN SND, *ø=30°, w=5.6%
13.5	BRN SND, *ø=29°, w=13.2%
18.5	BRN SND, *ø=36°, w=7.9%
23.5	BRN SND, *ø=35°, w=8.8%
28.5	BRN SND, *ø=35°, w=26.1%
33.5	GRY CLY, *c=3500 psf, w=22.6%
38.5	DRK GRY CLY, w=30.1%
42.0	DRK GRY CLY, *c=2625 psf, w=28.1%
44.5	GRY CLY, q_u=1374 psf, c=687 psf, γ_d=104.3 pcf, w=24.2%
47.0	GRY CLY, *c=2875 psf, w=23.8%
49.5	GRY CLY, q_u=9907 psf, c=4954 psf, γ_d=104.4 pcf, w=23.5%
52.0	DRK GRY CLY, *c=5125 psf, w=17.6%
54.5	LT GRY CLY, c=10800 psf, γ_d=116.3 pcf, w=17.0%
56.5	LT GRY CLY, *c=7000 psf, w=11.2%
59.3	LT GRY SLTY CLY, *c=3250 psf, w=18.1%
61.0	GRY LM, *c=4250 psf, w=27.6%
62.0	

Boring No. 8
Sta 435+82
21' RT

Drilled on: 9/8/11

NOTES:

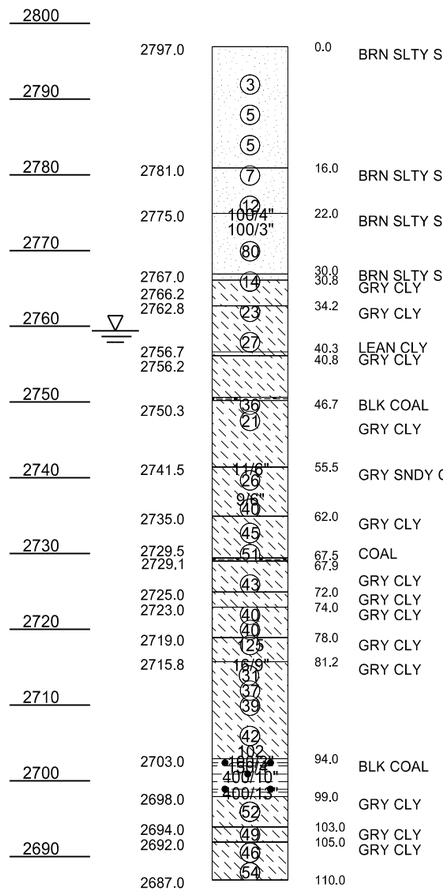
1. The encircled numbers indicate the number of blows delivered by a 140 lb. automatic hammer from a height of 30" to drive a 2" o.d. split-barrel sampler 1'-0".
2. Station references are for the I-94 Median Centerline.
3. The boring data shown is for owner's design and estimating purposes only. The boring logs are only representative of the exact location from which the samples were taken and interpretation between sample locations is discouraged. The owner assumes no responsibility if the soil conditions encountered during construction differ from those shown.

q_u=Unconfined Compressive Strength (psf)
w=Moisture Content (%)
ø=Friction Angle (deg)
c=Cohesion (psf)
γ_d=Dry Density (pcf)
*=These cohesive values and friction angles are estimated from blow counts

I-94 PAINTED CANYON LANDSLIDE REPAIR

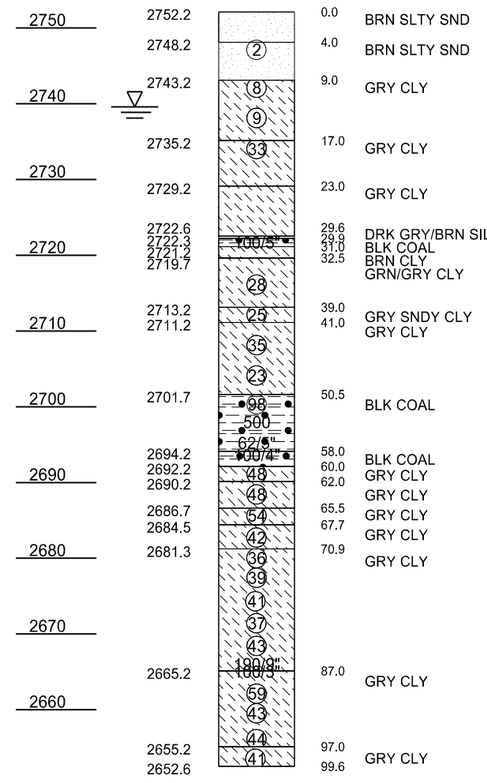
BORING LOGS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	175	4



Boring No. SW-01
Sta 433+85.80
72.88' LT

Drilled on: 3/14/14



Boring No. SW-02
Sta 433+93.60
252.78' LT

Drilled on: 3/14/14

NOTES:

1. The encircled numbers indicate the number of blows delivered by a 140 lb. automatic hammer from a height of 30" to drive a 2" o.d. split-barrel sampler 1'-0".
2. Station references are for the I-94 Median Centerline.
3. The boring data shown is for owner's design and estimating purposes only. The boring logs are only representative of the exact location from which the samples were taken and interpretation between sample locations is discouraged. The owner assumes no responsibility if the soil conditions encountered during construction differ from those shown.

q_u=Unconfined Compressive Strength (psf)
w=Moisture Content (%)
ø=Friction Angle (deg)
c=Cohesion (psf)
γ_d=Dry Density (pcf)
*=These cohesive values and friction angles are estimated from blow counts

I-94 PAINTED CANYON LANDSLIDE REPAIR

BORING LOGS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	1

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

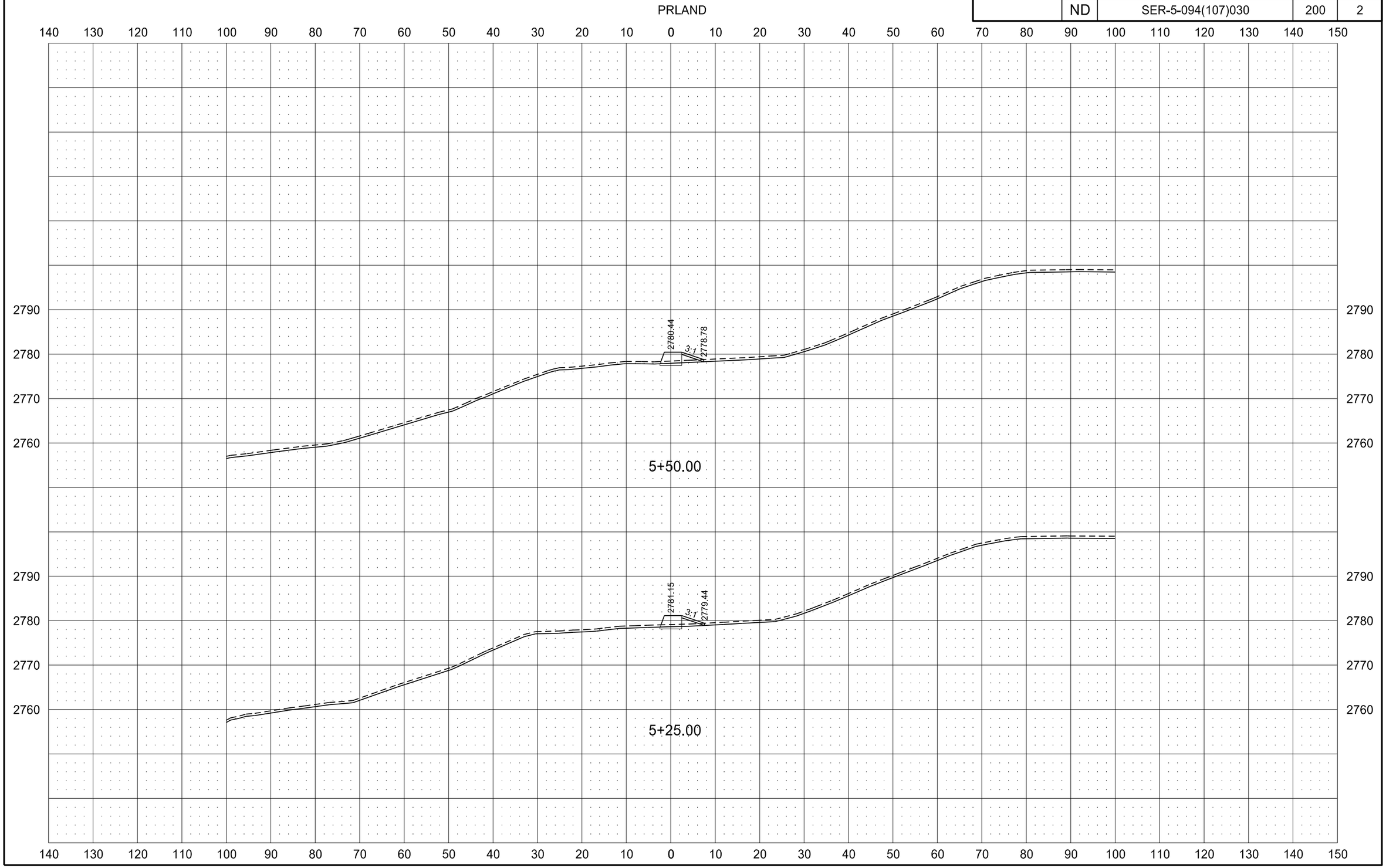
2781.86
3.1
2780.14

5+00.00

2790
2780
2770
2760

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	2



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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	3

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2779.21
3:1
2776.97

6+00.00

2779.77
3:1
2777.93

5+75.00

2790
2780
2770
2760

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	4

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2778.34
3:1
2776.44

6+50.00

2778.89
3:1
2776.59

6+25.00

2790
2780
2770
2760

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	5

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2777.28
3:1
2775.24

7+00.00

2790
2780
2770
2760

2777.94
3:1
2775.94

6+75.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	6

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2776.84
3:1
2774.95

7+39.00

2776.90
3:1
2774.86

7+25.00

2790
2780
2770
2760

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	7

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2777.35
3:1
2775.26

7+75.00

2790
2780
2770
2760

2776.90
3:1
2775.12

7+50.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	8

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2777.34
3:1
2775.14

8+25.00

2790
2780
2770
2760
2750

2777.36
3:1
2775.23

8+00.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	9

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780
2770
2760

2777.46
3:1
2775.55

9+00.00

2790
2780
2770
2760

2777.47
3:1
2775.63

8+75.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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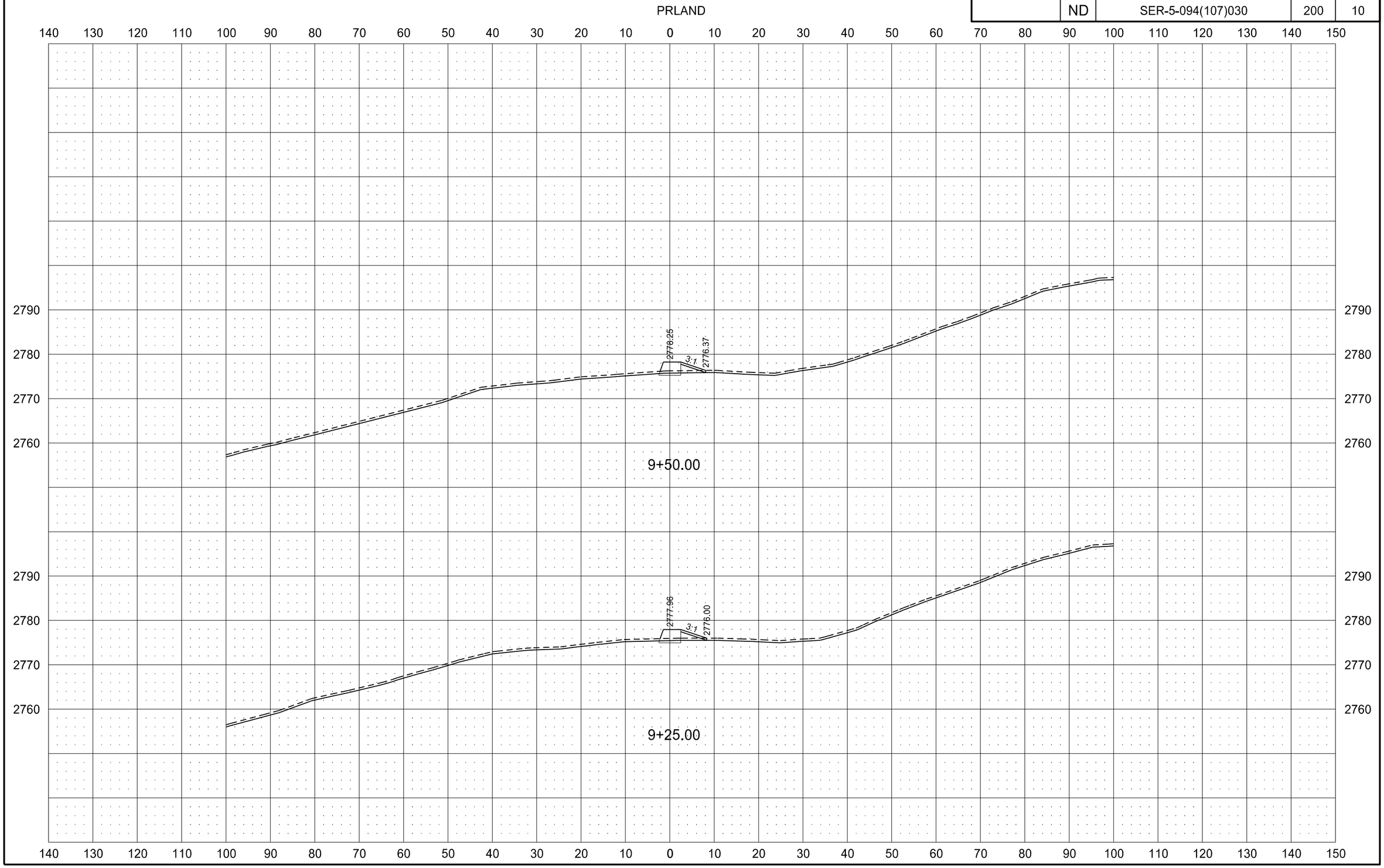
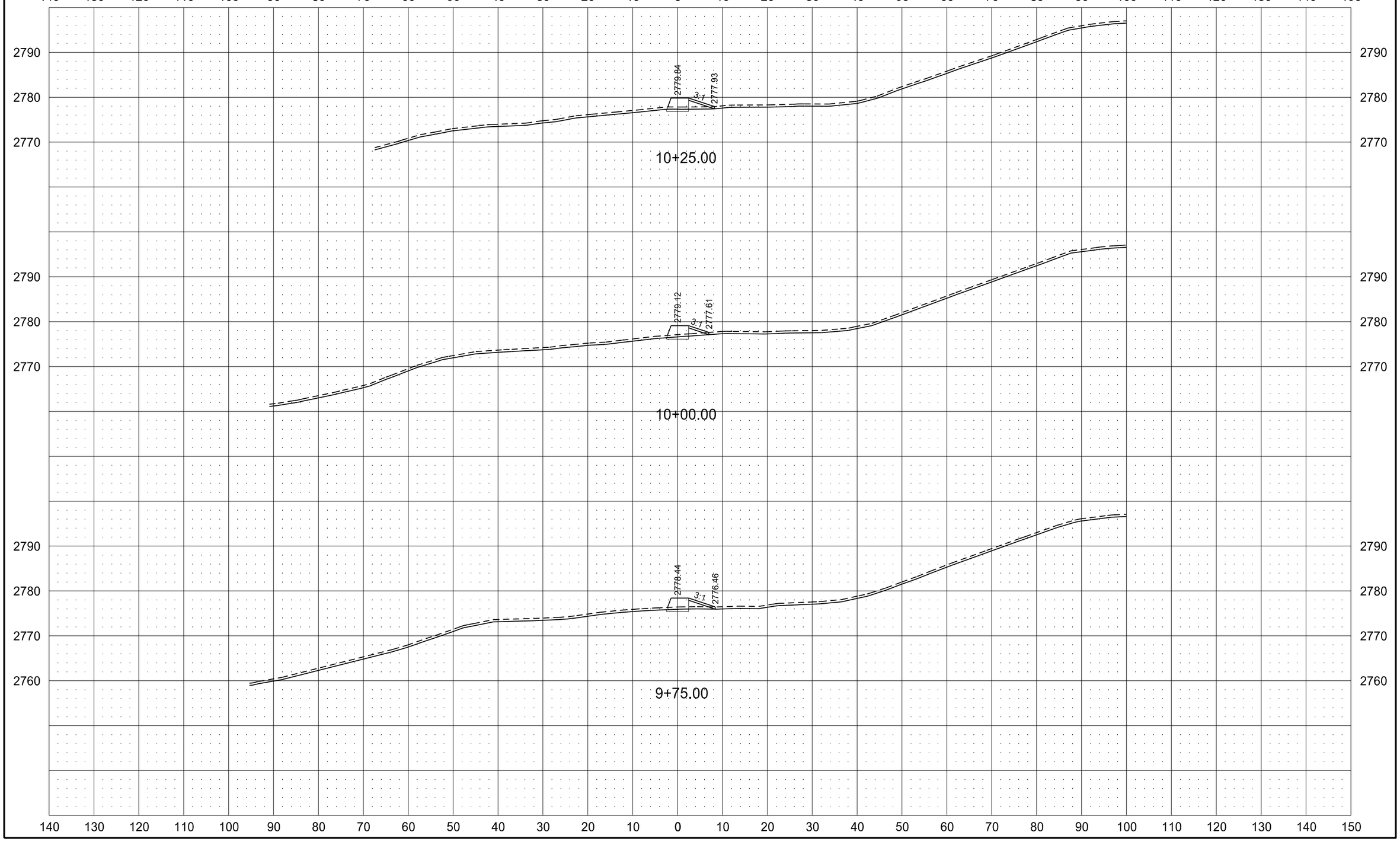
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	10



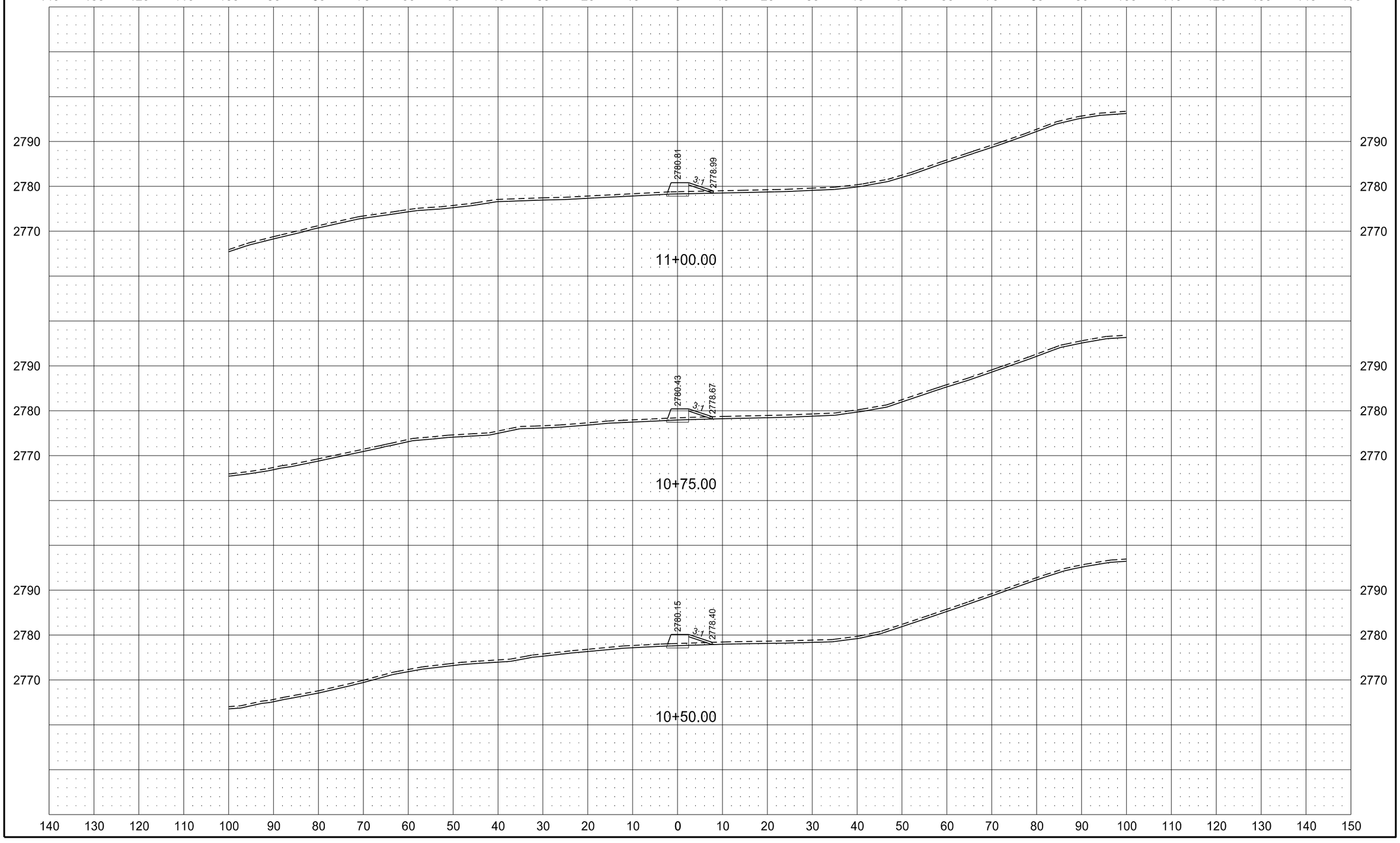
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	11

PRLAND



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	12

PRLAND



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	13

PRLAND

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

2790
2780

2781.73
3:1
2779.87

11+75.00

2790
2780
2770

2781.21
3:1
2779.51

11+50.00

2790
2780

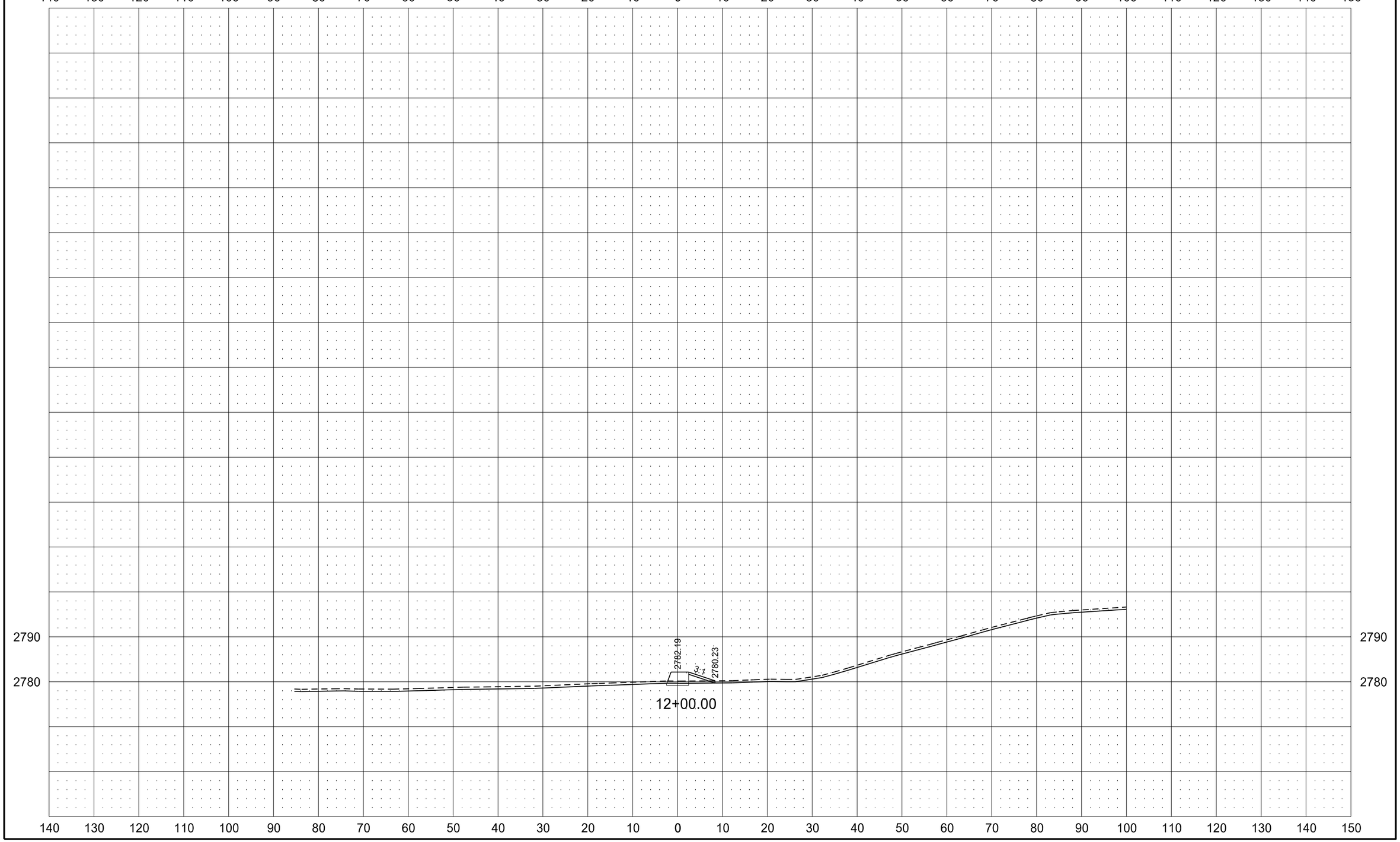
2780.98
3:1
2779.23

11+25.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SER-5-094(107)030	200	14

PRLAND



NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
A	ampere
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Az	azimuth
Bk	back
BF	back face
Bs	backsight
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
Brg	bearing
BI	beehive inlet
Beg	begin
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
Bd Ft	board feet
BH	bore hole
BS	both sides
Bot	bottom
Blvd	Boulevard
Bndry	boundary
BC	brass cap
Brkwy	breakaway
Br	bridge
Bldg	building
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
Cl or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSP	corrugated steel pipe
C	coulomb
Co	County
Crse	course
C Gr	course gravel
CS	course sand
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	Crossroad
Crn	crown
CF	cubic feet
M3	cubic meter
M3/s	cubic meters per second
CY	cubic yard
Cy/mi	cubic yards per mile
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
CS	curve to spiral
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Deg or D	degree
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
Ea	each
Esmt	easement
E	East
EB	Eastbound
Elast	elastomeric
EL	electric locker
E Mtr	electric meter
Elec	electric/al
EDM	electronic distance meter
Elev or El	elevation
Ellipt	elliptical
Emb	embankment
Emuls	emulsion/emulsified
ES	end section
Engr	engineer
ESS	environmental sensor station
Eq	equal
Eq	equation
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
F	Fahrenheit
FS	far side
F	farad
Fed	Federal
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fs	foresight
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

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NDDOT ABBREVIATIONS

D-101-2

FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed
Gal	gallon
Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Geod	geodetic
GIS	Geographical Information System
G	giga
GPS	Global Positioning System
Gov	government
Grd	graded/grade
Gr	gravel
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ha	hectare
Ht	height
HI	height of instrument
Hel	helical
H	henry
Hz	hertz
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
Hr	hour(s)
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
In or "	inch
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IM	iron monument
I Pn	Iron Pin
IP	iron Pipe
Jt	joint
J	joule
Jct	junction
K	kelvin
Kn	kilo newton
Kpa	kilo pascal
Kg	kilogram
Kg/m3	kilogram per cubic meter
Km	kilometer
K	Kip(s)
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
Ln	lane
Lg	large
Lat	latitude
Lt	left
L	length of curve
Lens	lenses
Lvl	level
LB	level book
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Lig Co	lignite coal
Lig Sl	lignite slack
LF	linear foot
Liq	liquid
LL	liquid limit
L	litre
Lm	loam
Loc	location
LC	long chord
Long.	longitude
Lp	loop
LD	loop detector
Lm	lumen
Lum	luminaire
L Sum	lump sum
Lx	lux
ML	main line
M Hr	man hour
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing
M	mega
Mer	meridian
M	meter
M/s	meters per second
M	mid ordinate of curve
Mi	mile
MM	mile marker
MP	mile post
Ml	milliliter
Mm	millimeter
Mm/hr	millimeters per hour
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Mun	municipal
N	nano
NGS	National Geodetic Survey
NS	near side
Neop	neoprene
Ntwk	network
N	newton
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number
Obsc	obscure(d)
Obsn	observation
Ocpd	occupied
Ocpy	occupy
Off Loc	office location
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PK	Parker-Kalon nail
Pa	pascal
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl	plate
Pt	point
PCC	point of compound curve
PC	point of curve
PI	point of intersection
PRC	point of reverse curvature
PT	point of tangent
POC	point on curve
POT	point on tangent
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
Lb or #	pounds
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd	preformed
Prep	preperation
Press.	pressure
PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

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NDDOT ABBREVIATIONS

D-101-3

Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RTP	random traverse point
Rge or R	range
RC	rapid curing
Rec	record
Rcy	recycle
RPCC	recycled Portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
Reinf	reinforcement
Res	reservation
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
RWIS	Roadway Weather Information System
Rk	rock
Rt	route
Salv	salvage(d)
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
San	sanitary sewer line
Sc	scoria
Sec	seconds
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sh	shale
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw	sidewalk
S	siemens
SD	sight distance
SN	sign number
Sig	signal
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam
Sgl	single
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SC	spiral to curve
ST	spiral to tangent
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
SF	square feet
Km2	square kilometer
M2	square meter
SY	square yard
Stk	stake
Std	standard
N	standard penetration test
Std Specs	Standard Specifications
Sta	station
Sta Yd	station yards
Stm L	steam line
SEC	steel encased concrete
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SE	superelevation
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical
SI	Systems International
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	tesla
T	thinwall tube sample
T/mi	tons per mile
Ts	topsoil
Twp or T	township
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
TB	transit book
Trans	transition
TT	transmission tower
Trans	transverse
Trav	traverse
TP	traverse point
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
TP	turning point
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VC	vertical curve
VCP	vitrified clay pipe
V	volt
Vol	volume
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
W	watt
Wrng	wearing
Wb	weber
WIM	Weigh In Motion
W	West
WB	Westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner
WGS	World Geodetic System
Z	zenith

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
AGC	Assiociated General Contractors of America
All PI	Alliance Pipeline
ALL SEAS WU	All Seasons Water Users Association
AMOCO PI	Amoco Pipeline Company
AMRDA HESS	Amerada Hess Corporation
AT&T	AT&T Corporation
B PAW	Bear Paw Energy Incorporated
BAKER ELEC	Baker Electric
BASIN ELEC	Basin Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative
BELLE PL	Belle Fourche Pipeline Company
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe Railway
BOEING	Boeing
BRNS RWD	Barnes Rural Water District
BURK-DIV ELEC	Burke-Divide Electric Cooperative
BURL WU	Burleigh Water Users
Cable One	Cable One
CABLE SERV	Cable Services
CAP ELEC	Capital Electric Cooperative Incorporat
CASS CO ELEC	Cass County Electric Cooperative
CASS RWU	Cass Rural Water Users Incorporated
CAV ELEC	Cavalier Rural Electric Cooperative
CBLCOM	Cablecom Of Fargo
CENEX PL	Cenex Pipeline
CENT PL WATER DIST	Central Pipe Line Water District
CENT PWR ELEC	Central Power Electric Cooperative
COE	Corps of Engineers
CONS TEL	Consolidated Telephone
CONT RES	Continental Resource Inc
CPR	Canadian Pacific Railway
D O E	Department Of Energy
DAK CARR	Dakota Carrier Network
DAK CENT TEL	Dakota Central Telephone
DAK RWD	Dakota Rural Water District
DGC	Dakota Gasification Company
DICKEY R NET	Dickey Rural Networks
DICKEY RWU	Dickey Rural Water Users Association
DICKEY TEL	Dickey Telephone
DNRR	Dakota Northern Railroad
DOME PL	Dome Pipeline Company
DVELEC	Dakota Valley Electric Cooperative
DVMW	Dakota, Missouri Valley & Western
ENBRDG	Enbridge Pipelines Incorporated
ENVENTIS	Enventis Telephone
FALK MNG	Falkirk Mining Company
FHWA	Federal Highway Administration
G FKS-TRL WD	Grand Forks-traill Water District
GETTY TRD & TRAN	Getty Trading & Transportation
GLDN W ELEC	Golden West Electric Cooperative
GRGS CO TEL	Griggs County Telephone
GT PLNS NAT GAS	Great Plains Natural Gas Company
HALS TEL	Halstad Telephone Company
IDEA1	Idea1
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ ELEC	McKenzie Electric Cooperative
MCKNZ WRD	McKenzie County Water Resource District
MCLEOD	McLeod USA
MCLN ELEC	McLean Electric Cooperative
MCLN-SHRDN R WAT	McLean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MID-CONT CABLE	Mid-Continent Cable
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MRE LBTY TEL	Moore & Liberty Telephone
MUNICIPAL	City Water And Sewer
MUNICIPAL	City Of '.....'
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	NDSU Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
ONEOK	Oneok gas
OSHA	Occupational Safety and Health Administration
OTTR TL PWR	Otter Tail Power Company
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
PVT ELEC	Private Electric
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RAMSEY R SEW	Ramsey Rural Sewer Association
RAMSEY RW	Ramsey Rural Water Association
RAMSEY UTIL	Ramsey County Rural Utilities
RED RIV TEL	Red River Rural Telephone
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Coop
RRVW	Red River Valley & Western Railroad
RSR ELEC	R.S.R. Electric Cooperative
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STER ENG	Sterling Energy
STUT RWU	Stutsman Rural Water Users
SW PL PRJ	Southwest Pipeline Project
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TESORO HGH PLNS PL	Tesoro High Plains Pipeline
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USFWS	US Fish and Wildlife Service
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WEB	W. E. B. Water Development Association
WILLI RWA	Williams Rural Water Association
WILSTN BAS PL	Williston Basin Interstate Pipeline Company
WLSH RWD	Walsh Water Rural Water District
WOLVRTN TEL	Wolverton Telephone
XLENER	Xcel Energy
YSVR	Yellowstone Valley Railroad

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Line Styles

- Limits of Const Transition Line
- Bale Check
- Rock Check
- Sight Distance Triangle Line
- Small Hidden Object
- Dimension Leader
- Existing Ground
- Existing Topsoil (Cross Section View)
- Large Hidden Object
- Edge Drain
- Geotextile Fabric Type D
- Existing Electrical
- Existing Fiber Optic Line
- Existing TV Fiber Optic
- Existing Gas Pipe
- Geogrid
- Existing Overhead Utility Line
- Existing Power
- Existing Fuel Pipeline
- Existing Undefined Above Ground Pipe Line
- Geotextile Fabric Type R
- Geotextile Fabric Type R1
- Remove Line
- Geotextile Fabric Type RR
- Geotextile Fabric Type S
- Floating Silt Curtain
- Existing Telephone Line
- Existing TV Line
- Existing Assumed Ground (Not Surveyed)
- Tentative Ground Line
- Existing Water or Steam Line
- Existing Under Drain
- Under Drain
- Wall
- Existing Slotted Drain
- Existing Cemetary Boundary
- Centerline Pavement Marking
- Barrier with Centerline Pavement Marking
- Barrier Pavement Marking
- Stripe 4 IN Dotted Extension White
- Stripe 8 IN Dotted Extension White
- Stripe 8 IN Lane Drop
- Wetland Mitigation
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Easement
- Existing Concrete
- Existing Easement
- Existing Gravel Surface
- Existing Aggregate (Cross Section View)
- Existing Curb and Gutter (Cross Section View)
- Existing Riprap
- Existing Underground Vault or Lift Station
- Tangent Line
- Hidden Object
- Existing Dirt Surface
- Existing Conduit
- Topsoil Profile
- Existing Conductor
- Conductor
- Fiber Optic
- Existing Loop Detector
- Subgrade, Subcut or Ditch Grade
- Existing Asphalt Surface
- Existing Asphalt (Cross Section View)
- Existing Reinforcement Rebar
- Existing Tie Point Line
- Existing State or International Line
- Existing Quarter Section Line
- Existing County
- Existing Section Line
- Existing Township
- Existing Railroad Centerline
- Centerline
- Existing Centerline
- Supplemental Contour
- Right of Way
- Existing Right of Way
- Existing Right of Way Railroad
- Failure Line
- Existing Conditions
- Existing Ground (Details)
- Existing Sixteenth Section Line
- Existing Right of Way Not State Owned
- Phantom Object
- Centerline Main
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Excavation Limits
- Existing Government Lot Line
- Existing Adjacent Block Lines
- Existing Adjacent Lot Lines
- Existing Adjacent Property Line
- Existing Adjacent Subdivision Lines

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D-101-21

Line Styles

- Subgrade Reinforcement
- Existing Down Guy Wire Down Guy
- Existing Fence
- Existing Railroad
- Existing Sanitary Sewer
- Existing Sanitary Force Main
- Existing Storm Drain
- Existing Storm Drain Force Main
- Fence
- Silt Fence
- Existing Field Line
- Exst Flow
- Flow
- Existing Culvert
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter
- Existing Double Micro Loop Detector
- Micro Loop Detector Double
- Existing Overhead Sign Structure
- Existing Micro Loop Detector
- Micro Loop Detector
- Existing Overhead Sign Structure Cantilever
- Existing Railroad Switch
- Overhead Sign Structure Cantilever
- 24 Inch Pipe
- Reinforced Concrete Pipe
- Signal Head with Mast Arm
- Existing Signal Head with Mast Arm
- Tie Bar at Random Spacing
- 3-Cable w Posts
- Existing 3-Cable w Posts
- Site Boundary
- Fiber Rolls
- Doweled Joint
- Tie Bar 30 Inch 4 Foot Center to Center
- Tie Bar 18 Inch 3 Foot Center to Center
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Depression Contours
- Existing City Corporate Limits or Reservation Boundary
- Gravel Pit - Borrow Area
- Existing Tree Boundary
- Tree Row
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Retaining Wall (Plan View)
- Sheet Piling
- W-Beam w Posts
- Existing W-Beam Guardrail with Posts
- Exst Wet Area-Vegetation Break
- Existing Wetland Delineated

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Symbols

D-101-30

North Arrow (Half Scale)

Truck Mounted Attenuator

Type I Barricade

Type II Barricade

Type III Barricade

Catch Basin

Cairn or Stone Circle

Video Detection Camera

Storm Drain Cap or Stub

Corrugated Metal End Section 18 Inch

Corrugated Metal End Section 24 Inch

Corrugated Metal End Section 30 Inch

Corrugated Metal End Section 36 Inch

Corrugated Metal End Section 42 Inch

Corrugated Metal End Section 48 Inch

Concrete Foundation

Ground Connection Conductor

Neutral Connection Conductor

Phase 1 Connection Conductor

Phase 2 Connection Conductor

Traffic Cone

Signal Controller

Pad Mounted Signal Controller

Alignment Data Point

Emergency Vehicle Detector

Attenuation Device

Diamond Grade Delineator Type A

Diamond Grade Delineator Type B

Diamond Grade Delineator Type C

Diamond Grade Delineator Type D

Diamond Grade Delineator Type E

Flexible Delineator

Flexible Delineator Type A

Flexible Delineator Type B

Flexible Delineator Type C

Flexible Delineator Type D

Flexible Delineator Type E

Delineator Type A

Delineator Type A Reset

Delineator Type B

Delineator Type B Reset

Delineator Type C

Delineator Type D

Delineator Type E

Delineator Drums

Spot Elevation

Existing Access Control Arrow

Existing Artifact

Existing Flashing Beacon

Existing Benchmark

Existing Railroad Battery Box

Existing Bush or Shrub

Existing Gas Cap or Stub

Existing Sanitary Cap or Stub

Existing Storm Drain Cap or Stub

Existing Water Cap or Stub

Existing Sanitary Cleanout

Existing Concrete Foundation

Existing Traffic Signal Controller

Existing Pad Mounted Signal Controller

Existing Sixteenth Section Corner

Existing Quarter Section Corner

Existing Section Corner

Existing Railroad Crossbuck

Existing Satellite Dish

Existing Fuel Dispensers

Existing Flexible Delineator Type A

Existing Flexible Delineator Type B

Existing Flexible Delineator Type C

Existing Flexible Delineator Type D

Existing Flexible Delineator Type E

Existing Delineator Type A

Existing Delineator Type B

Existing Delineator Type C

Existing Delineator Type D

Existing Delineator Type E

Existing EFB Misc

Existing Flashing Beacon

Existing Pipe Mounted Flasher

Existing Pad Mounted Feed Point

Existing Pipe Mounted Feed Point with Pad

Existing Pole Mounted Feed Point

Existing Railroad Frog

Existing Snow Gate 18

Existing Snow Gate 28

Existing Snow Gate 40

Existing Headwall

Existing Pedestrian Head with Number

Existing Signal Head

Existing Sprinkler Head

Existing Fire Hydrant

Existing Catch Basin Drop Inlet

Existing Curb Inlet

Existing Manhole Inlet

Existing Junction Box

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Symbols

D-101-31

- Existing Light Standard
- Existing High Mast Light Standard 10 Luminaire
- Existing High Mast Light Standard 3 Luminaire
- Existing High Mast Light Standard 4 Luminaire
- Existing High Mast Light Standard 5 Luminaire
- Existing High Mast Light Standard 6 Luminaire
- Existing High Mast Light Standard 7 Luminaire
- Existing High Mast Light Standard 8 Luminaire
- Existing High Mast Light Standard 9 Luminaire
- Existing Overhead Sign Structure Load Center
- Existing Luminaire
- Existing Light Standard Luminaire
- Existing Federal Mailbox
- Existing Private Mailbox
- Existing Meander Section Corner
- Existing Meter
- Existing Electrical Manhole
- Existing Gas Manhole
- Existing Sanitary Manhole
- Existing Sanitary Force Main Manhole
- Existing Sanitary Manhole with Valve
- Existing Storm Drain Manhole
- Existing Force Main Storm Drain Manhole
- Existing Force Main Storm Drain Manhole with Valve
- Existing Telephone Manhole
- Existing Manhole with Valve Water
- Existing Water Manhole
- Existing Mile Post Type A
- Existing Mile Post Type B
- Existing Mile Post Type C
- Existing Reference Marker
- Existing RW Marker
- Existing Utility Marker
- Iron Monument Found
- Iron Pin R/W Monument
- Existing Object Marker Type I
- Existing Object Marker Type II
- Existing Object Marker Type III
- Existing Electrical Pedestal
- Existing Telephone Pedestal
- Existing Fiber Optic Telephone Pedestal
- Existing TV Pedestal
- Existing Fiber Optic TV Pedestal
- Existing Fuel Filler Pipes
- Existing Traverse PI Aerial Panel
- Existing Pole
- Existing Power Pole
- Existing Power Pole with Transformer
- Existing Telephone Pole
- Existing Wood Pole
- Existing Post
- Existing Pedestrian Push Button Post
- Existing Control Point CP
- Existing Control Point GPS-RTK
- Existing Control Point TRI
- Existing Reference Marker Point NGS
- Existing Pull Box
- Existing Intelligent Transportation Pull Box
- Existing Water Pump
- Existing Slotted Reinforced Concrete Pipe
- Existing RR Profile Spot
- Existing Fuel Leak Sensors
- Existing Highway Sign
- Existing Miscellaneous Spot
- Existing Lighting Standard Pole
- Existing Traffic Signal Standard
- Existing Transformer
- Existing Large Evergreen Tree
- Existing Small Evergreen Tree
- Existing Large Tree
- Existing Small Tree
- Existing Tree Trunk
- Existing Pad Mounted Traffic Signal Control Box
- Existing Undefined Manhole
- Existing Undefined Pull Box
- Existing Undefined Pedestal
- Existing Undefined Valve
- Existing Undefined Pipe Vent
- Existing Gas Valve
- Existing Water Valve
- Existing Fuel Pipe Vent
- Existing Gas Pipe Vent
- Existing Sanitary Pipe Vent
- Existing Storm Drain Pipe Vent
- Existing Water Pipe Vent
- Existing Weather Station
- Existing Ground Water Well Bore Hole
- Existing Windmill or Tower
- Existing Witness Corner
- Flashing Beacon
- Flagger
- Pipe Mounted Flasher
- Sanitary Force Main with Valve

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Symbols

D-101-32

- Pad Mounted Feed Point
- Pipe Mounted Feed Point with Pad
- Pole Mounted Feed Point
- Headwall
- Double Headwall with Vegitation Barrier
- Single Headwall with Vegitation Barrier
- Pole Mounted Head
- Sprinkler Head
- Fire Hydrant
- Inlet Type 1
- Inlet Type 2
- Double Inlet Type 2
- Inlet Grate Type 2
- Junction Box
- High Mast Light Standard 10 Luminaire
- High Mast Light Standard 3 Luminaire
- High Mast Light Standard 4 Luminaire
- High Mast Light Standard 5 Luminaire
- High Mast Light Standard 6 Luminaire
- High Mast Light Standard 7 Luminaire
- High Mast Light Standard 8 Luminaire
- High Mast Light Standard 9 Luminaire
- Relocate Light Standard
- Overhead Sign Structure Load Center
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 175 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Manhole
- Manhole 48 Inch
- Sanitary Force Main Manhole
- Sanitary Sewer Manhole
- Storm Drain Manhole
- Storm Drain Manhole with Inlet
- Reset Mile Post
- Mile Post Type A
- Mile Post Type B
- Mile Post Type C
- Right of Way Marker
- Tubular Marker
- Alignment Monument
- Iron Pin Reference Monument
- Object Marker Type I
- Object Marker Type II
- Object Marker Type III
- Caution Mode Arrow Panel
- Back to Back Vertical Panel Sign
- Double Direction Arrow Panel
- Left Directional Arrow Panel
- Right Directional Arrow Panel
- Sequencing Arrow Panel
- Truck Mounted Arrow Panel
- Power Pole
- Wood Pole
- Pedestrian Push Button Post
- Property Corner
- Pull Box
- Intelligent Transportation Pull Box
- Sanitary Pump
- Storm Drain Pump
- Reinforced Pavement
- Reinforced Concrete End Section 15 Inch
- Reinforced Concrete End Section 18 Inch
- Reinforced Concrete End Section 24 Inch
- Reinforced Concrete End Section 30 Inch
- Reinforced Concrete End Section 36 Inch
- Reinforced Concrete End Section 42 Inch
- Reinforced Concrete End Section 48 Inch
- Reinforced Concrete End Section 54 Inch
- Reset Right of Way Marker
- Reset USGS Marker
- Right of Way Markers
- Riser 30 Inch
- Continuous Split Barrel Sample (CSB)
- Flight Auger Sample (FA)
- Split Barrel Sample (SB)
- Thinwall Tube Sample
- Highway Sign
- SNOW GATE 18 FT
- SNOW GATE 28 FT
- SNOW GATE 40 FT
- Standard Penetration Test (N)
- Transformer
- Inclinometer Tube (Incl)
- Underdrain Cleanout
- Excavation Unit
- Water Valve

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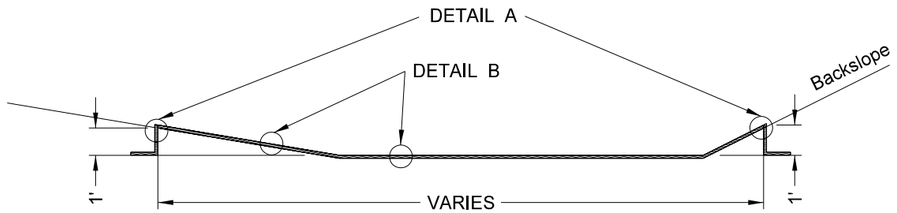
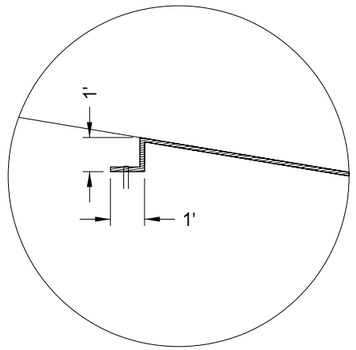
D-255-2

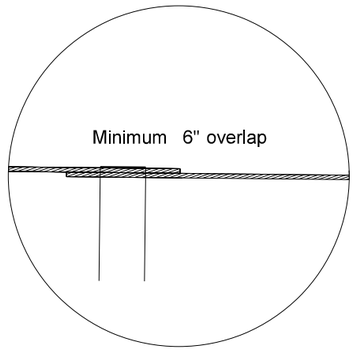
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



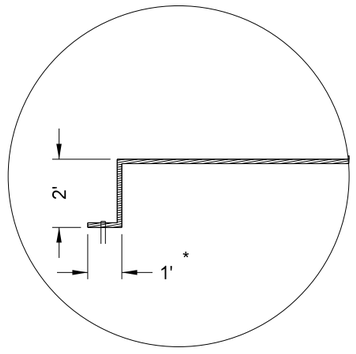
CROSS SECTION



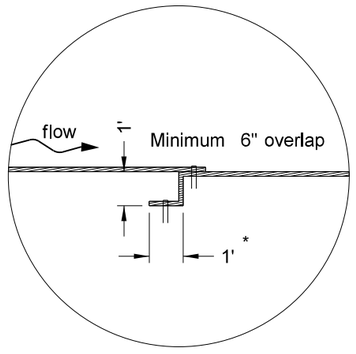
DETAIL A



DETAIL B



DETAIL C

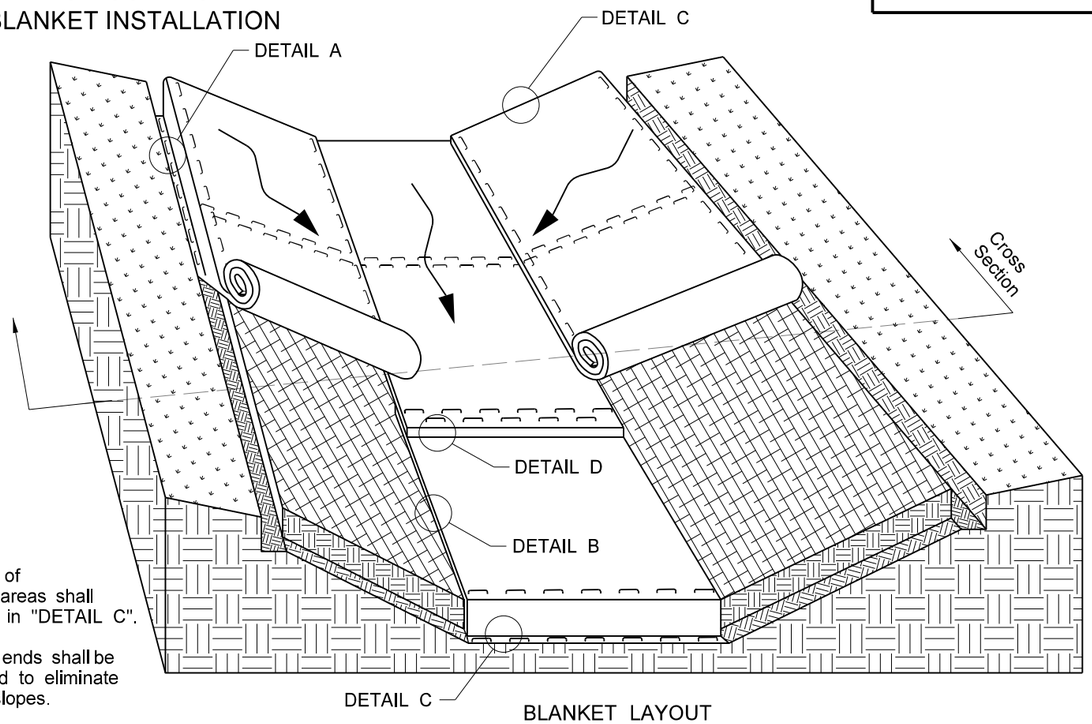


DETAIL D

* This tie may be placed ahead or back.

DETAILS

CHANNEL OR SLOPE INSTALLATION

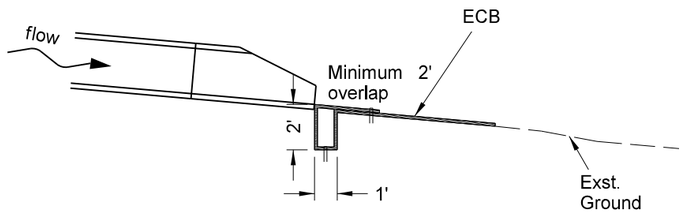


BLANKET LAYOUT

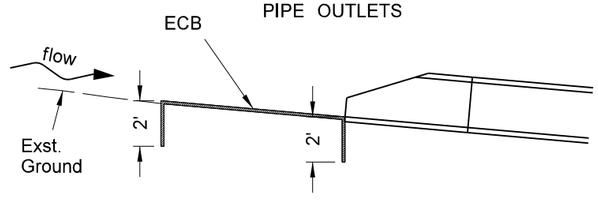
Notes:
Beginning and ending of erosion control blanket areas shall be installed as shown in "DETAIL C".

Erosion control blanket ends shall be entrenched and stapled to eliminate undermining on side slopes.

CHANNEL OR SLOPE INSTALLATION



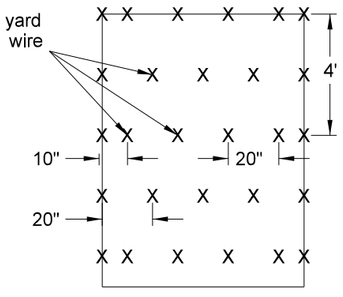
PIPE OUTLETS



PIPE INLETS

INSTALLATION AT PIPE ENDS

3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



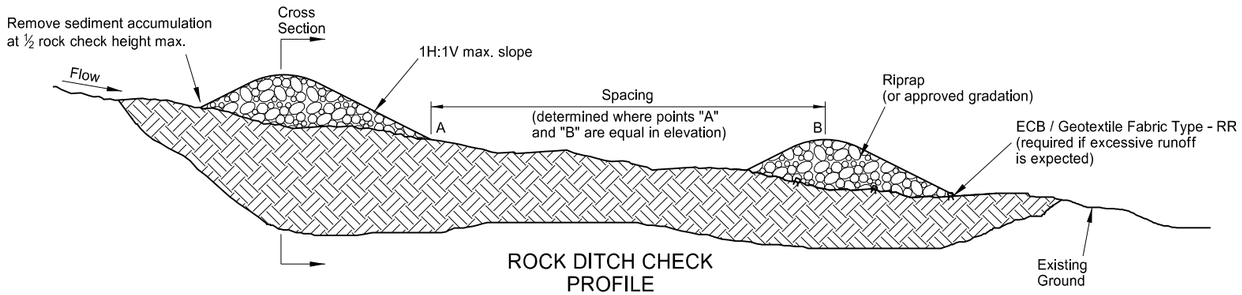
STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-5 to D-255-2.

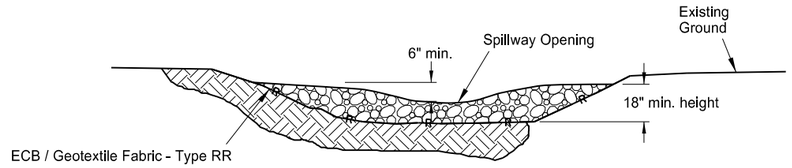
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 06/26/14 and the original document is stored at the North Dakota Department of Transportation

EROSION AND SILTATION CONTROLS

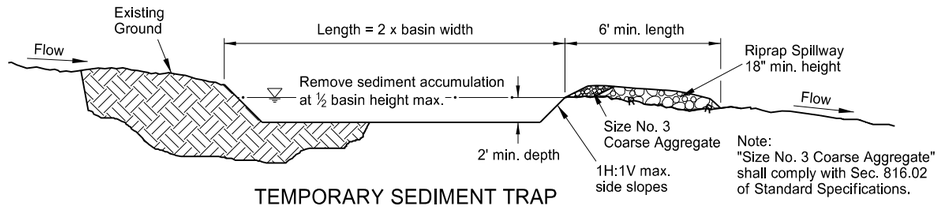
D-256-1



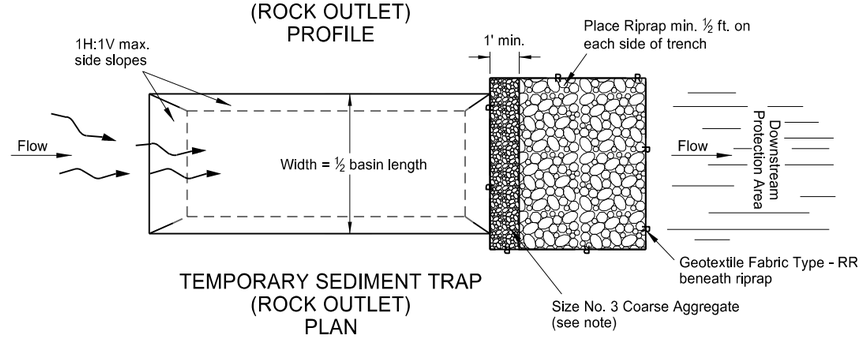
ROCK DITCH CHECK
PROFILE



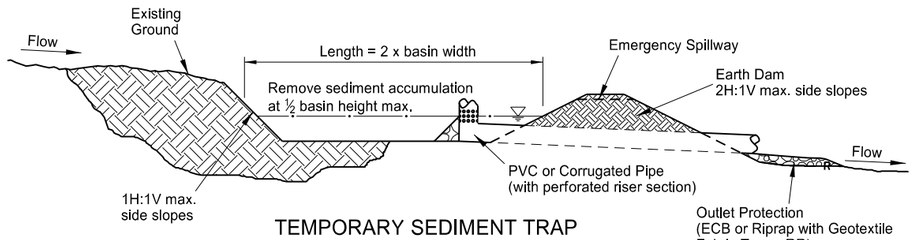
ROCK DITCH CHECK
CROSS SECTION



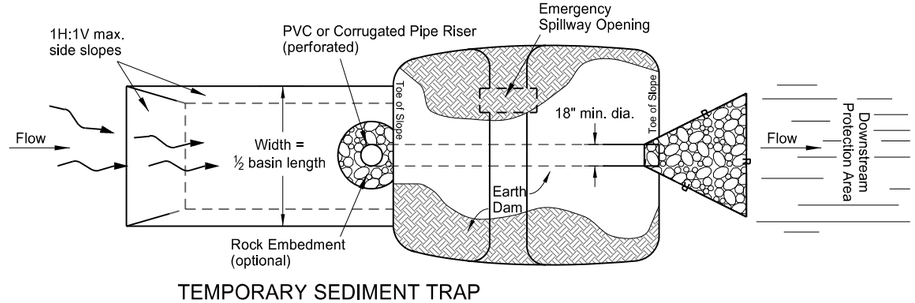
TEMPORARY SEDIMENT TRAP
(ROCK OUTLET)
PROFILE



TEMPORARY SEDIMENT TRAP
(ROCK OUTLET)
PLAN



TEMPORARY SEDIMENT TRAP
(RISER PIPE OUTLET)
PROFILE



TEMPORARY SEDIMENT TRAP
(RISER PIPE OUTLET)
PLAN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-2 to D-256-1. Deleted silt fence details.

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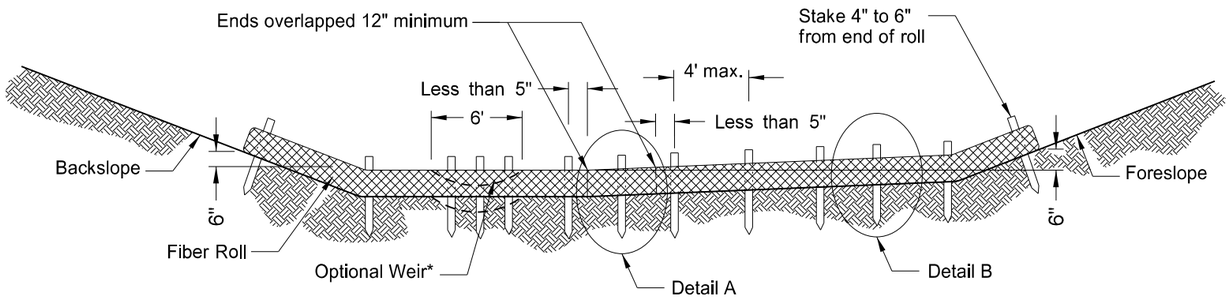
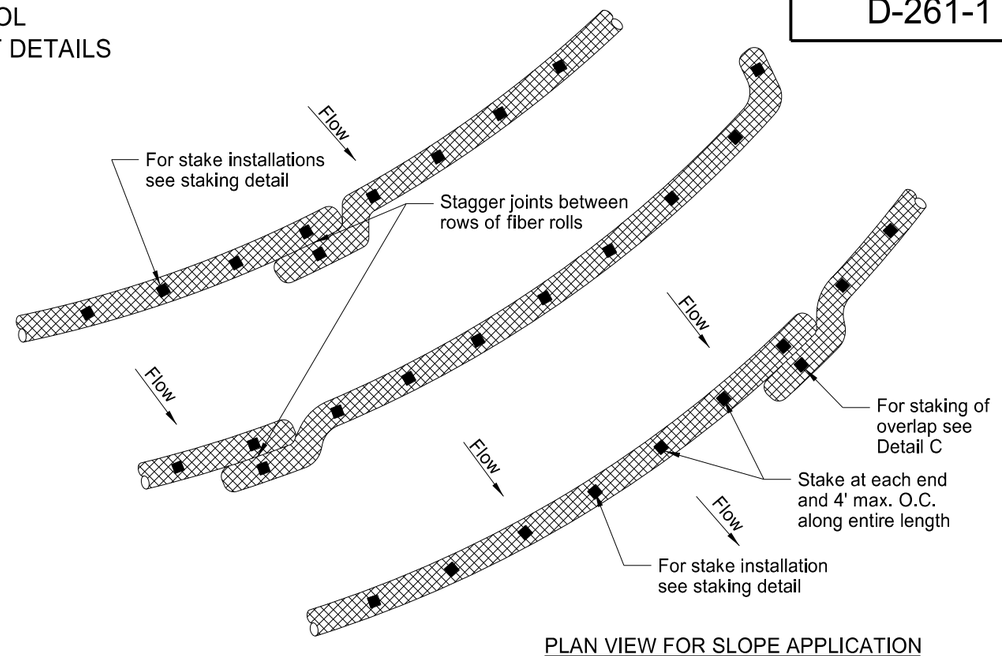
D-261-1

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

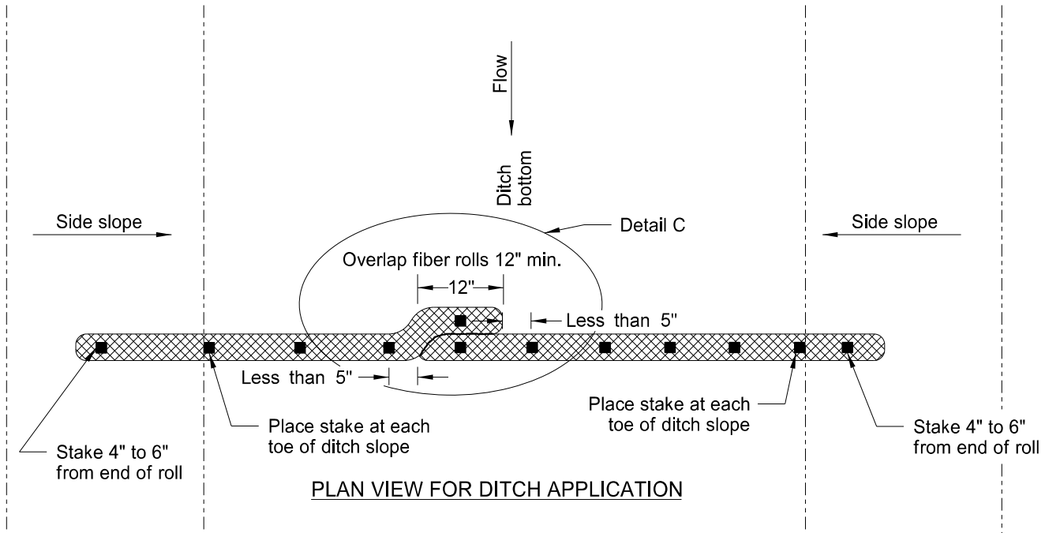


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up on adjacent property.

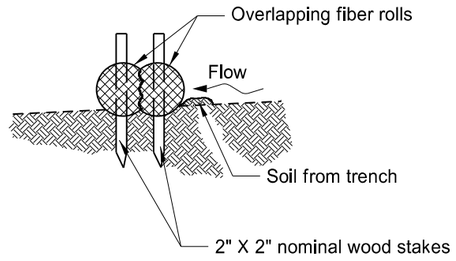
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

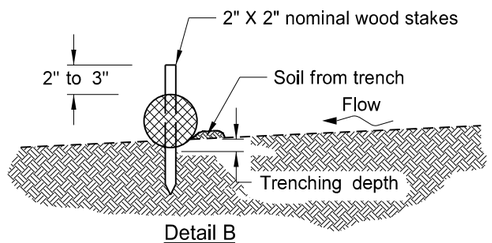


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

NOTE: Runoff must not be allowed to run under or around roll.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1

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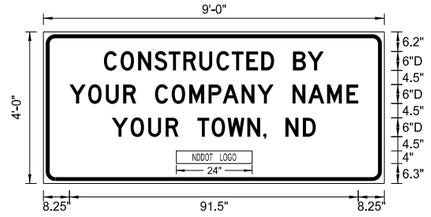
CONSTRUCTION SIGN DETAIL

D-704-5

SIGN NUMBER	G20-10-108
WIDTH x HEIGHT	9'-0" x 4'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-Refl
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE
	42.1	6.2	24	4	0

STATION(S): AREA: 36.0 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITION (X)																			LENGTH	SIZE	SERIES
C	O	N	S	T	R	U	C	T	E	D		B	Y						69.7	6	D 2000
19.2	24.5	30	35.1	39.7	44.3	49.4	54.8	59.7	64.3	69	73.1	79.1	83.7								
Y	O	U	R		C	O	M	P	A	N	Y		N	A	M	E			91.5	6	D 2000
8.3	14.2	19.8	25.3	29.4	35.4	40.7	46.2	52.4	56.8	62.8	67.8	72.9	78.9	83.9	89.9	96					
Y	O	U	R		T	O	W	N	,		N	D							64.6	6	D 2000
21.7	27.6	33.2	38.7	42.8	48.8	53.3	58.4	64.6	69.6	70.7	76.7	82.2									

Notes:

1. Sign shall be placed a distance of ½A following the End Road Work (G20-2a-48) sign. There shall be a maximum of 2 signs per project.
2. Sign shall be post mounted.
3. Sign required on rural projects with a 30 day or longer duration and it is not required on seal coat projects or other short duration projects.
4. Sign shall not be placed in urban areas or within city limits.

Advance Warning Sign Spacing (A)			
Road Type	Distance between signs min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revise sheeting to type IV

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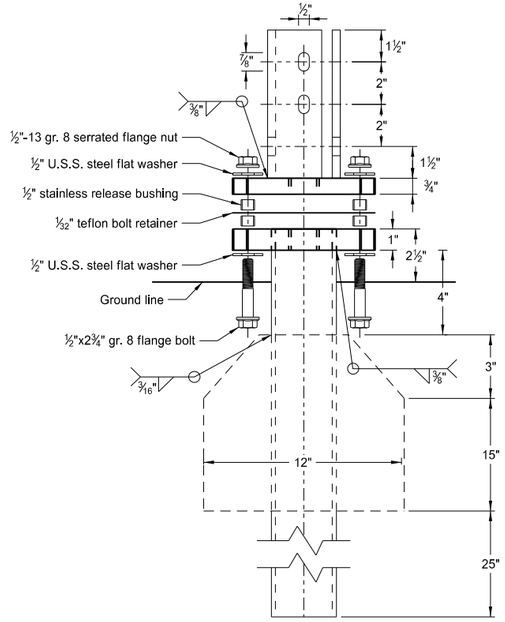
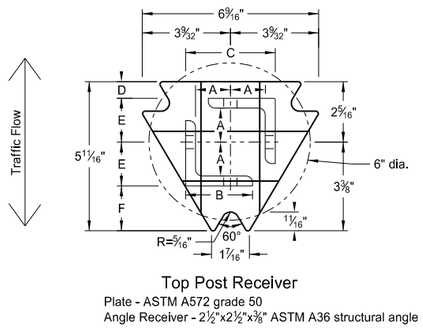
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

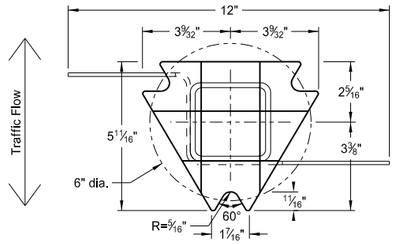


Multi-Directional
Slip Base Assembly

Perforated Tube



Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

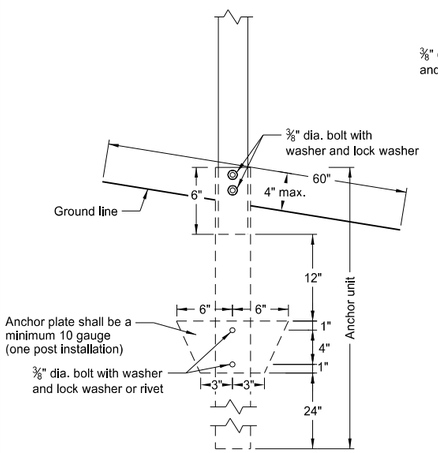
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2³⁄₁₆	10	Yes	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia $in.^4$	Cross Sec. Area $in.^2$	Section Modulus $in.^3$
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³⁄₁₆ x 2³⁄₁₆	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

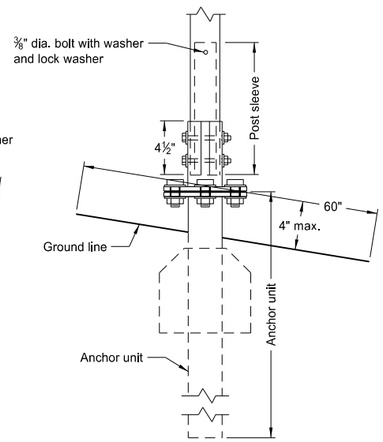
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2³⁄₁₆"x10 ga.	1⁹⁄₆₄"	2½"	3¹⁄₃₂"	25⁄₃₂"	1³³⁄₆₄"	1⅞"
2½"x10 ga.	1⁹⁄₃₂"	2½"	3⁵⁄₁₆"	⅝"	1²¹⁄₃₂"	1¾"

(A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.

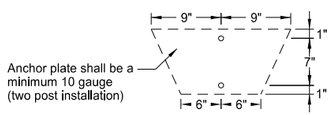
(B) The 2³⁄₁₆"x10 ga. may be inserted into 2½"x10 ga. for additional wind load.

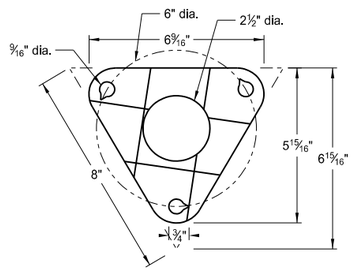


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





Bolt Retainer for Base Connection
Bolt Retainer- ¹⁄₃₂" Reprocessed Teflon

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

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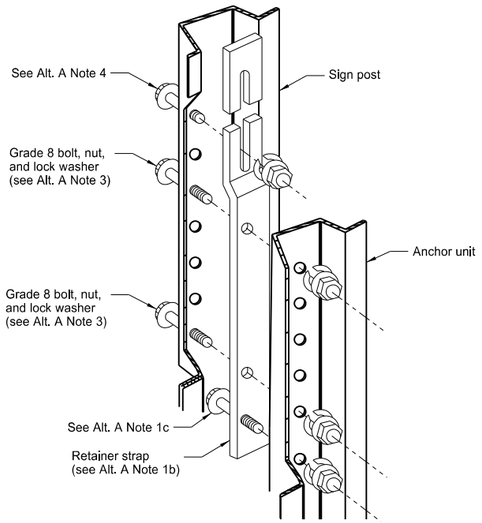
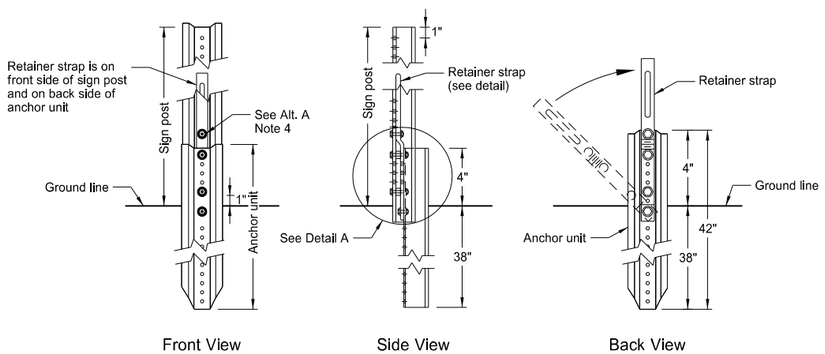
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post



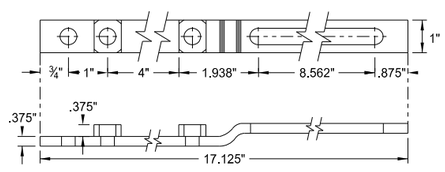
Detail A



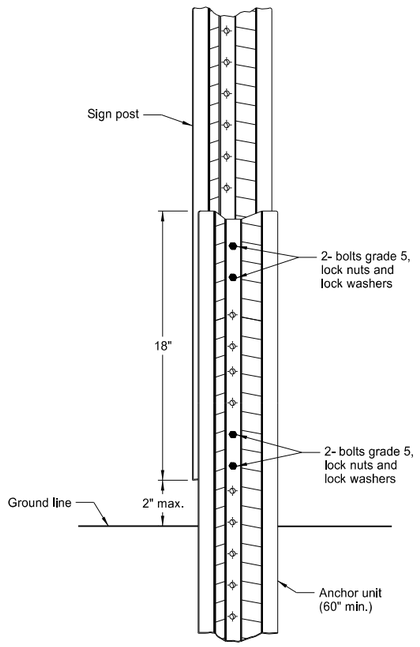
Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

A maximum of 2 posts shall be installed within 7'.

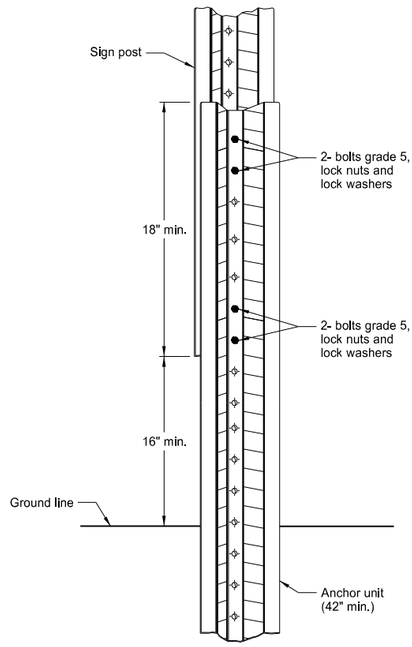


Retainer Strap Detail



Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

A maximum of 3 posts shall be installed within 7'.



Breakaway U-Channel Splice Detail
Alternate C
(2.5 and 3 lb/ft)

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
   c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
   d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
   b) Rotate strap to vertical position.
3. a) Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
   b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. The base post, strap and sign post shall be properly nested. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post at the bolts have full contact across the entire width.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

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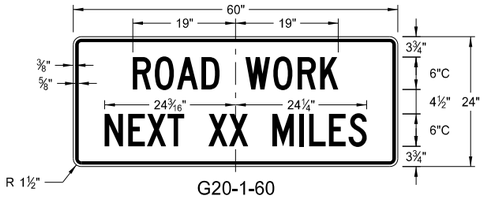
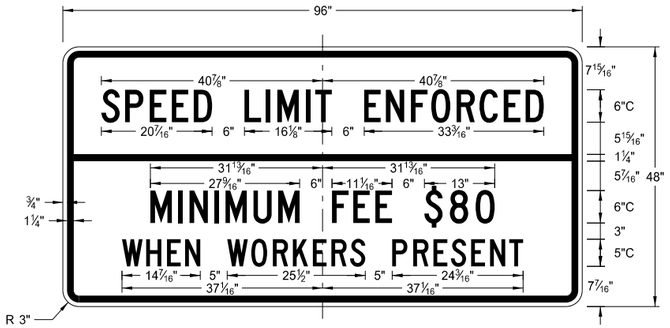
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

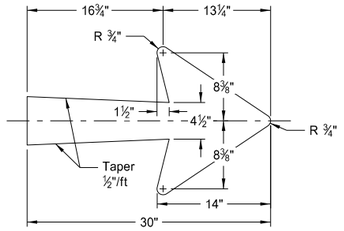


G20-1-60
Legend: black (non-refl)
Background: orange

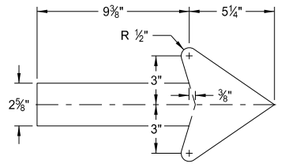
G20-4b-36
Legend: black (non-refl)
Background; orange



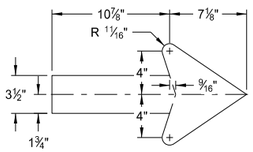
G20-55-96
Legend: black (non-refl)
Background: orange



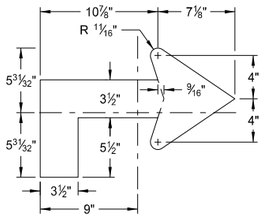
E5-1-48



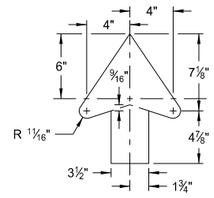
G20-50a-72
G20-52a-72



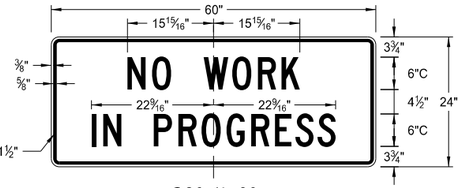
M4-9(L or R)-30
Right or Left



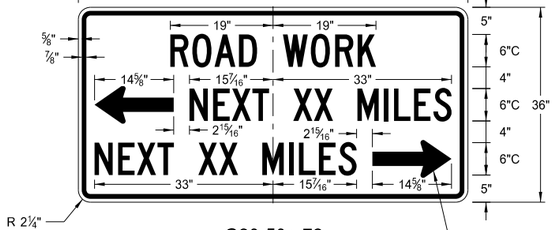
M4-9(L or R)-30
Advanced Right or Left



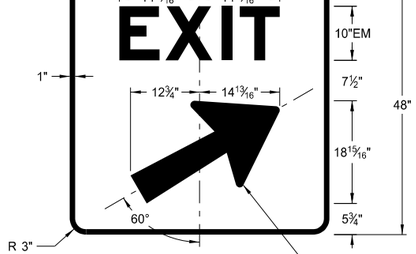
M4-9-30
Straight



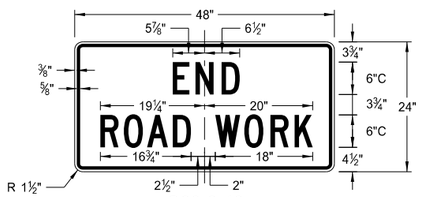
G20-1b-60
Legend: black (non-refl)
Background: orange



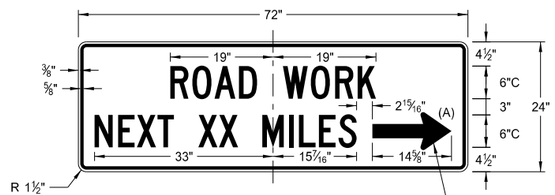
G20-50a-72
Legend: black (non-refl)
Background: orange



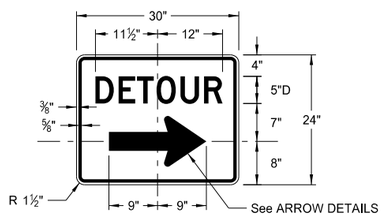
E5-1(L or R)-48
Legend: white
Background: green



G20-2-48
Legend: black (non-refl)
Background: orange



G20-52a-72
Legend: black (non-refl)
Background: orange



M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange

ARROW DETAILS

NOTES:

(A) Arrow may be right or left of the legend to indicate construction to the right or left.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

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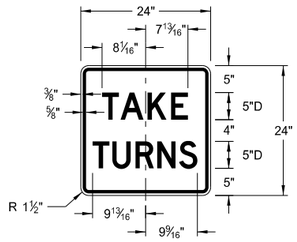
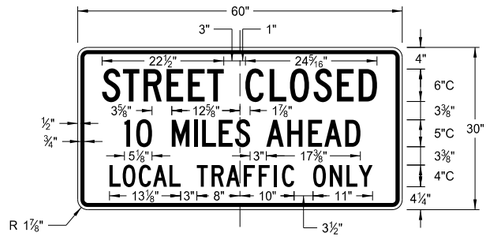
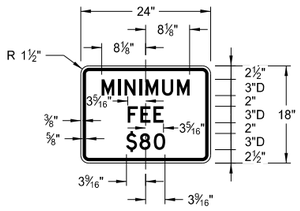
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



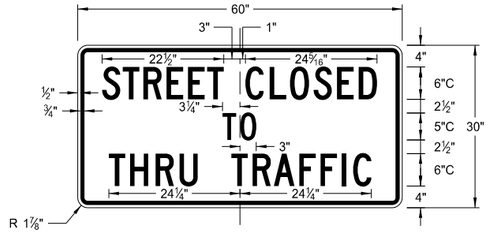
R1-50-24
Legend: black (non-refl)
Background: white



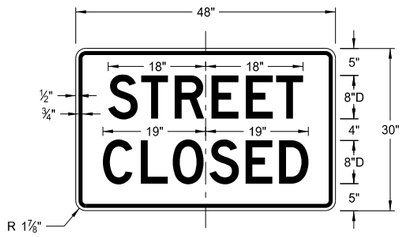
R11-3c-60
Legend: black (non-refl)
Background: white



R2-1a-24
Legend: black (non-refl)
Background: white



R11-4a-60
Legend: black (non-refl)
Background: white



R11-2a-48
Legend: black (non-refl)
Background: white

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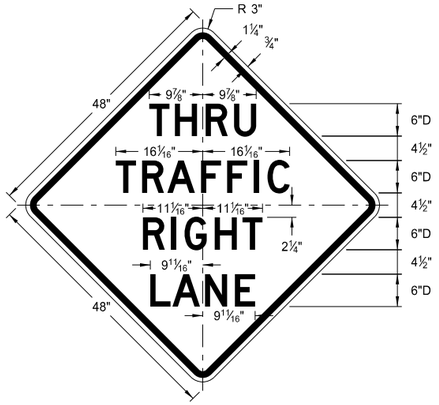
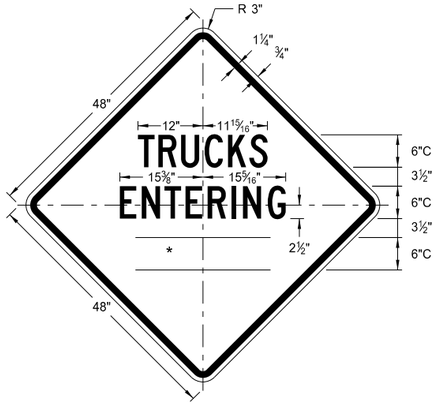
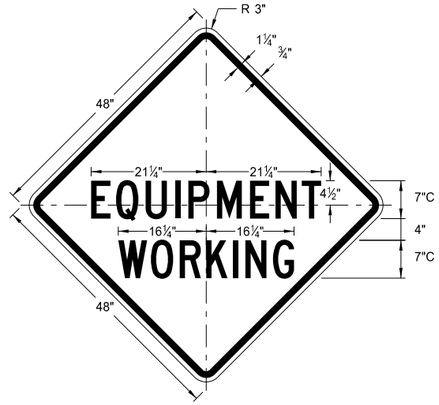
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



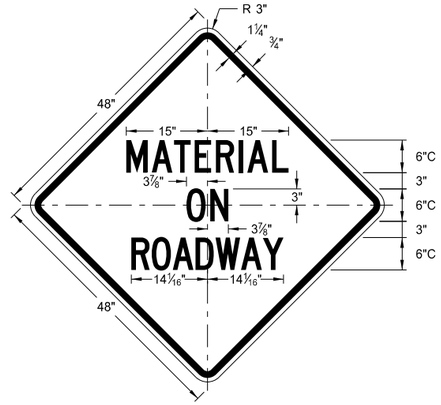
W5-8-48
Legend: black (non-refl)
Background: orange



W8-54-48
Legend: black (non-refl)
Background: orange



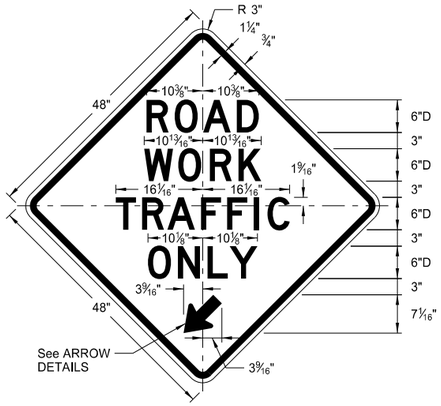
W20-51-48
Legend: black (non-refl)
Background: orange



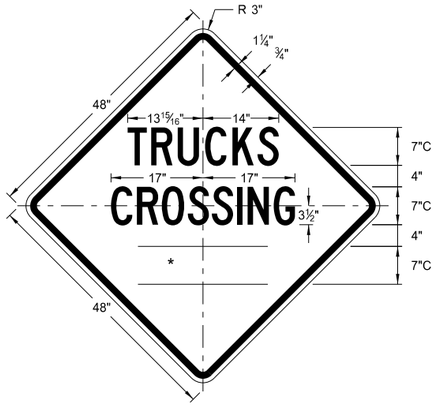
W21-51-48
Legend: black (non-refl)
Background: orange

WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES

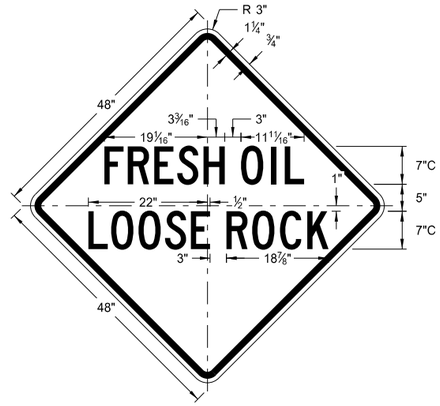


W5-9-48
Legend: black (non-refl)
Background: orange

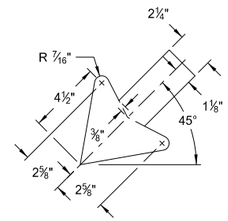


W8-55-48
Legend: black (non-refl)
Background: orange

W20-52-54
Legend: black (non-refl)
Background: orange

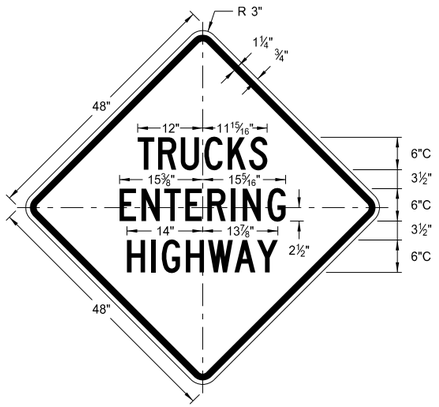


W22-8-48
Legend: black (non-refl)
Background: orange

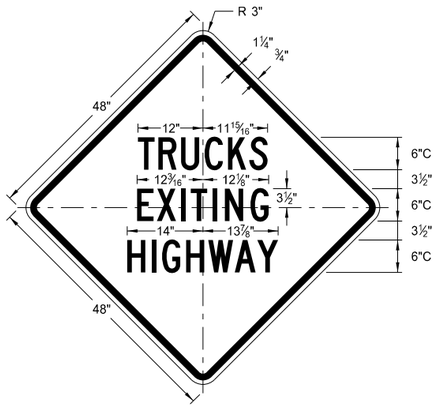


W5-9-48

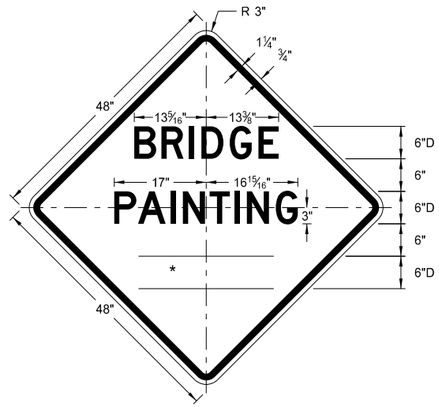
ARROW DETAILS



W8-53-48
Legend: black (non-refl)
Background: orange



W8-56-48
Legend: black (non-refl)
Background: orange



W21-50-48
Legend: black (non-refl)
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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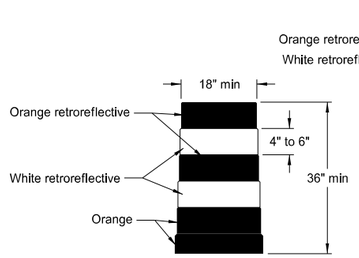
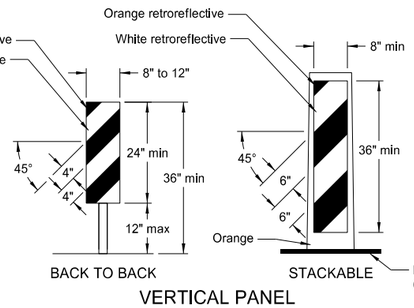
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



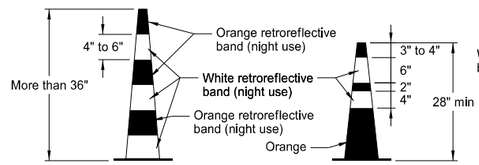
DELINEATOR DRUM

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.



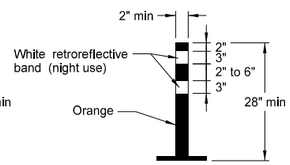
VERTICAL PANEL

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.



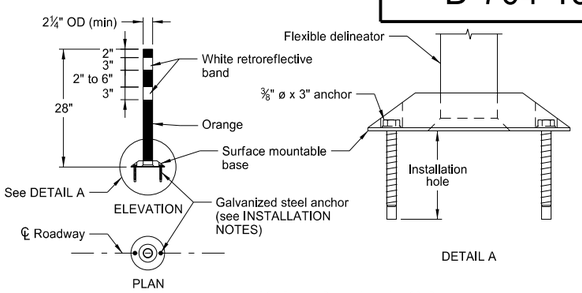
TRAFFIC CONE

Retroreflectorization of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized space between the orange and white stripes shall not exceed 3" wide.



TUBULAR MARKER

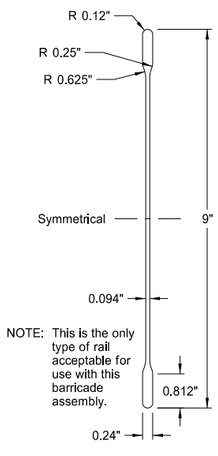
Retroreflectorization of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



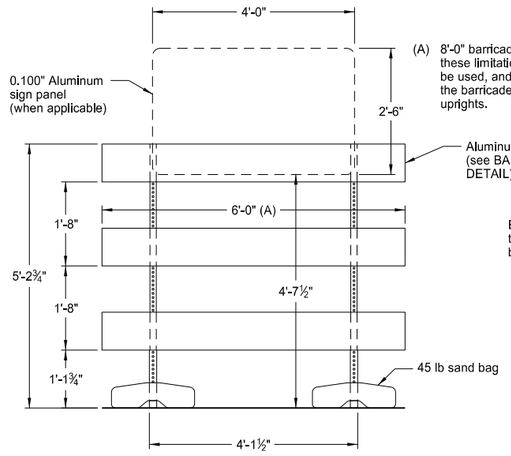
FLEXIBLE DELINEATOR

INSTALLATION NOTES:

1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl. Butyl shall be removed as close as possible to pavement surface.

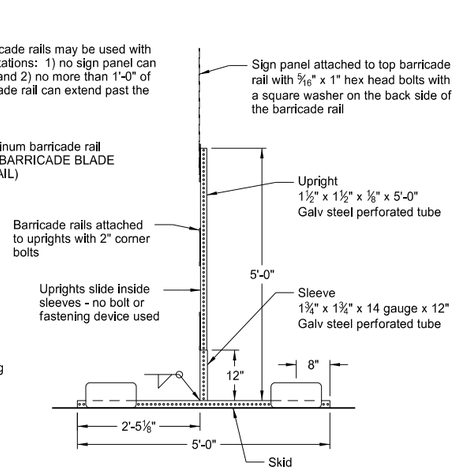


BARRICADE BLADE DETAIL



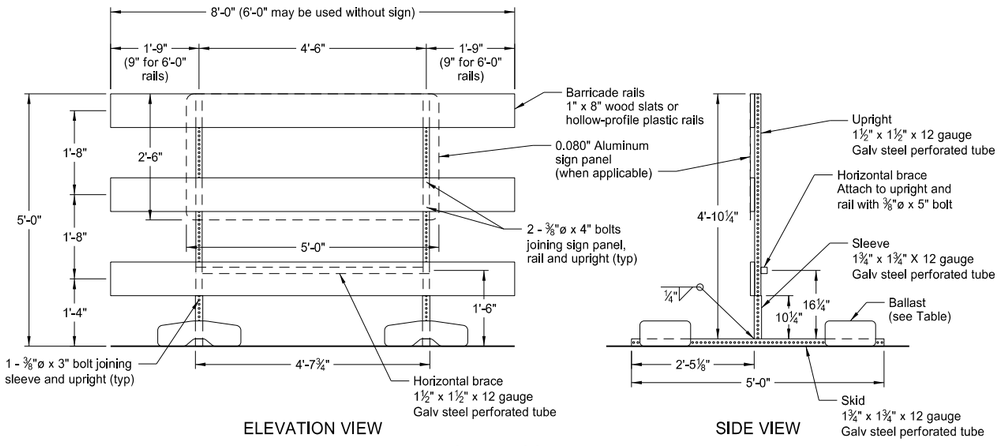
ELEVATION VIEW

(A) 8'-0" barricade rails may be used with these limitations: 1) no sign panel can be used, and 2) no more than 1'-0" of the barricade rail can extend past the uprights.



SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

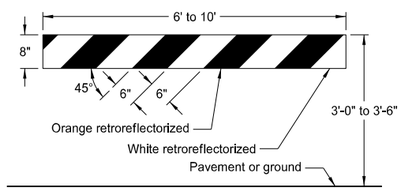


ELEVATION VIEW

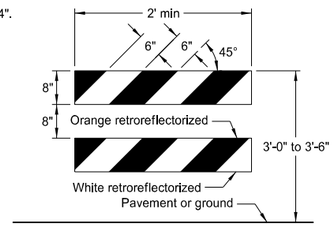
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

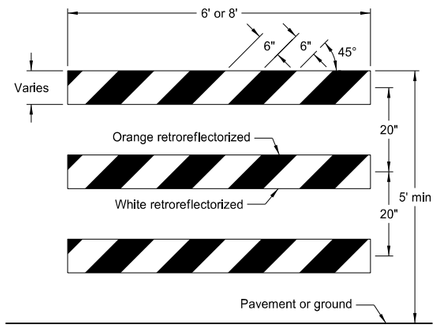
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".



TYPE I BARRICADE

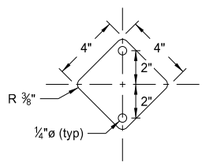


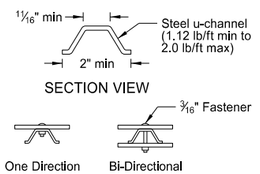
TYPE II BARRICADE

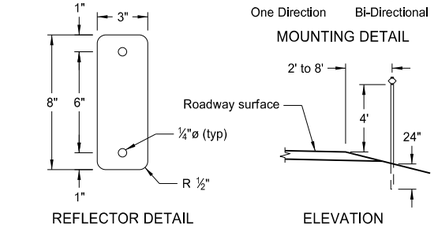


TYPE III BARRICADE

BARRICADE RAIL DETAILS







DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

Without Sign	4 - 25 lb sandbags
With Sign	6 - 25 lb sandbags

Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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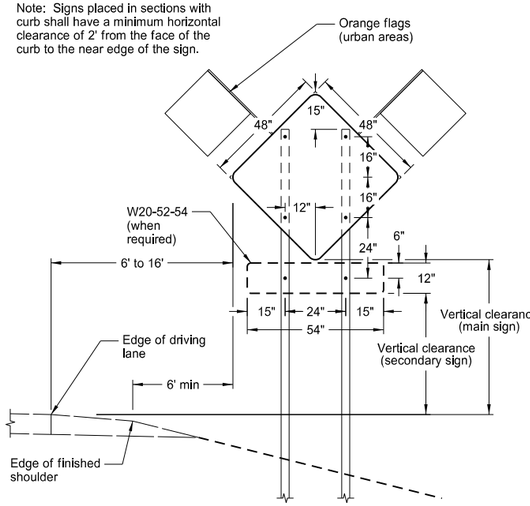
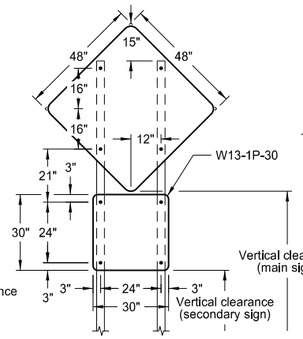
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

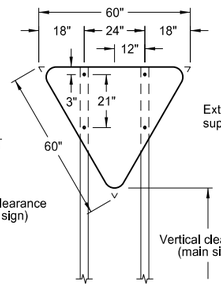
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



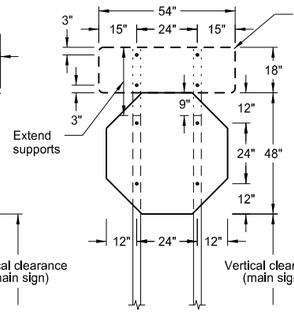
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



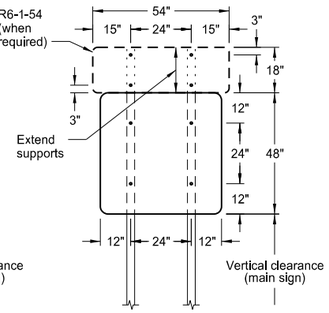
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



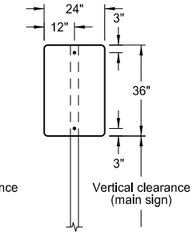
R1-2-60 - YIELD SIGN



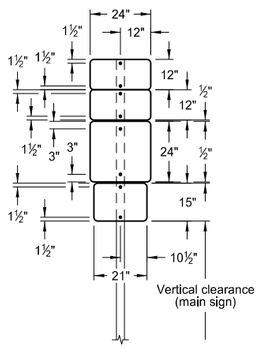
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



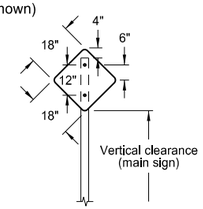
48" x 48" SIGN
(with R6-1-54 sign as required)



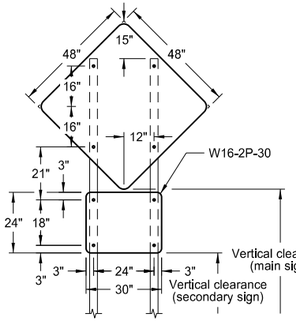
24" x 36" SIGN



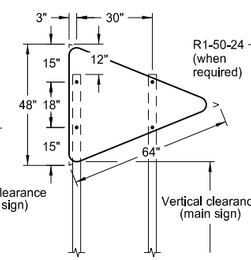
24" x 24"
ROUTE MARKER
ASSEMBLY



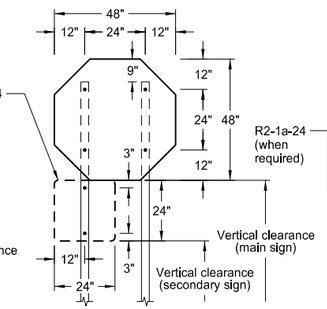
18" x 18"
DIAMOND SIGN



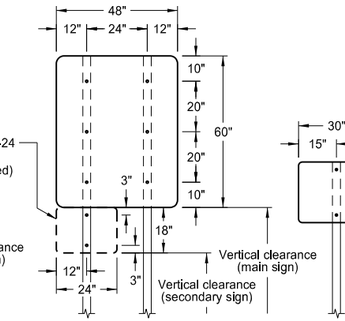
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



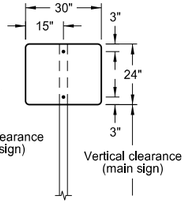
W14-3-64 - PENNANT SIGN



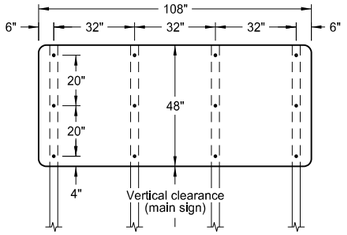
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



48" x 48" SIGN
(with R2-1a-24 sign as required)



30" x 24" SIGN



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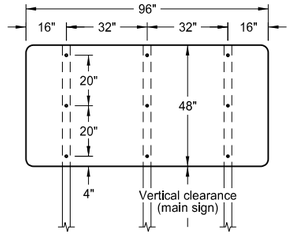

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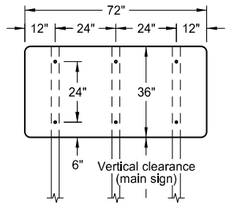
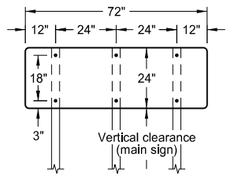


72" x 36" SIGN



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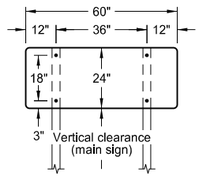
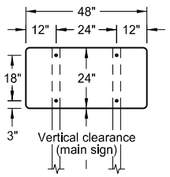


60" x 24" SIGN



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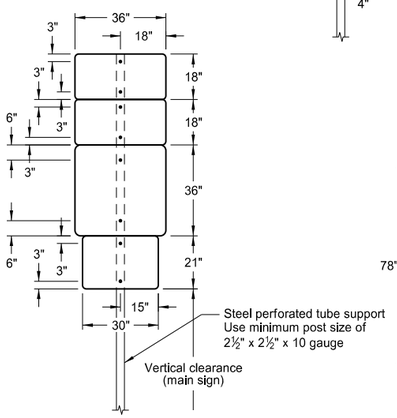
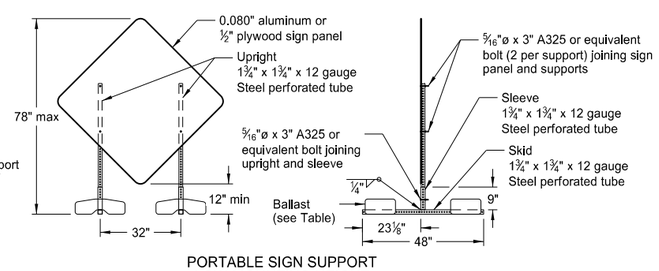
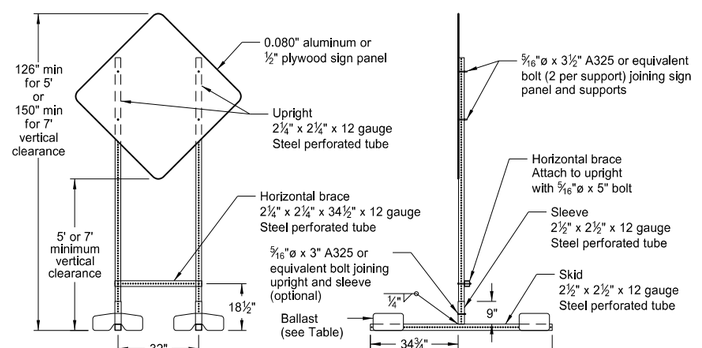


36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Supports shall be galvanized or painted. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.

   Signs over 50 square feet should be installed on 2½" x 2½" perforated tube supports as a minimum.

   Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. All holes to be punched round for ⅜" bolts.

3. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a lane closure sign)

4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

   Interstate - white legend on blue background
   Interstate Business Loop - white legend on green background
   US and State - black legend on white background
   County - yellow legend on blue background

5. Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

   The vertical clearance to secondary signs is 1'-0" less than the vertical clearance as stated above.

   Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.

6. Portable Signs: Provide portable signs that meet the vertical clearance as stated above. Use portable signs when it is necessary to place signs within the pavement surface.

   When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used as long as the view of the sign is not obstructed. Time delays caused by unforseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. The R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.

   Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6.

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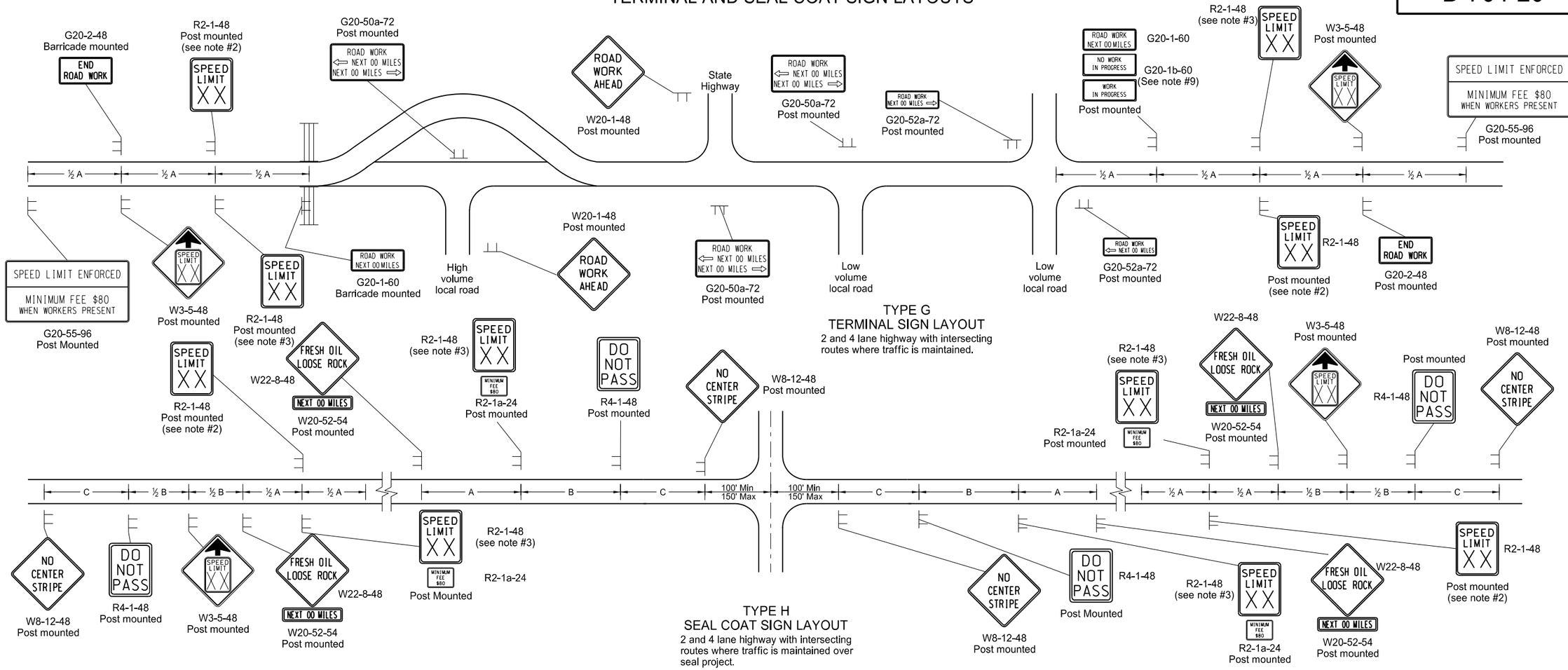
TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
2. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 MPH below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. On seal projects, signs R2-1-48, R2-1a-24, R4-1-48, W22-8-48 and W20-52-54 shall be placed just after all important intersections and at five mile intervals thereafter. Sign W8-12-48 shall be placed just after all important intersections and at 2 mile intervals thereafter until the short term center line pavement marking is in place. No short term pavement markings are placed when traffic volumes are 750 ADT or less.
7. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
8. Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
9. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
10. Other traffic control layouts will be required in the immediate work areas. If the speed limit is reduced in the work area, speed limit signs shall have the R2-1a-24 sign placed below.
11. G20-55-96 sign is not required if work is less than 15 days.

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

KEY

Type III barricade

Sign

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

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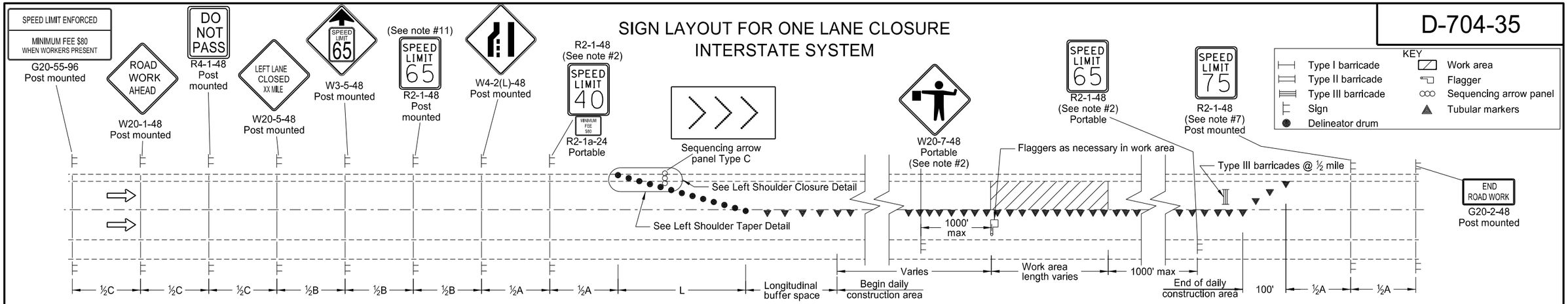
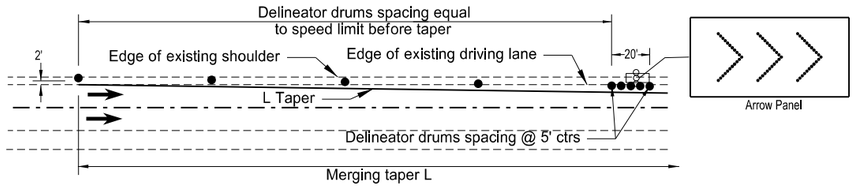
SIGN LAYOUT FOR ONE LANE CLOSURE INTERSTATE SYSTEM





LEFT SHOULDER TAPER DETAIL

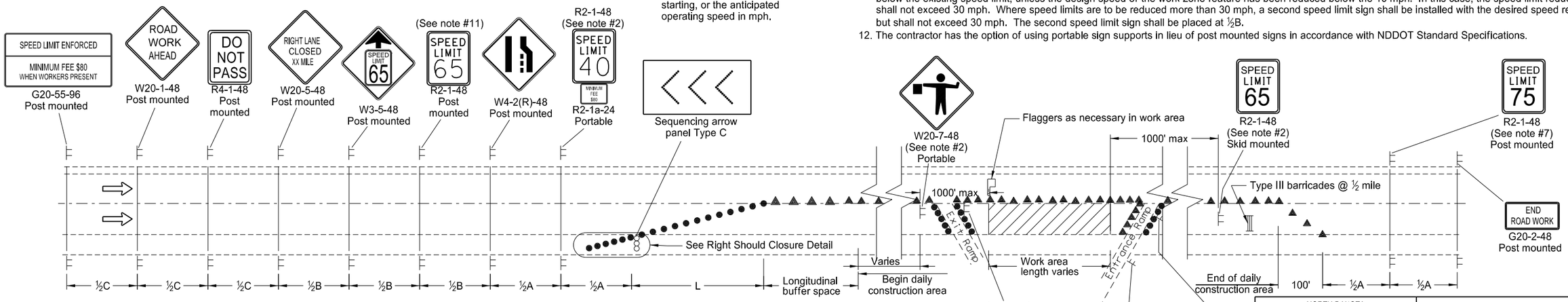
LEFT LANE CLOSED
WORKERS IN WORK AREA

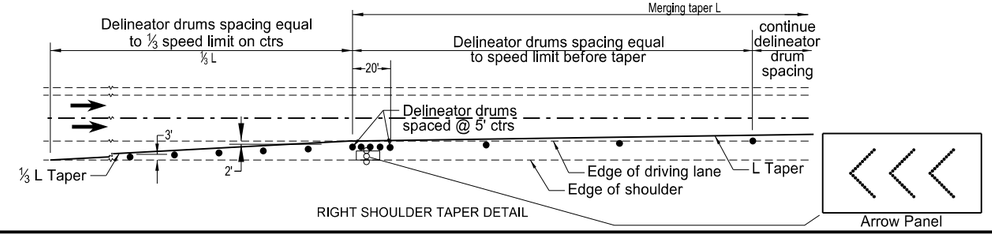
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

Longitudinal Buffer Space	
Speed (mph)*	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

*Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

Notes:
1. Advance signs for flagging shall be installed when flaggers are flagging.
2. The advanced flagger sign and the speed limit signs shall be moved as the work area moves through the construction zone. When the work area is not visible from the flagger, the flagger station shall be placed so the work area is visible. The 65 mph speed limit and the 40 mph speed limit sign shall be spaced at ½A in advance of the flagger sign. The 65 mph speed limit sign shall also be moved. Upon completion of the work day or when workers are not present, the 65 mph speed limit, 40 mph speed limit, and the Minimum Fee $80 signs shall be covered or removed.
3. RAMPS: When the work area encompasses an entrance ramp, the ramp shall be controlled by installing a 40 mph speed limit sign and covering any existing yield sign. Install new yield sign as necessary. When the main line 40 mph speed zone is moved past the ramp, the ramp speed limit sign shall be removed.
4. Variables:
   S=Numerical value of speed limit or 85th percentile
   W=The width of taper.
   L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater,
   or WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
5. Delineator drums, used for tapering traffic shall be spaced at the dimension "S". Tubular markers used for tangents shall be spaced at 2 times dimension "S".
6. Sequencing arrow panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
7. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
8. Existing speed limit signs within a reduced speed zone shall be covered.
9. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
10. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
11. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 mph. Where speed limits are to be reduced more than 30 mph, a second speed limit sign shall be installed with the desired speed reduction, but shall not exceed 30 mph. The second speed limit sign shall be placed at ½B.
12. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.





RIGHT SHOULDER TAPER DETAIL

RIGHT LANE CLOSED
WORKERS IN WORK AREA

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-7-2012	
REVISIONS	
DATE	CHANGE
6/23/2014	Revised Note 12

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