

20

PU-13-840
Exhibit 2

Filed: 5/9/2014

Pages: 9

Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc.

PRELIMINARY
SUBJECT TO
FINAL REVIEW
03/26/2014



REVISIONS					APPROVALS		DATE	DESIGN DATA
I	V11: OPTIMIZED; REVISED 21 & 39	DJF	DJF	DJF			03/26/14	CONDUCTOR: (2X) 477 KCMIL 267 TP HAWK ACSR DESIGN TENSION: 15% @ 0 F, FINAL SHIELD WIRE: 2-3/8" 7 STRAND EHS STEEL DESIGN TENSION: 75% SAG MATCH @ 60 F CREEP MIN. GROUND CLEARANCE: 30 FT CONDUCTOR SHOWN: 212 F, MAX SAG COORDINATE SYSTEM: UTM ZONE 14N, US FT
H	V10: PLS ADD & SPOTTING REV	DJF	DJF	DJF			03/25/14	
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	DJF			03/18/14	
F	FOR REVIEW, STR 1-7 REVISED	JRC	JRC	SMH			10/04/13	
E	FOR SD REVIEW / NO ND REVISIONS	JRC	JRC	SMH			09/24/13	
REV	DESCRIPTION	DMN	DGN	CHK	DATE	APPROVED BY:		

DATE	DESIGN DATA
10/04/13	DRAWN BY: JRC
10/04/13	DESIGN BY: JRC
10/04/13	CHECKED BY: SMH
	APPROVED BY:

BSS-E
Big Stone South to Ellendale

BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE

200.0 FT. HORIZ. SCALE

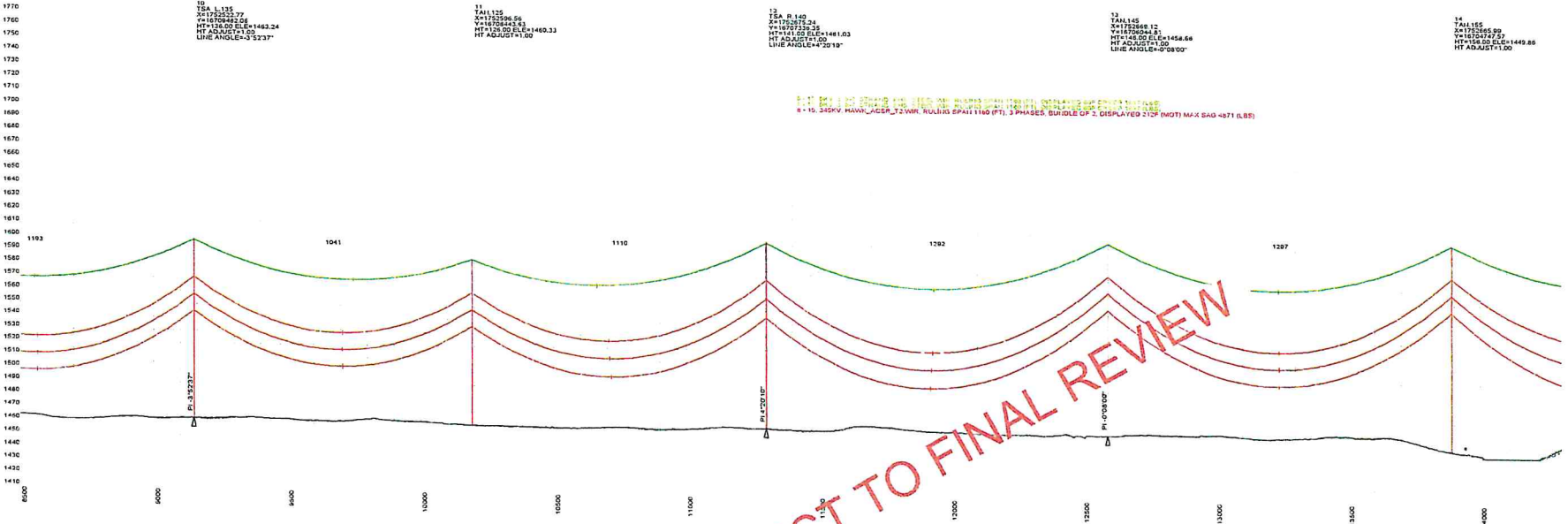
40.0 FT. VERT. SCALE

← NORTH

DWG. NO.
P1-1
REVISION: I
127156

EXHIBIT

2



PRELIMINARY SUBJECT TO FINAL REVIEW

PRELIMINARY
SUBJECT TO
FINAL REVIEW
03/26/2014



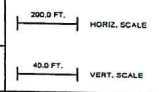
REVISIONS			
REV	DESCRIPTION	OWN	CHK
I	V11: OPTIMIZED; REVISED 21 & 39	DJF	DJF
H	V10: PLS ADDED & SPOTTING REV	DJF	DJF
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH
F	FOR REVIEW, STR 1-7 REVISED	JRC	JRC
E	FOR SD REVIEW/NO NO REVISIONS	JRC	SMH

APPROVALS		DATE
DRAWN BY:	JRC	10/04/13
DESIGN BY:	JRC	10/04/13
CHECKED BY:	SMH	10/04/13
APPROVED BY:		

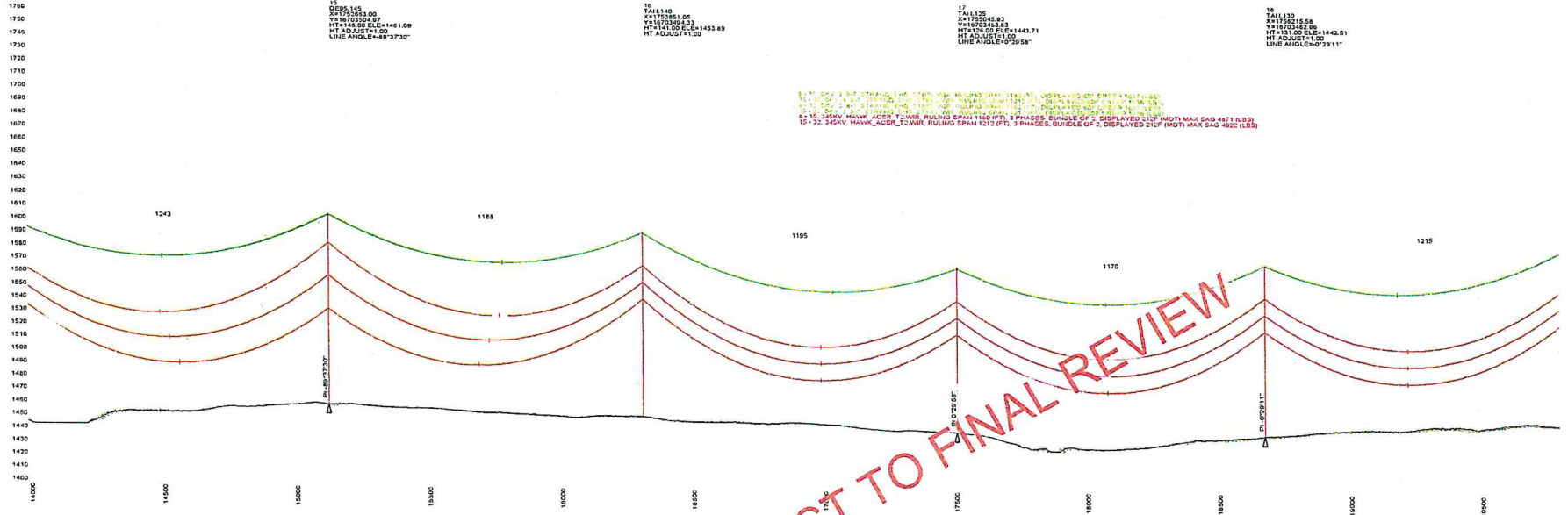
DESIGN DATA	
CONDUCTOR:	(2X) 477 KCMIL 267 TP HAWK ACSR
DESIGN TENSION:	18% @ O.F. FINAL
SHIELD WIRE:	2-3/8" 7 STRAND EHS STEEL
DESIGN TENSION:	75% SAG MATCH @ 60 F CREEP
MIN. GROUND CLEARANCE:	30 FT
CONDUCTOR SHOWN:	212 F. MAX SAG
COORDINATE SYSTEM:	UTM ZONE 14N, US FT



BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE



DWG. NO.
P1-3
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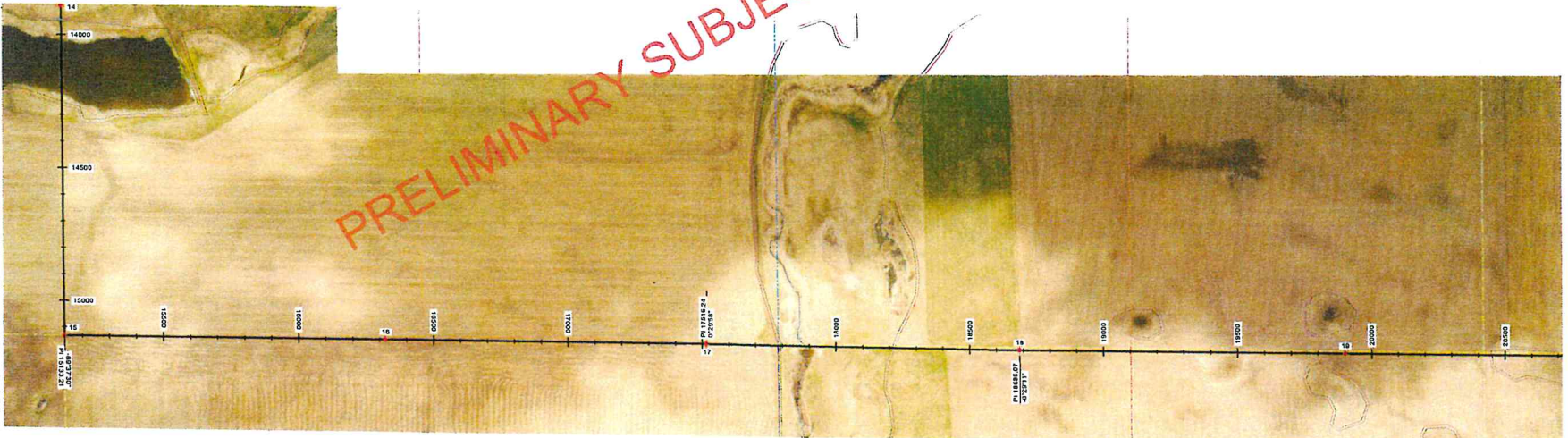


15
DEP5.145
X=1170523.00
Y=11670348.89
HT=145.00 ELEV=1461.09
HT ADJUST=1.00
LINE ANGLE=89°37'30"

16
TAL1140
X=11723881.05
Y=11670348.89
HT=141.00 ELEV=1453.89
HT ADJUST=1.00

17
TAL1125
X=1173268.89
Y=11670548.89
HT=139.00 ELEV=1443.71
HT ADJUST=1.00
LINE ANGLE=7°28'58"

18
TAL1130
X=1175215.58
Y=11670548.89
HT=141.00 ELEV=1443.51
HT ADJUST=1.00
LINE ANGLE=0°29'11"



PRELIMINARY SUBJECT TO FINAL REVIEW

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FINAL REVIEW
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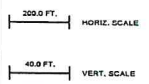
REV	DESCRIPTION	DWN	DGN	CHK	DATE
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H	V10: PLS ADDD & SPOTING REV	DJF	DJF	DJF	03/25/14
G	V09: SPOTING REVISIONS IN NO	SMH	SMH	DJF	03/18/14
F	FOR REVIEW, STR 1-7 REVISED	JRC	JRC	SMH	10/04/13
E	FOR SD REVIEW/ NO NO REVISIONS	JRC	JRC	SMH	09/24/13

APPROVALS	DATE
DRAWN BY: JRC	10/04/13
DESIGN BY: JRC	10/04/13
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APPROVED BY:	

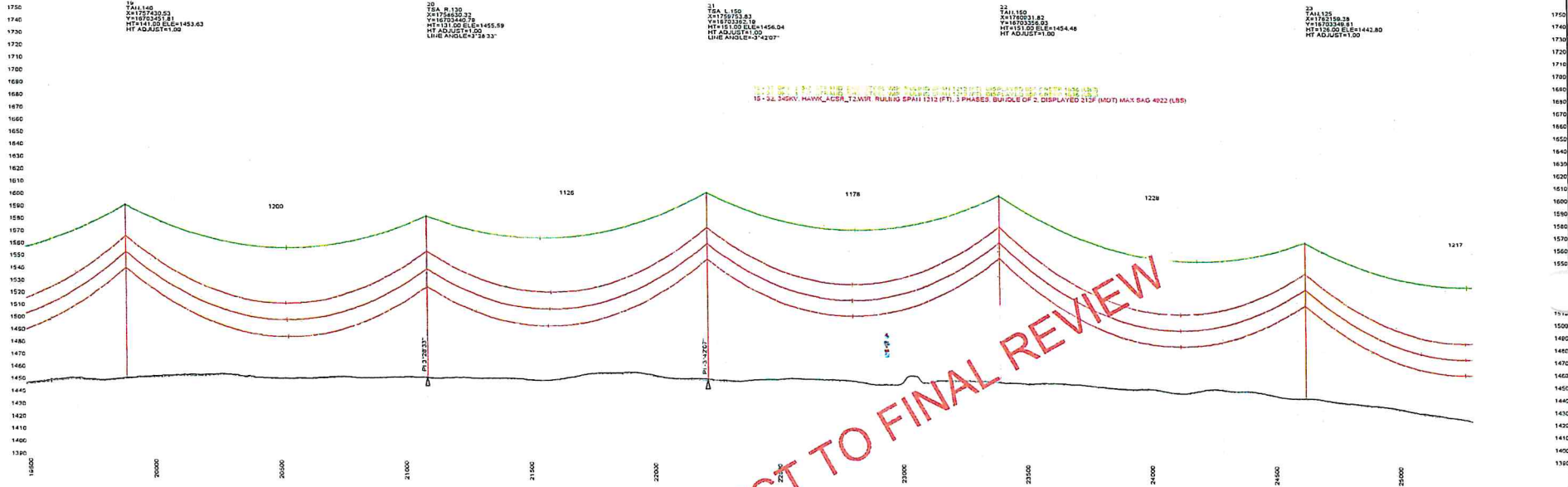
DESIGN DATA
CONDUCTOR: (2X) 477 KCMIL 26/7 TP HAWK ACSR
DESIGN TENSION: 18% @ 0 F. FINAL
SHIELD WIRE: 2-3/8" 7 STRAND EHS STEEL
DESIGN TENSION: 75% SAG MATCH @ 80 F CREEP
MIN. GROUND CLEARANCE: 30 FT
CONDUCTOR SHOWN: 212 F. MAX SAG
COORDINATE SYSTEM: UTM ZONE 14N, US FT



BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE



DWG. NO.
P1-4
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PRELIMINARY
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FINAL REVIEW
03/26/2014

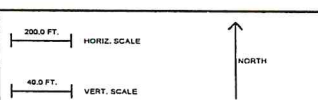


REVISIONS					
I	V11: OPTIMIZED; REVISED 21 & 39	DJF	DJF	DJF	03/28/14
H	V10: PLS ADD'D & SPOTTING REV	DJF	DJF	DJF	03/25/14
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	DJF	03/18/14
F	FOR REVIEW, STR 1-7 REVISED	JRC	JRC	SMH	10/04/13
E	FOR SO REVIEW, NO ND REVISIONS	JRC	JRC	SMH	09/24/13
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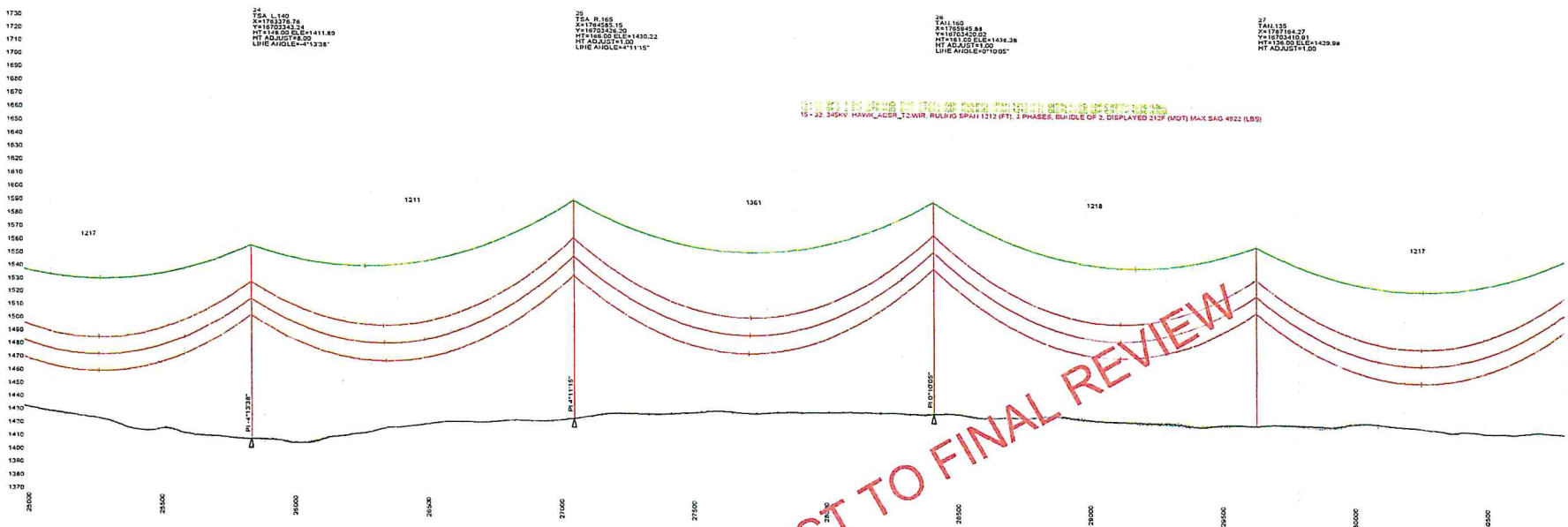
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DRAWN BY:	JRC	10/04/13	
DESIGN BY:	JRC	10/04/13	
CHECKED BY:	SMH	10/04/13	
APPROVED BY:			

DESIGN DATA	
CONDUCTOR:	(2X) 477 KCMIL 267 TP HAWK ACSR
DESIGN TENSION:	18% @ 0 F FINAL
SHIELD WIRE:	2-3/8" 7 STRAND EHS STEEL
DESIGN TENSION:	75% SAG MATCH @ 60 F CREEP
MIN. GROUND CLEARANCE:	30 FT
CONDUCTOR SHOWN:	212 F. MAX SAG
COORDINATE SYSTEM:	UTM ZONE 14N, US FT

BSS+E
Big Stone South to Ellendale
BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE



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24
TSA L1150
X=172323.76
Y=16752.24
HT=125.00 EL=1411.89
HT ADJUST=1.00
LINE ANGLE=413238"

25
TSA P 165
X=176895.15
Y=16752.24
HT=125.00 EL=1430.22
HT ADJUST=1.00
LINE ANGLE=41115"

26
TALL160
X=171885.88
Y=16752.24
HT=125.00 EL=1434.38
HT ADJUST=1.00
LINE ANGLE=41005"

27
TALL135
X=1787164.27
Y=16752.24
HT=125.00 EL=1429.88
HT ADJUST=1.00

15 - 32 345KV HAWK_ACR_2_TWR. RULING SPAW 1212 (FT). 3 PHASES. BUDDLE OF 2. DISPLAYED 212F (MOT) MAX SAG 4922 (LBS)



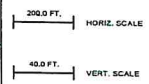
PRELIMINARY
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FINAL REVIEW
03/26/2014



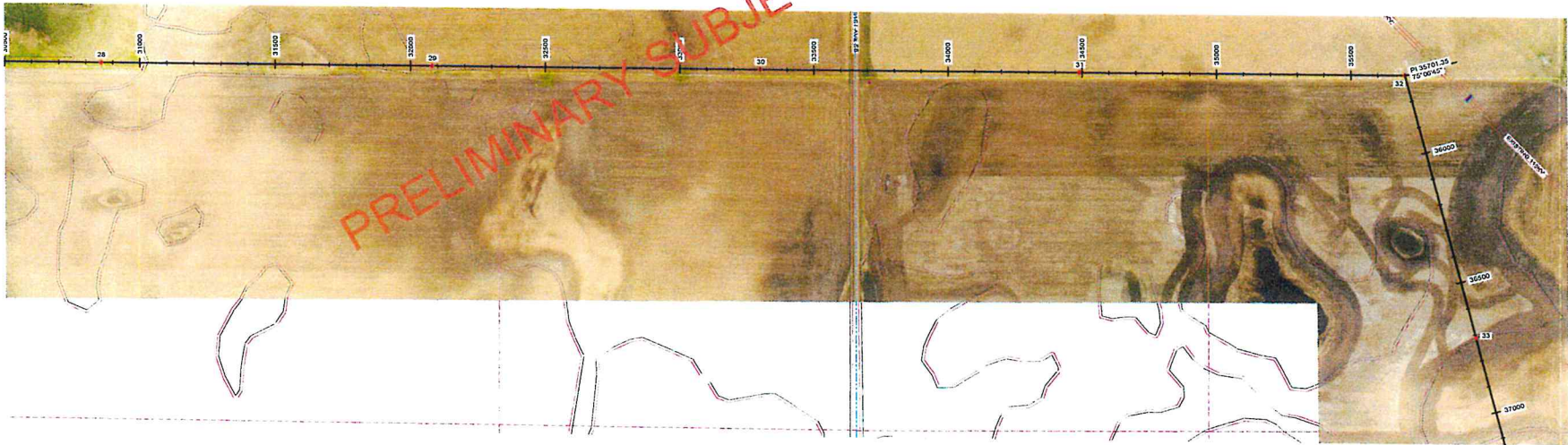
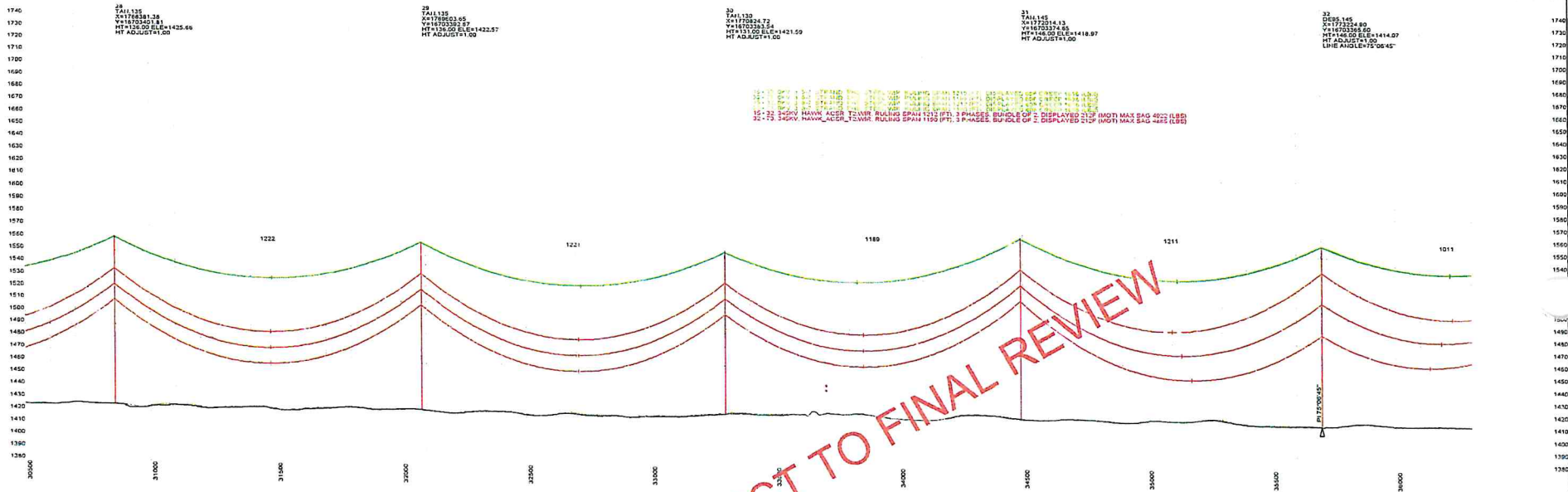
REVISIONS				APPROVALS		DATE	DESIGN DATA
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H	V10: PLS ADD & SPOTTING REV	DJF	DJF	DJF	DRAWN BY: JRC	10/04/13	
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	DJF	DESIGN BY: JRC	10/04/13	
F	FOR REVIEW. STR 1-7 REVISED	JRC	JRC	SMH	CHECKED BY: SMH	10/04/13	
E	FOR SO REVIEW/NO ND REVISIONS	JRC	JRC	SMH	APPROVED BY:		
REV	DESCRIPTION	DMN	DMN	DMN			



BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE



DWG. NO.
P1-6
REVISION: I
127156



PRELIMINARY
SUBJECT TO
FINAL REVIEW
03/26/2014



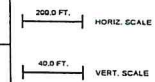
REVISIONS				
REV	DESCRIPTION	BY	CHK	DATE
I	V11: OPTIMIZED; REVISED 21 & 39	DJF	DJF	03/26/14
H	V10: PLS ADDD & SPOTTING REV	DJF	DJF	03/25/14
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	03/18/14
F	FOR REVIEW; STR 1-7 REVISED	JRC	SMH	10/04/13
E	FOR SD REVIEW; ND ND REVISIONS	JRC	SMH	09/24/13

APPROVALS		DATE
DRAWN BY: JRC		10/04/13
DESIGN BY: JRC		10/04/13
CHECKED BY: SMH		10/04/13
APPROVED BY:		

DESIGN DATA
 CONDUCTOR: (2X) 477 KCMIL 26/7 TP HAWK ACSR
 DESIGN TENSION: 18% @ 9 F. FINAL
 SHIELD WIRE: 2-3/8" 7 STRAND EHS STEEL
 DESIGN TENSION: 75% SAG MATCH @ 60 F CREEP
 MIN. GROUND CLEARANCE: 30 FT
 CONDUCTOR SHOWN: 212 F. MAX SAG
 COORDINATE SYSTEM: UTM ZONE 14N, US FT



BIG STONE SOUTH - ELLENDALE
 345 KV TRANSMISSION LINE



DWG. NO.
 P1-7
 REVISION: I
 127156

23
TALL 135
A=1372385.15
V=1659827.82
HT=131.00 ELE=1411.10
HT ADJUST=1.00

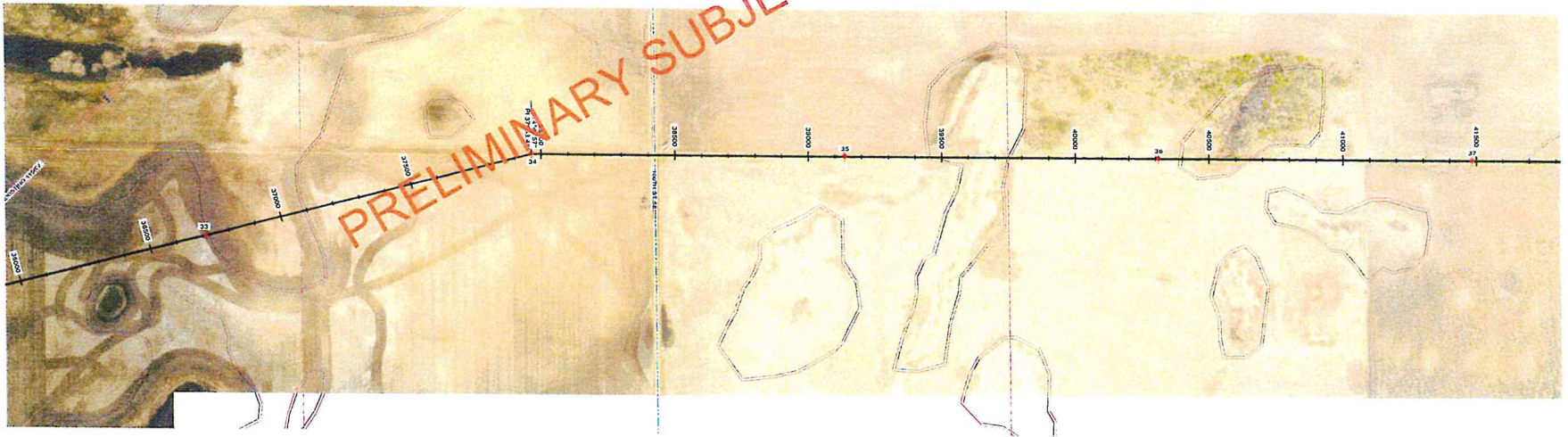
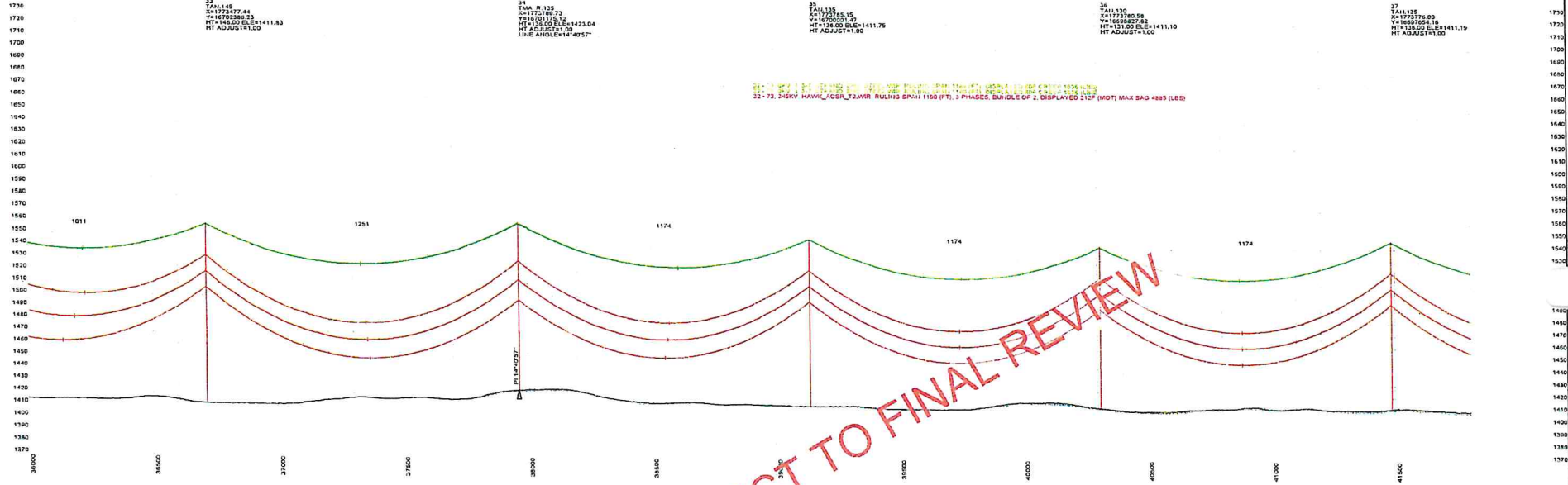
24
TMA R 125
A=1372385.15
V=1659827.82
HT=131.00 ELE=1411.10
HT ADJUST=1.00

25
TALL 135
A=1372385.15
V=1659827.82
HT=131.00 ELE=1411.10
HT ADJUST=1.00

26
TALL 135
A=1372385.15
V=1659827.82
HT=131.00 ELE=1411.10
HT ADJUST=1.00

27
TALL 135
A=1372385.15
V=1659827.82
HT=131.00 ELE=1411.10
HT ADJUST=1.00

32-73, 34KV: HAWK_ACSR_2, 2WR, RULHS SPA11 1150 (PT), 3 PHASES, BUNDLE OP 2, DISPLAYED 210P (MOT) MAX SAG 4885 (LBS)



PRELIMINARY
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03/26/2014



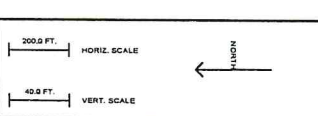
REVISIONS					
I	V11: OPTIMIZED- REVISED 21 & 39	DJF	DJF	DJF	03/26/14
H	V10: PLS ADDD & SPOTTING REV	DJF	DJF	DJF	03/25/14
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	DJF	03/18/14
F	FOR REVIEW, STR 1-7 REVISED	JRC	JRC	SMH	10/04/13
E	FOR 3D REVIEW/NO ND REVISIONS	JRC	JRC	SMH	09/24/13
REV	DESCRIPTION	DMN	CHK	DATE	

APPROVALS	DATE
DRAWN BY: JRC	10/04/13
DESIGN BY: JRC	10/04/13
CHECKED BY: SMH	10/04/13
APPROVED BY:	

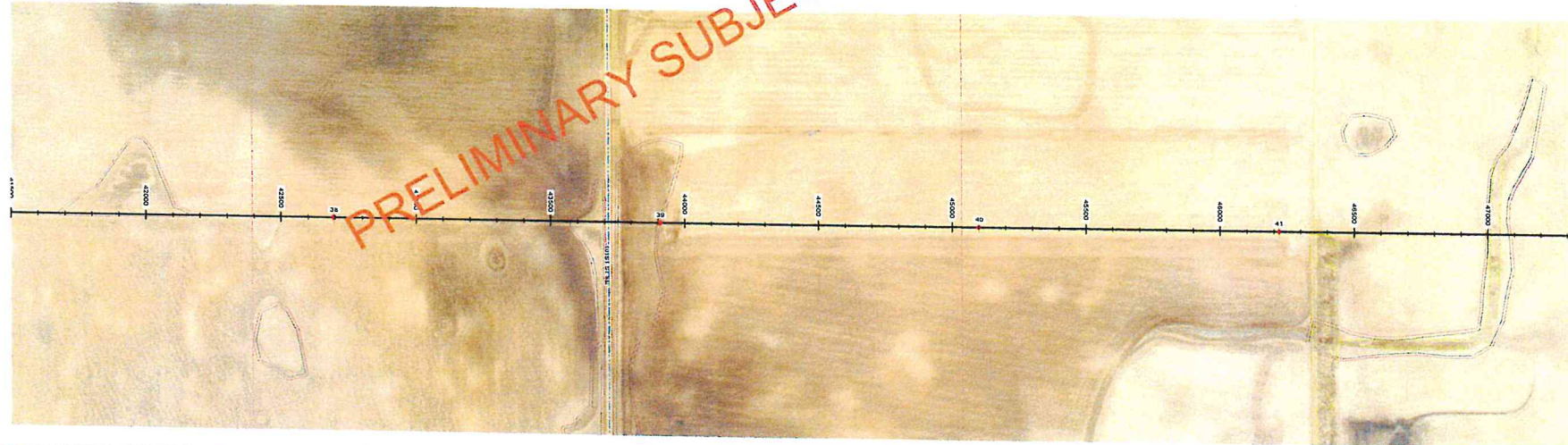
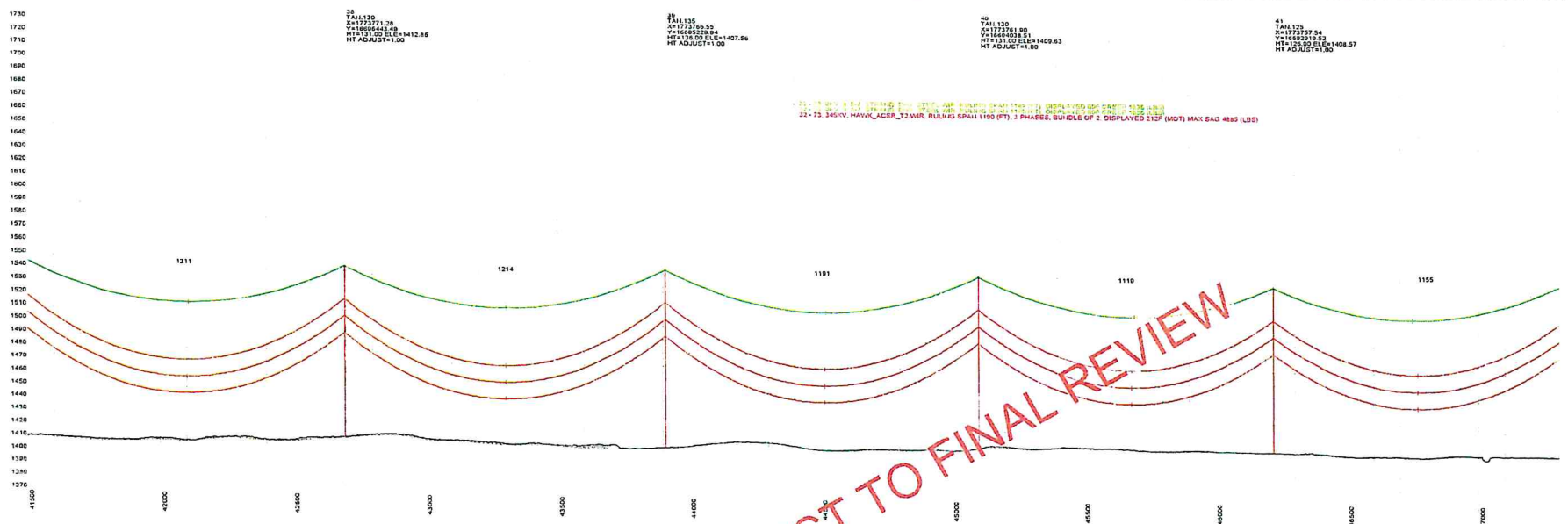
DESIGN DATA
CONDUCTOR: (2X) 477 KCMIL 267 TP HAWK ACSR
DESIGN TENSION: 15% @ 0 F. FINAL
SHIELD WIRE: 2-3/8" 7 STRAND EHS STEEL
DESIGN TENSION: 75% SAG MATCH @ 60 F CREEP
MIN. GROUND CLEARANCE: 30 FT
CONDUCTOR SHOWN: 212 F. MAX SAG
COORDINATE SYSTEM: UTM ZONE 14N, US FT

BSS+E
Big Stone South - Ellendale

BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE



DWG. NO.
P1-8
REVISION: 1
127156



PRELIMINARY
SUBJECT TO
FINAL REVIEW
03/26/2014

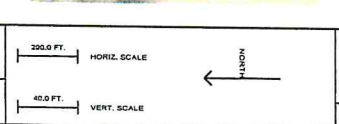


REVISIONS					APPROVALS		DATE	DESIGN DATA
I	V11: OPTIMIZED; REVISED 21 & 39	DJF	DJF	DJF			10/04/13	CONDUCTOR: (2X) 477 KCMIL 26/7 TP HAWK ACSR DESIGN TENSION: 18% @ 0 F. FINAL SHIELD WRE: 2-3/8" 7 STRAND EHS STEEL DESIGN TENSION: 75% SAG MATCH @ 60 F CREEP MIN. GROUND CLEARANCE: 30 FT CONDUCTOR SHOWN: 212 F. MAX SAG COORDINATE SYSTEM: UTM ZONE 14N, US FT
H	V10: PLS ADD & SPOTTING REV	DJF	DJF	DJF			10/04/13	
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	DJF			10/04/13	
F	FOR REVIEW; STR 1-7 REVISED	JRC	JRC	SMH			10/04/13	
E	FOR SD REVIEW / NO ND REVISIONS	JRC	JRC	SMH			09/24/13	
REV	DESCRIPTION	DWN	SMH	CHK			DATE	APPROVED BY:

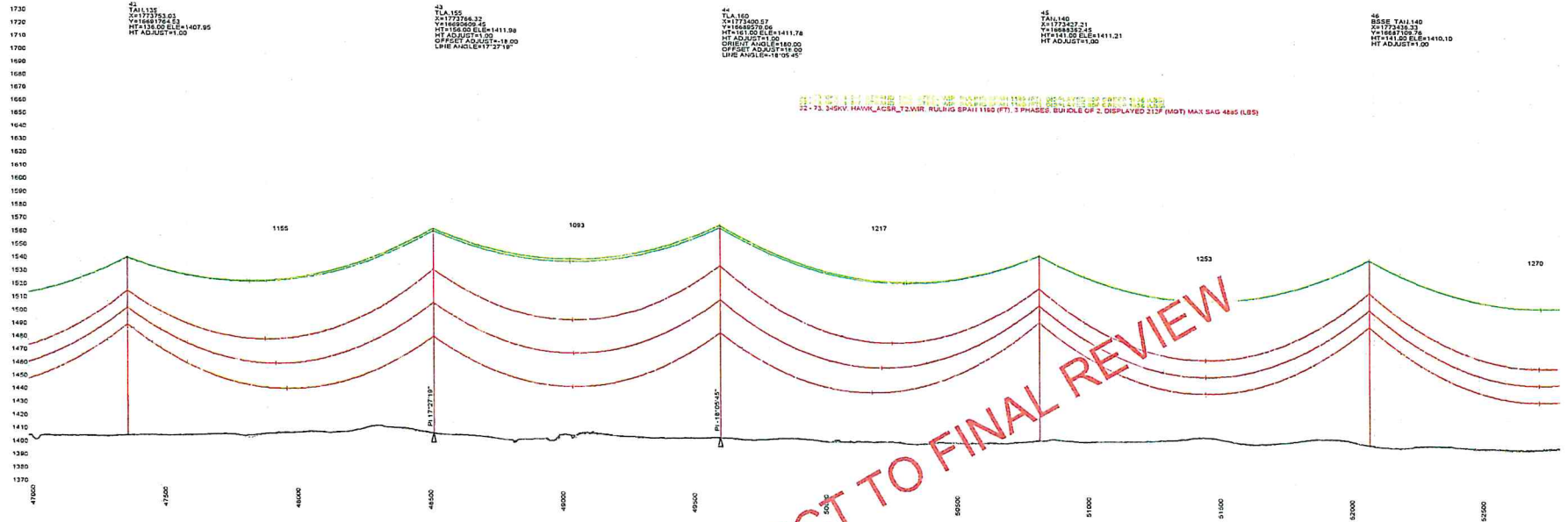
APPROVALS	DATE	DESIGN DATA
DRAWN BY: JRC	10/04/13	CONDUCTOR: (2X) 477 KCMIL 26/7 TP HAWK ACSR DESIGN TENSION: 18% @ 0 F. FINAL SHIELD WRE: 2-3/8" 7 STRAND EHS STEEL DESIGN TENSION: 75% SAG MATCH @ 60 F CREEP MIN. GROUND CLEARANCE: 30 FT CONDUCTOR SHOWN: 212 F. MAX SAG COORDINATE SYSTEM: UTM ZONE 14N, US FT
DESIGN BY: JRC	10/04/13	
CHECKED BY: SMH	10/04/13	
APPROVED BY:		

BSS+E
Big Stone South to Ellendale

BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE



DWG. NO.
P1-9
REVISION: I
127156



PRELIMINARY
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FINAL REVIEW
03/26/2014



REVISIONS				
REV	DESCRIPTION	DNW	DGN	CHK
I	V11: OPTIMIZED: REVISED 21 & 39	DJF	DJF	DJF
H	V10: PLS ADD & SPOTTING REV	DJF	DJF	DJF
G	V09: SPOTTING REVISIONS IN ND	SMH	SMH	DJF
F	FOR REVIEW, STR 1-7 REVISED	JRC	JRC	SMH
E	FOR SD REVIEW / NO ND REVISIONS	JRC	JRC	SMH

APPROVALS		DATE	DESIGN DATA
DRAWN BY: JRC		10/04/13	CONDUCTOR: (2X) 477 KCMIL 26/7 TP HAWK ACSR
DESIGN BY: JRC		10/04/13	DESIGN TENSION: 18% @ 0 F, FINAL
CHECKED BY: SMH		10/04/13	SHIELD WIRE: 2-3/8" 7 STRAND EHS STEEL
APPROVED BY:			DESIGN TENSION: 75% SAG MATCH @ 60 F CREEP
			MIN. GROUND CLEARANCE: 30 FT
			CONDUCTOR SHOWN: 312 F, MAX SAG
			COORDINATE SYSTEM: UTM ZONE 14N, US FT

BSS+E
Big Stone South to Ellendale

BIG STONE SOUTH - ELLENDALE
345 KV TRANSMISSION LINE

200.0 FT. HORIZ. SCALE

40.0 FT. VERT. SCALE

NORTH

DWG. NO.
P1-10
REVISION: I
127156