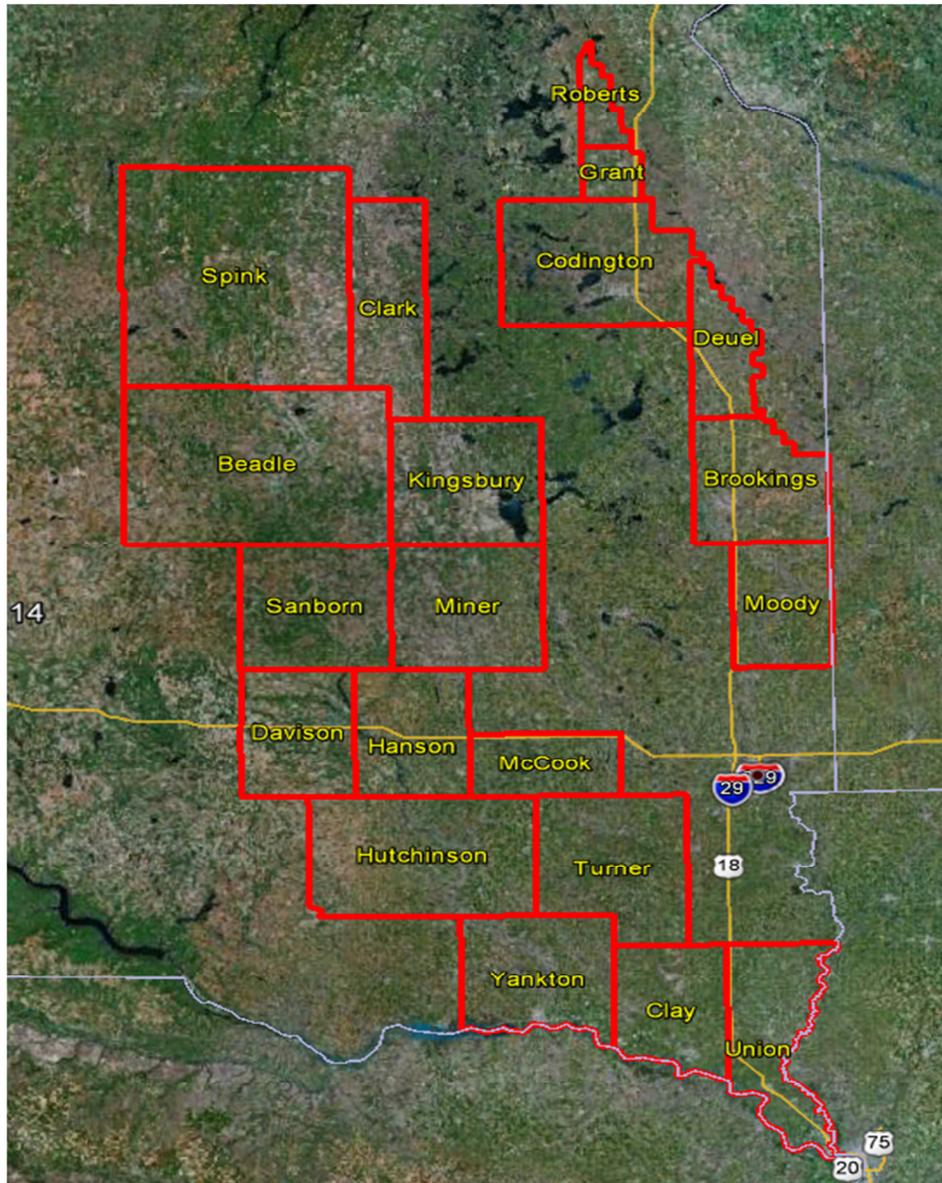


Geodetic Control Report

South Dakota LiDAR

368SSD12-1



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Fully Constrained Network East
Un-Constrained Network East
Fully Constrained Network West
Un-Constrained Network West

Appendix B

NGS Datasheets, Set Point Station Descriptions and Photos

Introduction

This report describes the GPS network adjustment performed to refine the positioning of airborne acquisition data (LiDAR) by GeoDigital International. The project is "South Dakota LiDAR" which included the Aerial survey of 20 counties in Eastern South Dakota.

The survey was conducted throughout the aerial acquisition during the months of March, April and May 2012. This report will present the steps followed to establish the GPS Network and adjustments performed.

GPS Network Survey – Personnel

GeoDigital Acquisition Crew
Manager of Aerial Operations: Craig Robertson
Ground Surveyor(s): Scott Taylor; Carson Adam; Gary Tao; William Kowalsky, Kevin Morgan

GPS Network Survey - Equipment and Configuration

Receiver Model(s): Sokkia GSR 2600, Novatel DL4
Number of GPS Receivers Used: 8
Antenna Model(s): Sokkia SK600, Novatel GPS702
Survey Method: Static Occupation (Long Term, >~4h)
Source of GPS Control: NGS – National Geodetic survey
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Geoid/Ellipsoid: Geoid 09
Units: Meters
NGS Monuments Used: QQ0640, AC7987, PR1071, PR1027, AC7894, AC8003, OQ1162, AC7935, AC7901, AC7967
Established Points: 368SSD-01, 368SSD-02, 368SSD-03, 368SSD-04, 368SSD-05, 368SSD-06
GPS Control Network Software: GrafNet (by Waypoint)

Requirements for LIDAR Control Points

Final control used for flight data processing should:

1. Be tied to geodetic control stations.
 - a. Geodetic control stations should be first order or better (unless otherwise specified by client). Preference shall be given to nationally maintained control points before provincial/state level better (unless otherwise specified by client).
 - b. All final flight & ground truthing control (published and/or new) should be tied to these geodetic points by two or more occupations (prove or disprove HI errors).
 - c. All new points used in final flight & ground truthing control require a tie to two AGREEING 3-D geodetic control stations (alternatively any combination of horizontal and vertical control such that both are represented twice). If disagreement is found (i.e. exceeding the tolerance required to meet project specifications), sufficient additional control points must be included in the survey to clearly identify the erroneous monument.
 - d. Final adjusted coordinates of published geodetic control stations should agree to $\pm 1/3^{\text{rd}}$ the required RMSE of the project or better. In cases where this is not achieved, additional control will be required to establish the error in the geodetic control point(s). When insufficient control can be found to agree to this standard, the issue must be taken to Operations Manager and the client.
2. Geodetic control stations may be used as final control for data processing if they meet the standards described in point 1d. In this case, the published coordinates shall be used unless special circumstances dictate otherwise.
3. Where projects use multiple control points for flight data processing, in addition to meeting the requirements of point 1, the flight control points must also be shown to tie to each other within the same specification (1d).

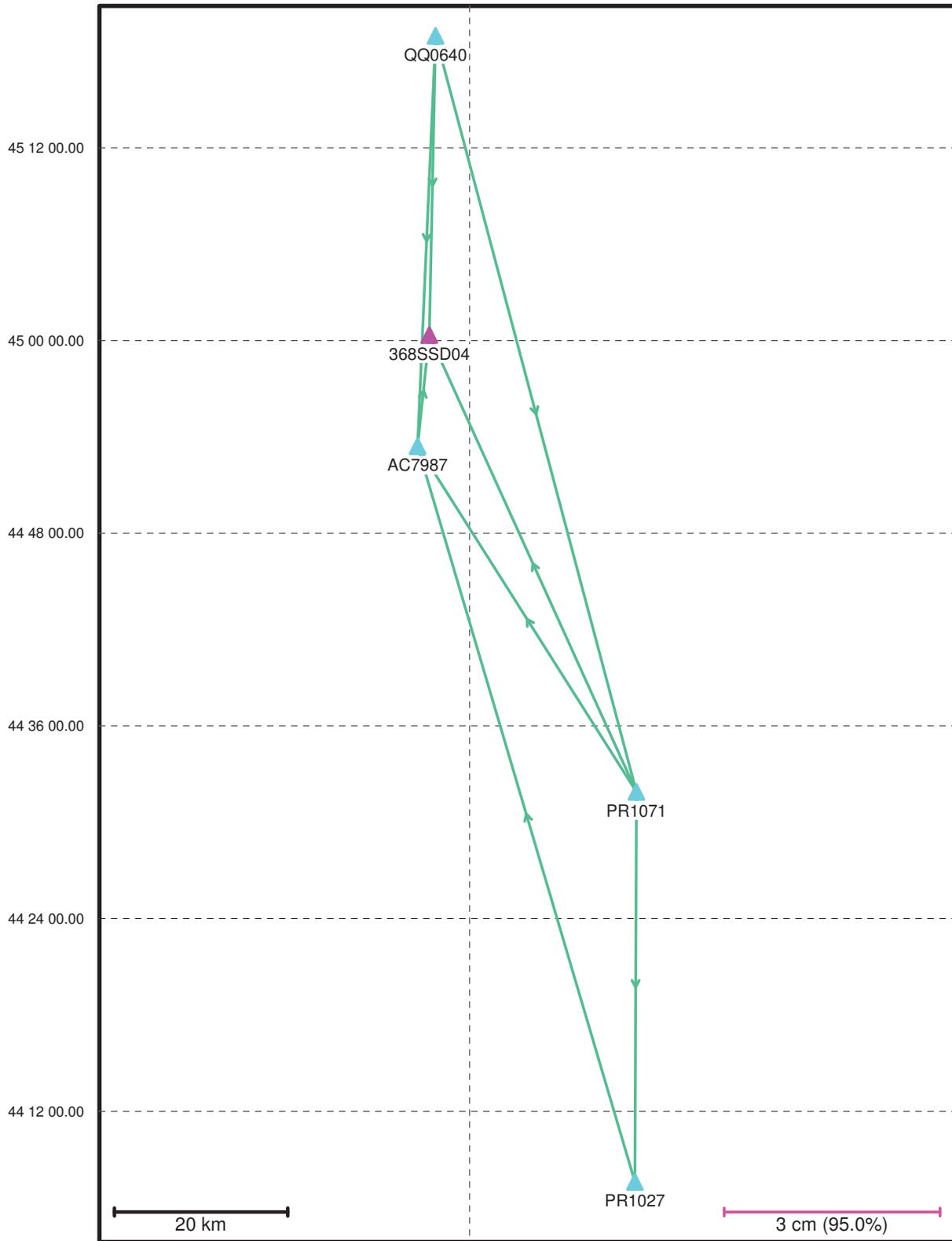
Typical collection parameters are defined as 6 satellites, PDOP of less than 4 and low geomagnetic activity. Under these conditions, the formula of 20 minutes plus 3 minutes per baseline kilometre shall be set as the minimum for each observation. Additional time shall be observed where the collection requirements cannot be met and/or obstructions are present.

Appendix A

Fully Constrained Network East
Un-Constrained Network East
Fully Constrained Network West
Un-Constrained Network East

Traverse - Map

Geographic, DMS



```

*****
* NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT *
* * * * *
* (c) Copyright NovAtel Inc., (2007) *
* * * * *
* Version: 7.80.2517 *
* * * * *

```

SD12-1 Fully Constrained Network East.net

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*****

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DATE(m/d/y): Thur. 4/19/12 TIME: 18:25:26

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*****

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```

DATUM:          'NAD83_CORS96'
GRID:           UTM, Zone 14
SCALE_FACTOR:   25.8242
CONFIDENCE LEVEL: 95.00 % (Scale factor is 2.4479)

```

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*****

```

INPUT CONTROL/CHECK POINTS

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*****

```

STA_ID	TYPE	-- LATITUDE --	-- LONGITUDE --	ELLHGT -	HZ-SD	V-SD
AC7987	GCP-3D	44 53 25.34836	-97 04 33.94998	502.205	0.00500	0.00500
PR1027	GCP-3D	44 07 35.76383	-96 45 31.27516	487.210	0.00500	0.00500
PR1071	GCP-3D	44 31 53.59709	-96 45 23.46307	509.188	0.01000	0.01000
QQ0640	GCP-3D	45 18 59.38654	-97 02 59.00413	589.670	0.00500	0.00500

```

*****

```

INPUT VECTORS

```

*****

```

SESSION NAME	VECTOR(m)	----- Covariance (m) [unscaled] -----
	DX/DY/DZ	standard deviations in brackets
AC7987 to 368SSD04 (1)	2459.3545 8797.7098 9095.8140	3.8176e-007 (0.0006) 1.8053e-007 2.0322e-006 (0.0014) 4.0413e-009 -1.3503e-006 1.8462e-006 (0.0014)
PR1027 to AC7987 (1)	-17892.5779 62096.9176 60541.0418	6.4054e-006 (0.0025) -2.1929e-006 5.1370e-006 (0.0023) 5.1447e-007 -2.6123e-006 3.2325e-006 (0.0018)
PR1071 to 368SSD04 (1)	-19303.4895 39703.0577 37430.3429	1.0574e-005 (0.0033) 1.2378e-006 2.1418e-006 (0.0015) -6.2940e-007 -1.3296e-006 1.8398e-006 (0.0014)
PR1071 to AC7987 (1)	-21762.8325 30905.3587 28334.5442	4.2238e-006 (0.0021) -1.7928e-006 3.4157e-006 (0.0018) 5.2137e-007 -1.6808e-006 1.8774e-006 (0.0014)
PR1071 to AC7987 (2)	-21762.8402 30905.3536 28334.5268	9.0066e-006 (0.0030) 1.4056e-006 2.3881e-006 (0.0015) -6.3817e-007 -1.3059e-006 1.6628e-006 (0.0013)
PR1071 to PR1027 (1)	-3870.2477 -31191.5560 -32206.5007	4.0552e-006 (0.0020) -1.2266e-006 3.1844e-006 (0.0018) 2.4981e-007 -1.5297e-006 1.8846e-006 (0.0014)

```

QQ0640 to AC7987 (1)  -6177.7761  8.7454e-006 (0.0030)
                      -32978.2130  1.2295e-006 2.5078e-006 (0.0016)
                      -33490.3724  -4.8355e-007 -1.3444e-006 1.7247e-006 (0.0013)

QQ0640 to 368SSD04 (1) -3718.4138  1.3211e-006 (0.0011)
                      -24180.5113  6.1789e-007 7.7029e-006 (0.0028)
                      -24394.5515  -4.6979e-007 -5.6812e-006 9.2290e-006 (0.0030)

QQ0640 to PR1071 (1)  15585.0678  8.7071e-006 (0.0030)
                      -63883.5645  1.8860e-006 2.3852e-006 (0.0015)
                      -61824.9015  -5.5137e-007 -1.3476e-006 1.7609e-006 (0.0013)
    
```

 OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)

SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST - (km)	STD - (m)
AC7987 to 368SSD04 (1)	-0.0009	-0.0039	-0.0001	0.309	12.9	0.0105
PR1027 to AC7987 (1)	0.0180	-0.0094	0.0194	0.317	88.6	0.0195
PR1071 to 368SSD04 (1)	0.0165	0.0059	-0.0020	0.305	57.9	0.0194
PR1071 to AC7987 (1)	0.0074	-0.0096	-0.0041	0.272	47.2	0.0157
PR1071 to AC7987 (2)	0.0144	0.0069	0.0039	0.349	47.2	0.0184
PR1071 to PR1027 (1)	-0.0171	-0.0008	-0.0187	0.564	45.0	0.0154
QQ0640 to AC7987 (1)	0.0093	0.0039	0.0047	0.235	47.4	0.0183
QQ0640 to 368SSD04 (1)	-0.0004	0.0002	-0.0053	0.155	34.5	0.0217
QQ0640 to PR1071 (1)	-0.0086	-0.0032	0.0042	0.112	90.3	0.0182

RMS	0.0121	0.0058	0.0096			

\$ - This session is flagged as a 3-sigma outlier

 CONTROL POINT RESIDUALS (ADJUSTMENT MADE)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
AC7987	-0.0051	-0.0012	-0.0043
PR1027	0.0046	0.0001	0.0063
PR1071	0.0009	-0.0049	-0.0178
QQ0640	0.0002	0.0024	0.0025

RMS	0.0035	0.0028	0.0098

 OUTPUT STATION COORDINATES (LAT/LONG/HT)

STA_ID	-- LATITUDE --	-- LONGITUDE --	- ELLHGT -	ORTHOHGT
368SSD04	45 00 20.58849	-97 03 31.99780	534.6677	559.8598
AC7987	44 53 25.34832	-97 04 33.95021	502.2003	527.2942
PR1027	44 07 35.76383	-96 45 31.27495	487.2161	513.0131
PR1071	44 31 53.59693	-96 45 23.46303	509.1699	534.2054
QQ0640	45 18 59.38662	-97 02 59.00412	589.6721	614.9944

OUTPUT STATION COORDINATES (GRID)

```
*****
STA_ID      - EASTING - - NORTHING - - ELLHGT -   ORTHOHGT
              (m)          (m)          (m)          (m)
368SSD04    652974.1137  4985418.5658  534.6677  559.8598
AC7987      651921.9851  4972572.9879  502.2003  527.2942
PR1027      679314.1622  4888376.8313  487.2161  513.0131
PR1071      678256.4018  4933362.3296  509.1699  534.2054
QQ0640      652862.7551  5019960.2246  589.6721  614.9944
```

OUTPUT VARIANCE/COVARIANCE

```
*****
                                2
STA_ID      SE/SN/SUP  ----- CX matrix (m )-----
              (95.00 %) (not scaled by confidence level)
              (m)          (ECEF, XYZ cartesian)
368SSD04    0.0104  1.8522e-005
              0.0099  2.2659e-006  3.4037e-005
              0.0172 -6.5868e-007 -1.6650e-005  3.1696e-005

AC7987      0.0092  1.4141e-005
              0.0078 -2.1457e-007  1.3206e-005
              0.0095 -9.4707e-008 -2.4233e-006  1.2048e-005

PR1027      0.0107  1.8993e-005
              0.0088 -1.3578e-006  1.6950e-005
              0.0106 -1.5881e-007 -3.0277e-006  1.5001e-005

PR1071      0.0127  2.6741e-005
              0.0082 -4.2084e-007  1.7814e-005
              0.0115 -1.9043e-007 -5.3523e-006  1.5489e-005

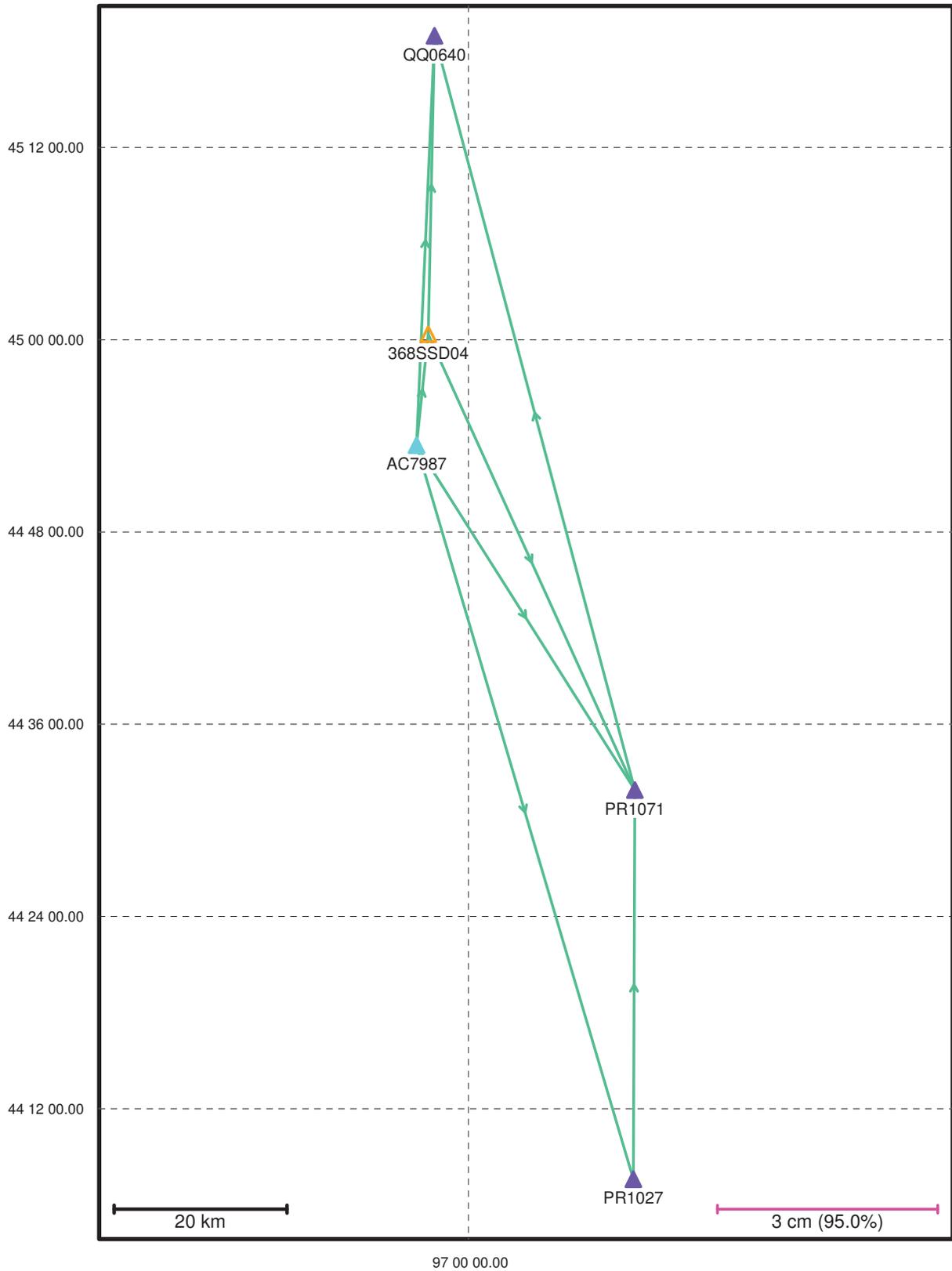
QQ0640      0.0098  1.6313e-005
              0.0083  7.3037e-007  1.4915e-005
              0.0102 -1.5947e-007 -2.8349e-006  1.3801e-005
```

VARIANCE FACTOR = 1.5995

Note: Values < 1.0 indicate statistics are pessimistic, while values > 1.0 indicate optimistic statistics. Entering this value as the network adjustment scale factor will bring variance factor to one.

Traverse - Map

Geographic, DMS



```

*****
* NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT *
* *
* (c) Copyright NovAtel Inc., (2007) *
* *
* Version: 7.80.2517 *
* *

```

```

* FILE: C:\Projects\368 SSD 12\2_Operations\4_Control\Grafnet Project\368S
SD12-1 Uncon Network East.net
*****

```

DATE(m/d/y): Wed. 4/25/12 TIME: 7:23:04

```

DATUM: 'NAD83_CORS96'
GRID: UTM, Zone 14
SCALE_FACTOR: 17.1100
CONFIDENCE LEVEL: 95.00 % (Scale factor is 2.4479)

```

INPUT CONTROL/CHECK POINTS

STA_ID	TYPE	-- LATITUDE --	-- LONGITUDE --	ELLHGT -	HZ-SD	V-SD
AC7987	GCP-3D	44 53 25.34836	-97 04 33.94998	502.205	0.00500	0.00500
PR1027	CHK-3D	44 07 35.76383	-96 45 31.27516	487.210		
PR1071	CHK-3D	44 31 53.59709	-96 45 23.46307	509.188		
QQ0640	CHK-3D	45 18 59.38654	-97 02 59.00413	589.670		

INPUT VECTORS

SESSION NAME	VECTOR(m)	----- Covariance (m) [unscaled] -----
	DX/DY/DZ	standard deviations in brackets
368SSD04 to PR1071 (1)	19303.4904 -39703.0575 -37430.3438	1.0624e-005 (0.0033) 1.0920e-006 2.0761e-006 (0.0014) -5.0404e-007 -1.2992e-006 1.8344e-006 (0.0014)
368SSD04 to QQ0640 (1)	3718.4136 24180.5098 24394.5530	1.3205e-006 (0.0011) 6.1879e-007 7.7135e-006 (0.0028) -4.7061e-007 -5.6801e-006 9.2157e-006 (0.0030)
AC7987 to 368SSD04 (1)	2459.3545 8797.7098 9095.8140	3.8176e-007 (0.0006) 1.8053e-007 2.0322e-006 (0.0014) 4.0413e-009 -1.3503e-006 1.8462e-006 (0.0014)
AC7987 to PR1027 (1)	17892.5778 -62096.9175 -60541.0426	6.3841e-006 (0.0025) -2.1925e-006 5.1344e-006 (0.0023) 5.2019e-007 -2.6195e-006 3.2432e-006 (0.0018)
AC7987 to PR1071 (1)	21762.8325 -30905.3587 -28334.5451	4.2145e-006 (0.0021) -1.7917e-006 3.4165e-006 (0.0018) 5.2332e-007 -1.6841e-006 1.8808e-006 (0.0014)
AC7987 to PR1071 (2)	21762.8414 -30905.3536 -28334.5275	8.7866e-006 (0.0030) 1.1127e-006 2.2634e-006 (0.0015) -4.4317e-007 -1.2545e-006 1.6526e-006 (0.0013)

```

AC7987 to QQ0640 (1)  6177.7761  8.7544e-006 (0.0030)
                    32978.2130  1.2288e-006  2.5111e-006 (0.0016)
                    33490.3714 -4.8353e-007 -1.3435e-006  1.7224e-006 (0.0013)

PR1027 to PR1071 (1)  3870.2472  4.0908e-006 (0.0020)
                    31191.5571 -1.1639e-006  3.1693e-006 (0.0018)
                    32206.4980  1.3003e-007 -1.5246e-006  1.9292e-006 (0.0014)

PR1071 to QQ0640 (1) -15585.0678  8.7205e-006 (0.0030)
                    63883.5644  1.8898e-006  2.3935e-006 (0.0015)
                    61824.9005 -5.5236e-007 -1.3478e-006  1.7571e-006 (0.0013)
    
```

 OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)

SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST - (km)	STD - (m)
368SSD04 to PR1071 (1)	-0.0132	-0.0057	0.0017	0.251	57.9	0.0158
368SSD04 to QQ0640 (1)	0.0010	-0.0007	0.0057	0.169	34.5	0.0177
AC7987 to 368SSD04 (1)	-0.0006	-0.0041	0.0008	0.328	12.9	0.0085
AC7987 to PR1027 (1)	0.0027	0.0069	0.0018	0.086	88.6	0.0159
AC7987 to PR1071 (1)	-0.0030	0.0098	0.0046	0.238	47.2	0.0128
AC7987 to PR1071 (2)	-0.0112	-0.0070	-0.0035	0.288	47.2	0.0147
AC7987 to QQ0640 (1)	-0.0084	-0.0038	-0.0006	0.195	47.4	0.0149
PR1027 to PR1071 (1)	0.0016	0.0045	0.0005	0.107	45.0	0.0125
PR1071 to QQ0640 (1)	0.0050	0.0037	0.0000	0.069	90.3	0.0148

RMS	0.0068	0.0057	0.0028			

\$ - This session is flagged as a 3-sigma outlier

 CHECK POINT RESIDUALS (East, North, Height - Local Level)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
PR1027	0.0303	-0.0016	0.0314
PR1071	0.0105	-0.0041	-0.0136
QQ0640	0.0062	0.0030	0.0103

RMS	0.0189	0.0031	0.0206

 CONTROL POINT RESIDUALS (ADJUSTMENT MADE)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
AC7987	0.0000	0.0000	0.0000

RMS	0.0000	0.0000	0.0000

 OUTPUT STATION COORDINATES (LAT/LONG/HT)

STA_ID	--	LATITUDE	--	LONGITUDE	--	ELLHGT	--	ORTHOHGT
368SSD04	45	00	20.58853	-97	03	31.99756	534.6730	559.8652
AC7987	44	53	25.34836	-97	04	33.94998	502.2047	527.2985
PR1027	44	07	35.76378	-96	45	31.27380	487.2411	513.0382
PR1071	44	31	53.59696	-96	45	23.46260	509.1741	534.2096
QQ0640	45	18	59.38664	-97	02	59.00385	589.6799	615.0022

 OUTPUT STATION COORDINATES (GRID)

STA_ID	-	EASTING	-	NORTHING	-	ELLHGT	-	ORTHOHGT
		(m)		(m)		(m)		(m)
368SSD04	652974.1191	4985418.5669	534.6730	559.8652				
AC7987	651921.9901	4972572.9893	502.2047	527.2985				
PR1027	679314.1879	4888376.8303	487.2411	513.0382				
PR1071	678256.4113	4933362.3307	509.1741	534.2096				
QQ0640	652862.7611	5019960.2253	589.6799	615.0022				

 OUTPUT VARIANCE/COVARIANCE

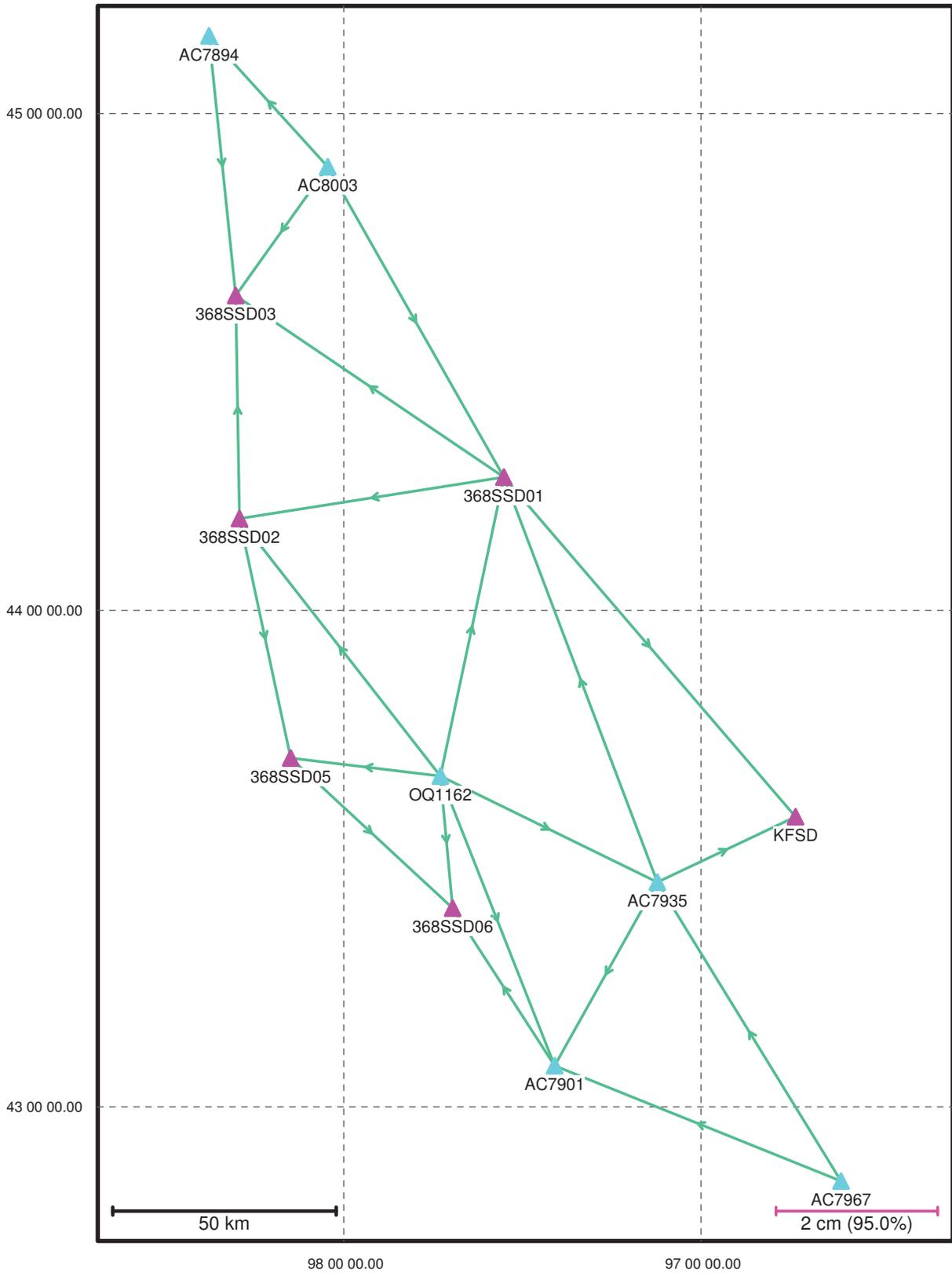
STA_ID	SE/SN/SUP	CX matrix (m) ²			
	(95.00 %)	(not scaled by confidence level)			
	(m)	(ECEF, XYZ cartesian)			
368SSD04	0.0135	3.0840e-005			
	0.0136	1.7843e-006	4.3589e-005		
	0.0181	-6.3904e-008	-1.1939e-005	4.1586e-005	
AC7987	0.0122	2.5000e-005			
	0.0122	-1.2540e-021	2.5000e-005		
	0.0122	-8.7484e-022	-4.9232e-020	2.5000e-005	
PR1027	0.0218	7.5951e-005			
	0.0146	-1.3790e-005	6.2884e-005		
	0.0210	2.4515e-006	-1.9107e-005	4.9153e-005	
PR1071	0.0169	4.7800e-005			
	0.0131	-9.2057e-007	3.6633e-005		
	0.0158	2.7641e-008	-6.6656e-006	3.3874e-005	
QQ0640	0.0164	4.6123e-005			
	0.0138	3.9992e-006	4.5663e-005		
	0.0182	-1.5349e-006	-1.1754e-005	4.0764e-005	

 VARIANCE FACTOR = 1.0000

Note: Values < 1.0 indicate statistics are pessimistic, while
 values > 1.0 indicate optimistic statistics. Entering this
 value as the network adjustment scale factor will bring
 variance factor to one.

Traverse - Map

Geographic, DMS



```

*****
* NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT *
* *
* (c) Copyright NovAtel Inc., (2007) *
* *
* Version: 7.80.2517 *
* *

```

* FILE: C:\Projects\368 SSD 12\2_Operations\4_Control\Grafnet Project\368S
SD12-1 FullyCon Network West.net

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*****

```

DATE(m/d/y): Tue. 5/01/12 TIME: 19:35:05

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*****

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```

DATUM:          'NAD83_CORS96'
GRID:           UTM, Zone 14
SCALE_FACTOR:   244.1785
CONFIDENCE LEVEL: 95.00 % (Scale factor is 2.4479)

```

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*****

```

INPUT CONTROL/CHECK POINTS

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*****

```

STA_ID	TYPE	--	LATITUDE	--	LONGITUDE	--	ELLHGT	-	HZ-SD	V-SD
AC7894	GCP-3D	45	09 22.94132	-98	22 35.00326		371.693	0.00500	0.00500	
AC7901	GCP-3D	43	04 57.50473	-97	24 35.58390		381.786	0.00500	0.00500	
AC7935	GCP-3D	43	27 08.77685	-97	07 20.90762		387.429	0.00500	0.00500	
AC7967	GCP-3D	42	51 02.63636	-96	36 31.55856		328.943	0.00500	0.00500	
AC8003	GCP-3D	44	53 33.72035	-98	02 38.93491		395.903	0.00500	0.00500	
OQ1162	GCP-3D	43	39 58.08703	-97	43 45.64149		389.114	0.00500	0.00500	

```

*****

```

INPUT VECTORS

```

*****

```

SESSION NAME	VECTOR(m)	-----	Covariance (m)	[unscaled]	-----
	DX/DY/DZ		standard deviations		in brackets
368SSD01 to 368SSD02 (1)	-59404.0222	1.5449e-007	(0.0004)		
	1806.1346	8.8001e-008	6.4935e-007	(0.0008)	
	-6714.3232	-6.2868e-008	-4.0520e-007	6.4251e-007	(0.0008)
368SSD01 to 368SSD03 (1)	-55176.9721	1.6071e-006	(0.0013)		
	36448.4533	1.1020e-006	7.5520e-006	(0.0027)	
	28895.2547	-5.5694e-007	-4.6270e-006	7.1022e-006	(0.0027)
368SSD01 to 368SSD03 (2)	-55176.9450	5.5220e-007	(0.0007)		
	36448.4357	3.4791e-007	2.2684e-006	(0.0015)	
	28895.2758	-1.9507e-007	-1.4423e-006	2.2321e-006	(0.0015)
368SSD01 to KFSD (1)	58459.8287	7.5751e-007	(0.0009)		
	-60394.3072	5.1502e-007	3.1285e-006	(0.0018)	
	-54765.5503	-3.1807e-007	-1.8908e-006	3.1802e-006	(0.0018)
368SSD01 to KFSD (2)	58459.8116	1.1091e-006	(0.0011)		
	-60394.2935	6.0695e-007	4.4925e-006	(0.0021)	
	-54765.5469	-3.7903e-007	-2.8110e-006	4.0636e-006	(0.0020)
368SSD02 to 368SSD05 (1)	6100.4975	3.0493e-006	(0.0017)		

```
-38464.7764 6.2840e-008 8.9528e-006 (0.0030)
-38577.2101 6.5957e-007 -5.2845e-006 8.0861e-006 (0.0028)

368SSD02 to 368SSD03 (1) 4227.0500 1.0748e-006 (0.0010)
34642.3136 7.6939e-007 5.0475e-006 (0.0022)
35609.5830 -3.9066e-007 -3.0632e-006 4.6846e-006 (0.0022)

368SSD05 to 368SSD06 (1) 33055.8930 8.7674e-007 (0.0009)
-27935.9343 5.4844e-007 3.5477e-006 (0.0019)
-24332.3330 -2.7438e-007 -2.1321e-006 3.0313e-006 (0.0017)

368SSD05 to 368SSD06 (2) 33055.8897 7.6013e-007 (0.0009)
-27935.9924 4.7921e-007 2.9889e-006 (0.0017)
-24332.2736 -3.1181e-007 -1.8286e-006 2.6603e-006 (0.0016)

AC7894 to 368SSD03 (1) -105.8015 9.2146e-007 (0.0010)
-41472.2021 6.2201e-007 3.5241e-006 (0.0019)
-41202.0762 -3.7912e-007 -2.1524e-006 3.1260e-006 (0.0018)

AC7901 to 368SSD06 (1) -19769.8265 3.6792e-007 (0.0006)
27000.0240 2.1940e-007 1.5441e-006 (0.0012)
25689.9301 -1.2694e-007 -9.4213e-007 1.3268e-006 (0.0012)

AC7935 to 368SSD01 (2) -26230.8968 9.4249e-007 (0.0010)
66615.7808 5.4532e-007 4.0108e-006 (0.0020)
65392.3564 -3.0407e-007 -2.4134e-006 3.4051e-006 (0.0018)

AC7935 to AC7901 (1) -26708.8230 1.0298e-006 (0.0010)
-24979.0239 4.6937e-007 4.4895e-006 (0.0021)
-29921.2650 -2.5220e-007 -2.7117e-006 3.7418e-006 (0.0019)

AC7935 to AC7901 (2) -26708.8524 5.0621e-007 (0.0007)
-24978.9948 2.9628e-007 2.0145e-006 (0.0014)
-29921.2559 -1.6910e-007 -1.2590e-006 2.1665e-006 (0.0015)

AC7935 to KFSD (1) 32228.9294 1.5181e-006 (0.0012)
6221.4719 2.1064e-006 7.8259e-006 (0.0028)
10626.8105 -3.9779e-007 -3.7392e-006 8.0891e-006 (0.0028)

AC7935 to KFSD (2) 32228.9155 1.7148e-007 (0.0004)
6221.4895 1.0853e-007 7.0832e-007 (0.0008)
10626.8032 -6.6471e-008 -4.2628e-007 6.8569e-007 (0.0008)

AC7967 to AC7901 (1) -62735.5501 1.3296e-006 (0.0012)
25366.5766 8.7388e-007 5.6533e-006 (0.0024)
18889.2401 -2.6207e-007 -3.3480e-006 5.6730e-006 (0.0024)

AC7967 to AC7935 (1) -36026.7496 4.6267e-006 (0.0022)
50345.6714 5.5985e-006 1.9745e-005 (0.0044)
48810.4531 -3.2576e-006 -6.8433e-006 1.1694e-005 (0.0034)

AC8003 to 368SSD01 (1) 32115.9111 6.4122e-007 (0.0008)
-53646.5552 3.9960e-007 2.6682e-006 (0.0016)
-49402.1176 -2.2415e-007 -1.6926e-006 2.6500e-006 (0.0016)

AC8003 to 368SSD03 (1) -23061.0345 4.0751e-007 (0.0006)
-17198.1201 2.1207e-007 1.1549e-006 (0.0011)
-20506.8415 -1.1140e-007 -7.7527e-007 1.3777e-006 (0.0012)

AC8003 to AC7894 (1) -22955.2341 4.7067e-007 (0.0007)
24274.0739 2.2381e-007 2.3791e-006 (0.0015)
20695.2400 7.7597e-009 -1.5852e-006 2.1671e-006 (0.0015)

OQ1162 to 368SSD05 (1) -33024.0500 4.6692e-007 (0.0007)
7395.9631 3.0788e-007 2.0456e-006 (0.0014)
2893.4541 -1.4639e-007 -1.2038e-006 1.6687e-006 (0.0013)
```

```

OQ1162 to 368SSD01 (1) 20279.5913 2.5901e-007 (0.0005)
                        44054.7204 1.3596e-007 1.1980e-006 (0.0011)
                        48184.8290 -1.1033e-007 -7.2794e-007 1.1073e-006 (0.0011)

OQ1162 to 368SSD02 (1) -39124.5774 4.4870e-006 (0.0021)
                        45860.7063 4.1318e-006 1.4019e-005 (0.0037)
                        41470.6679 -1.9036e-006 -5.2231e-006 1.3565e-005 (0.0037)

OQ1162 to 368SSD02 (2) -39124.4305 2.8147e-007 (0.0005)
                        45860.8553 1.4926e-007 1.3012e-006 (0.0011)
                        41470.5066 -1.2256e-007 -7.8962e-007 1.1977e-006 (0.0011)

OQ1162 to 368SSD05 (2) -33024.0533 5.4106e-007 (0.0007)
                        7395.9544 3.2084e-007 2.1718e-006 (0.0015)
                        2893.4522 -2.0773e-007 -1.3340e-006 1.9151e-006 (0.0014)

OQ1162 to 368SSD06 (1) 31.8450 2.1360e-006 (0.0015)
                        -20539.9705 3.4716e-007 6.8590e-006 (0.0026)
                        -21438.8817 -5.2086e-007 -4.5605e-006 5.3030e-006 (0.0023)

OQ1162 to 368SSD06 (2) 31.8407 4.3296e-005 (0.0066)
                        -20540.0378 -2.7238e-005 8.8812e-005 (0.0094)
                        -21438.8287 1.6631e-005 -3.1734e-005 3.1471e-005 (0.0056)

OQ1162 to AC7901 (1) 19801.6754 9.9258e-007 (0.0010)
                        -47540.1009 6.8690e-007 4.3885e-006 (0.0021)
                        -47128.7716 -3.4204e-007 -2.5478e-006 3.5435e-006 (0.0019)

OQ1162 to AC7901 (2) 19801.6625 8.4101e-007 (0.0009)
                        -47540.0626 5.0019e-007 3.4412e-006 (0.0019)
                        -47128.7524 -2.9899e-007 -2.1119e-006 2.9361e-006 (0.0017)

OQ1162 to AC7935 (1) 46510.4902 1.1175e-006 (0.0011)
                        -22561.0643 9.6176e-007 5.2731e-006 (0.0023)
                        -17207.5239 -7.5991e-007 -2.8553e-006 5.3421e-006 (0.0023)

OQ1162 to AC7935 (2) 46510.4871 8.2980e-007 (0.0009)
                        -22561.0606 4.9992e-007 3.5976e-006 (0.0019)
                        -17207.5266 -2.9948e-007 -2.2167e-006 3.1335e-006 (0.0018)

OQ1162 to AC7935 (3) 46510.4981 3.9220e-006 (0.0020)
                        -22561.0640 7.5262e-008 5.1030e-006 (0.0023)
                        -17207.5230 -2.2677e-007 -1.8683e-006 2.3185e-006 (0.0015)
    
```

 OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)

SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST - (km)	STD - (m)
368SSD01 to 368SSD02 (1)	-0.0032	0.0006	0.0089	0.159	59.8	0.0188
368SSD01 to 368SSD03 (1)	0.0248	0.0062	0.0415	0.676	72.2	0.0630
368SSD01 to 368SSD03 (2)	-0.0045	0.0007	0.0170	0.244	72.2	0.0351
368SSD01 to KFSD (1)	-0.0088	0.0066	-0.0193	0.221	100.3	0.0415
368SSD01 to KFSD (2)	0.0098	-0.0038	-0.0134	0.170	100.3	0.0486
368SSD02 to 368SSD05 (1)	-0.0893	0.0102	0.1599	3.346	54.8	0.0700
368SSD02 to 368SSD03 (1)	0.0275	0.0056	0.0253	0.758	49.9	0.0514
368SSD05 to 368SSD06 (1)	-0.0004	-0.0030	0.0689	1.390	49.7	0.0427
368SSD05 to 368SSD06 (2)	-0.0052	-0.0061	-0.0140	0.325	49.7	0.0396
AC7894 to 368SSD03 (1)	-0.0093	-0.0047	-0.0175	0.348	58.5	0.0430
AC7901 to 368SSD06 (1)	0.0031	0.0068	-0.0358	0.866	42.2	0.0281
AC7935 to 368SSD01 (2)	-0.0063	-0.0008	0.0159	0.176	97.0	0.0452
AC7935 to AC7901 (1)	-0.0108	0.0259	0.0093	0.625	47.3	0.0476
AC7935 to AC7901 (2)	0.0220	0.0020	0.0214	0.651	47.3	0.0338

AC7935 to KFSD (1)	-0.0129	0.0040	-0.0080	0.455	34.5	0.0652
AC7935 to KFSD (2)	0.0030	-0.0016	0.0085	0.265	34.5	0.0196
AC7967 to AC7901 (1)	-0.0090	-0.0040	-0.0153	0.259	70.3	0.0556
AC7967 to AC7935 (1)	0.0325	-0.0382	0.0604	0.996	78.8	0.0938
AC8003 to 368SSD01 (1)	-0.0049	-0.0034	-0.0307	0.392	79.7	0.0381
AC8003 to 368SSD03 (1)	-0.0089	-0.0025	-0.0143	0.483	35.3	0.0268
AC8003 to AC7894 (1)	0.0003	0.0043	-0.0065	0.198	39.3	0.0350
OQ1162 to 368SSD05 (1)	0.0056	-0.0079	-0.0082	0.373	34.0	0.0320
OQ1162 to 368SSD01 (1)	-0.0010	0.0044	0.0271	0.402	68.4	0.0250
OQ1162 to 368SSD02 (1)	0.1202	0.0047	-0.1972	3.157	73.2	0.0885
OQ1162 to 368SSD02 (2)	-0.0045	0.0043	0.0358	0.496	73.2	0.0261
OQ1162 to 368SSD05 (2)	0.0076	-0.0003	-0.0134	0.455	34.0	0.0336
OQ1162 to 368SSD06 (1)	0.0030	-0.0096	0.0634	2.162	29.7	0.0591
OQ1162 to 368SSD06 (2)	-0.0017	-0.0017	-0.0219	0.741	29.7	0.1999
OQ1162 to AC7901 (1)	-0.0181	0.0265	-0.0047	0.464	69.8	0.0467
OQ1162 to AC7901 (2)	-0.0002	-0.0124	0.0085	0.215	69.8	0.0420
OQ1162 to AC7935 (1)	0.0026	0.0053	0.0062	0.157	54.5	0.0535
OQ1162 to AC7935 (2)	0.0062	0.0050	0.0104	0.240	54.5	0.0430
OQ1162 to AC7935 (3)	-0.0052	0.0038	0.0065	0.168	54.5	0.0526

RMS	0.0284	0.0106	0.0514			

\$ - This session is flagged as a 3-sigma outlier

CONTROL POINT RESIDUALS (ADJUSTMENT MADE)

STA. NAME	-- RE --	-- RN --	-- RH --
	(m)	(m)	(m)
AC7894	-0.0012	-0.0010	-0.0002
AC7901	0.0000	-0.0016	-0.0024
AC7935	0.0010	0.0009	0.0009
AC7967	0.0008	-0.0004	0.0003
AC8003	-0.0036	0.0003	-0.0017
OQ1162	0.0030	0.0017	0.0031

RMS	0.0021	0.0011	0.0018

OUTPUT STATION COORDINATES (LAT/LONG/HT)

STA_ID	-- LATITUDE --	-- LONGITUDE --	-- ELLHGT --	ORTHOHGT
368SSD01	44 16 04.38891	-97 33 06.78382	474.0593	499.3552
368SSD02	44 11 03.94262	-98 17 28.79747	375.7676	401.0253
368SSD03	44 37 58.96122	-98 18 05.66949	370.3693	394.8881
368SSD05	43 42 07.73595	-98 08 51.49130	388.6436	414.8141
368SSD06	43 24 00.35765	-97 41 41.48358	375.8463	402.0193
AC7894	45 09 22.94129	-98 22 35.00332	371.6924	396.1318
AC7901	43 04 57.50468	-97 24 35.58390	381.7834	407.5541
AC7935	43 27 08.77688	-97 07 20.90758	387.4296	413.6162
AC7967	42 51 02.63635	-96 36 31.55852	328.9431	354.5871
AC8003	44 53 33.72036	-98 02 38.93507	395.9010	420.3459
KFSD	43 35 02.99664	-96 44 09.87836	406.7137	433.0136
OQ1162	43 39 58.08709	-97 43 45.64136	389.1169	415.1584

OUTPUT STATION COORDINATES (GRID)

STA_ID	- EASTING - (m)	- NORTHING - (m)	- ELLHGT - (m)	ORTHOHGT (m)
368SSD01	615578.0569	4902646.6456	474.0593	499.3552
368SSD02	556640.5261	4892601.3829	375.7676	401.0253
368SSD03	555396.8317	4942424.8609	370.3693	394.8881
368SSD05	568678.5464	4839145.0029	388.6436	414.8141
368SSD06	605687.7767	4806073.8534	375.8463	402.0193
AC7894	549016.1436	5000510.7875	371.6924	396.1318
AC7901	629435.0083	4771218.9022	381.7834	407.5541
AC7935	651907.9103	4812771.3508	387.4296	413.6162
AC7967	695381.0046	4747012.7324	328.9431	354.5871
AC8003	575476.2048	4971475.2176	395.9010	420.3459
KFSD	682773.2995	4828178.8605	406.7137	433.0136
OQ1162	602443.5728	4835576.7017	389.1169	415.1584

 OUTPUT VARIANCE/COVARIANCE

STA_ID	SE/SN/SUP (95.00 %) (m)	----- CX matrix (m)----- (not scaled by confidence level) (ECEF, XYZ cartesian)			
368SSD01	0.0123	2.7042e-005			
	0.0152	1.1993e-005	9.3309e-005		
	0.0296	-7.6524e-006	-5.3191e-005	8.8983e-005	
368SSD02	0.0143	3.6753e-005			
	0.0180	1.6487e-005	1.3119e-004		
	0.0350	-1.0948e-005	-7.4697e-005	1.2488e-004	
368SSD03	0.0158	4.6272e-005			
	0.0192	2.3304e-005	1.4763e-004		
	0.0381	-1.3068e-005	-8.9412e-005	1.5220e-004	
368SSD05	0.0171	5.2939e-005			
	0.0203	2.4885e-005	1.8586e-004		
	0.0411	-1.3132e-005	-1.0520e-004	1.6008e-004	
368SSD06	0.0182	5.9788e-005			
	0.0208	2.6999e-005	2.1220e-004		
	0.0441	-1.6381e-005	-1.2421e-004	1.7979e-004	
AC7894	0.0108	1.9561e-005			
	0.0112	7.9035e-007	2.2486e-005		
	0.0120	3.3423e-007	-1.5691e-006	2.2351e-005	
AC7901	0.0096	1.5531e-005			
	0.0103	1.0525e-006	2.0110e-005		
	0.0116	-6.1511e-008	-2.5215e-006	1.9839e-005	
AC7935	0.0094	1.5045e-005			
	0.0101	1.0747e-006	1.9820e-005		
	0.0115	-2.6364e-007	-2.4660e-006	1.9288e-005	
AC7967	0.0116	2.2406e-005			
	0.0119	5.1186e-007	2.4096e-005		
	0.0121	1.7229e-009	-4.4970e-007	2.4073e-005	
AC8003	0.0102	1.7437e-005			
	0.0108	9.9724e-007	2.1265e-005		
	0.0118	2.4823e-007	-2.1030e-006	2.1272e-005	
KFSD	0.0148	3.9817e-005			
	0.0189	2.0566e-005	1.3583e-004		
	0.0356	-1.1620e-005	-7.5082e-005	1.3252e-004	

```
OQ1162      0.0092  1.4283e-005
            0.0098  1.0528e-006  1.9235e-005
            0.0114  -2.8066e-007  -2.8134e-006  1.8524e-005
```

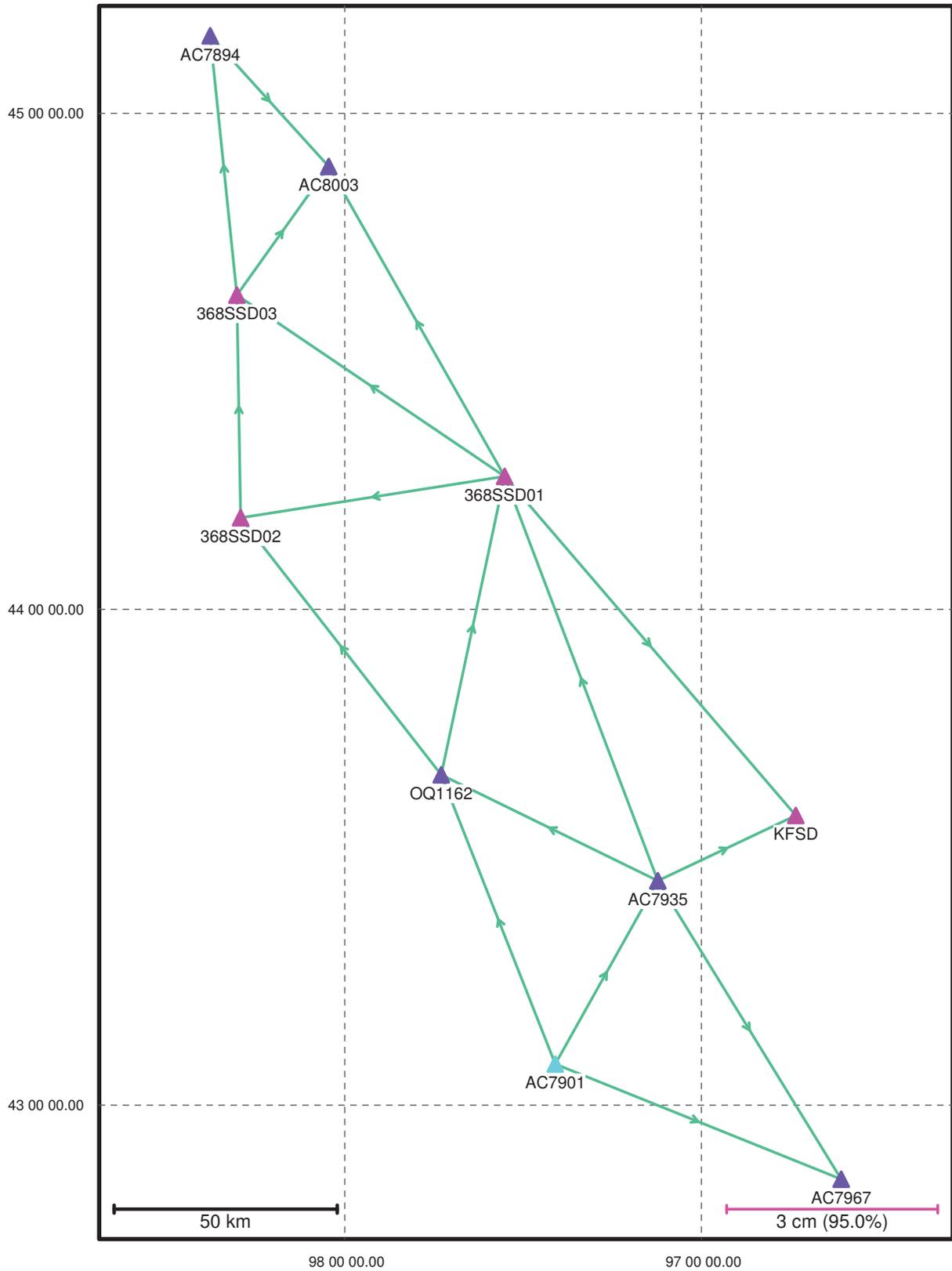
```
*****
VARIANCE FACTOR = 1.1212
```

Note: Values < 1.0 indicate statistics are pessimistic, while values > 1.0 indicate optimistic statistics. Entering this value as the network adjustment scale factor will bring variance factor to one.

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*****
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Traverse - Map

Geographic, DMS



```

*****
* NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT *
* *
* (c) Copyright NovAtel Inc., (2007) *
* *
* Version: 7.80.2517 *
* *
* FILE: C:\Projects\368 SSD 12\2_Operations\4_Control\Grafnet Project\368S
SD12-1 Uncon Network West.net
*****

```

DATE(m/d/y): Mon. 4/23/12 TIME: 13:08:09

```

DATUM:          'NAD83_CORS96'
GRID:           UTM, Zone 14
SCALE_FACTOR:   59.9540
CONFIDENCE LEVEL: 95.00 % (Scale factor is 2.4479)

```

INPUT CONTROL/CHECK POINTS

STA_ID	TYPE	-- LATITUDE --	-- LONGITUDE --	ELLHGT -	HZ-SD	V-SD
AC7894	CHK-3D	45 09 22.94132	-98 22 35.00326	371.693		
AC7901	GCP-3D	43 04 57.50473	-97 24 35.58390	381.786	0.00500	0.00500
AC7935	CHK-3D	43 27 08.77685	-97 07 20.90762	387.429		
AC7967	CHK-3D	42 51 02.63636	-96 36 31.55856	328.943		
AC8003	CHK-3D	44 53 33.72035	-98 02 38.93491	395.903		
OQ1162	CHK-3D	43 39 58.08703	-97 43 45.64149	389.114		

INPUT VECTORS

SESSION NAME	VECTOR(m)	----- Covariance (m) [unscaled] -----
	DX/DY/DZ	standard deviations in brackets
368SSD01 to 368SSD02 (1)	-59404.0202	2.9369e-007 (0.0005)
	1806.1359	-3.5105e-009 1.9012e-007 (0.0004)
	-6714.3252	-1.3352e-008 -1.1096e-007 1.3999e-007 (0.0004)
368SSD01 to 368SSD03 (1)	-55176.9621	8.9377e-006 (0.0030)
	36448.4510	-2.4273e-006 3.6273e-006 (0.0019)
	28895.2527	5.5172e-007 -2.0926e-006 3.2528e-006 (0.0018)
368SSD01 to 368SSD03 (2)	-55176.9439	1.5206e-006 (0.0012)
	36448.4381	-1.4327e-008 5.2342e-007 (0.0007)
	28895.2743	-5.6847e-008 -3.3185e-007 4.4214e-007 (0.0007)
368SSD01 to AC8003 (1)	-32115.9156	1.7214e-006 (0.0013)
	53646.5528	-7.1063e-008 5.8690e-007 (0.0008)
	49402.1211	-3.3963e-008 -3.7283e-007 4.9725e-007 (0.0007)
368SSD01 to KFSD (1)	58459.8043	3.3626e-006 (0.0018)
	-60394.2953	3.0302e-007 8.4393e-007 (0.0009)
	-54765.5467	-2.3987e-007 -5.1826e-007 6.6112e-007 (0.0008)
368SSD01 to KFSD (2)	58459.8309	1.3609e-006 (0.0012)

```
-60394.3098 -1.3446e-007 8.8962e-007 (0.0009)
-54765.5517 -8.2552e-009 -4.6043e-007 5.6120e-007 (0.0007)

368SSD02 to 368SSD03 (1) 4227.0467 7.7866e-006 (0.0028)
34642.3139 -2.1318e-006 3.1320e-006 (0.0018)
35609.5798 4.5916e-007 -1.7865e-006 2.7814e-006 (0.0017)

368SSD03 to AC7894 (1) 105.8078 3.9678e-006 (0.0020)
41472.1986 7.3625e-007 1.2091e-006 (0.0011)
41202.0767 -3.7284e-007 -6.9242e-007 9.2902e-007 (0.0010)

368SSD03 to AC8003 (1) 23061.0339 2.4158e-007 (0.0005)
17198.1175 1.2604e-007 6.8531e-007 (0.0008)
20506.8443 -6.6466e-008 -4.5958e-007 8.1595e-007 (0.0009)

AC7894 to AC8003 (1) 22955.2346 4.4827e-007 (0.0007)
-24274.0739 4.3800e-007 1.9776e-006 (0.0014)
-20695.2393 -1.4999e-007 -1.0437e-006 1.8294e-006 (0.0014)

AC7901 to AC7935 (1) 26708.8245 1.7602e-006 (0.0013)
24979.0231 -4.9363e-007 5.8684e-007 (0.0008)
29921.2640 6.9322e-008 -2.0963e-007 2.2548e-007 (0.0005)

AC7901 to AC7935 (2) 26708.8548 3.8351e-007 (0.0006)
24978.9947 -1.4497e-007 3.4682e-007 (0.0006)
29921.2532 3.1859e-008 -1.6335e-007 1.7484e-007 (0.0004)

AC7901 to AC7967 (1) 62735.5421 3.9667e-006 (0.0020)
-25366.5665 -1.3611e-006 4.2408e-006 (0.0021)
-18889.2465 4.7411e-007 -1.6737e-006 1.8650e-006 (0.0014)

AC7901 to OQ1162 (1) -19801.6706 4.1873e-006 (0.0020)
47540.1019 -7.8978e-007 1.0804e-006 (0.0010)
47128.7714 -1.5819e-008 -3.0253e-007 4.0965e-007 (0.0006)

AC7935 to 368SSD01 (1) -26230.8920 2.8878e-006 (0.0017)
66615.7784 3.6513e-007 8.1397e-007 (0.0009)
65392.3577 -2.1073e-007 -5.0142e-007 6.1694e-007 (0.0008)

AC7935 to AC7967 (1) 36026.6815 4.1571e-006 (0.0020)
-50345.5582 -1.4137e-006 4.5170e-006 (0.0021)
-48810.5046 5.3022e-007 -1.8256e-006 2.0308e-006 (0.0014)

AC7935 to KFSD (1) 32228.9154 8.5639e-008 (0.0003)
6221.4894 5.4181e-008 3.5353e-007 (0.0006)
10626.8032 -3.3312e-008 -2.1291e-007 3.4268e-007 (0.0006)

AC7935 to KFSD (2) 32228.9298 1.5860e-007 (0.0004)
6221.4720 1.5720e-007 7.2829e-007 (0.0009)
10626.8131 -5.6787e-008 -3.9848e-007 7.4759e-007 (0.0009)

AC7935 to OQ1162 (1) -46510.4890 5.3945e-006 (0.0023)
22561.0612 1.9016e-006 1.9056e-006 (0.0014)
17207.5260 -7.7023e-007 -9.5344e-007 1.0601e-006 (0.0010)

AC7935 to OQ1162 (2) -46510.4945 9.3744e-006 (0.0031)
22561.0785 -3.0954e-006 3.2611e-006 (0.0018)
17207.5045 6.6396e-007 -1.1500e-006 1.1744e-006 (0.0011)

AC7935 to OQ1162 (3) -46510.4980 3.9275e-006 (0.0020)
22561.0643 4.8026e-008 5.2216e-006 (0.0023)
17207.5223 -2.0893e-007 -1.9729e-006 2.4182e-006 (0.0016)

OQ1162 to 368SSD02 (1) -39124.4240 4.6401e-007 (0.0007)
45860.8573 1.6113e-008 3.3389e-007 (0.0006)
41470.5055 -3.7602e-008 -1.9325e-007 2.3807e-007 (0.0005)
```

OQ1162 to 368SSD01 (1) 20279.5984 4.4762e-007 (0.0007)
 44054.7232 1.4639e-008 3.2142e-007 (0.0006)
 48184.8283 -3.6506e-008 -1.8688e-007 2.2580e-007 (0.0005)

 OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)

SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST (km)	- STD - (m)
368SSD01 to 368SSD02 (1)	0.0001	0.0006	-0.0005	0.014	59.8	0.0061
368SSD01 to 368SSD03 (1)	0.0137	0.0064	0.0211	0.359	72.2	0.0308
368SSD01 to 368SSD03 (2)	-0.0061	-0.0017	-0.0013	0.089	72.2	0.0122
368SSD01 to AC8003 (1)	-0.0006	-0.0004	-0.0036	0.046	79.7	0.0130
368SSD01 to KFSD (1)	0.0139	-0.0049	0.0041	0.153	100.3	0.0171
368SSD01 to KFSD (2)	-0.0143	0.0065	-0.0004	0.156	100.3	0.0130
368SSD02 to 368SSD03 (1)	0.0247	0.0066	0.0182	0.629	49.9	0.0287
368SSD03 to AC7894 (1)	-0.0064	-0.0009	0.0056	0.146	58.5	0.0191
368SSD03 to AC8003 (1)	0.0004	0.0007	0.0021	0.062	35.3	0.0102
AC7894 to AC8003 (1)	-0.0006	0.0006	0.0072	0.186	39.3	0.0160
AC7901 to AC7935 (1)	0.0235	-0.0143	0.0039	0.589	47.3	0.0124
AC7901 to AC7935 (2)	-0.0101	0.0102	-0.0064	0.332	47.3	0.0074
AC7901 to AC7967 (1)	-0.0079	0.0040	-0.0056	0.149	70.3	0.0246
AC7901 to OQ1162 (1)	0.0275	-0.0116	0.0195	0.511	69.8	0.0184
AC7935 to 368SSD01 (1)	-0.0048	0.0018	-0.0103	0.119	97.0	0.0161
AC7935 to AC7967 (1)	0.0082	-0.0042	0.0059	0.139	78.8	0.0253
AC7935 to KFSD (1)	0.0068	-0.0020	0.0041	0.237	34.5	0.0068
AC7935 to KFSD (2)	-0.0096	0.0015	-0.0140	0.494	34.5	0.0099
AC7935 to OQ1162 (1)	-0.0045	0.0007	-0.0092	0.188	54.5	0.0224
AC7935 to OQ1162 (2)	0.0032	0.0049	0.0175	0.339	54.5	0.0288
AC7935 to OQ1162 (3)	0.0048	0.0020	-0.0053	0.136	54.5	0.0263
OQ1162 to 368SSD02 (1)	0.0011	-0.0005	0.0020	0.032	73.2	0.0079
OQ1162 to 368SSD01 (1)	-0.0010	-0.0007	0.0057	0.085	68.4	0.0077

RMS	0.0115	0.0054	0.0097			

\$ - This session is flagged as a 3-sigma outlier

 CHECK POINT RESIDUALS (East, North, Height - Local Level)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
AC7894	0.0094	0.0050	-0.0396
AC7935	0.0153	0.0127	0.0163
AC7967	-0.0251	0.0027	-0.0293
AC8003	0.0074	0.0114	-0.0398
OQ1162	0.0171	0.0191	0.0190

RMS	0.0161	0.0117	0.0304

 CONTROL POINT RESIDUALS (ADJUSTMENT MADE)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
AC7901	-0.0000	0.0000	-0.0000

RMS 0.0000 0.0000 0.0000

 OUTPUT STATION COORDINATES (LAT/LONG/HT)

STA_ID	--	LATITUDE	--	LONGITUDE	--	ELLHGT	-	ORTHOHGT
368SSD01	44	16 04.38937	-97	33 06.78289	474.0509	499.3468		
368SSD02	44	11 03.94307	-98	17 28.79631	375.7469	401.0046		
368SSD03	44	37 58.96163	-98	18 05.66859	370.3395	394.8583		
AC7894	45	09 22.94148	-98	22 35.00283	371.6531	396.0924		
AC7901	43	04 57.50473	-97	24 35.58390	381.7858	407.5565		
AC7935	43	27 08.77726	-97	07 20.90694	387.4450	413.6316		
AC7967	42	51 02.63645	-96	36 31.55967	328.9134	354.5575		
AC8003	44	53 33.72072	-98	02 38.93457	395.8629	420.3078		
KFSD	43	35 02.99700	-96	44 09.87756	406.7249	433.0248		
OQ1162	43	39 58.08765	-97	43 45.64073	389.1328	415.1743		

 OUTPUT STATION COORDINATES (GRID)

STA_ID	-	EASTING	-	NORTHING	-	ELLHGT	-	ORTHOHGT
		(m)		(m)		(m)		(m)
368SSD01	615578.0774	4902646.6601	474.0509	499.3468				
368SSD02	556640.5517	4892601.3971	375.7469	401.0046				
368SSD03	555396.8512	4942424.8738	370.3395	394.8583				
AC7894	549016.1542	5000510.7935	371.6531	396.0924				
AC7901	629435.0082	4771218.9038	381.7858	407.5565				
AC7935	651907.9244	4812771.3630	387.4450	413.6316				
AC7967	695380.9786	4747012.7348	328.9134	354.5575				
AC8003	575476.2157	4971475.2287	395.8629	420.3078				
KFSD	682773.3172	4828178.8722	406.7249	433.0248				
OQ1162	602443.5866	4835576.7192	389.1328	415.1743				

 OUTPUT VARIANCE/COVARIANCE

STA_ID	SE/SN/SUP	CX matrix (m) ²			
	(95.00 %)	(not scaled by confidence level)			
	(m)	(ECEF, XYZ cartesian)			
368SSD01	0.0202	6.7549e-005			
	0.0137	-3.8755e-006	4.5965e-005		
	0.0175	-6.3838e-007	-9.9274e-006	3.7359e-005	
368SSD02	0.0213	7.5185e-005			
	0.0140	-4.1681e-006	5.0402e-005		
	0.0185	-9.6362e-007	-1.2236e-005	4.0312e-005	
368SSD03	0.0256	1.0826e-004			
	0.0148	-6.3277e-006	6.2864e-005		
	0.0216	-1.2520e-006	-2.0582e-005	5.2648e-005	
AC7894	0.0279	1.3189e-004			
	0.0177	5.0484e-006	1.0341e-004		
	0.0289	-5.9951e-006	-4.3018e-005	8.5615e-005	
AC7901	0.0122	2.5000e-005			
	0.0122	-4.6324e-021	2.5000e-005		
	0.0122	2.9559e-021	-1.9544e-020	2.5000e-005	

```
AC7935      0.0161  4.1909e-005
            0.0129 -5.3735e-006  3.5750e-005
            0.0148  9.1366e-007 -4.5171e-006  2.9971e-005

AC7967      0.0310  1.5073e-004
            0.0194 -4.2863e-005  1.5865e-004
            0.0319  1.5210e-005 -5.3384e-005  8.4426e-005

AC8003      0.0259  1.1140e-004
            0.0151 -4.8144e-006  6.7449e-005
            0.0226 -1.9585e-006 -2.3615e-005  5.6794e-005

KFSD        0.0166  4.4912e-005
            0.0137 -3.5296e-006  4.5392e-005
            0.0176 -9.8940e-008 -1.0034e-005  3.8642e-005

OQ1162      0.0204  6.8916e-005
            0.0137 -4.4523e-006  4.4815e-005
            0.0170 -4.8673e-007 -8.4068e-006  3.5551e-005
```

```
*****
VARIANCE FACTOR = 1.7487
```

Note: Values < 1.0 indicate statistics are pessimistic, while values > 1.0 indicate optimistic statistics. Entering this value as the network adjustment scale factor will bring variance factor to one.

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*****
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Appendix B

NGS Datasheets, Set Point Station Descriptions and Photos

AC7894 CBN - This is a Cooperative Base Network Control Station.
AC7894 DESIGNATION - 20 328.35
AC7894 PID - AC7894
AC7894 STATE/COUNTY- SD/SPINK
AC7894 USGS QUAD - MELLETTE (1954)
AC7894
AC7894 *CURRENT SURVEY CONTROL
AC7894

AC7894*	NAD 83(2007)-	45 09 22.94133(N)	098 22 35.00326(W)	ADJUSTED
AC7894*	NAVD 88 -	396.1 (meters)	1300. (feet)	GPS OBS

AC7894

AC7894	EPOCH DATE -	2002.00		
AC7894	X -	-656,347.330 (meters)		COMP
AC7894	Y -	-4,457,484.813 (meters)		COMP
AC7894	Z -	4,499,883.413 (meters)		COMP
AC7894	LAPLACE CORR-	-1.78 (seconds)		DEFLEC09
AC7894	ELLIP HEIGHT-	371.693 (meters)	(02/10/07)	ADJUSTED
AC7894	GEOID HEIGHT-	-24.44 (meters)		GEOID09

AC7894
AC7894 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AC7894 Type PID Designation North East Ellip
AC7894 -----
AC7894 NETWORK AC7894 20 328.35 0.88 0.63 2.67
AC7894 -----
AC7894

AC7894.The horizontal coordinates were established by GPS observations
AC7894.and adjusted by the National Geodetic Survey in February 2007.
AC7894
AC7894.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC7894.See [National Readjustment](#) for more information.
AC7894
AC7894.The horizontal coordinates are valid at the epoch date displayed above
AC7894.which is a decimal equivalence of Year/Month/Day.
AC7894
AC7894.The orthometric height was determined by GPS observations and a
AC7894.high-resolution geoid model.
AC7894
AC7894.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC7894
AC7894.The Laplace correction was computed from DEFLEC09 derived deflections.
AC7894
AC7894.The ellipsoidal height was determined by GPS observations
AC7894.and is referenced to NAD 83.
AC7894
AC7894.The geoid height was determined by GEOID09.
AC7894

AC7894;		North	East	Units	Scale	Factor	Converg.
AC7894;SPC	SD N	- 148,299.901	727,651.719	MT	0.99994079	+1 08	56.7
AC7894;SPC	SD N	- 486,547.26	2,387,304.01	sFT	0.99994079	+1 08	56.7
AC7894;UTM	14	- 5,000,510.788	549,016.145	MT	0.99962954	+0 26	31.8

AC7894

AC7894! - Elev Factor x Scale Factor = Combined Factor
AC7894!SPC SD N - 0.99994173 x 0.99994079 = 0.99988252
AC7894!UTM 14 - 0.99994173 x 0.99962954 = 0.99957129

AC7894

AC7894 SUPERSEDED SURVEY CONTROL

AC7894

AC7894 ELLIP H (04/15/04) 371.710 (m) GP() 2 1

AC7894 NAD 83(1996)- 45 09 22.94081(N) 098 22 35.00271(W) AD() B

AC7894 ELLIP H (04/18/97) 371.736 (m) GP() 4 1

AC7894

AC7894.Superseded values are not recommended for survey control.

AC7894.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AC7894.[See file dsdata.txt](#) to determine how the superseded data were derived.

AC7894

AC7894_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TNR4901600510(NAD 83)

AC7894

AC7894_MARKER: Z = SEE DESCRIPTION

AC7894_SETTING: 47 = GALVANIZED STEEL PIPE W/O SLEEVE (10 FT.+)

AC7894_STAMPING: 20-328.35 1995

AC7894_MARK LOGO: NGS

AC7894_PROJECTION: FLUSH

AC7894_MAGNETIC: P = MARKER IS A STEEL PIPE

AC7894_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

AC7894_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AC7894+SATELLITE: SATELLITE OBSERVATIONS - July 09, 1996

AC7894_ROD/PIPE-DEPTH: 6.4 meters

AC7894

AC7894 HISTORY	- Date	Condition	Report By
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AC7894 HISTORY	- 1995	MONUMENTED	SDDT
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AC7894 HISTORY	- 19960709	GOOD	NGS
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AC7894

AC7894 STATION DESCRIPTION

AC7894

AC7894'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996 (DFC)

AC7894'THE STATION IS LOCATED ABOUT 6.0 MI (9.7 KM) EAST OF MELLETTE AND 2.4

AC7894'MI (3.9 KM) WEST OF BRENTFORD, ON STATE HIGHWAY 20. OWNERSHIP--THE

AC7894'STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM THE JUNCTION OF

AC7894'STATE HIGHWAY 20 AND COUNTY ROAD 11, 0.1 MI (0.2 KM) WEST OF

AC7894'BRENTFORD, GO WEST ON STATE HIGHWAY 20 FOR 2.3 MI (3.7 KM) TO THE

AC7894'STATION ON THE LEFT. THE STATION IS A PUNCH POINT ON TOP OF A

AC7894'STAINLESS STEEL RIVET FASTENED TO A METAL PIPE CAP ATTACHED TO A 1

AC7894'1/2-INCH GALVANIZED STEEL PIPE. LOCATED 21.9 M (71.9 FT) SOUTH OF THE

AC7894'HIGHWAY CENTERLINE, 7.5 M (24.6 FT) SOUTHEAST OF THE EAST END OF A

AC7894'CONCRETE PIPE CULVERT, 6.7 M (22.0 FT) EAST OF THE CENTER OF A FIELD

AC7894'ENTRANCE, 0.3 M (1.0 FT) SOUTH OF A METAL GUARD POST, AND 0.3 M (1.0

AC7894'FT) NORTH OF A WITNESS POST. NOTE--ACCESS TO THE DATUM POINT IS

AC7894'THROUGH A 5-INCH LOGO CAP.

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AC7901 CBN - This is a Cooperative Base Network Control Station.
AC7901 DESIGNATION - 46 334.00
AC7901 PID - AC7901
AC7901 STATE/COUNTY- SD/YANKTON
AC7901 USGS QUAD - JAMESVILLE (1957)
AC7901
AC7901 *CURRENT SURVEY CONTROL
AC7901
AC7901* NAD 83(2007)- 43 04 57.50474(N) 097 24 35.58390(W) ADJUSTED
AC7901* NAVD 88 - 407.6 (meters) 1337. (feet) GPS OBS
AC7901
AC7901 EPOCH DATE - 2002.00
AC7901 X - -601,754.117 (meters) COMP
AC7901 Y - -4,627,000.212 (meters) COMP
AC7901 Z - 4,334,472.428 (meters) COMP
AC7901 LAPLACE CORR- 1.04 (seconds) DEFLEC09
AC7901 ELLIP HEIGHT- 381.786 (meters) (02/10/07) ADJUSTED
AC7901 GEOID HEIGHT- -25.77 (meters) GEOID09
AC7901
AC7901 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AC7901 Type PID Designation North East Ellip
AC7901 -----
AC7901 NETWORK AC7901 46 334.00 0.69 0.51 2.37
AC7901 -----
AC7901
AC7901.The horizontal coordinates were established by GPS observations
AC7901.and adjusted by the National Geodetic Survey in February 2007.
AC7901
AC7901.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC7901.See National Readjustment for more information.
AC7901
AC7901.The horizontal coordinates are valid at the epoch date displayed above
AC7901.which is a decimal equivalence of Year/Month/Day.
AC7901
AC7901.The orthometric height was determined by GPS observations and a
AC7901.high-resolution geoid model.
AC7901
AC7901.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC7901
AC7901.The Laplace correction was computed from DEFLEC09 derived deflections.
AC7901
AC7901.The ellipsoidal height was determined by GPS observations
AC7901.and is referenced to NAD 83.
AC7901
AC7901.The geoid height was determined by GEOID09.
AC7901
AC7901; North East Units Scale Factor Converg.
AC7901;SPC SD S - 87,430.640 838,000.148 MT 0.99995030 +2 01 00.3
AC7901;SPC SD S - 286,845.36 2,749,338.82 sFT 0.99995030 +2 01 00.3
AC7901;UTM 14 - 4,771,218.904 629,435.008 MT 0.99980610 +1 05 10.6
AC7901
AC7901! - Elev Factor x Scale Factor = Combined Factor
AC7901!SPC SD S - 0.99994013 x 0.99995030 = 0.99989043
AC7901!UTM 14 - 0.99994013 x 0.99980610 = 0.99974624
AC7901

```

AC7901 SUPERSEDED SURVEY CONTROL
 AC7901
 AC7901 ELLIP H (04/15/04) 381.784 (m) GP() 2 1
 AC7901 NAD 83(1996)- 43 04 57.50452(N) 097 24 35.58353(W) AD() B
 AC7901 ELLIP H (04/18/97) 381.816 (m) GP() 4 1

AC7901
 AC7901.Superseded values are not recommended for survey control.
 AC7901.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 AC7901.[See file dsdata.txt](#) to determine how the superseded data were derived.

AC7901
 AC7901_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPN2943571218(NAD 83)
 AC7901

AC7901_MARKER: Z = SEE DESCRIPTION
 AC7901_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)
 AC7901_STAMPING: 46-334.00 1995
 AC7901_PROJECTION: FLUSH
 AC7901_MAGNETIC: P = MARKER IS A STEEL PIPE
 AC7901_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 AC7901_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 AC7901+SATELLITE: SATELLITE OBSERVATIONS - September 25, 1996
 AC7901_ROD/PIPE-DEPTH: 6.4 meters
 AC7901_SLEEVE-DEPTH : 1.8 meters

AC7901

AC7901	HISTORY	- Date	Condition	Report By
AC7901	HISTORY	- 1994	MONUMENTED	SDDT
AC7901	HISTORY	- 19960925	GOOD	SDDT

AC7901
 AC7901 STATION DESCRIPTION
 AC7901
 AC7901'DESCRIBED BY SD DEPT OF TRANSP 1996 (DFC)
 AC7901'THE STATION IS LOCATED 9.0 MI (14.5 KM) NORTHEAST OF LESTERVILLE AND
 AC7901'5.0 MI (8.0 KM) WEST OF MAYFIELD, ON STATE HIGHWAY 46. OWNERSHIP--THE
 AC7901'STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM THE JUNCTION OF
 AC7901'STATE HIGHWAY 46 AND A NORTH/SOUTH PAVED COUNTY ROAD IN MAYFIELD, GO
 AC7901'WEST ON STATE HIGHWAY 46 FOR 4.8 MI (7.7 KM) TO STATION ON THE LEFT.
 AC7901'THE STATION IS A PUNCH POINT ON TOP OF A STAINLESS STEEL RIVET
 AC7901'FASTENED TO A METAL PIPE CAP ATTACHED TO A 1 1/2-INCH GALVANIZED STEEL
 AC7901'PIPE. LOCATED 87.0 FT (26.5 M) SOUTH OF CENTER OF THE HIGHWAY, 54.0
 AC7901'FT (16.5 M) SOUTH OF MILEPOST 334, 2.0 FT (0.6 M) NORTH OF A WITNESS
 AC7901'POST AND FENCE, AND 1.0 FT (0.3 M) SOUTH OF A METAL GUARD POST.
 AC7901'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN
 AC7901'A 4-INCH PVC CAP.

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AC7935 CBN - This is a Cooperative Base Network Control Station.
AC7935 DESIGNATION - 19 057.75
AC7935 PID - AC7935
AC7935 STATE/COUNTY- SD/TURNER
AC7935 USGS QUAD - PARKER NE (1968)
AC7935
AC7935 *CURRENT SURVEY CONTROL
AC7935
AC7935* NAD 83(2007)- 43 27 08.77686(N) 097 07 20.90762(W) ADJUSTED
AC7935* NAVD 88 - 413.6 (meters) 1357. (feet) GPS OBS
AC7935
AC7935 EPOCH DATE - 2002.00
AC7935 X - -575,045.286 (meters) COMP
AC7935 Y - -4,602,021.200 (meters) COMP
AC7935 Z - 4,364,393.664 (meters) COMP
AC7935 LAPLACE CORR- -1.58 (seconds) DEFLEC09
AC7935 ELLIP HEIGHT- 387.429 (meters) (02/10/07) ADJUSTED
AC7935 GEOID HEIGHT- -26.19 (meters) GEOID09
AC7935
AC7935 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AC7935 Type PID Designation North East Ellip
AC7935 -----
AC7935 NETWORK AC7935 19 057.75 0.71 0.57 2.45
AC7935 -----
AC7935
AC7935.The horizontal coordinates were established by GPS observations
AC7935.and adjusted by the National Geodetic Survey in February 2007.
AC7935
AC7935.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC7935.See National Readjustment for more information.
AC7935
AC7935.The horizontal coordinates are valid at the epoch date displayed above
AC7935.which is a decimal equivalence of Year/Month/Day.
AC7935
AC7935.The orthometric height was determined by GPS observations and a
AC7935.high-resolution geoid model.
AC7935
AC7935.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC7935
AC7935.The Laplace correction was computed from DEFLEC09 derived deflections.
AC7935
AC7935.The ellipsoidal height was determined by GPS observations
AC7935.and is referenced to NAD 83.
AC7935
AC7935.The geoid height was determined by GEOID09.
AC7935
AC7935; North East Units Scale Factor Converg.
AC7935;SPC SD S - 129,344.794 859,799.520 MT 0.99991105 +2 12 54.1
AC7935;SPC SD S - 424,358.71 2,820,858.93 sFT 0.99991105 +2 12 54.1
AC7935;UTM 14 - 4,812,771.350 651,907.909 MT 0.99988386 +1 17 29.5
AC7935
AC7935! - Elev Factor x Scale Factor = Combined Factor
AC7935!SPC SD S - 0.99993925 x 0.99991105 = 0.99985030
AC7935!UTM 14 - 0.99993925 x 0.99988386 = 0.99982312
AC7935

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AC7935 SUPERSEDED SURVEY CONTROL
AC7935
AC7935 ELLIP H (04/15/04) 387.445 (m) GP() 2 1
AC7935 NAD 83(1996)- 43 27 08.77649(N) 097 07 20.90702(W) AD() B
AC7935 ELLIP H (04/18/97) 387.460 (m) GP() 4 1
AC7935

AC7935.Superseded values are not recommended for survey control.
AC7935.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AC7935.[See file dsdata.txt](#) to determine how the superseded data were derived.

AC7935
AC7935_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPP5190712771(NAD 83)
AC7935

AC7935_MARKER: Z = SEE DESCRIPTION
AC7935_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)
AC7935_STAMPING: 19-57.75 1995
AC7935_MARK LOGO: NGS
AC7935_PROJECTION: FLUSH
AC7935_MAGNETIC: P = MARKER IS A STEEL PIPE
AC7935_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AC7935_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AC7935+SATELLITE: SATELLITE OBSERVATIONS - February 04, 2005
AC7935_ROD/PIPE-DEPTH: 6.4 meters
AC7935_SLEEVE-DEPTH : 1.8 meters

AC7935
AC7935 HISTORY - Date Condition Report By
AC7935 HISTORY - 1995 MONUMENTED SDDT
AC7935 HISTORY - 19960927 GOOD NGS
AC7935 HISTORY - 20050204 GOOD INDIV

AC7935
AC7935 STATION DESCRIPTION
AC7935

AC7935'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996 (DFC)
AC7935'THE STATION IS LOCATED ABOUT 14.7 MI (23.7 KM) SOUTH-SOUTHWEST OF
AC7935'PUMPKIN CENTER, 3.0 MI (4.8 KM) NORTH OF PARKER, AND 3.5 MI (5.6 KM)
AC7935'SOUTH OF THE TURNER/MINNEHAHA COUNTY LINE, ON STATE HIGHWAY 19.
AC7935'OWNERSHIP--THE STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM THE
AC7935'JUNCTION OF STATE HIGHWAYS 19 AND 44 ON THE EAST SIDE OF PARKER, GO
AC7935'NORTH ON U.S. HIGHWAY 19 FOR 3.7 KM (2.30 MI) TO THE STATION ON THE
AC7935'LEFT. THE STATION IS A PUNCH POINT ON TOP OF A STAINLESS STEEL RIVET
AC7935'FASTENED TO A METAL PIPE CAP ATTACHED TO A 1 1/2-INCH GALVANIZED STEEL
AC7935'PIPE. LOCATED 74.0 FT (22.6 M) WEST OF THE HIGHWAY CENTER, 15.0 FT
AC7935'(4.6 M) NORTH OF THE CENTER OF A FIELD ENTRANCE ROAD, 2.0 FT (0.6 M)
AC7935'EAST OF A WITNESS POST AND FENCE, AND 1.0 FT (0.3 M) WEST OF A METAL
AC7935'GUARD POST. NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO
AC7935'CAP AND THEN A 4-INCH PVC CAP.

AC7935
AC7935 STATION RECOVERY (2005)
AC7935
AC7935'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2005
AC7935'RECOVERED IN GOOD CONDITION.



AC7967 *****

AC7967 CBN - This is a Cooperative Base Network Control Station.
AC7967 DESIGNATION - 48 381.53
AC7967 PID - AC7967
AC7967 STATE/COUNTY- SD/UNION
AC7967 USGS QUAD - JEFFERSON (1994)

AC7967
AC7967 *CURRENT SURVEY CONTROL

AC7967* NAD 83(2007)- 42 51 02.63637(N) 096 36 31.55856(W) ADJUSTED
AC7967* NAVD 88 - 354.6 (meters) 1163. (feet) GPS OBS

AC7967 EPOCH DATE - 2002.00
AC7967 X - -539,018.560 (meters) COMP
AC7967 Y - -4,652,366.797 (meters) COMP
AC7967 Z - 4,315,583.199 (meters) COMP
AC7967 LAPLACE CORR- -3.31 (seconds) DEFLEC09
AC7967 ELLIP HEIGHT- 328.943 (meters) (02/10/07) ADJUSTED
AC7967 GEOID HEIGHT- -25.64 (meters) GEOID09

AC7967 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AC7967 Type PID Designation North East Ellip
AC7967 NETWORK AC7967 48 381.53 0.59 0.45 1.84
AC7967 -----

AC7967.The horizontal coordinates were established by GPS observations
AC7967.and adjusted by the National Geodetic Survey in February 2007.

AC7967
AC7967.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC7967.See [National Readjustment](#) for more information.

AC7967
AC7967.The horizontal coordinates are valid at the epoch date displayed above
AC7967.which is a decimal equivalence of Year/Month/Day.

AC7967
AC7967.The orthometric height was determined by GPS observations and a
AC7967.high-resolution geoid model.

AC7967
AC7967.The X, Y, and Z were computed from the position and the ellipsoidal ht.

AC7967
AC7967.The Laplace correction was computed from DEFLEC09 derived deflections.

AC7967
AC7967.The ellipsoidal height was determined by GPS observations
AC7967.and is referenced to NAD 83.

AC7967
AC7967.The geoid height was determined by GEOID09.

AC7967
AC7967;
AC7967;SPC SD S - North East Units Scale Factor Converg.
AC7967;SPC SD S - 64,304.168 904,335.667 MT 0.99999593 +2 34 09.8
AC7967;SPC SD S - 210,971.26 2,966,974.60 sFT 0.99999593 +2 34 09.8
AC7967;UTM 14 - 4,747,012.733 695,381.004 MT 1.00006965 +1 37 36.4
AC7967

AC7967! - Elev Factor x Scale Factor = Combined Factor
AC7967!SPC SD S - 0.99994842 x 0.99999593 = 0.99994435
AC7967!UTM 14 - 0.99994842 x 1.00006965 = 1.00001806

AC7967

AC7967 SUPERSEDED SURVEY CONTROL

AC7967

AC7967 ELLIP H (04/15/04) 328.940 (m) GP() 2 1

AC7967 NAD 83(1996)- 42 51 02.63617(N) 096 36 31.55819(W) AD() B

AC7967 ELLIP H (04/18/97) 328.982 (m) GP() 4 1

AC7967

AC7967.Superseded values are not recommended for survey control.

AC7967.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AC7967.[See file dsdata.txt](#) to determine how the superseded data were derived.

AC7967

AC7967_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPN9538147012(NAD 83)

AC7967

AC7967_MARKER: Z = SEE DESCRIPTION

AC7967_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)

AC7967_STAMPING: 48-381.53 1995

AC7967_MARK LOGO: NGS

AC7967_PROJECTION: FLUSH

AC7967_MAGNETIC: P = MARKER IS A STEEL PIPE

AC7967_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

AC7967_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AC7967+SATELLITE: SATELLITE OBSERVATIONS - September 28, 1996

AC7967_ROD/PIPE-DEPTH: 6.4 meters

AC7967_SLEEVE-DEPTH : 1.8 meters

AC7967

AC7967 HISTORY	- Date	Condition	Report By
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AC7967 HISTORY	- 1994	MONUMENTED	SDDT
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AC7967 HISTORY	- 19960928	GOOD	NGS
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AC7967 HISTORY	- 19961205	GOOD	NGS
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AC7967

AC7967 STATION DESCRIPTION

AC7967

AC7967'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996 (DFC)

AC7967'THE STATION IS LOCATED ABOUT 9.5 MI (15.3 KM) EAST OF INTERSTATE

AC7967'HIGHWAY 29 EXIT 31, 7.0 MI (11.3 KM) EAST OF SPINK, AND 3.0 MI (4.8

AC7967'KM) WEST OF THE SOUTH DAKOTA/MINNESOTA STATE LINE, ON STATE HIGHWAY

AC7967'48. OWNERSHIP--THE STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM

AC7967'THE JUNCTION OF STATE HIGHWAY 48 AND COUNTY ROAD 21 IN SPINK, GO EAST

AC7967'ON STATE HIGHWAY 48 FOR 7.2 MI (11.6 KM) TO THE STATION ON THE RIGHT.

AC7967'THE STATION IS A PUNCH POINT ON TOP OF A STAINLESS STEEL RIVET

AC7967'FASTENED TO A METAL PIPE CAP ATTACHED TO A 1 1/2-INCH GALVANIZED STEEL

AC7967'PIPE. LOCATED 1.0 MI (1.6 KM) EAST OF THE JUNCTION OF STATE HIGHWAY

AC7967'11 NORTH, 0.13 MI (0.21 KM) WEST OF THE WEST END OF A BRIDGE, 85.5 FT

AC7967'(26.1 M) SOUTH OF THE HIGHWAY CENTER, 1.2 FT (0.4 M) NORTH OF A

AC7967'WITNESS POST AND FENCE, AND 1.0 FT (0.3 M) SOUTH OF METAL GUARD POST.

AC7967'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN

AC7967'A 4-INCH PVC CAP.

AC7967

AC7967 STATION RECOVERY (1996)

AC7967

AC7967'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (JDS)

AC7967'RECOVERED AS DESCRIBED--FULL DESCRIPTION SUBMITTED WITH SOUTH DAKOTA

AC7967'HARN PROJECT.

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AC7987 *****
AC7987 CBN - This is a Cooperative Base Network Control Station.
AC7987 DESIGNATION - A 467
AC7987 PID - AC7987
AC7987 STATE/COUNTY- SD/CODINGTON
AC7987 USGS QUAD - WATERTOWN EAST (1969)
AC7987
AC7987 *CURRENT SURVEY CONTROL
AC7987
AC7987* NAD 83(2007)- 44 53 25.34837(N) 097 04 33.94998(W) ADJUSTED
AC7987* NAVD 88 - 527.287 (meters) 1729.94 (feet) ADJUSTED
AC7987
AC7987 EPOCH DATE - 2002.00
AC7987 X - -557,614.661 (meters) COMP
AC7987 Y - -4,492,076.061 (meters) COMP
AC7987 Z - 4,479,080.097 (meters) COMP
AC7987 LAPLACE CORR- -0.89 (seconds) DEFLEC09
AC7987 ELLIP HEIGHT- 502.205 (meters) (02/10/07) ADJUSTED
AC7987 GEOID HEIGHT- -25.09 (meters) GEOID09
AC7987 DYNAMIC HT - 527.209 (meters) 1729.68 (feet) COMP
AC7987
AC7987 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AC7987 Type PID Designation North East Ellip
AC7987 -----
AC7987 NETWORK AC7987 A 467 0.71 0.53 2.33
AC7987 -----
AC7987 MODELED GRAV- 980,453.5 (mgal) NAVD 88
AC7987
AC7987 VERT ORDER - FIRST CLASS II
AC7987
AC7987.The horizontal coordinates were established by GPS observations
AC7987.and adjusted by the National Geodetic Survey in February 2007.
AC7987
AC7987.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC7987.See National Readjustment for more information.
AC7987
AC7987.The horizontal coordinates are valid at the epoch date displayed above
AC7987.which is a decimal equivalence of Year/Month/Day.
AC7987
AC7987.The orthometric height was determined by differential leveling and
AC7987.adjusted in July 1998.
AC7987
AC7987.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC7987
AC7987.The Laplace correction was computed from DEFLEC09 derived deflections.
AC7987
AC7987.The ellipsoidal height was determined by GPS observations
AC7987.and is referenced to NAD 83.
AC7987
AC7987.The geoid height was determined by GEOID09.
AC7987
AC7987.The dynamic height is computed by dividing the NAVD 88
AC7987.geopotential number by the normal gravity value computed on the
AC7987.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AC7987.degrees latitude (g = 980.6199 gals.).
AC7987

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AC7987.The modeled gravity was interpolated from observed gravity values.

AC7987

AC7987;		North	East	Units	Scale Factor	Converg.
AC7987;SPC SD N	-	121,631.084	830,916.304	MT	0.99994303	+2 04 09.7
AC7987;SPC SD N	-	399,051.31	2,726,097.91	sFT	0.99994303	+2 04 09.7
AC7987;UTM 14	-	4,972,572.989	651,921.990	MT	0.99988381	+1 21 29.0

AC7987

AC7987!	-	Elev Factor	x	Scale Factor	=	Combined Factor
AC7987!SPC SD N	-	0.99992127	x	0.99994303	=	0.99986430
AC7987!UTM 14	-	0.99992127	x	0.99988381	=	0.99980509

AC7987

AC7987

SUPERSEDED SURVEY CONTROL

AC7987

AC7987	ELLIP H (04/15/04)	502.228	(m)		GP()	2 1
AC7987	NAD 83(1996)-	44 53 25.34788(N)		097 04 33.94949(W)	AD()	B
AC7987	ELLIP H (04/18/97)	502.246	(m)		GP()	4 1
AC7987	NAVD 88 (04/18/97)	527.3	(m)	1730.	(f) GPS OBS	

AC7987

AC7987.Superseded values are not recommended for survey control.

AC7987.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AC7987.[See file dsdata.txt](#) to determine how the superseded data were derived.

AC7987

AC7987_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPQ5192172572(NAD 83)

AC7987

AC7987_MARKER: I = METAL ROD

AC7987_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)

AC7987_STAMPING: A 467 1995

AC7987_MARK LOGO: NGS

AC7987_PROJECTION: FLUSH

AC7987_MAGNETIC: I = MARKER IS A STEEL ROD

AC7987_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

AC7987_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AC7987+SATELLITE: SATELLITE OBSERVATIONS - October 11, 1996

AC7987_ROD/PIPE-DEPTH: 12.3 meters

AC7987_SLEEVE-DEPTH : 0.9 meters

AC7987

AC7987	HISTORY	-	Date	Condition	Report By
AC7987	HISTORY	-	1995	MONUMENTED	NGS
AC7987	HISTORY	-	19960612	GOOD	NGS
AC7987	HISTORY	-	19961011	GOOD	CHANCE

AC7987

AC7987

STATION DESCRIPTION

AC7987

AC7987'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996 (DFC)

AC7987'THE STATION IS LOCATED ABOUT 7.0 MI (11.3 KM) WEST OF KRAZENBURG, 6.6

AC7987'MI (10.6 KM) SOUTH-SOUTHEAST OF RAUVILLE, AND 2.0 MI (3.2 KM) EAST OF

AC7987'WATERTOWN, ON U.S. HIGHWAY 212. OWNERSHIP--THE STATE OF SOUTH DAKOTA.

AC7987'TO REACH THE STATION FROM THE JUNCTION OF INTERSTATE HIGHWAY 29 AND

AC7987'U.S. HIGHWAY 212, ABOUT 3.0 MI (4.8 KM) EAST OF WATERTOWN, GO WEST ON

AC7987'U.S. HIGHWAY 212 FOR 0.95 MI (1.53 KM) TO A DRIVEWAY AND THE STATION

AC7987'ON THE RIGHT. THE STATION IS 115.5 FT (35.2 M) NORTH OF THE HIGHWAY

AC7987'CENTERLINE, 26.5 FT (8.1 M) WEST OF A SIGN (ELMIRA 33-350), 20.5 FT

AC7987'(6.2 M) NORTHWEST OF THE NORTHWEST CORNER OF A CULVERT UNDER THE

AC7987'DRIVEWAY, AND 1.0 FT (0.3 M) SOUTH OF A WITNESS POST AND A FENCE.

AC7987'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP.

AC7987

AC7987

STATION RECOVERY (1996)

AC7987

AC7987'RECOVERY NOTE BY JE CHANCE AND ASSOCIATES 1996 (LH)
AC7987'1.5 KM (0.95 MI) WESTERLY ALONG U.S. HIGHWAY 212 FROM THE JUNCTION OF
AC7987'INTERSTATE HIGHWAY 29 IN WATERTOWN (EXIT 177), 348.0 M (1141.7 FT)
AC7987'WEST OF MILEPOST 379, 31.9 M (104.7 FT) NORTH OF THE CENTERLINE OF THE
AC7987'WESTBOUND LANES OF THE HIGHWAY, 10.1 M (33.1 FT) NORTHWEST OF THE
AC7987'CENTER OF A DRIVEWAY, 6.0 M (19.7 FT) WEST OF THE CENTER OF A FIELD
AC7987'ENTRANCE AND GATE, 0.4 M (1.3 FT) BELOW THE LEVEL OF THE HIGHWAY, AND
AC7987'0.3 M (1.0 FT) SOUTH OF A WITNESS POST AND FENCE. NOTE--ACCESS TO THE
AC7987'DATUM POINT IS THROUGH A 5-INCH LOGO CAP. THE SLEEVE DEPTH DOES NOT
AC7987'MEET THE SPECIFICATIONS FOR A CLASS A MARK.



AC8003 CBN - This is a Cooperative Base Network Control Station.
AC8003 DESIGNATION - K 468
AC8003 PID - AC8003
AC8003 STATE/COUNTY- SD/SPINK
AC8003 USGS QUAD - DOLAND (1971)
AC8003
AC8003 *CURRENT SURVEY CONTROL
AC8003
AC8003* NAD 83(2007)- 44 53 33.72036(N) 098 02 38.93491(W) ADJUSTED
AC8003* NAVD 88 - 420.348 (meters) 1379.09 (feet) ADJUSTED
AC8003
AC8003 EPOCH DATE - 2002.00
AC8003 X - -633,392.095 (meters) COMP
AC8003 Y - -4,481,758.897 (meters) COMP
AC8003 Z - 4,479,188.175 (meters) COMP
AC8003 LAPLACE CORR- -1.11 (seconds) DEFLEC09
AC8003 ELLIP HEIGHT- 395.903 (meters) (02/10/07) ADJUSTED
AC8003 GEOID HEIGHT- -24.45 (meters) GEOID09
AC8003 DYNAMIC HT - 420.301 (meters) 1378.94 (feet) COMP
AC8003
AC8003 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AC8003 Type PID Designation North East Ellip
AC8003 -----
AC8003 NETWORK AC8003 K 468 0.98 0.63 2.94
AC8003 -----
AC8003 MODELED GRAV- 980,492.2 (mgal) NAVD 88
AC8003
AC8003 VERT ORDER - FIRST CLASS II
AC8003
AC8003.The horizontal coordinates were established by GPS observations
AC8003.and adjusted by the National Geodetic Survey in February 2007.
AC8003
AC8003.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC8003.See [National Readjustment](#) for more information.
AC8003
AC8003.The horizontal coordinates are valid at the epoch date displayed above
AC8003.which is a decimal equivalence of Year/Month/Day.
AC8003
AC8003.The orthometric height was determined by differential leveling and
AC8003.adjusted in July 1998.
AC8003
AC8003.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC8003
AC8003.The Laplace correction was computed from DEFLEC09 derived deflections.
AC8003
AC8003.The ellipsoidal height was determined by GPS observations
AC8003.and is referenced to NAD 83.
AC8003
AC8003.The geoid height was determined by GEOID09.
AC8003
AC8003.The dynamic height is computed by dividing the NAVD 88
AC8003.geopotential number by the normal gravity value computed on the
AC8003.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AC8003.degrees latitude (g = 980.6199 gals.).
AC8003

AC8003.The modeled gravity was interpolated from observed gravity values.

AC8003

AC8003;		North	East	Units	Scale Factor	Converg.
AC8003;SPC SD N	-	119,585.158	754,476.404	MT	0.99994292	+1 23 03.2
AC8003;SPC SD N	-	392,338.97	2,475,311.34	sFT	0.99994292	+1 23 03.2
AC8003;UTM 14	-	4,971,475.217	575,476.208	MT	0.99967005	+0 40 28.8

AC8003

AC8003! - Elev Factor x Scale Factor = Combined Factor

AC8003!SPC SD N - 0.99993793 x 0.99994292 = 0.99988085

AC8003!UTM 14 - 0.99993793 x 0.99967005 = 0.99960800

AC8003

AC8003

SUPERSEDED SURVEY CONTROL

AC8003

AC8003 ELLIP H (04/15/04) 395.917 (m) GP() 2 1

AC8003 NAD 83(1996)- 44 53 33.71985(N) 098 02 38.93437(W) AD() B

AC8003 ELLIP H (04/18/97) 395.948 (m) GP() 4 1

AC8003 NAVD 88 (04/18/97) 420.3 (m) 1379. (f) GPS OBS

AC8003

AC8003.Superseded values are not recommended for survey control.

AC8003.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AC8003.[See file dsdata.txt](#) to determine how the superseded data were derived.

AC8003

AC8003_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TNQ7547671475(NAD 83)

AC8003

AC8003_MARKER: F = FLANGE-ENCASED ROD

AC8003_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)

AC8003_STAMPING: K 468 1995

AC8003_MARK LOGO: NGS

AC8003_PROJECTION: FLUSH

AC8003_MAGNETIC: I = MARKER IS A STEEL ROD

AC8003_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

AC8003_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AC8003+SATELLITE: SATELLITE OBSERVATIONS - August 25, 1999

AC8003_ROD/PIPE-DEPTH: 4.1 meters

AC8003_SLEEVE-DEPTH : 0.9 meters

AC8003

AC8003	HISTORY	- Date	Condition	Report By
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AC8003	HISTORY	- 1995	MONUMENTED	NGS
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AC8003	HISTORY	- 19951011	GOOD	NGS
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AC8003	HISTORY	- 19990825	GOOD	NGS
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AC8003

AC8003 STATION DESCRIPTION

AC8003

AC8003'DESCRIBED BY NATIONAL GEODETIC SURVEY 1995 (GAS)

AC8003'4.6 KM (2.85 MI) EASTERLY ALONG U.S. HIGHWAY 212 FROM THE JUNCTION OF

AC8003'HUMPHREY DRIVE IN DOLAND, 541.0 M (1774.9 FT) EAST OF MILEPOST 330,

AC8003'27.2 M (89.2 FT) NORTH OF THE HIGHWAY CENTERLINE, 10.8 M (35.4 FT)

AC8003'NORTH OF A FENCE CORNER, 10.5 M (34.4 FT) WEST OF THE CENTER OF COUNTY

AC8003'ROAD 1, 1.3 M (4.3 FT) BELOW THE LEVEL OF THE HIGHWAY, AND 0.5 M (1.6

AC8003'FT) EAST OF A WITNESS POST AND FENCE. NOTE--ACCESS TO THE DATUM POINT

AC8003'IS THROUGH A 5-INCH LOGO CAP. THE SLEEVE DEPTH DOES NOT MEET THE

AC8003'SPECIFICATIONS FOR A CLASS A MARK.

AC8003

AC8003 STATION RECOVERY (1995)

AC8003

AC8003'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1995 (DFC)

AC8003'THE STATION IS LOCATED ABOUT 5.2 MI (8.4 KM) WEST-SOUTHWEST OF

AC8003'RAYMOND, 3.0 MI (4.8 KM) WEST OF THE SPINK/CLARK COUNTY LINE, AND 2.8
AC8003'MI (4.5 KM) EAST OF DOLAND, ON U.S. HIGHWAY 212. OWNERSHIP--THE STATE
AC8003'OF SOUTH DAKOTA. TO REACH THE STATION FROM THE JUNCTION OF U.S.
AC8003'HIGHWAY 212 AND STATE HIGHWAY 37 NORTH ON THE EAST SIDE OF DOLAND, GO
AC8003'EAST ON U.S. HIGHWAY 212 FOR 3.0 MI (4.8 KM) TO A GRAVEL ROAD LEFT
AC8003'(COUNTY ROAD 1) AND THE STATION ON LEFT. THE STATION IS LOCATED 89.3
AC8003'FT (27.2 M) NORTH OF THE HIGHWAY CENTERLINE, 53.2 FT (16.2 M)
AC8003'WEST-NORTHWEST OF A COUNTY ROAD SIGN, 35.1 FT (10.7 M) NORTH OF A
AC8003'FENCE CORNER, 35.0 FT (10.7 M) WEST OF THE GRAVEL ROAD CENTER, AND 1.7
AC8003'FT (0.5 M) EAST OF A WITNESS POST IN FENCE LINE. NOTE--ACCESS TO THE
AC8003'DATUM POINT IS THROUGH A 5-INCH LOGO CAP.

AC8003

AC8003

STATION RECOVERY (1999)

AC8003

AC8003'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1999 (GAS)

AC8003'4.6 KM (2.85 MI) EASTERLY ALONG U.S. HIGHWAY 212 FROM THE JUNCTION OF
AC8003'HUMPHREY DRIVE IN DOLAND, 541.0 M (1774.9 FT) EAST OF MILEPOST 330,
AC8003'27.2 M (89.2 FT) NORTH OF THE HIGHWAY CENTERLINE, 10.8 M (35.4 FT)
AC8003'NORTH OF A FENCE CORNER, 10.5 M (34.4 FT) WEST OF THE CENTER OF COUNTY
AC8003'ROAD 1, 1.3 M (4.3 FT) BELOW THE LEVEL OF THE HIGHWAY, AND 0.5 M (1.6
AC8003'FT) EAST OF A WITNESS POST AND FENCE. NOTE--ACCESS TO THE DATUM POINT
AC8003'IS THROUGH A 5-INCH LOGO CAP. THE SLEEVE DEPTH DOES NOT MEET THE
AC8003'SPECIFICATIONS FOR A CLASS A MARK. THE MONUMENT IS ON COUNTY ROAD
AC8003'RIGHT-OF-WAY. THIS IS A COOPERATIVE BASE NETWORK CONTROL STATION.



OQ1162 *****

OQ1162 CBN - This is a Cooperative Base Network Control Station.
OQ1162 DESIGNATION - I90 346.9
OQ1162 PID - OQ1162
OQ1162 STATE/COUNTY- SD/HANSON
OQ1162 USGS QUAD - FARMER (1973)

OQ1162
OQ1162 *CURRENT SURVEY CONTROL

OQ1162* NAD 83(2007)- 43 39 58.08704(N) 097 43 45.64149(W) ADJUSTED
OQ1162* NAVD 88 - 415.163 (meters) 1362.08 (feet) ADJUSTED

OQ1162 EPOCH DATE - 2002.00
OQ1162 X - -621,555.780 (meters) COMP
OQ1162 Y - -4,579,460.133 (meters) COMP
OQ1162 Z - 4,381,601.178 (meters) COMP
OQ1162 LAPLACE CORR- 1.88 (seconds) DEFLEC09
OQ1162 ELLIP HEIGHT- 389.114 (meters) (02/10/07) ADJUSTED
OQ1162 GEOID HEIGHT- -26.04 (meters) GEOID09
OQ1162 DYNAMIC HT - 415.062 (meters) 1361.75 (feet) COMP

OQ1162 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----

OQ1162 Type PID Designation North East Ellip
OQ1162 -----
OQ1162 NETWORK OQ1162 I90 346.9 0.92 0.61 2.98
OQ1162 -----

OQ1162 MODELED GRAV- 980,362.4 (mgal) NAVD 88

OQ1162 VERT ORDER - FIRST CLASS II

OQ1162.The horizontal coordinates were established by GPS observations
OQ1162.and adjusted by the National Geodetic Survey in February 2007.

OQ1162.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
OQ1162.See [National Readjustment](#) for more information.

OQ1162.The horizontal coordinates are valid at the epoch date displayed above
OQ1162.which is a decimal equivalence of Year/Month/Day.

OQ1162.The orthometric height was determined by differential leveling and
OQ1162.adjusted in September 1993.

OQ1162.The X, Y, and Z were computed from the position and the ellipsoidal ht.

OQ1162.The Laplace correction was computed from DEFLEC09 derived deflections.

OQ1162.The ellipsoidal height was determined by GPS observations
OQ1162.and is referenced to NAD 83.

OQ1162.The geoid height was determined by GEOID09.

OQ1162.The dynamic height is computed by dividing the NAVD 88
OQ1162.geopotential number by the normal gravity value computed on the
OQ1162.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
OQ1162.degrees latitude (g = 980.6199 gals.).

OQ1162

QQ1162.The modeled gravity was interpolated from observed gravity values.

QQ1162

North	East	Units	Scale Factor	Converg.
151,354.497	809,969.709	MT	0.99990722	+1 47 46.9
496,568.88	2,657,375.62	sFT	0.99990722	+1 47 46.9
4,835,576.700	602,443.570	MT	0.99972908	+0 52 38.7

QQ1162

QQ1162! - Elev Factor x Scale Factor = Combined Factor

QQ1162!SPC SD S - 0.99993899 x 0.99990722 = 0.99984621

QQ1162!UTM 14 - 0.99993899 x 0.99972908 = 0.99966808

QQ1162

QQ1162 SUPERSEDED SURVEY CONTROL

QQ1162

QQ1162 ELLIP H (04/15/04) 389.105 (m) GP () 2 1

QQ1162 NAD 83(1996)- 43 39 58.08678(N) 097 43 45.64115(W) AD () B

QQ1162 ELLIP H (04/18/97) 389.140 (m) GP () 4 1

QQ1162 NAVD 88 (04/18/97) 415.16 (m) 1362.1 (f) LEVELING 3

QQ1162

QQ1162.Superseded values are not recommended for survey control.

QQ1162.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

QQ1162.[See file dsdata.txt](#) to determine how the superseded data were derived.

QQ1162

QQ1162_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPP0244335576(NAD 83)

QQ1162

QQ1162_MARKER: Z = SEE DESCRIPTION

QQ1162_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)

QQ1162_SP_SET: GALVANIZED STEEL PIPE IN SLEEV

QQ1162_STAMPING: I90 346.9

QQ1162_MARK LOGO: NGS

QQ1162_PROJECTION: FLUSH

QQ1162_MAGNETIC: P = MARKER IS A STEEL PIPE

QQ1162_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

QQ1162_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

QQ1162+SATELLITE: SATELLITE OBSERVATIONS - July 25, 1996

QQ1162_ROD/PIPE-DEPTH: 6.4 meters

QQ1162_SLEEVE-DEPTH : 1.8 meters

QQ1162

QQ1162 HISTORY - Date Condition Report By

QQ1162 HISTORY - 1990 MONUMENTED SDDT

QQ1162 HISTORY - 19910621 GOOD NGS

QQ1162 HISTORY - 19960725 GOOD NGS

QQ1162

QQ1162 STATION DESCRIPTION

QQ1162

QQ1162'DESCRIBED BY NATIONAL GEODETIC SURVEY 1991

QQ1162'4.6 KM (2.9 MI) EASTERLY ALONG INTERSTATE HIGHWAY 90 FROM THE

QQ1162'JUNCTION OF STATE HIGHWAY 262 (EXIT 344) IN ALEXANDRIA, A STAINLESS

QQ1162'STEEL BALL EPOXIED TO A PIPE CAP THAT IS ATTACHED TO A 1 1/2-INCH

QQ1162'GALVANIZED STEEL PIPE, 200.0 M (656.2 FT) WEST OF THE NORTHWEST

QQ1162'CORNER OF BRIDGE NUMBER 31-120-126, 31.5 M (103.3 FT) NORTH OF THE

QQ1162'CENTERLINE OF THE WESTBOUND LANES OF THE HIGHWAY, 11.5 M (37.7 FT)

QQ1162'EAST OF A BRACED FENCE POST, 2.0 M (6.6 FT) BELOW THE LEVEL OF THE

QQ1162'HIGHWAY, AND 0.4 M (1.3 FT) SOUTHWEST OF A WITNESS POST AND FENCE.

QQ1162'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN

QQ1162'THROUGH A 4-INCH PVC CAP.

OQ1162
OQ1162
OQ1162

STATION RECOVERY (1996)

OQ1162'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (DFC)
OQ1162'THE STATION IS LOCATED ABOUT 3.0 MI (4.8 KM) EAST OF ALEXANDRIA, ON
OQ1162'INTERSTATE HIGHWAY 90. OWNERSHIP--THE STATE OF SOUTH DAKOTA. TO
OQ1162'REACH THE STATION FROM THE JUNCTION OF INTERSTATE HIGHWAY 90 AND STATE
OQ1162'HIGHWAY 262 (EXIT 344) IN ALEXANDRIA, GO EAST ON THE INTERSTATE
OQ1162'HIGHWAY FOR 2.9 MILES (4.7 KM) TO THE STATION ON THE LEFT. THE
OQ1162'STATION IS A PUNCH POINT ON TOP OF A STAINLESS STEEL RIVET FASTENED TO
OQ1162'A METAL PIPE CAP ATTACHED TO A 1 1/2-INCH GALVANIZED STEEL PIPE.
OQ1162'LOCATED 206.1 M (676.2 FT) WEST OF THE NORTHWEST CORNER OF A COUNTY
OQ1162'ROAD OVERPASS (NUMBER 31-120-126) OF THE HIGHWAY, 138.8 M (455.4 FT)
OQ1162'NORTHWEST OF MILEPOST 347, 31.4 M (103.0 FT) NORTH OF THE WESTBOUND
OQ1162'HIGHWAY CENTERLINE, 11.5 M (37.7 FT) EAST OF A BRACED FENCE POST, 2.0
OQ1162'M (6.6 FT) BELOW THE LEVEL OF THE HIGHWAY, 0.4 M (1.3 FT) NORTH OF A
OQ1162'METAL GUARD POST, 0.4 M (1.3 FT) SOUTH OF A WITNESS POST AND FENCE,
OQ1162'AND 0.1 M (0.3 FT) BELOW THE GROUND SURFACE. NOTE--ACCESS TO THE
OQ1162'DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN A 4-INCH PVC CAP.



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PR1027 *****
PR1027 CBN - This is a Cooperative Base Network Control Station.
PR1027 DESIGNATION - I29 120.1
PR1027 PID - PR1027
PR1027 STATE/COUNTY- SD/MOODY
PR1027 USGS QUAD - MEDARY (1981)
PR1027
PR1027 *CURRENT SURVEY CONTROL
PR1027
PR1027* NAD 83(2007)- 44 07 35.76384(N) 096 45 31.27516(W) ADJUSTED
PR1027* NAVD 88 - 513.020 (meters) 1683.13 (feet) ADJUSTED
PR1027
PR1027 EPOCH DATE - 2002.00
PR1027 X - -539,722.107 (meters) COMP
PR1027 Y - -4,554,172.948 (meters) COMP
PR1027 Z - 4,418,539.040 (meters) COMP
PR1027 LAPLACE CORR- -1.99 (seconds) DEFLEC09
PR1027 ELLIP HEIGHT- 487.210 (meters) (02/10/07) ADJUSTED
PR1027 GEOID HEIGHT- -25.80 (meters) GEOID09
PR1027 DYNAMIC HT - 512.907 (meters) 1682.76 (feet) COMP
PR1027
PR1027 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
PR1027 Type PID Designation North East Ellip
PR1027 -----
PR1027 NETWORK PR1027 I29 120.1 0.61 0.47 2.04
PR1027 -----
PR1027 MODELED GRAV- 980,382.5 (mgal) NAVD 88
PR1027
PR1027 VERT ORDER - FIRST CLASS II
PR1027
PR1027.The horizontal coordinates were established by GPS observations
PR1027.and adjusted by the National Geodetic Survey in February 2007.
PR1027
PR1027.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
PR1027.See National Readjustment for more information.
PR1027
PR1027.The horizontal coordinates are valid at the epoch date displayed above
PR1027.which is a decimal equivalence of Year/Month/Day.
PR1027
PR1027.The orthometric height was determined by differential leveling and
PR1027.adjusted in October 1997.
PR1027
PR1027.The X, Y, and Z were computed from the position and the ellipsoidal ht.
PR1027
PR1027.The Laplace correction was computed from DEFLEC09 derived deflections.
PR1027
PR1027.The ellipsoidal height was determined by GPS observations
PR1027.and is referenced to NAD 83.
PR1027
PR1027.The geoid height was determined by GEOID09.
PR1027
PR1027.The dynamic height is computed by dividing the NAVD 88
PR1027.geopotential number by the normal gravity value computed on the
PR1027.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
PR1027.degrees latitude (g = 980.6199 gals.).
PR1027

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PR1027.The modeled gravity was interpolated from observed gravity values.

PR1027

PR1027;		North	East	Units	Scale Factor	Converg.
PR1027;SPC SD S	-	205,376.587	885,994.664	MT	0.99994618	+2 27 57.5
PR1027;SPC SD S	-	673,806.35	2,906,800.83	sFT	0.99994618	+2 27 57.5
PR1027;UTM 14	-	4,888,376.831	679,314.158	MT	0.99999546	+1 33 39.3

PR1027

PR1027! - Elev Factor x Scale Factor = Combined Factor

PR1027!SPC SD S - 0.99992361 x 0.99994618 = 0.99986979

PR1027!UTM 14 - 0.99992361 x 0.99999546 = 0.99991907

PR1027

PR1027 SUPERSEDED SURVEY CONTROL

PR1027

PR1027 ELLIP H (04/15/04) 487.235 (m) GP() 2 1

PR1027 NAD 83(1996)- 44 07 35.76338(N) 096 45 31.27439(W) AD() B

PR1027 ELLIP H (04/18/97) 487.242 (m) GP() 4 1

PR1027 NAVD 88 (04/18/97) 513.03 (m) 1683.2 (f) LEVELING 3

PR1027 NAVD 88 (06/15/91) 513.031 (m) 1683.17 (f) UNKNOWN 1 2

PR1027

PR1027.Superseded values are not recommended for survey control.

PR1027.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

PR1027.[See file dsdata.txt](#) to determine how the superseded data were derived.

PR1027

PR1027_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPP7931488376(NAD 83)

PR1027

PR1027_MARKER: Z = SEE DESCRIPTION

PR1027_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)

PR1027_SP_SET: GALVANIZED STEEL PIPE IN SLEEVE

PR1027_STAMPING: I29-120.1 1990

PR1027_MARK LOGO: NGS

PR1027_PROJECTION: FLUSH

PR1027_MAGNETIC: P = MARKER IS A STEEL PIPE

PR1027_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

PR1027_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

PR1027+SATELLITE: SATELLITE OBSERVATIONS - September 03, 2008

PR1027_ROD/PIPE-DEPTH: 6.4 meters

PR1027_SLEEVE-DEPTH : 1.8 meters

PR1027

PR1027 HISTORY	- Date	Condition	Report By
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PR1027 HISTORY	- 1990	MONUMENTED	SDDT
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PR1027 HISTORY	- 19900530	GOOD	NGS
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PR1027 HISTORY	- 19960617	GOOD	NGS
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PR1027 HISTORY	- 20080903	GOOD	SDDT
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PR1027

PR1027 STATION DESCRIPTION

PR1027

PR1027'DESCRIBED BY NATIONAL GEODETIC SURVEY 1990

PR1027'16.4 KM (10.2 MI) NORTHERLY ALONG INTERSTATE HIGHWAY 29 FROM ITS

PR1027'JUNCTION WITH STATE HIGHWAY 34 (COLEMAN EXIT 104), 0.35 KM (0.22 MI)

PR1027'NORTH OF THE INTERSECTION OF A COUNTY ROAD, 53.9 M (176.8 FT) SOUTH OF

PR1027'THE MOST SOUTHERLY OF 3 FENCE BRACE POSTS, 31.4 M (103.0 FT) EAST OF

PR1027'AND LEVEL WITH THE CENTERLINE OF THE NORTHBOUND LANES OF THE HIGHWAY,

PR1027'AND 0.4 M (1.3 FT) WEST OF A WITNESS POST AND FENCE. NOTE--THE DATUM

PR1027'POINT IS A STAINLESS STEEL BALL EPOXIED TO AN IRON PIPE CAP THAT IS

PR1027'ATTACHED TO A 1 1/2 INCH IRON PIPE. ACCESS TO THE DATUM POINT IS

PR1027'THROUGH A 5-INCH LOGO CAP AND THEN THROUGH A 4-INCH PVC SCREW CAP.

PR1027

PR1027

STATION RECOVERY (1996)

PR1027

PR1027'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (DFC)

PR1027'THE STATION IS LOCATED ABOUT 10.2 MI (16.4 KM) NORTH OF THE JUNCTION
PR1027'OF INTERSTATE HIGHWAY 29 AND STATE HIGHWAY 34, ON INTERSTATE HIGHWAY
PR1027'29. OWNERSHIP--THE STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM
PR1027'THE JUNCTION OF STATE HIGHWAY 34 AND INTERSTATE HIGHWAY 29 (COLEMAN
PR1027'EXIT 109), GO NORTH ALONG INTERSTATE 29 FOR 10.2 MI (16.4 KM) TO THE
PR1027'STATION ON THE RIGHT. THE STATION IS A PUNCH POINT ON TOP OF A
PR1027'STAINLESS STEEL RIVET FASTENED TO A METAL PIPE CAP ATTACHED TO A 1
PR1027'1/2-INCH GALVANIZED STEEL PIPE. LOCATED 0.35 KM (0.20 MI) NORTH OF
PR1027'THE INTERSECTION OF A COUNTY ROAD, 53.9 M (176.8 FT) SOUTH OF THE MOST
PR1027'SOUTHERLY OF 3 BRACED FENCE POSTS, 31.4 M (103.0 FT) EAST OF AND LEVEL
PR1027'WITH THE CENTERLINE OF THE NORTHBOUND HIGHWAY, AND 0.4 M (1.3 FT) WEST
PR1027'OF A WITNESS POST AND FENCE. NOTE--ACCESS TO THE DATUM POINT IS
PR1027'THROUGH A 5-INCH LOGO CAP AND THEN A 4-INCH PVC CAP.

PR1027

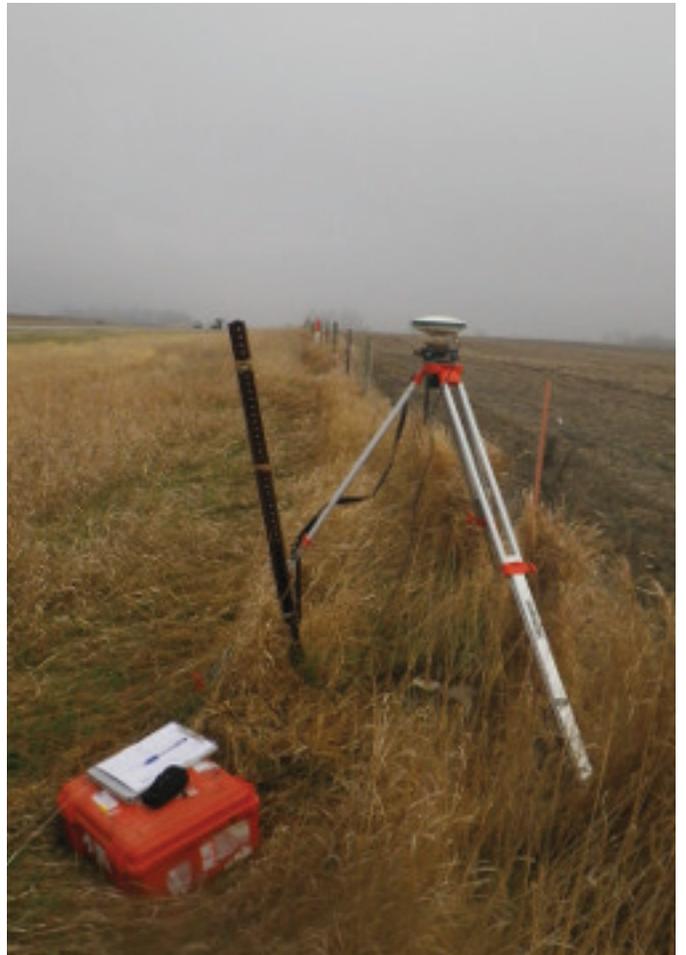
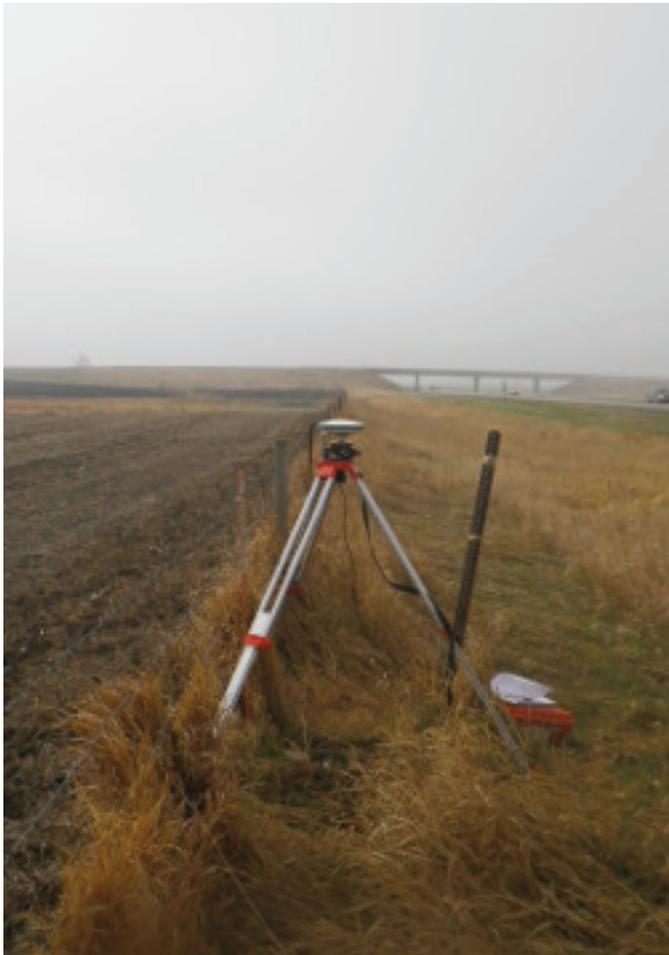
PR1027

STATION RECOVERY (2008)

PR1027

PR1027'RECOVERY NOTE BY SD DEPT OF TRANSP 2008 (KHG)

PR1027'RECOVERED AS DESCRIBED



PR1071 *****

PR1071 CBN - This is a Cooperative Base Network Control Station.
PR1071 DESIGNATION - I29 148.00
PR1071 PID - PR1071
PR1071 STATE/COUNTY- SD/BROOKINGS
PR1071 USGS QUAD - ESTELLINE SE (1981)

PR1071
PR1071 *CURRENT SURVEY CONTROL

PR1071* NAD 83(2007)- 44 31 53.59710(N) 096 45 23.46307(W) ADJUSTED
PR1071* NAVD 88 - 534.214 (meters) 1752.67 (feet) ADJUSTED

PR1071 EPOCH DATE - 2002.00
PR1071 X - -535,851.842 (meters) COMP
PR1071 Y - -4,522,981.421 (meters) COMP
PR1071 Z - 4,450,745.575 (meters) COMP
PR1071 LAPLACE CORR- -2.90 (seconds) DEFLECO9
PR1071 ELLIP HEIGHT- 509.188 (meters) (02/10/07) ADJUSTED
PR1071 GEOID HEIGHT- -25.04 (meters) GEOID09
PR1071 DYNAMIC HT - 534.126 (meters) 1752.38 (feet) COMP

PR1071 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----

PR1071 Type PID Designation North East Ellip
PR1071 NETWORK PR1071 I29 148.00 0.45 0.33 1.10

PR1071 MODELED GRAV- 980,435.7 (mgal) NAVD 88

PR1071 VERT ORDER - FIRST CLASS II

PR1071.The horizontal coordinates were established by GPS observations
PR1071.and adjusted by the National Geodetic Survey in February 2007.

PR1071.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
PR1071.See [National Readjustment](#) for more information.

PR1071.The horizontal coordinates are valid at the epoch date displayed above
PR1071.which is a decimal equivalence of Year/Month/Day.

PR1071.The orthometric height was determined by differential leveling and
PR1071.adjusted in October 1997.

PR1071.The X, Y, and Z were computed from the position and the ellipsoidal ht.

PR1071.The Laplace correction was computed from DEFLECO9 derived deflections.

PR1071.The ellipsoidal height was determined by GPS observations
PR1071.and is referenced to NAD 83.

PR1071.The geoid height was determined by GEOID09.

PR1071.The dynamic height is computed by dividing the NAVD 88
PR1071.geopotential number by the normal gravity value computed on the
PR1071.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
PR1071.degrees latitude (g = 980.6199 gals.).

PR1071

PR1071.The modeled gravity was interpolated from observed gravity values.

PR1071

PR1071;		North	East	Units	Scale Factor	Converg.
PR1071;SPC SD N	-	82,751.839	857,739.444	MT	0.99997997	+2 17 43.9
PR1071;SPC SD N	-	271,494.99	2,814,100.16	sFT	0.99997997	+2 17 43.9
PR1071;UTM 14	-	4,933,362.334	678,256.401	MT	0.99999077	+1 34 25.6

PR1071

PR1071! - Elev Factor x Scale Factor = Combined Factor

PR1071!SPC SD N - 0.99992017 x 0.99997997 = 0.99990014

PR1071!UTM 14 - 0.99992017 x 0.99999077 = 0.99991094

PR1071

PR1071 SUPERSEDED SURVEY CONTROL

PR1071

PR1071	ELLIP H (04/15/04)	509.180	(m)		GP()	2 1
PR1071	NAD 83(1996)-	44 31 53.59657(N)		096 45 23.46230(W)	AD()	B
PR1071	ELLIP H (04/18/97)	509.187	(m)		GP()	4 1
PR1071	NAVD 88 (07/31/03)	534.21	(m)	1752.7	(f) LEVELING	3
PR1071	NAVD 88 (04/18/97)	534.23	(m)	1752.7	(f) LEVELING	3
PR1071	NAVD 88 (06/15/91)	534.228	(m)	1752.71	(f) UNKNOWN	1 2

PR1071

PR1071.Superseded values are not recommended for survey control.

PR1071.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

PR1071.[See file dsdata.txt](#) to determine how the superseded data were derived.

PR1071

PR1071_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPQ7825633362(NAD 83)

PR1071

PR1071_MARKER: Z = SEE DESCRIPTION

PR1071_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)

PR1071_SP_SET: GALVANIZED STEEL PIPE IN SLEEV

PR1071_STAMPING: 29-148.00

PR1071_MARK LOGO: NGS

PR1071_PROJECTION: FLUSH

PR1071_MAGNETIC: P = MARKER IS A STEEL PIPE

PR1071_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

PR1071_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

PR1071+SATELLITE: SATELLITE OBSERVATIONS - 2002

PR1071_ROD/PIPE-DEPTH: 6.4 meters

PR1071_SLEEVE-DEPTH : 1.8 meters

PR1071

PR1071	HISTORY	- Date	Condition	Report By
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PR1071	HISTORY	- UNK	MONUMENTED	SDDT
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PR1071	HISTORY	- 19900703	GOOD	NGS
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PR1071	HISTORY	- 19960623	GOOD	NGS
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PR1071	HISTORY	- 2002	GOOD	MNDT
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PR1071

PR1071 STATION DESCRIPTION

PR1071

PR1071'DESCRIBED BY NATIONAL GEODETIC SURVEY 1990

PR1071'24.5 KM (15.2 MI) NORTHERLY ALONG INTERSTATE HIGHWAY 29 FROM ITS

PR1071'JUNCTION WITH U.S. HIGHWAY 14 (EXIT 132) IN BROOKINGS, 31.8 M

PR1071'(104.3 FT) EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF THE

PR1071'HIGHWAY, 30.4 M (99.7 FT) SOUTH OF THE MOST SOUTHERLY OF 2 FENCE

PR1071'BRACE POSTS, 19.6 M (64.3 FT) EAST OF MILEPOST 148, 10.7 M (35.1 FT)

PR1071'NORTHWEST OF AN IRRIGATION WELL, 2.5 M (8.2 FT) BELOW THE LEVEL OF THE

PR1071'HIGHWAY, AND 0.35 M (1.15 FT) WEST OF A WITNESS POST AND FENCE.

PR1071'FENCE. NOTE--THE DATUM POINT IS A STAINLESS STEEL BALL EPOXIED TO AN

PR1071'IRON PIPE CAP THAT IS ATTACHED TO A 1 1/2 INCH IRON PIPE. ACCESS TO

PR1071'THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN THROUGH A
PR1071'4-INCH PVC SCREW CAP.

PR1071

PR1071 STATION RECOVERY (1996)

PR1071

PR1071'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (DFC)

PR1071'THE STATION IS LOCATED ABOUT 15.0 MI (24.1 KM) NORTH OF BROOKINGS, 8.0
PR1071'MI (12.9 KM) SOUTHEAST OF ESTILLINE, AND 0.8 MI (1.3 KM) SOUTH OF THE
PR1071'DEUEL/BROOKINGS COUNTY LINE ON INTERSTATE HIGHWAY 29. OWNERSHIP--THE
PR1071'STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM THE JUNCTION OF
PR1071'INTERSTATE HIGHWAY 29 AND U.S. HIGHWAY 14 (EXIT 132) IN BROOKINGS, GO
PR1071'NORTH ON INTERSTATE HIGHWAY 29 FOR 24.5 KM (15.20 MI) TO THE STATION
PR1071'ON THE RIGHT. THE STATION IS A PUNCH POINT ON TOP OF A STAINLESS
PR1071'STEEL RIVET FASTENED TO A METAL PIPE CAP ATTACHED TO A 1 1/2-INCH
PR1071'GALVANIZED STEEL PIPE. LOCATED 31.8 M (104.3 FT) EAST OF THE
PR1071'CENTERLINE OF THE NORTHBOUND HIGHWAY, 30.4 M (99.7 FT) SOUTH OF THE
PR1071'MOST SOUTHERLY OF 2 BRACED FENCE POSTS, 19.6 M (64.3 FT) EAST OF
PR1071'MILEPOST 148, 2.5 M (8.2 FT) BELOW THE LEVEL OF THE HIGHWAY, 0.3 M
PR1071'(1.0 FT) EAST OF A METAL GUARD POST, AND 0.3 M (1.0 FT) WEST OF A
PR1071'WITNESS POST AND FENCE. NOTE--ACCESS TO THE DATUM POINT IS THROUGH A
PR1071'5-INCH LOGO CAP AND THEN A 4-INCH PVC CAP.

PR1071

PR1071 STATION RECOVERY (2002)

PR1071

PR1071'RECOVERY NOTE BY MN DEPT OF TRANSP 2002 (DKH)

PR1071'RECOVERED AS DESCRIBED.



QQ0640 *****

QQ0640 CBN - This is a Cooperative Base Network Control Station.

QQ0640 DESIGNATION - I29 207.50

QQ0640 PID - QQ0640

QQ0640 STATE/COUNTY- SD/ROBERTS

QQ0640 USGS QUAD - SUMMIT (1970)

QQ0640

QQ0640 *CURRENT SURVEY CONTROL

QQ0640

QQ0640* NAD 83(2007)- 45 18 59.38655(N) 097 02 59.00413(W) ADJUSTED

QQ0640* NAVD 88 - 614.979 (meters) 2017.64 (feet) ADJUSTED

QQ0640

QQ0640 EPOCH DATE - 2002.00

QQ0640 X - -551,436.899 (meters) COMP

QQ0640 Y - -4,459,097.843 (meters) COMP

QQ0640 Z - 4,512,570.456 (meters) COMP

QQ0640 LAPLACE CORR- -3.49 (seconds) DEFLEC09

QQ0640 ELLIP HEIGHT- 589.670 (meters) (02/10/07) ADJUSTED

QQ0640 GEOID HEIGHT- -25.32 (meters) GEOID09

QQ0640 DYNAMIC HT - 614.909 (meters) 2017.41 (feet) COMP

QQ0640

QQ0640 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----

QQ0640 Type PID Designation North East Ellip

QQ0640

QQ0640 NETWORK QQ0640 I29 207.50 0.71 0.59 2.37

QQ0640

QQ0640 MODELED GRAV- 980,482.2 (mgal) NAVD 88

QQ0640

QQ0640 VERT ORDER - FIRST CLASS II

QQ0640

QQ0640.The horizontal coordinates were established by GPS observations

QQ0640.and adjusted by the National Geodetic Survey in February 2007.

QQ0640

QQ0640.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).

QQ0640.See [National Readjustment](#) for more information.

QQ0640

QQ0640.The horizontal coordinates are valid at the epoch date displayed above

QQ0640.which is a decimal equivalence of Year/Month/Day.

QQ0640

QQ0640.The orthometric height was determined by differential leveling and

QQ0640.adjusted in July 1998.

QQ0640

QQ0640.The X, Y, and Z were computed from the position and the ellipsoidal ht.

QQ0640

QQ0640.The Laplace correction was computed from DEFLEC09 derived deflections.

QQ0640

QQ0640.The ellipsoidal height was determined by GPS observations

QQ0640.and is referenced to NAD 83.

QQ0640

QQ0640.The geoid height was determined by GEOID09.

QQ0640

QQ0640.The dynamic height is computed by dividing the NAVD 88
 QQ0640.geopotential number by the normal gravity value computed on the
 QQ0640.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 QQ0640.degrees latitude (g = 980.6199 gals.).
 QQ0640
 QQ0640.The modeled gravity was interpolated from observed gravity values.

QQ0640;
 QQ0640;SPC SD N - North East Units Scale Factor Converg.
 QQ0640;SPC SD N - 169,028.980 831,272.945 MT 0.99994981 +2 05 16.9
 QQ0640;SPC SD N - 554,555.91 2,727,267.99 sFT 0.99994981 +2 05 16.9
 QQ0640;UTM 14 - 5,019,960.222 652,862.755 MT 0.99988731 +1 23 12.9
 QQ0640
 QQ0640!
 QQ0640!SPC SD N - Elev Factor x Scale Factor = Combined Factor
 QQ0640!SPC SD N - 0.99990756 x 0.99994981 = 0.99985737
 QQ0640!UTM 14 - 0.99990756 x 0.99988731 = 0.99979488

QQ0640
 QQ0640 SUPERSEDED SURVEY CONTROL

QQ0640
 QQ0640 ELLIP H (04/15/04) 589.697 (m) GP() 2 1
 QQ0640 NAD 83(1996)- 45 18 59.38605(N) 097 02 59.00365(W) AD() B
 QQ0640 ELLIP H (04/18/97) 589.711 (m) GP() 4 1
 QQ0640 NAVD 88 (04/18/97) 614.97 (m) 2017.6 (f) LEVELING 3
 QQ0640 NAVD 88 (06/15/91) 614.969 (m) 2017.61 (f) UNKNOWN 1 2

QQ0640
 QQ0640.Superseded values are not recommended for survey control.
 QQ0640.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 QQ0640.[See file dsdata.txt](#) to determine how the superseded data were derived.

QQ0640
 QQ0640_U.S. NATIONAL GRID SPATIAL ADDRESS: 14TPR5286219960(NAD 83)

QQ0640
 QQ0640_MARKER: Z = SEE DESCRIPTION
 QQ0640_SETTING: 57 = GALVANIZED STEEL PIPE IN SLEEVE (10 FT.+)
 QQ0640_SP_SET: GALVANIZED STEEL PIPE IN SLEEV
 QQ0640_STAMPING: 29-207.50
 QQ0640_MARK LOGO: NGS
 QQ0640_PROJECTION: FLUSH
 QQ0640_MAGNETIC: P = MARKER IS A STEEL PIPE
 QQ0640_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
 QQ0640+STABILITY: POSITION/ELEVATION WELL
 QQ0640_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 QQ0640+SATELLITE: SATELLITE OBSERVATIONS - May 20, 1997
 QQ0640_ROD/PIPE-DEPTH: 6.4 meters
 QQ0640_SLEEVE-DEPTH : 1.8 meters

QQ0640
 QQ0640 HISTORY - Date Condition Report By
 QQ0640 HISTORY - UNK MONUMENTED SDDT
 QQ0640 HISTORY - 19900721 GOOD NGS
 QQ0640 HISTORY - 19900725 GOOD NGS
 QQ0640 HISTORY - 19960712 GOOD NGS
 QQ0640 HISTORY - 19970520 GOOD NGS

QQ0640
 QQ0640 STATION DESCRIPTION

QQ0640
 QQ0640'DESCRIBED BY NATIONAL GEODETIC SURVEY 1990
 QQ0640'0.2 KM (0.1 MI) NORTHERLY ALONG INTERSTATE HIGHWAY 29 FROM THE
 QQ0640'JUNCTION OF U.S. HIGHWAY 12 (SUMMIT EXIT 207), 128.0 M (419.9 FT)

QQ0640'EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF THE HIGHWAY, 59.0 M
QQ0640'(193.6 FT) NORTHEAST OF THE CENTER OF THE NORTHBOUND ON RAMP, 7.9 M
QQ0640'(25.9 FT) NORTH-NORTHWEST OF THE NORTHWESTERLY OF 6 FENCE BRACE POST,
QQ0640'6.0 M (19.7 FT) ABOVE THE LEVEL OF THE HIGHWAY, 0.5 M (1.6 FT)
QQ0640'SOUTHWEST OF A FENCE, AND 0.4 M (1.3 FT) NORTHEAST OF A WITNESS POST.
QQ0640'NOTE--THE DATUM POINT IS A STAINLESS STEEL BALL EPOXIED TO AN IRON
QQ0640'PIPE CAP THAT IS ATTACHED TO A 1 1/2 INCH IRON PIPE. ACCESS TO THE
QQ0640'DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN THROUGH A 4-INCH
QQ0640'PVC SCREW CAP.

QQ0640

QQ0640

STATION RECOVERY (1990)

QQ0640

QQ0640'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990

QQ0640'RECOVERED IN GOOD CONDITION.

QQ0640

QQ0640

STATION RECOVERY (1996)

QQ0640

QQ0640'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (DFC)

QQ0640'THE STATION IS LOCATED ABOUT 2.0 MI (3.2 KM) WEST OF SUMMIT, ALONG THE
QQ0640'INTERSTATE HIGHWAY 29 NORTHBOUND ON-RAMP AT EXIT 207. OWNERSHIP--THE
QQ0640'STATE OF SOUTH DAKOTA. TO REACH THE STATION FROM THE JUNCTION OF
QQ0640'INTERSTATE HIGHWAY 29 AND U.S. HIGHWAY 12 (EXIT 207) WEST OF SUMMIT,
QQ0640'GO EAST OF U.S. HIGHWAY 12 FOR 0.1 MI (0.2 KM) TO THE NORTHBOUND
QQ0640'INTERSTATE HIGHWAY ON-RAMP, TURN LEFT AND GO NORTH ON THE RAMP FOR 0.2
QQ0640'MI (0.3 KM) TO THE STATION ON THE RIGHT. THE STATION IS A PUNCH POINT
QQ0640'ON TOP OF A STAINLESS STEEL RIVET FASTENED TO A METAL PIPE CAP
QQ0640'ATTACHED TO A 1 1/2-INCH GALVANIZED STEEL PIPE. LOCATED 129.8 M
QQ0640'(425.9 FT) EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF THE
QQ0640'HIGHWAY, 58.7 M (192.6 FT) NORTHEAST OF THE CENTER OF THE RAMP, 10.0 M
QQ0640'(32.8 FT) ABOVE THE LEVEL OF THE RAMP, 0.5 M (1.6 FT) SOUTHWEST OF A
QQ0640'WITNESS POST AND FENCE, AND 0.4 M (1.3 FT) NORTHEAST OF A METAL GUARD
QQ0640'POST. NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP
QQ0640'AND THEN A 4-INCH PVC CAP.

QQ0640

QQ0640

STATION RECOVERY (1997)

QQ0640

QQ0640'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1997 (GAS)

QQ0640'0.2 KM (0.10 MI) NORTHERLY ALONG INTERSTATE HIGHWAY 29 FROM THE
QQ0640'JUNCTION OF U.S. HIGHWAY 12 AT SUMMIT (EXIT 207), 128.0 M (419.9 FT)
QQ0640'EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF THE HIGHWAY, 59.0 M
QQ0640'(193.6 FT) NORTHEAST OF THE CENTER OF THE NORTHBOUND ON RAMP, 7.7 M
QQ0640'(25.3 FT) NORTHWEST OF THE NORTHWEST END OF 6 BRACED FENCE POSTS, 6.0
QQ0640'M (19.7 FT) ABOVE THE LEVEL OF THE HIGHWAY, 0.5 M (1.6 FT) SOUTHWEST
QQ0640'OF A FENCE, AND 0.4 M (1.3 FT) NORTHEAST OF A WITNESS POST. NOTE--THE
QQ0640'DATUM POINT IS A STAINLESS STEEL RIVET AFFIXED TO A STEEL PIPE CAP
QQ0640'THAT IS ATTACHED TO A 1 1/2-INCH GALVANIZED STEEL PIPE. ACCESS TO THE
QQ0640'DATUM POINT IS THROUGH A 5-INCH LOGO CAP AND THEN THROUGH A 4-INCH PVC
QQ0640'CAP. THE MONUMENT IS A SOUTH DAKOTA HARN STATION.





STATION DESCRIPTION FORM

PROJECT No.: 368SSD12
PROJECT NAME: South dakota
LOCATION: Kingsbury County

PHOTOS TAKEN:

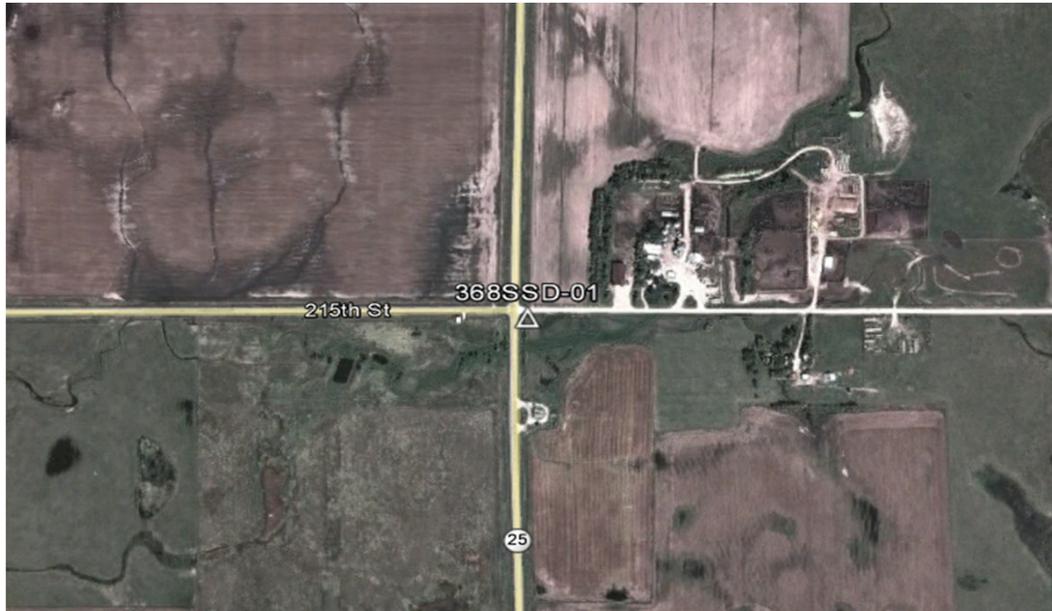
STATION NAME: 368SSD-01	MARKER TYPE: Rebar 0.5" x 3.0'	DATE: April 2012
STATION NUMBER: 368SSD-01	STATION LOCALITY: Kingsbury County South Dakota	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN: 99	UTM ZONE: 14
LATITUDE: N 44 16 04.38891	LONGITUDE: W 097 33 06.78382	ELLIPSOID HEIGHT metres (h): 474.059
UTM NORTHING metres: 4 902 646.783	UTM EASTING metres: 615 578.056	GEOID HEIGHT metres (MSL): 499.355

MONUMENT IS: FLUSH WITH GROUND ABOVE GROUND _____ cm BELOW GROUND _____ cm

MARKER LOCATION:

Inside the road allowance approx 2 meters from a fence post perpendicular to the fence line.

DIAGRAM (Include Ties to Relevant Features)







STATION DESCRIPTION FORM

PROJECT No.: 368SSD12
PROJECT NAME: South dakota
LOCATION: Sanborn County

PHOTOS TAKEN:

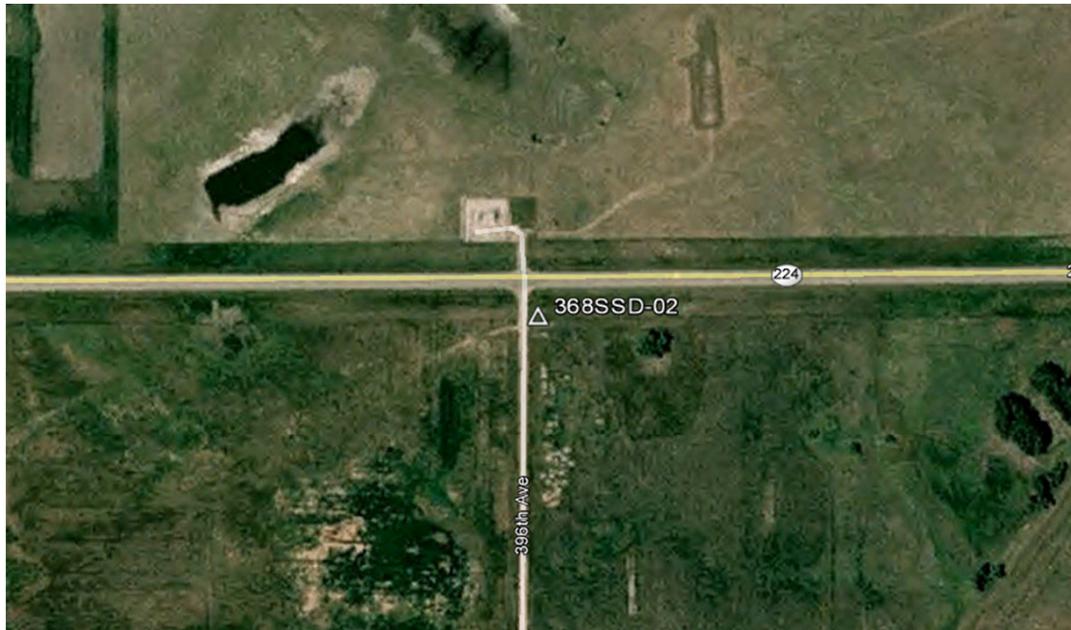
STATION NAME: 368SSD-02	MARKER TYPE: Brass Cap on Post	DATE: April 2012
STATION NUMBER: 368SSD-02	STATION LOCALITY: Sanborn County South Dakota	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN: 99	UTM ZONE: 14
LATITUDE: N 44 11 03.94262	LONGITUDE: W 098 17 28.79747	ELLIPSOID HEIGHT metres (h): 375.767
UTM NORTHING metres: 4 892 601.383	UTM EASTING metres: 556 640.383	GEOID HEIGHT metres (MSL): 401.025

MONUMENT IS: FLUSH WITH GROUND ABOVE GROUND _____ CM BELOW GROUND _____ CM

MARKER LOCATION:

On the East side of 396th Ave /South side of Hwy 224, the point is a South Dakota Survey Ref marker.

DIAGRAM (Include Ties to Relevant Features)





STATION DESCRIPTION FORM

PROJECT No.: 368SSD12
PROJECT NAME: South dakota
LOCATION: Spink County

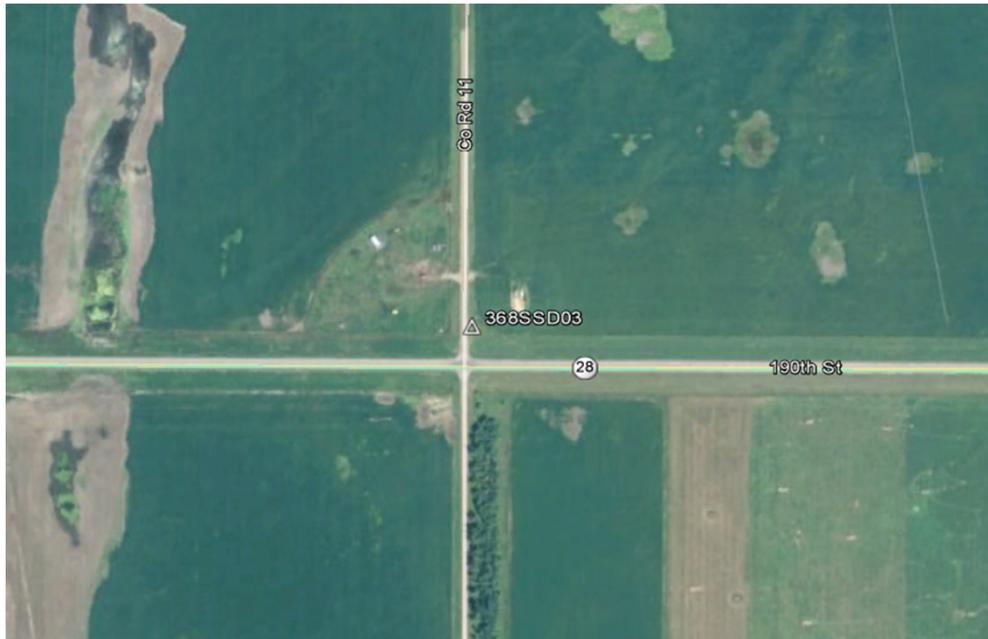
PHOTOS TAKEN:

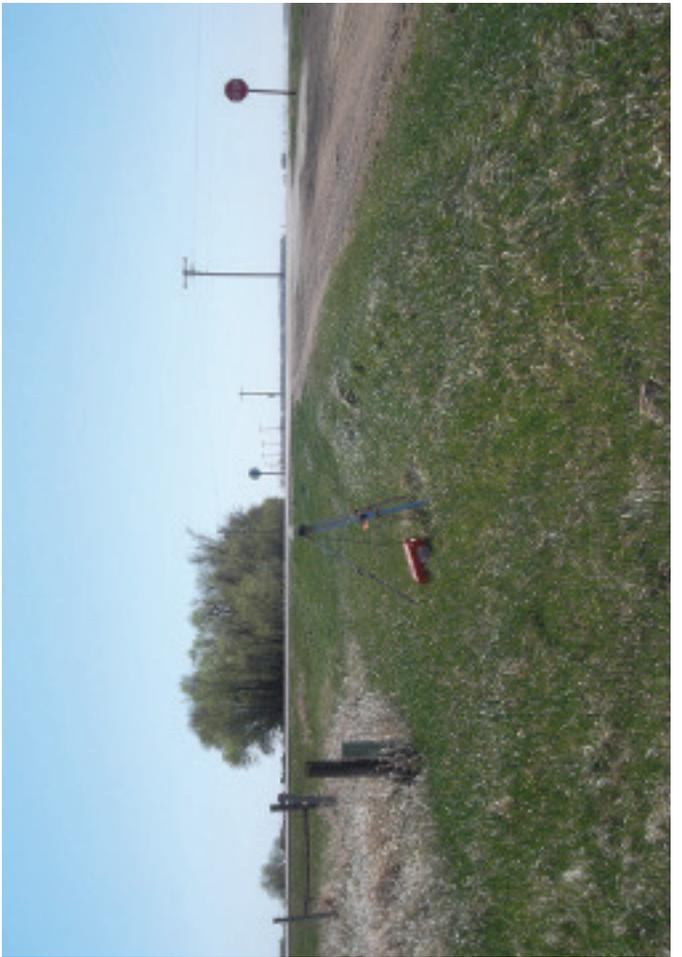
STATION NAME: 368SSD-03	MARKER TYPE: Rebar 0.5" x 4.0'	DATE: April 2012
STATION NUMBER: 368SSD-03	STATION LOCALITY: Spink County South Dakota	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN: 99	UTM ZONE: 14
LATITUDE: N 44 37 58.96122	LONGITUDE: W 098 18 05.66949	ELLIPSOID HEIGHT metres (h): 370.369
UTM NORTHING metres: 4 942 424.864	UTM EASTING metres: 555 396.832	GEOID HEIGHT metres (MSL): 394.888

MONUMENT IS: FLUSH WITH GROUND ABOVE GROUND _____ cm BELOW GROUND _____ cm

MARKER LOCATION:
In road allowance opposite a utility marker (wooden post).

DIAGRAM (Include Ties to Relevant Features)







STATION DESCRIPTION FORM

PROJECT No.: 368SSD12
PROJECT NAME: South dakota
LOCATION: Sanborn County

PHOTOS TAKEN:

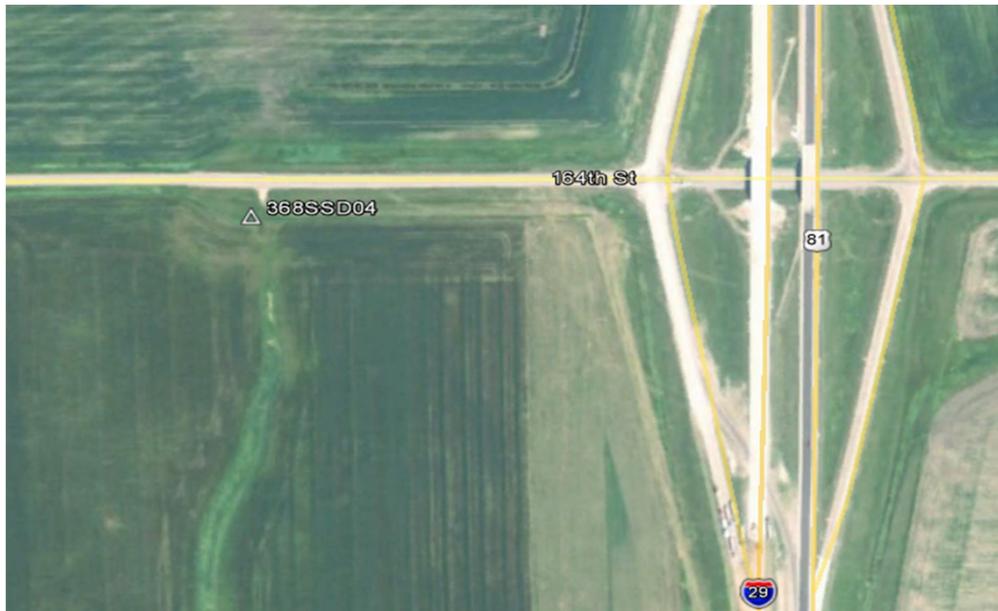
STATION NAME: 368SSD-04	MARKER TYPE: 1/2" x 4' Re-bar	DATE: April 2012
STATION NUMBER: 368SSD-04	STATION LOCALITY: Codington County South Dakota	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN: 99	UTM ZONE: 14
LATITUDE: N 45 00 20.58849	LONGITUDE: W 097 03 31.99780	ELLIPSOID HEIGHT metres (h): 534.667
UTM NORTHING metres: 4 985 418.566	UTM EASTING metres: 652 974.114	GEOID HEIGHT metres (MSL): 559.859

MONUMENT IS: FLUSH WITH GROUND ABOVE GROUND _____ CM BELOW GROUND _____ CM

MARKER LOCATION:

On the south side of County Rd 164 st inside the County Rd allowance, west of an entrance to a cultivated field, set 2 m opposite an existing fence post.

DIAGRAM (Include Ties to Relevant Features)







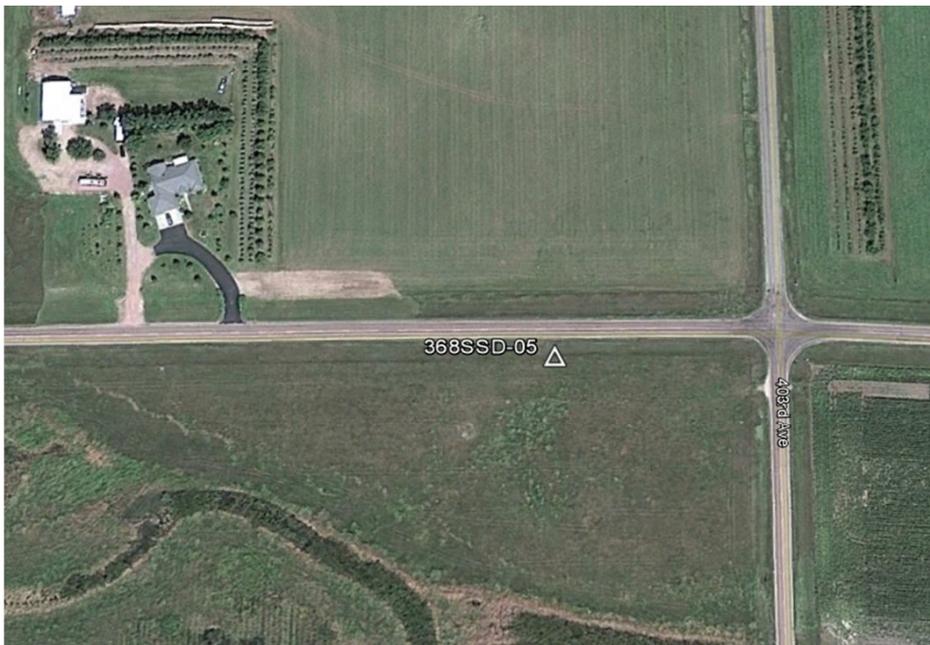
STATION DESCRIPTION FORM

PROJECT No.: 368SSD12
PROJECT NAME: South dakota
LOCATION: Davison County

PHOTOS TAKEN:

STATION NAME: 368SSD-05	MARKER TYPE: 1/2 "x 4' Rebar	DATE: 23 April 2012
STATION NUMBER: 368SSD-05	STATION LOCALITY: Davison, South Dakota	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN: 99	UTM ZONE: 14
LATITUDE: 43 42 07.73595	LONGITUDE: 098 08 51.49130	ELLIPSOID HEIGHT metres (h): 388.644
UTM NORTHING metres: 4 839 145.003	UTM EASTING metres: 568 678.546	GEOID HEIGHT metres (MSL): 414.814
MONUMENT IS: <input type="checkbox"/> FLUSH WITH GROUND <input type="checkbox"/> ABOVE GROUND _____ cm <input type="checkbox"/> BELOW GROUND _____ cm		
MARKER LOCATION: Approx 1 m North from a fence post and 5m east of an access way to a cultivated field		

DIAGRAM (Include Ties to Relevant Features)







STATION DESCRIPTION FORM

PROJECT No.: 368SSD12
PROJECT NAME: South dakota
LOCATION: Hutchinson County

PHOTOS TAKEN:

STATION NAME: 368SSD-06	MARKER TYPE: 1/2 " Rebar x 4 '	DATE: 23 April 2012
STATION NUMBER: 368SSD-06	STATION LOCALITY: Huchinson, South Dakota	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN: 99	UTM ZONE: 14
LATITUDE: N 43 24 00.35765	LONGITUDE: W 097 41 41.48358	ELLIPSOID HEIGHT metres (h): 375.846
UTM NORTHING metres: 4 806 073.853	UTM EASTING metres: 605 687.776	GEOID HEIGHT metres (MSL): 402.019

MONUMENT IS: FLUSH WITH GROUND ABOVE GROUND _____ cm BELOW GROUND _____ cm

MARKER LOCATION:

Approx 1 m North from a fence post and 9m east of an access way to a cultivated field

DIAGRAM (Include Ties to Relevant Features)



