

# Appendix A

# NGS OPUS Output

## NGS OPUS Solution 1

FILE: 89691472.08o 000062901

### NGS OPUS SOLUTION REPORT

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All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <http://www.ngs.noaa.gov/OPUS/about.html#accuracy>

USER: pdailey@njrati.org	DATE: February 21, 2010
RINEX FILE: 8969147o.08o	TIME: 14:11:44 UTC
SOFTWARE: page5 0909.08 master50.pl 081023	START: 2008/05/26 14:21:00
EPHEMERIS: igs14811.eph [precise]	STOP: 2008/05/26 21:44:00
NAV FILE: brdc1470.08n	OBS USED: 18491 / 19236 : 96\%
ANT NAME: TRM41249.00      NONE	# FIXED AMB: 61 / 72 : 85\%
ARP HEIGHT: 1.5	OVERALL RMS: 0.017(m)

REF FRAME: NAD\_83(CORS96)(EPOCH:2002.0000)                    ITRFOO (EPOCH:2008.4010)

X:	939900.948(m)	0.025(m)	939900.245(m)	0.025(m)
Y:	-5150611.988(m)	0.008(m)	-5150610.502(m)	0.008(m)
Z:	3630563.038(m)	0.021(m)	3630562.883(m)	0.021(m)
LAT:	34 55 8.30878	0.017(m)	34 55 8.33416	0.017(m)
E LON:	280 20 30.24278	0.026(m)	280 20 30.22604	0.026(m)
W LON:	79 39 29.75722	0.026(m)	79 39 29.77396	0.026(m)
EL HGT:	110.196(m)	0.012(m)	108.805(m)	0.012(m)
ORTHO HGT:	141.772(m)	0.028(m)	[NAVD88 (Computed using GEOID03)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 17)	SPC (3200 NC )
Northing (Y) [meters]	3864879.250	129874.137
Easting (X) [meters]	622559.919	549457.252
Convergence [degrees]	0.76812771	-0.37993149
Point Scale	0.99978513	0.99988936
Combined Factor	0.99976784	0.99987206

US NATIONAL GRID DESIGNATOR: 17SPU2255964879(NAD 83)

### BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DG7402	NCPO POLKTON CORS ARP	N345933.173	W0801037.858	48094.7
DK4045	NCTR TROY CORS ARP	N352201.845	W0795212.771	53345.6
DG5938	NCCA CARTHAGE CORS ARP	N352030.048	W0792305.085	53111.4

### NEAREST NGS PUBLISHED CONTROL POINT

EB2854	FRUITLAND RM 2 AZIMUTH	N345516.664	W0793924.904	286.2
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This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

## NGS OPUS Solution 2

FILE: 89691491.08o 000062905

### NGS OPUS SOLUTION REPORT

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All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <http://www.ngs.noaa.gov/OPUS/about.html#accuracy>

USER: pdaily@njrati.org	DATE: February 21, 2010
RINEX FILE: 8969149w.08o	TIME: 14:15:33 UTC
SOFTWARE: page5 0909.08 master40.pl 081023	START: 2008/05/28 22:20:00
EPHEMERIS: igs14813.eph [precise]	STOP: 2008/05/29 20:40:00
NAV FILE: brdc1490.08n	OBS USED: 58256 / 60076 : 97\%
ANT NAME: TRM41249.00      NONE	# FIXED AMB: 157 / 181 : 87\%
ARP HEIGHT: 1.5	OVERALL RMS: 0.017(m)

REF FRAME: NAD\_83(CORS96) (EPOCH:2002.0000)                    ITRFOO (EPOCH:2008.4082)

X:	939900.953(m)	0.013(m)	939900.250(m)	0.013(m)
Y:	-5150611.985(m)	0.034(m)	-5150610.499(m)	0.034(m)
Z:	3630563.028(m)	0.016(m)	3630562.873(m)	0.016(m)
LAT:	34 55 8.30856	0.008(m)	34 55 8.33393	0.008(m)
E LON:	280 20 30.24299	0.008(m)	280 20 30.22626	0.008(m)
W LON:	79 39 29.75701	0.008(m)	79 39 29.77374	0.008(m)
EL HGT:	110.189(m)	0.037(m)	108.798(m)	0.037(m)
ORTHO HGT:	141.765(m)	0.045(m)	[NAVD88 (Computed using GEOID03)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 17)	SPC (3200 NC )
Northing (Y) [meters]	3864879.243	129874.130
Easting (X) [meters]	622559.924	549457.257
Convergence [degrees]	0.76812774	-0.37993146
Point Scale	0.99978513	0.99988936
Combined Factor	0.99976784	0.99987206

US NATIONAL GRID DESIGNATOR: 17SPU2255964879(NAD 83)

### BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DG7402	NCPO POLKTON CORS ARP	N345933.173	W0801037.858	48094.7
DK4045	NCTR TROY CORS ARP	N352201.845	W0795212.771	53345.6
DI1682	NCLU LUMBERTON CORS ARP	N343736.336	W0790439.695	62252.3

NEAREST NGS PUBLISHED CONTROL POINT  
EB2854      FRUITLAND RM 2 AZIMUTH      N345516.664 W0793924.904      286.2

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

# NGS Data Sheet EB1559

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DATABASE = ,PROGRAM = datasheet, VERSION = 7.60
1           National Geodetic Survey,   Retrieval Date = MAY 27, 2008
EB1559 ****
EB1559 DESIGNATION - ROCKINGHAM RESET
EB1559 PID      - EB1559
EB1559 STATE/COUNTY- NC/RICHMOND
EB1559 USGS QUAD - HAMLET (1982)
EB1559
EB1559          *CURRENT SURVEY CONTROL
EB1559
EB1559* NAD 83(2007)- 34 54 31.49602(N)    079 41 01.64429(W)    ADJUSTED
EB1559* NAVD 88     -      118.731 (meters)    389.54 (feet)    ADJUSTED
EB1559
EB1559-----EPOCH DATE -      2002.00
EB1559 X      -      937,719.254 (meters)      COMP
EB1559 Y      -      -5,151,650.434 (meters)      COMP
EB1559 Z      -      3,629,619.608 (meters)      COMP
EB1559 LAPLACE CORR-      -4.82 (seconds)      DEFLEC99
EB1559 ELLIP HEIGHT-      87.199 (meters)      (02/10/07) ADJUSTED
EB1559 GEOID HEIGHT-      -31.48 (meters)      GEOID03
EB1559 DYNAMIC HT -      118.622 (meters)    389.18 (feet)    COMP
EB1559
EB1559 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
EB1559 Type    PID    Designation      North   East   Ellip
EB1559
EB1559 NETWORK EB1559 ROCKINGHAM RESET      1.29   1.06   2.74
EB1559
EB1559 MODELED GRAV-      979,707.4 (mgal)      NAVD 88
EB1559
EB1559 VERT ORDER - FIRST      CLASS II
EB1559
EB1559.The horizontal coordinates were established by GPS observations
EB1559.and adjusted by the National Geodetic Survey in February 2007.
EB1559
EB1559.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
EB1559.The horizontal coordinates are valid at the epoch date displayed above.
EB1559.The epoch date for horizontal control is a decimal equivalence
EB1559.of Year/Month/Day.
EB1559
EB1559.The orthometric height was determined by differential leveling
EB1559.and adjusted in June 1991.
EB1559
EB1559.The X, Y, and Z were computed from the position and the ellipsoidal ht.
EB1559
EB1559.The Laplace correction was computed from DEFLEC99 derived deflections.
EB1559
EB1559.The ellipsoidal height was determined by GPS observations
EB1559.and is referenced to NAD 83.
EB1559
EB1559.The geoid height was determined by GEOID03.
EB1559
EB1559.The dynamic height is computed by dividing the NAVD 88
EB1559.geopotential number by the normal gravity value computed on the
EB1559.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
EB1559.degrees latitude (g = 980.6199 gals.).
EB1559
EB1559.The modeled gravity was interpolated from observed gravity values.
EB1559
EB1559;          North      East      Units Scale Factor Converg.
EB1559;SPC NC   -  128,755.617  547,117.399  MT  0.99989040  -0 23 40.8
EB1559;SPC NC   -  422,425.72   1,795,001.00  sFT  0.99989040  -0 23 40.8

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EB1559;UTM 17 - 3,863,714.200 620,243.197 MT 0.99977820 +0 45 11.9  
 EB1559  
 EB1559! - Elev Factor x Scale Factor = Combined Factor  
 EB1559!SPC NC - 0.99998631 x 0.99989040 = 0.99987671  
 EB1559!UTM 17 - 0.99998631 x 0.99977820 = 0.99976452  
 EB1559  
 EB1559: Primary Azimuth Mark Grid Az  
 EB1559:SPC NC - ROCKINGHAM RM 1 AZIMUTH 063 44 34.0  
 EB1559:UTM 17 - ROCKINGHAM RM 1 AZIMUTH 062 35 41.3  
 EB1559  
 EB1559|-----|  
 EB1559| PID Reference Object Distance Geod. Az |  
 EB1559| dddmmss.s |  
 EB1559| EB3564 ROCKINGHAM RM 1 AZIMUTH 0632053.2 |  
 EB1559| EB3565 ROCKINGHAM RM 2 25.344 METERS 08611 |  
 EB1559| EB1561 ROCKINGHAM RM 4 18.703 METERS 09503 |  
 EB1559| EB3563 ROCKINGHAM RM 20.840 METERS 16626 |  
 EB1559| EB1560 ROCKINGHAM RM 3 30.681 METERS 19004 |  
 EB1559| EB2850 HAMLET SEABOARD RR WATER TANK APPROX. 3.1 KM 2044531.0 |  
 EB1559| EB1562 PACE APPROX. 0.7 KM 2144024.4 |  
 EB1559|-----|  
 EB1559  
 EB1559 SUPERSEDED SURVEY CONTROL  
 EB1559  
 EB1559 NAD 83(2001)- 34 54 31.49597(N) 079 41 01.64418(W) AD( ) 1  
 EB1559 ELLIP H (03/13/03) 87.214 (m) GP( ) 4 2  
 EB1559 NAD 83(1986)- 34 54 31.50606(N) 079 41 01.64801(W) AD( ) 1  
 EB1559 NAD 83(1986)- 34 54 31.50078(N) 079 41 01.65069(W) AD( ) 1  
 EB1559 NAD 27 - 34 54 30.94100(N) 079 41 02.45300(W) AD( ) 1  
 EB1559 NAVD 88 (07/24/98) 118.73 (m) 389.5 (f) LEVELING 3  
 EB1559 NGVD 29 (10/06/93) 118.999 (m) 390.42 (f) ADJUSTED 1 2  
 EB1559  
 EB1559.Superseeded values are not recommended for survey control.  
 EB1559.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 EB1559  
 EB1559\_U.S. NATIONAL GRID SPATIAL ADDRESS: 17SPU2024363714(NAD 83)  
 EB1559\_MARKER: DS = TRIANGULATION STATION DISK  
 EB1559\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT  
 EB1559\_SP\_SET: CONCRETE POST  
 EB1559\_STAMPING: ROCKINGHAM 1918 1980  
 EB1559\_MARK LOGO: NGS  
 EB1559\_PROJECTION: PROJECTING 5 CENTIMETERS  
 EB1559\_MAGNETIC: N = NO MAGNETIC MATERIAL  
 EB1559\_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO  
 EB1559+STABILITY: SURFACE MOTION  
 EB1559\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR  
 EB1559+SATELLITE: SATELLITE OBSERVATIONS - July 28, 1993  
 EB1559  
 EB1559 HISTORY - Date Condition Report By  
 EB1559 HISTORY - 1980 MONUMENTED NGS  
 EB1559 HISTORY - 1980 GOOD NGS  
 EB1559 HISTORY - 1982 GOOD LOCENG  
 EB1559 HISTORY - 19930728 GOOD NCGS  
 EB1559  
 EB1559 STATION DESCRIPTION  
 EB1559  
 EB1559'DESCRIBED BY NATIONAL GEODETIC SURVEY 1980 (HDM)  
 EB1559'1.5 MI NE FROM HAMLET.  
 EB1559'1.6 MILES NORTHEAST ALONG N.C. 177 FROM INTERSECTION WITH U.S. 74  
 EB1559'IN HAMLET, ACROSS HIGHWAY FROM INTERSECTION WITH SR 1627 AND IN A  
 EB1559'VACANT LOT BESIDE A VACANT FRAME HOUSE, 74.0 FEET SOUTHEAST OF  
 EB1559'CENTERLINE OF HIGHWAY, 89.0 FEET NORTHWEST OF NORTHWEST RAIL,  
 EB1559'63.2 FEET WEST OF POWER POLE 4004 WITH REFERENCE TAG, 30.2 FEET SOUTH  
 EB1559'OF 18 INCH OAK WITH REFERENCE TAG AND 28.2 FEET NORTH OF 12 INCH

EB1559' OAK WITH REFERENCE TAG.

EB1559' THE MARK IS 1.3 FT NE FROM A WITNESS POST.

EB1559' THE MARK IS ABOVE LEVEL WITH HIGHWAY.

EB1559

EB1559 STATION RECOVERY (1980)

EB1559

EB1559' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1980 (CLN)

EB1559' THE STATION MARK AND REFERENCE MARK 3 WERE RECOVERED. THE STATION

EB1559' MARK HAD BEEN DISTURBED AND WAS DUG OUT AND THE SUB-SURFACE MARK

EB1559' LOWERED AND BOTH MARKS RESET. REFERENCE MARK 3 WAS FOUND IN GOOD

EB1559' CONDITION. REFERENCE MARK 2 WAS FOUND WITH TOP OF MARK BROKEN OFF.

EB1559' REFERENCE MARK 1 WAS SEARCHED FOR BUT WAS NOT FOUND. A REFERENCE MARK

EB1559' 4 WAS ESTABLISHED AT THIS TIME.

EB1559'

EB1559' A COMPLETE NEW DESCRIPTION FOLLOWS.

EB1559'

EB1559' STATION IS ABOUT 1-1/2 MILES NORTHEAST OF HAMLET AND 0.05 MILE

EB1559' SOUTHWEST OF THE JUNCTION OF STATE HIGHWAY 177 AND SR1672 AND JUST

EB1559' WEST OF A SMALL FRAME HOUSE THAT IS ABANDONED AND FALLING APART.

EB1559'

EB1559' STATION MARKS ARE STANDARD DISKS STAMPED--ROCKINGHAM 1918 1980--,

EB1559' SURFACE DISK IS SET IN THE TOP OF A CYLINDRICAL CONCRETE POST THAT IS

EB1559' 12-INCHES IN DIAMETER AND FLUSH WITH THE GROUND. SUB-SURFACE MARK IS

EB1559' SET IN AN IRREGULAR MASS OF CONCRETE 3.5 FEET BELOW GROUND SURFACE.

EB1559' THEY ARE 28.2 FEET NORTH OF A 12-INCH OAK TREE WITH A REFERENCE TAG,

EB1559' 30.2 FEET SOUTH OF AN 18-INCH OAK TREE WITH A REFERENCE TAG, 63.2 FEET

EB1559' WEST OF POWERLINE POLE 4004 WITH A REFERENCE TAG, 74 FEET SOUTHEAST OF

EB1559' THE CENTERLINE OF STATE ROUTE 177 AND 89 FEET NORTHWEST OF THE

EB1559' NORTHWEST RAIL OF RAILROAD TRACKS AND 1.3 FEET NORTHEAST OF A METAL

EB1559' WITNESS POST.

EB1559'

EB1559' REFERENCE MARK 3 IS A STANDARD DISK STAMPED--ROCKINGHAM NO 3 1933-,

EB1559' SET IN THE TOP OF A 14-INCH SQUARE CONCRETE POST THAT PROJECTS 2

EB1559' INCHES. IT IS 1.5 FEET WEST SOUTHWEST OF A TELEPHONE LINE POLE WITH A

EB1559' REFERENCE TAG, 34 FEET NORTHWEST OF THE NORTHWEST RAIL OF RAILROAD

EB1559' TRACKS, 63.1 SOUTHWEST OF ANOTHER TELEPHONE POLE WITH A REFERENCE TAG

EB1559' AND 117.8 FEET SOUTHEAST OF THE CENTERLINE OF STATE ROUTE 177.

EB1559'

EB1559' REFERENCE MARK 4 IS A STANDARD DISK STAMPED--ROCKINGHAM 1918 NO 4

EB1559' 1980--, SET IN THE TOP OF A CYLINDRICAL CONCRETE POST THAT IS

EB1559' 14-INCHES IN DIAMETER AND PROJECTS 3 INCHES. IT IS 1.7 WEST OF

EB1559' POWERLINE POLE 4004, WITH A REFERENCE TAG, 38 FEET SOUTHEAST OF THE

EB1559' SOUTHEAST CORNER OF A CONCRETE BLOCK, WELL HOUSE, 59.5 FEET NORTHEAST

EB1559' OF A TELEPHONE LINE POLE WITH A REFERENCE TAG AND 40.9 FEET NORTHWEST

EB1559' OF THE NORTHWEST RAIL OF RAILROAD TRACKS.

EB1559'

EB1559' TO REACH THE STATION FROM THE JUNCTION OF US HIGHWAY 74 AND STATE

EB1559' HIGHWAY 177, GO NORTHEASTERLY ON STATE HIGHWAY 177 FOR 1.6 MILES TO

EB1559' THE MARK ON THE RIGHT.

EB1559'

EB1559' THE STATION IS A STANDARD NGS DISK STAMPED--ROCKINGHAM 1918 1980--,

EB1559' SET INTO THE TOP OF A ROUND CONCRETE MONUMENT 12 INCHES IN DIAMETER

EB1559' FLUSH WITH GROUND LOCATED 89 FEET NW OF NW RAIL OF RAILROAD TRACKS, 74

EB1559' FEET SE OF CENTERLINE OF ST 177, 63.2 FT W FROM PLP 4004 W/TAG, 30.2

EB1559' FT S FROM 18 INCH OAK W/TAG, AND 28.2 FT N FROM 12 INCH OAK W/TAG.

EB1559'

EB1559' THE UNDERGROUND MARK IS A STANDARD NGS DISK STAMPED--ROCKINGHAM 1918

EB1559' 1980--, SET INTO AN IRREGULAR MASS OF CONCRETE 3.5 FEET BELOW THE

EB1559' SURFACE.

EB1559'

EB1559' REFERENCE MARK NO 3 IS A STANDARD CGS DISK STAMPED--ROCKINGHAM NO 3

EB1559' 1933--, SET INTO THE TOP OF A SQUARE CONCRETE MONUMENT 14 INCHES ON

EB1559' SIDE PROJECTING 2 INCHES ABOVE THE GROUND LOCATED 63.1 FT SW FROM TELE

EB1559' POLE W/TAG, 34 FT NW OF NW RAIL, 117.8 FT SE FROM CENTERLINE ST RT

EB1559'177, AND 1.5 FT WSW FROM TEL POLE W/TAG.

EB1559'

EB1559'REFERENCE MARK NO 4 IS A STANDARD NGS DISK STAMPED--ROCKINGHAM 1918 NO  
EB1559'4 1980--, SET INTO THE TOP OF A ROUND CONCRETE MONUMENT 14 INCHES IN  
EB1559'DIAMETER PROJECTING 3 INCHES ABOVE THE GROUND LOCATED 40.9 FT NW OF NW  
EB1559'RAIL, 1.7 FT W FROM PLP NO 4004 W/TAG, 59.5 FT NE FROM TEL POLE W/TAG,  
EB1559'AND 38.0 FT S OF SE CORNER CONCRETE BLOCKWELL HOUSE.

EB1559

EB1559 STATION RECOVERY (1982)

EB1559

EB1559'RECOVERY NOTE BY LOCAL ENGINEER (INDIVIDUAL OR FIRM) 1982 (DR)  
EB1559'STATION WAS RECOVERED IN GOOD SHAPE. I DID NOT CHECK FOR REFERENCE  
EB1559'MARKS, HOWEVER, I DID FIND THAT NCGS STATION SARGES IS VISIBLE FROM  
EB1559'ROCKINGHAM.

EB1559

EB1559 STATION RECOVERY (1993)

EB1559

EB1559'RECOVERY NOTE BY NORTH CAROLINA GEODETIC SURVEY 1993 (LWA)  
EB1559'RECOVERED AS DESCRIBED. THE ROAD IS SR 1627 (EARLE FRANKLIN ROAD)NOT  
EB1559'SR 1672. MARK IS IN A JUNK YARD AND LINES-OF-SIGHT ARE BLOCKED TO  
EB1559'REFERENCE MARKS.

\*\*\* retrieval complete.

Elapsed Time = 00:00:01

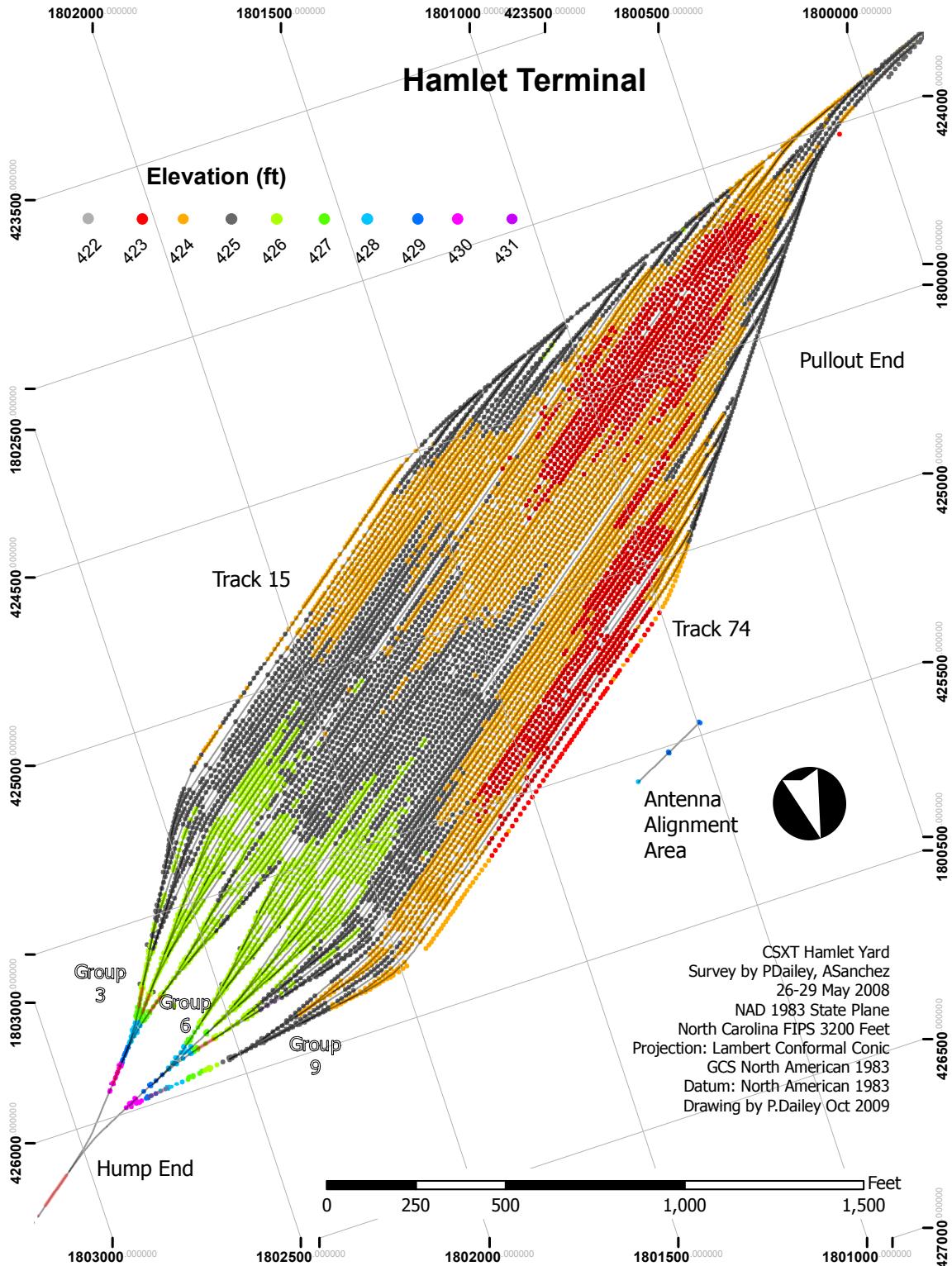


Figure 1: Hump Yard Elevation Color Map

Table 1: Hump Yard Profiles

Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9
Track 15	Track 25	Track 33	Track 41	Track 49	Track 57	Track 65
Track 17	Track 26	Track 34	Track 42	Track 50	Track 58	Track 66
Track 18	Track 27	Track 35	Track 43	Track 51	Track 59	Track 67
Track 19	Track 28	Track 36	Track 44	Track 52	Track 60	Track 68
Track 20	Track 29	Track 37	Track 45	Track 53	Track 61	Track 69
Track 21	Track 30	Track 38	Track 46	Track 54	Track 62	Track 70
Track 22	Track 31	Track 39	Track 47	Track 55	Track 63	Track 71
Track 23	Track 32	Track 40	Track 48	Track 56	Track 64	Track 72
Track 24						Track 74

## Hump Yard Profiles

Table 1 note: Track group headings are hyperlinked to Excel workbooks containing track elevation data. Track numbers are hyperlinked to drawings.

Hamlet Terminal track number designation

The 1955 Hamlet terminal design planned for eleven groups. However only seven of the eleven track groups were constructed, totaling 58 tracks. Track groups one and two were never constructed, however track numbering follows the original eleven group numbering convention. Consequently, track numbering begins in group 3 with track 15, skips 16, and continue sequentially from track 17 through track 72, skips 73, concluding with track 74 in group 9.

Figure 2: Group 3 Track Profile Thumbnails

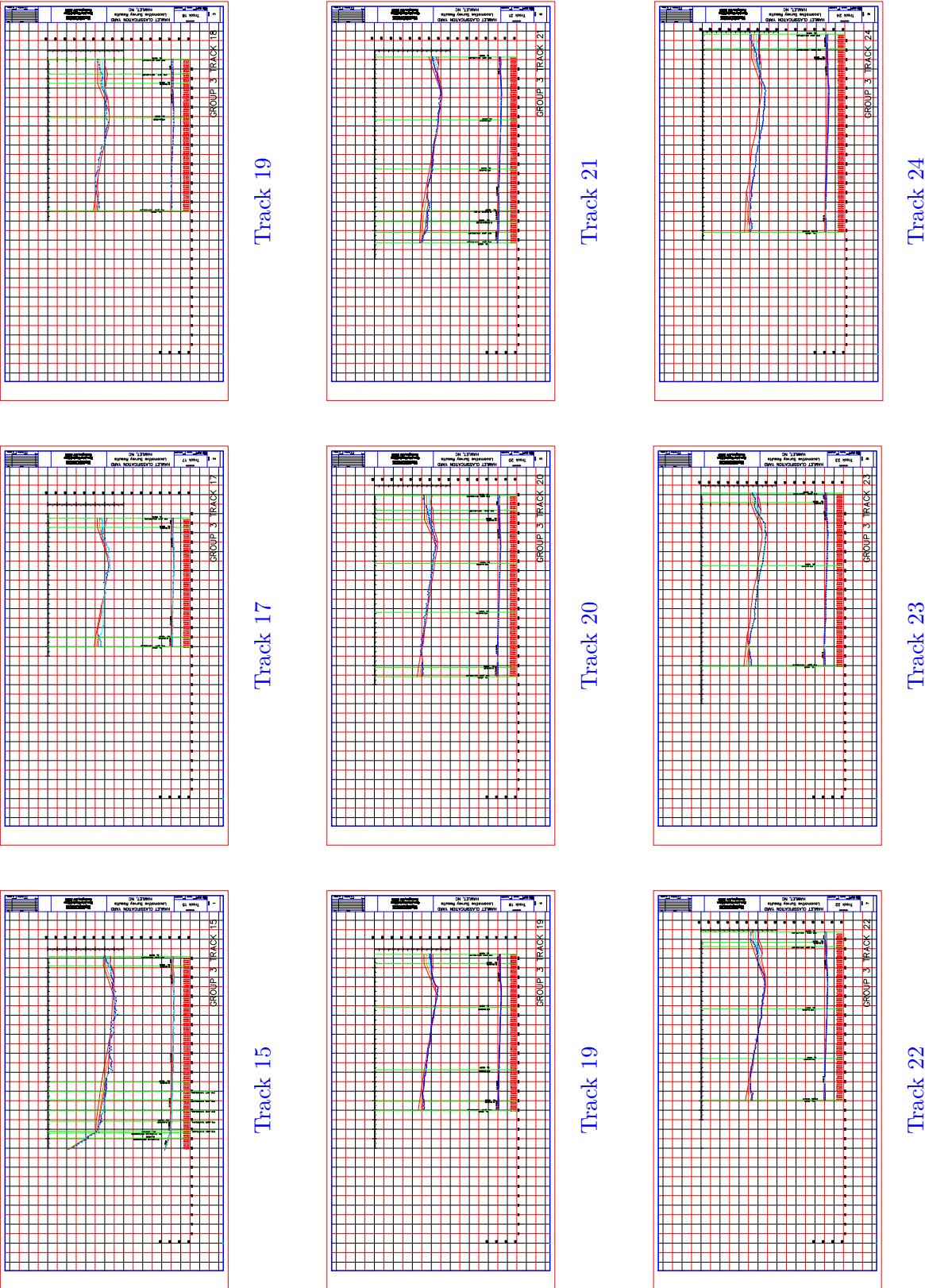


Figure 3: Group 4 Track Profile Thumbnails

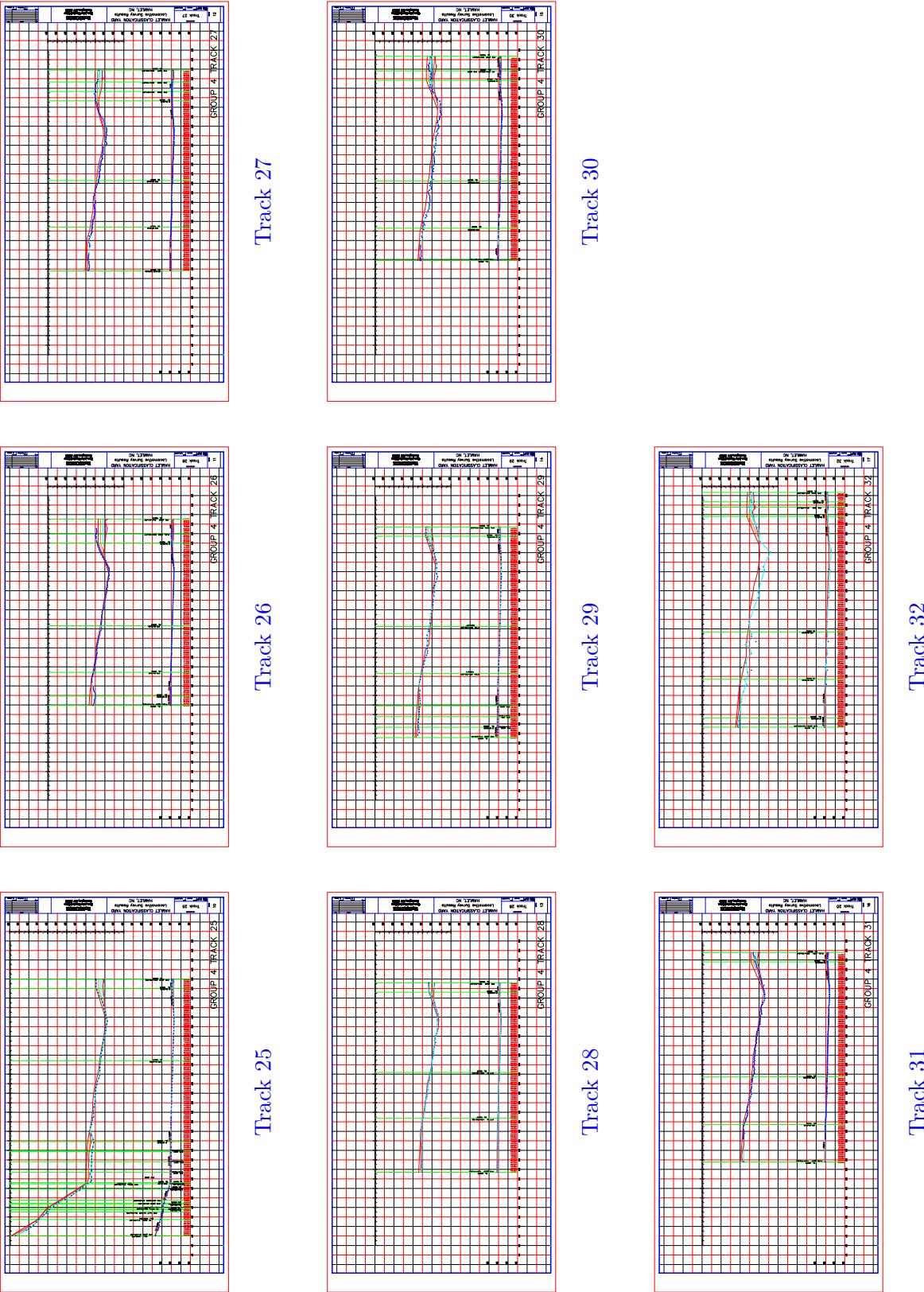


Figure 4: Group 5 Track Profile Thumbnails

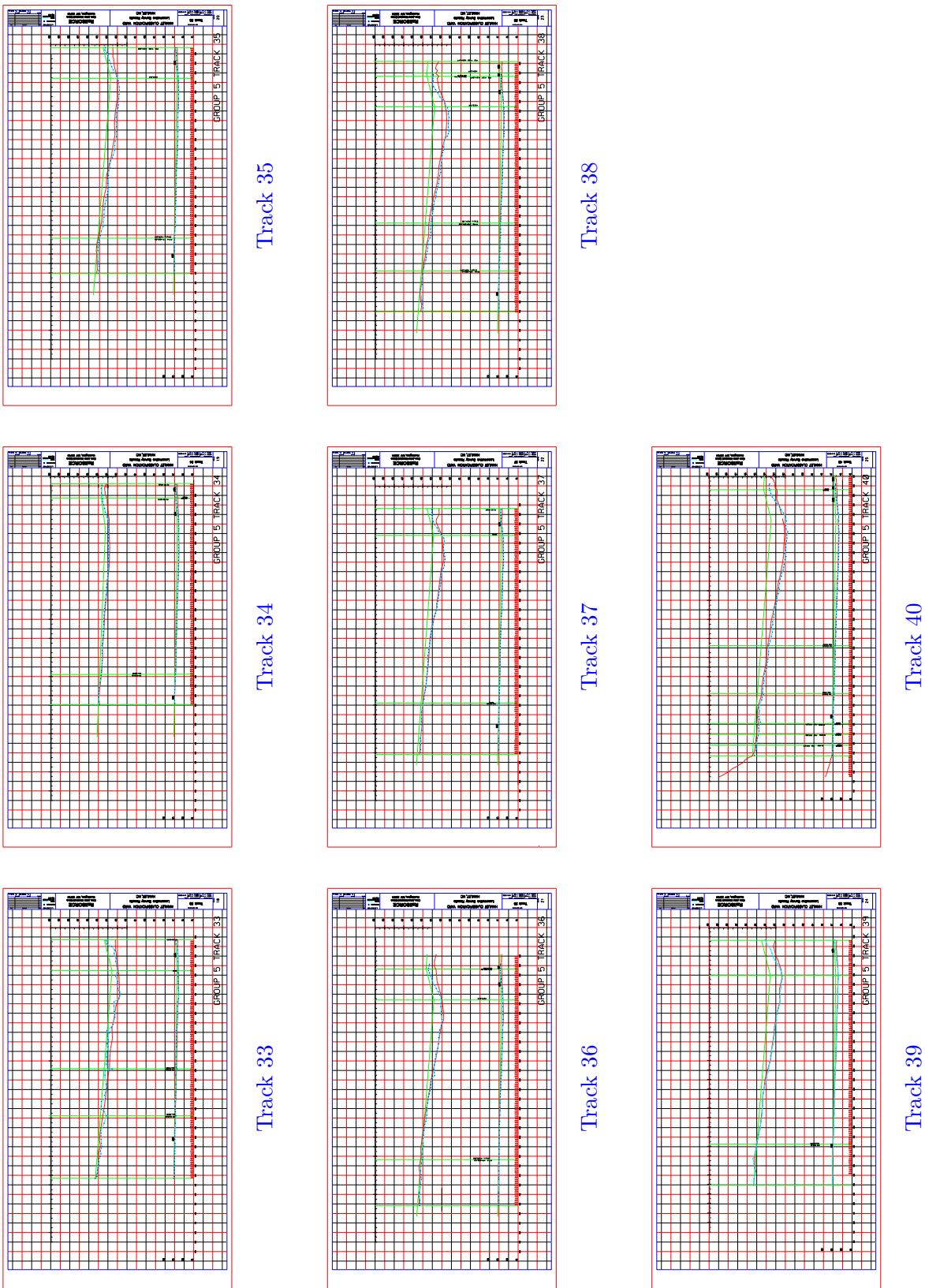


Figure 5: Group 6 Track Profile Thumbnails

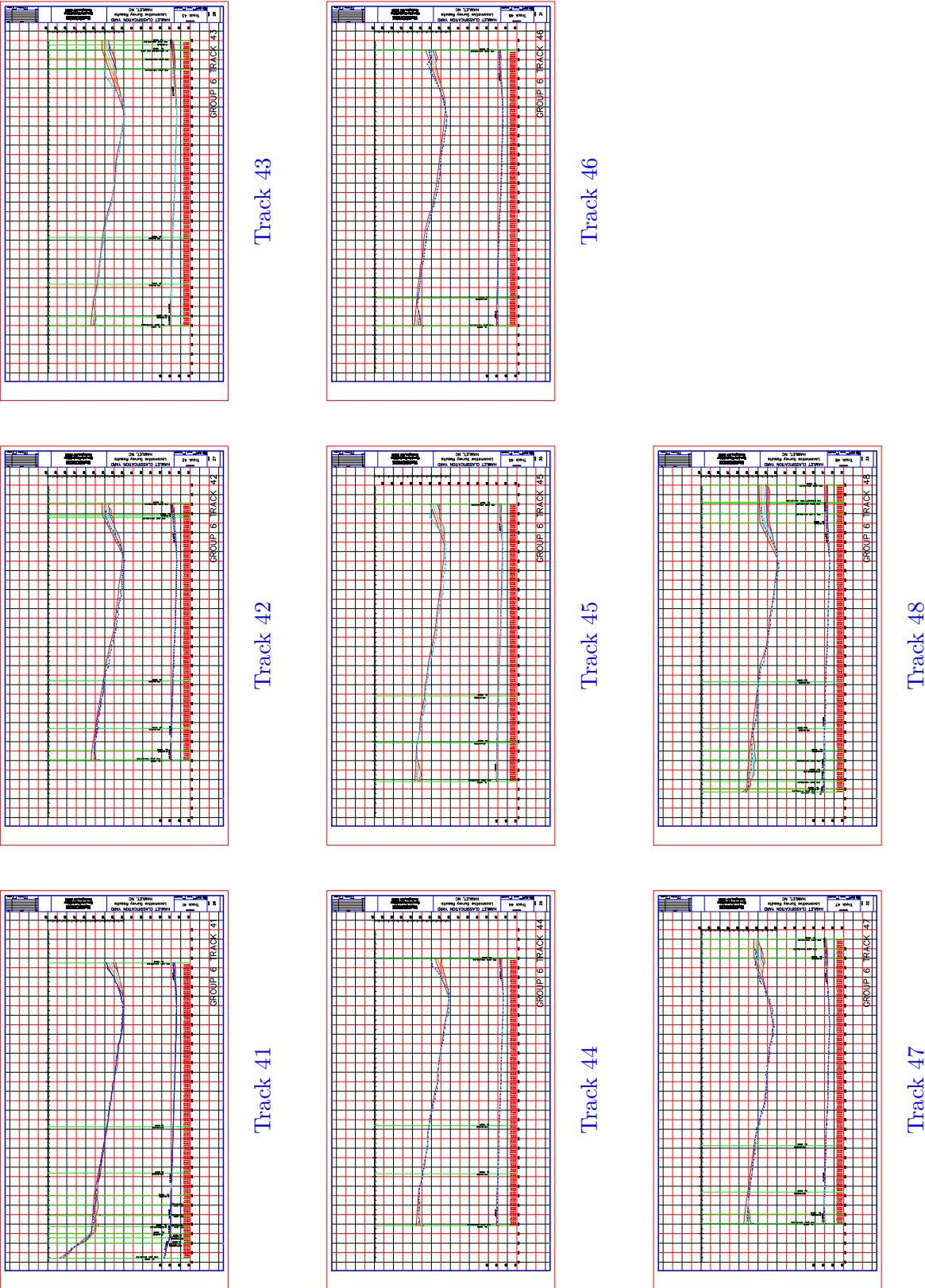


Figure 6: Group 7 Track Profile Thumbnails

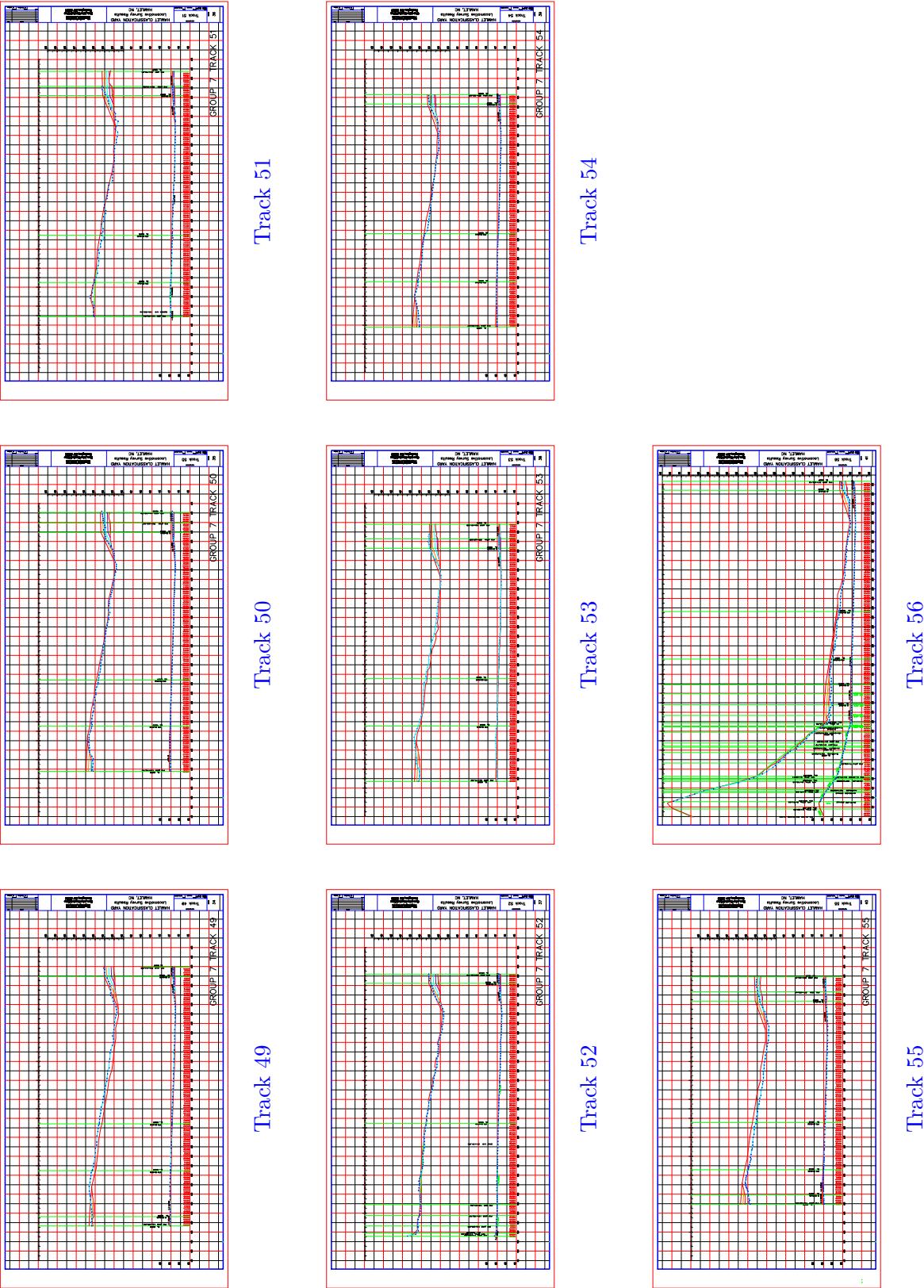


Figure 7: Group 8 Track Profile Thumbnails

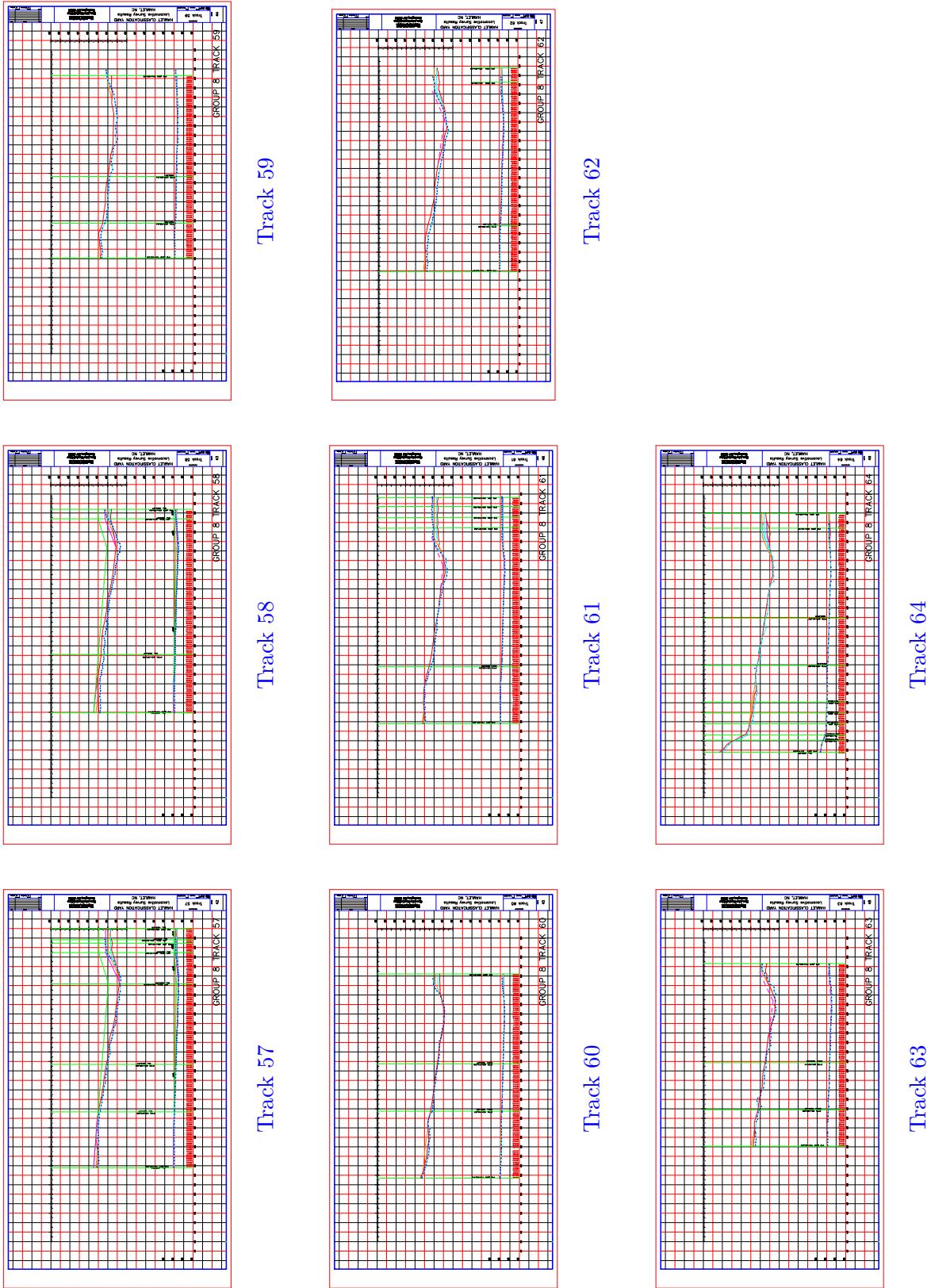
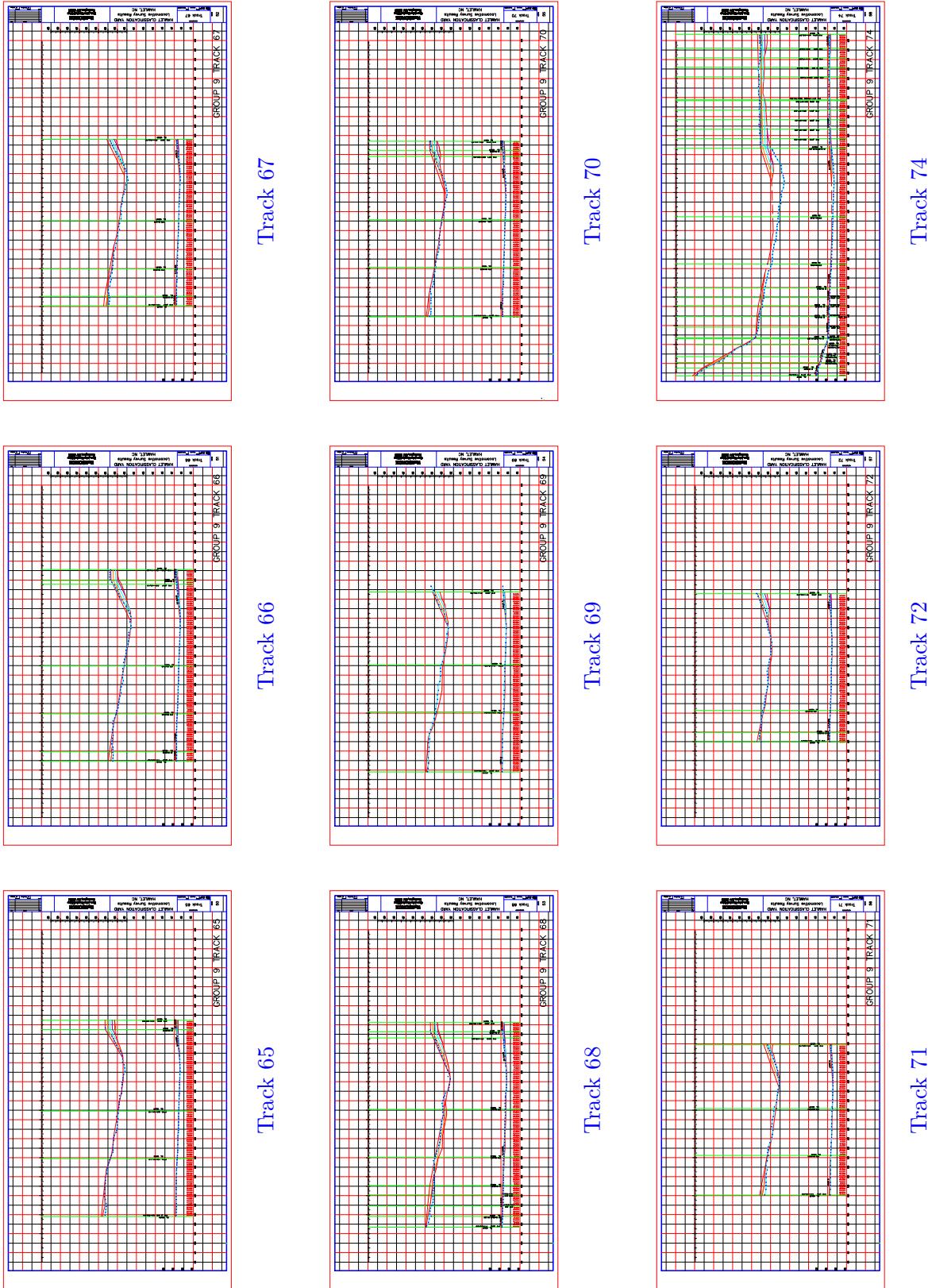


Figure 8: Group 9 Track Profile Thumbnails



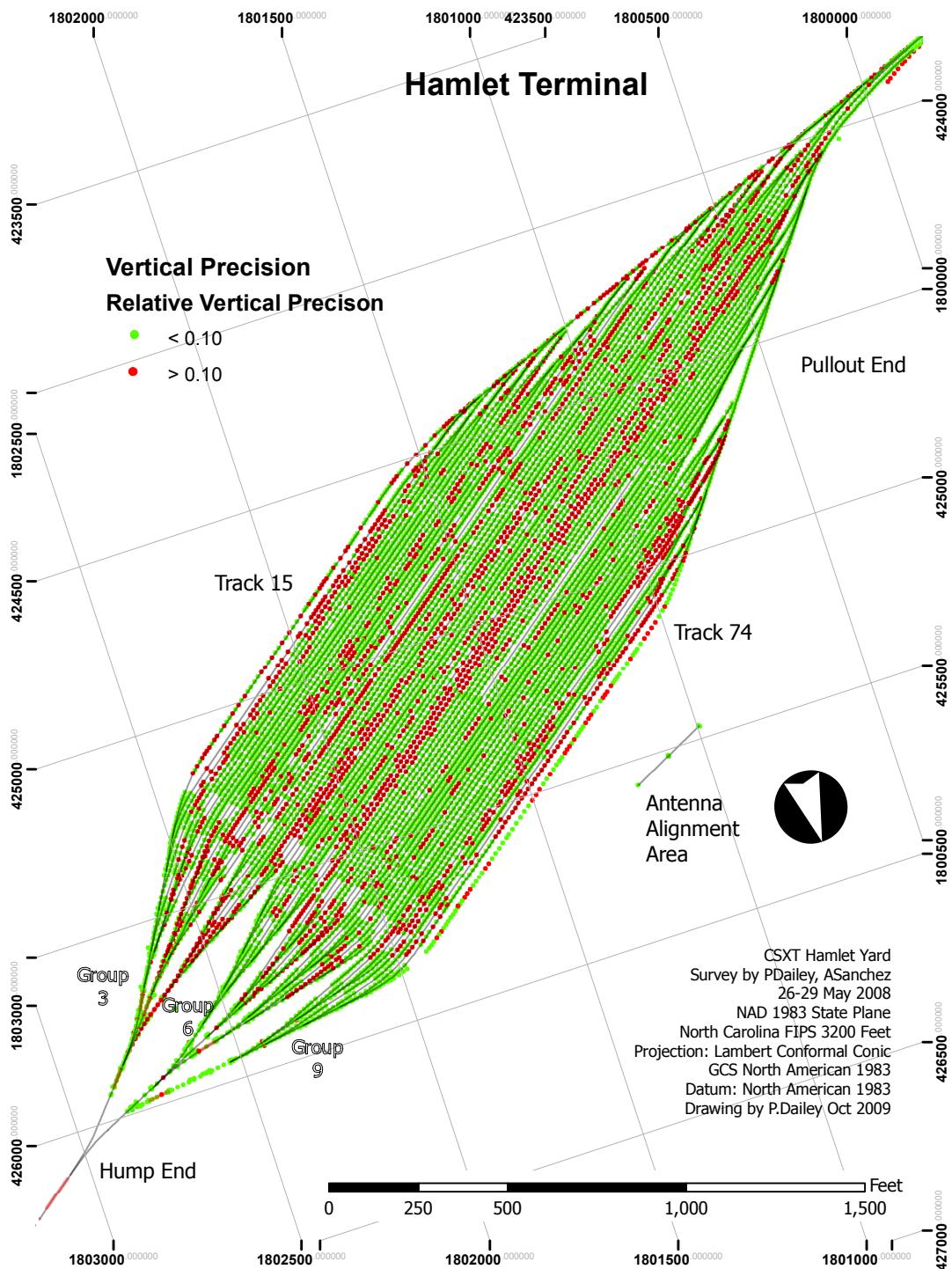


Figure 9: Relative Vertical Precision Color Map

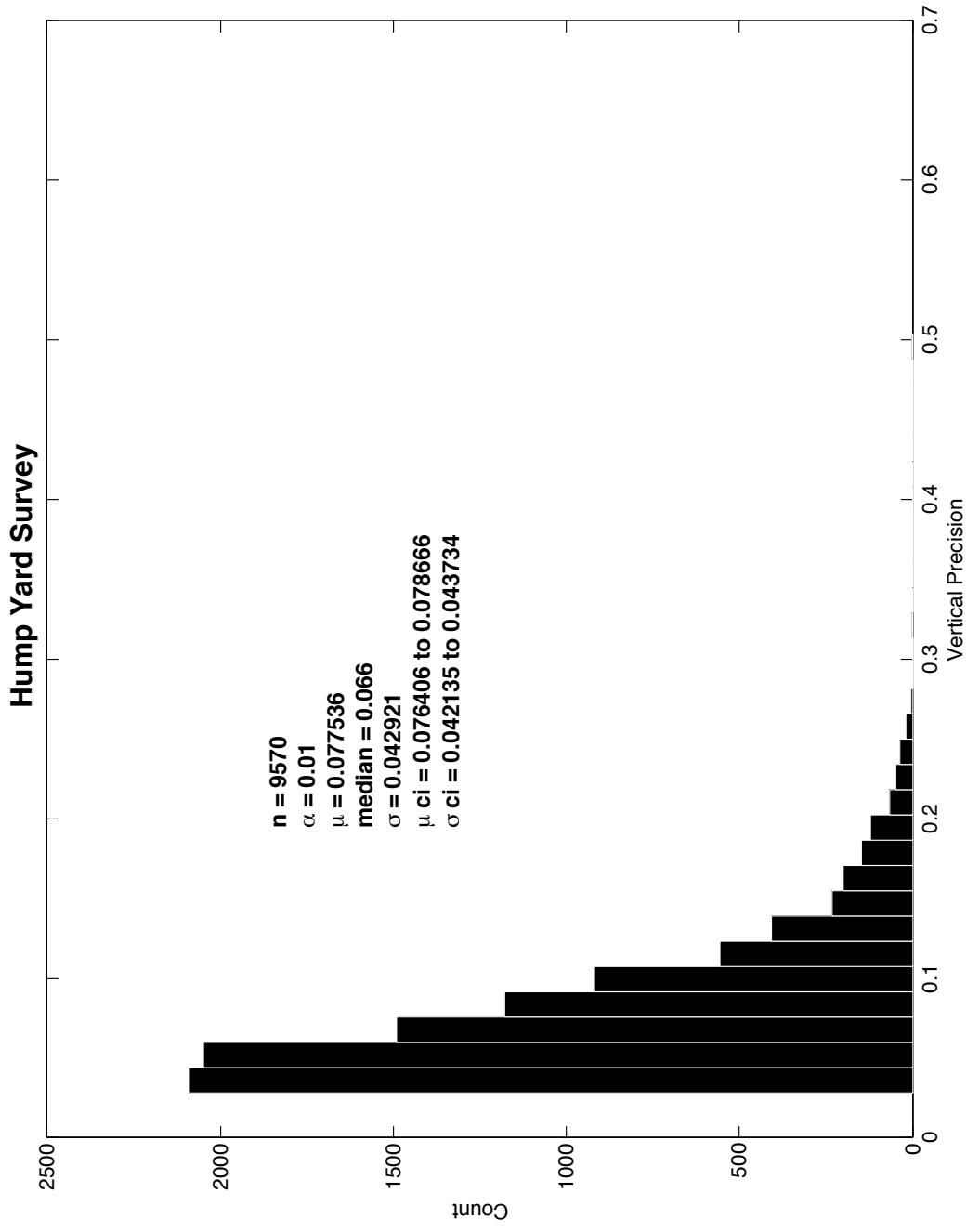


Figure 10: Relative Vertical Precision Histogram

*Student Version of MATLAB*

# Ad Hoc Reference Station TEQC Report

version: teqc 2009Oct19

```

Poss. # of obs epochs : 1771
Epochs w/ observations : 1771
Epochs repeated : 0 (0.00\%)
Possible obs > 0.0 deg: 17729
Possible obs > 10.0 deg: 14739
Complete obs > 10.0 deg: 14666
    Missed obs > 10.0 deg: 59
    Deleted obs > 10.0 deg: 14
Obs w/ SV duplication : 0 (within non-repeated epochs)
Moving average MP1 : 0.379945 m
Moving average MP2 : 0.516314 m
Points in MP moving avg : 50
No. of Rx clock offsets : 0
Total Rx clock drift : 0.000000 ms
Rate of Rx clock drift : 0.000 ms/hr
Avg time between resets : Inf minute(s)
Freq no. and timecode : 2 10368 3fc000
Report gap > than : 10.00 minute(s)
epochs w/ msec clk slip : 23
other msec mp events : 0 (: 384) {expect ~= 1:50}
IOD signifying a slip : >400.0 cm/minute
IOD slips < 10.0 deg* : 0
IOD slips > 10.0 deg : 0
IOD or MP slips < 10.0*: 0
IOD or MP slips > 10.0 : 191
* or unknown elevation
      first epoch     last epoch     hrs   dt #expt #have \%   mp1   mp2 o/slps
SUM 08 5 26 14:21 08 5 26 21:44 7.379 15 14739 14666 100 0.38 0.52      77

```

Processing parameters are:

```

Receiver tracking capability : 24 SVs
Maximum ionospheric rate (L1) : 400.00 cm/min
Report data gap greater than : 10.00 min
Expected rms of MP1 multipath : 50.00 cm
Expected rms of MP2 multipath : 65.00 cm
Multipath slip sigma threshold : 4.00 cm
\% increase in MP rms for C/A | A/S : 100.00 \%
Points in MP moving averages : 50
Minimum signal to noise for L1 : 0
Minimum signal to noise for L2 : 0
Elevation mask (cutoff) : 10.00 degrees
Elevation comparison threshold : 25.00 degrees
Orbit path spline fit sample time : 10 min
SVs w/ code data for position try : 5
Width of ASCII summary plot : 72
Data indicators on summary plot : yes
Do ionospheric observable : yes
Do ionospheric derivative : yes
Do high-pass ionosphere observable : no
Do multipath observables : yes
Do 1-ms receiver clock slips : yes
Tolerance for 1-ms clock slips : 1.00e-02 ms
Do receiver LLI slips : yes
Do plot file(s) : yes

```

Observations start : 2008 May 26 14:21:30.000  
 Observations end : 2008 May 26 21:44:00.000  
 Observation interval : 15.0000 second(s)

SV	#+hor	<ele>	#+mask	<ele>	#reprt	#compl	L1	L2	P1	P2	CA	L2C
G10	204	6.67	51	11.76	51	44	47	47	0	47	51	0
G18	1332	47.02	1231	50.47	1231	1231	1231	1231	0	1231	1231	0
G21	980	48.20	875	53.40	875	875	875	875	0	875	875	0
G24	671	35.75	570	41.22	570	570	570	570	0	570	570	0
G26	498	23.02	378	28.77	378	378	378	378	0	378	378	0
G29	812	12.42	498	17.07	497	496	497	496	0	496	497	0
G09	1119	37.70	1012	41.16	1012	1011	1012	1011	0	1011	1012	0
G15	679	29.33	546	35.28	542	542	542	542	0	542	542	0
G06	888	11.65	568	15.42	558	553	557	554	0	554	558	0
G22	1682	43.62	1565	46.47	1553	1553	1553	1553	0	1553	1553	0
G14	1693	42.02	1581	44.64	1578	1578	1578	1578	0	1578	1578	0
G05	1217	22.51	958	27.27	954	954	954	954	0	954	954	0
G12	1077	17.79	806	22.11	803	803	803	803	0	803	803	0
G30	1266	26.70	1046	31.19	1042	1042	1042	1042	0	1042	1042	0
G31	1163	47.77	1064	51.76	1060	1060	1060	1060	0	1060	1060	0
G32	1030	41.03	908	45.88	904	904	904	904	0	904	904	0
G16	578	31.76	476	37.52	472	472	472	472	0	472	472	0
G20	562	24.12	454	28.66	452	452	452	452	0	452	452	0
G23	278	11.33	152	16.66	148	148	148	148	0	148	148	0

Obs below mask ( 10.00 deg) : 18  
 Obs above mask w/ no L1 : 5  
 Obs above mask w/ no L2 : 10  
 Obs above mask w/ no P1 | CA : 0  
 Obs above mask w/ no P2 | L2C : 10  
 Obs above mask w/ low L1 S/N : 0  
 Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 14698  
 Obs deleted (any reason) : 32  
 Obs complete : 14666

No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000000 ms/hr

elev (deg)	tot	slps	<ION rms, m>	5=\%	1 m	15=\%	2 m
85 - 90	0	0	0.000000				
80 - 85	179	0	0.000000				
75 - 80	225	0	0.000000				
70 - 75	373	0	0.000000				
65 - 70	806	0	0.000000				
60 - 65	1019	0	0.000000				
55 - 60	1163	0	0.000000				
50 - 55	897	0	0.000000				
45 - 50	890	0	0.000000				
40 - 45	1025	0	0.000000				

35 - 40	1207	0	0.000000
30 - 35	1082	0	0.000000
25 - 30	1408	0	0.000000
20 - 25	1206	0	0.000000
15 - 20	1625	0	0.000000
10 - 15	1542	0	0.000000
5 - 10	18	0	0.000000
0 - 5	0	0	0.000000
< 0	0	0	0.000000

MP1 RMS summary (per SV):

SV	obs>10	# del	<elev>	MP1 rms [m]	slips		L1 rx		L2 rx		slips		L1 rx		L2 rx	
					< 25	< 25	< 25	> 25	> 25	> 25	< 25	> 25	> 25	< 25	> 25	
G10	51	7	13.36	0.923253	0	2	5	0	0	0	0	0	0	0	0	0
G18	1231	0	50.50	0.347035	2	0	0	14	1	1	1	1	1	1	1	1
G21	875	0	53.43	0.325922	2	0	0	9	1	1	1	1	1	1	1	1
G24	570	0	41.25	0.397141	2	0	0	5	1	1	1	1	1	1	1	1
G26	378	0	28.88	0.412081	3	0	0	2	1	1	1	1	1	1	1	1
G29	497	1	17.22	0.618820	6	1	1	1	1	1	1	1	1	1	1	1
G09	1012	1	41.24	0.312861	2	1	1	11	0	0	0	0	0	0	0	0
G15	542	0	35.11	0.370183	3	0	0	4	1	1	1	1	1	1	1	1
G06	558	5	15.65	0.610298	7	3	5	0	0	0	0	0	0	0	0	0
G22	1553	0	46.80	0.367457	5	1	1	15	0	0	0	0	0	0	0	0
G14	1578	0	44.76	0.384592	3	1	1	18	0	0	0	0	0	0	0	0
G05	954	0	27.43	0.391200	6	2	2	8	0	0	0	0	0	0	0	0
G12	803	0	22.25	0.414531	6	1	1	4	0	0	0	0	0	0	0	0
G30	1042	0	31.34	0.396713	4	1	1	10	0	0	0	0	0	0	0	0
G31	1060	0	51.99	0.289880	2	1	1	12	0	0	0	0	0	0	0	0
G32	904	0	46.13	0.304541	2	1	1	10	0	0	0	0	0	0	0	0
G16	472	0	37.92	0.357017	2	1	1	5	0	0	0	0	0	0	0	0
G20	452	0	28.92	0.379451	2	1	1	4	0	0	0	0	0	0	0	0
G23	148	0	17.37	0.384658	2	1	1	0	0	0	0	0	0	0	0	0

```

mean MP1 rms : 0.379997 m
total mean elevation : 39.02 degrees
# MP1 obs > 10 : 14666
# qc MP1 slips < 25 : 61
# Rvr L1 slips < 25 : 18
# Rvr L2 slips < 25 : 23
# qc MP1 slips > 25 : 132
# Rvr L1 slips > 25 : 6
# Rvr L2 slips > 25 : 6

```

elev (deg)	tot slps	<MP1 rms, m>	5=\%	1 m	15=\%	2 m
85 - 90	0	0	0.000000			
80 - 85	179	2	0.239693 ##			
75 - 80	225	3	0.210178 ##			
70 - 75	373	4	0.243548 ##			
65 - 70	806	12	0.229097 ##			
60 - 65	1019	10	0.235793 #			
55 - 60	1163	19	0.257506 ###			
50 - 55	897	8	0.301766 #			
45 - 50	890	14	0.313660 ###			
40 - 45	1025	12	0.279523 ##			

35 - 40	1207	17	0.304659	##
30 - 35	1082	16	0.335762	##
25 - 30	1408	15	0.378914	##
20 - 25	1206	14	0.421666	##
15 - 20	1625	24	0.478295	##
10 - 15	1542	23	0.682098	##
5 - 10	18	0	0.643854	
0 - 5	0	0	0.000000	
< 0	0	0	0.000000	

MP2 RMS summary (per SV):

SV	obs>10	# del	<elev>	MP2 rms [m]	slips		L1 rx	L2 rx	slips		L1 rx	L2 rx
					< 25	< 25	< 25	> 25	> 25	> 25	> 25	> 25
G10	51	7	13.36	1.413000	0	2	5	0	0	0	0	0
G18	1231	0	50.50	0.396074	2	0	0	14	1	1	1	1
G21	875	0	53.43	0.388736	2	0	0	9	1	1	1	1
G24	570	0	41.25	0.385116	2	0	0	5	1	1	1	1
G26	378	0	28.88	0.464846	3	0	0	2	1	1	1	1
G29	497	1	17.22	0.962715	6	1	1	1	1	1	1	1
G09	1012	1	41.24	0.436712	2	1	1	11	0	0	0	0
G15	542	0	35.11	0.562902	3	0	0	4	1	1	1	1
G06	558	5	15.65	1.008073	7	3	5	0	0	0	0	0
G22	1553	0	46.80	0.463067	5	1	1	15	0	0	0	0
G14	1578	0	44.76	0.501127	3	1	1	18	0	0	0	0
G05	954	0	27.43	0.622019	4	2	2	8	0	0	0	0
G12	803	0	22.25	0.632334	6	1	1	4	0	0	0	0
G30	1042	0	31.34	0.606855	4	1	1	10	0	0	0	0
G31	1060	0	51.99	0.417034	2	1	1	12	0	0	0	0
G32	904	0	46.13	0.376080	2	1	1	10	0	0	0	0
G16	472	0	37.92	0.464800	2	1	1	5	0	0	0	0
G20	452	0	28.92	0.395601	2	1	1	4	0	0	0	0
G23	148	0	17.37	0.561845	2	1	1	0	0	0	0	0

```

mean MP2 rms : 0.516399 m
total mean elevation : 39.02 degrees
# MP2 obs > 10 : 14666
# qc MP2 slips < 25 : 59
# Rvr L1 slips < 25 : 18
# Rvr L2 slips < 25 : 23
# qc MP2 slips > 25 : 132
# Rvr L1 slips > 25 : 6
# Rvr L2 slips > 25 : 6

```

elev (deg)	tot slps	<MP2 rms, m>	5=\%	1 m	15=\%	2 m
85 - 90	0	0.000000				
80 - 85	179	2	0.206162	##		
75 - 80	225	3	0.253823	##		
70 - 75	373	4	0.242799	##		
65 - 70	806	12	0.258877	##		
60 - 65	1019	10	0.265736	#		
55 - 60	1163	19	0.272441	###		
50 - 55	897	8	0.318394	#		
45 - 50	890	14	0.347364	###		
40 - 45	1025	12	0.451888	##		

35 - 40	1207	17	0.418142	##
30 - 35	1082	16	0.522575	##
25 - 30	1408	15	0.569631	##
20 - 25	1206	14	0.597640	##
15 - 20	1625	24	0.673954	##
10 - 15	1542	21	0.993207	##
5 - 10	18	0	0.735622	
0 - 5	0	0	0.000000	
< 0	0	0	0.000000	

S/N L1 summary (per elevation bin):

elev (deg)	tot	SN1 sig	mean	0 5	1 0
85 - 90	0	0.000	0.000		
80 - 85	179	0.686	6.966 ##		
75 - 80	225	0.511	6.920 ##		
70 - 75	374	0.456	6.893 ##		
65 - 70	806	0.342	6.931 #		
60 - 65	1020	0.388	6.888 ##		
55 - 60	1164	0.358	6.912 #		
50 - 55	897	0.432	6.833 ##		
45 - 50	891	0.500	6.718 ##		
40 - 45	1026	0.526	6.620 ##		
35 - 40	1207	0.509	6.307 ##		
30 - 35	1083	0.361	6.014 #		
25 - 30	1408	0.342	5.929 #		
20 - 25	1208	0.556	5.617 ##		
15 - 20	1625	0.684	5.297 ##		
10 - 15	1562	0.924	4.624 #####		
5 - 10	18	1.339	4.167 #####		
0 - 5	0	0.000	0.000		

S/N L2 summary (per elevation bin):

elev (deg)	tot	SN2 sig	mean	0 5	1 0
85 - 90	0	0.000	0.000		
80 - 85	179	0.796	8.648 ##		
75 - 80	225	0.744	8.364 ##		
70 - 75	374	0.665	8.535 ##		
65 - 70	806	0.485	8.176 ##		
60 - 65	1020	0.293	8.016 #		
55 - 60	1164	0.431	8.145 ##		
50 - 55	897	0.330	8.020 #		
45 - 50	891	0.309	7.969 #		
40 - 45	1026	0.439	7.834 ##		
35 - 40	1207	0.516	7.326 ##		
30 - 35	1083	0.454	7.141 ##		
25 - 30	1408	0.488	6.959 ##		
20 - 25	1207	0.529	6.574 ##		
15 - 20	1625	0.466	6.226 ##		
10 - 15	1558	0.436	5.937 ##		
5 - 10	18	1.420	5.389 #####		
0 - 5	0	0.000	0.000		