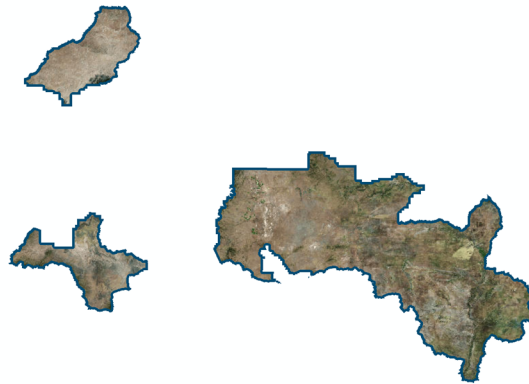


Lidar Mapping Report

Acquisition, Processing, and Delivery of Airborne Lidar Elevation Data for NM_NRCS_Central_2017_D18



USGS Contract: G16PC00029

Contractor: Merrick-Surdex-JV

Task Order Number: 140G0218F0026

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TOTAL AWARD: \$1,935,853.05 (Fixed Price)

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Submitted to:



Submitted by:



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Project Summary

Merrick-Surdex Joint Venture, LLP (“Merrick-Surdex JV”) was awarded the NM_NRCS_Central_2017_D18 (USGS Task Order Number 140G0218F0026) project by the United State Geological Survey (USGS) to provide high-resolution lidar for four (4) distinct Areas of Interest (AOIs) totaling approximately 9,697 square miles located in New Mexico. The four AOIs are identified as Middle Rio Grande East, NM Upper Pecos, Arroyo Chico, and Rio Salado. This project will support the 3DEP mission and the Natural Resources Conservation Service (NRCS).

The lidar mapping requirements and deliverables meet Quality Level Two (QL2) standards as outlined in the USGS-NGP Lidar Base Specifications, Techniques and Methods 11–B4, Version 1.2, November 2014 (TM11-B4) (<http://pubs.usgs.gov/tm/11b4/pdf/tm11-B4.pdf>). QL2 lidar specifications suggest a point density of greater than or equal to two points per square meter (≥ 2 ppsm) Aggregate Nominal Pulse Density (ANPD), and point spacing of less than or equal to seven-tenths of a meter (≤ 0.71 m) Aggregate Nominal Pulse Spacing (ANPS).

The vertical accuracy requirements of the lidar data meets or exceeds the following:

Absolute Vertical Accuracy

- ≤ 10 cm RMSEz
- ≤ 19.6 cm Non-vegetated Vertical Accuracy (NVA) at the 95% confidence level
- ≤ 29.4 cm Vegetated Vertical Accuracy (VVA) at the 95% percentile

Relative Vertical Accuracy

- ≤ 6 cm Smooth surface repeatability
- ≤ 8 cm Swath overlap difference, RMSDz
- ± 16 cm Swath overlap difference, maximum

Horizontal Accuracy

- This data set was produced to meet ASPRS “Positional Accuracy Standards for Digital Geospatial Data” (2014) for a 20 (cm) RMSE_x / RMSE_y Horizontal Accuracy Class which equates to Positional Horizontal Accuracy = +/- 49 cm at a 95% confidence level.

Project Spatial Reference

- Projection – Universal Transverse Mercator (UTM), Zone 13 North (13N)
- Horizontal Datum - North American Datum of 1983 (NAD 83), National Adjustment of 2011 (NA2011) (epoch 2010.00)
- Vertical Datum – North American Vertical Datum of 1988 (NAVD 88); GEOID 12B
- Units – Meters
- EPSG Codes - UTM Zone 13N = EPSG 6342

CONTACT INFORMATION

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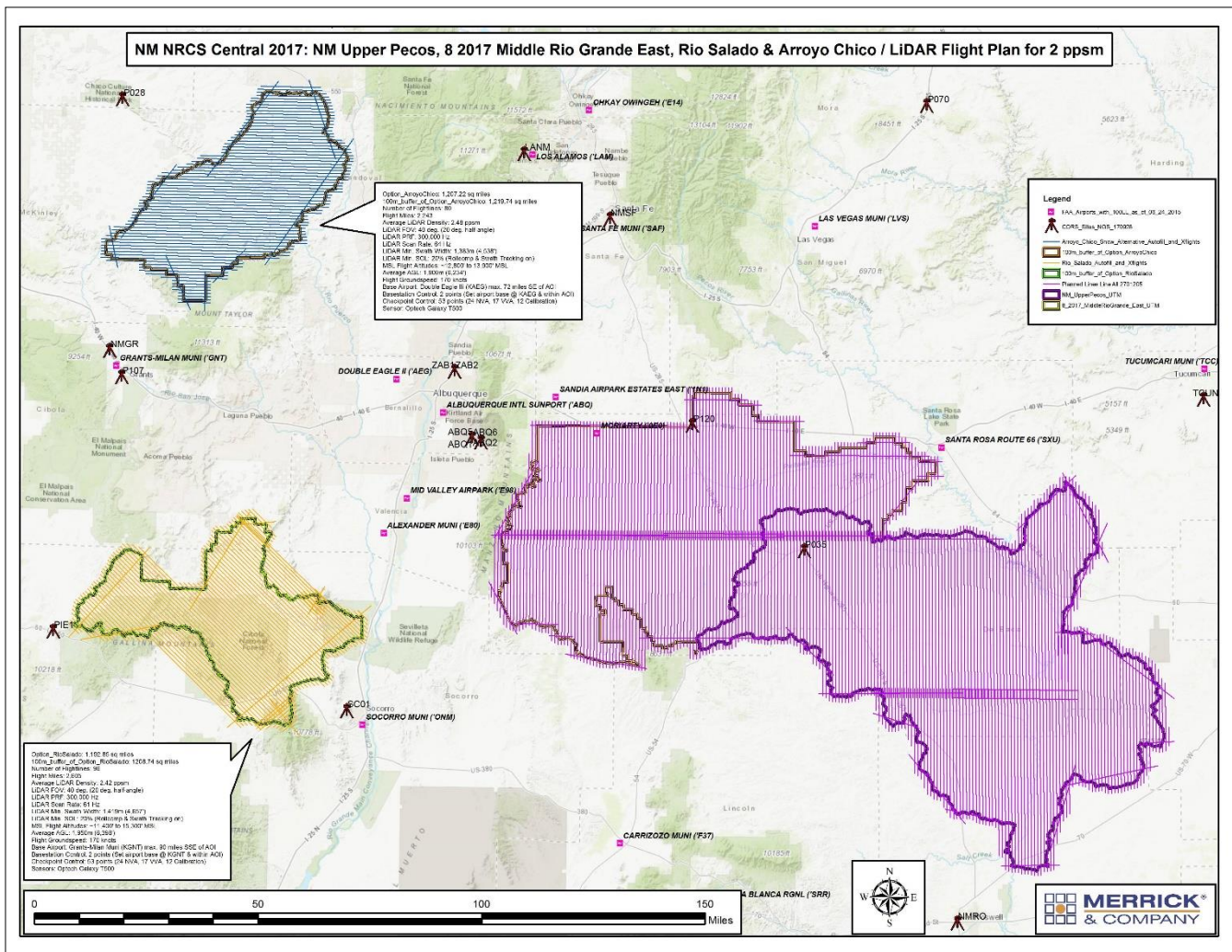
Project Report

The contents of this report summarize the methods used to calibrate and classify the lidar data as well as the results of these methods for the project NM_NRCS_Central_2017_D18 (USGS NM NRCS Central).

Lidar Flight Information

The acquisition area for the NM NRCS Central project is delineated by the fully dissolved extent of the client-approved Esri shapefiles (*Option_RioSalado*, *Option_ArroyoChico*, *NM_UpperPecos_UTM*, *8_2017_MiddleRioGrande_East_UTM*). The Merrick-Surdex JV acquired the QL2 lidar point cloud utilizing Optech Galaxy lidar sensors. The Galaxy is a high performance 550 kHz lidar sensor capable of collecting large areas efficiently.

Merrick-Surdex JV planned an acquisition area of approximately 9,697 square miles, divided between the four AOIs, to include a one hundred-meter (100m) buffer per TM11-B4. See below illustration of the proposed lidar flight plan.

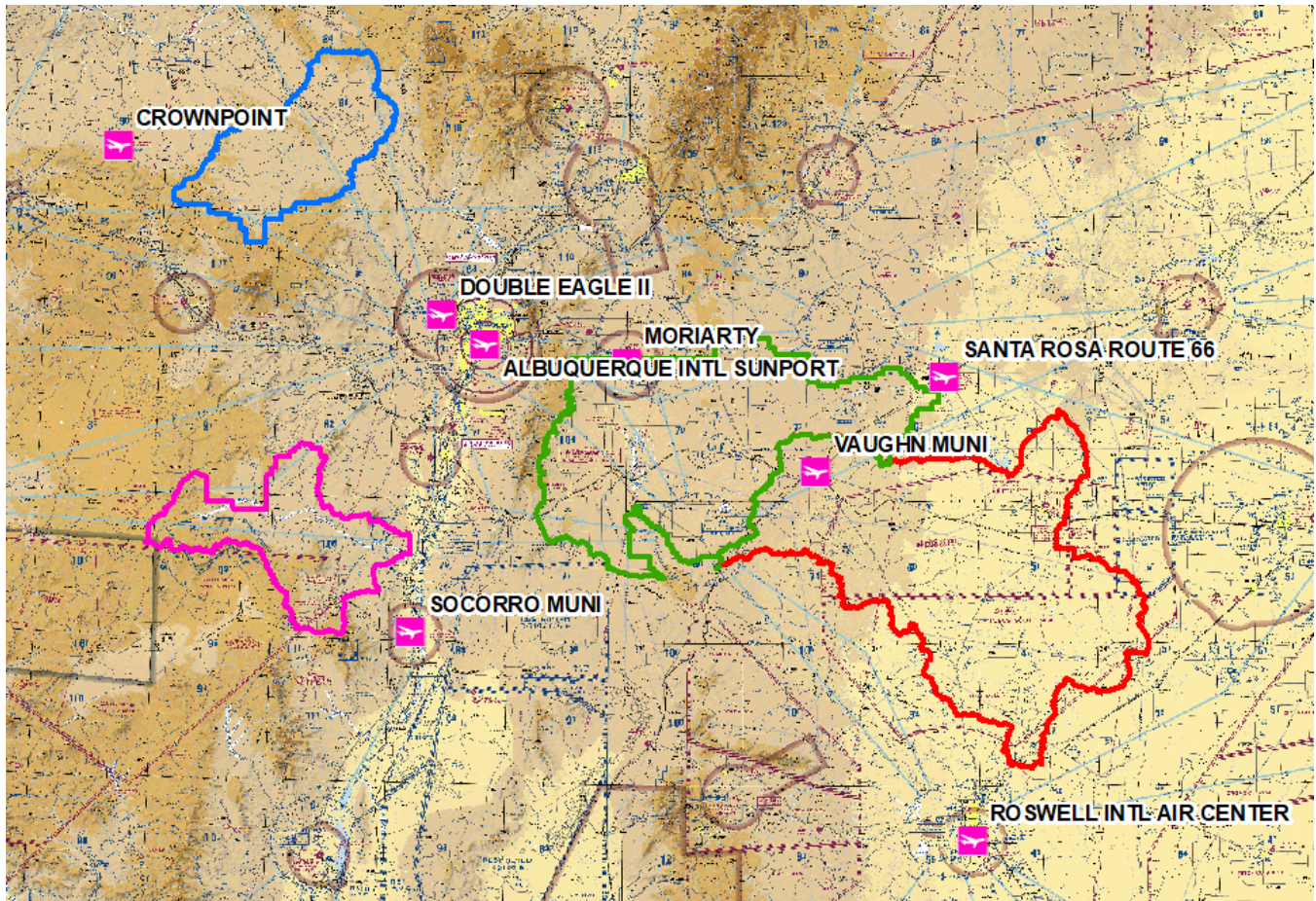


Airports of Operation

Multiple airports were used for the collection of this project. See below for a list of the airports used as well as an image of the project area with airports displayed.

- Moriarty Airport – Moriarty, New Mexico
 - FAA Identifier: OEO
 - Lat/Long: 34-58-41.4000N / 106-00-00.1000W
 - Elevation: 6204.2 ft. / 1891.0 m (surveyed)
 - From City: 2 miles SE of MORIARTY, NM
 - Zip Code: 87035
- Albuquerque International Sunport Airport– Albuquerque, New Mexico
 - FAA Identifier: ABQ
 - Lat/Long: 35-02-20.1536N / 106-36-29.7438W
 - Elevation: 5354.9 ft. / 1632.2 m (surveyed)
 - From City: 3 miles SE of ALBUQUERQUE, NM
 - Zip Code: 87106
- Vaughn Municipal Airport– Vaughn, New Mexico
 - FAA Identifier: N17
 - Lat/Long: 34-36-16.4890N / 105-11-30.5590W
 - Elevation: 5935.9 ft. / 1809 m (estimated)
 - From City: 1-mile NE of VAUGHN, NM
 - Zip Code: 88321
- Santa Rosa Route 66 Airport– Santa Rosa, New Mexico
 - FAA Identifier: SXU
 - Lat/Long: 34-56-08.4195N / 104-38-33.2295W
 - Elevation: 4791.4 ft. / 1460 m (estimated)
 - From City: 3 miles E of SANTA ROSA, NM
 - Zip Code: 88435
- Roswell International Air Center Airport– Roswell, New Mexico
 - FAA Identifier: ROW
 - Lat/Long: 33-17-59.5308N / 104-31-45.8315W
 - Elevation: 3671 ft. / 1118.9 m (surveyed)
 - From City: 3 miles S of ROSWELL, NM
 - Zip Code: 88203
- Double Eagle II Airport– Albuquerque, New Mexico
 - FAA Identifier: AEG
 - Lat/Long: 35-08-42.5502N / 106-47-42.5912W
 - Elevation: 5837.4 ft. / 1779.2 m (surveyed)
 - From City: 7 miles NW of ALBUQUERQUE, NM
 - Zip Code: 87121
- Crownpoint Airport– Crownpoint, New Mexico
 - FAA Identifier: OE8
 - Lat/Long: 35-43-03.5720N / 108-12-05.7460W
 - Elevation: 6696 ft. / 2040.9 m (surveyed)
 - From City: 3 miles NW of CROWNPOINT, NM
 - Zip Code: 87313
- Socorro Municipal Airport– Socorro, New Mexico

- FAA Identifier: ONM
- Lat/Long: 34-01-20.9000N / 106-54-11.3000W
- Elevation: 4875.2 ft. / 1486.0 m (surveyed)
- From City: 3 miles S of SOCORRO, NM
- Zip Code: 87801



Aerial Mission(s) Duration / Time

The project was collected using three lidar fixed wing aircraft using three different Optech Galaxy lidar sensors. Lidar data collection for the project was accomplished between December 17, 2017 and February 8, 2018. Each mission represents a lift of the aircraft and system from the ground, collects data, and lands again. Multiple lifts within a day are represented by Mission A, B, C, and D. The table below relates each mission to the date collected, the sensor and serial number used, the start/end time and the actual average MSL (Mean Sea Level) in meters. The time is shown in GPS seconds of the week.

Mission(s)	Date	Sensor S/N	Start Time GPS sec.	End Time GPS sec.	Actual Avg. MSL (m)
171217_A	December 17, 2017	5060380	67928	89792	4100
171218_A	December 18, 2017	5060380	140618	147463	3900

171218_B	December 18, 2017	5060380	147565	152797	3915
171218_C	December 18, 2017	5060380	153277	163571	3910
171219_A	December 19, 2017	5060380	237617	260409	3980
171220_A	December 20, 2017	5060380	314628	328064	4050
171222_A	December 22, 2017	5060380	496905	508804	4000
171229_A	December 29, 2017	5060380	493766	505595	3900
171230_A	December 30, 2017	5060380	579084	597198	3800
171230_A	December 30, 2017	5060314	570713	584475	4050
171230_B	December 30, 2017	5060314	590818	602762	3950
171231_A	December 31, 2017	5060314	54280	64579	4000
180101_A	January 01, 2018	5060380	145992	157303	3850
180101_A	January 01, 2018	5060382	168184	176831	3850
180102_A	January 02, 2018	5060314	227027	238397	3850
180102_B	January 02, 2018	5060314	245044	256374	3900
180103_A	January 03, 2018	5060314	311828	319878	4000
180103_B	January 03, 2018	5060314	329498	336581	4050
180103_C	January 03, 2018	5060314	336710	343181	4000
180104_A	January 04, 2018	5060314	406849	419730	4050
180104_B	January 04, 2018	5060314	423763	430496	4000
180104_A	January 04, 2018	5060382	420330	432710	4050
180105_A	January 05, 2018	5060314	435864	451973	3850
180105_A	January 05, 2018	5060382	488516	502689	3950
180105_A	January 05, 2018	5060380	492444	509809	4000
180106_A	January 06, 2018	5060314	584946	598176	3900
180106_A	January 06, 2018	5060382	576515	586437	3800
180106_B	January 06, 2018	5060382	595161	607263	3900
180106_A	January 06, 2018	5060380	578437	593633	4300
180108_A	January 08, 2018	5060380	147289	157779	4200
180109_A	January 09, 2018	5060382	231837	247596	3900
180111_A	January 11, 2018	5060314	429577	435210	3475
180111_B	January 11, 2018	5060314	425679	428860	3475
180111_A	January 11, 2018	5060382	426263	434766	3750
180112_A	January 12, 2018	5060314	438863	455264	3700
180112_B	January 12, 2018	5060314	487998	502996	3600
180112_A	January 12, 2018	5060382	496031	501806	3575
180113_A	January 13, 2018	5060314	583651	606261	3950
180113_A	January 13, 2018	5060382	581993	592690	3900
180113_B	January 13, 2018	5060382	594834	604109	3850
180114_A	January 14, 2018	5060314	63892	72212	3900
180114_B	January 14, 2018	5060314	72368	88141	3950
180117_A	January 17, 2018	5060314	326772	352074	3950
180117_A	January 17, 2018	5060382	339578	348394	3850
180118_A	January 18, 2018	5060314	411341	425863	3850
180118_A	January 18, 2018	5060382	410877	423950	3550
180119_A	January 19, 2018	5060314	498527	506925	3700
180119_A	January 19, 2018	5060382	496427	510846	3700
180120_A	January 20, 2018	5060314	578617	594848	3600

180120_A	January 20, 2018	5060382	581949	592772	3500
180122_A	January 22, 2018	5060314	144874	161350	3550
180123_A	January 23, 2018	5060314	231010	246784	3450
180123_B	January 23, 2018	5060314	250732	263604	3300
180123_A	January 23, 2018	5060382	236818	245796	3400
180123_B	January 23, 2018	5060382	249936	260346	3350
180127_A	January 27, 2018	5060382	576492	597529	3250
180127_A	January 27, 2018	5060314	576940	593889	3200
180127_B	January 27, 2018	5060314	597774	613194	3150
180128_A	January 28, 2018	5060314	61747	77450	3190
180128_A	January 28, 2018	5060382	61612	74413	3350
180129_A	January 29, 2018	5060314	150020	164335	3250
180129_A	January 29, 2018	5060382	150218	168763	3400
180130_A	January 30, 2018	5060314	235825	247994	3250
180130_A	January 30, 2018	5060382	247732	258763	3200
180201_A	February 01, 2018	5060382	413490	421980	3800
180201_B	February 01, 2018	5060382	350077	352689	4050
180201_C	February 01, 2018	5060382	405506	421980	3200
180201_D	February 01, 2018	5060382	426864	437505	3175
180202_A	February 02, 2018	5060382	500594	517189	3150
180203_A	February 03, 2018	5060382	579858	599379	3350
180204_A	February 04, 2018	5060382	61394	80953	3300
180206_A	February 06, 2018	5060382	246231	264966	3200
180208_A	February 08, 2018	5060380	406662	422880	4300
180222_A	February 22, 2018	5060382	425309	430100	3200

GNSS / IMU Data

A five-minute INS initialization is conducted on the ground, with the aircraft engines running, prior to flight, to establish fine-alignment of the INS. GPS ambiguities are resolved by flying within ten kilometers of the base stations. During the data collection, the operator recorded information on log sheets which includes weather conditions, lidar operation parameters, and flight line statistics. Near the end of the mission, GPS ambiguities were again resolved by flying within ten kilometers of the base stations to aid in post-processing. Data is sent back to the main office for preliminary processing to check overall quality of GPS / INS data and to ensure sufficient overlap between flight lines. Any problematic data may be re-flown immediately as required.

The airborne GPS data was post-processed using Applanix POSPac Mobile Mapping Suite version 8.x. A fixed-bias carrier phase solution was computed in both the forward and reverse chronological directions. Whenever practical, lidar acquisition was limited to periods when the PDOP (Positional Dilution Of Precision) was less than 4.0. PDOP indicates satellite geometry relating to position. Generally, PDOP's of 4.0 or less result in a good quality solution, however PDOP's between 4.0 and 5.0 can still yield good results most of the time. PDOP's over 6.0 are of questionable results and PDOP's of over 7.0 usually result in a poor solution. Usually as the number of satellites increase the PDOP decreases. Other quality control checks used for the GPS include analyzing the combined separation of the forward and reverse GPS processing from one base station and the results of the

combined separation when processed from two different base stations. An analysis of the number of satellites, present during the flight and data collection times, is also performed.

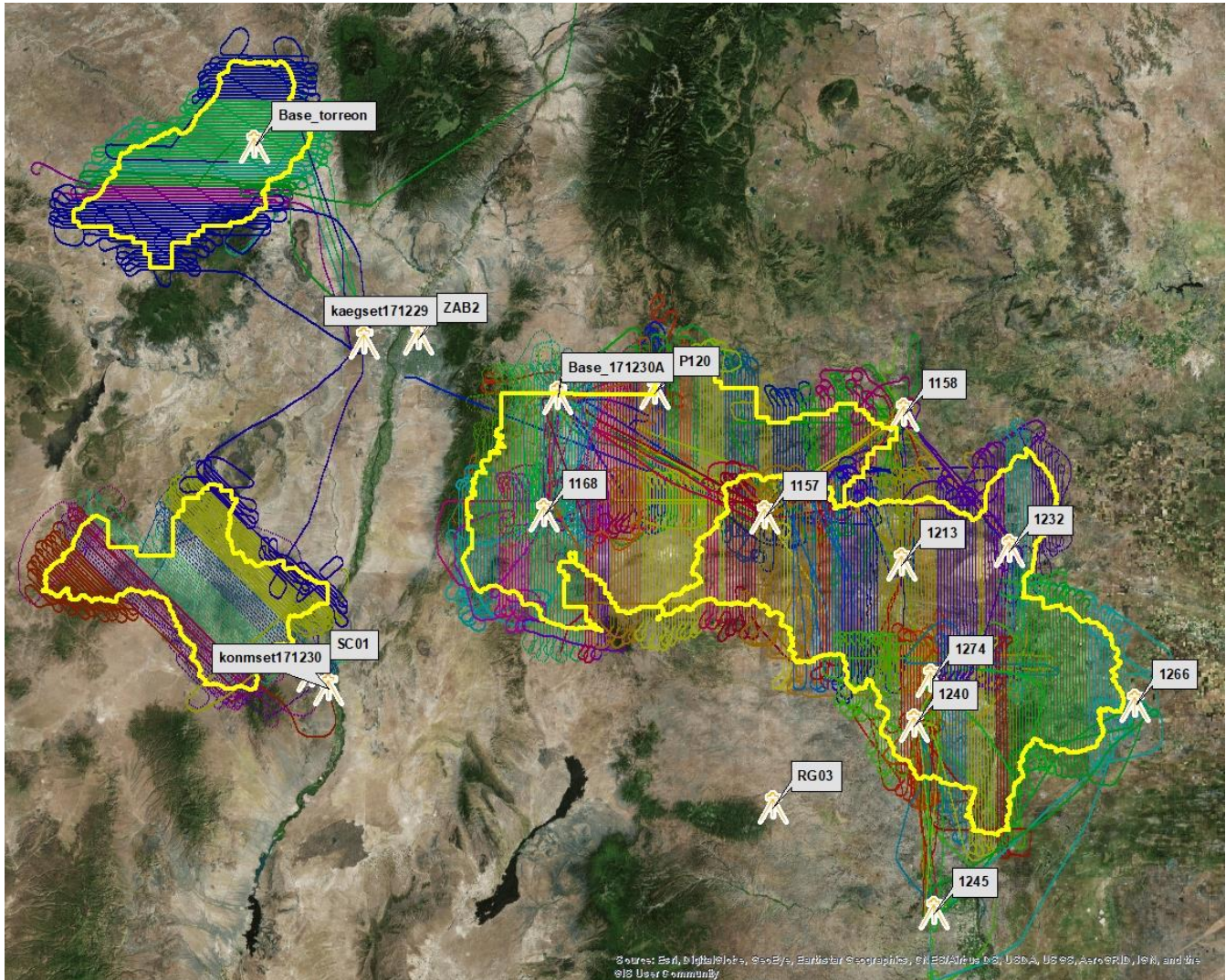
The GPS trajectory was combined with the raw IMU data and post-processed using POSpac Mobile Mapping Suite version 8.x. The Smoothed Best Estimated Trajectory (SBET) and refined attitude data are then utilized in the LMS Post Processor to compute the laser point-positions – the trajectory is combined with the attitude data and laser range measurements to produce the 3-dimensional coordinates of the mass points. Up to four return values are produced within the Optech lidar Mapping Suite (LMS) processor software for each pulse which ensures the greatest chance of ground returns in a heavily forested area.

GPS Controls

Ground GNSS Base Stations were set up to control the lidar airborne flight lines. In addition, CORS (Continually Operating Reference Stations) are at times used to further enhance the airborne solution. The ground GNSS Base Stations coordinates were obtained from NGS (National Geodetic Survey) Online Positioning User Service (OPUS) solutions. CORS coordinates were obtained from NGS datasheets. See the following table and map for ground GNSS Base Station information and locations:

Point ID	Latitude (NAD83 – 2011)	Longitude (NAD83 – 2011)	Ellipsoid Height (m)
Base_torreon	N35°47'23.99892"	W107°14'25.33999"	1920.013
kaegset171229	N35°09'35.13406"	W106°47'11.83013"	1743.911
konmset171230	N34°01'28.28701"	W106°53'56.43650"	1434.858
Base_171230A	N34°59'06.40439"	W106°00'38.97047"	1871.821
1157	N34°36'08.04827"	W105°11'17.52212"	1786.380
1158	N34°56'02.96599"	W104°38'15.52168"	1440.093
1168	N34°36'11.68913"	W106°03'43.68431"	1848.594
1213	N34°26'46.40672"	W104°38'52.55045"	1454.425
1232	N34°29'17.91532"	W104°13'25.96436"	1239.039
1245	N33°18'24.00671"	W104°31'37.46510"	1090.252
1240	N33°55'11.64187"	W104°36'07.30274"	1298.906
SC01	N34°04'04.62701"	W106°57'59.55914"	2097.375
ZAB2	N35°10'24.86709"	W106°34'02.24051"	1619.739
P120	N35°00'26.83846"	W105°37'33.87880"	2089.646
RG03	N33°39'16.88793"	W105°09'14.99503"	1572.580
1266	N33°58'50.20604"	W103°44'12.08357"	1333.340
1274	N34°03'58.28234"	W104°32'11.66492"	1218.959

GNSS Base Station Map – missions color coded



Lidar Calibration – see appendix 1 for a more detailed workflow description

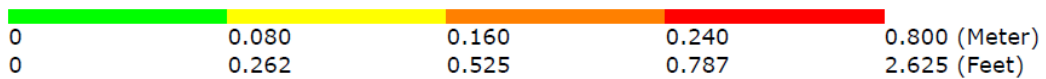
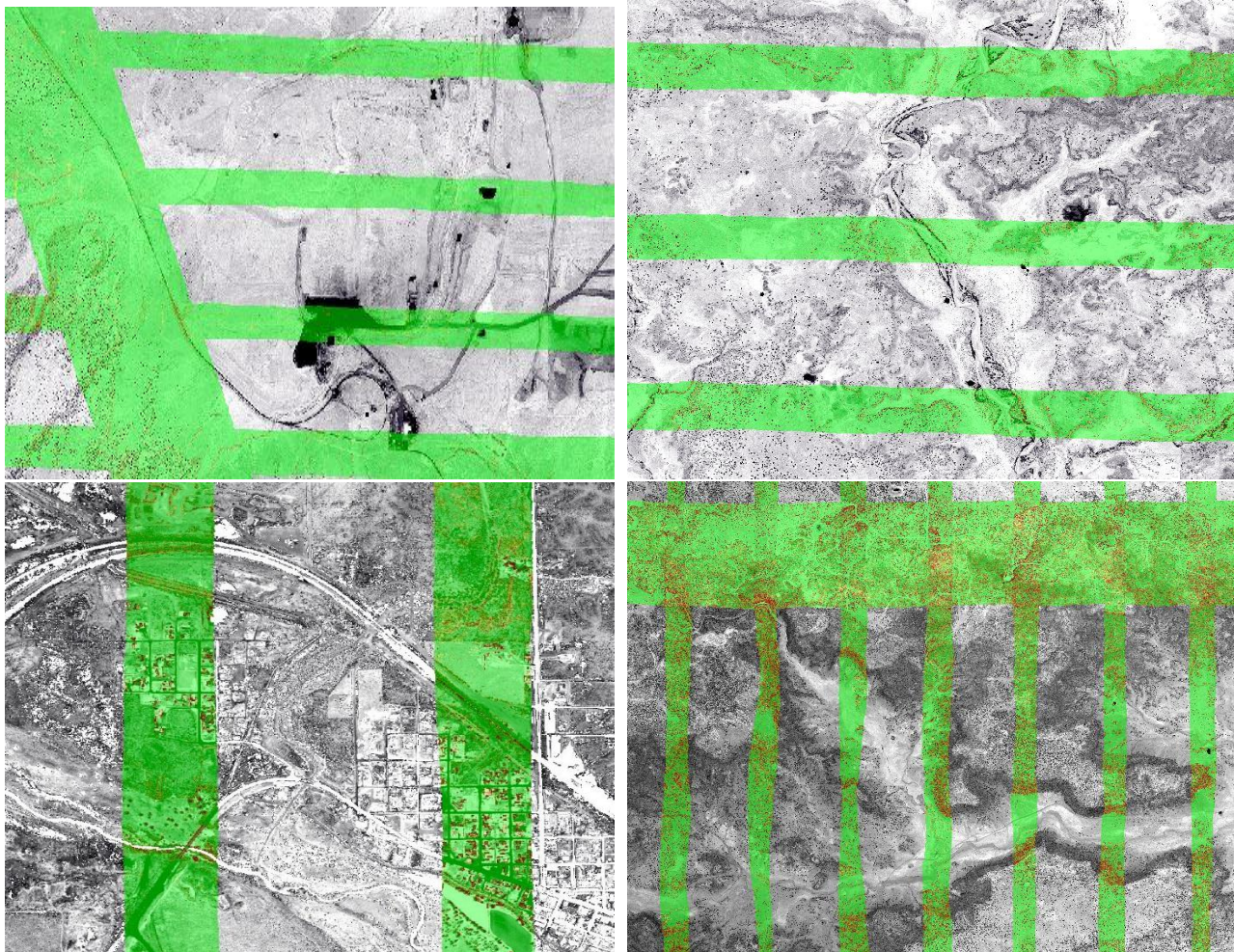
Merrick-Surdex JV takes great care to ensure all lidar acquisition missions are carried out in a manner conducive to post-processing an accurate data set. This begins in the flight-planning stage with attention to GPS baseline distances and GPS satellite constellation geometry and outages. Proper AGPS surveying techniques are always followed including pre- and post-mission static initializations. In-air IMU alignments (figure-eights) are performed both before and after on-site collection to ensure proper calibration of the IMU accelerometers and gyros.

A minimum of one cross-flight is planned throughout the project area across all flightlines and over roadways where possible. The cross-flight provides a common control surface used to remove any vertical discrepancies in the lidar data between flightlines. The cross-flight is critical to ensure flightline ties across the project area. The areas of overlap between flightlines are used to boresight (calibrate) the lidar point cloud to achieve proper flightline to flightline alignment in all three axes. This includes adjustment of both IMU and scanner-related variables such as roll, pitch, heading, timing interval (range), and torsion. Each lidar mission flown is accompanied by a hands-on boresight in the office.

After boresighting is complete a detailed statistical report is generated to check relative and absolute accuracies before filtering of lidar begins.

Relative Accuracy – flight line to flight line

The project representative flight line separation raster examples (below) depict the vertical separation of flight lines by thematically coloring the separation magnitude on a color ramp based on relative distance. This color thematic rendering is modulated by intensity to show land cover features.



Unfiltered Lidar Control Point Report

The following tables illustrate the results of the lidar data compared to the lidar control points post-calibration. The listing is sorted by the Z Error column showing, in ascending order, the vertical difference between the lidar points and the ninety-eight (98) surveyed ground points used for lidar calibration.

Arroyo Chico

Project Data Unit: Meter
 Vertical Accuracy Class tested: 10.0-cm
 Elevation Calculation Method: Interpolated from TIN
 LiDAR Classifications Included: 0-255

Check Points in Report: 13
 Check Points with LiDAR Coverage: 13
 Check Points (NVA): 13
 Check Points (VVA): 0
 Average Vertical Error Reported: -0.050 Meter
 Maximum (highest) Vertical Error Reported: 0.001 Meter
 Median Vertical Error Reported: -0.048 Meter
 Minimum (lowest) Vertical Error Reported: -0.101 Meter
 Standard deviation of Vertical Error: 0.035 Meter
 Skewness of Vertical Error: -0.231
 Kurtosis of Vertical Error: -1.354
 Non-vegetated Vertical Accuracy (NVA) RMSE(z): 6.010cm PASS
 Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/-: 11.780cm PASS
 FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-: 11.780cm
 Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM): 6.124cm PASS
 Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- (DEM): 12.003cm PASS

This data set was tested to meet ASPRS Positional Accuracy Standard for Digital Geospatial Data (2014) for a 10.0-cm RMSEz Vertical Accuracy Class. Actual NVA accuracy was found to be RMSEz = 6.010cm, equating to +/- 11.780cm at the 95% confidence level.

Check Point Id	Check Point X	Check Point Y	Coverage	Check Point Z	Z from lidar	Z Error
3001	281619.705	3959459.165	Yes	2055.91	2055.812	-0.098
3002	256842.879	3946473.99	Yes	2055.775	2055.727	-0.048
3002B	253940.331	3947417.972	Yes	2078.727	2078.63	-0.097
3003	310071.92	3984411.834	Yes	2121.088	2120.987	-0.101
3004	250589.672	3957151.249	Yes	2125.662	2125.639	-0.023
3005	310438.301	3978204.145	Yes	2130.175	2130.154	-0.021
3006	277370.782	3937005.258	Yes	2023.971	2023.972	0.001
3007	265789.149	3933419.611	Yes	2022.476	2022.463	-0.013
3008	300109.217	3944695.718	Yes	1856.193	1856.171	-0.022
3009	261905.166	3965044.726	Yes	2075.724	2075.663	-0.061
3010	301766.91	3971356.376	Yes	2054.742	2054.673	-0.069
3011	289175.426	3989783.531	Yes	2199.338	2199.269	-0.069
3012	248823.075	3937761.878	Yes	2130.188	2130.164	-0.024

Lidar Control Point Layout



Rio Salado

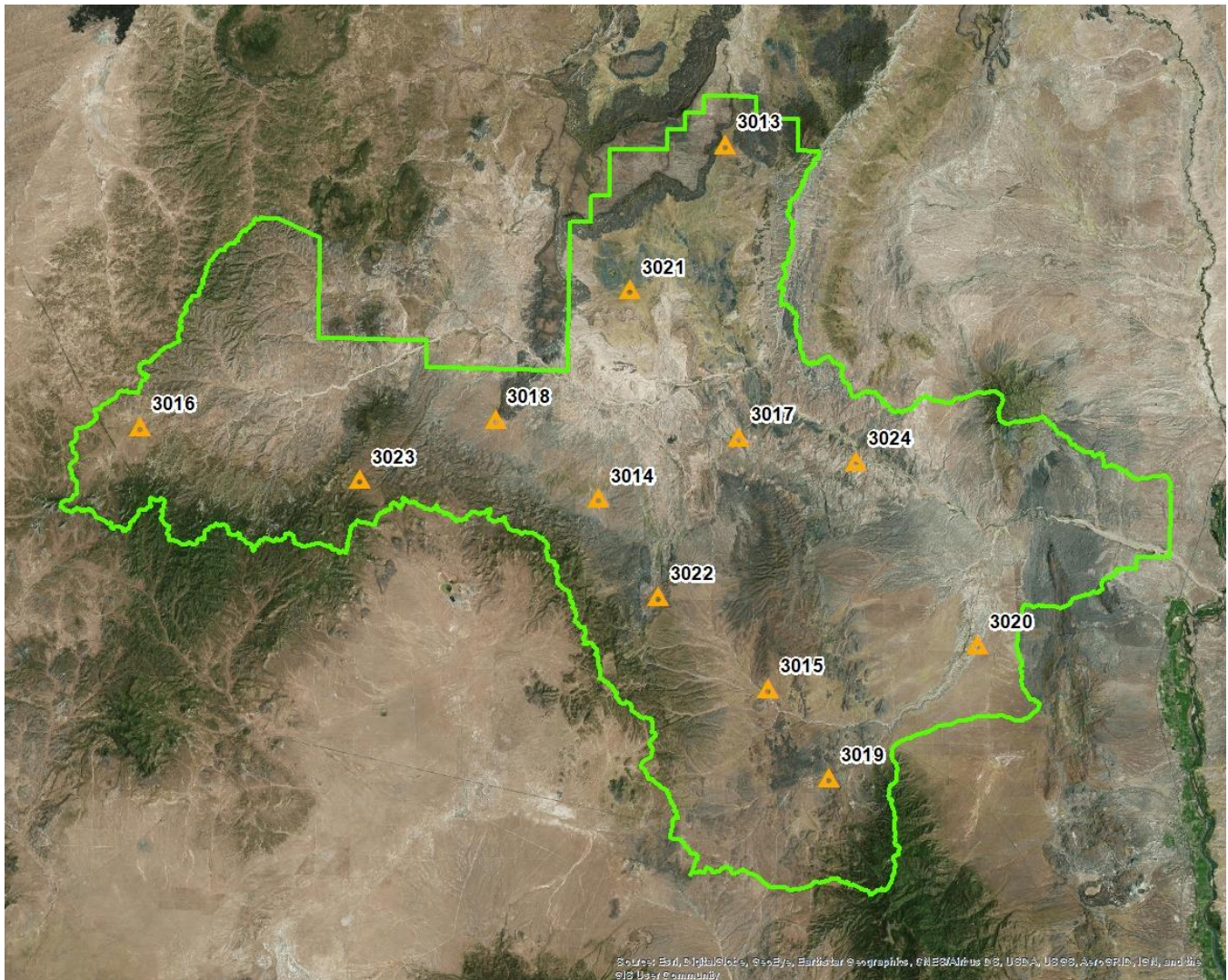
Project Data Unit: Meter
Vertical Accuracy Class tested: 10.0-cm
Elevation Calculation Method: Interpolated from TIN
LiDAR Classifications Included: 0/0W

Check Points in Report: 12
Check Points with LiDAR Coverage: 12
Check Points (NVA): 12
Check Points (VVA): 0
Average Vertical Error Reported: 0.000 Meter
Maximum (highest) Vertical Error Reported: 0.05 Meter
Median Vertical Error Reported: -0.002 Meter
Minimum (lowest) Vertical Error Reported: -0.04 Meter
Standard deviation of Vertical Error: 0.028 Meter
Skewness of Vertical Error: 0.407
Kurtosis of Vertical Error: -0.708
Non-vegetated Vertical Accuracy (NVA) RMSE(z): 2.657cm PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/-: 5.208cm PASS
FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-: 5.208cm
Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM): 3.373cm PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- (DEM): 6.612cm PASS

This data set was tested to meet ASPRS Positional Accuracy Standard for Digital Geospatial Data (2014) for a 10.0-cm RMSEz Vertical Accuracy Class. Actual NVA accuracy was found to be RMSEz = 2.657cm, equating to +/- 5.208cm at the 95% confidence level.

Check Point Id	Check Point X	Check Point Y	Coverage	Check Point Z	Z from lidar	Z Error
3022	276305.296	3793921.649	Yes	2146.51	2146.47	-0.04
3020	306015.902	3789429.258	Yes	1761.286	1761.254	-0.032
3018	261130.555	3810383.844	Yes	1990.33	1990.304	-0.026
3024	294704.271	3806507.698	Yes	1680.409	1680.39	-0.019
3013	282493.488	3835947.028	Yes	1905.811	1905.803	-0.008
3023	248502.907	3804769.88	Yes	2285.633	2285.628	-0.005
3016	228037.94	3809719.177	Yes	2273.234	2273.235	0.001
3019	292195.328	3777040.508	Yes	1997.975	1997.981	0.006
3015	286521.33	3785318.397	Yes	2047.026	2047.04	0.014
3014	270753.837	3803030.343	Yes	2014.214	2014.229	0.015
3021	273649.427	3822463.285	Yes	1847.571	1847.613	0.042
3017	283776.775	3808717.526	Yes	1823.088	1823.138	0.05

Lidar Control Point Layout



Rio Grande East & NM Upper Pecos

Project Data Unit: Meter
 Vertical Accuracy Class tested: 10.0-cm
 Elevation Calculation Method: Interpolated from TIN
 LIDAR Classifications Included: 0/0W

Check Points in Report: 73
 Check Points with LIDAR Coverage: 73
 Check Points (NVA): 73
 Check Points (VVA): 0
 Average Vertical Error Reported: 0.000 Meter
 Maximum (highest) Vertical Error Reported: 0.11 Meter
 Median Vertical Error Reported: -0.002 Meter
 Minimum (lowest) Vertical Error Reported: -0.102 Meter
 Standard deviation of Vertical Error: 0.039 Meter
 Skewness of Vertical Error: 0.024
 Kurtosis of Vertical Error: 0.112
 Non-vegetated Vertical Accuracy (NVA) RMSE(z): 3.897cm PASS
 Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/-: 7.638cm PASS
 FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-: 7.638cm
 Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM): 3.990cm PASS
 Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- (DEM): 7.821cm PASS

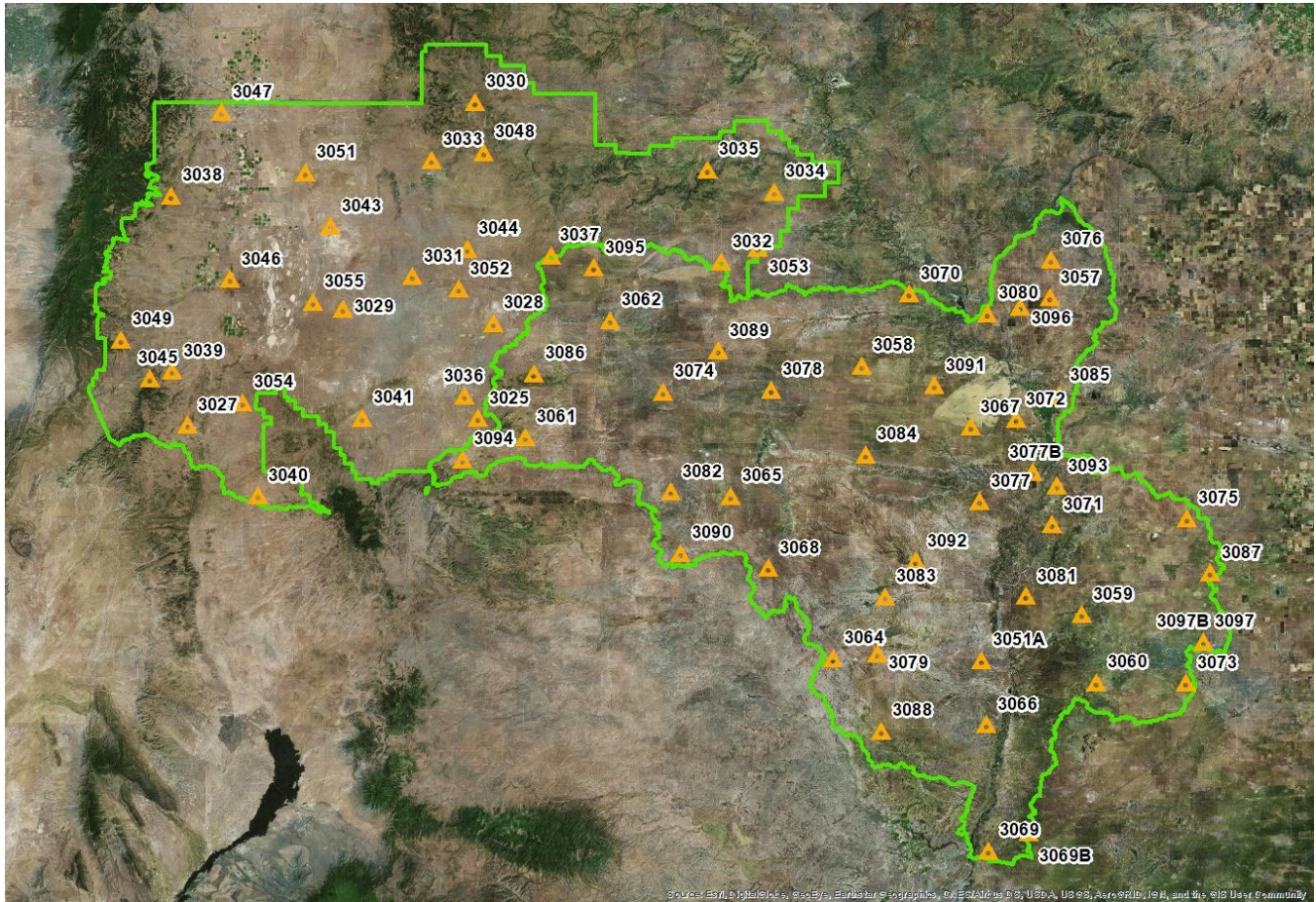
This data set was tested to meet ASPRS Positional Accuracy Standard for Digital Geospatial Data (2014) for a 10.0-cm RMSEz Vertical Accuracy Class. Actual NVA accuracy was found to be RMSEz = 3.897cm, equating to +/- 7.638cm at the 95% confidence level.

Check Point Id	Check Point X	Check Point Y	Coverage	Check Point Z	Z from lidar	Z Error
3038	390398.651	3854114.284	Yes	1996.57	1996.68	0.11
3037	470131.354	3841624.873	Yes	1883.977	1884.058	0.081
3069B	570214.34	3720773.315	Yes	1228.13	1228.188	0.058
3034	516915.21	3854904.647	Yes	1532.839	1532.895	0.056
3073	603278.62	3751968.612	Yes	1366.986	1367.041	0.055
3076	574925.86	3840813.176	Yes	1437.851	1437.905	0.054
3046	402773.122	3836637.243	Yes	1863.154	1863.205	0.051
3067	558124.386	3805642.482	Yes	1339.841	1339.892	0.051
3030	454156.309	3873769.963	Yes	1967.051	1967.101	0.05
3079	538601.369	3758216.956	Yes	1384.422	1384.471	0.049
3093	576192.833	3793310.165	Yes	1222.494	1222.535	0.041
3065	507832.848	3791203.814	Yes	1622.768	1622.808	0.04
3095	479062.422	3839061.933	Yes	1785.293	1785.332	0.039
3081	569730.513	3770215.578	Yes	1226.641	1226.678	0.037
3069	561717.614	3716874.08	Yes	1121.661	1121.694	0.033
3096	568576.276	3830827.139	Yes	1343.313	1343.344	0.031
3068	515663.176	3776097.088	Yes	1471.3	1471.331	0.031
3097	607004.098	3760584.626	Yes	1376.411	1376.439	0.028
3071	575241.735	3785182.838	Yes	1233.011	1233.037	0.026
3059	581488.614	3766413.037	Yes	1202.335	1202.361	0.026
3089	505115.892	3821644.387	Yes	1609.758	1609.783	0.025
3072	567702.112	3807224.142	Yes	1249.25	1249.273	0.023
3051A	560365.261	3756748.3	Yes	1187.785	1187.806	0.021
3049	379800.524	3824000.338	Yes	2077.293	2077.313	0.02

3042	459998.328	3839061.727	Yes	1913.308	1913.328	0.02
3087	608427.975	3775124.581	Yes	1369.671	1369.687	0.016
3057	574657.587	3832763.991	Yes	1367.924	1367.937	0.013
3085	576667.128	3812205.234	Yes	1253.171	1253.182	0.011
3048	456025.539	3863249.71	Yes	1974.281	1974.289	0.008
3090	497211.626	3779246.789	Yes	1599.085	1599.092	0.007
3075	603460.327	3786540.456	Yes	1369.966	1369.97	0.004
3078	516346.51	3813479.421	Yes	1577.373	1577.377	0.004
3084	536117.355	3799912.613	Yes	1454.918	1454.921	0.003
3061	464731.708	3803537.59	Yes	1883.254	1883.256	0.002
3062	482418.374	3828011.357	Yes	1823.166	1823.166	0
3045	385913.351	3815861.878	Yes	1964.587	1964.587	0
3092	546603.172	3777504.485	Yes	1255.608	1255.606	-0.002
3039	390633.306	3817413.338	Yes	2005.256	2005.254	-0.002
3082	495177.37	3792134.306	Yes	1650.761	1650.758	-0.003
3080	561675.461	3829443.333	Yes	1354.21	1354.207	-0.003
3077B	571058.08	3796092.027	Yes	1215.43	1215.425	-0.005
3083	540057.972	3770076.237	Yes	1259.51	1259.503	-0.007
3028	457864.031	3827374.219	Yes	1859.331	1859.322	-0.009
3052	450696.101	3834633.27	Yes	1904.277	1904.264	-0.013
3035	502838.55	3859572.524	Yes	1630.9	1630.886	-0.014
3031	441002.244	3837201.939	Yes	1971.579	1971.564	-0.015
3086	466471.49	3816856.6	Yes	1902.136	1902.121	-0.015
3088	539279.966	3742002.568	Yes	1223.774	1223.759	-0.015
3053	513369.224	3843094.275	Yes	1572.63	1572.614	-0.016
3077	559982.55	3790111.766	Yes	1276.517	1276.5	-0.017
3060	584405.849	3752118.101	Yes	1209.886	1209.869	-0.017
3070	545214.686	3833600.989	Yes	1398.702	1398.683	-0.019
3036	451790.608	3812117.385	Yes	1862.801	1862.779	-0.022
3032	505697.192	3840271.916	Yes	1624.194	1624.172	-0.022
3029	426321.66	3830473.803	Yes	1921.358	1921.333	-0.025
3091	550552.499	3814405.315	Yes	1387.096	1387.07	-0.026
3097B	606931.096	3760586.019	Yes	1375.864	1375.837	-0.027
3040	408471.981	3791297.169	Yes	1941.357	1941.329	-0.028
3025	454643.992	3807431.246	Yes	1909.703	1909.672	-0.031
3055	420140.438	3831903.635	Yes	1865.879	1865.846	-0.033
3074	493573.459	3813029.273	Yes	1756.35	1756.315	-0.035
3066	561489.014	3743306.462	Yes	1147.543	1147.498	-0.045
3064	529221.495	3757202.106	Yes	1380.036	1379.99	-0.046
3027	393700.653	3806089.439	Yes	2031.102	2031.056	-0.046
3044	452503.361	3843015.229	Yes	1926.811	1926.763	-0.048
3033	444988.209	3861609.337	Yes	2049.759	2049.709	-0.05
3094	451524.477	3798907.359	Yes	1947.966	1947.915	-0.051
3051	418518.663	3858981.942	Yes	1888.381	1888.328	-0.053

3043	423773.355	3847723.13	Yes	1869.199	1869.141	-0.058
3054	405342.393	3810834.858	Yes	2011.372	2011.311	-0.061
3041	430406.239	3807566.325	Yes	1924.842	1924.777	-0.065
3058	535359.439	3818546.694	Yes	1447.926	1447.839	-0.087
3047	400938.654	3871626.475	Yes	1902.331	1902.229	-0.102

Lidar Control Point Layout



Lidar Filtering and Classification

The lidar filtering process encompasses a series of automated and manual steps to classify the boresighted point cloud data set. Each project represents unique characteristics in terms of cultural features (urbanized vs. rural areas), terrain type and vegetation coverage. These characteristics are thoroughly evaluated at the onset of the project to ensure that the appropriate automated filters are applied and that subsequent manual filtering yields correctly classified data. Data is most often classified by ground and “unclassified”, but specific project applications can include a wide variety of classifications including but not limited to buildings, vegetation, power lines, etc. MARS® software is used for the auto-filtering, manual filtering and QC of the classified data.

Merrick-Surdex JV used the American Society for Photogrammetry and Remote Sensing’s (ASPRS) LAS Specification Version 1.4 – R13, 15 July 2013, Point Data Record Format 6 for this project and classified the lidar

point cloud in accordance with the following classification classes and bitflags. Classes highlighted in **GREEN** represent project specific requirements.

- **Class 1 = Unclassified**
- **Class 2 = Bare-earth Ground**
- Class 3 = Low Vegetation
- Class 4 = Medium Vegetation
- Class 5 = High Vegetation
- Class 6 = Buildings
- **Class 7 = Low point (noise)**
- Class 8 = Model Key Points
- **Class 9 = Water**
- **Class 10 = Ignored ground (near a breakline)**
- **Class 17 = Bridge decks**
- **Class 18 = High noise**
- Bitflags
 - Overlap: Any part of a swath that also is covered by any part of any other swath.
 - Withheld: Within the LAS file specification, a single bit flag indicating that the associated lidar point is geometrically anomalous or unreliable and should be ignored for all normal processes.

Merrick-Surdex JV has developed several customized automated filters that are applied to the lidar data set based on project specifications, terrain, and vegetation characteristics. A filtering macro, which may contain one or more filtering algorithms, is executed to derive LAS files separated into the different classification groups as defined in the ASPRS classification table. The macros are tested in several portions of the project area to verify the appropriateness of the filters. Often, there is a combination of several filter macros that optimize the filtering based on the unique characteristics of the project. Automatic filtering generally yields a ground surface that is 85-90% valid, so additional editing (hand-filtering) is required to produce a more robust ground surface.

Lidar data is next taken into a graphic environment using MARS® to manually re-classify (or hand-filter) “noise” and other features that may remain in the ground classification after auto filter. A cross-section of the post auto-filtered surface is viewed to assist in the reclassification of non-ground data artifacts. The following is an example of re-classification of the non-ground points (elevated features) that need to be excluded from the true ground surface. Certain features such as berms, hilltops, cliffs and other features may have been aggressively auto-filtered and points will need to be re-classified into the ground classification. Data in the profile view displays non-ground (Unclassified, class 1) in grey and ground in brown/tan (Class 2). In figure 1, a small building was not auto-filtered and needs to be manually re-classified. Note that figure 2 has the building points reclassified to unclassified from the true ground surface.

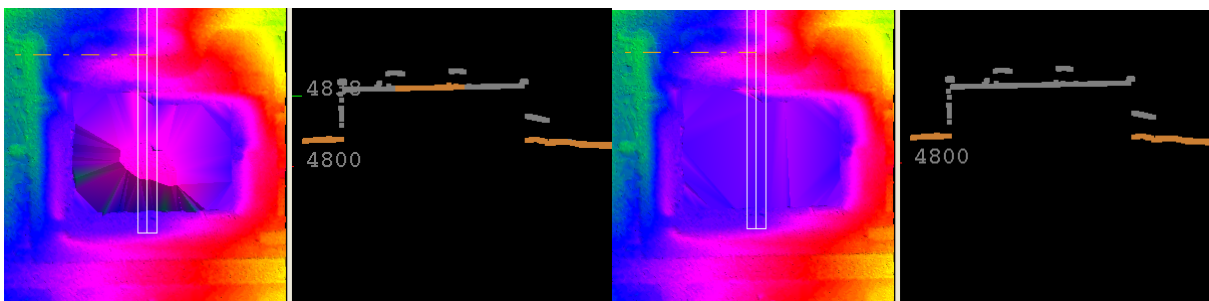


Figure 1

Figure 2

A combination of automated and semi-automated routines to classify buildings and vegetation. We expect that the classified buildings will meet a filtering criterion in the range of 90-95%.

At this point, individual lidar points from the original point cloud have now been parsed into separate classifications.

Filtered Lidar Check Point Report

After the hand-filtering has been completed and quality checked, a Check Point Report is generated to validate that the accuracy of the ground surface is within the defined accuracy specifications. Each surveyed ground check point is compared to the lidar surface by interpolating an elevation from a Triangulated Irregular Network (TIN) of the surface. The MARS® derived report provides an in-depth statistical report, including an RMSE of the vertical errors; a primary component in most accuracy standards and a statistically valid assessment of the overall accuracy of the ground surface.

The below lidar check point report provides statistics for 201 NVA and 149 VVA ground survey points used to validate the final filtered lidar surface.

Filtered Lidar Check Point Report

Middle Rio Grande East, NM Upper Pecos, Arroyo Chico, and Rio Salado

Units: Meter (/Feet)

Vertical Accuracy Class tested: 10-cm

Check Points in defined project area (DPA):	350
Check Points with Lidar Coverage	350
Check Points with Lidar Coverage (NVA)	201
Check Points with Lidar Coverage (VVA)	149
Average Z Error (NVA)	-0.018/-0.059
Maximum Z Error (NVA)	0.119/0.391
Median Z Error (NVA)	-0.017/-0.055
Minimum Z Error (NVA)	-0.109/-0.358
Standard deviation of Vertical Error (NVA)	0.039/0.128
Skewness of Vertical Error (NVA)	0.164
Kurtosis of Vertical Error (NVA)	0.351
Non-vegetated Vertical Accuracy (NVA) RMSE(z) ¹	0.043/0.141 PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- ¹	0.084/0.277 PASS
FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-	0.084/0.277
Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM) ²	0.045/0.147 PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level (DEM) +/- ²	0.088/0.288 PASS
Vegetated Vertical Accuracy (VVA) at the 95th Percentile (DEM) +/- ²	0.131/0.430 PASS

This data set was tested to meet ASPRS Positional Accuracy Standard for Digital Geospatial Data (2014) for a 10-cm RMSEz Vertical Accuracy Class. Actual NVA accuracy was found to be RMSEz = 4.305cm, equating to +/- 8.437cm at the 95% confidence level. Actual VVA accuracy was found to be +/- 13.111cm at the 95th percentile.

¹ This value is calculated from TIN-based testing of the raw swath lidar point cloud data.

² This value is calculated from RAM-based grid testing of the classified tiled lidar data. The grid cells are sized according to the Quality Level selected, and are defined in the USGS NGP Lidar Base Specification Version 1.2 (page 15, Table 7).

Check Point Id	Check Point X	Check Point Y	Coverage	Check Point Z	Z from Lidar	Z Error	NVA / VVA
1001	290296.410	3974888.677	Yes	2003.916	2003.917	0.001	NVA
1002	280323.370	3955678.092	Yes	2011.412	2011.375	-0.037	NVA
1002B	256817.597	3946449.691	Yes	2055.732	2055.739	0.007	NVA
1003	270697.742	3963217.163	Yes	2036.225	2036.203	-0.022	NVA
1003B	273493.873	3954938.863	Yes	1972.199	1972.141	-0.058	NVA
1004	312421.611	3962854.063	Yes	2004.236	2004.283	0.047	NVA
1005	300399.362	3961129.196	Yes	1937.416	1937.365	-0.051	NVA
1006B	253913.403	3947398.427	Yes	2078.304	2078.244	-0.060	NVA
1007	254296.862	3935790.234	Yes	2108.725	2108.765	0.040	NVA
1008	240700.766	3944923.090	Yes	2196.385	2196.412	0.027	NVA
1009	277646.557	3937191.526	Yes	2019.725	2019.809	0.084	NVA
1010	286331.726	3934825.414	Yes	2452.477	2452.403	-0.074	NVA
1011	250029.139	3946047.765	Yes	2073.266	2073.309	0.043	NVA
1012	301083.913	3972018.899	Yes	2030.400	2030.349	-0.051	NVA
1013	248834.213	3937764.407	Yes	2129.943	2129.960	0.017	NVA
1014	271843.820	3936036.011	Yes	2041.454	2041.478	0.024	NVA
1015	289154.490	3989997.903	Yes	2194.723	2194.678	-0.045	NVA
1016	279056.299	3960694.672	Yes	2030.773	2030.738	-0.035	NVA
1017	261342.255	3965167.988	Yes	2087.270	2087.254	-0.016	NVA
1018	265816.074	3933524.870	Yes	2020.655	2020.692	0.037	NVA
1019	300090.856	3944696.673	Yes	1856.210	1856.244	0.034	NVA
1020	265961.118	3919690.953	Yes	2215.630	2215.692	0.062	NVA
1021	309779.495	3984650.011	Yes	2117.714	2117.711	-0.003	NVA
1022	310462.318	3978215.072	Yes	2130.307	2130.346	0.039	NVA
1023	250861.559	3957414.830	Yes	2117.200	2117.226	0.026	NVA
1024	294770.569	3982988.714	Yes	2104.143	2104.185	0.042	NVA
1025	272068.013	3821673.464	Yes	1872.457	1872.491	0.034	NVA
1026	270445.384	3803566.176	Yes	1998.462	1998.472	0.010	NVA
1027	305990.618	3789426.525	Yes	1760.285	1760.225	-0.060	NVA
1028	282474.083	3835914.073	Yes	1905.305	1905.277	-0.028	NVA
1029	286504.927	3785302.118	Yes	2046.946	2046.945	-0.001	NVA
1030	276337.220	3793885.351	Yes	2145.294	2145.281	-0.013	NVA
1031	298273.988	3780145.629	Yes	1903.804	1903.786	-0.018	NVA
1032	294722.500	3806504.465	Yes	1680.096	1680.066	-0.030	NVA
1033	248479.646	3804717.817	Yes	2288.835	2288.829	-0.006	NVA
1034	274897.386	3798901.497	Yes	2049.255	2049.276	0.021	NVA
1035	282252.413	3781683.159	Yes	2113.302	2113.268	-0.034	NVA
1036	223542.064	3804284.218	Yes	2387.256	2387.241	-0.015	NVA
1037	254341.145	3816467.154	Yes	2000.614	2000.593	-0.021	NVA
1038	287802.913	3771931.341	Yes	2087.113	2087.154	0.041	NVA
1039	289636.086	3816018.431	Yes	1912.043	1912.033	-0.010	NVA
1040	283798.463	3808649.445	Yes	1823.787	1823.906	0.119	NVA

1041	280358.782	3829479.365	Yes	1855.752	1855.753	0.001	NVA
1042	227761.107	3809421.579	Yes	2277.270	2277.252	-0.018	NVA
1043	322902.694	3797619.639	Yes	1470.191	1470.279	0.088	NVA
1044	273362.033	3816089.276	Yes	1856.226	1856.253	0.027	NVA
1045	280476.710	3821634.169	Yes	1801.738	1801.780	0.042	NVA
1046	261159.296	3810326.452	Yes	1989.707	1989.653	-0.054	NVA
1047	295433.308	3774449.818	Yes	2161.049	2161.062	0.013	NVA
1048	239788.074	3825491.195	Yes	2216.392	2216.423	0.031	NVA
1048B	240513.207	3823216.642	Yes	2229.654	2229.664	0.010	NVA
2001	265957.945	3933699.877	Yes	2017.659	2017.649	-0.010	VVA
2002	289185.142	3989827.720	Yes	2198.116	2198.137	0.021	VVA
2003	312447.438	3963038.066	Yes	2005.707	2005.794	0.087	VVA
2004	309790.075	3984638.846	Yes	2117.599	2117.629	0.030	VVA
2005	265494.964	3922180.345	Yes	2145.984	2146.058	0.074	VVA
2006	254297.334	3935877.451	Yes	2108.175	2108.173	-0.002	VVA
2007	286302.620	3934855.471	Yes	2452.493	2452.529	0.036	VVA
2008	290335.721	3974755.982	Yes	2003.475	2003.467	-0.008	VVA
2009	261338.856	3965190.748	Yes	2087.309	2087.304	-0.005	VVA
2010	256837.963	3946438.564	Yes	2055.935	2055.976	0.041	VVA
2010B	253919.233	3947380.615	Yes	2078.287	2078.290	0.003	VVA
2011	300423.308	3961173.554	Yes	1936.550	1936.589	0.039	VVA
2012	279019.399	3960744.055	Yes	2029.972	2030.035	0.063	VVA
2013	277748.326	3937253.755	Yes	2016.727	2016.828	0.101	VVA
2014	280371.353	3955674.493	Yes	2010.751	2010.792	0.041	VVA
2014B	273504.782	3954959.367	Yes	1971.848	1971.859	0.011	VVA
2015	240691.986	3944944.880	Yes	2197.031	2197.086	0.055	VVA
2016	301043.231	3972031.078	Yes	2028.808	2028.874	0.066	VVA
2017	248849.425	3937737.037	Yes	2130.437	2130.509	0.072	VVA
2018	289609.797	3816039.502	Yes	1911.940	1912.052	0.112	VVA
2019	227744.591	3809419.775	Yes	2277.121	2277.160	0.039	VVA
2020	270434.816	3803597.320	Yes	1997.847	1997.929	0.082	VVA
2021	239753.608	3825458.627	Yes	2216.436	2216.534	0.098	VVA
2021B	240524.028	3823210.161	Yes	2228.756	2228.788	0.032	VVA
2022	306036.302	3789463.454	Yes	1761.718	1761.826	0.108	VVA
2023	322862.306	3797667.087	Yes	1474.219	1474.336	0.117	VVA
2024	286463.609	3785304.242	Yes	2047.301	2047.382	0.081	VVA
2025	273364.547	3816121.987	Yes	1856.579	1856.656	0.077	VVA
2026	294693.024	3806489.652	Yes	1680.555	1680.579	0.024	VVA
2027	261093.494	3810300.427	Yes	1991.975	1991.984	0.009	VVA
2028	282482.272	3835952.104	Yes	1904.617	1904.691	0.074	VVA
2029	276354.257	3793814.920	Yes	2148.749	2148.784	0.035	VVA
2030	248436.820	3804736.674	Yes	2291.176	2291.332	0.156	VVA
2031	223027.964	3804394.828	Yes	2387.183	2387.315	0.132	VVA
2032	287752.241	3771892.210	Yes	2089.433	2089.484	0.051	VVA

2033	280405.382	3829543.773	Yes	1856.243	1856.283	0.040	VVA
2034	298303.758	3780120.675	Yes	1904.419	1904.487	0.068	VVA
1049	494394.581	3862763.120	Yes	1689.335	1689.318	-0.017	NVA
1050	453987.553	3873780.795	Yes	1968.159	1968.152	-0.007	NVA
1051	405256.014	3810834.628	Yes	2011.851	2011.777	-0.074	NVA
1052	393216.136	3843033.910	Yes	1908.650	1908.633	-0.017	NVA
1053	448037.985	3852378.021	Yes	1971.840	1971.802	-0.038	NVA
1054	408470.020	3791190.725	Yes	1943.758	1943.715	-0.043	NVA
1055	417035.587	3859032.965	Yes	1882.137	1882.050	-0.087	NVA
1056	469864.664	3841554.770	Yes	1888.445	1888.437	-0.008	NVA
1057	406469.761	3801200.440	Yes	1953.376	1953.328	-0.048	NVA
1058	397925.544	3826673.281	Yes	1920.270	1920.164	-0.106	NVA
1060	389934.623	3854471.448	Yes	1991.198	1991.138	-0.060	NVA
1060B	395686.032	3854412.006	Yes	1930.285	1930.284	-0.001	NVA
1061	399351.311	3871640.526	Yes	1923.756	1923.690	-0.066	NVA
1062	425881.708	3830835.527	Yes	1921.767	1921.759	-0.008	NVA
1063	511924.109	3869437.311	Yes	1628.063	1628.045	-0.018	NVA
1064	402819.418	3838248.267	Yes	1862.778	1862.773	-0.005	NVA
1065	385975.547	3815765.729	Yes	1962.191	1962.189	-0.002	NVA
1066	430288.250	3807643.725	Yes	1922.002	1921.920	-0.082	NVA
1067	503459.147	3859350.949	Yes	1617.576	1617.567	-0.009	NVA
1068	428256.791	3866995.436	Yes	2047.150	2047.192	0.042	NVA
1069	516996.504	3854949.155	Yes	1532.157	1532.195	0.038	NVA
1070	478323.973	3847522.500	Yes	1788.443	1788.451	0.008	NVA
1071	462978.510	3857167.280	Yes	1912.038	1911.966	-0.072	NVA
1071B	466236.912	3858774.886	Yes	1802.380	1802.422	0.042	NVA
1072	418781.708	3830953.949	Yes	1861.014	1860.918	-0.096	NVA
1073	379700.524	3824002.744	Yes	2078.366	2078.328	-0.038	NVA
1074	403786.921	3858358.447	Yes	1873.780	1873.704	-0.076	NVA
1075	451927.479	3812116.677	Yes	1864.871	1864.794	-0.077	NVA
1076	393622.488	3806088.112	Yes	2028.785	2028.684	-0.101	NVA
1077	423781.490	3847710.863	Yes	1869.078	1869.030	-0.048	NVA
1078	450710.310	3836264.458	Yes	1890.543	1890.537	-0.006	NVA
1079	428142.839	3873049.589	Yes	2055.445	2055.426	-0.019	NVA
1080	528324.080	3860018.443	Yes	1404.141	1404.116	-0.025	NVA
1081	373747.256	3811983.993	Yes	1837.531	1837.522	-0.009	NVA
1082	437027.016	3837610.816	Yes	1997.080	1997.071	-0.009	NVA
1083	457850.608	3827447.469	Yes	1859.374	1859.271	-0.103	NVA
1084	449301.980	3873468.516	Yes	2074.926	2074.899	-0.027	NVA
1085	451089.873	3845970.253	Yes	1934.263	1934.214	-0.049	NVA
1085B	452494.183	3843010.840	Yes	1926.605	1926.553	-0.052	NVA
1086	426124.543	3810648.943	Yes	1906.072	1906.008	-0.064	NVA
1087	439238.369	3800843.252	Yes	1958.027	1957.918	-0.109	NVA
1088	456089.796	3863884.850	Yes	1966.813	1966.799	-0.014	NVA

1089	475850.591	3866626.957	Yes	1795.371	1795.356	-0.015	NVA
1090	487945.700	3848735.755	Yes	1758.383	1758.345	-0.038	NVA
1091	505698.166	3840178.768	Yes	1624.780	1624.741	-0.039	NVA
1092	433383.576	3845217.526	Yes	1931.420	1931.475	0.055	NVA
1092B	433367.107	3842562.692	Yes	1915.739	1915.733	-0.006	NVA
1093	454523.990	3807512.780	Yes	1907.160	1907.087	-0.073	NVA
1094	443692.833	3873799.771	Yes	2119.065	2119.026	-0.039	NVA
1096	402715.240	3830094.241	Yes	1866.293	1866.338	0.045	NVA
1097	379482.898	3837502.121	Yes	2073.339	2073.359	0.020	NVA
1098	443620.753	3864637.494	Yes	2090.931	2090.896	-0.035	NVA
1099	429147.227	3799357.401	Yes	1970.550	1970.485	-0.065	NVA
1101	442391.199	3817019.090	Yes	1854.980	1854.931	-0.049	NVA
1102	460329.334	3839356.384	Yes	1918.064	1918.054	-0.010	NVA
1103	390635.282	3817503.153	Yes	2005.444	2005.420	-0.024	NVA
1104	513379.117	3843216.271	Yes	1573.796	1573.790	-0.006	NVA
1105	459430.971	3855565.423	Yes	1928.633	1928.612	-0.021	NVA
1106	465422.664	3872558.035	Yes	1899.601	1899.590	-0.011	NVA
1107	396566.441	3863930.788	Yes	1956.584	1956.497	-0.087	NVA
1108	407017.700	3825338.694	Yes	1855.705	1855.750	0.045	NVA
1109	483054.547	3856746.651	Yes	1700.398	1700.350	-0.048	NVA
1110	380461.338	3846939.764	Yes	2071.838	2071.811	-0.027	NVA
1111	470032.470	3828359.216	Yes	1883.752	1883.649	-0.103	NVA
1112	549841.697	3782828.074	Yes	1301.165	1301.151	-0.014	NVA
1113	528944.559	3747110.246	Yes	1308.520	1308.508	-0.012	NVA
1113B	528923.363	3747084.679	Yes	1308.327	1308.292	-0.035	NVA
1114	516337.080	3815187.065	Yes	1595.405	1595.372	-0.033	NVA
1115	467812.910	3818190.287	Yes	1890.052	1890.006	-0.046	NVA
1116	507760.140	3791177.142	Yes	1621.044	1621.043	-0.001	NVA
1117	560075.201	3790166.695	Yes	1275.742	1275.713	-0.029	NVA
1118	581498.448	3766343.260	Yes	1203.732	1203.721	-0.011	NVA
1118A	575150.272	3785098.935	Yes	1233.397	1233.360	-0.037	NVA
1119	544451.427	3834135.118	Yes	1402.580	1402.558	-0.022	NVA
1120	490652.124	3817045.854	Yes	1774.331	1774.329	-0.002	NVA
1121	538626.070	3758276.933	Yes	1385.365	1385.405	0.040	NVA
1123	573079.068	3777985.512	Yes	1228.473	1228.420	-0.053	NVA
1124	600495.707	3767861.432	Yes	1300.889	1300.915	0.026	NVA
1124B	600509.161	3767811.670	Yes	1301.027	1301.007	-0.020	NVA
1125	526792.797	3825298.893	Yes	1519.792	1519.733	-0.059	NVA
1126	529084.819	3757178.401	Yes	1379.376	1379.286	-0.090	NVA
1127	574914.727	3842294.741	Yes	1447.321	1447.329	0.008	NVA
1128	560496.604	3757018.586	Yes	1187.391	1187.333	-0.058	NVA
1129	528540.228	3788683.692	Yes	1376.750	1376.748	-0.002	NVA
1130	592031.111	3791094.715	Yes	1360.987	1360.953	-0.034	NVA
1130B	592041.986	3791112.566	Yes	1361.454	1361.415	-0.039	NVA

1131	515715.057	3775951.920	Yes	1471.624	1471.620	-0.004	NVA
1132	560869.519	3829435.776	Yes	1363.180	1363.203	0.023	NVA
1133	567715.898	3807224.242	Yes	1248.665	1248.654	-0.011	NVA
1134	572888.798	3820719.520	Yes	1283.859	1283.847	-0.012	NVA
1135	556441.790	3814786.299	Yes	1373.452	1373.458	0.006	NVA
1136	561681.588	3716848.347	Yes	1122.161	1122.113	-0.048	NVA
1137	535609.299	3800721.245	Yes	1460.598	1460.548	-0.050	NVA
1138	576156.708	3793224.483	Yes	1223.836	1223.836	0.000	NVA
1139	603368.193	3786540.550	Yes	1368.585	1368.536	-0.049	NVA
1140	568562.142	3832732.276	Yes	1353.408	1353.403	-0.005	NVA
1141	546695.488	3777481.657	Yes	1257.488	1257.480	-0.008	NVA
1142	556790.527	3805638.699	Yes	1343.645	1343.654	0.009	NVA
1143	592464.699	3759626.379	Yes	1260.746	1260.733	-0.013	NVA
1143B	592464.234	3759674.059	Yes	1261.879	1261.847	-0.032	NVA
1144	479123.516	3809216.014	Yes	1750.626	1750.614	-0.012	NVA
1145	451472.508	3798820.026	Yes	1945.968	1945.875	-0.093	NVA
1146	513985.076	3832407.537	Yes	1578.611	1578.629	0.018	NVA
1147	482389.159	3828079.055	Yes	1824.004	1823.901	-0.103	NVA
1148	487954.256	3802438.611	Yes	1760.771	1760.737	-0.034	NVA
1149	527400.643	3762202.859	Yes	1403.072	1403.024	-0.048	NVA
1150	539999.578	3770138.083	Yes	1259.349	1259.320	-0.029	NVA
1151	603354.798	3751936.172	Yes	1367.890	1367.920	0.030	NVA
1152	569824.907	3770303.878	Yes	1223.608	1223.540	-0.068	NVA
1152B	569771.487	3770290.177	Yes	1224.408	1224.377	-0.031	NVA
1153	561517.690	3743737.980	Yes	1148.532	1148.498	-0.034	NVA
1155	479869.366	3839072.334	Yes	1777.417	1777.407	-0.010	NVA
1156	571006.472	3796101.615	Yes	1218.106	1218.077	-0.029	NVA
1157	608430.649	3775052.525	Yes	1369.764	1369.777	0.013	NVA
1158	535115.048	3820058.303	Yes	1460.291	1460.198	-0.093	NVA
1159	464736.753	3803656.220	Yes	1887.869	1887.825	-0.044	NVA
1160	515779.091	3808496.311	Yes	1603.895	1603.889	-0.006	NVA
1161	554802.821	3744800.231	Yes	1224.308	1224.300	-0.008	NVA
1162	548458.237	3814464.024	Yes	1387.778	1387.797	0.019	NVA
1164	505054.878	3817416.215	Yes	1641.735	1641.710	-0.025	NVA
1165	570183.836	3720758.677	Yes	1227.693	1227.614	-0.079	NVA
1166	575000.366	3832770.094	Yes	1367.735	1367.722	-0.013	NVA
1167	573300.668	3748630.525	Yes	1207.456	1207.405	-0.051	NVA
1168	606997.616	3760667.728	Yes	1373.762	1373.712	-0.050	NVA
1169	496121.722	3809550.474	Yes	1722.706	1722.704	-0.002	NVA
1170	576336.020	3812139.300	Yes	1254.350	1254.339	-0.011	NVA
1171	587670.266	3783683.768	Yes	1304.336	1304.319	-0.017	NVA
1172	494835.143	3792523.688	Yes	1655.377	1655.382	0.005	NVA
1173	543888.703	3760241.381	Yes	1297.998	1298.019	0.021	NVA
1174	584430.459	3752054.003	Yes	1210.113	1210.102	-0.011	NVA

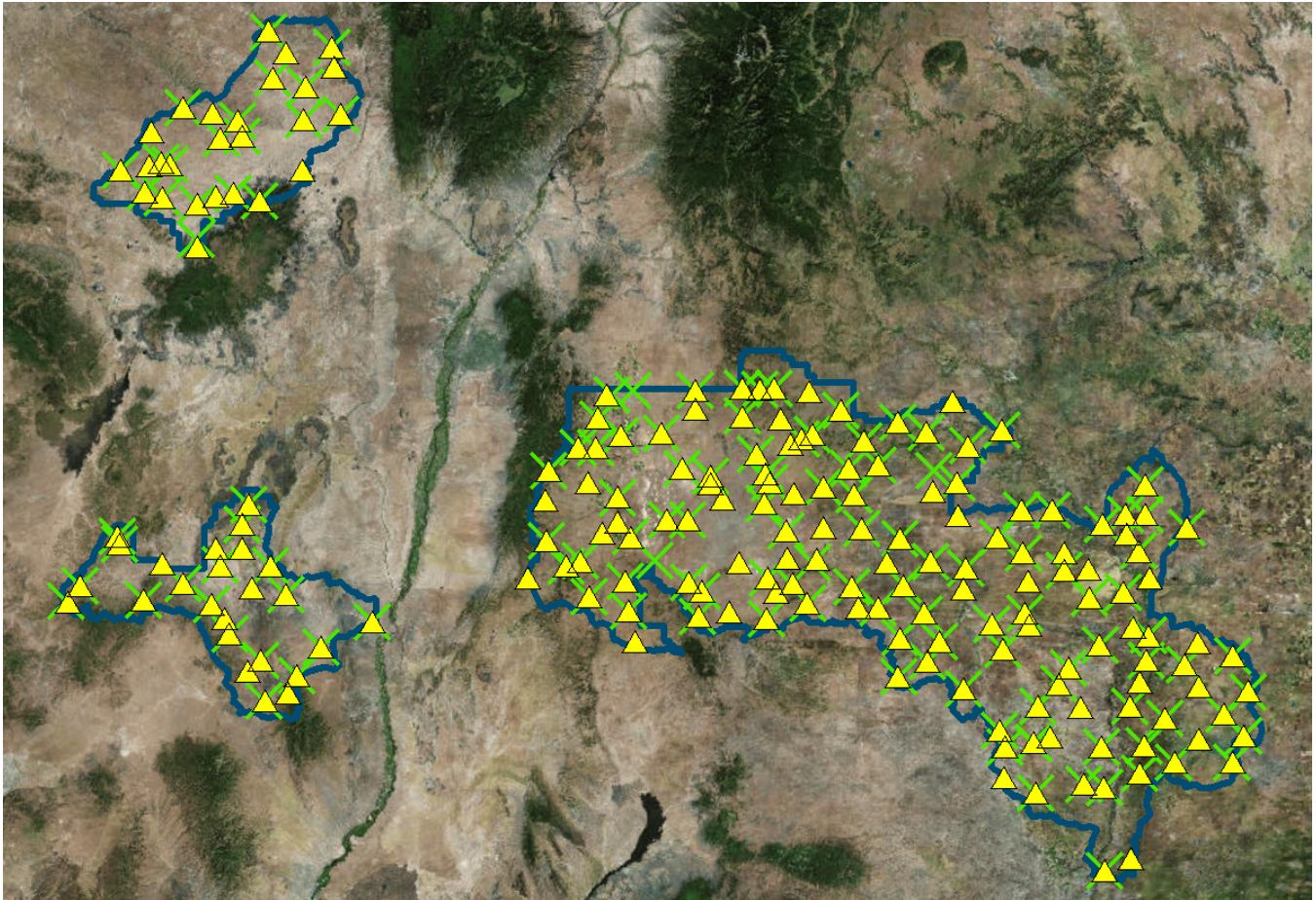
1175	494787.988	3824993.260	Yes	1697.432	1697.411	-0.021	NVA
1176	534752.050	3834105.724	Yes	1480.022	1479.987	-0.035	NVA
1177	539207.789	3742000.053	Yes	1223.075	1223.067	-0.008	NVA
1178	592381.916	3776573.789	Yes	1276.487	1276.520	0.033	NVA
1178B	592440.989	3776568.824	Yes	1276.726	1276.739	0.013	NVA
1179	536630.977	3810817.096	Yes	1450.596	1450.521	-0.075	NVA
1180	481337.959	3802311.997	Yes	1758.105	1758.054	-0.051	NVA
1181	525054.691	3796919.086	Yes	1460.840	1460.824	-0.016	NVA
1182	537216.237	3796750.002	Yes	1385.547	1385.536	-0.011	NVA
1183	588445.732	3828408.459	Yes	1480.773	1480.756	-0.017	NVA
1184	494244.628	3779737.121	Yes	1674.423	1674.427	0.004	NVA
1185	502718.806	3800417.573	Yes	1709.562	1709.560	-0.002	NVA
1186	503938.496	3784785.720	Yes	1559.754	1559.706	-0.048	NVA
1187	548404.161	3820080.408	Yes	1387.430	1387.401	-0.029	NVA
1189	574580.419	3757497.066	Yes	1171.245	1171.224	-0.021	NVA
1190	553949.723	3769805.013	Yes	1195.844	1195.895	0.051	NVA
1191	459877.043	3810165.050	Yes	1924.004	1923.969	-0.035	NVA
1191A	546691.761	3777489.401	Yes	1257.569	1257.584	0.015	NVA
1192	458337.089	3818558.426	Yes	1952.724	1952.705	-0.019	NVA
1193	568839.158	3826423.099	Yes	1309.640	1309.619	-0.021	NVA
2035	443692.661	3873772.047	Yes	2120.969	2121.067	0.098	VVA
2035B	443607.161	3864655.322	Yes	2090.228	2090.408	0.180	VVA
2036	423773.024	3847683.208	Yes	1869.467	1869.462	-0.005	VVA
2037	396626.635	3863921.234	Yes	1955.043	1955.047	0.004	VVA
2038	407000.043	3825407.632	Yes	1855.755	1855.986	0.231	VVA
2039	402819.703	3838188.373	Yes	1862.518	1862.694	0.176	VVA
2040	475816.936	3866676.949	Yes	1795.791	1795.772	-0.019	VVA
2041	405220.745	3810890.439	Yes	2011.681	2011.646	-0.035	VVA
2042	528292.120	3860010.581	Yes	1403.540	1403.575	0.035	VVA
2043	425889.684	3830801.084	Yes	1922.479	1922.620	0.141	VVA
2044	505963.065	3846883.430	Yes	1625.075	1625.174	0.099	VVA
2045	428136.268	3873026.350	Yes	2055.517	2055.485	-0.032	VVA
2046	448004.188	3852385.975	Yes	1973.209	1973.188	-0.021	VVA
2047	453984.849	3873787.462	Yes	1967.663	1967.720	0.057	VVA
2048	390625.034	3817568.711	Yes	2005.021	2005.110	0.089	VVA
2049	462997.702	3857166.093	Yes	1911.545	1911.534	-0.011	VVA
2049B	466261.569	3858769.251	Yes	1801.062	1801.084	0.022	VVA
2050	457895.721	3827284.252	Yes	1859.430	1859.457	0.027	VVA
2051	478347.746	3847514.681	Yes	1788.596	1788.683	0.087	VVA
2052	407933.154	3873088.225	Yes	1887.041	1887.360	0.319	VVA
2053	406390.276	3801254.469	Yes	1956.241	1956.230	-0.011	VVA
2054	451862.460	3812155.825	Yes	1863.659	1863.584	-0.075	VVA
2055	389951.190	3854480.123	Yes	1990.717	1990.724	0.007	VVA
2055B	395692.294	3854399.734	Yes	1930.466	1930.530	0.064	VVA

2056	433351.514	3845214.432	Yes	1931.743	1931.789	0.046	VVA
2057	380443.819	3847070.878	Yes	2070.369	2070.340	-0.029	VVA
2058	426035.164	3810732.826	Yes	1905.503	1905.494	-0.009	VVA
2059	449311.136	3873474.010	Yes	2075.008	2074.997	-0.011	VVA
2060	513468.985	3843114.381	Yes	1569.546	1569.571	0.025	VVA
2061	483080.137	3856743.277	Yes	1701.552	1701.623	0.071	VVA
2062	429069.508	3799420.092	Yes	1967.712	1967.690	-0.022	VVA
2063	451065.221	3845981.473	Yes	1934.785	1934.880	0.095	VVA
2063B	452504.140	3842988.610	Yes	1926.217	1926.226	0.009	VVA
2064	469862.717	3841519.291	Yes	1890.290	1890.272	-0.018	VVA
2065	430202.289	3807702.034	Yes	1919.550	1919.620	0.070	VVA
2066B	400926.213	3871657.666	Yes	1900.518	1900.472	-0.046	VVA
2067	487937.501	3848762.380	Yes	1759.083	1759.061	-0.022	VVA
2068	403795.806	3858333.953	Yes	1873.629	1873.607	-0.022	VVA
2069	385939.554	3815751.752	Yes	1960.106	1960.183	0.077	VVA
2070	516932.388	3855010.028	Yes	1530.639	1530.603	-0.036	VVA
2071	414947.779	3817601.363	Yes	1882.628	1882.764	0.136	VVA
2072	450636.121	3836269.290	Yes	1890.449	1890.529	0.080	VVA
2073	379636.209	3823996.924	Yes	2079.333	2079.410	0.077	VVA
2074	417042.637	3859004.065	Yes	1882.331	1882.300	-0.031	VVA
2075	418808.422	3830968.132	Yes	1860.783	1860.742	-0.041	VVA
2076	393669.018	3806056.527	Yes	2030.236	2030.272	0.036	VVA
2077	494413.757	3862748.692	Yes	1689.108	1689.092	-0.016	VVA
2078	503439.046	3859337.634	Yes	1617.334	1617.350	0.016	VVA
2079	587693.261	3783787.116	Yes	1305.872	1305.821	-0.051	VVA
2079B	603469.245	3786567.171	Yes	1370.184	1370.225	0.041	VVA
2080	549891.063	3782902.630	Yes	1298.638	1298.713	0.075	VVA
2081	494821.923	3824984.370	Yes	1696.489	1696.468	-0.021	VVA
2082	560163.862	3790269.282	Yes	1275.648	1275.668	0.020	VVA
2082B	560188.900	3790241.721	Yes	1275.364	1275.427	0.063	VVA
2083	567724.864	3807255.358	Yes	1249.106	1249.161	0.055	VVA
2084	479140.080	3809227.065	Yes	1750.973	1751.034	0.061	VVA
2086	581426.907	3766395.872	Yes	1202.190	1202.169	-0.021	VVA
2087	561616.062	3716792.487	Yes	1121.760	1121.697	-0.063	VVA
2087B	561719.047	3716795.366	Yes	1122.943	1122.941	-0.002	VVA
2088	507735.254	3791211.495	Yes	1622.132	1622.200	0.068	VVA
2089	584340.502	3752084.253	Yes	1209.979	1209.892	-0.087	VVA
2090	464886.903	3803731.057	Yes	1887.661	1887.793	0.132	VVA
2091	482397.184	3827959.279	Yes	1825.402	1825.380	-0.022	VVA
2092	535573.371	3800736.632	Yes	1460.772	1460.905	0.133	VVA
2093	544458.924	3834100.777	Yes	1402.124	1402.194	0.070	VVA
2094	561538.068	3743734.786	Yes	1148.490	1148.507	0.017	VVA
2095	529166.149	3757171.998	Yes	1379.397	1379.381	-0.016	VVA
2096	574889.062	3842297.859	Yes	1447.457	1447.467	0.010	VVA

2097	600462.050	3767814.496	Yes	1302.158	1302.129	-0.029	VVA
2098	568578.839	3832705.784	Yes	1352.756	1352.740	-0.016	VVA
2099	494827.804	3792569.154	Yes	1655.504	1655.475	-0.029	VVA
2100	534735.743	3834055.761	Yes	1478.295	1478.257	-0.038	VVA
2101	538629.250	3758403.349	Yes	1385.514	1385.540	0.026	VVA
2101B	538590.422	3758182.539	Yes	1383.895	1383.976	0.081	VVA
2102	556850.353	3805626.865	Yes	1343.741	1343.793	0.052	VVA
2103	516311.395	3815171.496	Yes	1594.244	1594.244	0.000	VVA
2103B	526777.258	3825279.997	Yes	1520.166	1520.116	-0.050	VVA
2104	539212.995	3742084.342	Yes	1223.941	1223.961	0.020	VVA
2105	574574.710	3757400.548	Yes	1172.620	1172.672	0.052	VVA
2106	546664.589	3777576.865	Yes	1259.181	1259.170	-0.011	VVA
2107	588409.618	3828444.712	Yes	1480.921	1480.912	-0.009	VVA
2108	554813.101	3744782.549	Yes	1224.329	1224.392	0.063	VVA
2109	548485.614	3814497.434	Yes	1387.853	1387.880	0.027	VVA
2110	572878.372	3820761.580	Yes	1284.483	1284.548	0.065	VVA
2111	528555.772	3788720.331	Yes	1376.857	1376.869	0.012	VVA
2112	540069.417	3770206.018	Yes	1259.566	1259.596	0.030	VVA
2113	505081.506	3817408.467	Yes	1641.564	1641.595	0.031	VVA
2114	575077.558	3832746.323	Yes	1367.571	1367.576	0.005	VVA
2115	494478.756	3779739.198	Yes	1667.046	1667.149	0.103	VVA
2116	560524.360	3757013.219	Yes	1187.252	1187.237	-0.015	VVA
2117	495947.256	3809806.695	Yes	1722.214	1722.337	0.123	VVA
2118	502772.178	3800326.663	Yes	1708.592	1708.697	0.105	VVA
2119	535139.841	3820055.070	Yes	1460.403	1460.350	-0.053	VVA
2120	515661.439	3776032.774	Yes	1471.669	1471.654	-0.015	VVA
2121	608417.138	3774863.833	Yes	1376.436	1376.465	0.029	VVA
2122	575193.795	3785071.561	Yes	1233.789	1233.717	-0.072	VVA
2123	459779.565	3810145.511	Yes	1925.580	1925.648	0.068	VVA
2124	503974.423	3784791.279	Yes	1559.959	1559.946	-0.013	VVA
2125	606942.278	3760659.340	Yes	1374.222	1374.326	0.104	VVA
2126	603284.855	3751905.468	Yes	1366.893	1367.065	0.172	VVA
2126B	603273.639	3751916.436	Yes	1366.733	1366.760	0.027	VVA
2127	466527.735	3816922.931	Yes	1901.400	1901.393	-0.007	VVA
2128	525033.562	3796906.832	Yes	1461.426	1461.389	-0.037	VVA
2129	573304.941	3748556.264	Yes	1206.643	1206.576	-0.067	VVA
2130	560829.255	3829423.313	Yes	1362.502	1362.523	0.021	VVA
2131	487929.442	3802448.623	Yes	1761.755	1761.713	-0.042	VVA
2132	576132.911	3793320.767	Yes	1221.561	1221.644	0.083	VVA
2134	569806.383	3770188.417	Yes	1228.465	1228.506	0.041	VVA
2135	479895.057	3839093.347	Yes	1777.080	1777.104	0.024	VVA
2135A	574572.085	3757499.218	Yes	1171.127	1171.123	-0.004	VVA
2136	527338.648	3762244.814	Yes	1403.903	1403.794	-0.109	VVA
2137	451435.222	3798725.965	Yes	1943.235	1943.319	0.084	VVA

Lidar Check Point Layout

- Yellow = NVA
- Green = VVA



Hydro-flattening Breakline Collection

Hydro- flattening breaklines are captured per the USGS National Geospatial Program Lidar Base Specification Version 1.2. Final hydro-flattened breaklines features are appropriately turned into polygons (flat elevations) and polylines (decreasing by elevation) and are used to reclassify ground points in water to Water (Class 9). The lidar points around the breaklines are reclassified to Ignored Ground (Class 10) based on predetermined buffer.

Linear hydrographic features

To collect hydrographic features, Merrick-Surdex JV uses a methodology that directly interacts with the lidar bare-earth data to collect drainage breaklines. To determine the alignment of a drainageway, the technician first views the area as a TIN of bare-earth points using a color ramp to depict varying elevations. In areas of extremely flat terrain, the technician may need to determine the direction of flow based on measuring lidar bare-earth points at each end of the drain. The operator will then use the color ramped TIN to digitize the drainage in 2D with the elevation being attributed directly from the bare-earth LAS data. MARS® software has the capability of “flipping” views between the elevation TIN, Intensity and imagery, as necessary, to further assist in the determination of the drainage. All drainage breaklines are collected in a downhill direction. For each point collected, the software uses a five-foot (5’) search radius to identify the lowest point within that proximity.

Within each radius, if a bare-earth point is not found that is lower than the previous point, the elevation for subsequent point remains the same as the previous point. This forces the drain to always flow in a downhill direction. Waterbodies that are embedded along a drainageway are validated to ensure consistency with the downhill direction of flow.

This methodology may differ from those of other vendors in that Merrick-Surdex JV relies on the bare-earth data to attribute breakline elevations. As a result of our methodology, there is no mismatch between lidar bare-earth data and breaklines that might otherwise be collected in stereo 3D as a separate process. This is particularly important in densely vegetated areas where breaklines collected in 3D from imagery will most likely not match (either horizontally or vertically), the more reliable lidar bare-earth data.

Merrick-Surdex JV has the capability of “draping” 2D breaklines to a bare-earth elevation model to attribute the “z” as opposed to the forced downhill attribution methodology described above. However, the problem with this process is the “pooling” effect or depressions along the drainageway caused by a lack of consistent penetration in densely vegetated areas.

Criteria of linear hydrographic breaklines are as follows:

- Linear hydrographic features (e.g., visible streams, rivers, shorelines, canals, etc.) greater than one hundred feet (100') wide will be captured as a double-lined polygon
 - linear hydrographic features must be flat and level bank-to-bank (perpendicular to the apparent flow centerline) with gradient following the immediately surrounding terrain
 - water surface edge must be at or just below the immediately surrounding terrain
 - streams should break at road crossings (e.g., culverts), and streams and rivers should not break at bridges

Waterbodies

Waterbodies are digitized from the color ramped TIN, similar to the process described above. The elevation attribute is determined as the technician collects the hydro feature by using the lowest bare-earth point within the polygon.

Criteria of waterbody breaklines are as follows:

- Waterbodies (e.g., lakes, ponds, reservoirs) greater than two (2) acres in size are surrounded by a water breakline (i.e., closed polygon)
 - waterbodies must be flat and level with a single elevation for every bank vertex
 - water surface edge must be at or just below the immediately surrounding terrain
 - long impoundments, such as reservoirs or inlets, whose water surface elevations drop when moving downstream should be treated as rivers

Color cycles provide a clear indication of where breaklines are to be collected, especially hydrographic breaklines. Figure 3 demonstrates no breaklines, where Figure 4 is breakline enforced displayed using color cycles within the MARS[®] software environment.

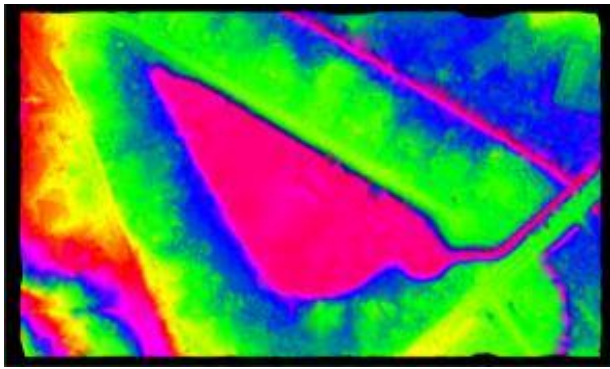


Figure 3

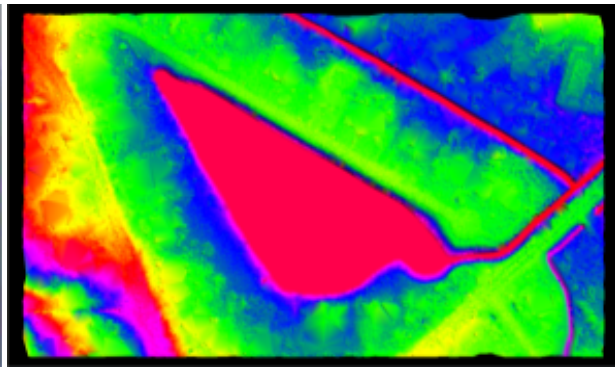


Figure 4

Bare-Earth DEM

Merrick-Surdex JV exports the hydro-flattening breakline enforced Class 2 (ground) lidar points to a one-meter (1m) cell size, 32-bit format using MARS®, the DEMs are exported to the project tiling scheme. Projection information is applied that reflects the project requirements.

Intensity Images

Merrick-Surdex JV exports all lidar points to a one-meter (1m) cell size 16-bit client desired format using MARS®, the intensity images are exported to the project tiling scheme and / or project-wide boundary. Projection information is applied that reflects the project requirements.

List of Deliverables

- Minimum standards as outlined in **TM11-B4 / Exhibit 1**
- Raw lidar point cloud
 - Fully compliant ASPRS LAS 1.4, point record format 6
 - Calibrated
 - By swath
 - Intensity values normalized (rescaled) to 16-bit
 - Federal Geographic Data Committee (FGDC) compliant metadata
- Classified lidar point cloud
 - Fully compliant ASPRS LAS 1.4, point record format 6
 - By tile
 - Intensity values normalized (rescaled) to 16-bit
 - FGDC-compliant metadata
- Cliff Shadows – per USGS direction, files are being provided to delineate data voids caused by the shadowing effect on the laser in small isolated areas of extreme terrain relief. Both vector and raster file formats are being delivered.
 - Shapefiles
 - JPEG2000
- Bare-earth DEM
 - 1m cell size 32-bit floating point raster in ERDAS IMG format
 - Bare-earth (hydro-flattened)
 - Culverts will not be removed from the DEMs

- Bridges will be removed from the DEMs
 - By tile
 - FGDC-compliant metadata
- Hydro-flattened breaklines
 - Project-wide Esri feature class(es) for insertion into file geodatabase
 - PolylineZ
 - FGDC-compliant metadata
- Intensity Images
 - 1m cell size 8-bit, 256 color gray scale in GeoTIFF format
 - By tile
 - FGDC-compliant metadata
- Control
 - Survey report
 - Esri shapefile format
 - FGDC-compliant metadata
- FGDC-compliant metadata (project level)
- Detailed lidar Mapping / Project Report

Appendix 1

Following is a more detailed lidar calibration workflow description:

LIDAR CALIBRATION AND BLOCK LAS OUTPUT

Note: All figures represented on the following pages are for general illustration purposes, and are not examples derived from the project.

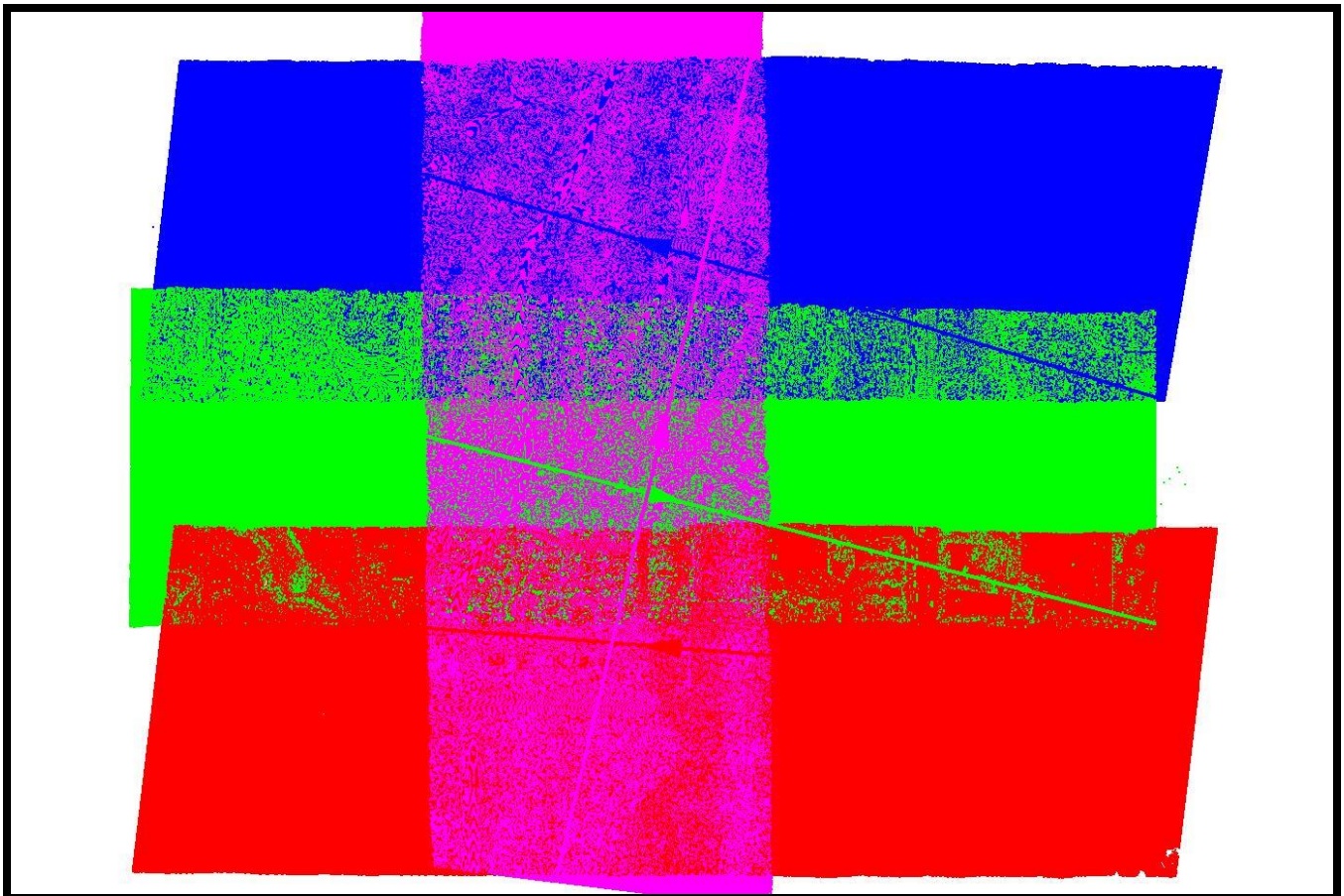
Initial Processing

Lidar data is output as LAS point data using Optech's Lidar Mapping Suite (LMS). LMS matches ground and roof planes plus roof lines to self-calibrate and correct system biases. These biases occur within the hardware of the laser scanning systems, within the Inertial Measurement Unit (IMU) and because of environmental conditions which affect the refraction of light. The systemic biases that are corrected for include scale, roll, pitch, and heading.

In addition to the self-calibration mode LMS runs a "production" mode which applies the self-calibration parameters and then analyzes each individual flight line and applies small adjustments to each line to tie overlapping lidar points even more tightly together.

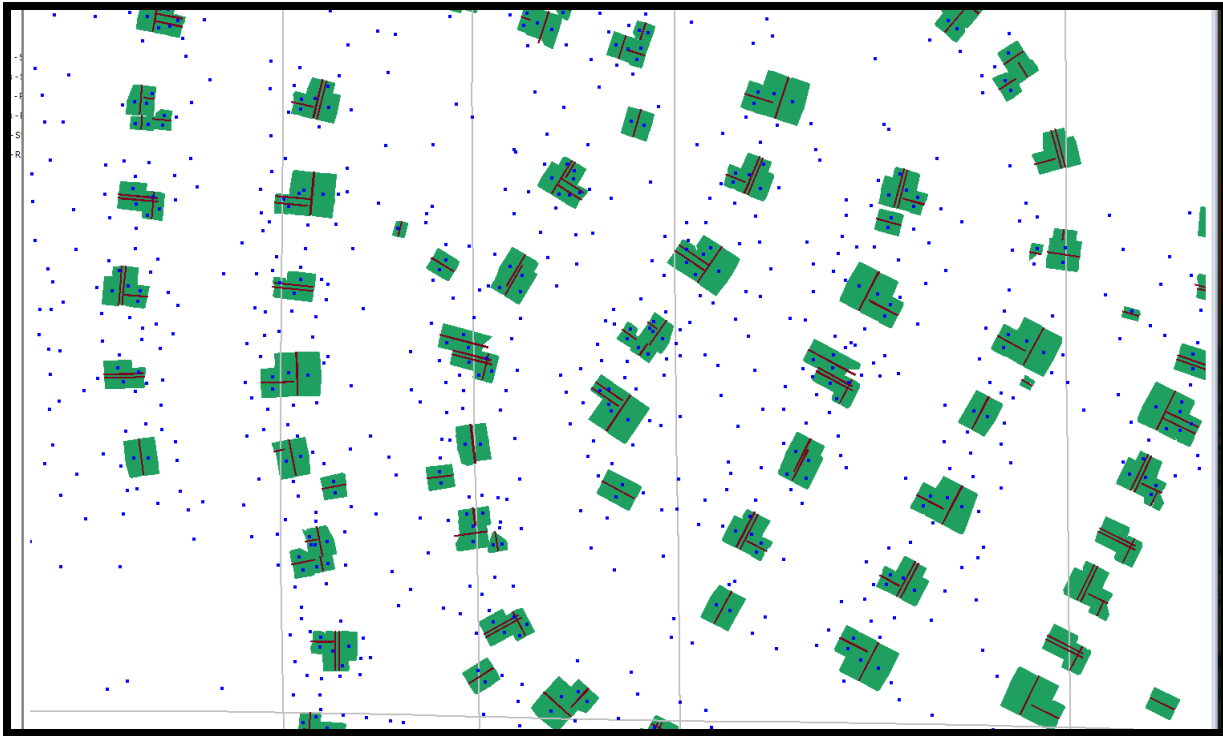
Boresight Self-Calibration Processing Procedures

An LMS boresight calibration is performed on an as-needed basis to correct scale, roll, pitch and heading biases. A minimum of three overlapping flights are flown in opposing directions with one cross flight.



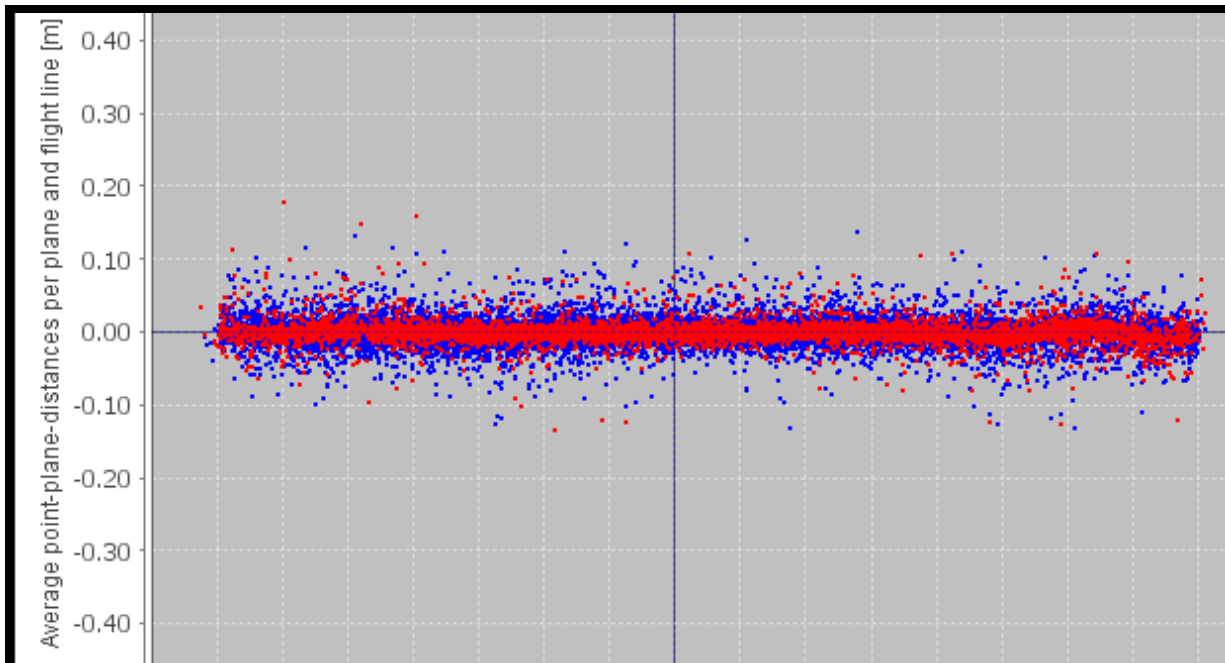
The Boresighting module frees scan angle scale, scan angle lag, XYZ boresight corrections and elevation position corrections while locking scan angle offset and XY position corrections.

The picked calibration site will have a good distribution of buildings for the self-calibration software to match ground planes, roof planes and roof lines.

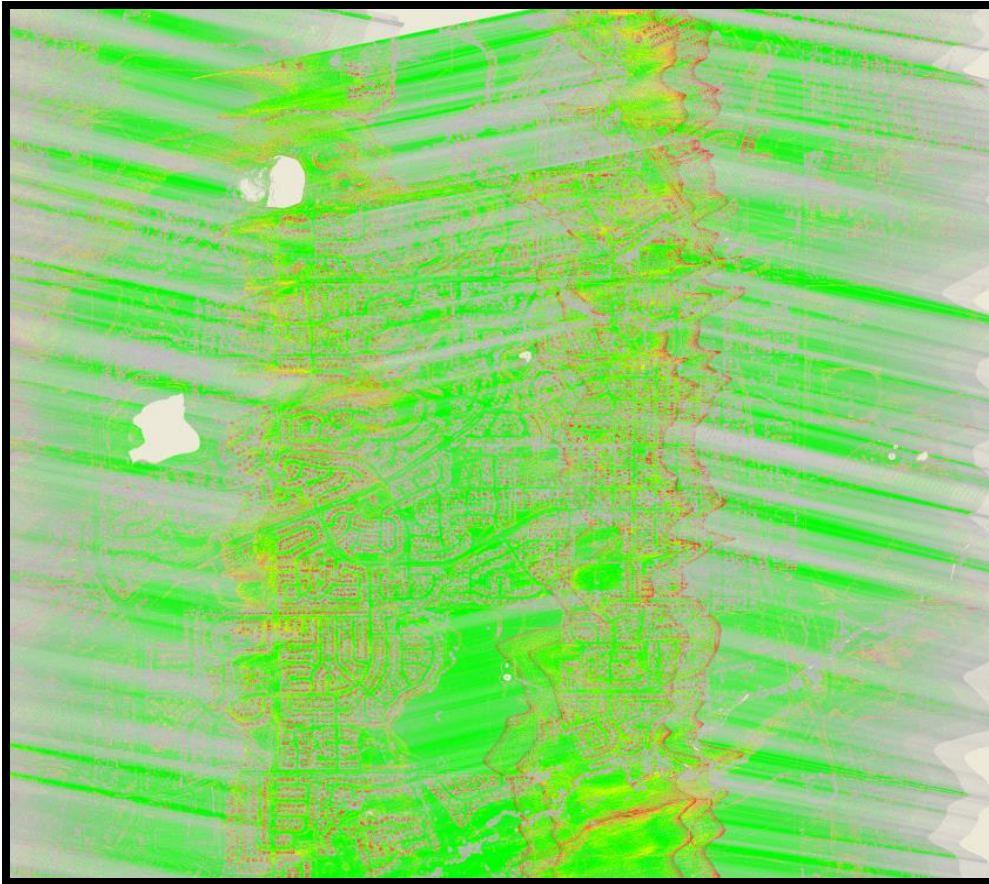


At the conclusion of the self-calibration run the data is quality checked with LMS plots

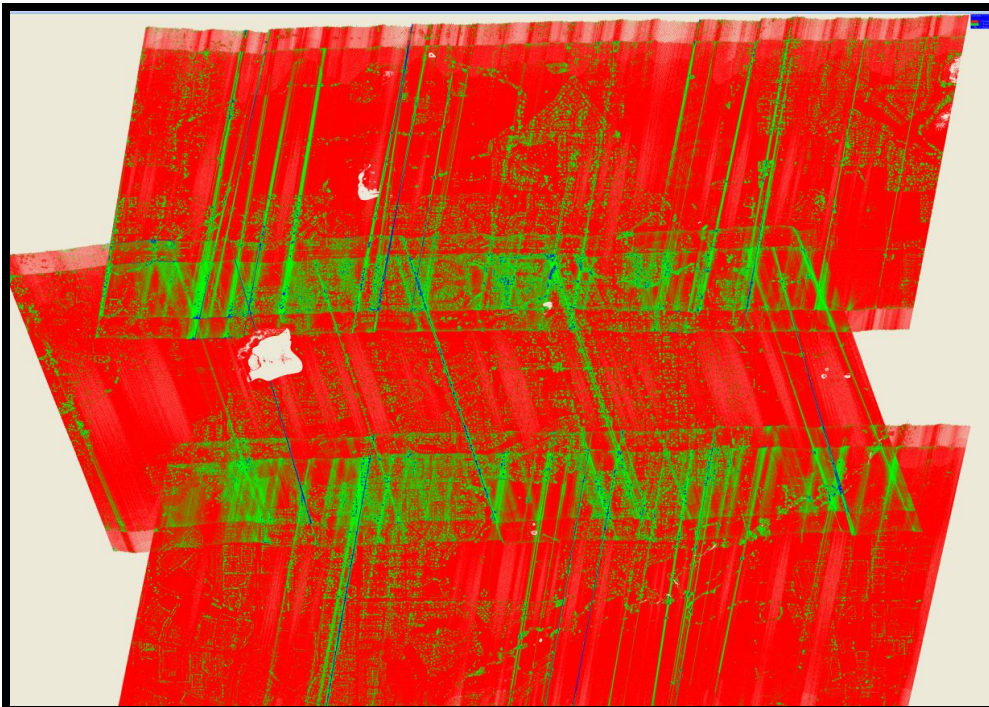
Plot of plane vertical distances from datum plane.



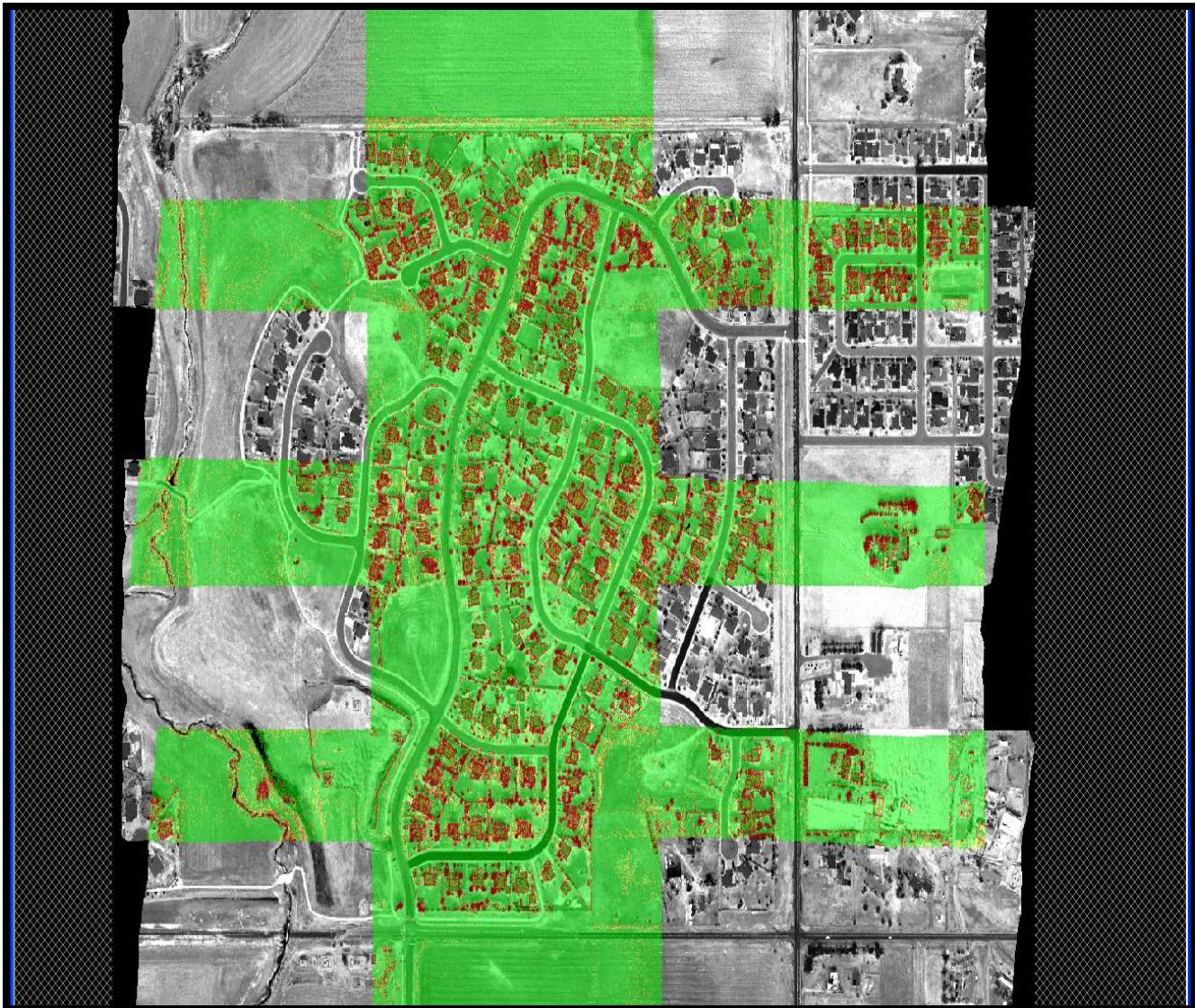
Plot of height differenced between flight lines. (Green=less than 5cm).



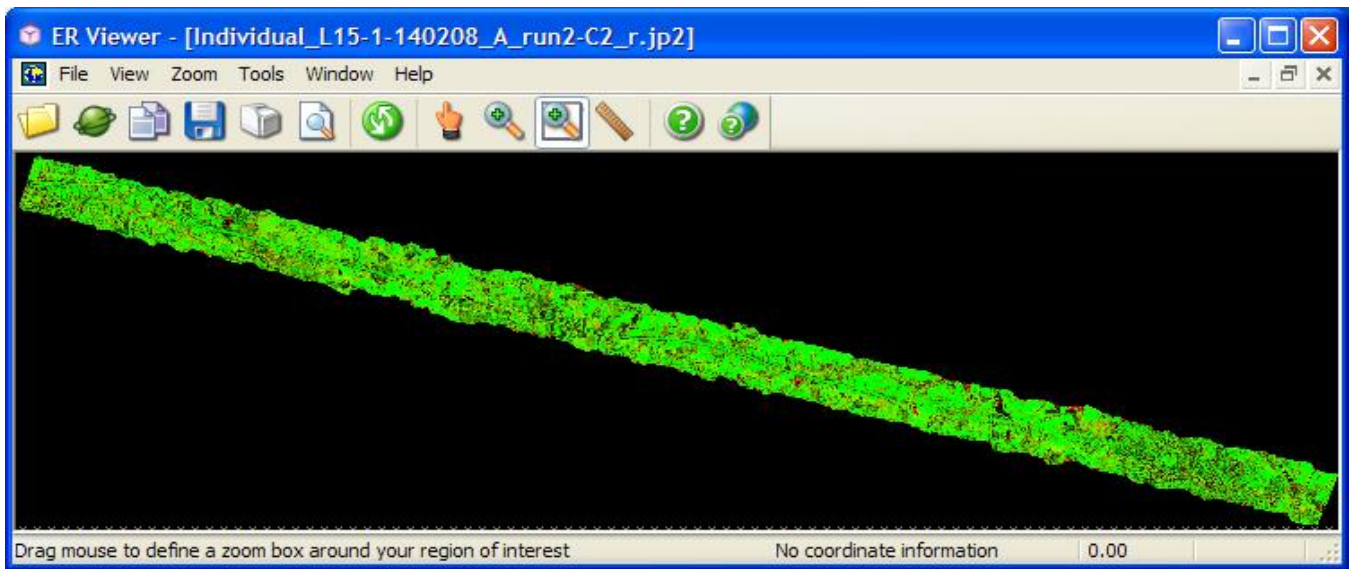
Plot of point densities. (Red=5-9 points per cell, green 10+ points per cell).



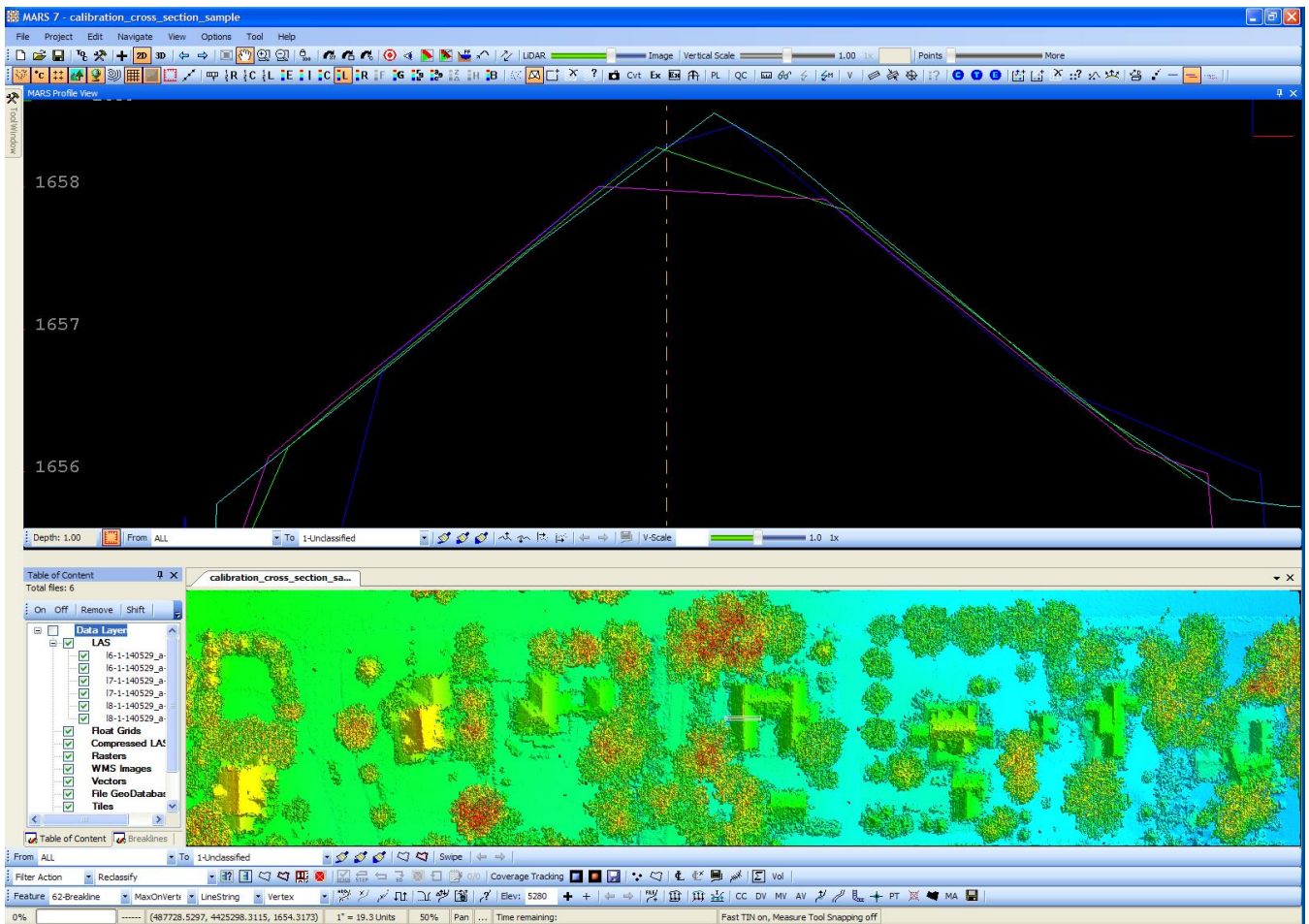
A Flight Line Separation Raster image is generated in Merrick Advanced Remote Sensing Software (MARS®), in this example ground returns from multiple flight lines that are fitting within 3 centimeters are colored green.



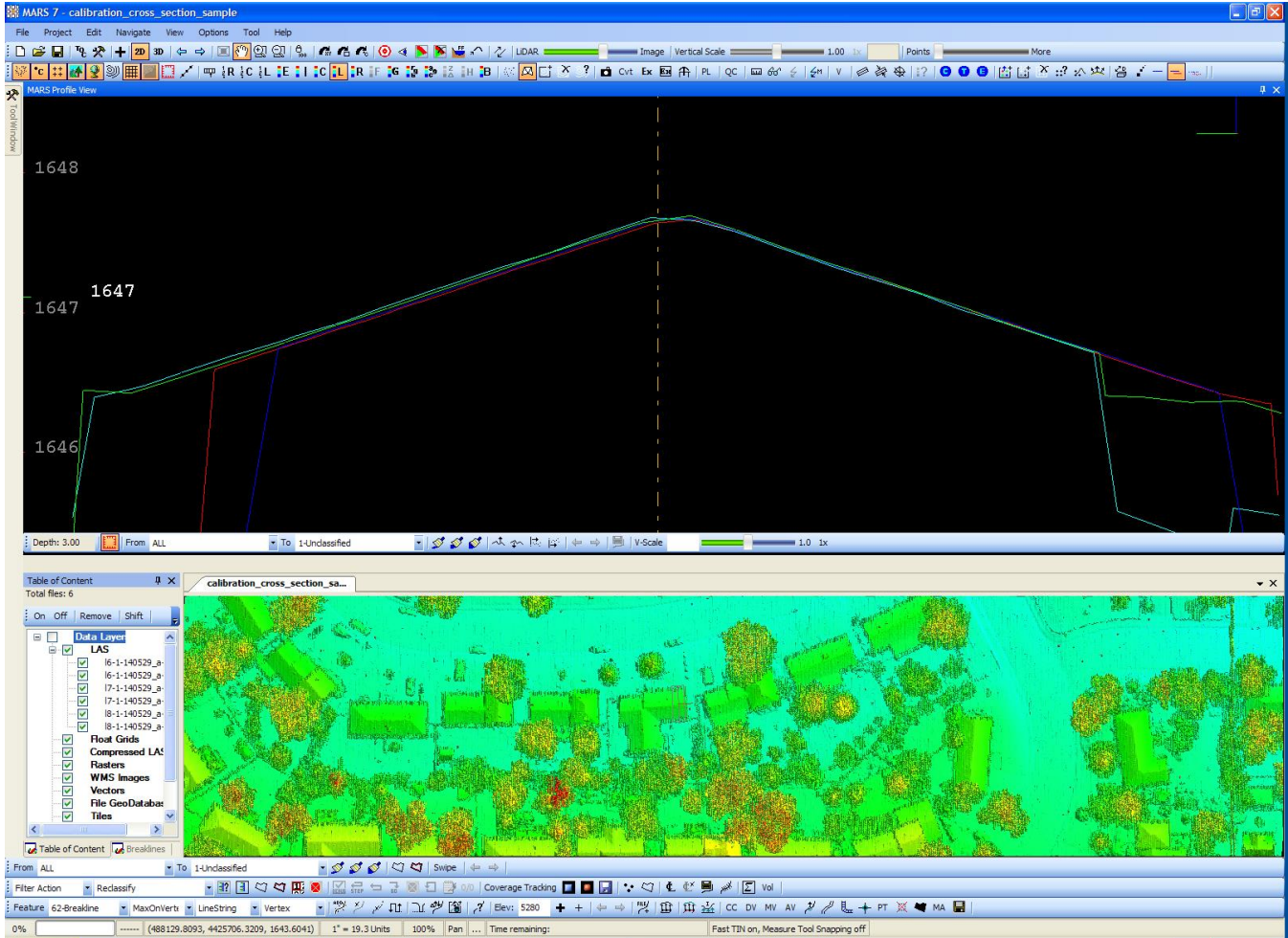
MARS® tests for internal relative vertical accuracy using inbound and outbound scan values. Again, Green is showing inbound and outbound scan data fitting to 3 centimeters.



Building cross sections are checked for good alignment. Pitch and heading are checked on roof planes parallel to the flight direction.



Roll and scale are checked on roof planes perpendicular to the flight direction.

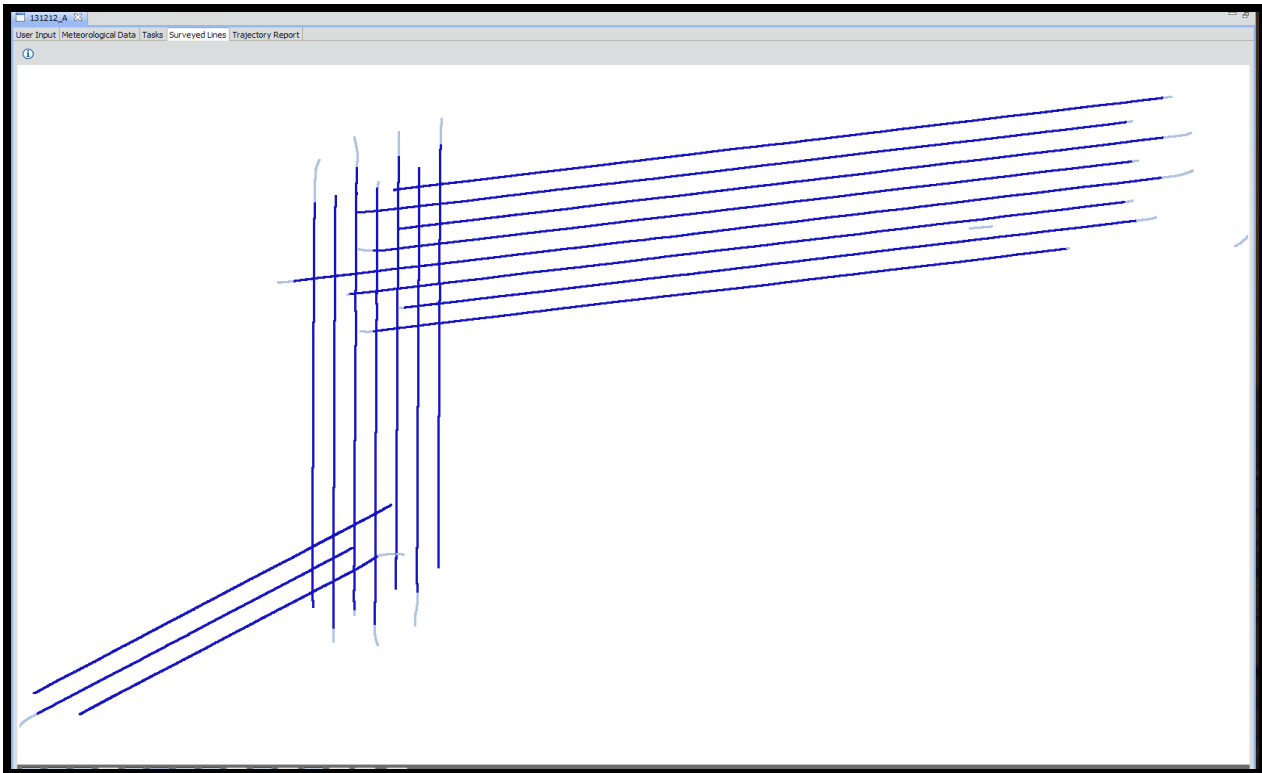


The LMS program outputs a "LCP" file with all the correction parameters. The calibration process may be run several times until the boresight adjustments are acceptable. When the boresight solution is acceptable the LCP file adjustments are saved and also applied to subsequent projects. Each new project is again analyzed and when the adjustment biases show too much drift a new boresight calibration is run. The LCP file may hold calibration tolerances for several projects.

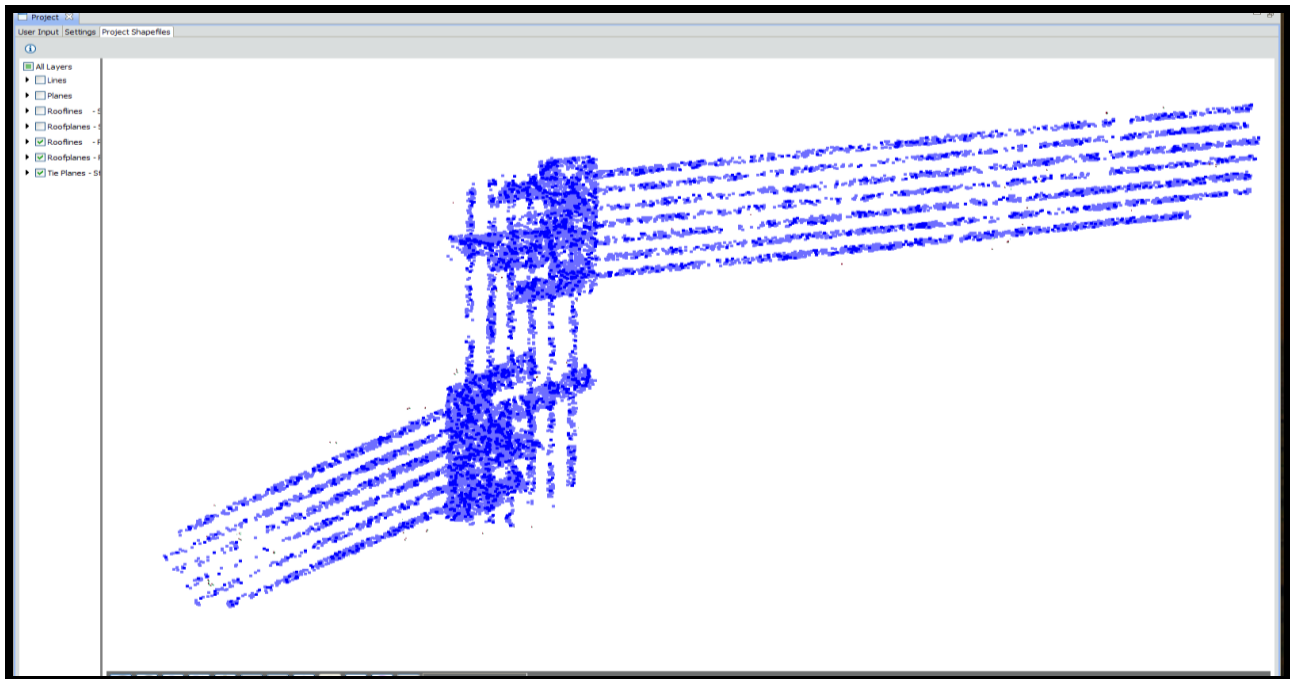
Block LAS Production Processing Procedures

The LMS production mode is run on each flight line to further tie the final lidar LAS flight line files tightly together. Production settings allow scan angle scale, scan angle lag to float and allows elevation to move slightly during flight line to flight line comparison thus further tying flight lines together. A cross flight with locked elevation data is used for controlling flight line elevations.

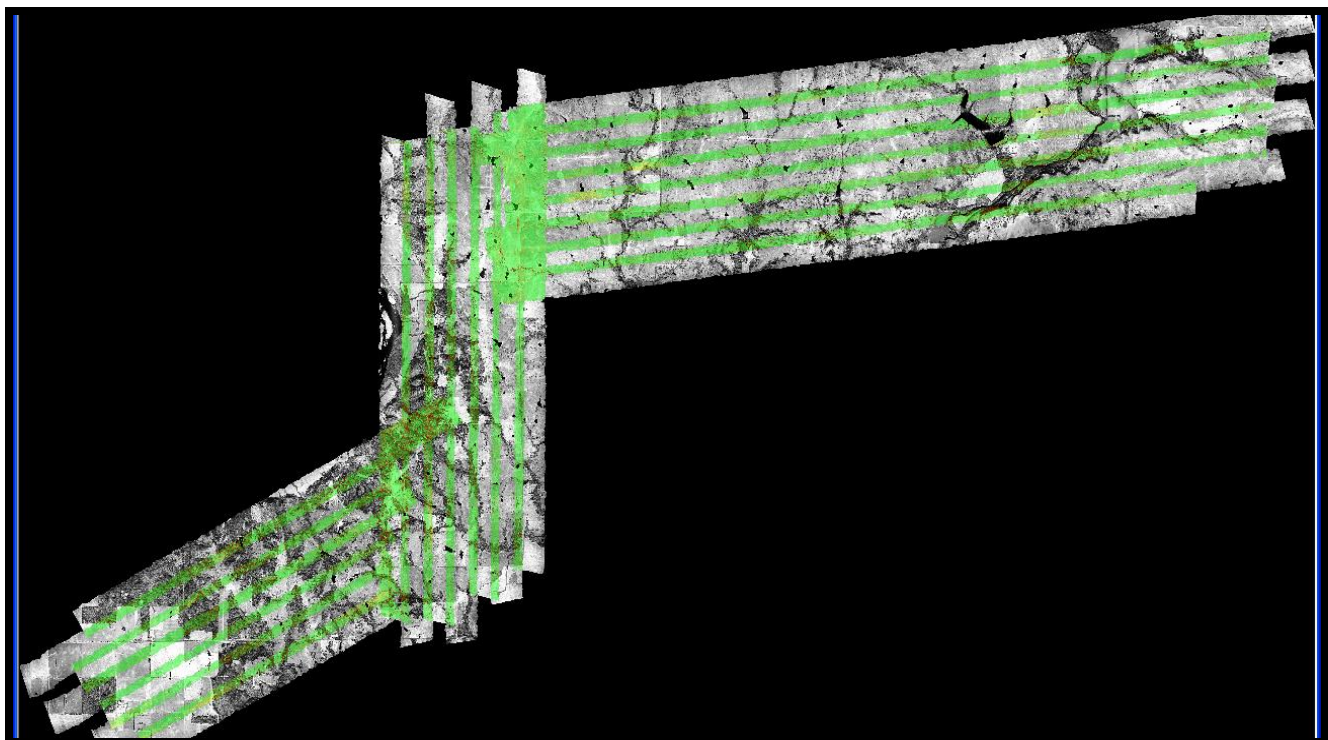
A block of data is selected to process with LMS production settings. Data collected during turns at the ends of flight lines is deselected (light blue lines).



As in self-calibration the LMS production program analyses ground, roof planes and rooflines. One cross flight is locked in elevation and all other lines are adjusted to it. Unlike the calibration site the distribution of roof planes is usually much less dense. Here matched ground tie planes are blue.

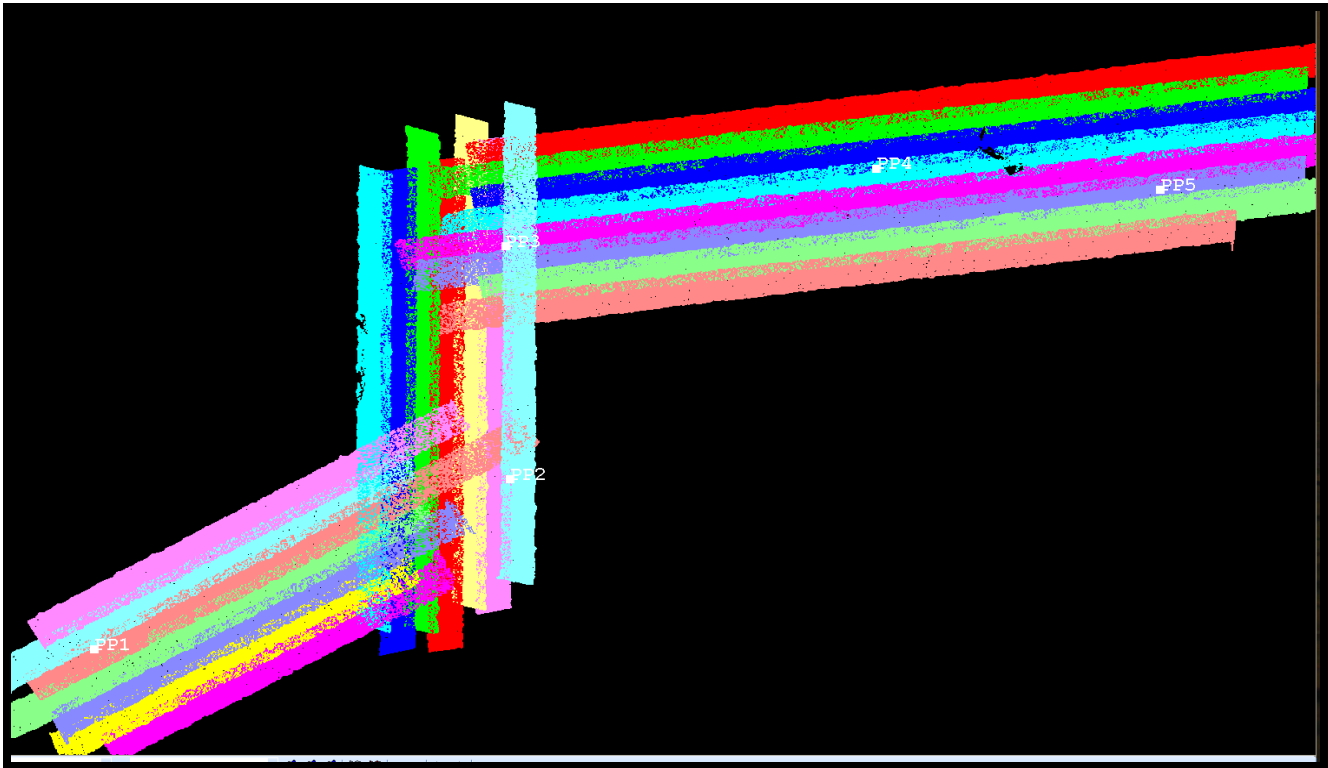


The same quality control outputs used to check self-calibrations are available to analyze the production run. Output plots are again available in LMS and cross sections plus a Flight Line Separation Raster are generated in MARS® to check coverage and quality.



Correcting the Final Elevation

After all the lines are tied together a ground control network is imported into MARS®. The ground control network may be pre-existing or collected by a licensed surveyor.



The next step is to match the ground control elevations to the lidar data set. A control report is run and the data set is shifted slightly to zero out the average elevation error and points checked for quality.

The final step before boresighted, leveled LAS files are ready for filtering is to run the MARS® QC Module on the block data. The Boresighted lidar QC Report outputs individual reports on Point Density, Nominal Pulse Spacing, Data Voids, Spatial Distribution, Scan Angles, Control Report, Flight Line Separation, Flight Line Overlap, Buffered Boundary, LAS Formats, Datums and Coordinates.

These reports are checked with the required specifications in the Project Management Plan.

Following is the Survey Report:



CENTRAL NEW MEXICO LIDAR MAPPING PROJECT
GROUND CONTROL SURVEY REPORT

JOB NO. 65219750

DATE JANUARY 2018

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**CENTRAL NEW MEXICO
LIDAR MAPPING PROJECT
GROUND CONTROL SURVEY REPORT**

I. INTRODUCTION

II. HORIZONTAL AND VERTICAL CONTROL

III. JOB SUMMARY AND EQUIPMENT

A. COORDINATES

NAD-83 (North American Datum of 1983) 2011 GEODETIC SYSTEM

NAD-83 UTM ZONE 13 NORTH

NAVD-88 (North American Vertical Datum of 1988) GEOID 12B

B. BASE MAP AND SAMPLE OCCUPATION PHOTO

**C. EXISTING NGS (NATIONAL GEODETIC SURVEY) HORIZONTAL AND
VERTICAL CONTROL DATA SHEETS**

I. INTRODUCTION

II.

This report summarizes the results of a ground control survey requested by USGS. The survey was conducted in the Arroyo Chico, Rio Salado, Middle Rio Grande, and Upper Pecos areas, New Mexico for LIDAR (Light Detection and Ranging) mapping.

The ground control field observations were performed by Merrick & Company commencing on January 4, 2018 through the completion date of January 31, 2018. Merrick used Trimble RTX (A satellite-based service using worldwide continuously operating reference stations) verified with NGS (National Geodetic Survey) ground stations to establish horizontal and vertical control constraints for the LIDAR acquisition. Merrick also surveyed approximately 450 checkpoints to verify confidence levels of the LIDAR datasets.

III. HORIZONTAL AND VERTICAL CONTROL

IV.

The project coordinate system is UTM ZONE 13 NORTH based on NAD-83, adjustment of 2011. The geodetic network was tied to CORS (Continuously Operating Reference Stations) via RTX and NGS ground stations. RTX coordinates are observed in WGS84(G1762). WGS stands for World Geodetic System and the G1762 is a reference to the GPS week. Coordinate values are converted into NAD83(2011) and NAVD88 values using the HTDP (Horizontal Time Dependent Positioning) program version 3.2.5 published by the National Geodetic Survey. The following existing NGS control points were used as horizontal checks to control this survey.

NGS Primary Horizontal Control Checkpoints		
PT# (NGS NAME)	RECORD POSITION NAD-83 (2011)	
	LATITUDE	LONGITUDE
P 299	35°57'21.11504"N	106°56'58.12838"W
Y 76	34°58'16.05002"N	104°47'31.78610"W
COONEY	34°03'24.68857"N	106°55'19.16202"W
TOLTEC	35°13'12.35119"N	107°54'52.70468"W
NGS Primary Control Horizontal NAD-83 (2011) Comparisons: Record Versus Measured		
PT# (NGS NAME)	NORTH (meters)	EAST (meters)
P 299	-0.034	+0.099
Y 76	+0.000	+0.348
COONEY	-0.316	+0.036
TOLTEC	-0.289	+0.191

NGS Primary Vertical Control checks		
Comparisons: Record Versus Measured		
PT# (NGS NAME)	RECORD	MEASURED
	NAVD 88 elevation in meters	Difference in meters
ACME 2	1234.049	0.000
CITY	1840.972	+0.054
COONEY	1459.210	+0.005
K 357	2139.497	+0.018
M 12	1402.539	-0.144
P 299	2087.157	-0.033
Q 102	2014.188	+0.037
TOLTEC	2002.383	-0.051
WALKER	1086.817	-0.047
Y 76	1565.340	-0.095

V. JOB SUMMARY AND EQUIPMENT

The coordinate system is the UTM Zone 13 North and the units are in meters. The projection parameters are as follows:

PROJECTION: TRANSVERSE MERCATOR
 LATITUDE OF ORIGIN = N 0° 00' 00.000000"
 LONGITUDE OF ORIGIN = W 105° 00' 00.000000"
 FALSE NORTHING =0.000m
 FALSE EASTING =500000.000m
 SCALE FACTOR =0.9996000000

The data collected was converted and checked with published ground station coordinates. The specifications for accuracy with RTX are 4 centimeters horizontally and 4 centimeters vertically.

Satellite data was collected using two Trimble R10 receivers. The coordinates were processed using Trimble Business Center (Version 3.9).

CENTRAL NEW MEXICO LIDAR CHECKPOINTS

65219750

JANUARY 2018

PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
1001	35°53'45.00600"N	107°19'24.55680"W	1983.329	3974888.937	290296.392	2003.883	NVA
1002	35°37'55.03800"N	107°41'07.64880"W	2034.902	3946449.657	256817.613	2055.696	NVA
1002A	35°43'14.14200"N	107°25'43.02480"W	1990.651	3955678.210	280323.821	2011.381	NVA
1003	35°47'10.69800"N	107°32'13.55280"W	2015.380	3963216.854	270698.193	2036.189	NVA
1003B	35°42'44.58600"N	107°30'13.88880"W	1951.390	3954938.536	273493.504	1972.165	NVA
1004	35°47'30.82200"N	107°04'32.40840"W	1984.028	3962854.612	312421.548	2004.211	NVA
1005	35°46'26.34600"N	107°12'29.47680"W	1916.886	3961129.729	300399.162	1937.388	NVA
1006B	35°38'23.22600"N	107°43'04.03680"W	2057.459	3947398.883	253913.281	2078.268	NVA
1007	35°32'07.17000"N	107°42'36.10080"W	2088.060	3935789.911	254296.845	2108.692	NVA
1008	35°36'50.81400"N	107°51'45.89280"W	2175.595	3944923.586	240701.225	2196.346	NVA
1009	35°33'12.47400"N	107°27'11.15280"W	1999.237	3937191.790	277646.276	2019.697	NVA
1010	35°32'02.59800"N	107°21'24.22080"W	2432.178	3934825.148	286331.569	2452.451	NVA
1011	35°37'35.92200"N	107°45'36.78480"W	2052.432	3946048.132	250029.482	2073.230	NVA
1012	35°52'20.04600"N	107°12'11.98080"W	2009.978	3972019.434	301083.975	2030.370	NVA
1013	35°33'06.24600"N	107°46'14.98080"W	2109.251	3937763.971	248834.282	2129.908	NVA
1014	35°32'30.24600"N	107°31'00.22080"W	2020.924	3936036.018	271844.275	2041.424	NVA
1015	36°01'54.10200"N	107°20'24.53280"W	2174.312	3989997.544	289154.241	2194.686	NVA
1016	35°45'55.81800"N	107°26'38.39280"W	2009.999	3960695.187	279056.607	2030.740	NVA
1017	35°48'05.95800"N	107°38'27.95280"W	2066.356	3965168.512	261342.587	2087.232	NVA
1018	35°31'03.77400"N	107°34'56.77680"W	2000.093	3933525.397	265816.141	2020.625	NVA
1019	35°37'33.11400"N	107°12'27.02880"W	1835.688	3944696.571	300091.021	1856.185	NVA
1020	35°23'35.28600"N	107°34'36.68880"W	2195.338	3919691.052	265961.450	2215.603	NVA
1021	35°59'15.95400"N	107°06'36.35280"W	2097.680	3984650.212	309779.090	2117.683	NVA
1022	35°55'47.69400"N	107°06'03.55680"W	2110.220	3978214.750	310462.202	2130.278	NVA
1023	35°43'45.21000"N	107°45'16.40880"W	2096.259	3957414.996	250861.561	2117.161	NVA
1024	35°58'11.11800"N	107°16'33.73680"W	2083.734	3982988.829	294770.927	2104.109	NVA
1025	34°30'41.45400"N	107°28'58.40040"W	1851.281	3821673.264	272068.330	1872.452	NVA

CENTRAL NEW MEXICO LIDAR CHECKPOINTS

65219750

JANUARY 2018

PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
1026	34°20'52.85400"N	107°29'44.51640"W	1977.193	3803566.155	270445.159	1998.460	NVA
1027	34°13'40.27800"N	107°06'22.74840"W	1738.557	3789426.979	305990.725	1760.295	NVA
1028	34°38'31.50600"N	107°22'23.76840"W	1884.312	3835914.611	282474.332	1905.300	NVA
1029	34°11'12.71400"N	107°19'00.15240"W	2025.432	3785301.578	286504.943	2046.952	NVA
1030	34°15'43.47000"N	107°25'45.04440"W	2123.957	3793885.184	276337.124	2145.296	NVA
1031	34°08'33.88200"N	107°11'16.40040"W	1882.161	3780145.781	298273.499	1903.815	NVA
1032	34°22'46.50600"N	107°13'57.53640"W	1658.696	3806504.024	294722.349	1680.100	NVA
1033	34°21'11.86200"N	107°44'04.62840"W	2267.639	3804718.356	248479.198	2288.828	NVA
1034	34°18'25.07400"N	107°26'45.99240"W	2027.951	3798901.767	274897.791	2049.257	NVA
1035	34°09'12.15000"N	107°21'42.87240"W	2091.758	3781682.630	282252.640	2113.308	NVA
1036	34°20'34.92600"N	108°00'19.04040"W	2366.051	3804284.612	223542.214	2387.245	NVA
1037	34°27'37.96200"N	107°40'27.54840"W	1979.391	3816467.655	254340.890	2000.606	NVA
1038	34°03'59.92200"N	107°17'57.72840"W	2065.474	3771931.343	287802.844	2087.123	NVA
1039	34°27'51.46200"N	107°17'24.96840"W	1890.779	3816018.037	289635.967	1912.044	NVA
1040	34°23'48.10200"N	107°21'06.90840"W	1802.470	3808649.773	283798.076	1823.788	NVA
1041	34°35'01.15800"N	107°23'40.80840"W	1834.653	3829479.765	280358.516	1855.748	NVA
1042	34°23'25.49400"N	107°57'39.99240"W	2256.095	3809421.366	227761.166	2277.257	NVA
1043	34°18'16.97400"N	106°55'28.16040"W	1448.345	3797619.649	322902.472	1470.202	NVA
1044	34°27'41.34600"N	107°28'02.38440"W	1834.999	3816088.745	273361.676	1856.223	NVA
1045	34°30'46.74600"N	107°23'28.89240"W	1780.550	3821633.655	280476.527	1801.735	NVA
1046	34°24'24.57000"N	107°35'54.41640"W	1968.426	3810327.010	261159.037	1989.702	NVA
1047	34°05'27.11400"N	107°13'02.38440"W	2139.477	3774450.317	295433.626	2161.060	NVA
1048	34°32'17.71800"N	107°50'07.18440"W	2195.366	3825491.309	239788.322	2216.378	NVA
1048B	34°31'04.60200"N	107°49'36.29640"W	2208.612	3823216.111	240512.922	2229.641	NVA
1049	34°54'26.22600"N	105°03'40.89240"W	1668.229	3862763.120	494394.581	1689.335	NVA
1050	35°00'20.17800"N	105°30'15.36840"W	1948.368	3873780.795	453987.553	1968.159	NVA
1051	34°26'04.79400"N	106°01'52.35240"W	1992.092	3810834.628	405256.014	2011.851	NVA
1052	34°43'25.69800"N	106°09'58.60440"W	1888.714	3843033.910	393216.136	1908.650	NVA

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			METERS	METERS	METERS	METERS	
1053	34°48'44.37000"N	105°34'05.30040"W	1952.039	3852378.021	448037.985	1971.840	NVA
1054	34°15'28.17000"N	105°59'38.90040"W	1923.699	3791190.725	408470.020	1943.758	NVA
1055	34°52'12.99000"N	105°54'27.86040"W	1862.248	3859032.965	417035.587	1882.137	NVA
1056	34°42'56.17800"N	105°19'44.79240"W	1868.186	3841554.770	469864.664	1888.445	NVA
1057	34°20'52.45800"N	106°01'01.01640"W	1933.480	3801200.440	406469.761	1953.376	NVA
1058	34°34'36.39000"N	106°06'46.36440"W	1900.399	3826673.281	397925.544	1920.270	NVA
1060	34°49'35.67000"N	106°12'12.99240"W	1971.445	3854471.448	389934.623	1991.198	NVA
1060B	34°49'35.92200"N	106°08'26.58840"W	1910.417	3854412.006	395686.032	1930.285	NVA
1061	34°58'56.44200"N	106°06'09.78840"W	1904.178	3871640.526	399351.311	1923.756	NVA
1062	34°37'00.13800"N	105°48'30.52440"W	1901.823	3830835.527	425881.708	1921.767	NVA
1063	34°58'02.69400"N	104°52'09.76440"W	1606.372	3869437.311	511924.109	1628.063	NVA
1064	34°40'53.81400"N	106°03'39.09240"W	1842.848	3838248.267	402819.418	1862.778	NVA
1065	34°28'37.83000"N	106°14'30.04440"W	1942.113	3815765.729	385975.547	1962.191	NVA
1066	34°24'28.38600"N	105°45'30.66840"W	1902.064	3807643.725	430288.250	1922.002	NVA
1067	34°52'35.49000"N	104°57'43.73640"W	1596.158	3859350.949	503459.147	1617.576	NVA
1068	34°56'34.53000"N	105°47'08.37240"W	2027.455	3866995.436	428256.791	2047.150	NVA
1069	34°50'12.10200"N	104°48'50.79240"W	1510.217	3854949.155	516996.504	1532.157	NVA
1070	34°46'10.68600"N	105°14'12.76440"W	1767.912	3847522.500	478323.973	1788.443	NVA
1071	34°51'22.19400"N	105°24'17.99640"W	1891.920	3857167.280	462978.510	1912.038	NVA
1071B	34°52'14.79000"N	105°22'09.90840"W	1782.153	3858774.886	466236.912	1802.380	NVA
1072	34°37'02.04600"N	105°53'09.34440"W	1841.089	3830953.949	418781.708	1861.014	NVA
1073	34°33'02.61000"N	106°18'40.17240"W	2058.291	3824002.744	379700.524	2078.366	NVA
1074	34°51'46.89000"N	106°03'09.35640"W	1853.854	3858358.447	403786.921	1873.780	NVA
1075	34°26'58.03800"N	105°31'23.98440"W	1844.654	3812116.677	451927.479	1864.871	NVA
1076	34°23'26.64600"N	106°09'25.98840"W	2008.845	3806088.112	393622.488	2028.785	NVA
1077	34°46'07.37400"N	105°49'58.47240"W	1849.141	3847710.863	423781.490	1869.078	NVA
1078	34°40'01.75800"N	105°32'16.72440"W	1870.681	3836264.458	450710.310	1890.543	NVA
1079	34°59'51.01800"N	105°47'14.74440"W	2035.817	3873049.589	428142.839	2055.445	NVA

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			METERS	METERS	METERS	METERS	
1080	34°52'55.75800"N	104°41'24.17640"W	1381.802	3860018.443	528324.080	1404.141	NVA
1081	34°26'29.95800"N	106°22'27.29640"W	1817.125	3811983.993	373747.256	1837.531	NVA
1082	34°40'42.76200"N	105°41'14.70840"W	1977.238	3837610.816	437027.016	1997.080	NVA
1083	34°35'16.67400"N	105°27'34.59240"W	1839.325	3827447.469	457850.608	1859.374	NVA
1084	35°00'09.23400"N	105°33'20.15640"W	2055.246	3873468.516	449301.980	2074.926	NVA
1085	34°45'16.90200"N	105°32'03.83640"W	1914.465	3845970.253	451089.873	1934.263	NVA
1085B	34°43'41.07000"N	105°31'08.00040"W	1906.775	3843010.840	452494.183	1926.605	NVA
1086	34°26'04.90200"N	105°48'14.68440"W	1886.186	3810648.943	426124.543	1906.072	NVA
1087	34°20'49.65000"N	105°39'38.37240"W	1938.034	3800843.252	439238.369	1958.027	NVA
1088	34°54'59.27400"N	105°28'50.55240"W	1946.833	3863884.850	456089.796	1966.813	NVA
1089	34°56'30.67800"N	105°15'52.05240"W	1774.835	3866626.957	475850.591	1795.371	NVA
1090	34°46'50.64600"N	105°07'54.29640"W	1737.480	3848735.755	487945.700	1758.383	NVA
1091	34°42'13.05000"N	104°56'16.00440"W	1603.044	3840178.768	505698.166	1624.780	NVA
1092	34°44'48.85800"N	105°43'40.04040"W	1911.555	3845217.526	433383.576	1931.420	NVA
1092B	34°43'22.67400"N	105°43'39.93240"W	1895.854	3842562.692	433367.107	1915.739	NVA
1093	34°24'28.99800"N	105°29'41.34840"W	1886.866	3807512.780	454523.990	1907.160	NVA
1094	35°00'18.91800"N	105°37'01.52040"W	2099.467	3873799.771	443692.833	2119.065	NVA
1096	34°36'29.10600"N	106°03'39.81240"W	1846.433	3830094.241	402715.240	1866.293	NVA
1097	34°40'20.65800"N	106°18'55.61640"W	2053.408	3837502.121	379482.898	2073.339	NVA
1098	34°55'21.48600"N	105°37'02.13240"W	2071.159	3864637.494	443620.753	2090.931	NVA
1099	34°19'59.10600"N	105°46'12.89640"W	1950.634	3799357.401	429147.227	1970.550	NVA
1100	34°58'56.19000"N	106°14'21.22440"W	2140.843	3871778.784	386890.876	2160.245	NVA
1101	34°29'35.43000"N	105°37'38.88840"W	1834.929	3817019.090	442391.199	1854.980	NVA
1102	34°41'43.63800"N	105°25'59.30040"W	1898.054	3839356.384	460329.334	1918.064	NVA
1103	34°29'36.04200"N	106°11'28.20840"W	1985.473	3817503.153	390635.282	2005.444	NVA
1104	34°43'51.40200"N	104°51'13.89240"W	1551.830	3843216.271	513379.117	1573.796	NVA
1105	34°50'29.70600"N	105°26'37.42440"W	1908.635	3855565.423	459430.971	1928.633	NVA
1106	34°59'42.12600"N	105°22'44.03640"W	1879.445	3872558.035	465422.664	1899.601	NVA

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			METERS	METERS	METERS	METERS	
1107	34°54'45.19800"N	106°07'56.16840"W	1936.933	3863930.788	396566.441	1956.584	NVA
1108	34°33'56.17800"N	106°00'49.02840"W	1835.892	3825338.694	407017.700	1855.705	NVA
1109	34°51'10.45800"N	105°11'07.32840"W	1679.679	3856746.651	483054.547	1700.398	NVA
1110	34°45'27.37800"N	106°18'21.99240"W	2052.079	3846939.764	380461.338	2071.838	NVA
1111	34°35'47.81400"N	105°19'36.51240"W	1863.352	3828359.216	470032.470	1883.752	NVA
1112	34°11'06.88200"N	104°27'32.79240"W	1277.651	3782828.074	549841.697	1301.165	NVA
1113	33°51'50.05800"N	104°41'13.44840"W	1285.292	3747110.246	528944.559	1308.520	NVA
1113B	33°51'49.23000"N	104°41'14.27640"W	1285.100	3747084.679	528923.363	1308.327	NVA
1114	34°28'41.28600"N	104°49'19.52040"W	1572.843	3815187.065	516337.080	1595.405	NVA
1115	34°30'17.44200"N	105°21'02.26440"W	1869.557	3818190.287	467812.910	1890.052	NVA
1116	34°15'42.13800"N	104°54'56.55240"W	1598.395	3791177.142	507760.140	1621.044	NVA
1117	34°15'03.18600"N	104°20'51.17640"W	1252.098	3790166.695	560075.201	1275.742	NVA
1118	34°02'04.54200"N	104°07'01.70040"W	1180.213	3766343.260	581498.448	1203.732	NVA
1118A	34°12'15.13800"N	104°11'03.40440"W	1209.779	3785098.935	575150.272	1233.397	NVA
1119	34°38'53.43000"N	104°30'53.78040"W	1379.482	3834135.118	544451.427	1402.580	NVA
1120	34°29'41.94600"N	105°06'06.54840"W	1752.928	3817045.854	490652.124	1774.331	NVA
1121	33°57'51.49800"N	104°34'54.87240"W	1362.006	3758276.933	538626.070	1385.365	NVA
1123	34°08'24.73800"N	104°12'26.49240"W	1204.882	3777985.512	573079.068	1228.473	NVA
1124	34°02'47.88600"N	103°54'40.31640"W	1277.732	3767861.432	600495.707	1300.889	NVA
1124B	34°02'46.26600"N	103°54'39.81240"W	1277.870	3767811.670	600509.161	1301.027	NVA
1125	34°34'08.77800"N	104°42'28.47240"W	1497.065	3825298.893	526792.797	1519.792	NVA
1126	33°57'16.93800"N	104°41'06.78840"W	1356.126	3757178.401	529084.819	1379.376	NVA
1127	34°43'11.91000"N	104°10'54.54840"W	1423.916	3842294.741	574914.727	1447.321	NVA
1128	33°57'06.93000"N	104°20'43.00440"W	1163.781	3757018.586	560496.604	1187.391	NVA
1129	34°14'19.87800"N	104°41'24.28440"W	1353.573	3788683.692	528540.228	1376.750	NVA
1130	34°15'24.89400"N	104°00'01.54440"W	1337.515	3791094.715	592031.111	1360.987	NVA
1130B	34°15'25.47000"N	104°00'01.11240"W	1337.982	3791112.566	592041.986	1361.454	NVA
1131	34°07'27.49800"N	104°49'46.48440"W	1448.677	3775951.920	515715.057	1471.624	NVA

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			METERS	METERS	METERS	METERS	
1132	34°36'17.83800"N	104°20'10.06440"W	1339.742	3829435.776	560869.519	1363.180	NVA
1133	34°24'15.24600"N	104°15'47.62440"W	1224.974	3807224.242	567715.898	1248.665	NVA
1134	34°31'32.07000"N	104°12'20.87640"W	1260.251	3820719.520	572888.798	1283.859	NVA
1135	34°28'23.17800"N	104°23'07.40040"W	1349.945	3814786.299	556441.790	1373.452	NVA
1136	33°35'22.47000"N	104°20'06.93240"W	1098.925	3716848.347	561681.588	1122.161	NVA
1137	34°20'49.90200"N	104°36'46.14840"W	1437.397	3800721.245	535609.299	1460.598	NVA
1138	34°16'38.65800"N	104°10'21.50040"W	1200.154	3793224.483	576156.708	1223.836	NVA
1139	34°12'53.22600"N	103°52'40.29240"W	1345.350	3786540.550	603368.193	1368.585	NVA
1140	34°38'03.10200"N	104°15'07.08840"W	1329.924	3832732.276	568562.142	1353.408	NVA
1141	34°08'13.83000"N	104°29'36.74040"W	1234.011	3777481.657	546695.488	1257.488	NVA
1142	34°23'26.14200"N	104°22'55.91640"W	1320.056	3805638.699	556790.527	1343.645	NVA
1143	33°58'23.21400"N	103°59'56.64840"W	1237.449	3759626.379	592464.699	1260.746	NVA
1143B	33°58'24.76200"N	103°59'56.64840"W	1238.582	3759674.059	592464.234	1261.879	NVA
1144	34°25'27.13800"N	105°13'37.91640"W	1729.554	3809216.014	479123.516	1750.626	NVA
1145	34°19'46.29000"N	105°31'39.10440"W	1925.754	3798820.026	451472.508	1945.968	NVA
1146	34°38'00.47400"N	104°50'50.70840"W	1556.467	3832407.537	513985.076	1578.611	NVA
1147	34°35'39.75000"N	105°11'31.37640"W	1803.104	3828079.055	482389.159	1824.004	NVA
1148	34°21'47.61000"N	105°07'51.59640"W	1739.185	3802438.611	487954.256	1760.771	NVA
1149	34°00'00.23400"N	104°42'11.84040"W	1379.858	3762202.859	527400.643	1403.072	NVA
1150	34°04'16.41000"N	104°33'59.39640"W	1235.942	3770138.083	539999.578	1259.349	NVA
1151	33°54'09.91800"N	103°52'55.59240"W	1344.884	3751936.172	603354.798	1367.890	NVA
1152	34°04'16.15800"N	104°14'35.76840"W	1200.008	3770303.878	569824.907	1223.608	NVA
1152B	34°04'15.72600"N	104°14'37.85640"W	1200.808	3770290.177	569771.487	1224.408	NVA
1153	33°49'55.54200"N	104°20'06.57240"W	1125.037	3743737.980	561517.690	1148.532	NVA
1155	34°41'36.47400"N	105°13'11.24040"W	1756.755	3839072.334	479869.366	1777.417	NVA
1156	34°18'13.37400"N	104°13'42.05640"W	1194.388	3796101.615	571006.472	1218.106	NVA
1157	34°06'38.46600"N	103°49'27.65640"W	1346.760	3775052.525	608430.649	1369.764	NVA
1158	34°31'17.74200"N	104°37'02.63640"W	1437.242	3820058.303	535115.048	1460.291	NVA

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			METERS	METERS	METERS	METERS	
1159	34°22'25.23000"N	105°23'00.74040"W	1867.280	3803656.220	464736.753	1887.869	NVA
1160	34°25'04.09800"N	104°49'41.84040"W	1581.219	3808496.311	515779.091	1603.895	NVA
1161	33°50'31.36200"N	104°24'27.57240"W	1200.862	3744800.231	554802.821	1224.308	NVA
1162	34°28'14.17800"N	104°28'20.42040"W	1364.401	3814464.024	548458.237	1387.778	NVA
1164	34°29'54.07800"N	104°56'41.78040"W	1619.658	3817416.215	505054.878	1641.735	NVA
1165	33°37'27.53400"N	104°14'35.98440"W	1204.472	3720758.677	570183.836	1227.693	NVA
1166	34°38'02.70600"N	104°10'54.22440"W	1344.223	3832770.094	575000.366	1367.735	NVA
1167	33°52'31.67400"N	104°12'26.70840"W	1183.928	3748630.525	573300.668	1207.456	NVA
1168	33°58'52.05000"N	103°50'29.93640"W	1350.774	3760667.728	606997.616	1373.762	NVA
1169	34°25'38.73000"N	105°02'31.95240"W	1700.865	3809550.474	496121.722	1722.706	NVA
1170	34°26'52.63800"N	104°10'08.43240"W	1230.683	3812139.300	576336.020	1254.350	NVA
1171	34°11'25.67400"N	104°02'54.74040"W	1280.843	3783683.768	587670.266	1304.336	NVA
1172	34°16'25.91400"N	105°03'21.99240"W	1633.250	3792523.688	494835.143	1655.377	NVA
1173	33°58'54.53400"N	104°31'29.45640"W	1274.568	3760241.381	543888.703	1297.998	NVA
1174	33°54'19.81800"N	104°05'12.33240"W	1186.711	3752054.003	584430.459	1210.113	NVA
1175	34°34'00.06600"N	105°03'24.54840"W	1675.975	3824993.260	494787.988	1697.432	NVA
1176	34°38'53.82600"N	104°37'14.80440"W	1457.190	3834105.724	534752.050	1480.022	NVA
1177	33°49'02.94600"N	104°34'34.82040"W	1199.732	3742000.053	539207.789	1223.075	NVA
1178	34°07'33.40200"N	103°59'53.40840"W	1253.103	3776573.789	592381.916	1276.487	NVA
1178B	34°07'33.22200"N	103°59'51.10440"W	1253.343	3776568.824	592440.989	1276.726	NVA
1178C	34°11'25.42200"N	104°02'55.02840"W	1280.883	3783675.937	587662.967	1304.376	NVA
1179	34°26'17.53800"N	104°36'04.60440"W	1427.418	3810817.096	536630.977	1450.596	NVA
1180	34°21'43.14600"N	105°12'10.61640"W	1736.823	3802311.997	481337.959	1758.105	NVA
1181	34°18'47.57400"N	104°43'39.68040"W	1437.819	3796919.086	525054.691	1460.840	NVA
1182	34°18'40.77000"N	104°35'43.86840"W	1362.281	3796750.002	537216.237	1385.547	NVA
1183	34°35'37.26600"N	104°02'07.83240"W	1457.328	3828408.459	588445.732	1480.773	NVA
1184	34°09'30.76200"N	105°03'44.78040"W	1652.207	3779737.121	494244.628	1674.423	NVA
1185	34°20'42.23400"N	104°58'13.58040"W	1687.227	3800417.573	502718.806	1709.562	NVA

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			METERS	METERS	METERS	METERS	
1186	34°12'14.70600"N	104°57'26.09640"W	1537.163	3784785.720	503938.496	1559.754	NVA
1187	34°31'16.51800"N	104°28'21.39240"W	1364.095	3820080.408	548404.161	1387.430	NVA
1189	33°57'19.20600"N	104°11'34.18440"W	1147.651	3757497.066	574580.419	1171.245	NVA
1190	34°04'03.34200"N	104°24'55.22040"W	1172.307	3769805.013	553949.723	1195.844	NVA
1191	34°25'55.90200"N	105°26'12.11640"W	1903.609	3810165.050	459877.043	1924.004	NVA
1191A	34°08'14.08200"N	104°29'36.88440"W	1234.092	3777489.401	546691.761	1257.569	NVA
1192	34°30'28.17000"N	105°27'13.92840"W	1932.516	3818558.426	458337.089	1952.724	NVA
1193	34°34'38.22600"N	104°14'58.05240"W	1286.097	3826423.099	568839.158	1309.640	NVA
2001	35°31'09.57000"N	107°34'51.34080"W	1997.095	3933700.427	265957.781	2017.628	VVA
2002	36°01'48.63000"N	107°20'23.12880"W	2177.703	3989828.064	289185.333	2198.079	VVA
2003	35°47'36.79800"N	107°04'31.54440"W	1985.501	3963038.303	312447.143	2005.681	VVA
2004	35°59'15.59400"N	107°06'35.92080"W	2097.566	3984638.884	309789.669	2117.568	VVA
2005	35°24'55.60200"N	107°34'57.74880"W	2125.633	3922180.013	265494.696	2145.955	VVA
2006	35°32'10.01400"N	107°42'36.17280"W	2087.509	3935877.609	254297.443	2108.142	VVA
2007	35°32'03.57000"N	107°21'25.40880"W	2432.193	3934855.816	286302.361	2452.467	VVA
2008	35°53'40.72200"N	107°19'22.86480"W	1982.888	3974755.908	290335.679	2003.442	VVA
2009	35°48'06.67800"N	107°38'28.13280"W	2066.395	3965190.824	261338.666	2087.271	VVA
2010	35°37'54.71400"N	107°41'06.82080"W	2035.106	3946439.102	256838.173	2055.900	VVA
2010B	35°38'22.65000"N	107°43'03.78480"W	2057.442	3947380.956	253919.130	2078.251	VVA
2011	35°46'27.78600"N	107°12'28.54080"W	1916.021	3961173.574	300423.667	1936.522	VVA
2012	35°45'57.36600"N	107°26'39.90480"W	2009.198	3960743.839	279019.820	2029.939	VVA
2013	35°33'14.56200"N	107°27'07.15680"W	1996.238	3937253.629	277748.510	2016.698	VVA
2014	35°43'14.07000"N	107°25'41.11680"W	1989.990	3955674.804	280371.716	2010.719	VVA
2014B	35°42'45.27000"N	107°30'13.45680"W	1951.039	3954959.338	273504.900	1971.815	VVA
2015	35°36'51.49800"N	107°51'46.28880"W	2176.242	3944944.958	240691.873	2196.994	VVA
2016	35°52'20.40600"N	107°12'13.60080"W	2008.385	3972031.444	301043.593	2028.778	VVA
2017	35°33'05.38200"N	107°46'14.33280"W	2109.745	3937736.884	248849.854	2130.402	VVA
2018	34°27'52.14600"N	107°17'26.01240"W	1890.676	3816039.715	289609.802	1911.941	VVA

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			METERS	METERS	METERS	METERS	
2019	34°23'25.42200"N	107°57'40.64040"W	2255.945	3809419.631	227744.547	2277.108	VVA
2020	34°20'53.86200"N	107°29'44.94840"W	1976.579	3803597.485	270434.882	1997.846	VVA
2021	34°32'16.63800"N	107°50'08.51640"W	2195.410	3825458.982	239753.421	2216.423	VVA
2021B	34°31'04.42200"N	107°49'35.86440"W	2207.715	3823210.256	240523.785	2228.744	VVA
2022	34°13'41.50200"N	107°06'20.98440"W	1739.990	3789463.754	306036.646	1761.728	VVA
2023	34°18'18.48600"N	106°55'29.78040"W	1452.374	3797667.015	322861.938	1474.231	VVA
2024	34°11'12.78600"N	107°19'01.77240"W	2025.787	3785304.740	286463.515	2047.307	VVA
2025	34°27'42.42600"N	107°28'02.31240"W	1835.352	3816121.977	273364.324	1856.576	VVA
2026	34°22'46.00200"N	107°13'58.68840"W	1659.155	3806489.143	294692.580	1680.559	VVA
2027	34°24'23.67000"N	107°35'56.97240"W	1970.693	3810300.952	261093.049	1991.970	VVA
2028	34°38'32.73000"N	107°22'23.48040"W	1883.625	3835952.152	282482.555	1904.612	VVA
2029	34°15'41.20200"N	107°25'44.32440"W	2127.411	3793814.864	276353.874	2148.750	VVA
2030	34°21'12.40200"N	107°44'06.32040"W	2269.981	3804736.161	248436.406	2291.169	VVA
2031	34°20'38.02200"N	108°00'39.26880"W	2365.972	3804395.350	223027.976	2387.170	VVA
2032	34°03'58.62600"N	107°17'59.67240"W	2067.794	3771892.535	287752.102	2089.443	VVA
2033	34°35'03.28200"N	107°23'39.04440"W	1835.145	3829544.142	280405.022	1856.239	VVA
2034	34°08'33.09000"N	107°11'15.21240"W	1882.775	3780120.728	298303.408	1904.429	VVA
2035	35°00'18.01800"N	105°37'01.52040"W	2101.371	3873772.047	443692.661	2120.969	VVA
2035B	34°55'22.06200"N	105°37'02.67240"W	2070.456	3864655.322	443607.161	2090.228	VVA
2036	34°46'06.47400"N	105°49'58.79640"W	1849.529	3847683.208	423773.024	1869.467	VVA
2037	34°54'44.91000"N	106°07'53.79240"W	1935.391	3863921.234	396626.635	1955.043	VVA
2038	34°33'58.41000"N	106°00'49.74840"W	1835.941	3825407.632	407000.043	1855.755	VVA
2039	34°40'51.87000"N	106°03'39.05640"W	1842.589	3838188.373	402819.703	1862.518	VVA
2040	34°56'32.29800"N	105°15'53.38440"W	1775.256	3866676.949	475816.936	1795.791	VVA
2041	34°26'06.59400"N	106°01'53.75640"W	1991.923	3810890.439	405220.745	2011.681	VVA
2042	34°52'55.50600"N	104°41'25.43640"W	1381.202	3860010.581	528292.120	1403.540	VVA
2043	34°36'59.02200"N	105°48'30.20040"W	1902.535	3830801.084	425889.684	1922.479	VVA
2044	34°45'50.70600"N	104°56'05.42040"W	1603.441	3846883.430	505963.065	1625.075	VVA

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			METERS	METERS	METERS	METERS	
2045	34°59'50.26200"N	105°47'14.99640"W	2035.888	3873026.350	428136.268	2055.517	VVA
2046	34°48'44.62200"N	105°34'06.63240"W	1953.408	3852385.975	448004.188	1973.209	VVA
2047	35°00'20.39400"N	105°30'15.47640"W	1947.873	3873787.462	453984.849	1967.663	VVA
2048	34°29'38.16600"N	106°11'28.64040"W	1985.050	3817568.711	390625.034	2005.021	VVA
2049	34°51'22.15800"N	105°24'17.24040"W	1891.426	3857166.093	462997.702	1911.545	VVA
2049B	34°52'14.61000"N	105°22'08.93640"W	1780.834	3858769.251	466261.569	1801.062	VVA
2050	34°35'11.38200"N	105°27'32.79240"W	1839.378	3827284.252	457895.721	1859.430	VVA
2051	34°46'10.43400"N	105°14'11.82840"W	1768.065	3847514.681	478347.746	1788.596	VVA
2052	34°59'46.37400"N	106°00'31.92840"W	1867.361	3873088.225	407933.154	1887.041	VVA
2053	34°20'54.18600"N	106°01'04.14840"W	1936.345	3801254.469	406390.276	1956.241	VVA
2054	34°26'59.29800"N	105°31'26.54040"W	1843.443	3812155.825	451862.460	1863.659	VVA
2055	34°49'35.95800"N	106°12'12.34440"W	1970.964	3854480.123	389951.190	1990.717	VVA
2055B	34°49'35.52600"N	106°08'26.33640"W	1910.598	3854399.734	395692.294	1930.466	VVA
2056	34°44'48.75000"N	105°43'41.30040"W	1911.878	3845214.432	433351.514	1931.743	VVA
2057	34°45'31.62600"N	106°18'22.74840"W	2050.612	3847070.878	380443.819	2070.369	VVA
2058	34°26'07.60200"N	105°48'18.21240"W	1885.618	3810732.826	426035.164	1905.503	VVA
2059	35°00'09.41400"N	105°33'19.79640"W	2055.328	3873474.010	449311.136	2075.008	VVA
2060	34°43'48.09000"N	104°51'10.36440"W	1547.574	3843114.381	513468.985	1569.546	VVA
2061	34°51'10.35000"N	105°11'06.32040"W	1680.832	3856743.277	483080.137	1701.552	VVA
2062	34°20'01.12200"N	105°46'15.95640"W	1947.796	3799420.092	429069.508	1967.712	VVA
2063	34°45'17.26200"N	105°32'04.80840"W	1914.987	3845981.473	451065.221	1934.785	VVA
2063B	34°43'40.35000"N	105°31'07.60440"W	1906.387	3842988.610	452504.140	1926.217	VVA
2064	34°42'55.02600"N	105°19'44.86440"W	1870.031	3841519.291	469862.717	1890.290	VVA
2065	34°24'30.25800"N	105°45'34.05240"W	1899.613	3807702.034	430202.289	1919.550	VVA
2066	34°58'57.01800"N	106°14'21.47640"W	2139.199	3871804.372	386884.803	2158.601	VVA
2066B	34°58'57.55800"N	106°05'07.68840"W	1880.913	3871657.666	400926.213	1900.518	VVA
2067	34°46'51.51000"N	105°07'54.62040"W	1738.181	3848762.380	487937.501	1759.083	VVA
2068	34°51'46.09800"N	106°03'08.99640"W	1853.703	3858333.953	403795.806	1873.629	VVA

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			METERS	METERS	METERS	METERS	
2069	34°28'37.36200"N	106°14'31.44840"W	1940.027	3815751.752	385939.554	1960.106	VVA
2070	34°50'14.08200"N	104°48'53.31240"W	1508.703	3855010.028	516932.388	1530.639	VVA
2071	34°29'47.49000"N	105°55'35.07240"W	1862.829	3817601.363	414947.779	1882.628	VVA
2072	34°40'01.90200"N	105°32'19.64040"W	1870.588	3836269.290	450636.121	1890.449	VVA
2073	34°33'02.39400"N	106°18'42.69240"W	2059.258	3823996.924	379636.209	2079.333	VVA
2074	34°52'12.05400"N	105°54'27.57240"W	1862.442	3859004.065	417042.637	1882.331	VVA
2075	34°37'02.51400"N	105°53'08.30040"W	1840.858	3830968.132	418808.422	1860.783	VVA
2076	34°23'25.63800"N	106°09'24.15240"W	2010.297	3806056.527	393669.018	2030.236	VVA
2077	34°54'25.75800"N	105°03'40.13640"W	1668.001	3862748.692	494413.757	1689.108	VVA
2078	34°52'35.05800"N	104°57'44.52840"W	1595.917	3859337.634	503439.046	1617.334	VVA
2079	34°11'29.02200"N	104°02'53.80440"W	1282.379	3783787.116	587693.261	1305.872	VVA
2079B	34°12'54.05400"N	103°52'36.33240"W	1346.951	3786567.171	603469.245	1370.184	VVA
2080	34°11'09.29400"N	104°27'30.84840"W	1275.123	3782902.630	549891.063	1298.638	VVA
2081	34°33'59.77800"N	105°03'23.21640"W	1675.031	3824984.370	494821.923	1696.489	VVA
2082	34°15'06.49800"N	104°20'47.68440"W	1252.003	3790269.282	560163.862	1275.648	VVA
2082B	34°15'05.59800"N	104°20'46.71240"W	1251.719	3790241.721	560188.900	1275.364	VVA
2083	34°24'16.25400"N	104°15'47.26440"W	1225.415	3807255.358	567724.864	1249.106	VVA
2084	34°25'27.49800"N	105°13'37.26840"W	1729.900	3809227.065	479140.080	1750.973	VVA
2086	34°02'06.27000"N	104°07'04.47240"W	1178.670	3766395.872	581426.907	1202.190	VVA
2087	33°35'20.67000"N	104°20'09.48840"W	1098.524	3716792.487	561616.062	1121.760	VVA
2087B	33°35'20.74200"N	104°20'05.49240"W	1099.708	3716795.366	561719.047	1122.943	VVA
2088	34°15'43.25400"N	104°54'57.52440"W	1599.484	3791211.495	507735.254	1622.132	VVA
2089	33°54'20.82600"N	104°05'15.82440"W	1186.575	3752084.253	584340.502	1209.979	VVA
2090	34°22'27.67800"N	105°22'54.87240"W	1867.067	3803731.057	464886.903	1887.661	VVA
2091	34°35'35.86200"N	105°11'31.05240"W	1804.501	3827959.279	482397.184	1825.402	VVA
2092	34°20'50.40600"N	104°36'47.55240"W	1437.572	3800736.632	535573.371	1460.772	VVA
2093	34°38'52.31400"N	104°30'53.49240"W	1379.026	3834100.777	544458.924	1402.124	VVA
2094	33°49'55.43400"N	104°20'05.78040"W	1124.995	3743734.786	561538.068	1148.490	VVA

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			METERS	METERS	METERS	METERS	
2095	33°57'16.72200"N	104°41'03.62040"W	1356.146	3757171.998	529166.149	1379.397	VVA
2096	34°43'12.01800"N	104°10'55.55640"W	1424.052	3842297.859	574889.062	1447.457	VVA
2097	34°02'46.37400"N	103°54'41.64840"W	1279.000	3767814.496	600462.050	1302.158	VVA
2098	34°38'02.23800"N	104°15'06.44040"W	1329.271	3832705.784	568578.839	1352.756	VVA
2099	34°16'27.39000"N	105°03'22.28040"W	1633.378	3792569.154	494827.804	1655.504	VVA
2100	34°38'52.20600"N	104°37'15.45240"W	1455.463	3834055.761	534735.743	1478.295	VVA
2101	33°57'55.60200"N	104°34'54.72840"W	1362.154	3758403.349	538629.250	1385.514	VVA
2101B	33°57'48.43800"N	104°34'56.27640"W	1360.537	3758182.539	538590.422	1383.895	VVA
2102	34°23'25.74600"N	104°22'53.57640"W	1320.151	3805626.865	556850.353	1343.741	VVA
2103	34°28'40.78200"N	104°49'20.52840"W	1571.682	3815171.496	516311.395	1594.244	VVA
2103B	34°34'08.16600"N	104°42'29.08440"W	1497.439	3825279.997	526777.258	1520.166	VVA
2104	33°49'05.68200"N	104°34'34.60440"W	1200.598	3742084.342	539212.995	1223.941	VVA
2105	33°57'16.07400"N	104°11'34.43640"W	1149.027	3757400.548	574574.710	1172.620	VVA
2106	34°08'16.92600"N	104°29'37.92840"W	1235.704	3777576.865	546664.589	1259.181	VVA
2107	34°35'38.45400"N	104°02'09.23640"W	1457.476	3828444.712	588409.618	1480.921	VVA
2108	33°50'30.78600"N	104°24'27.17640"W	1200.884	3744782.549	554813.101	1224.329	VVA
2109	34°28'15.25800"N	104°28'19.34040"W	1364.476	3814497.434	548485.614	1387.853	VVA
2110	34°31'33.43800"N	104°12'21.27240"W	1260.875	3820761.580	572878.372	1284.483	VVA
2111	34°14'21.06600"N	104°41'23.67240"W	1353.680	3788720.331	528555.772	1376.857	VVA
2112	34°04'18.60600"N	104°33'56.66040"W	1236.158	3770206.018	540069.417	1259.566	VVA
2113	34°29'53.82600"N	104°56'40.73640"W	1619.486	3817408.467	505081.506	1641.564	VVA
2114	34°38'01.91400"N	104°10'51.20040"W	1344.059	3832746.323	575077.558	1367.571	VVA
2115	34°09'30.83400"N	105°03'35.63640"W	1644.819	3779739.198	494478.756	1667.046	VVA
2116	33°57'06.75000"N	104°20'41.92440"W	1163.642	3757013.219	560524.360	1187.252	VVA
2117	34°25'47.04600"N	105°02'38.79240"W	1700.387	3809806.695	495947.256	1722.214	VVA
2118	34°20'39.28200"N	104°58'11.49240"W	1686.253	3800326.663	502772.178	1708.592	VVA
2119	34°31'17.63400"N	104°37'01.66440"W	1437.353	3820055.070	535139.841	1460.403	VVA
2120	34°07'30.12600"N	104°49'48.57240"W	1448.724	3776032.774	515661.439	1471.669	VVA

CENTRAL NEW MEXICO LIDAR CHECKPOINTS

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PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
2121	34°06'32.34600"N	103°49'28.26840"W	1353.433	3774863.833	608417.138	1376.436	VVA
2122	34°12'14.23800"N	104°11'01.71240"W	1210.172	3785071.561	575193.795	1233.789	VVA
2123	34°25'55.25400"N	105°26'15.93240"W	1905.187	3810145.511	459779.565	1925.580	VVA
2124	34°12'14.88600"N	104°57'24.69240"W	1537.367	3784791.279	503974.423	1559.959	VVA
2125	33°58'51.79800"N	103°50'32.09640"W	1351.233	3760659.340	606942.278	1374.222	VVA
2126	33°54'08.94600"N	103°52'58.32840"W	1343.886	3751905.468	603284.855	1366.893	VVA
2126B	33°54'09.30600"N	103°52'58.76040"W	1343.726	3751916.436	603273.639	1366.733	VVA
2127	34°29'36.15000"N	105°21'52.48440"W	1880.927	3816922.931	466527.735	1901.400	VVA
2128	34°18'47.17800"N	104°43'40.50840"W	1438.405	3796906.832	525033.562	1461.426	VVA
2129	33°52'29.26200"N	104°12'26.56440"W	1183.117	3748556.264	573304.941	1206.643	VVA
2130	34°36'17.44200"N	104°20'11.64840"W	1339.064	3829423.313	560829.255	1362.502	VVA
2131	34°21'47.93400"N	105°07'52.56840"W	1740.171	3802448.623	487929.442	1761.755	VVA
2132	34°16'41.79000"N	104°10'22.40040"W	1197.878	3793320.767	576132.911	1221.561	VVA
2134	34°04'12.41400"N	104°14'36.52440"W	1204.864	3770188.417	569806.383	1228.465	VVA
2135	34°41'37.15800"N	105°13'10.23240"W	1756.417	3839093.347	479895.057	1777.080	VVA
2135A	33°57'19.27800"N	104°11'34.50840"W	1147.533	3757499.218	574572.085	1171.127	VVA
2136	34°00'01.60200"N	104°42'14.25240"W	1380.690	3762244.814	527338.648	1403.903	VVA
2137	34°19'43.23000"N	105°31'40.54440"W	1923.023	3798725.965	451435.222	1943.235	VVA
3001	35°45'17.80200"N	107°24'55.18080"W	2035.167	3959459.353	281620.059	2055.878	CAL
3002	35°37'55.86600"N	107°41'06.67680"W	2034.945	3946474.507	256842.766	2055.739	CAL
3002B	35°38'23.87400"N	107°43'02.99280"W	2057.882	3947418.128	253940.098	2078.691	CAL
3003	35°59'08.43000"N	107°06'24.47280"W	2101.061	3984411.915	310071.608	2121.057	CAL
3004	35°43'36.42600"N	107°45'26.92080"W	2104.721	3957151.702	250589.779	2125.622	CAL
3005	35°55'47.33400"N	107°06'04.49280"W	2110.086	3978204.162	310438.504	2130.145	CAL
3006	35°33'06.21000"N	107°27'21.91680"W	2003.485	3937005.512	277370.387	2023.943	CAL
3007	35°31'00.31800"N	107°34'57.74880"W	2001.915	3933419.534	265788.861	2022.446	CAL
3008	35°37'33.11400"N	107°12'26.30880"W	1835.671	3944696.164	300109.135	1856.168	CAL
3009	35°48'02.43000"N	107°38'05.41680"W	2054.814	3965044.533	261905.459	2075.686	CAL

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PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
3010	35°51'59.05800"N	107°11'44.18880"W	2034.331	3971356.978	301766.514	2054.712	CAL
3011	36°01'47.19000"N	107°20'23.48880"W	2178.924	3989783.903	289175.254	2199.302	CAL
3012	35°33'06.17400"N	107°46'15.41280"W	2109.495	3937762.058	248823.340	2130.152	CAL
3012A	36°01'48.63000"N	107°20'23.12880"W	2177.696	3989828.064	289185.333	2198.072	CAL
3013	34°38'32.58600"N	107°22'23.04840"W	1884.819	3835947.456	282493.451	1905.806	CAL
3014	34°20'35.71800"N	107°29'31.91640"W	1992.944	3803030.250	270754.198	2014.212	CAL
3015	34°11'13.25400"N	107°18'59.54040"W	2025.512	3785317.860	286520.990	2047.032	CAL
3016	34°23'35.43000"N	107°57'29.51640"W	2252.061	3809719.743	228037.730	2273.221	CAL
3017	34°23'50.29800"N	107°21'07.80840"W	1801.771	3808717.967	283776.660	1823.089	CAL
3018	34°24'26.40600"N	107°35'55.60440"W	1969.049	3810384.361	261130.148	1990.325	CAL
3019	34°06'48.83400"N	107°15'10.90440"W	1976.381	3777040.087	292194.922	1997.983	CAL
3020	34°13'40.38600"N	107°06'21.77640"W	1739.558	3789429.792	306015.667	1761.296	CAL
3021	34°31'08.34600"N	107°27'57.20040"W	1826.399	3822463.651	273649.515	1847.566	CAL
3022	34°15'44.62200"N	107°25'46.34040"W	2125.174	3793921.470	276304.818	2146.513	CAL
3023	34°21'13.55400"N	107°44'03.76440"W	2264.437	3804769.898	248502.684	2285.626	CAL
3024	34°22'46.61400"N	107°13'58.25640"W	1659.009	3806507.756	294704.030	1680.413	CAL
3025	34°24'26.37000"N	105°29'36.63240"W	1889.406	3807431.246	454643.992	1909.703	CAL
3027	34°23'26.71800"N	106°09'22.92840"W	2011.164	3806089.439	393700.653	2031.102	CAL
3028	34°35'14.29800"N	105°27'34.05240"W	1839.281	3827374.219	457864.031	1859.331	CAL
3029	34°36'48.51000"N	105°48'13.13640"W	1901.418	3830473.803	426321.660	1921.358	CAL
3030	35°00'19.85400"N	105°30'08.70840"W	1947.256	3873769.963	454156.309	1967.051	CAL
3031	34°40'30.34200"N	105°38'38.39640"W	1951.765	3837201.939	441002.244	1971.579	CAL
3032	34°42'16.07400"N	104°56'16.04040"W	1602.459	3840271.916	505697.192	1624.194	CAL
3033	34°53'43.45800"N	105°36'07.52040"W	2029.946	3861609.337	444988.209	2049.759	CAL
3034	34°50'10.66200"N	104°48'53.99640"W	1510.902	3854904.647	516915.210	1532.839	CAL
3035	34°52'42.69000"N	104°58'08.18040"W	1609.502	3859572.524	502838.550	1630.900	CAL
3036	34°26'58.03800"N	105°31'29.34840"W	1842.586	3812117.385	451790.608	1862.801	CAL
3037	34°42'58.48200"N	105°19'34.31640"W	1863.710	3841624.873	470131.354	1883.977	CAL

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PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
3038	34°49'24.25800"N	106°11'54.56040"W	1976.800	3854114.284	390398.651	1996.570	CAL
3039	34°29'33.12600"N	106°11'28.24440"W	1985.285	3817413.338	390633.306	2005.256	CAL
3040	34°15'31.62600"N	105°59'38.86440"W	1921.299	3791297.169	408471.981	1941.357	CAL
3041	34°24'25.90200"N	105°45'26.02440"W	1904.904	3807566.325	430406.239	1924.842	CAL
3042	34°41'34.02600"N	105°26'12.26040"W	1893.303	3839061.727	459998.328	1913.308	CAL
3043	34°46'07.77000"N	105°49'58.79640"W	1849.262	3847723.130	423773.355	1869.199	CAL
3044	34°43'41.21400"N	105°31'07.64040"W	1906.981	3843015.229	452503.361	1926.811	CAL
3045	34°28'40.92600"N	106°14'32.52840"W	1944.507	3815861.878	385913.351	1964.587	CAL
3046	34°40'01.50600"N	106°03'40.24440"W	1843.239	3836637.243	402773.122	1863.154	CAL
3047	34°58'56.55000"N	106°05'07.18440"W	1882.725	3871626.475	400938.654	1902.331	CAL
3048	34°54'38.64600"N	105°28'52.96440"W	1954.302	3863249.710	456025.539	1974.281	CAL
3049	34°33'02.57400"N	106°18'36.24840"W	2057.219	3824000.338	379800.524	2077.293	CAL
3051	34°52'11.76600"N	105°53'29.43240"W	1868.507	3858981.942	418518.663	1888.381	CAL
3051A	33°56'58.18200"N	104°20'48.18840"W	1164.177	3756748.300	560365.261	1187.785	CAL
3052	34°39'08.80200"N	105°32'16.94040"W	1884.408	3834633.270	450696.101	1904.277	CAL
3053	34°43'47.44200"N	104°51'14.28840"W	1550.662	3843094.275	513369.224	1572.630	CAL
3054	34°26'04.83000"N	106°01'48.96840"W	1991.614	3810834.858	405342.393	2011.372	CAL
3055	34°37'33.25800"N	105°52'16.31640"W	1845.935	3831903.635	420140.438	1865.879	CAL
3057	34°38'02.59800"N	104°11'07.68840"W	1344.413	3832763.991	574657.587	1367.924	CAL
3058	34°30'28.63800"N	104°36'53.27640"W	1424.850	3818546.694	535359.439	1447.926	CAL
3059	34°02'06.81000"N	104°07'02.06040"W	1178.816	3766413.037	581488.614	1202.335	CAL
3060	33°54'21.90600"N	104°05'13.26840"W	1186.483	3752118.101	584405.849	1209.886	CAL
3061	34°22'21.37800"N	105°23'00.92040"W	1862.664	3803537.590	464731.708	1883.254	CAL
3062	34°35'37.55400"N	105°11'30.22440"W	1802.264	3828011.357	482418.374	1823.166	CAL
3064	33°57'17.69400"N	104°41'01.46040"W	1356.784	3757202.106	529221.495	1380.036	CAL
3065	34°15'43.00200"N	104°54'53.70840"W	1600.117	3791203.814	507832.848	1622.768	CAL
3066	33°49'41.53800"N	104°20'07.79640"W	1124.053	3743306.462	561489.014	1147.543	CAL
3067	34°23'25.99800"N	104°22'03.68040"W	1316.237	3805642.482	558124.386	1339.841	CAL

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PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
3068	34°07'32.21400"N	104°49'48.50040"W	1448.355	3776097.088	515663.176	1471.300	CAL
3069	33°35'23.29800"N	104°20'05.52840"W	1098.425	3716874.080	561717.614	1121.661	CAL
3069B	33°37'28.00200"N	104°14'34.79640"W	1204.909	3720773.315	570214.340	1228.130	CAL
3070	34°38'35.97000"N	104°30'23.90040"W	1375.577	3833600.989	545214.686	1398.702	CAL
3071	34°12'17.83800"N	104°10'59.80440"W	1209.393	3785182.838	575241.735	1233.011	CAL
3072	34°24'15.24600"N	104°15'48.16440"W	1225.559	3807224.142	567702.112	1249.250	CAL
3073	33°54'10.99800"N	103°52'58.54440"W	1343.978	3751968.612	603278.620	1366.986	CAL
3074	34°27'31.62600"N	105°04'11.88840"W	1734.714	3813029.273	493573.459	1756.350	CAL
3075	34°12'53.19000"N	103°52'36.69240"W	1346.733	3786540.456	603460.327	1369.966	CAL
3076	34°42'23.81400"N	104°10'54.58440"W	1414.426	3840813.176	574925.860	1437.851	CAL
3077	34°15'01.42200"N	104°20'54.81240"W	1252.874	3790111.766	559982.550	1276.517	CAL
3077B	34°18'13.05000"N	104°13'40.04040"W	1191.712	3796092.027	571058.080	1215.430	CAL
3078	34°27'45.84600"N	104°49'19.26840"W	1554.772	3813479.421	516346.510	1577.373	CAL
3079	33°57'49.55400"N	104°34'55.84440"W	1361.063	3758216.956	538601.369	1384.422	CAL
3080	34°36'17.91000"N	104°19'38.42040"W	1330.763	3829443.333	561675.461	1354.210	CAL
3081	34°04'13.31400"N	104°14'39.47640"W	1203.040	3770215.578	569730.513	1226.641	CAL
3082	34°16'13.27800"N	105°03'08.60040"W	1628.611	3792134.306	495177.370	1650.761	CAL
3083	34°04'14.39400"N	104°33'57.12840"W	1236.102	3770076.237	540057.972	1259.510	CAL
3084	34°20'23.58600"N	104°36'26.38440"W	1431.701	3799912.613	536117.355	1454.918	CAL
3085	34°26'54.69000"N	104°09'55.43640"W	1229.507	3812205.234	576667.128	1253.171	CAL
3086	34°29'33.99000"N	105°21'54.68040"W	1881.663	3816856.600	466471.490	1902.136	CAL
3087	34°06'40.80600"N	103°49'27.72840"W	1346.666	3775124.581	608427.975	1369.671	CAL
3088	33°49'03.01800"N	104°34'32.01240"W	1200.430	3742002.568	539279.966	1223.774	CAL
3089	34°32'11.34600"N	104°56'39.29640"W	1587.770	3821644.387	505115.892	1609.758	CAL
3090	34°09'14.88600"N	105°01'48.89640"W	1576.729	3779246.789	497211.626	1599.085	CAL
3091	34°28'11.91000"N	104°26'58.34040"W	1363.682	3814405.315	550552.499	1387.096	CAL
3092	34°08'14.58600"N	104°29'40.34040"W	1232.132	3777504.485	546603.172	1255.608	CAL
3093	34°16'41.43000"N	104°10'20.06040"W	1198.811	3793310.165	576192.833	1222.494	CAL

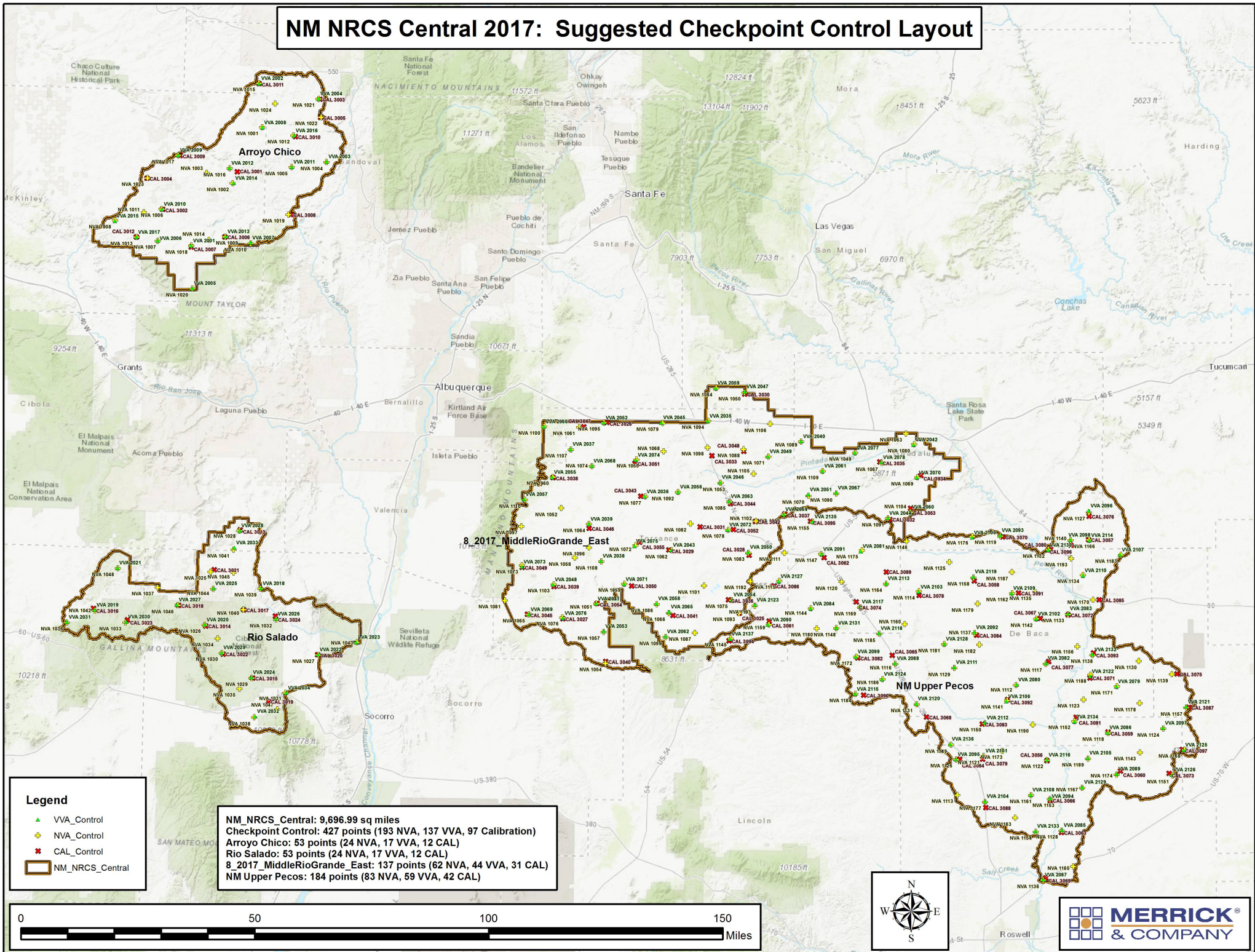
CENTRAL NEW MEXICO LIDAR CHECKPOINTS

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JANUARY 2018

PT#	NAD83(2011)		ELLIPSOID	UTM ZONE 13 NORTH		NAVD 88	
	LATITUDE	LONGITUDE	HEIGHT	NORTHING	EASTING	ELEVATION	
			METERS	METERS	METERS	METERS	
3094	34°19'49.13400"N	105°31'37.08840"W	1927.751	3798907.359	451524.477	1947.966	CAL
3095	34°41'36.07800"N	105°13'42.95640"W	1764.666	3839061.933	479062.422	1785.293	CAL
3096	34°37'01.25400"N	104°15'07.08840"W	1319.811	3830827.139	568576.276	1343.313	CAL
3097	33°58'49.35000"N	103°50'29.72040"W	1353.424	3760584.626	607004.098	1376.411	CAL
3097B	33°58'49.42200"N	103°50'32.56440"W	1352.876	3760586.019	606931.096	1375.864	CAL

NM NRCS Central 2017: Suggested Checkpoint Control Layout





The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.4
1      National Geodetic Survey,  Retrieval Date = FEBRUARY  2, 2018
DR0777
*****
DR0777 DESIGNATION - ACME 2
DR0777 PID - DR0777
DR0777 STATE/COUNTY- NM/CHAVES
DR0777 COUNTRY - US
DR0777 USGS QUAD - HAYSTACK MOUNTAIN (1982)
DR0777
DR0777 *CURRENT SURVEY CONTROL
DR0777
-----
DR0777* NAD 83(1992) POSITION- 33 38 02.67720(N) 104 13 32.00399(W)
ADJUSTED
DR0777* NAVD 88 ORTHO HEIGHT - 1234.049 (meters) 4048.71 (feet)
ADJUSTED
DR0777
-----
DR0777 GEOID HEIGHT - -23.225 (meters)
GEOID12B
DR0777 LAPLACE CORR - -0.20 (seconds)
DEFLEC12B
DR0777 DYNAMIC HEIGHT - 1232.375 (meters) 4043.22 (feet) COMP
DR0777 MODELED GRAVITY - 979,237.3 (mgal) NAVD
88
DR0777
DR0777 HORZ ORDER - SECOND
DR0777 VERT ORDER - FIRST CLASS II
DR0777
DR0777.The horizontal coordinates were established by classical geodetic
methods
DR0777.and adjusted by the National Geodetic Survey in December 1993.
DR0777.
DR0777.The orthometric height was determined by differential leveling and
DR0777.adjusted by the NATIONAL GEODETIC SURVEY
DR0777.in June 1991.
DR0777
DR0777.Significant digits in the geoid height do not necessarily reflect
accuracy.
DR0777.GEOID12B height accuracy estimate available here.
DR0777
DR0777.The Laplace correction was computed from DEFLEC12B derived
deflections.
DR0777
DR0777.The dynamic height is computed by dividing the NAVD 88
DR0777.geopotential number by the normal gravity value computed on the
DR0777.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DR0777.degrees latitude (g = 980.6199 gals.).
DR0777
DR0777.The modeled gravity was interpolated from observed gravity values.
```

DR0777

DR0777. The following values were computed from the NAD 83(1992) position.

DR0777

DR0777; North East Units Scale Factor

Converg.

DR0777;SPC NM E - 292,077.928 174,998.509 MT 0.99991032 +0 03

34.9

DR0777;SPC NM E - 958,259.00 574,140.94 sFT 0.99991032 +0 03

34.9

DR0777;SPC NM C - 293,908.422 687,822.341 MT 1.00033479 +1 07

17.9

DR0777;SPC NM C - 964,264.55 2,256,630.46 sFT 1.00033479 +1 07

17.9

DR0777;UTM 13 - 3,721,853.239 571,824.217 MT 0.99966360 +0 25

44.3

DR0777

DR0777! - Elev Factor x Scale Factor = Combined Factor

DR0777!SPC NM E - 0.99980995 x 0.99991032 = 0.99972029

DR0777!SPC NM C - 0.99980995 x 1.00033479 = 1.00014467

DR0777!UTM 13 - 0.99980995 x 0.99966360 = 0.99947361

DR0777

DR0777: Primary Azimuth Mark Grid Az

DR0777:SPC NM E - ACME 2 AZ MK 235 42 34.8

DR0777:SPC NM C - ACME 2 AZ MK 234 38 51.8

DR0777:UTM 13 - ACME 2 AZ MK 235 20 25.4

DR0777

DR0777_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SET7182421853(NAD 83)

DR0777

DR0777|-----

DR0777| PID Reference Object Distance Geod. Az

DR0777| dddmmss.s

DR0777| CJ5583 ACME 2 RM 1 60.916 METERS 14731

DR0777| DR0774 ACME 2 AZ MK 2354609.7

DR0777| CJ5584 ACME 2 RM 2 24.809 METERS 23555

DR0777|-----

DR0777

DR0777 SUPERSEDED SURVEY CONTROL

DR0777

DR0777 NAD 83(1986)- 33 38 02.68243(N) 104 13 31.99959(W) AD() 2

DR0777 NAD 27 - 33 38 02.35325(N) 104 13 30.11857(W) AD() 2

DR0777 NGVD 29 (07/19/86) 1233.4 (m) 4047. (f) VERT ANG

DR0777

DR0777.Superseded values are not recommended for survey control.

DR0777

DR0777.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

DR0777.See file [dsdata.pdf](#) to determine how the superseded data were derived.

DR0777

DR0777_MARKER: DS = TRIANGULATION STATION DISK

DR0777_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

DR0777_STAMPING: ACME 2 1961

DR0777_MARK LOGO: CGS

DR0777_PROJECTION: PROJECTING 30 CENTIMETERS

DR0777_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

DR0777+STABILITY: SURFACE MOTION

DR0777

DR0777	HISTORY	- Date	Condition	Report By
DR0777	HISTORY	- 1961	MONUMENTED	CGS
DR0777	HISTORY	- 1967	GOOD	CGS
DR0777	HISTORY	- 1978	GOOD	DMA
DR0777	HISTORY	- 1982	GOOD	NGS
DR0777	HISTORY	- 1982	GOOD	NGS

DR0777

DR0777

STATION DESCRIPTION

DR0777

DR0777'DESCRIBED BY COAST AND GEODETIC SURVEY 1961 (GWM)

DR0777'THE STATION IS 24 MILES EAST OF ROSWELL, 10-1/2 MILES WEST-SOUTHWEST
DR0777'OF ELKINS, 7-1/2 MILES EAST OF THE PECOS RIVER, ON THE NORTH
DR0777'SIDE OF THE NORTH RIGHT-OF-WAY FENCE OF U.S. HIGHWAY 70,
DR0777'JUST WEST OF A TRACK ROAD WHICH CROSSES THE HIGHWAY AND AT
DR0777'A POINT WHERE THE HIGHWAY BEGINS A STEEP DESCENT TO THE EAST.
DR0777'THE HIGHWAY REACHES A HIGHER SUMMIT 1.0 MILE WEST-SOUTHWEST
DR0777'OF THE STATION.

DR0777'

DR0777'TO REACH THE STATION FROM THE COUNTY COURTHOUSE IN ROSWELL,
DR0777'DRIVE NORTH ON U.S. HIGHWAYS 70 AND 285 FOR 4.7 MILES TO THE
DR0777'JUNCTION OF THESE TWO HIGHWAYS. KEEP RIGHT WITH U.S. HIGHWAY
DR0777'70 AND CONTINUE NORTHEAST FOR 10.8 MILES TO THE BRIDGE
DR0777'OVER THE PECOS RIVER. CROSS THE BRIDGE AND CONTINUE THE
DR0777'HIGHWAY FOR 8.5 MILES TO A SIDE ROAD ON THE RIGHT AT SIGN
DR0777'READING, CAMPBELL, AND THE AZIMUTH MARK. CONTINUE EASTERLY ON
DR0777'THE HIGHWAY FOR 0.95 MILE TO A TRACK CROSS ROAD AND THE
DR0777'STATION ON THE LEFT.

DR0777'

DR0777'THE SURFACE MARK, A STANDARD DISK STAMPED ACME 2 1961, IS
DR0777'SET IN THE TOP OF A CONCRETE MONUMENT, 12 INCHES SQUARE AT THE
DR0777'TOP, PROJECTING 2 INCHES ABOVE THE SURFACE OF THE GROUND.
DR0777'IT IS 74.0 FEET NORTH OF THE CENTER OF U.S. HIGHWAY 70, 63.2 FEET
DR0777'WEST-SOUTHWEST OF THE CENTER OF THE GATE AND TRACK ROAD AT THE
DR0777'NORTH RIGHT-OF-WAY FENCE, 4.5 FEET NORTH-NORTHWEST OF A
DR0777'METAL WITNESS POST WITH SIGN AND 3.7 FEET NORTH OF THE NORTH
DR0777'RIGHT-OF-WAY FENCE.

DR0777'

DR0777'THE UNDERGROUND-STATION MARK, A STANDARD DISK STAMPED ACME
DR0777'2 1961, IS SET IN THE TOP OF A MASS OF CONCRETE 46 INCHES
DR0777'BELOW THE SURFACE OF THE GROUND.

DR0777'

DR0777'REFERENCE MARK 1, A STANDARD DISK STAMPED ACME 2 NO 1 1961,
DR0777'IS SET IN THE TOP OF A CONCRETE MONUMENT, 12 INCHES SQUARE
DR0777'AT THE TOP, PROJECTING 5 INCHES ABOVE THE SURFACE OF THE
DR0777'GROUND. IT IS 126.0 FEET SOUTHEAST OF THE CENTER OF U.S.
DR0777'HIGHWAY 70, 28.4 FEET WEST-NORTHWEST OF THE CENTER OF THE
DR0777'GATE AND TRACK ROAD AT THE SOUTH RIGHT-OF-WAY FENCE AND 1.0
DR0777'FOOT NORTH OF THIS FENCE.

DR0777'

DR0777'REFERENCE MARK 2, A STANDARD DISK STAMPED ACME 2 NO 2 1961,
DR0777'IS SET IN THE TOP OF A CONCRETE MONUMENT, 12 INCHES SQUARE

DR0777'AT THE TOP, PROJECTING 6 INCHES ABOVE THE SURFACE OF THE
DR0777'GROUND. IT IS 71.5 FEET NORTH OF THE CENTER OF U.S. HIGHWAY
DR0777'70, 1.5 FEET NORTHEAST OF A FENCE POST AND 10 INCHES NORTH
DR0777'OF THE NORTH RIGHT-OF-WAY FENCE.

DR0777'

DR0777'THE AZIMUTH MARK, A STANDARD DISK STAMPED ACME 2 1961, IS
DR0777'SET IN THE TOP OF A CONCRETE MONUMENT, 12 INCHES SQUARE AT
DR0777'THE TOP, PROJECTING 6 INCHES ABOVE THE SURFACE OF THE GROUND.
DR0777'IT IS 126.0 FEET SOUTH OF THE CENTER OF U.S. HIGHWAY 70, 28.5
DR0777'FEET NORTH OF A POWERLINE POLE, 22.0 FEET EAST-NORTHEAST OF
DR0777'THE CENTER OF THE BLADED ROAD AND A CATTLE GUARD, 1.5 FEET
DR0777'SOUTH OF A METAL WITNESS POST WITH SIGN AND 1.0 FOOT NORTH
DR0777'OF THE SOUTH RIGHT-OF-WAY FENCE.

DR0777'

DR0777'THE PICTURE POINT IS THE CENTER OF THE TRACK ROAD AND GATE
DR0777'AT THE NORTH RIGHT-OF-WAY FENCE EAST-NORTHEAST OF THE STATION.

DR0777'

DR0777'() DISTANCES CONVERTED TO METERS.

DR0777'

DR0777'

STATION RECOVERY (1967)

DR0777'

DR0777'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1967 (TT)

DR0777'STATION RECOVERED AS DESCRIBED.

DR0777'ALL MARKS IN GOOD CONDITION.

DR0777'

DR0777'STATION MARK--STANDARD METAL DISK SET IN 12 IN. SQUARE CONCRETE
DR0777'POST PROJECTING 0.2 FT. ABOVE GROUND STAMPED ACME 2 1961.

DR0777'

DR0777'NO CHANGE IN REFERENCE DISTANCES FOR MARKS.

DR0777'

DR0777'REFERENCE MARK NO. 1--A STANDARD C AND GS R.M. DISK SET IN A 12
DR0777'IN. SQUARE CONCRETE POST PROJECTING 1.0 FT. ABOVE THE GROUND
DR0777'AND STAMPED ACME 2 NO. 1 1961.

DR0777'

DR0777'REFERENCE MARK NO. 2--A STANDARD C AND GS R.M. DISK SET IN
DR0777'A 12 IN. SQUARE CONCRETE POST WHICH PROJECTS 10 IN. ABOVE
DR0777'THE GROUND AND STAMPED ACME 2 NO. 2 1961.

DR0777'

DR0777'

STATION RECOVERY (1978)

DR0777'

DR0777'RECOVERY NOTE BY DEFENSE MAP AGENCY 1978 (ODJ)

DR0777'STATION MARKS AND REFERENCE MARKS RECOVERED AS DESCRIBED BY J.L.

DR0777'GUMMOW, USC AND GS 1961.

DR0777'

DR0777'A POWER LINE CROSSES HIGHWAY SOUTHWEST TO NORTHEAST ABOUT 25 FEET
DR0777'EAST OF STATION.

DR0777'

DR0777'STATION WAS NOT INCLUDED IN LEVEL LINE 21 NEW MEXICO AND DOES NOT
DR0777'HAVE A PRECISE ELEVATION.

DR0777'

DR0777'AZIMUTH MARK RECOVERED AS DESCRIBED.

DR0777'

DR0777'

STATION RECOVERY (1982)

DR0777'

DR0777'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1982 (RHK)

DR0777'THE STATION, REFERENCE MARKS NO 1, NO 2, AND THE AZIMUTH MARK WERE
DR0777'RECOVERED IN GOOD CONDITION AS DESCRIBED IN 1961.

DR0777

DR0777

STATION RECOVERY (1982)

DR0777

DR0777'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1982

DR0777'39.7 KM (24.65 MI) NE FROM ROSWELL.

DR0777'27.2 KM (16.9 MI) NORTHEASTERLY ALONG THE SANTA FE RAILROAD FROM THE

DR0777'RAILROAD STATION IN ROSWELL, THENCE 12.5 KM (7.75 MI) NORTHEASTERLY

DR0777'ALONG U.S. HIGHWAY 70, 0.2 KM (0.1 MI) NORTHEAST OF MILEPOST 359,

DR0777'24.8 METERS (81.4 FT) NORTHEAST OF REFERENCE MARK 2, 22.6 METERS
(74.1

DR0777'FT) NORTHWEST OF THE CENTERLINE OF THE HIGHWAY, 19.3 METERS (63.3 FT)

DR0777'SOUTHWEST OF THE CENTER OF A CATTLE GUARD AND DIRT ROAD LEADING NORTH

DR0777'AND 1.1 METERS (3.6 FT) NORTHWEST OF A FENCE.

DR0777'THE MARK IS 1.4 METERS NW FROM A WITNESS POST.

DR0777'THE MARK IS ABOVE LEVEL WITH THE HIGHWAY.

*** retrieval complete.

Elapsed Time = 00:00:02

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.4

1 National Geodetic Survey, Retrieval Date = JANUARY 25, 2018

EP0236

EP0236 DESIGNATION - CITY

EP0236 PID - EP0236

EP0236 STATE/COUNTY- NM/GUADALUPE

EP0236 COUNTRY - US

EP0236 USGS QUAD - VAUGHN (1978)

EP0236

EP0236 *CURRENT SURVEY CONTROL

EP0236

EP0236* NAD 83(1992) POSITION- 34 35 53.97651(N) 105 12 42.61992(W)
ADJUSTED

EP0236* [NAVD 88](#) ORTHO HEIGHT - 1840.972 (meters) 6039.92 (feet)
ADJUSTED

EP0236

EP0236 GEOID HEIGHT - -20.825 (meters)

GEOID12B

EP0236 LAPLACE CORR - -5.50 (seconds)

DEFLEC12B

EP0236 DYNAMIC HEIGHT - 1838.375 (meters) 6031.40 (feet) COMP

EP0236 MODELED GRAVITY - 979,158.6 (mgal) NAVD

88

EP0236

EP0236 HORZ ORDER - FIRST

EP0236 VERT ORDER - FIRST CLASS II

EP0236

EP0236.The horizontal coordinates were established by classical geodetic methods

EP0236.and adjusted by the National Geodetic Survey in December 1993.

EP0236.

EP0236.The orthometric height was determined by differential leveling and

EP0236.adjusted by the NATIONAL GEODETIC SURVEY

EP0236.in June 1991.

EP0236

EP0236.Significant digits in the geoid height do not necessarily reflect accuracy.

EP0236.GEOID12B height accuracy estimate available [here](#).

EP0236

EP0236.The Laplace correction was computed from DEFLEC12B derived deflections.

EP0236

EP0236.The dynamic height is computed by dividing the NAVD 88

EP0236.geopotential number by the normal gravity value computed on the

EP0236.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

EP0236.degrees latitude (g = 980.6199 gals.).

EP0236

EP0236.The modeled gravity was interpolated from observed gravity values.

EP0236
 EP0236. The following values were computed from the NAD 83(1992) position.
 EP0236

EP0236;	North	East	Units	Scale Factor	
Converge.					
EP0236;SPC NM E	- 399,372.716	84,419.110	MT	0.99998910	-0 29
55.9					
EP0236;SPC NM E	- 1,310,275.32	276,965.03	sFT	0.99998910	-0 29
55.9					
EP0236;SPC NM C	- 399,508.186	595,224.959	MT	1.00001173	+0 35
22.3					
EP0236;SPC NM C	- 1,310,719.77	1,952,833.89	sFT	1.00001173	+0 35
22.3					
EP0236;UTM 13	- 3,828,520.899	480,575.350	MT	0.99960465	-0 07
13.0					

EP0236
 EP0236!
 EP0236!SPC NM E - Elev Factor x Scale Factor = Combined Factor
 EP0236!SPC NM E - 0.99971437 x 0.99998910 = 0.99970347
 EP0236!SPC NM C - 0.99971437 x 1.00001173 = 0.99972609
 EP0236!UTM 13 - 0.99971437 x 0.99960465 = 0.99931913

EP0236
 EP0236: Primary Azimuth Mark Grid Az
 EP0236:SPC NM E - VAUGHN 318 17 46.8
 EP0236:SPC NM C - VAUGHN 317 12 28.6
 EP0236:UTM 13 - VAUGHN 317 55 03.9

EP0236
 EP0236_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SDU8057528520(NAD 83)
 EP0236

EP0236	PID	Reference Object	Distance	Geod. Az
EP0236				dddmmss.s
EP0236	EP0238	CITY RM 1	15.519 METERS	13923
EP0236	EP0237	CITY RM 2	18.405 METERS	24453
EP0236	EP0240	VAUGHN	APPROX. 1.2 KM	3174750.9

EP0236
 EP0236
 EP0236
 EP0236
 EP0236 NAD 83(1986)- 34 35 53.98285(N) 105 12 42.61928(W) AD() 1
 EP0236 NAD 27 - 34 35 53.73700(N) 105 12 40.61700(W) AD() 1
 EP0236 NGVD 29 (??/??/92) 1840.171 (m) 6037.29 (f) ADJ UNCH 1

2
 EP0236 NGVD 29 1840.17 (m) 6037.3 (f) LEVELING 3

EP0236
 EP0236
 EP0236.Superseded values are not recommended for survey control.
 EP0236
 EP0236.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 EP0236.See file [dsdata.pdf](#) to determine how the superseded data were derived.
 EP0236

EP0236_MARKER: DS = TRIANGULATION STATION DISK
EP0236_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
EP0236_STAMPING: CITY 1948
EP0236_MARK LOGO: CGS
EP0236_MAGNETIC: N = NO MAGNETIC MATERIAL
EP0236_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
EP0236+STABILITY: SURFACE MOTION
EP0236_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
EP0236+SATELLITE: SATELLITE OBSERVATIONS - December 13, 2005
EP0236

EP0236	HISTORY	- Date	Condition	Report By
EP0236	HISTORY	- 1948	MONUMENTED	CGS
EP0236	HISTORY	- 1958	GOOD	CGS
EP0236	HISTORY	- 1963	GOOD	USAF
EP0236	HISTORY	- 1969	GOOD	USAF
EP0236	HISTORY	- 1974	GOOD	USGS
EP0236	HISTORY	- 19810825	GOOD	NGS
EP0236	HISTORY	- 1983	GOOD	NGS
EP0236	HISTORY	- 20051213	GOOD	GEOCAC

EP0236

EP0236 STATION DESCRIPTION

EP0236

EP0236 'DESCRIBED BY COAST AND GEODETIC SURVEY 1948 (DHK)
EP0236 'THE STATION IS LOCATED IN THE TOWN OF VAUGHN, 0.5 MILE SOUTH
EP0236 'OF THE POST OFFICE IN OLD TOWN VAUGHN, ON A LOW FLAT-TOPPED
EP0236 'RIDGE, 73 PACES NORTH OF A EAST-WEST FENCE LINE, 15 PACES
EP0236 'EAST OF THE CENTER LINE OF A DIM TRACK ROAD, 6 FEET NORTH
EP0236 'OF A 4 X 4 WITNESS POST, SET FLUSH, STAMPED, CITY 1948. THE
EP0236 'UNDERGROUND MARK IS A COPPER BAR.

EP0236 '

EP0236 'REFERENCE MARK NO. 1 IS APPROXIMATELY 6 INCHES LOWER THAN
EP0236 'THE STATION, SET FLUSH, STAMPED, CITY NO 1 1948.

EP0236 '

EP0236 'REFERENCE MARK NO. 2 IS APPROXIMATELY 6 INCHES HIGHER THAN
EP0236 'THE STATION, 12 FEET WEST OF THE CENTER LINE OF DIM TRACK
EP0236 'ROAD, SET FLUSH, STAMPED, CITY NO 2 1948.

EP0236 '

EP0236 'STATION VAUGHN 1934 IS THE AZIMUTH.

EP0236 '

EP0236 'TO REACH FROM THE POST OFFICE IN OLD TOWN VAUGHN. GO SOUTH
EP0236 'FOR 0.25 MILE TO THE INTERSECTION OF U.S. HIGHWAY 60. CROSS
EP0236 'HIGHWAY AND CONTINUE SOUTH FOR 0.15 MILE TO POINT WHERE STREET
EP0236 'TURNS WEST AND DIM TRACK ROAD CONTINUES SOUTH. TAKE TRACK
EP0236 'ROAD (S) STRAIGHT AHEAD FOR 100 FEET TO FORK. TAKE LEFT
EP0236 'FORK FOR 0.1 MILE TO SUMMIT AND STATION.

EP0236

EP0236 STATION RECOVERY (1958)

EP0236

EP0236 'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1958
EP0236 '1.5 MI SW FROM VAUGHN.

EP0236 'ABOUT 0.9 MILE WEST ALONG THE ATCHISON, TOPEKA AND SANTA FE RAILWAY
EP0236 'FROM THE STATION AT VAUGHN, THENCE 0.35 MILE SOUTH ALONG MAIN STREET
EP0236 'OF WEST VAUGHN, THENCE 0.25 MILE SOUTH ALONG A DIRT ROAD TO THE CREST
EP0236 'OF A HILL, 48 FEET EAST OF THE CENTER LINE OF A TRAIL ROAD, 129 FEET
EP0236 'SOUTH OF A POWER POLE, 227 FEET NORTH OF A FENCE, 6 FEET NORTH OF A
EP0236 'WHITE WOODEN WITNESS POST, AND IN THE TOP OF A CONCRETE POST FLUSH
EP0236 'WITH THE GROUND.

EP0236
EP0236 STATION RECOVERY (1963)
EP0236
EP0236 'RECOVERY NOTE BY US AIR FORCE 1963
EP0236 'STATION FOUND IN GOOD CONDITION. DESCRIPTION ADEQUATE.
EP0236
EP0236 STATION RECOVERY (1969)
EP0236
EP0236 'RECOVERY NOTE BY US AIR FORCE 1969
EP0236 'STATION, BOTH REFERENCE MARKS, AND THE AZIMUTH MARK (VAUGHN
EP0236 '1934) WERE RECOVERED IN GOOD CONDITION.
EP0236 '
EP0236 'THE ROUTE DESCRIPTION WAS ADEQUATE.
EP0236
EP0236 STATION RECOVERY (1974)
EP0236
EP0236 'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1974 (JTD)
EP0236 'TO REACH THE STATION FROM THE POST OFFICE IN WEST VAUGHN,
EP0236 'N. MEX., GO EAST ONE BLOCK. TURN RIGHT (SOUTH) AND GO 3-1/2
EP0236 'BLOCKS TO TOP OF RODGE AND STATION SITE. THE STATION IS
EP0236 '50 FT. EAST OF ROAD.
EP0236
EP0236 STATION RECOVERY (1981)
EP0236
EP0236 'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1981 (CLN)
EP0236 'STATION MARK, REFERENCE MARKS 1 AND 2 WERE RECOVERED IN GOOD
EP0236 'CONDITION. DISTANCE AND DIRECTION TO REFERENCE MARKS COMPARED
EP0236 'FAVORABLY WITH PREVIOUS DATA. THE FENCE LINE IS NO LONGER AT STATION
EP0236 'SITE. STATION IS REACHED FROM THE POST OFFICE IN VAUGHN, GO EAST ON
EP0236 'US HIGHWAYS 60, 285 AND 54 FOR 0.05 MI (0.08 KM) , TURN RIGHT AND GO
EP0236 'SOUTH ON A SURFACED STREET FOR 0.15 MI (0.24 KM) TO A PAVED CROSS
EP0236 'STREET AND END OF THE SURFACED STREET, CONTINUE SOUTH, STRAIGHT
AHEAD,
EP0236 'UPHILL ON A TRACK ROAD FOR 0.05 MI (0.08 KM) , TOP OF HILL, STATION
ON
EP0236 'LEFT. STATION IS A STANDARD DISK STAMPED--CITY 1948, SET IN TOP OF A
EP0236 'SQUARE CONCRETE MONUMENT PROJECTING ABOUT 1-INCH, 47 FT (14.3 M) EAST
EP0236 'OF THE CENTER OF THE TRACK ROAD, 19 FT (5.8 M) SOUTH OF A POWER LINE
EP0236 'POLE NO 1717, 3 FT (0.9 M) WEST OF A METAL WITNESS POST. REFERENCE
EP0236 'MARK 1 IS A STANDARD DISK STAMPED--CITY NO 1 1948, SET IN TOP OF A
EP0236 'SQUARE CONCRETE MONUMENT PROJECTING ABOUT 1 INCH, 76 FT (23.2 M) EAST
EP0236 'OF THE TRACK ROAD. REFERENCE MARK 2 IS A STANDARD DISK STAMPED--CITY
EP0236 'NO 2 1948-- , SET IN TOP OF A SQUARE CONCRETE MONUMENT PROJECTING
ABOUT
EP0236 '3 INCHES, 10 FT (3.0 M) WEST OF THE TRACK ROAD.
EP0236
EP0236 STATION RECOVERY (1983)
EP0236
EP0236 'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1983
EP0236 'RECOVERED IN GOOD CONDITION.
EP0236
EP0236 STATION RECOVERY (2005)
EP0236
EP0236 'RECOVERY NOTE BY GEOCACHING 2005 (HMT)
EP0236 'THE PAVED STREET LEADING SOUTH FROM US ROUTE 60 IS NOW NAMED CEDAR
EP0236 'STREET.
EP0236 'IT STILL BECOMES AN UNPAVED TRACK ROAD AT 6TH STREET. THE PRIMARY

EP0236'MARK AND
EP0236'RM2 STILL HAVE WITNESS POSTS, BUT THERE IS NO WITNESS POST AT RM1.
THE
EP0236'MARKS
EP0236'THEMSELVES ARE ALL IN EXCELLENT CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:02

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.4

1 National Geodetic Survey, Retrieval Date = FEBRUARY 12, 2018

EQ0216

EQ0216 CBN - This is a Cooperative Base Network Control Station.

EQ0216 DESIGNATION - COONEY

EQ0216 PID - EQ0216

EQ0216 STATE/COUNTY- NM/SOCORRO

EQ0216 COUNTRY - US

EQ0216 USGS QUAD - SOCORRO (1979)

EQ0216

EQ0216 *CURRENT SURVEY CONTROL

EQ0216

EQ0216* NAD 83(2011) POSITION- 34 03 24.68857(N) 106 55 19.16202(W)
ADJUSTED

EQ0216* NAD 83(2011) ELLIP HT- 1437.030 (meters) (06/27/12)
ADJUSTED

EQ0216* NAD 83(2011) EPOCH - 2010.00

EQ0216* [NAVD 88](#) ORTHO HEIGHT - 1459.210 (meters) 4787.42 (feet) POSTED

EQ0216

EQ0216 GEOID HEIGHT - -22.201 (meters)

GEOID12B

EQ0216 NAD 83(2011) X - -1,540,024.705 (meters) COMP

EQ0216 NAD 83(2011) Y - -5,061,833.028 (meters) COMP

EQ0216 NAD 83(2011) Z - 3,552,478.185 (meters) COMP

EQ0216 LAPLACE CORR - -3.82 (seconds)

DEFLEC12B

EQ0216 DYNAMIC HEIGHT - 1457.13 (meters) 4780.6 (feet) COMP

EQ0216 MODELED GRAVITY - 979,159.4 (mgal) NAVD

88

EQ0216

EQ0216 VERT ORDER - * POSTED, SEE BELOW

EQ0216

EQ0216 Network accuracy estimates per FGDC Geospatial Positioning Accuracy

EQ0216 Standards:

EQ0216 FGDC (95% conf, cm) Standard deviation (cm) CorrNE

EQ0216 Horiz Ellip SD_N SD_E SD_h (unitless)

EQ0216 -----

EQ0216 NETWORK 0.54 1.71 0.23 0.21 0.87 -0.08688440

EQ0216 -----

EQ0216 Click [here](#) for local accuracies and other accuracy information.

EQ0216

EQ0216

EQ0216.The horizontal coordinates were established by GPS observations

EQ0216.and adjusted by the National Geodetic Survey in June 2012.

EQ0216

EQ0216.NAD 83(2011) refers to NAD 83 coordinates where the reference frame
has

EQ0216.been affixed to the stable North American tectonic plate. See

EQ0216.[NA2011](#) for more information.
EQ0216
EQ0216.The horizontal coordinates are valid at the epoch date displayed above
EQ0216.which is a decimal equivalence of Year/Month/Day.
EQ0216
EQ0216.The orthometric height was determined by differential leveling
EQ0216.and adjusted by the NATIONAL GEODETIC SURVEY in 1992.
EQ0216
EQ0216.* This is a POSTED BENCH MARK height.
EQ0216
EQ0216.Significant digits in the geoid height do not necessarily reflect accuracy.
EQ0216.GEOID12B height accuracy estimate available [here](#).
EQ0216
EQ0216.The X, Y, and Z were computed from the position and the ellipsoidal ht.
EQ0216
EQ0216.The Laplace correction was computed from DEFLEC12B derived deflections.
EQ0216
EQ0216.The ellipsoidal height was determined by GPS observations
EQ0216.and is referenced to NAD 83.
EQ0216
EQ0216.The dynamic height is computed by dividing the NAVD 88
EQ0216.geopotential number by the normal gravity value computed on the
EQ0216.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
EQ0216.degrees latitude (g = 980.6199 gals.).
EQ0216
EQ0216.The modeled gravity was interpolated from observed gravity values.
EQ0216
EQ0216. The following values were computed from the NAD 83(2011) position.
EQ0216
EQ0216;

	North	East	Units	Scale	Factor
Converg.					
EQ0216;SPC NM C	- 339,163.797	437,965.461	MT	0.99994742	-0 22
34.8					
EQ0216;SPC NM C	- 1,112,739.89	1,436,891.68	sFT	0.99994742	-0 22
34.8					
EQ0216;UTM 13	- 3,770,126.837	322,614.282	MT	0.99998789	-1 04
35.8					

EQ0216
EQ0216!

	Elev Factor	x	Scale Factor	=	Combined Factor
EQ0216!SPC NM C	- 0.99977446	x	0.99994742	=	0.99972189
EQ0216!UTM 13	- 0.99977446	x	0.99998789	=	0.99976235

EQ0216
EQ0216_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SCT2261470126(NAD 83)
EQ0216
EQ0216
EQ0216
EQ0216
EQ0216
EQ0216 NAD 83(2007)- 34 03 24.68812(N) 106 55 19.16281(W) AD(2002.00) 0
EQ0216 ELLIP H (02/10/07) 1437.058 (m) GP(2002.00)
EQ0216 NAD 83(1992)- 34 03 24.68785(N) 106 55 19.16273(W) AD() A
EQ0216 ELLIP H (05/26/00) 1437.076 (m) GP() 2
1
EQ0216 NAVD 88 1459.21 (m) 4787.4 (f) LEVELING 3

EQ0216 NGVD 29 (??/??/92) 1458.472 (m) 4785.00 (f) ADJ UNCH 1
2

EQ0216

EQ0216.Superseded values are not recommended for survey control.

EQ0216

EQ0216.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

EQ0216.See file [dsdata.pdf](#) to determine how the superseded data were derived.

EQ0216

EQ0216_MARKER: DB = BENCH MARK DISK

EQ0216_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

EQ0216_STAMPING: COONEY RG 1950

EQ0216_MARK LOGO: USGS

EQ0216_MAGNETIC: N = NO MAGNETIC MATERIAL

EQ0216_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

EQ0216+STABILITY: SURFACE MOTION

EQ0216_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

EQ0216+SATELLITE: SATELLITE OBSERVATIONS - March 12, 1999

EQ0216

EQ0216	HISTORY	- Date	Condition	Report By
EQ0216	HISTORY	- 1950	MONUMENTED	USGS
EQ0216	HISTORY	- 1951	GOOD	CGS
EQ0216	HISTORY	- 19990312	GOOD	USGS
EQ0216	HISTORY	- 20050616	GOOD	INDIV

EQ0216

EQ0216 STATION DESCRIPTION

EQ0216

EQ0216'DESCRIBED BY COAST AND GEODETIC SURVEY 1951

EQ0216'1.25 MI SW FROM SOCORRO.

EQ0216'1.25 MILES SOUTHWEST ALONG A GRAVELED ROAD FROM THE RESEARCH

EQ0216'LABORATORY BUILDING AT THE SCHOOL OF MINES AT SOCORRO, 50 FEET

EQ0216'SOUTHEAST OF THE CENTER LINE OF THE ROAD, 50 FEET EAST OF A POWER

EQ0216'LINE, 10 FEET WEST OF BENCH MARK T 222, 5 FEET WEST OF A WITNESS
POST,

EQ0216'SET IN THE TOP OF A CONCRETE POST WHICH PROJECTS 0.5 FOOT ABOVE THE

EQ0216'GROUND.

EQ0216

EQ0216 STATION RECOVERY (1999)

EQ0216

EQ0216'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1999 (KO)

EQ0216'THE STATION IS LOCATED ON THE GROUNDS OF THE NEW MEXICO INSTITUTE OF

EQ0216'MINING AND TECHNOLOGY IN THE WESTERN PART OF SOCORRO. OWNERSHIP --

EQ0216'NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY, CONTACT PROFESSOR

EQ0216'KALMAN ORAVECZ, TELEPHONE 505-835-5225, SOCORRO NM 87801. TO REACH

EQ0216'THE STATION FROM THE INTERSECTION OF OLIVE LANE AND CANYON DRIVE ON

EQ0216'THE NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY CAMPUS, PROCEED
WEST

EQ0216'ON CANYON DRIVE FOR 0.6 MI (1.0 KM) TO A DITCH LEADING NORTH.

CONTINUE

EQ0216'STRAIGHT ON CANYON DRIVE FOR 0.3 MI (0.5 KM), AS THE ROAD BEARS

EQ0216'SOUTHWEST, TO A JUNCTION WITH A TARRD ROAD LEADING DUE SOUTH. TURN

EQ0216'LEFT, SOUTH, ON THE TARRD ROAD AND GO 0.6 MI (1.0 KM) TO THE END OF

EQ0216'THE ROAD, WHERE IT JOINS ANOTHER TARRD ROAD THAT TRENDS

EQ0216'NORTHEAST-SOUTHWEST. TURN LEFT, NORTHEAST, AND GO ABOUT 90 M (295.3

EQ0216'FT), PASSING THROUGH A FENCE. TURN RIGHT, SOUTH, AND GO 20 M (65.6

EQ0216'FT) TO THE STATION. THE STATION IS SET IN THE TOP OF A 0.15 M (0.49

EQ0216'FT) DIAMETER ROUND CONCRETE POST PROJECTING 0.15 M (0.49 FT) ABOVE

EQ0216'GROUND. LOCATED 18 M (59.1 FT) SOUTH OF THE CENTER OF THE ROAD AND 3
EQ0216'M (9.8 FT) WEST OF BENCHMARK T 222. A 0.6 M (2.0 FT) TALL WITNESS
EQ0216'POST IS SET AT THE MIDPOINT BETWEEN THE TWO MARKS.

EQ0216

EQ0216

STATION RECOVERY (2005)

EQ0216

EQ0216'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2005 (BHI)

EQ0216'RECOVERED IN GOOD CONDITION.

*** retrieval complete.

Elapsed Time = 00:00:04

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.3

1 National Geodetic Survey, Retrieval Date = JANUARY 24, 2018

EQ0520

EQ0520 DESIGNATION - K 357

EQ0520 PID - EQ0520

EQ0520 STATE/COUNTY- NM/SOCORRO

EQ0520 COUNTRY - US

EQ0520 USGS QUAD - TRES MONTOSAS (1995)

EQ0520

EQ0520 *CURRENT SURVEY CONTROL

EQ0520

EQ0520* NAD 83(1986) POSITION- 34 03 51. (N) 107 28 16. (W) SCALED

EQ0520* [NAVD 88](#) ORTHO HEIGHT - 2139.497 (meters) 7019.33 (feet)

ADJUSTED

EQ0520

EQ0520 GEOID HEIGHT - -21.615 (meters)

GEOID12B

EQ0520 DYNAMIC HEIGHT - 2136.176 (meters) 7008.44 (feet) COMP

EQ0520 MODELED GRAVITY - 979,007.2 (mgal) NAVD

88

EQ0520

EQ0520 VERT ORDER - FIRST CLASS I

EQ0520

EQ0520.The horizontal coordinates were scaled from a topographic map and have

EQ0520.an estimated accuracy of +/- 6 seconds.

EQ0520.

EQ0520.The orthometric height was determined by differential leveling and

EQ0520.adjusted by the NATIONAL GEODETIC SURVEY

EQ0520.in June 1991.

EQ0520

EQ0520.Significant digits in the geoid height do not necessarily reflect accuracy.

EQ0520.GEOID12B height accuracy estimate available [here](#).

EQ0520

EQ0520.The dynamic height is computed by dividing the NAVD 88

EQ0520.geopotential number by the normal gravity value computed on the

EQ0520.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

EQ0520.degrees latitude (g = 980.6199 gals.).

EQ0520

EQ0520.The modeled gravity was interpolated from observed gravity values.

EQ0520

EQ0520; North East Units Estimated Accuracy

EQ0520;SPC NM C - 340,440. 387,280. MT (+/- 180 meters

Scaled)

EQ0520

EQ0520_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SBT719720(NAD 83)

EQ0520

EQ0520 SUPERSEDED SURVEY CONTROL
EQ0520
EQ0520 NGVD 29 (??/??/92) 2138.563 (m) 7016.27 (f) ADJ UNCH 1

1

EQ0520
EQ0520.Superseded values are not recommended for survey control.
EQ0520
EQ0520.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
EQ0520.See file [dsdata.pdf](#) to determine how the superseded data were derived.

EQ0520
EQ0520_MARKER: DB = BENCH MARK DISK
EQ0520_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
EQ0520_STAMPING: K 357 1978
EQ0520_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

EQ0520
EQ0520 HISTORY - Date Condition Report By
EQ0520 HISTORY - 1978 MONUMENTED NGS

EQ0520
EQ0520 STATION DESCRIPTION

EQ0520
EQ0520'DESCRIBED BY NATIONAL GEODETIC SURVEY 1978
EQ0520'13.4 MI WEST FROM MAGDALENA.
EQ0520'11.65 MILES WEST ALONG U.S. HIGHWAY 60 FROM THE POST OFFICE IN
EQ0520'MAGDALENA, THENCE 0.75 MILE SOUTHWEST ALONG STATE HIGHWAY 52, AND
EQ0520'THENCE 1.0 MILE WEST ALONG A GRAVELED ROAD, 70 FEET SOUTH OF THE
EQ0520'CENTER OF THE GRAVED ROAD, AND 1 FOOT NORTH OF A POWER POLE. DISK IS
EQ0520'SET LEVEL WITH THE GROUND, ACCESS TO WHICH IS HAD THROUGH A 4 INCH
EQ0520'PLASTIC SCREW PLUG.

*** retrieval complete.
Elapsed Time = 00:00:02

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.4

1 National Geodetic Survey, Retrieval Date = JANUARY 25, 2018

EP0170

EP0170 DESIGNATION - M 12

EP0170 PID - EP0170

EP0170 STATE/COUNTY- NM/GUADALUPE

EP0170 COUNTRY - US

EP0170 USGS QUAD - SANTA ROSA (1963)

EP0170

*CURRENT SURVEY CONTROL

EP0170

EP0170* NAD 83(1986) POSITION- 34 56 30.0 (N) 104 41 11.5 (W)

HD_HELD2

EP0170* [NAVD 88](#) ORTHO HEIGHT - 1402.539 (meters) 4601.50 (feet)

ADJUSTED

EP0170

EP0170 GEOID HEIGHT - -22.289 (meters)

GEOID12B

EP0170 DYNAMIC HEIGHT - 1400.688 (meters) 4595.42 (feet) COMP

EP0170 MODELED GRAVITY - 979,265.9 (mgal) NAVD

88

EP0170

EP0170 VERT ORDER - FIRST CLASS II

EP0170

EP0170.The horizontal coordinates were established by autonomous hand held GPS

EP0170.observations and have an estimated accuracy of +/- 10 meters.

EP0170.

EP0170.The orthometric height was determined by differential leveling and

EP0170.adjusted by the NATIONAL GEODETIC SURVEY

EP0170.in June 1991.

EP0170

EP0170.Significant digits in the geoid height do not necessarily reflect accuracy.

EP0170.GEOID12B height accuracy estimate available [here](#).

EP0170

EP0170.[Photographs](#) are available for this station.

EP0170

EP0170.The dynamic height is computed by dividing the NAVD 88

EP0170.geopotential number by the normal gravity value computed on the

EP0170.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

EP0170.degrees latitude (g = 980.6199 gals.).

EP0170

EP0170.The modeled gravity was interpolated from observed gravity values.

EP0170

EP0170;

EP0170;SPC NM E - North East Units Estimated Accuracy

GPS)

EP0170
EP0170_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SEU2862566619(NAD 83)
EP0170
EP0170 SUPERSEDED SURVEY CONTROL
EP0170
EP0170 NGVD 29 (??/??/92) 1401.856 (m) 4599.26 (f) ADJ UNCH 1

2

EP0170
EP0170.Superseded values are not recommended for survey control.
EP0170
EP0170.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
EP0170.See file [dsdata.pdf](#) to determine how the superseded data were derived.

EP0170
EP0170_MARKER: DB = BENCH MARK DISK
EP0170_SETTING: 35 = SET IN A MAT FOUNDATION OR CONCRETE SLAB OTHER THAN
EP0170+WITH SETTING: PAVEMENT
EP0170_SP_SET: BALUSTRADE
EP0170_STAMPING: M 12 1927 4599.256
EP0170_MARK LOGO: CGS
EP0170_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
EP0170+STABILITY: SURFACE MOTION
EP0170_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
EP0170+SATELLITE: SATELLITE OBSERVATIONS - June 18, 2004

EP0170
EP0170 HISTORY - Date Condition Report By
EP0170 HISTORY - 1927 MONUMENTED CGS
EP0170 HISTORY - 1934 GOOD CGS
EP0170 HISTORY - 1966 GOOD CGS
EP0170 HISTORY - 20040618 GOOD NGS
EP0170 HISTORY - 20090702 GOOD GEOCAC
EP0170 HISTORY - 20130908 GOOD GEOCAC

EP0170
EP0170 STATION DESCRIPTION
EP0170
EP0170'DESCRIBED BY COAST AND GEODETIC SURVEY 1934
EP0170'IN SANTA ROSA.
EP0170'AT SANTA ROSA, AT THE WEST ENTRANCE TO GUADLUPE COUNTY COURTHOUSE ON
EP0170'TOP OF CAPSTONE TO LEFT OF DOOR AS YOU ENTER. STANDARD DISK SET IN
EP0170'STONE BALUSTRADE. STAMPED M-12.

EP0170
EP0170 STATION RECOVERY (1966)
EP0170
EP0170'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1966
EP0170'RECOVERED IN GOOD CONDITION.

EP0170
EP0170 STATION RECOVERY (2004)
EP0170
EP0170'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (DW)
EP0170'RECOVERED IN GOOD CONDITION.

EP0170
EP0170 STATION RECOVERY (2009)
EP0170
EP0170'RECOVERY NOTE BY GEOCACHING 2009 (LPC)
EP0170'THE DISK HAS BEEN PAINTED OVER, BUT IS STILL THERE AND STILL LEGIBLE.

EP0170
EP0170 STATION RECOVERY (2013)

EP0170

EP0170'RECOVERY NOTE BY GEOCACHING 2013 (APC)

EP0170'THE PAINT' HAS SINCE BEEN REMOVED FROM SURFACE OF DISK.

*** retrieval complete.

Elapsed Time = 00:00:01

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.4
1      National Geodetic Survey,  Retrieval Date = FEBRUARY 12, 2018
FO0481
*****
FO0481  FBN          -  This is a Federal Base Network Control Station.
FO0481  DESIGNATION -  P 299
FO0481  PID          -  FO0481
FO0481  STATE/COUNTY-  NM/SANDOVAL
FO0481  COUNTRY     -  US
FO0481  USGS QUAD   -  SAN PABLO (1970)
FO0481
FO0481                      *CURRENT SURVEY CONTROL
FO0481

FO0481* NAD 83(2011) POSITION- 35 57 21.11504(N) 106 56 58.12838(W)
ADJUSTED
FO0481* NAD 83(2011) ELLIP HT- 2067.697 (meters)          (06/27/12)
ADJUSTED
FO0481* NAD 83(2011) EPOCH   - 2010.00
FO0481* NAVD 88 ORTHO HEIGHT - 2087.157 (meters)          6847.61 (feet)
ADJUSTED
FO0481

FO0481 GEOID HEIGHT      -          -19.433 (meters)
GEOID12B
FO0481 NAD 83(2011) X    - -1,507,361.906 (meters)          COMP
FO0481 NAD 83(2011) Y    - -4,945,952.049 (meters)          COMP
FO0481 NAD 83(2011) Z    -  3,725,442.783 (meters)          COMP
FO0481 LAPLACE CORR      -           9.41 (seconds)
DEFLEC12B
FO0481 DYNAMIC HEIGHT   -          2084.244 (meters)          6838.06 (feet) COMP
FO0481 MODELED GRAVITY   -          979,162.6 (mgal)          NAVD
88
FO0481
FO0481 VERT ORDER        -  SECOND    CLASS 0
FO0481
FO0481 Network accuracy estimates per FGDC Geospatial Positioning Accuracy
FO0481 Standards:
FO0481          FGDC (95% conf, cm)    Standard deviation (cm)    CorrNE
FO0481          Horiz Ellip              SD_N  SD_E  SD_h          (unitless)
FO0481 -----
FO0481 NETWORK    0.39  1.18              0.17  0.15  0.60          -0.02827181
FO0481 -----
FO0481 Click here for local accuracies and other accuracy information.
FO0481
FO0481
FO0481.The horizontal coordinates were established by GPS observations
FO0481.and adjusted by the National Geodetic Survey in June 2012.
FO0481
FO0481.NAD 83(2011) refers to NAD 83 coordinates where the reference frame
has
```

FO0481.been affixed to the stable North American tectonic plate. See
FO0481.[NA2011](#) for more information.

FO0481

FO0481.The horizontal coordinates are valid at the epoch date displayed
above

FO0481.which is a decimal equivalence of Year/Month/Day.

FO0481

FO0481.The orthometric height was determined by differential leveling and
FO0481.adjusted by the NATIONAL GEODETIC SURVEY

FO0481.in June 1991.

FO0481

FO0481.Significant digits in the geoid height do not necessarily reflect
accuracy.

FO0481.GEOID12B height accuracy estimate available [here](#).

FO0481

FO0481.The X, Y, and Z were computed from the position and the ellipsoidal
ht.

FO0481

FO0481.The Laplace correction was computed from DEFLEC12B derived
deflections.

FO0481

FO0481.The ellipsoidal height was determined by GPS observations

FO0481.and is referenced to NAD 83.

FO0481

FO0481.The dynamic height is computed by dividing the NAVD 88

FO0481.geopotential number by the normal gravity value computed on the

FO0481.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

FO0481.degrees latitude (g = 980.6199 gals.).

FO0481

FO0481.The modeled gravity was interpolated from observed gravity values.

FO0481

FO0481. The following values were computed from the NAD 83(2011) position.

FO0481

FO0481;	North	East	Units	Scale	Factor	
Converg.						
FO0481;SPC NM C	- 549,842.407	436,902.991	MT	0.99994904	-0 24	38.6
FO0481;SPC NM C	- 1,803,941.30	1,433,405.90	sFT	0.99994904	-0 24	38.6
FO0481;UTM 13	- 3,980,809.861	324,189.519	MT	0.99998087	-1 08	41.8

FO0481

FO0481!
FO0481!SPC NM C - Elev Factor x Scale Factor = Combined Factor

FO0481!SPC NM C - 0.99967558 x 0.99994904 = 0.99962464

FO0481!UTM 13 - 0.99967558 x 0.99998087 = 0.99965646

FO0481

FO0481_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SCV2418980809(NAD 83)

FO0481

FO0481

SUPERSEDED SURVEY CONTROL

FO0481

FO0481 NAD 83(2007)- 35 57 21.11461(N) 106 56 58.12909(W) AD(2002.00) 0

FO0481 ELLIP H (02/10/07) 2067.717 (m) GP(2002.00)

FO0481 NAD 83(1992)- 35 57 21.11435(N) 106 56 58.12912(W) AD() A

FO0481 ELLIP H (05/26/00) 2067.732 (m) GP() 2

1

FO0481 NAVD 88 2087.16 (m) 6847.6 (f) LEVELING 3

FO0481 NGVD 29 (??/??/92) 2086.081 (m) 6844.08 (f) ADJ UNCH 2
0

FO0481

FO0481.Superseded values are not recommended for survey control.

FO0481

FO0481.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

FO0481.See file [dsdata.pdf](#) to determine how the superseded data were derived.

FO0481

FO0481_MARKER: DB = BENCH MARK DISK

FO0481_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

FO0481_STAMPING: P 299 1957

FO0481_MARK LOGO: CGS

FO0481_MAGNETIC: N = NO MAGNETIC MATERIAL

FO0481_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

FO0481+STABILITY: SURFACE MOTION

FO0481_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

FO0481+SATELLITE: SATELLITE OBSERVATIONS - June 16, 2005

FO0481

FO0481	HISTORY	- Date	Condition	Report By
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FO0481	HISTORY	- 1957	MONUMENTED	CGS
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FO0481	HISTORY	- 19990221	GOOD	NGS
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FO0481	HISTORY	- 20040518	GOOD	NMHD
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FO0481	HISTORY	- 20050616	GOOD	INDIV
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FO0481

FO0481 STATION DESCRIPTION

FO0481

FO0481'DESCRIBED BY COAST AND GEODETIC SURVEY 1957

FO0481'4.95 MI S FROM CUBA.

FO0481'ABOUT 4.95 MILES SOUTH ALONG STATE HIGHWAY 44 FROM THE BRIDGE OVER
THE

FO0481'RIO PUERCO AT CUBA, IN SECTION 21, T.20 N., R.1 W., 98 FEET SOUTHWEST

FO0481'OF THE CENTER LINE OF THE HIGHWAY, 319 FEET NORTHWEST OF THE
NORTHWEST

FO0481'CORNER OF A BRIDGE 22 FEET WEST-NORTHWEST OF THE CENTER LINE OF

FO0481'LANDING STRIP, 1 1/2 FEET NORTHEAST OF A FENCE LINE, 2 FEET SOUTHEAST

FO0481'OF A WHITE WOODEN WITNESS POST AND IN THE TOP OF A CONCRETE POST
WHICH

FO0481'PROJECTS 5 INCHES.

FO0481

FO0481 STATION RECOVERY (1999)

FO0481

FO0481'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1999 (WAS)

FO0481'THE STATION IS LOCATED ABOUT 5 MI (8.0 KM) SOUTH OF CUBA, ON THE EDGE

FO0481'OF OPEN RANGE LAND, IN THE RIGHT OF WAY OF COUNTY ROAD 11.

FO0481'OWNERSHIP--SANDOVAL COUNTY, PUBLIC WORKS/ROAD DEPARTMENT, TELEPHONE

FO0481'505-867-7500, 711 CAMINO DEL PUEBLO, BERNALILLO NM 87004. TO REACH

FO0481'THE STATION FROM THE INTERSECTION OF STATE HIGHWAYS 44, 197 AND
COUNTY

FO0481'ROAD 11 ON THE SOUTH EDGE OF CUBA, GO SOUTH ON COUNTY ROAD 11 FOR 5.2

FO0481'MI (8.4 KM) TO THE STATION ON THE RIGHT, ABOUT 0.05 MI (0.08 KM)

NORTH

FO0481'OF A BRIDGE OVER A WASH WITH GUARDRAILS ON BOTH SIDES OF THE ROAD.

FO0481'NOTE--THE STATION IS 0.3 MI (0.5 KM) NORTH OF THE INTERSECTION OF

FO0481'COUNTY ROAD 11 AND SAN PABLO ROAD, WHICH LEADS EAST. THE STATION IS

FO0481'SET IN THE TOP OF A 0.25 M (0.82 FT) ROUND CONCRETE POST PROJECTING

FO0481'0.15 M (0.49 FT) ABOVE GROUND. LOCATED 84.5 M (277.2 FT)

FO0481'NORTH-NORTHWEST OF THE NORTH END OF A GUARDRAIL ON THE WEST SIDE OF
FO0481'COUNTY ROAD 11 AT A WASH CROSSING, 29.7 M (97.4 FT) WEST OF THE
FO0481'CENTERLINE OF COUNTY ROAD 11, 0.5 M (1.6 FT) EAST OF A FENCE AND 0.5
M

FO0481'(1.6 FT) EAST OF A FIBERGLASS WITNESS POST.

FO0481

FO0481 STATION RECOVERY (2004)

FO0481

FO0481'RECOVERY NOTE BY NM HIGHWAY DEPT 2004 (JW)

FO0481'STATION RECOVERED AS DESCRIBED IN GOOD CONDITION.

FO0481

FO0481 STATION RECOVERY (2005)

FO0481

FO0481'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2005 (BHI)

FO0481'RECOVERED IN GOOD CONDITION.

*** retrieval complete.

Elapsed Time = 00:00:02

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.3

1 National Geodetic Survey, Retrieval Date = JANUARY 10, 2018

EQ0410

EQ0410 DESIGNATION - Q 102

EQ0410 PID - EQ0410

EQ0410 STATE/COUNTY- NM/SOCORRO

EQ0410 COUNTRY - US

EQ0410 USGS QUAD - ARROYO LANDAVASO (1995)

EQ0410

EQ0410 *CURRENT SURVEY CONTROL

EQ0410

EQ0410* NAD 83(1986) POSITION- 34 07 22. (N) 107 16 45. (W) SCALED

EQ0410* [NAVD 88](#) ORTHO HEIGHT - 2014.188 (meters) 6608.22 (feet)

ADJUSTED

EQ0410

EQ0410 GEOID HEIGHT - -21.598 (meters)

GEOID12B

EQ0410 DYNAMIC HEIGHT - 2011.147 (meters) 6598.24 (feet) COMP

EQ0410 MODELED GRAVITY - 979,053.9 (mgal) NAVD

88

EQ0410

EQ0410 VERT ORDER - FIRST CLASS I

EQ0410

EQ0410.The horizontal coordinates were scaled from a topographic map and have

EQ0410.an estimated accuracy of +/- 6 seconds.

EQ0410.

EQ0410.The orthometric height was determined by differential leveling and

EQ0410.adjusted by the NATIONAL GEODETIC SURVEY

EQ0410.in June 1991.

EQ0410

EQ0410.Significant digits in the geoid height do not necessarily reflect accuracy.

EQ0410.GEOID12B height accuracy estimate available [here](#).

EQ0410

EQ0410.The dynamic height is computed by dividing the NAVD 88

EQ0410.geopotential number by the normal gravity value computed on the

EQ0410.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

EQ0410.degrees latitude (g = 980.6199 gals.).

EQ0410

EQ0410.The modeled gravity was interpolated from observed gravity values.

EQ0410

EQ0410; North East Units Estimated Accuracy

EQ0410;SPC NM C - 346,750. 405,070. MT (+/- 180 meters

Scaled)

EQ0410

EQ0410_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SBT898781(NAD 83)

EQ0410

EQ0410 SUPERSEDED SURVEY CONTROL
EQ0410
EQ0410 NGVD 29 (??/??/92) 2013.321 (m) 6605.37 (f) ADJ UNCH 1

1

EQ0410
EQ0410.Superseded values are not recommended for survey control.
EQ0410
EQ0410.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
EQ0410.See file [dsdata.pdf](#) to determine how the superseded data were derived.

EQ0410
EQ0410_MARKER: DB = BENCH MARK DISK
EQ0410_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
EQ0410_STAMPING: Q 102 1935
EQ0410_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
EQ0410+STABILITY: SURFACE MOTION

EQ0410
EQ0410 HISTORY - Date Condition Report By
EQ0410 HISTORY - 1935 MONUMENTED CGS
EQ0410 HISTORY - 1941 GOOD CGS
EQ0410 HISTORY - 1953 GOOD CGS
EQ0410 HISTORY - 1978 GOOD NGS

EQ0410
EQ0410 STATION DESCRIPTION

EQ0410
EQ0410'DESCRIBED BY COAST AND GEODETIC SURVEY 1941
EQ0410'2.5 MI NW FROM MAGDALENA.
EQ0410'TO REACH BENCH MARK FROM THE POST OFFICE IN MAGDALENA, PROCEED WEST
ON
EQ0410'U. S. HIGHWAY NO. 60, GO 1.7 MILES TO INTERSECTION OF STATE HIGHWAY
EQ0410'NO. 52. THENCE, TURN RIGHT (NORTH) ONTO STATE HIGHWAY NO. 52, GO 0.8
EQ0410'MILE TO SITE OF BENCH MARK. BENCH MARK IS ON THE OUTSIDE OF A CURVE,
EQ0410'ON TOP OF THE SECOND HILL. 54.0 FEET WEST OF AND ABOUT THE SAME
EQ0410'ELEVATION AS THE CENTERLINE OF THE HIGHWAY. 3.0 FEET SOUTH OF A 4 X

4

EQ0410'INCH WOODEN MARKER POST. THE MONUMENT PROJECTS 0.3 FOOT.

EQ0410
EQ0410 STATION RECOVERY (1953)

EQ0410
EQ0410'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1953
EQ0410'RECOVERED IN GOOD CONDITION.

EQ0410
EQ0410 STATION RECOVERY (1978)

EQ0410
EQ0410'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1978
EQ0410'NOTE=OMIT THE HEADING AND MILEAGE OF ORIGINAL DESCRIPTION. ADD=1.0
EQ0410'MILE WEST ALONG U.S. HIGHWAY 60 FROM THE POST OFFICE IN MAGDALENA,
EQ0410'AND THENCE 1.9 MILES NORTHWEST ALONG HIGHWAY 52.

*** retrieval complete.
Elapsed Time = 00:00:01

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.4
1      National Geodetic Survey,  Retrieval Date = FEBRUARY 12, 2018
FO0859
*****
FO0859  FBN          -   This is a Federal Base Network Control Station.
FO0859  DESIGNATION -   TOLTEC
FO0859  PID          -   FO0859
FO0859  STATE/COUNTY-  NM/CIBOLA
FO0859  COUNTRY     -   US
FO0859  USGS QUAD   -   MILAN (1995)
FO0859
FO0859                                *CURRENT SURVEY CONTROL
FO0859

FO0859* NAD 83(2011) POSITION- 35 13 12.35119(N) 107 54 52.70468(W)
ADJUSTED
FO0859* NAD 83(2011) ELLIP HT- 1981.967 (meters)          (06/27/12)
ADJUSTED
FO0859* NAD 83(2011) EPOCH   - 2010.00
FO0859* NAVD 88 ORTHO HEIGHT - 2002.383 (meters)          6569.48 (feet)
ADJUSTED
FO0859

FO0859 GEOID HEIGHT      -          -20.403 (meters)
GEOID12B
FO0859 NAD 83(2011) X    -  -1,605,056.128 (meters)          COMP
FO0859 NAD 83(2011) Y    -  -4,965,011.455 (meters)          COMP
FO0859 NAD 83(2011) Z    -   3,658,985.209 (meters)          COMP
FO0859 LAPLACE CORR      -           -2.72 (seconds)
DEFLEC12B
FO0859 DYNAMIC HEIGHT    -           1999.542 (meters)        6560.16 (feet) COMP
FO0859 MODELED GRAVITY    -           979,143.8 (mgal)          NAVD
88
FO0859
FO0859 VERT ORDER        -   FIRST      CLASS II
FO0859
FO0859 Network accuracy estimates per FGDC Geospatial Positioning Accuracy
FO0859 Standards:
FO0859          FGDC (95% conf, cm)      Standard deviation (cm)      CorrNE
FO0859          Horiz Ellip              SD_N   SD_E   SD_h          (unitless)
FO0859 -----
FO0859 NETWORK      0.62   1.92              0.28   0.22   0.98          0.11544097
FO0859 -----
FO0859 Click here for local accuracies and other accuracy information.
FO0859
FO0859
FO0859.The horizontal coordinates were established by GPS observations
FO0859.and adjusted by the National Geodetic Survey in June 2012.
FO0859
FO0859.NAD 83(2011) refers to NAD 83 coordinates where the reference frame
has
```

FO0859.been affixed to the stable North American tectonic plate. See
FO0859.[NA2011](#) for more information.

FO0859
FO0859.The horizontal coordinates are valid at the epoch date displayed
above

FO0859.which is a decimal equivalence of Year/Month/Day.

FO0859
FO0859.The orthometric height was determined by differential leveling and
FO0859.adjusted by the NATIONAL GEODETIC SURVEY
FO0859.in June 1991.

FO0859
FO0859.Significant digits in the geoid height do not necessarily reflect
accuracy.

FO0859.GEOID12B height accuracy estimate available [here](#).

FO0859
FO0859.[Photographs](#) are available for this station.

FO0859
FO0859.The X, Y, and Z were computed from the position and the ellipsoidal
ht.

FO0859
FO0859.The Laplace correction was computed from DEFLEC12B derived
deflections.

FO0859
FO0859.The ellipsoidal height was determined by GPS observations
FO0859.and is referenced to NAD 83.

FO0859
FO0859.The dynamic height is computed by dividing the NAVD 88
FO0859.geopotential number by the normal gravity value computed on the
FO0859.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
FO0859.degrees latitude (g = 980.6199 gals.).

FO0859
FO0859.The modeled gravity was interpolated from observed gravity values.

FO0859
FO0859. The following values were computed from the NAD 83(2011) position.

FO0859
FO0859;

	North	East	Units	Scale Factor	
Converg.					
FO0859;SPC NM W	- 468,000.797	822,598.192	MT	0.99991734	-0 02
48.8					
FO0859;SPC NM W	- 1,535,432.61	2,698,807.57	sFT	0.99991734	-0 02
48.8					
FO0859;UTM 13	- 3,901,344.975	234,709.780	MT	1.00046744	-1 40
54.9					

FO0859
FO0859!
FO0859!SPC NM W - Elev Factor x Scale Factor = Combined Factor
FO0859!UTM 13 - 0.99968900 x 0.99991734 = 0.99960637
FO0859!UTM 13 - 0.99968900 x 1.00046744 = 1.00015630

FO0859
FO0859:
FO0859:SPC NM W - Primary Azimuth Mark Grid Az
FO0859:UTM 13 - TOLTEC AZ MK 303 31 39.7
FO0859:UTM 13 - TOLTEC AZ MK 305 09 45.8

FO0859
FO0859_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SBV3470901344(NAD 83)

FO0859
FO0859|-----

FO0859	PID	Reference Object	Distance	Geod. Az
FO0859				dddmsss.s
FO0859	CD4080	TOLTEC RM 1	6.452 METERS	00816
FO0859	FO1653	WINDMILL 7 MI N OF GRANTS	APPROX. 6.2 KM	0502507.5
FO0859	FO1612	LA MOSCA LOOKOUT HOUSE	APPROX. 29.2 KM	0830529.3
FO0859	FO1645	BLACK TANK 5 MI NW OF GRANTS	APPROX. 2.3 KM	0952659.5
FO0859	CD4081	TOLTEC RM 2	6.828 METERS	10920
FO0859	FO1644	SILVER TANK 4 MI NNW OF GRANTS	APPROX. 2.5 KM	1151928.6
FO0859	CD4079	TOLTEC AZ MK		3032850.9
FO0859	-----			
FO0859	SUPERSEDED SURVEY CONTROL			
FO0859	NAD 83(2007)-	35 13 12.35074(N)	107 54 52.70523(W)	AD(2002.00) 0
FO0859	ELLIP H (02/10/07)	1981.990 (m)		GP(2002.00)
FO0859	NAD 83(1992)-	35 13 12.35059(N)	107 54 52.70517(W)	AD() B
FO0859	ELLIP H (08/10/04)	1981.991 (m)		GP() 4
1	FO0859	NAD 83(1992)-	35 13 12.35077(N)	107 54 52.70498(W) AD() 1
FO0859	ELLIP H (12/21/93)	1982.103 (m)		GP() 4
1	FO0859	NAD 83(1986)-	35 13 12.35142(N)	107 54 52.70691(W) AD() 1
FO0859	NAD 27	- 35 13 12.22231(N)	107 54 50.49394(W)	AD() 1
FO0859	NAVD 88	2002.38 (m)	6569.5 (f)	LEVELING 3
FO0859	NGVD 29 (06/29/92)	2001.3 (m)	6566. (f)	VERT ANG
FO0859	NGVD 29 (07/19/86)	2001.3 (m)	6566. (f)	VERT ANG
FO0859	Superseded values are not recommended for survey control.			
FO0859	NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.			
FO0859	See file dsdata.pdf to determine how the superseded data were derived.			
FO0859	_MARKER: DS = TRIANGULATION STATION DISK			
FO0859	_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT			
FO0859	_STAMPING: TOLTEC 1945			
FO0859	_MARK LOGO: CGS			
FO0859	_PROJECTION: PROJECTING 10 CENTIMETERS			
FO0859	_MAGNETIC: N = NO MAGNETIC MATERIAL			
FO0859	_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO			
FO0859	+STABILITY: SURFACE MOTION			
FO0859	_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR			
FO0859	+SATELLITE: SATELLITE OBSERVATIONS - May 19, 2004			
FO0859	HISTORY - Date Condition Report By			
FO0859	HISTORY	- 1945	MONUMENTED	CGS
FO0859	HISTORY	- 1949	GOOD	USGS

FO0859	HISTORY	- 1971	GOOD	NMHD
FO0859	HISTORY	- 1982	GOOD	NGS
FO0859	HISTORY	- 19920108	GOOD	NGS
FO0859	HISTORY	- 20040519	GOOD	NMHD
FO0859	HISTORY	- 20050616	GOOD	INDIV

FO0859

FO0859

STATION DESCRIPTION

FO0859

FO0859'DESCRIBED BY COAST AND GEODETIC SURVEY 1945 (RAM)
 FO0859'STATION IS LOCATED ABOUT 6 MILES (AIR LINE) NW OF GRANTS,
 FO0859'5 MILES SE OF BLUEWATER, AND 0.3 MILE NNW OF SANTA FE RAILROAD
 FO0859'BLOCK SIGNAL 1012. IT IS ON THE NE SIDE OF U.S. HIGHWAY
 FO0859'66, AT ABOUT THE CENTER OF A CURVE IN THE HIGHWAY.

FO0859'

FO0859'TO REACH THE STATION FROM THE CITY HALL IN GRANTS, GO W AND
 FO0859'NW ON U.S. HIGHWAY 66 FOR 6.4 MILES TO STATION ON THE RIGHT (NE).

FO0859'

FO0859'STATION IS LOCATED 51 FEET SW OF THE CENTER OF THE MOST S
 FO0859'TRACKS OF THE ATCHISON, TOPEKA AND SANTA FE RAILWAY, 50-1/2
 FO0859'FEET SSE OF TELEPHONE POLE 3310, 50 FEET NE OF THE CENTER OF
 FO0859'U.S. HIGHWAY 66, AND 16 FEET SW OF THE SW RAILROAD RIGHT-OF-WAY
 FO0859'FENCE. IT IS MARKED BY A BRONZE STATION STAMPED TOLTEC
 FO0859'1945 AND SET IN THE TOP OF A SQUARE CONCRETE POST WHICH PROJECTS
 FO0859'6 INCHES ABOVE THE GROUND. AN UNDERGROUND MARK, A BRONZE
 FO0859'STATION DISK, IS SET IN CONCRETE 30 INCHES BELOW THE SURFACE
 FO0859'OF THE GROUND.

FO0859'

FO0859'REFERENCE MARK 1 IS N OF THE STATION AND ABOUT 1-1/2 FEET
 FO0859'LOWER. IT IS 2-1/2 FEET SW OF THE SW RAILROAD RIGHT-OF-WAY
 FO0859'FENCE. IT IS A BRONZE REFERENCE DISK STAMPED TOLTEC NO
 FO0859'1 1945 AND IS SET IN THE TOP OF A SQUARE CONCRETE POST WHICH
 FO0859'PROJECTS 1/2 FOOT ABOVE THE GROUND.

FO0859'

FO0859'REFERENCE MARK 2 IS ESE OF THE STATION AND ABOUT 1-1/2 FEET
 FO0859'LOWER. IT IS 1-1/2 FEET SW OF THE SW RAILROAD RIGHT-OF-WAY
 FO0859'FENCE. IT IS A BRONZE REFERENCE DISK STAMPED TOLTEC NO 2
 FO0859'1945 AND IS SET IN THE TOP OF A SQUARE CONCRETE POST WHICH
 FO0859'PROJECTS 1/2 FOOT ABOVE THE GROUND.

FO0859'

FO0859'AZIMUTH MARK IS LOCATED 0.3 MILE WNW OF THE STATION, ABOUT
 FO0859'100 YARDS WSW OF U.S. HIGHWAY 66, 34 FEET WSW OF THE NEAREST
 FO0859'EDGE OF AN OLD QUARRY PIT, AND 4-1/2 FEET SE OF A 4-INCH
 FO0859'SQUARE WHITE WITNESS POST. IT IS ON THE CREST OF A LOW RIDGE.
 FO0859'IT IS A BRONZE AZIMUTH DISK STAMPED TOLTEC 1945 AND CEMENTED
 FO0859'IN A DRILL HOLE IN BEDROCK. IT IS FLUSH WITH THE GROUND.

FO0859

FO0859

STATION RECOVERY (1949)

FO0859

FO0859'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1949
 FO0859'DESCRIPTION AND POSITION LISTED IN NGS QUAD 35107-3, STATION 1024.

FO0859'

FO0859'RECOVERED BY USGS IN 1949 AS DESCRIBED.

FO0859'

FO0859'STATION MARK--A BRONZE STATION STAMPED---TOLTEC 1945--- AND SET IN
 FO0859'THE TOP OF A SQUARE CONCRETE POST WHICH PROJECTS 6 IN. ABOVE THE
 FO0859'GROUND.

FO0859

FO0859 STATION RECOVERY (1971)
FO0859
FO0859'RECOVERY NOTE BY NM HIGHWAY DEPT 1971
FO0859'TOLTEC 1945-GOOD
FO0859
FO0859 STATION RECOVERY (1982)
FO0859
FO0859'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1982
FO0859'10.4 KM (6.45 MI) NW FROM GRANTS.
FO0859'10.4 KM (6.45 MI) NORTHWESTERLY ALONG THE SANTA FE RAILROAD FROM THE
FO0859'RAILROAD STATION IN GRANTS, 0.1 KM (0.05 MI) SOUTHEAST OF MILEPOST
FO0859'102, 16.2 METERS (53.1 FT) SOUTHWEST OF THE NEAR RAIL, 15.3 METERS
FO0859'(50.2 FT) NORTHEAST OF THE CENTER OF A TRACK ROAD AND 3.7 METERS
(12.1
FO0859'FT) SOUTHWEST OF THE EDGE OF A RAILROAD CUT.
FO0859'THE MARK IS 2.5 METERS S FROM A WITNESS POST.
FO0859'THE MARK IS 1.2 M ABOVE THE TRACKS.
FO0859
FO0859 STATION RECOVERY (1992)
FO0859
FO0859'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1992
FO0859'STATION IS LOCATED ABOUT 9.6 KM (6.0 MI) NORTHWEST OF GRANTS, 8.0 KM
FO0859'(5.0 MI) SOUTHEAST OF BLUEWATER, ON THE NORTHEAST SIDE OF AND ABOUT
FO0859'THE CENTER OF A CURVE IN STATE HIGHWAY 122 (OLD U.S. HIGHWAY 66).
FO0859'OWNERSHIP--NEW MEXICO DEPARTMENT OF TRANSPORTATION.
FO0859'TO REACH THE STATION FROM EXIT 79 ON INTERSTATE HIGHWAY 40, GO
FO0859'EASTERLY ON PAVED ROAD FOR 0.40 KM (0.25 MI) TO THE T-JUNCTION WITH
FO0859'STATE HIGHWAY 122. TURN LEFT, NORTHWESTERLY, ON HIGHWAY 122 FOR 4.42
FO0859'KM (2.75 MI) TO THE STATION ON THE RIGHT.
FO0859'STATION IS 55.6 M (182.4 FT) NORTHEAST FROM THE CENTER OF NORTHBOUND
FO0859'LANES OF HIGHWAY 122, 15.2 M (49.9 FT) NORTHEAST FROM CENTER OF OLD
FO0859'HIGHWAY BED, 14.8 M (48.6 FT) SOUTHWEST FROM THE SOUTHWESTERNMOST
FO0859'RAIL OF THE TRAIN TRACKS AND 3.0 M (9.8 FT) SOUTHWEST FROM A METAL
FO0859'WITNESS POST.
FO0859
FO0859 STATION RECOVERY (2004)
FO0859
FO0859'RECOVERY NOTE BY NM HIGHWAY DEPT 2004 (EM)
FO0859'THE STATION IS LOCATED ABOUT 6 MI NORTHWEST OF GRANTS AND 4 MI
FO0859'SOUTHEAST OF BLUEWATER ALONG NM-1220. OWNERSHIP--NEW MEXICO
FO0859'DEPARTMENT OF TRANSPORTATION, TELEPHONE 800-432-4269, 1120 CERRILLOS
FO0859'ROAD, SANTA FE NM 87504-1149.
FO0859'
FO0859'FROM INTERSTATE-40 EXIT 79 IN GRANTS-MILAN, GO NORTHEAST FOR 0.3 MI
TO
FO0859'THE JUNCTION WITH NM-122. TURN LEFT, NORTHWEST, ON NM-122 AND GO
4.5
FO0859'MI TO THE STATION ON THE RIGHT ON THE SOUTHWEST EDGE OF A RAILROAD
FO0859'CUT.
FO0859'
FO0859'THE STATION IS SET IN THE TOP OF A SQUARE CONCRETE POST. THE STATION
FO0859'IS APPROXIMATELY 60 M NORTHEAST OF THE CENTERLINE OF NM-122 AND
FO0859'APPROXIMATELY 15 M SOUTHWEST OF THE SANTA FE RAILROAD TRACKS.
FO0859
FO0859 STATION RECOVERY (2005)
FO0859
FO0859'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2005 (BHI)

FO0859'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:03

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.4
1      National Geodetic Survey,  Retrieval Date = FEBRUARY  2, 2018
DR0764
*****
DR0764 DESIGNATION - WALKER
DR0764 PID - DR0764
DR0764 STATE/COUNTY- NM/CHAVES
DR0764 COUNTRY - US
DR0764 USGS QUAD - MELENA (1982)
DR0764
DR0764 *CURRENT SURVEY CONTROL
DR0764
-----
DR0764* NAD 83(1992) POSITION- 33 30 14.04034(N) 104 26 04.91078(W)
ADJUSTED
DR0764* NAVD 88 ORTHO HEIGHT - 1086.817 (meters) 3565.67 (feet)
ADJUSTED
DR0764
-----
DR0764 GEOID HEIGHT - -23.271 (meters)
GEOID12B
DR0764 LAPLACE CORR - 0.54 (seconds)
DEFLEC12B
DR0764 DYNAMIC HEIGHT - 1085.356 (meters) 3560.87 (feet) COMP
DR0764 MODELED GRAVITY - 979,255.4 (mgal) NAVD
88
DR0764
DR0764 HORZ ORDER - FIRST
DR0764 VERT ORDER - FIRST CLASS II
DR0764
DR0764.The horizontal coordinates were established by classical geodetic
methods
DR0764.and adjusted by the National Geodetic Survey in December 1993.
DR0764.
DR0764.The orthometric height was determined by differential leveling and
DR0764.adjusted by the NATIONAL GEODETIC SURVEY
DR0764.in June 1991.
DR0764
DR0764.Significant digits in the geoid height do not necessarily reflect
accuracy.
DR0764.GEOID12B height accuracy estimate available here.
DR0764
DR0764.The Laplace correction was computed from DEFLEC12B derived
deflections.
DR0764
DR0764.The dynamic height is computed by dividing the NAVD 88
DR0764.geopotential number by the normal gravity value computed on the
DR0764.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DR0764.degrees latitude (g = 980.6199 gals.).
DR0764
DR0764.The modeled gravity was interpolated from observed gravity values.
```

DR0764

DR0764. The following values were computed from the NAD 83(1992) position.

DR0764

DR0764; North East Units Scale Factor

Converg.

DR0764;SPC NM E - 277,640.107 155,582.266 MT 0.99991018 -0 03
21.4

DR0764;SPC NM E - 910,890.92 510,439.48 sFT 0.99991018 -0 03
21.4

DR0764;UTM 13 - 3,707,294.603 552,506.321 MT 0.99963399 +0 18
43.4

DR0764

DR0764! - Elev Factor x Scale Factor = Combined Factor

DR0764!SPC NM E - 0.99983306 x 0.99991018 = 0.99974325

DR0764!UTM 13 - 0.99983306 x 0.99963399 = 0.99946711

DR0764

DR0764: Primary Azimuth Mark Grid Az

DR0764:SPC NM E - MELENA 001 59 57.4

DR0764:UTM 13 - MELENA 001 37 52.6

DR0764

DR0764_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SET5250607294(NAD 83)

DR0764

DR0764|-----

DR0764| PID Reference Object Distance Geod. Az

DR0764| dddmmss.s

DR0764| DR0854 MELENA APPROX. 4.1 KM 0015636.0

DR0764| CJ9208 WALKER AZ MK 0333735.7

DR0764| CJ9209 WALKER RM 1 31.254 METERS 12134

DR0764| DR0875 ROSWELL COURTHOUSE DOME APPROX.14.4 KM 2142421.1

DR0764| CJ9210 WALKER RM 2 41.368 METERS 21452

DR0764|-----

DR0764

SUPERSEDED SURVEY CONTROL

DR0764

DR0764 NAD 83(1986)- 33 30 14.04486(N) 104 26 04.90632(W) AD() 1

DR0764 NAD 27 - 33 30 13.70000(N) 104 26 03.01700(W) AD() 1

DR0764 NGVD 29 (12/31/91) 1086.9 (m) 3566. (f) VERT ANG

DR0764

DR0764.Superseded values are not recommended for survey control.

DR0764

DR0764.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

DR0764.See file [dsdata.pdf](#) to determine how the superseded data were derived.

DR0764

DR0764_MARKER: DS = TRIANGULATION STATION DISK

DR0764_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

DR0764_STAMPING: WALKER 1935

DR0764_MARK LOGO: CGS

DR0764_PROJECTION: PROJECTING 10 CENTIMETERS

DR0764_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY

DR0764

DR0764	HISTORY	- Date	Condition	Report By
DR0764	HISTORY	- 1935	MONUMENTED	CGS
DR0764	HISTORY	- 1961	GOOD	USGS
DR0764	HISTORY	- 1982	GOOD	NGS
DR0764	HISTORY	- 1982	GOOD	NGS

DR0764

STATION DESCRIPTION

DR0764

DR0764'DESCRIBED BY COAST AND GEODETIC SURVEY 1935 (WRP)
DR0764'THE STATION IS 7 MILES AIR LINE NORTH-NORTHEAST OF ROSWELL,
DR0764'1.4 MILES SOUTH OF YELLOW PLASTER HOUSE OF W.C. WALKER, 0.4
DR0764'MILE WEST OF THE A.T. AND S.F.R.R. TRACKS, ON A LOW RISE 66
DR0764'FEET WEST OF THE CENTER OF U.S. HIGHWAY 70, ON THE NORTH SIDE
DR0764'OF A WIDE DRAW AND 4 FEET EAST OF FENCE. TO REACH FROM ROSWELL,
DR0764'DRIVE NORTH AND EAST FROM THE COURTHOUSE 10.6 MILES
DR0764'ON U.S. HIGHWAY 70. THE SURFACE, UNDERGROUND, REFERENCE,
DR0764'AND AZIMUTH MARKS ARE STANDARD DISKS SET IN CONCRETE.
DR0764'REFERENCE MARK NO. 1 IS 36-1/2

DR0764'FEET EAST OF THE CENTER OF THE HIGHWAY AND 102.54 FEET
DR0764'FROM THE STATION S 58 DEG 26 MIN E, AND NO. 2 IS 59
DR0764'FEET WEST OF THE CENTER OF THE HIGHWAY, 77 FEET NORTH OF
DR0764'FENCE CORNER, 1 FOOT EAST OF FENCE, AND 135.72 FEET FROM
DR0764'THE STATION S 34 DEG 52 MIN W. THE AZIMUTH MARK IS
DR0764'74 FEET WEST OF THE CENTER OF THE HIGHWAY, 2 FEET EAST
DR0764'OF FENCE AND 0.5 MILE FROM THE STATION N 33 DEG 38 MIN E.

DR0764

STATION RECOVERY (1961)

DR0764

DR0764'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1961
DR0764'DESCRIPTION AND POSITION LISTED IN NGS QUAD 33104-1, STATION 1011.
DR0764'

DR0764'STATION RECOVERED AND INTERSECTED BY USGS IN 1948.

DR0764'

DR0764'RECOVERED BY USGS IN 1961 AND REVISED DESCRIPTION AS FOLLOWS

DR0764'

DR0764'TO REACH FROM COURTHOUSE IN ROSWELL, PROCEED N. ALONG U.S. HIGHWAY
285

DR0764'3.9 MI., THENCE RIGHT E. AND NE. ALONG OLD U.S. HIGHWAY 70 6.7 MI. TO
DR0764'STATION SITE AS ORIGINALLY DESCRIBED.

DR0764'

DR0764'STATION MARK--STANDARD USC AND GS DISK SET IN CONCRETE.

DR0764

STATION RECOVERY (1982)

DR0764

DR0764'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1982 (RHK)
DR0764'THE STATION, REFERENCE MARKS NO 1 AND NO 2 WERE RECOVERED IN GOOD
DR0764'CONDITION. THE AZIMUTH WAS NOT RECOVERED, THE MEASUREMENTS ARE
DR0764'ADEQUATE.

DR0764'

DR0764'TO REACH FROM THE WEST SIDE OF THE CHAVES COUNTY COURTHOUSE IN
DR0764'ROSWELL GO NORTH ON U.S. HIGHWAYS 285 AND 70 FOR 8.4 KM (5.2 MI) TO A
DR0764'FORK WHERE U.S. HIGHWAY 70 BEARS NORTHEAST, TAKE THE RIGHT FORK AND
DR0764'CONTINUE NORTHEAST ON U.S. HIGHWAY 70 FOR 1.8 KM (1.1 MI) TO A PAVED
DR0764'ROAD RIGHT, TURN RIGHT AND GO EAST FOR 3.7 KM (2.3 MI) TO A

DR0764'Y-JUNCTION, TURN LEFT AND GO NORTHEAST ON A PAVED ROAD (OLD
DR0764'ROSWELL-CLOVIS HIGHWAY FOR 3.9 KM (2.4 MI) TO THE STATION ON THE
LEFT.

DR0764

DR0764

STATION RECOVERY (1982)

DR0764

DR0764'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1982

DR0764'14.6 KM (9.1 MI) NE FROM ROSWELL.

DR0764'14.3 KM (8.9 MI) NORTHEASTERLY ALONG THE SANTA FE RAILROAD FROM THE

DR0764'RAILROAD STATION IN ROSWELL, THENCE 0.3 KM (0.2 MI) NORTHWEST ACROSS

A

DR0764'PASTURE TO THE OLD ROSWELL-CLOVIS HIGHWAY, 41.8 METERS (137.1 FT)

DR0764'NORTHEAST OF REFERENCE MARK 2, 31.4 METERS (103.0 FT) NORTHWEST OF

DR0764'REFERENCE MARK 1, 19.2 METERS (63.0 FT) NORTHWEST OF THE CENTERLINE

OF

DR0764'THE OLD HIGHWAY AND 1.1 METERS (3.6 FT) SOUTHEAST OF A FENCE.

DR0764'THE MARK IS 0.3 METERS NE FROM A WITNESS POST.

DR0764'THE MARK IS 0.6 M ABOVE THE HIGHWAY.

*** retrieval complete.

Elapsed Time = 00:00:02

The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.4

1 National Geodetic Survey, Retrieval Date = JANUARY 25, 2018

EP0186

EP0186 DESIGNATION - Y 76

EP0186 PID - EP0186

EP0186 STATE/COUNTY- NM/GUADALUPE

EP0186 COUNTRY - US

EP0186 USGS QUAD - PASTURA NE (1978)

EP0186

EP0186 *CURRENT SURVEY CONTROL

EP0186

EP0186* NAD 83(2011) POSITION- 34 58 16.05002(N) 104 47 31.78610(W) NO
CHECK

EP0186* NAD 83(2011) ELLIP HT- 1543.418 (meters) (06/27/12) NO
CHECK

EP0186* NAD 83(2011) EPOCH - 2010.00

EP0186* [NAVD 88](#) ORTHO HEIGHT - 1565.340 (meters) 5135.62 (feet)
ADJUSTED

EP0186

EP0186 GEOID HEIGHT - -21.916 (meters)

GEOID12B

EP0186 NAD 83(2011) X - -1,336,190.477 (meters) COMP

EP0186 NAD 83(2011) Y - -5,060,080.397 (meters) COMP

EP0186 NAD 83(2011) Z - 3,636,127.005 (meters) COMP

EP0186 LAPLACE CORR - -5.16 (seconds)

DEFLEC12B

EP0186 DYNAMIC HEIGHT - 1563.243 (meters) 5128.74 (feet) COMP

EP0186 MODELED GRAVITY - 979,239.8 (mgal) NAVD

88

EP0186

EP0186 VERT ORDER - SECOND CLASS 0

EP0186

EP0186 Network accuracy estimates per FGDC Geospatial Positioning Accuracy

EP0186 Standards:

EP0186	FGDC (95% conf, cm)	Standard deviation (cm)			CorrNE
EP0186	Horiz Ellip	SD_N	SD_E	SD_h	(unitless)

EP0186	-----	-----	-----	-----	-----		
EP0186	NETWORK	0.96	3.14	0.41	0.37	1.60	-0.01751705

EP0186

EP0186 Click [here](#) for local accuracies and other accuracy information.

EP0186

EP0186

EP0186.The horizontal coordinates were established by GPS observations

EP0186.and adjusted by the National Geodetic Survey in June 2012.

EP0186

EP0186.NAD 83(2011) refers to NAD 83 coordinates where the reference frame
has

EP0186.been affixed to the stable North American tectonic plate. See

EP0186.[NA2011](#) for more information.
EP0186
EP0186.The horizontal coordinates are valid at the epoch date displayed above
EP0186.which is a decimal equivalence of Year/Month/Day.
EP0186
EP0186.No horizontal observational check was made to the station.
EP0186.
EP0186.The orthometric height was determined by differential leveling and EP0186.adjusted by the NATIONAL GEODETIC SURVEY
EP0186.in June 1991.
EP0186
EP0186.Significant digits in the geoid height do not necessarily reflect accuracy.
EP0186.GEOID12B height accuracy estimate available [here](#).
EP0186
EP0186.[Photographs](#) are available for this station.
EP0186
EP0186.The X, Y, and Z were computed from the position and the ellipsoidal ht.
EP0186
EP0186.The Laplace correction was computed from DEFLEC12B derived deflections.
EP0186
EP0186.The ellipsoidal height was determined by GPS observations
EP0186.and is referenced to NAD 83.
EP0186
EP0186.The dynamic height is computed by dividing the NAVD 88
EP0186.geopotential number by the normal gravity value computed on the
EP0186.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
EP0186.degrees latitude (g = 980.6199 gals.).
EP0186
EP0186.The modeled gravity was interpolated from observed gravity values.
EP0186
EP0186. The following values were computed from the NAD 83(2011) position.
EP0186
EP0186;

	North	East	Units	Scale Factor	
Converg.					
EP0186;SPC NM E	- 440,471.293	123,103.243	MT	0.99993072	-0 15
46.8					
EP0186;SPC NM E	- 1,445,112.90	403,881.22	sFT	0.99993072	-0 15
46.8					
EP0186;UTM 13	- 3,869,860.668	518,972.162	MT	0.99960444	+0 07
08.9					

EP0186
EP0186!

	Elev Factor	x	Scale Factor	=	Combined Factor
EP0186!SPC NM E	- 0.99975779	x	0.99993072	=	0.99968853
EP0186!UTM 13	- 0.99975779	x	0.99960444	=	0.99936233

EP0186
EP0186_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SEU1897269860(NAD 83)
EP0186
EP0186

SUPERSEDED SURVEY CONTROL

EP0186
EP0186

EP0186	NAD 83(2007)-	34 58 16.04975(N)	104 47 31.78693(W)	AD(2002.00)	0
EP0186	ELLIP H (02/10/07)	1543.441 (m)		GP(2002.00)	
EP0186	NAD 83(1992)-	34 58 16.04963(N)	104 47 31.78663(W)	AD() B

EP0186 ELLIP H (08/10/04) 1543.447 (m) GP() 4
1
EP0186 NAVD 88 1565.34 (m) 5135.6 (f) LEVELING 3
EP0186 NGVD 29 (??/??/92) 1564.617 (m) 5133.25 (f) ADJ UNCH 2

0
EP0186
EP0186.Superseded values are not recommended for survey control.
EP0186
EP0186.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
EP0186.See file [dsdata.pdf](#) to determine how the superseded data were derived.

EP0186
EP0186_MARKER: DB = BENCH MARK DISK
EP0186_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
EP0186_STAMPING: Y 76 1934
EP0186_MARK LOGO: CGS
EP0186_PROJECTION: PROJECTING 25 CENTIMETERS
EP0186_MAGNETIC: N = NO MAGNETIC MATERIAL
EP0186_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
EP0186+STABILITY: SURFACE MOTION
EP0186_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
EP0186+SATELLITE: SATELLITE OBSERVATIONS - May 18, 2004

EP0186
EP0186 HISTORY - Date Condition Report By
EP0186 HISTORY - 1934 MONUMENTED CGS
EP0186 HISTORY - 20040518 GOOD NMHD

EP0186
EP0186 STATION DESCRIPTION
EP0186
EP0186'DESCRIBED BY COAST AND GEODETIC SURVEY 1934
EP0186'6.3 MI NW FROM SANTA ROSA.
EP0186'6.3 MILES NORTHWEST ALONG U. S. HIGHWAY 84 FROM SANTA ROSA, GUADALUPE
EP0186'COUNTY, 105 FEET NORTHWEST OF THE INTERSECTION OF STATE HIGHWAY 6,
100

EP0186'YARDS NORTHEAST OF A BUILDING, 96 FEET NORTH OF THE CENTERLINE OF U.
EP0186'S. HIGHWAY 84, 100 FEET NORTH OF A ROW OF POLES, AND 2 FEET SOUTH OF
A

EP0186'FENCE. A STANDARD DISK, SET IN THE TOP OF A CONCRETE POST.

EP0186
EP0186 STATION RECOVERY (2004)
EP0186

EP0186'RECOVERY NOTE BY NM HIGHWAY DEPT 2004 (JW)
EP0186'THE STATION IS LOCATED ABOUT 6 MILES WEST OF SANTA ROSA AND 0.2 MI
EP0186'NORTH OF INTERSTATE-40 AT EXIT 267. OWNERSHIP - UNKNOWN.
EP0186'

EP0186'TO REACH THE STATION FROM THE INTERSECTION OF INTERSTATE-40 AND OLD
EP0186'US-66 IN SANTA ROSA, GO WEST ON INTERSTATE-40 FOR 7.4 MI TO THE
EP0186'COLONIAS EXIT (EXIT 267). EXIT THE INTERSTATE AND PROCEED NORTH FOR
EP0186'0.15 MI ON A DEAD END PAVED ROAD TO THE STATION ON THE LEFT.
EP0186'

EP0186'THE STATION IS SET IN THE TOP OF A 25 CM SQUARE CONCRETE POST THAT
EP0186'PROJECTS 25 CM. THE STATION IS 36 M SOUTHEAST OF A 4-WIRE UTILITY
EP0186'POLE LOCATED ON THE WEST SIDE OF A FENCE, 28 M WEST OF THE
CENTERLINE

EP0186'OF A DEAD END ROAD, 17.7 M WEST OF A 5-STRAND RIGHT-OF-WAY BARBED
EP0186'WIRE FENCE. REMNANTS OF THE OLD BUILDING AND ROAD FROM THE 1934
EP0186'DESCRIPTION ARE STILL VISIBLE WEST OF THE STATION.