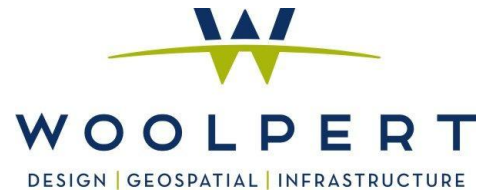
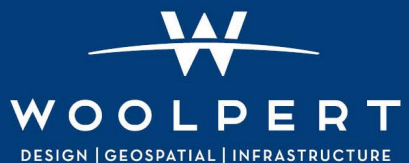


GROUND CONTROL SURVEY REPORT



RIO HONDO, NM LIDAR

1/12/2015





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SECTION 1: SURVEY REPORT

INTRODUCTION

Report Date: 7/15/2015

Project Name: Rio Hondo, NM LiDAR
Client Information: USGS / NGTOC
Contract Number: G10PC00057
Task Order: G14PD01094
Date of Contract: 10/8/2014
Delivery Date: 8/14/2015

Prepared By: David Kuxhausen, PLS
Woolpert Project Number: 74713

This report contains a comprehensive outline of the LiDAR Ground Control Survey that supported the Rio Hondo Watershed LiDAR project. All surveys were performed in such a way as to achieve ground control accuracies that meet or exceed the National Mapping Accuracy Standards.

PROJECT AREA

The project area consists of approximately 1,813 square miles of the Rio Hondo Watershed in New Mexico.

PURPOSE

The purpose of this survey was to establish three-dimensional coordinates for 23 ground control points (GCPs) and a minimum of 66 quality control (QC) points.

The GCPs were located on open, bare earth surfaces with a level slope to enable effective assessment of swath-to-swath reproducibility and absolute accuracy. The QC points were collected uniformly dispersed over the project area in the appropriate land cover categories to verify fundamental, supplemental, and consolidated vertical accuracies throughout the task order AOI.

DATE OF SURVEY

Ground control field operations took place January 6th 2015 thru January 14 2015.

MONUMENTATION

Prior to aerial imagery acquisition, Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing bench marks were utilized as checks to ensure that quality x, y, and z coordinate values were computed for each of the newly established photogrammetric control stations. Recovery information sheets for the existing NGS control stations can be found in Section 5 of this report. A control diagram showing the ground control stations used to support this LiDAR mapping project can be found in Section 6 of this report.

ACCURACY STANDARDS

The data collected under this task order shall meet the National Standard for spatial Database Accuracy (NSSDA) standards. The NSSDA standards specify that vertical accuracy be reported at the 95 percent confidence level for data tested by an independent source of higher accuracy.

The Fundamental Vertical Accuracy (FVA): 18.13 cm at a 95% confidence level, derived according to NSSDA, i.e., based on $RMSE_z$ of 9.25 cm in the “open terrain” land cover category.

The Supplemental Vertical Accuracy (SVA): The SVA will be reported for each of the land cover classes within the task order AOI. The target SVA is 26.9 cm at a 95th percentile level, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for Lidar Data, i.e., based on the 95th percentile error for each required land cover class.

The Consolidated Vertical Accuracy (CVA): 26.9 cm at a 95th percentile level, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for Lidar Data, i.e., based on the 95th percentile error in all land cover categories combined.

Automated and manual filtering for lidar products shall use the following minimum performance for artifact/feature removal from the bare earth model: The bare earth surface model shall have a minimum of 95% of surface canopy artifacts, including buildings, vegetation, bridges or overpass structures removed.

GPS EQUIPMENT

Woolpert utilized 3 Trimble Navigation R8 Model 3 GNSS dual-frequency GPS receivers with a Trimble TDL-450 radio as dual base stations. Additionally, Woolpert utilized a Trimble Navigation R8 Model 3 GNSS dual-frequency GPS receiver and a TSC3 data collector as a rover for this project.

METHODOLOGY

REAL-TIME KINEMATIC (RTK) GPS

The field crew utilized Real-Time Kinematic (RTK) GPS surveying throughout most of the ground control data collection process. Using RTK GPS techniques, observations were performed on a total of 23 LiDAR control points and 66 ground control quality check points. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting between 60 to 180 seconds. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this photogrammetric project.

FAST-STATIC GPS

In addition to the RTK GPS techniques, the project field crew utilized Fast-static GPS surveying techniques on the two temporary survey marks that were established within the project area using a 5-second epoch collection rate. This data was also utilized for the ABGPS.

Using Fast-Static GPS techniques, observations were performed on nine (9) Temporary control points. The survey was conducted at a 5-second sync rate with each observation lasting between 4-10 hours.

GPS DATA ANALYSIS AND PROCESSING

The field crew chief processed all session baselines each day using Trimble Navigation's Trimble Business Center (TBC) Version 3.21 baseline processor with the accompanying broadcast ephemeris. Daily processing ensured the integrity of the network as it was constructed, and allowed the field crews to immediately reschedule observations of poor baselines. Once the field work was complete, the processed baselines were then run through a rigorous loop closure analysis. As a result of this analysis, unacceptable GPS vectors were removed and field blunders, if any, were detected and eliminated. Once this process was completed, both unconstrained and constrained adjustments were conducted in order to effectively incorporate the static observation data.

The GPS base stations and constrained geodetic control stations consisted of the following:

Point Designation	NGS PID	Type	Constrained
1001	N/A	TSM	3d
1002	N/A	TSM	3d
1003	N/A	TSM	3d
1004	N/A	TSM	3d
1005	N/A	TSM	3d
1006	N/A	TSM	3d
1007	N/A	TSM	3d

Point Designation	NGS PID	Type	Constrained
1008	N/A	TSM	3d
1009	N/A	TSM	3d
NMRO	DG6517	CORS	HORZ
P027	DK7580	CORS	HORZ

Stations 1001 - 1009 were used as temporary control base stations. These points were established by utilizing the 5-second epoch static data that was collected during the project field mobilization mission. The raw data was sent to the NGS program "OPUS Projects" to establish the final coordinates.

DATUM REFERENCE AND FINAL COORDINATES

New horizontal GPS control within the New Mexico Watershed project area was based on the UTM Coordinate System Zone 13 North, referenced to North American Datum 1983, national re-adjustment of 2011 (NAD83/2011) epoch 2010.00, expressed in meters. All vertical control was based on the North American Vertical Datum of 1988 (NAVD88), also expressed in meters. These coordinates for the LiDAR control survey can be found in Section 2 of this report.

QUALITY ASSURANCE

Existing NGS published bench marks were surveyed to assure that there were no discrepancies in the field observation data. Close examinations of the residuals showed no distortions in orientation or scale.

The ground control data meets positional accuracies necessary to support 1.0 point per 0.3 meters squared (1' GSD) data at 95% confidence level as outlined in the *Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA)*, published by the Federal Geographic Data Committee (FGDC-STD-007.3-1998).

SECTION 2: GROUND/GEODETIC CONTROL COORDINATE LISTINGS

COORDINATE SYSTEM: GRID

HORIZONTAL DATUM: NAD83 2011 UTM Zone 13-N

VERTICAL DATUM: NAVD88

ZONE: 13-North

GEOID MODEL: GEOID 12A

UNITS: Meters

LiDAR GROUND CONTROL

Point No.	UTM Zone 13-North		Ortho Height (NAVD88) (m)	Description
	Northing (m)	Easting (m)		
101	3695499.783	554480.987	1059.212	LIDAR CTL
102	3703905.187	544321.029	1099.521	LIDAR CTL
103	3712545.473	518691.113	1274.291	LIDAR CTL
104	3673573.105	518353.823	1289.067	LIDAR CTL
105	3709764.241	484553.861	1627.990	LIDAR CTL
106	3688981.100	493557.351	1459.129	LIDAR CTL
107	3697078.915	467960.860	1655.766	LIDAR CTL
108	3695681.373	426655.323	2978.744	LIDAR CTL
109	3677365.730	435754.805	2298.911	LIDAR CTL
110	3691038.298	448947.230	1875.603	LIDAR CTL
111	3723401.884	448066.223	2021.654	LIDAR CTL
112	3698124.028	432723.494	2561.381	LIDAR CTL
113	3717105.842	446908.223	2029.377	LIDAR CTL
114	3710008.898	434899.231	2187.413	LIDAR CTL
115	3702791.692	439233.682	2161.187	LIDAR CTL
116	3676271.652	430858.964	2331.748	LIDAR CTL
117	3701138.213	521017.299	1236.537	LIDAR CTL
118	3684983.128	525062.792	1251.520	LIDAR CTL
119	3703090.504	449897.819	2066.930	LIDAR CTL
120	3677654.132	459879.169	2432.297	LIDAR CTL
120 B	3677653.577	459878.525	2434.803	LIDAR CTL
121	3709738.558	459150.805	1795.023	LIDAR CTL
122	3676398.714	475577.217	1891.262	LIDAR CTL

QUALITY CONTROL POINTS

Point No.	UTM Zone 13-North		Ortho Height (NAVD88) (m)	Description
	Northing (m)	Easting (m)		
2001	3692373.445	556394.639	1054.172	BARE EARTH
2002	3705665.652	546846.790	1094.469	BARE EARTH
2003	3710103.600	519830.801	1307.973	BARE EARTH
2004	3708438.736	503403.327	1372.971	BARE EARTH
2005	3711936.098	482986.613	1664.134	BARE EARTH
2006	3719731.591	447171.429	2103.941	BARE EARTH
2007	3707228.586	437650.955	2149.210	BARE EARTH
2008	3697920.952	438074.347	2212.227	BARE EARTH
2009	3694201.976	430417.777	2445.285	BARE EARTH
2010	3679791.522	434654.703	2217.994	BARE EARTH
2011	3690224.012	448549.249	1928.486	BARE EARTH
2012	3677650.351	459894.682	2434.946	BARE EARTH
2013	3690837.947	485109.343	1518.913	BARE EARTH
2014	3706729.634	462894.799	1770.697	BARE EARTH
2015	3682402.189	483474.468	1691.278	BARE EARTH
2016	3697968.970	502373.862	1388.489	BARE EARTH
2017	3692108.209	514801.156	1318.375	BARE EARTH
2018	3690897.294	538911.417	1115.157	BARE EARTH
2019	3701975.552	521001.658	1242.241	BARE EARTH
2020	3705368.369	480797.107	1704.518	BARE EARTH
2021	3690218.149	474501.543	1626.180	BARE EARTH
2022	3702695.479	536259.835	1149.173	BARE EARTH
4001	3692379.675	556366.212	1054.095	SAGE/STEPPE
4002	3705684.765	546814.713	1094.749	SAGE/STEPPE
4003	3710092.333	519802.409	1308.078	SAGE/STEPPE
4004	3708412.923	503419.597	1372.473	SAGE/STEPPE
4005	3711943.915	482963.270	1664.569	SAGE/STEPPE
4006	3719801.749	447152.949	2106.207	SAGE/STEPPE
4007	3707219.302	437637.182	2148.570	SAGE/STEPPE
4008	3697908.310	438126.984	2209.976	SAGE/STEPPE
4009	3694227.705	430427.522	2442.488	SAGE/STEPPE
4010	3679801.880	434629.757	2215.162	SAGE/STEPPE
4011	3690126.470	448644.526	1929.735	SAGE/STEPPE
4012	3677715.858	459899.063	2432.340	SAGE/STEPPE
4013	3690826.767	485132.005	1518.717	SAGE/STEPPE
4014	3706761.195	462895.987	1769.418	SAGE/STEPPE
4015	3682389.774	483454.322	1693.841	SAGE/STEPPE
4016	3697935.960	502379.961	1391.976	SAGE/STEPPE

Point No.	UTM Zone 13-North		Ortho Height (NAVD88) (m)	Description
	Northing (m)	Easting (m)		
4017	3692099.820	514769.614	1318.229	SAGE/STEPPE
4018	3690841.095	538896.734	1115.459	SAGE/STEPPE
4019	3701975.807	521023.900	1242.669	SAGE/STEPPE
4020	3705393.725	480795.734	1703.353	SAGE/STEPPE
4021	3690201.272	474512.058	1626.052	SAGE/STEPPE
4022	3702673.619	536240.457	1149.228	SAGE/STEPPE
5001	3692899.504	555911.185	1055.122	BRUSH/TREES
5002	3709769.895	484511.040	1631.213	BRUSH/TREES
5003	3695783.522	436492.654	2235.310	BRUSH/TREES
5004	3703400.970	437424.688	2187.950	BRUSH/TREES
5005	3711919.266	482981.865	1666.144	BRUSH/TREES
5006	3719760.449	447110.933	2106.517	BRUSH/TREES
5007	3707186.440	437583.226	2145.788	BRUSH/TREES
5008	3697845.578	438107.709	2214.445	BRUSH/TREES
5009	3694174.973	430450.668	2448.349	BRUSH/TREES
5010	3679777.548	434595.799	2215.978	BRUSH/TREES
5011	3690100.536	448649.314	1932.983	BRUSH/TREES
5012	3677678.826	459860.809	2431.562	BRUSH/TREES
5013	3690818.415	485101.224	1517.935	BRUSH/TREES
5014	3706720.056	462952.466	1768.378	BRUSH/TREES
5015	3682397.326	483520.937	1687.798	BRUSH/TREES
5016	3698016.031	502343.047	1384.526	BRUSH/TREES
5017	3694017.541	453924.007	1819.265	BRUSH/TREES
5018	3701891.606	448567.255	2079.124	BRUSH/TREES
5019	3722712.195	447986.664	2062.556	BRUSH/TREES
5020	3710696.640	467127.978	1935.179	BRUSH/TREES
5021	3684521.361	438756.883	2064.674	BRUSH/TREES
5022	3705608.524	439983.014	2114.737	BRUSH/TREES

CONTROL BASE STATIONS

Point No.	PID	UTM Zone 13-North		Ortho Height (NAVD88) (m)	Description
		Northing (m)	Easting (m)		
1001	N/A	3709060.332	484263.614	1629.172	TSM
1002	N/A	3706454.503	463186.226	1758.598	TSM
1003	N/A	3692146.169	480866.062	1546.642	TSM
1004	N/A	3692199.729	509496.361	1343.969	TSM
1005	N/A	3685325.304	438535.902	2243.085	TSM
1006	N/A	3696680.546	435400.708	2333.687	TSM
1007	N/A	3712243.708	444097.046	2037.821	TSM
1008	N/A	3698386.169	546411.556	1090.711	TSM
1009	N/A	3709914.130	515753.216	1308.388	TSM
NMRO	DG6517	3695148.388	538213.353	1118.891	CORS
P027	DK7580	3629607.054	424711.294	2918.379	CORS

NGS CONTROL BASE STATION CHECK POINTS

Woolpert Collection				
Designation	UTM Zone 13-North (m)		Elev. (m)	PID
	Northing (m)	Easting (m)		
A 144	3711374.830	483763.116	1642.657	DR0472
B 254	3689802.498	548262.326	1088.160	DR0090
WALKER	3707294.603	552506.321	1086.817	DR0764
WHITE	3692284.611	509346.949	1355.401	DR0324
X 50	3711655.049	449686.089	1901.641	DR0720
Z 24 RESET	3691011.583	503456.636	1446.472	DR0333
Z 50	3707893.862	461467.902	1774.114	DR0522

NGS Published Datasheet Positions				
Designation	UTM Zone 13-North (m)		Elev. (m)	PID
	Northing (m)	Easting (m)		
A 144	3711352.401	483804.42	1642.7	DR0472
B 254	3689778.104	548282.56	1088.187	DR0090
WALKER	3707294.623	552506.368	1086.813	DR0764
WHITE	3692284.609	509346.960	1355.432	DR0324
X 50 GPS	3711680.364	449861.125	1901.623	DR0720
Z 24 RESET	3691013.574	503463.021	1446.470	DR0333
Z 50	3707873.972	461508.344	1774.117	DR0522

Grid Deltas

Grid Deltas UTM 13-N (m)		
Δ North (m)	Δ East (m)	Δ Elev. (m)
N/A	N/A	-0.043
N/A	N/A	-0.027
-0.020	-0.047	0.004
0.002	-0.011	-0.031
N/A	N/A	0.018
N/A	N/A	0.002
N/A	N/A	-0.003

COORDINATE SYSTEM: GEODETIC

HORIZONTAL DATUM: NAD83 (2011) Epoch 2010.00

VERTICAL DATUM: NAVD88

UNITS: Meters

DATE: 7/9/2014

LiDAR GROUND CONTROL

Point No.	Geodetic Coordinates NAD-83 2011 (2010.00)		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
101	33°23'50.71502"	-104°24'50.95482"	1035.928	LIDAR CTL
102	33°28'25.32178"	-104°31'22.75699"	1076.259	LIDAR CTL
103	33°33'08.59258"	-104°47'55.14384"	1251.487	LIDAR CTL
104	33°12'03.13406"	-104°48'11.08184"	1266.565	LIDAR CTL
105	33°31'38.47173"	-105°09'58.84099"	1606.472	LIDAR CTL
106	33°20'23.95307"	-105°04'09.24301"	1437.299	LIDAR CTL
107	33°24'45.24718"	-105°20'40.50666"	1635.360	LIDAR CTL
108	33°23'52.56683"	-105°47'19.28923"	2958.999	LIDAR CTL
109	33°13'59.96976"	-105°41'22.37085"	2279.142	LIDAR CTL
110	33°21'26.45789"	-105°32'55.42897"	1856.058	LIDAR CTL
111	33°38'57.12499"	-105°33'36.27402"	2001.816	LIDAR CTL
112	33°25'13.30768"	-105°43'25.05525"	2541.826	LIDAR CTL
113	33°35'32.49609"	-105°34'19.87858"	2009.627	LIDAR CTL
114	33°31'39.67445"	-105°42'03.91866"	2167.806	LIDAR CTL
115	33°27'46.26107"	-105°39'14.12206"	2141.666	LIDAR CTL
116	33°13'23.35716"	-105°44'31.22800"	2311.796	LIDAR CTL
117	33°26'58.03743"	-104°46'25.89679"	1213.756	LIDAR CTL
118	33°18'13.15182"	-104°43'50.81395"	1228.731	LIDAR CTL

Point No.	Geodetic Coordinates NAD-83 2011 (2010.00)		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
119	33°27'57.95128"	-105°32'21.06499"	2047.282	LIDAR CTL
120	33°14'13.53133"	-105°25'50.30493"	2412.570	LIDAR CTL
120 B	33°14'13.51323"	-105°25'50.32973"	2415.076	LIDAR CTL
121	33°31'35.22746"	-105°26'23.68627"	1775.035	LIDAR CTL
122	33°13'34.45479"	-105°15'43.60394"	1870.711	LIDAR CTL

QUALITY CONTROL POINTS

Point No.	Geodetic Coordinates NAD-83 2011 (2010.00)		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
2001	33°22'08.84842"	-104°23'37.58248"	1030.862	BARE EARTH
2002	33°29'22.09602"	-104°29'44.56700"	1071.190	BARE EARTH
2003	33°31'49.23016"	-104°47'11.14115"	1285.169	BARE EARTH
2004	33°30'55.81437"	-104°57'48.07221"	1350.572	BARE EARTH
2005	33°32'48.90704"	-105°10'59.75113"	1642.720	BARE EARTH
2006	33°36'57.79757"	-105°34'10.22748"	2084.166	BARE EARTH
2007	33°30'09.99318"	-105°40'16.54519"	2129.653	BARE EARTH
2008	33°25'07.87455"	-105°39'57.82395"	2192.715	BARE EARTH
2009	33°23'05.43491"	-105°44'53.23819"	2425.590	BARE EARTH
2010	33°15'18.49671"	-105°42'05.50408"	2198.215	BARE EARTH
2011	33°20'59.94969"	-105°33'10.66058"	1908.947	BARE EARTH
2012	33°14'13.41065"	-105°25'49.70493"	2415.218	BARE EARTH
2013	33°21'23.94588"	-105°09'36.17569"	1497.476	BARE EARTH
2014	33°29'58.01996"	-105°23'58.08919"	1750.555	BARE EARTH
2015	33°16'49.93780"	-105°10'38.87955"	1670.031	BARE EARTH
2016	33°25'15.86155"	-104°58'28.07851"	1366.247	BARE EARTH
2017	33°22'05.19747"	-104°50'27.21237"	1295.826	BARE EARTH
2018	33°21'23.70866"	-104°34'54.37620"	1092.028	BARE EARTH
2019	33°27'25.22757"	-104°46'26.43214"	1219.456	BARE EARTH
2020	33°29'15.51621"	-105°12'24.14878"	1683.268	BARE EARTH
2021	33°21'03.10285"	-105°16'26.56518"	1605.382	BARE EARTH
2022	33°27'47.13500"	-104°36'35.26150"	1126.025	BARE EARTH
4001	33°22'09.05607"	-104°23'38.68110"	1030.786	SAGE/STEPPE
4002	33°29'22.72167"	-104°29'45.80642"	1071.470	SAGE/STEPPE
4003	33°31'48.86620"	-104°47'12.24280"	1285.275	SAGE/STEPPE
4004	33°30'54.97602"	-104°57'47.44186"	1350.074	SAGE/STEPPE
4005	33°32'49.15952"	-105°11'00.65690"	1643.157	SAGE/STEPPE
4006	33°37'00.07221"	-105°34'10.95963"	2086.432	SAGE/STEPPE
4007	33°30'09.68885"	-105°40'17.07663"	2129.012	SAGE/STEPPE
4008	33°25'07.47503"	-105°39'55.78277"	2190.464	SAGE/STEPPE

Point No.	Geodetic Coordinates NAD-83 2011 (2010.00)		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
4009	33°23'06.27258"	-105°44'52.86818"	2422.793	SAGE/STEPPE
4010	33°15'18.82760"	-105°42'06.47085"	2195.383	SAGE/STEPPE
4011	33°20'56.79891"	-105°33'06.95442"	1910.197	SAGE/STEPPE
4012	33°14'15.53830"	-105°25'49.54603"	2412.611	SAGE/STEPPE
4013	33°21'23.58398"	-105°09'35.29816"	1497.279	SAGE/STEPPE
4014	33°29'59.04491"	-105°23'58.04784"	1749.276	SAGE/STEPPE
4015	33°16'49.53355"	-105°10'39.65760"	1672.596	SAGE/STEPPE
4016	33°25'14.78964"	-104°58'27.84265"	1369.734	SAGE/STEPPE
4017	33°22'04.92662"	-104°50'28.43353"	1295.681	SAGE/STEPPE
4018	33°21'21.88576"	-104°34'54.95305"	1092.331	SAGE/STEPPE
4019	33°27'25.23425"	-104°46'25.57050"	1219.884	SAGE/STEPPE
4020	33°29'16.33942"	-105°12'24.20394"	1682.102	SAGE/STEPPE
4021	33°21'02.55574"	-105°16'26.15663"	1605.253	SAGE/STEPPE
4022	33°27'46.42758"	-104°36'36.01538"	1126.080	SAGE/STEPPE
5001	33°22'26.02031"	-104°23'56.17329"	1031.818	BRUSH/TREES
5002	33°31'38.65310"	-105°10'00.50149"	1609.698	BRUSH/TREES
5003	33°23'58.14152"	-105°40'58.52179"	2215.771	BRUSH/TREES
5004	33°28'05.66836"	-105°40'24.35236"	2168.422	BRUSH/TREES
5005	33°32'48.36021"	-105°10'59.93413"	1644.731	BRUSH/TREES
5006	33°36'58.72374"	-105°34'12.58131"	2086.743	BRUSH/TREES
5007	33°30'08.61056"	-105°40'19.15949"	2126.231	BRUSH/TREES
5008	33°25'05.43419"	-105°39'56.51353"	2194.933	BRUSH/TREES
5009	33°23'04.56583"	-105°44'51.95772"	2428.655	BRUSH/TREES
5010	33°15'18.03016"	-105°42'07.77687"	2196.197	BRUSH/TREES
5011	33°20'55.95765"	-105°33'06.76385"	1913.445	BRUSH/TREES
5012	33°14'14.33073"	-105°25'51.01830"	2411.836	BRUSH/TREES
5013	33°21'23.31126"	-105°09'36.48868"	1496.498	BRUSH/TREES
5014	33°29'57.71618"	-105°23'55.85279"	1748.233	BRUSH/TREES
5015	33°16'49.78247"	-105°10'37.08275"	1666.549	BRUSH/TREES
5016	33°25'17.38994"	-104°58'29.27128"	1362.284	BRUSH/TREES
5017	33°23'04.00406"	-105°29'43.41307"	1799.612	BRUSH/TREES
5018	33°27'18.79657"	-105°33'12.36444"	2059.521	BRUSH/TREES
5019	33°38'34.71787"	-105°33'39.21742"	2042.731	BRUSH/TREES
5020	33°32'07.32755"	-105°21'14.55105"	1914.873	BRUSH/TREES
5021	33°17'52.93979"	-105°39'28.12150"	2045.031	BRUSH/TREES
5022	33°29'17.87242"	-105°38'45.77282"	2095.193	BRUSH/TREES

CONTROL BASE STATIONS

Point No.	PID	Geodetic Coordinates NAD-83 2011 (2010.00)		Ellipsoid Height (m)	Description
		Latitude (N)	Longitude (W)		
1001	N/A	33°31'15.60023"	-105°10'10.04913"	1607.677	TSM
1002	N/A	33°29'49.12273"	-105°23'46.75385"	1738.443	TSM
1003	N/A	33°22'06.18373"	-105°12'20.46333"	1525.431	TSM
1004	N/A	33°22'08.38519"	-104°53'52.49796"	1321.560	TSM
1005	N/A	33°18'18.99821"	-105°39'36.86250"	2223.439	TSM
1006	N/A	33°24'27.03222"	-105°41'41.02275"	2314.148	TSM
1007	N/A	33°32'54.11182"	-105°36'07.84644"	2018.163	TSM
1008	N/A	33°25'25.80144"	-104°30'02.78796"	1067.459	TSM
1009	N/A	33°31'43.32257"	-104°49'49.24430"	1285.666	TSM
NMRO	DG6517	33°23'41.83424"	-104°35'20.73727"	1095.737	CORS
P027	DK7580	32°48'06.67485"	-105°48'14.93505"	2897.760	CORS

SECTION 3: GROUND/GEODETIC CONTROL LOGS AND PHOTOS

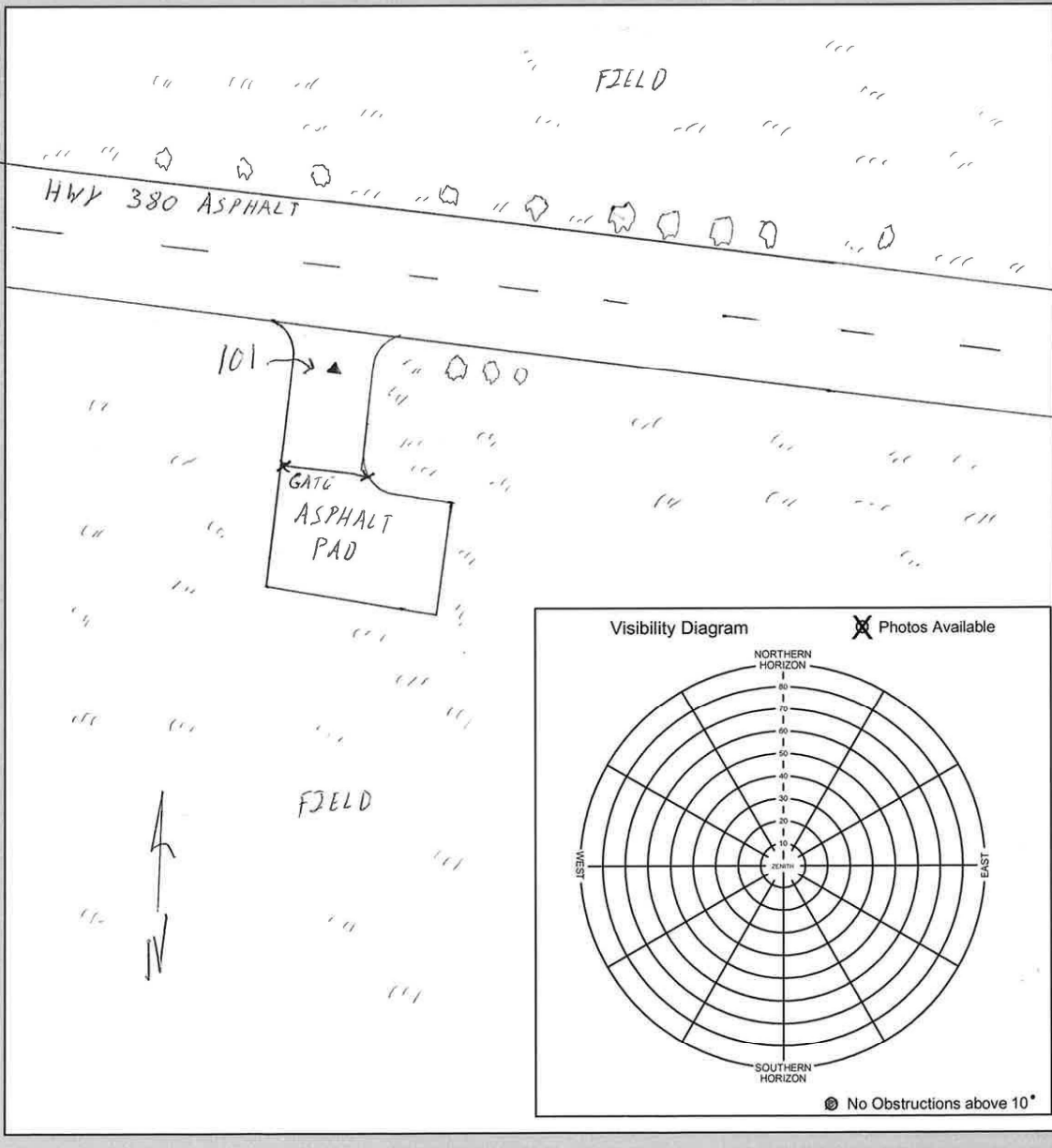
This section contains the station recovery information sheets and photographs for the ground control, geodetic control and checkpoint stations established for the project. The stations appear as they are ordered in the final coordinate listing of Section 2.

The data is assembled on the following pages.

LiDAR Survey - LiDAR Control



LiDAR Control point # 101	General location ROSWELL, NM	Ground Class
Latitude N 33° 23' 50.26"	Longitude W 104° 24' 50.98"	Calendar Date 1/15/2015
		Observer Initials CPR



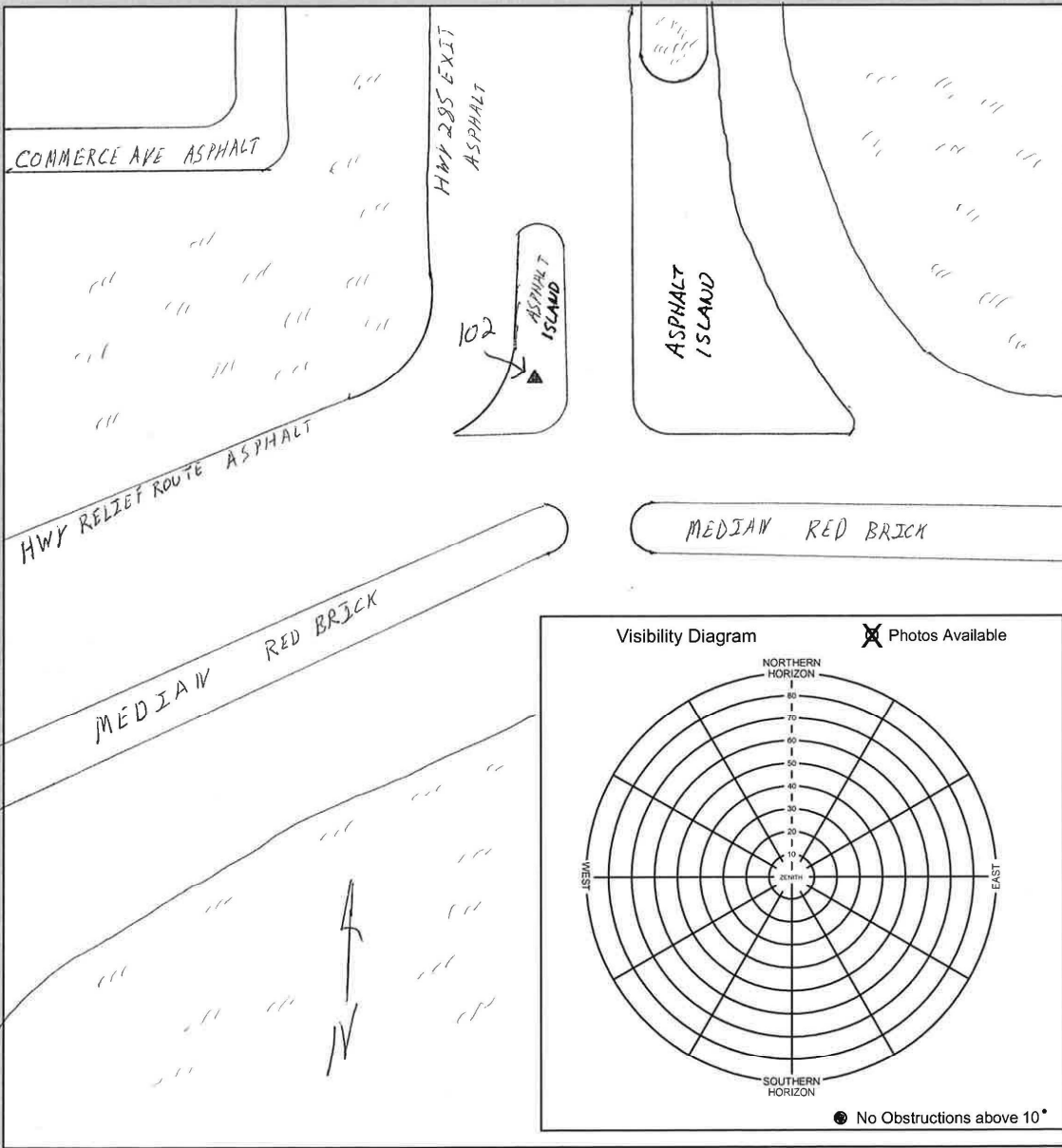


101, 2, 15JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 102	General location ROSWELL, NM	Ground Class
Latitude N 33° 28' 25"	Longitude W 104° 31' 22"	Calendar Date 1/15/2015
		Observer Initials CPR



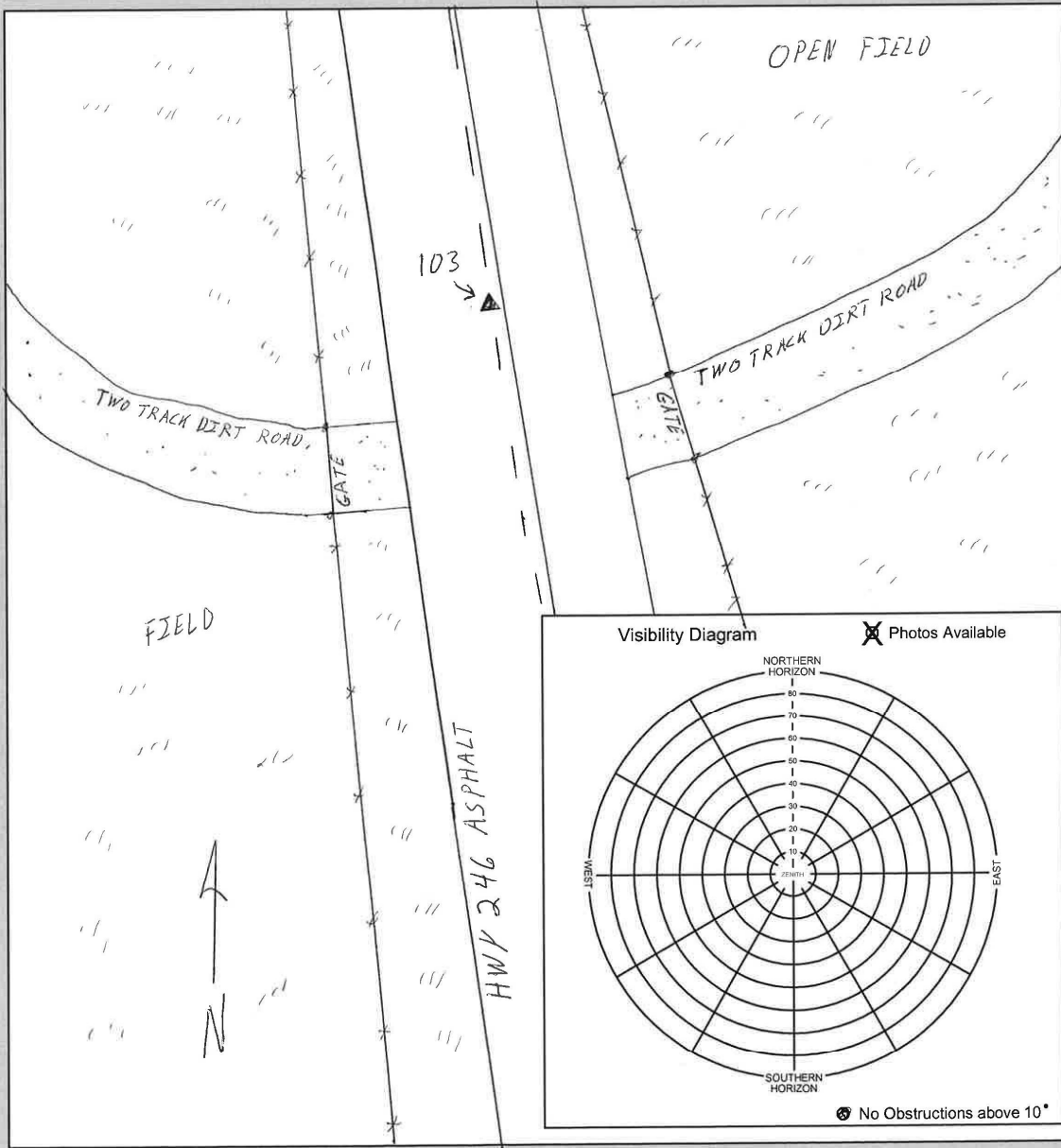


102, 2, 15JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 103	General location ROSWELL, NM	Ground Class
Latitude N33°33'8.99"	Longitude W104°47'54.99"	Calendar Date 1/14/2015
		Observer Initials CPR





103, 2, 14JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 104	General location ROSWELL, NM	Ground Class
Latitude N 33° 12' 2.89"	Longitude W 104° 48' 11.18"	Calendar Date 1/13/2015
		Observer Initials CPR

OPEN FIELD

N

104

OPEN FIELD

CR 145 RD GRAVEL

Visibility Diagram ✕ Photos Available

No Obstructions above 10'

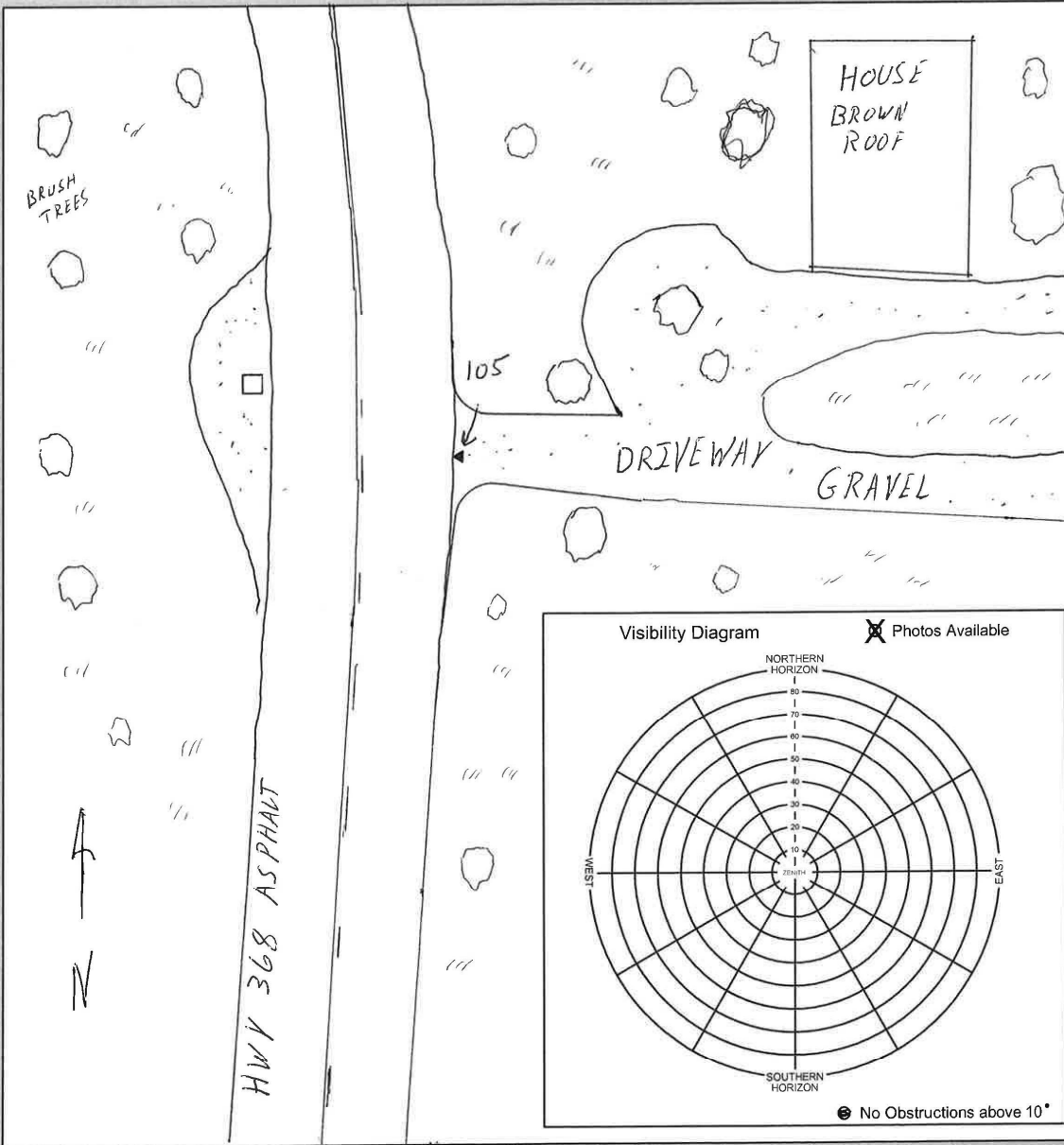


104, 2, 13JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 105	General location ROSWELL, NM	Ground Class
Latitude N 33° 31' 38.53"	Longitude W 105° 9' 59.45"	Calendar Date 1/19/2015
		Observer Initials CPR



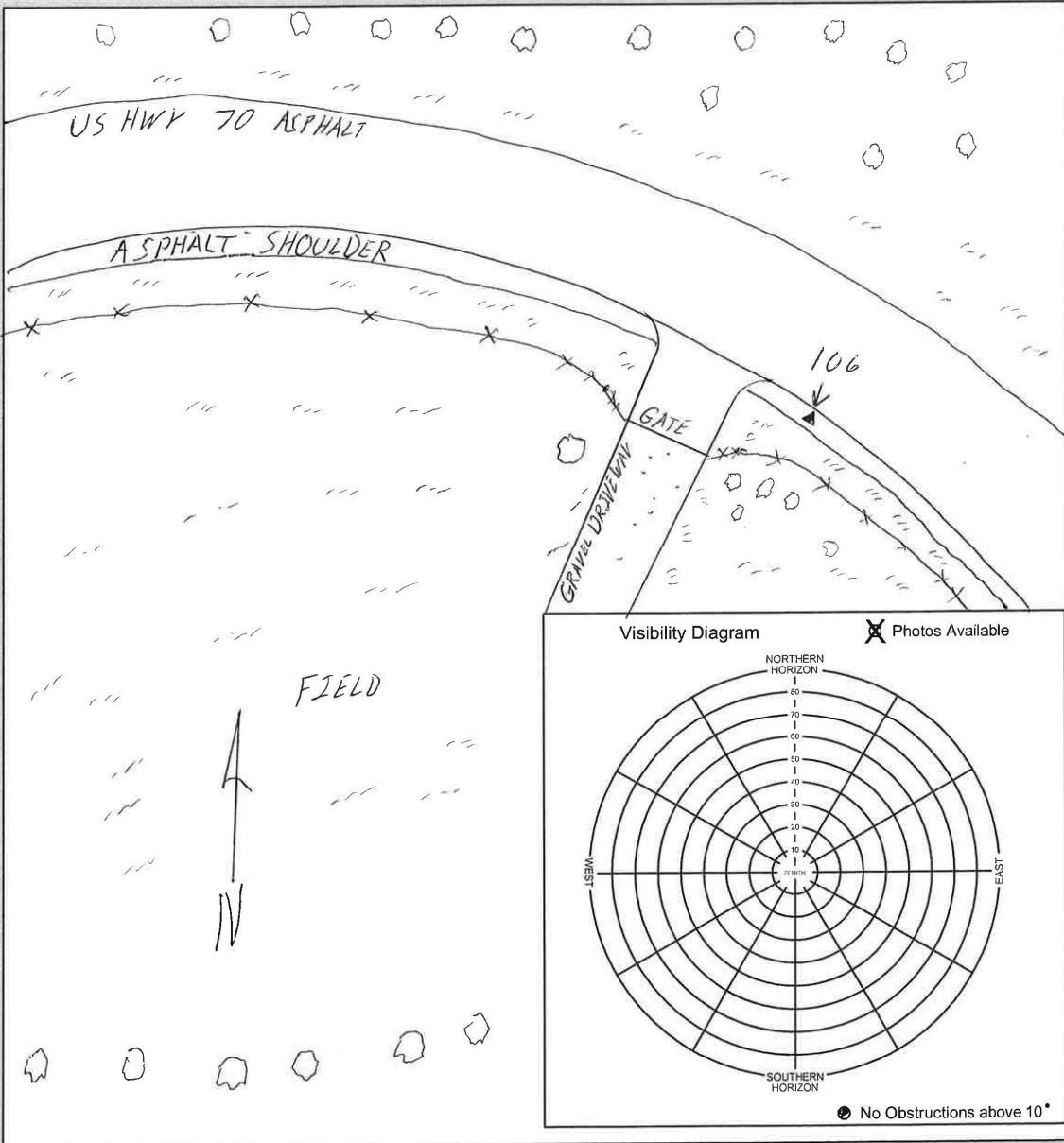


105, 2, 09JAN2015

LiDAR Survey - LiDAR Control



LIDAR Control point # 106	General location SUNSET, NM	Ground Class
Latitude N 33° 20' 23.91"	Longitude W 105° 4' 9.55"	Calendar Date 1/13/2015
Observer Initials CPR		



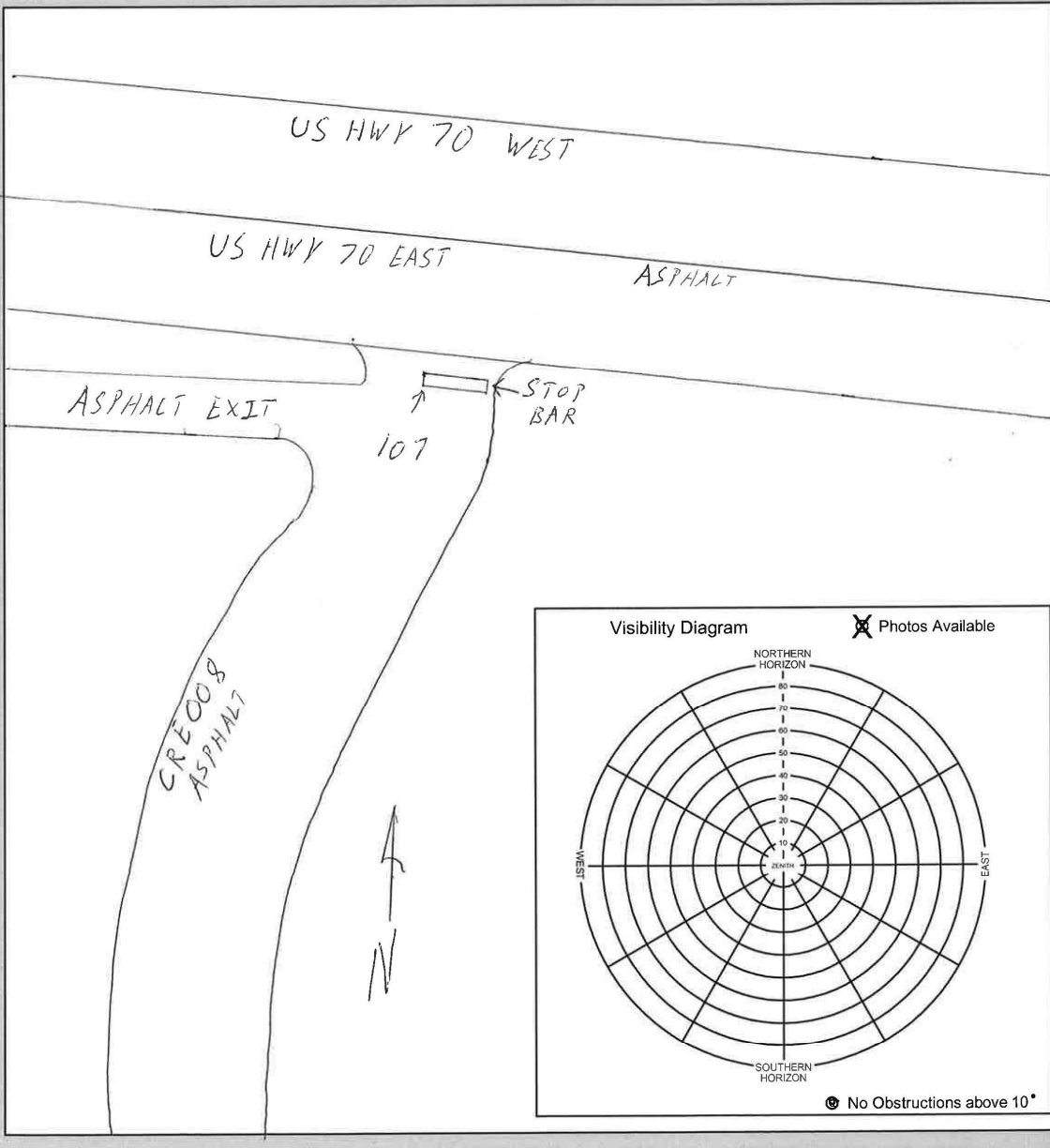


106, 2, 13JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 107	General location SAN PATRICIO, NM	Ground Class
Latitude N 33° 24' 45.16"	Longitude W 105° 20' 40.79"	Calendar Date 1/10/2015
		Observer Initials CPR



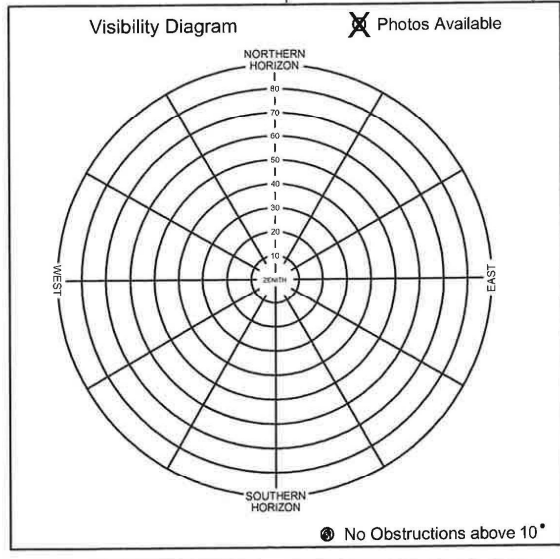
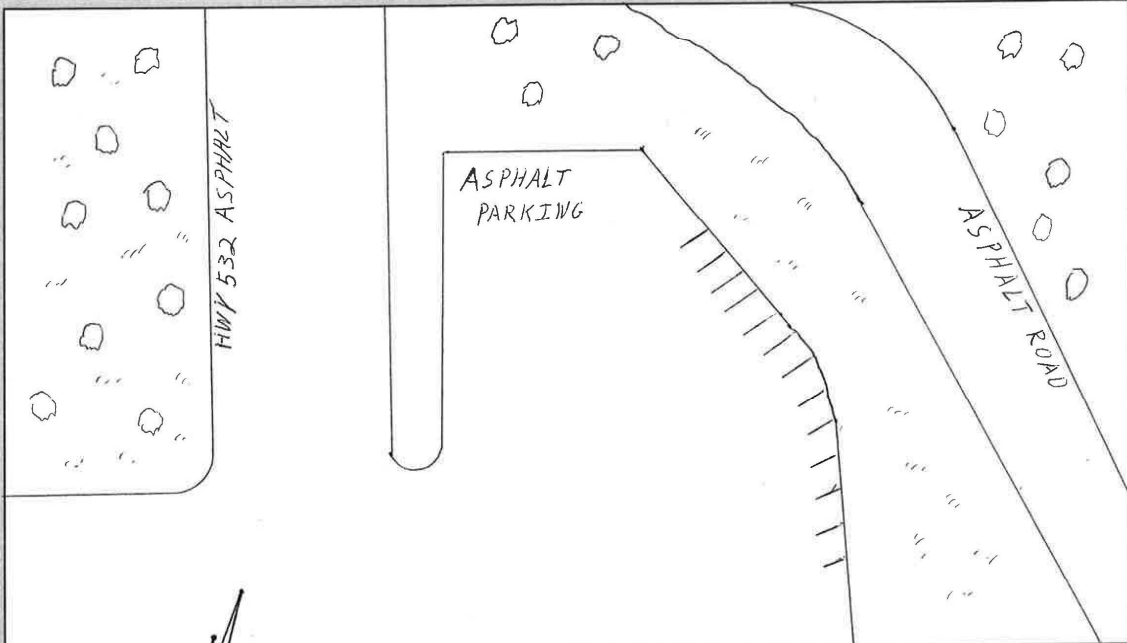


107, 2, 10JAN2015

LiDAR Survey - LiDAR Control



LIDAR Control point #	108	General location	SKI APACHE, NM	Ground Class	
Latitude	N 33° 23' 52.84"	Longitude	W 105° 47' 18.47"	Calendar Date	1/12/2015
				Observer Initials	CPR



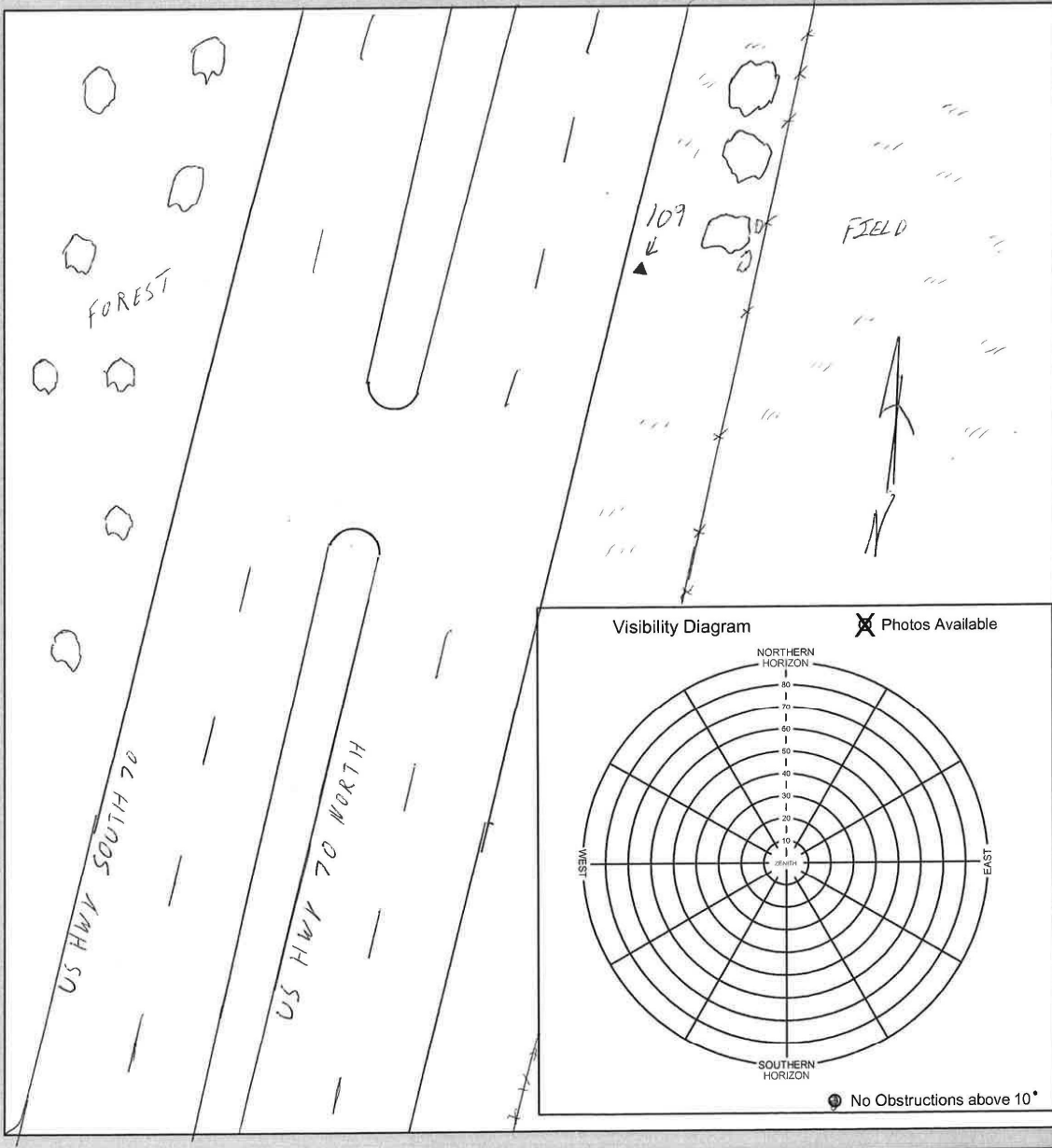


108, 2, 12JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 109	General location RUIDOSO, NM	Ground Class
Latitude N 33° 13' 59.11 "	Longitude W 105° 41' 23.49 "	Calendar Date 11/12/05
		Observer Initials CPR



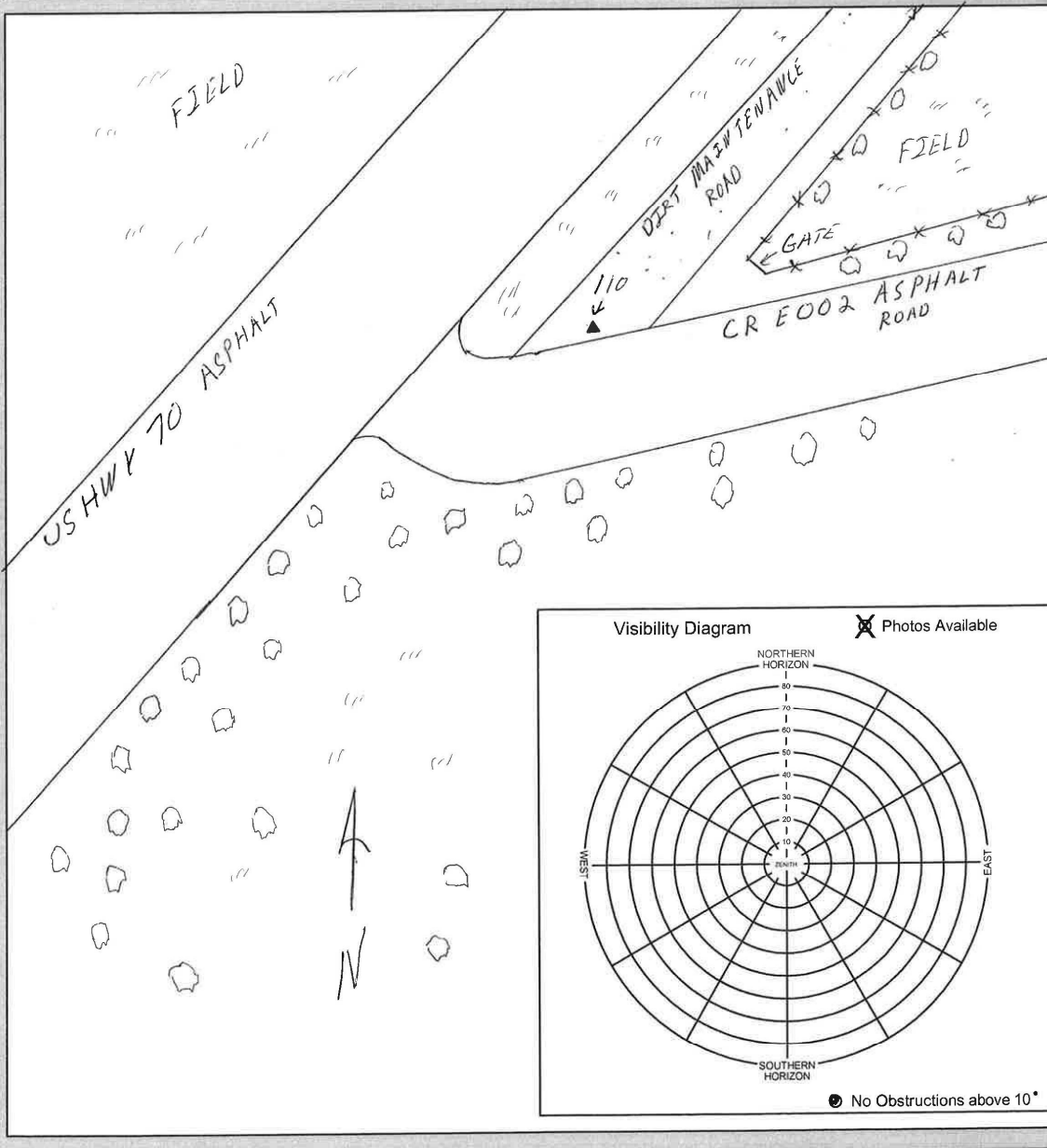


109, 2, 11JAN2015

LiDAR Survey - LiDAR Control



LIDAR Control point #	110	General location	RUIDOSO DOWNS, NM	Ground Class	
Latitude	N 33° 21' 26.87"	Longitude	W 105° 32' 55.65"	Calendar Date	11/2/2015
				Observer Initials	CPR



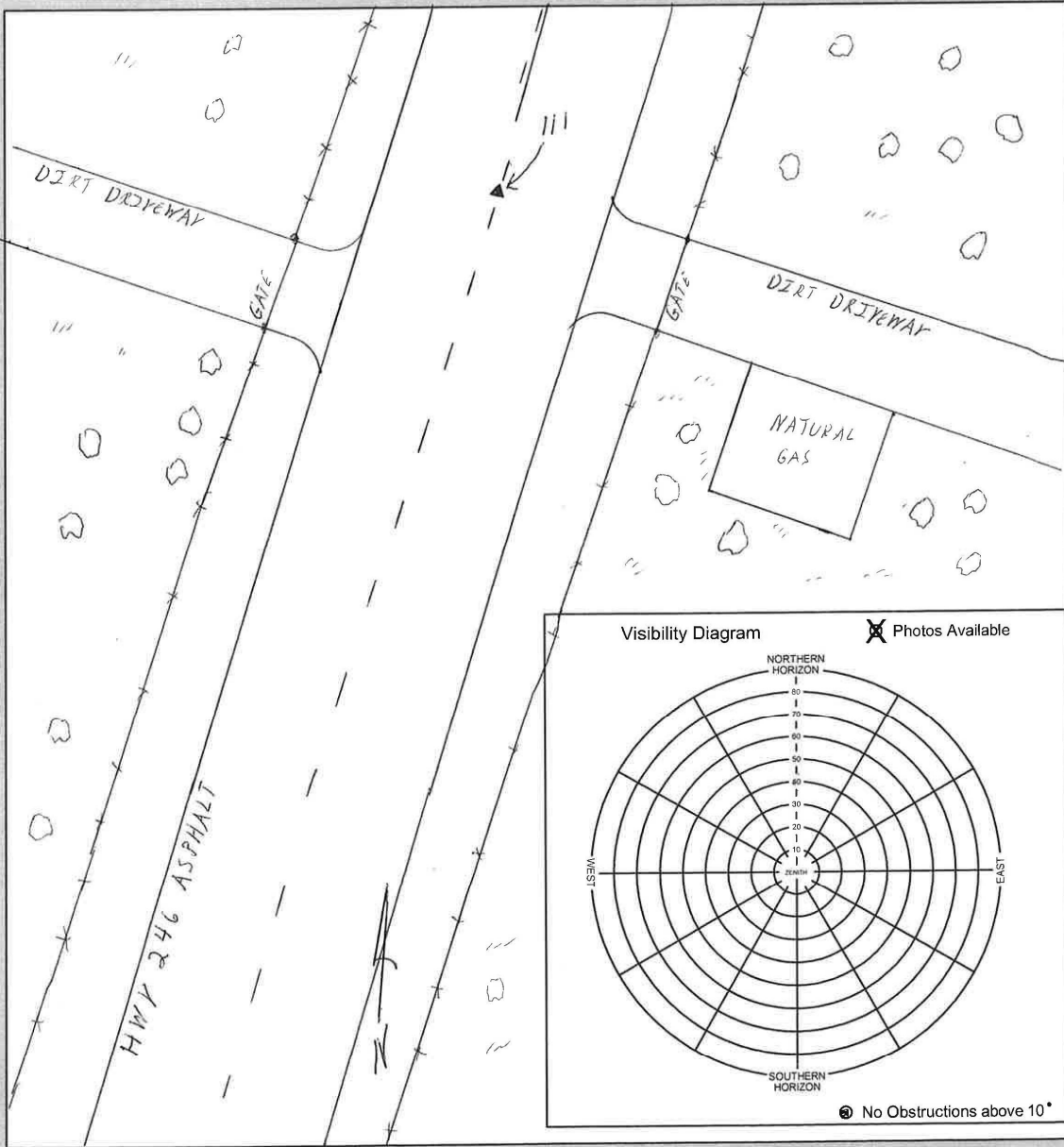


110, 2, 12JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point #	111	General location	CAPITAN, NM	Ground Class	
Latitude	N 33° 38' 57 "	Longitude	W 105° 33' 36.17 "	Calendar Date	1/13/2015
				Observer Initials	CPR



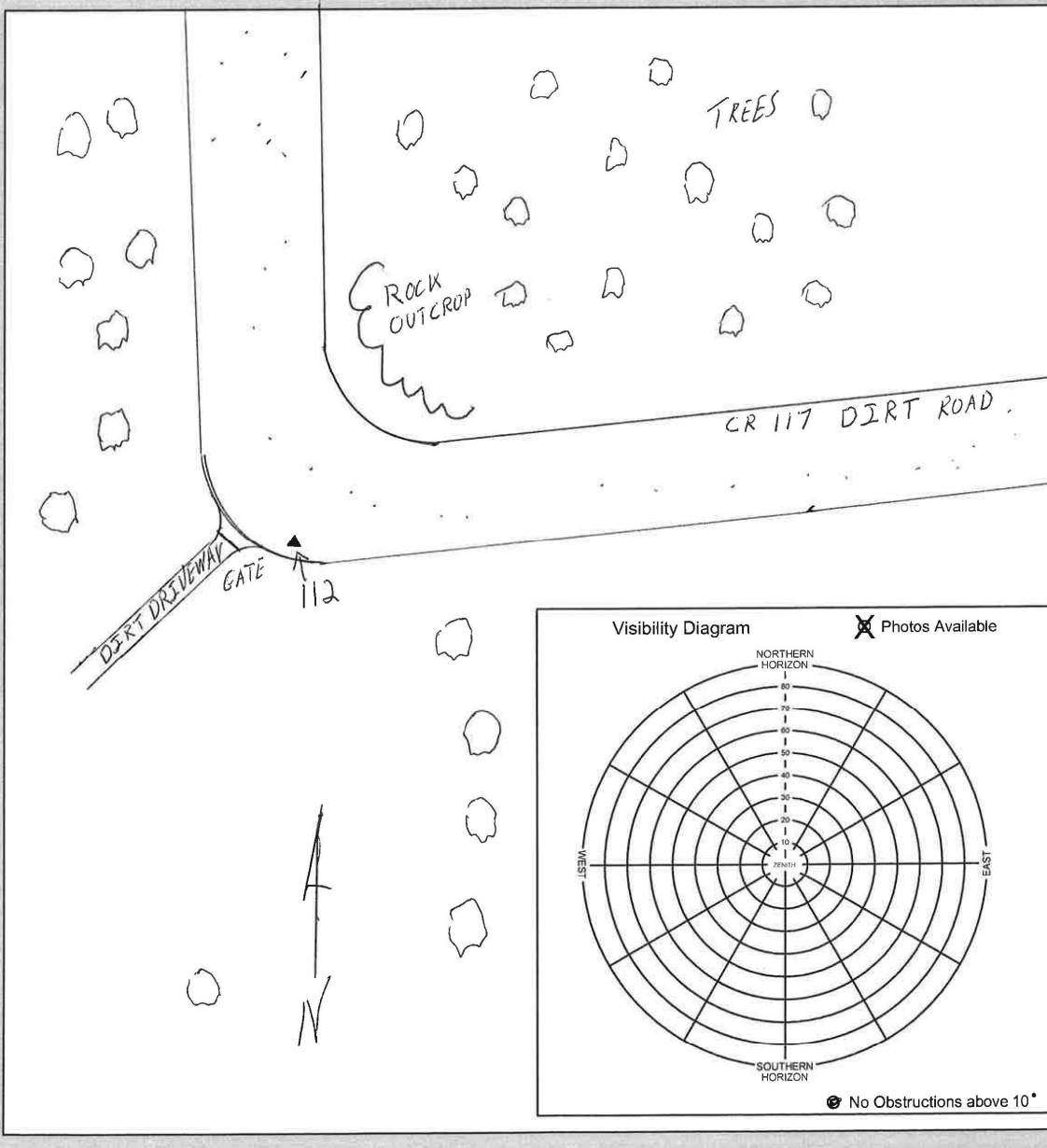


111, 2, 13JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point #	112	General location	ALTO, NM	Ground Class	
Latitude	N 33° 25' 14.67"	Longitude	W 105° 43' 25.74"	Calendar Date	1/12/2015
				Observer Initials	CPR



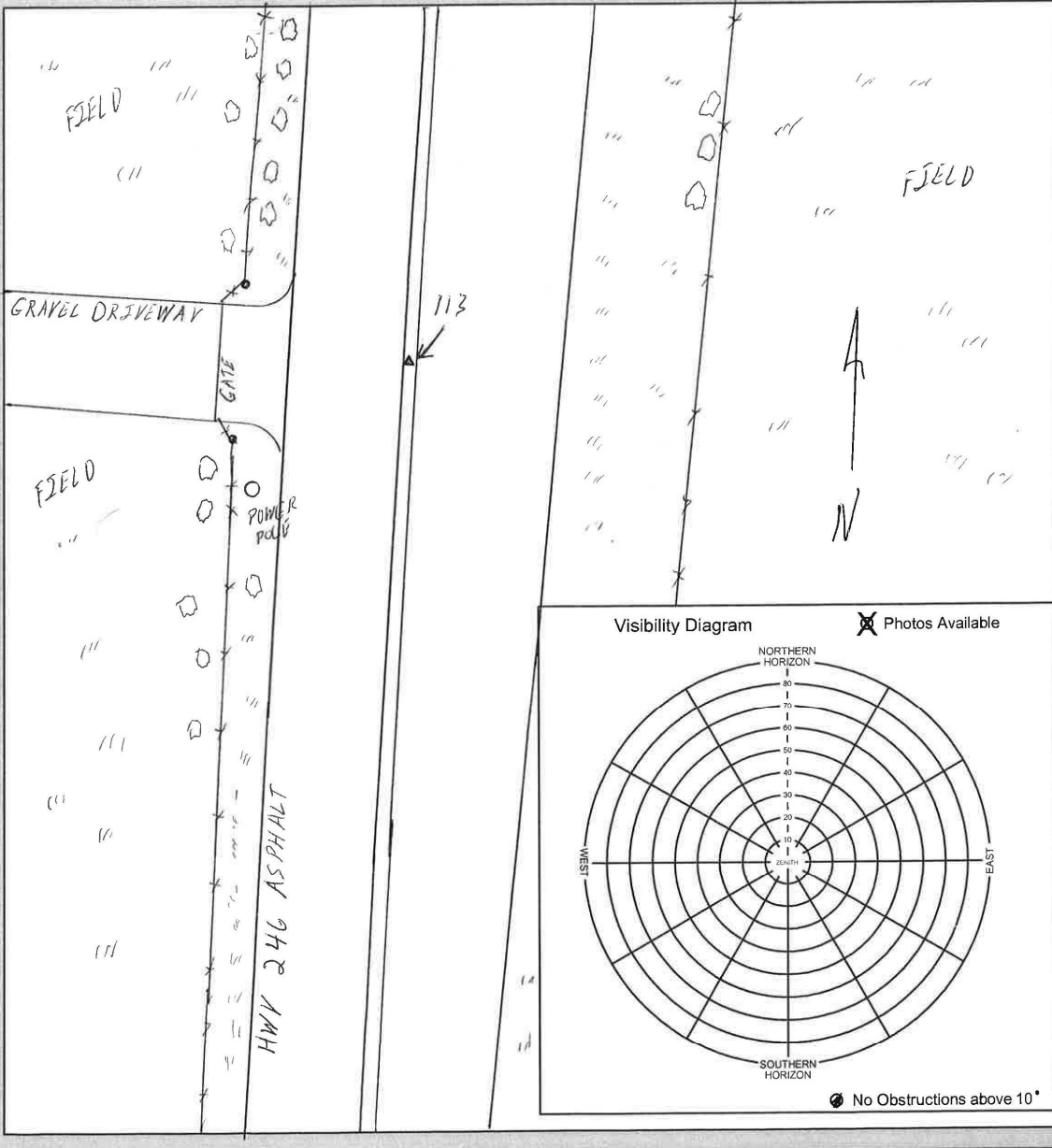


112, 2, 12JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point #	113	General location	CAPITAN, NM	Ground Class	
Latitude	N33° 35' 32.68"	Longitude	W105° 34' 20.24"	Calendar Date	1/13/2015
				Observer Initials	CPR



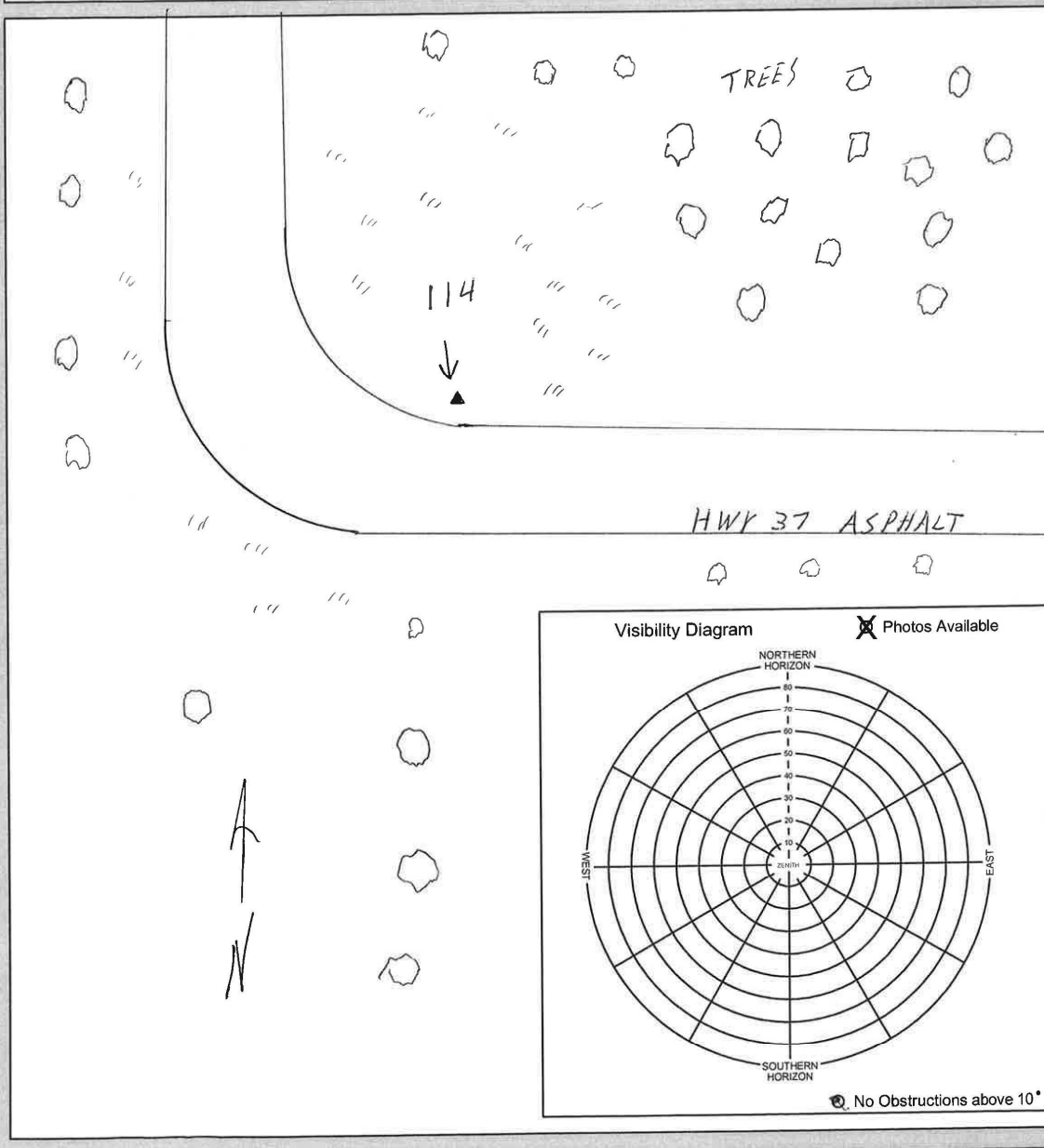


113, 2, 13JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 114	General location NOGAL, NM	Ground Class
Latitude N 33° 31' 39.78"	Longitude W 105° 42' 3.84 "	Calendar Date 1/12/2015
		Observer Initials CPR



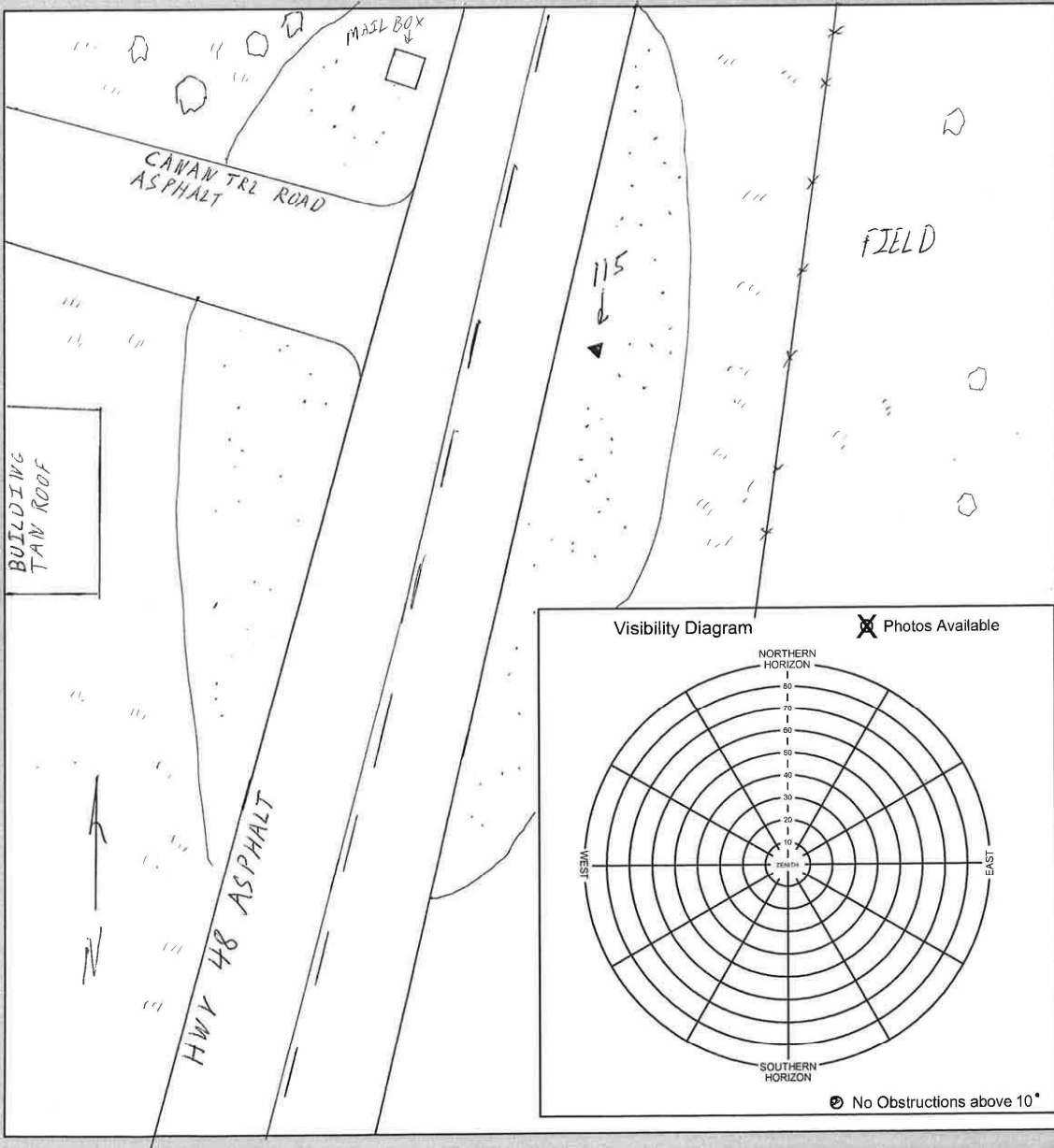


114, 2, 12JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 115	General location ANGUS, NM	Ground Class
Latitude N 33° 27' 46.91"	Longitude W 105° 39' 14.08"	Calendar Date 1/12/2015
		Observer Initials CPR



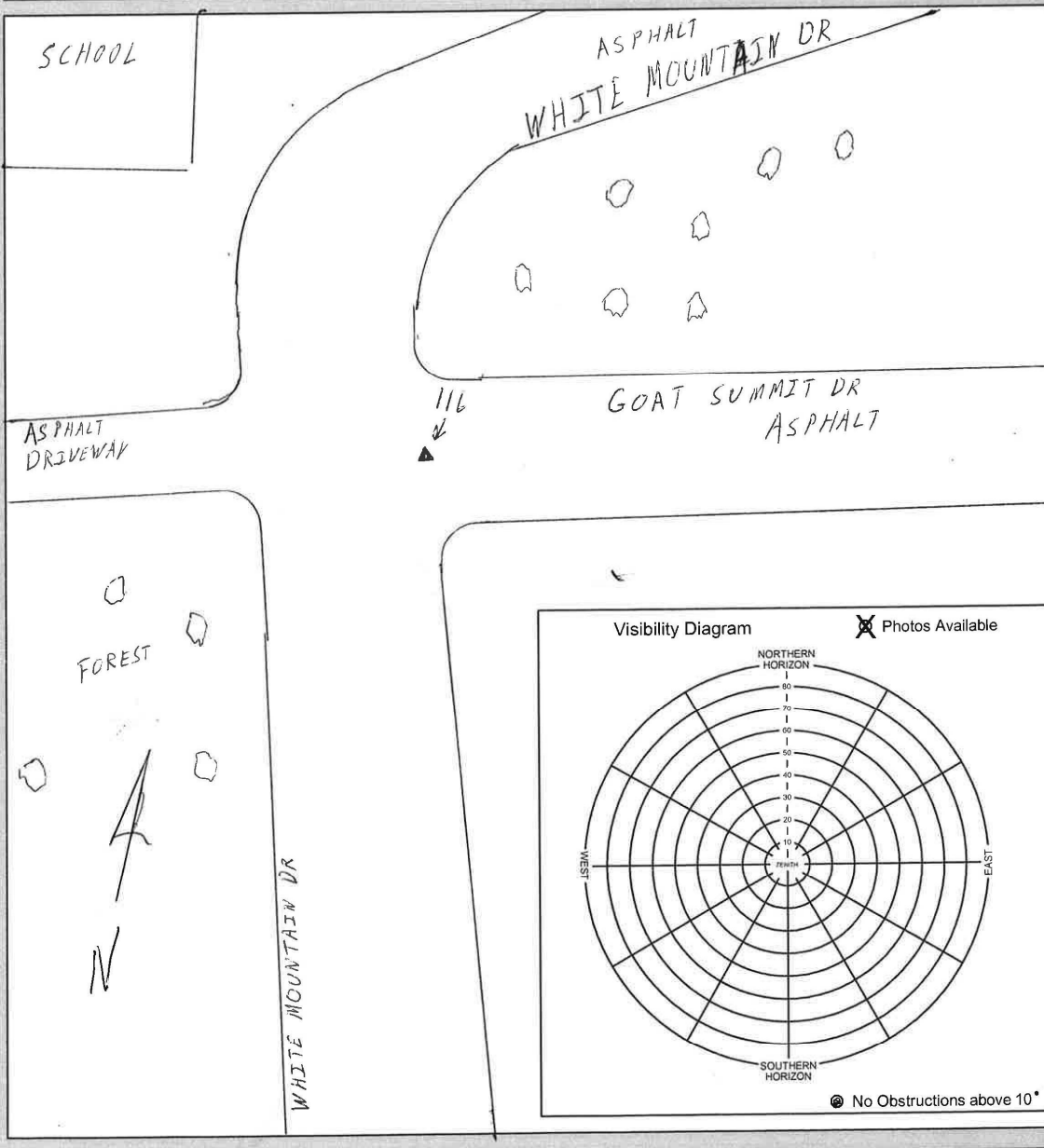


115, 2, 12JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 116	General location RUIDOSO, NM	Ground Class
Latitude N 33° 13' 23.08"	Longitude W 105° 44' 31.67"	Calendar Date 1/11/2015
		Observer Initials CPR



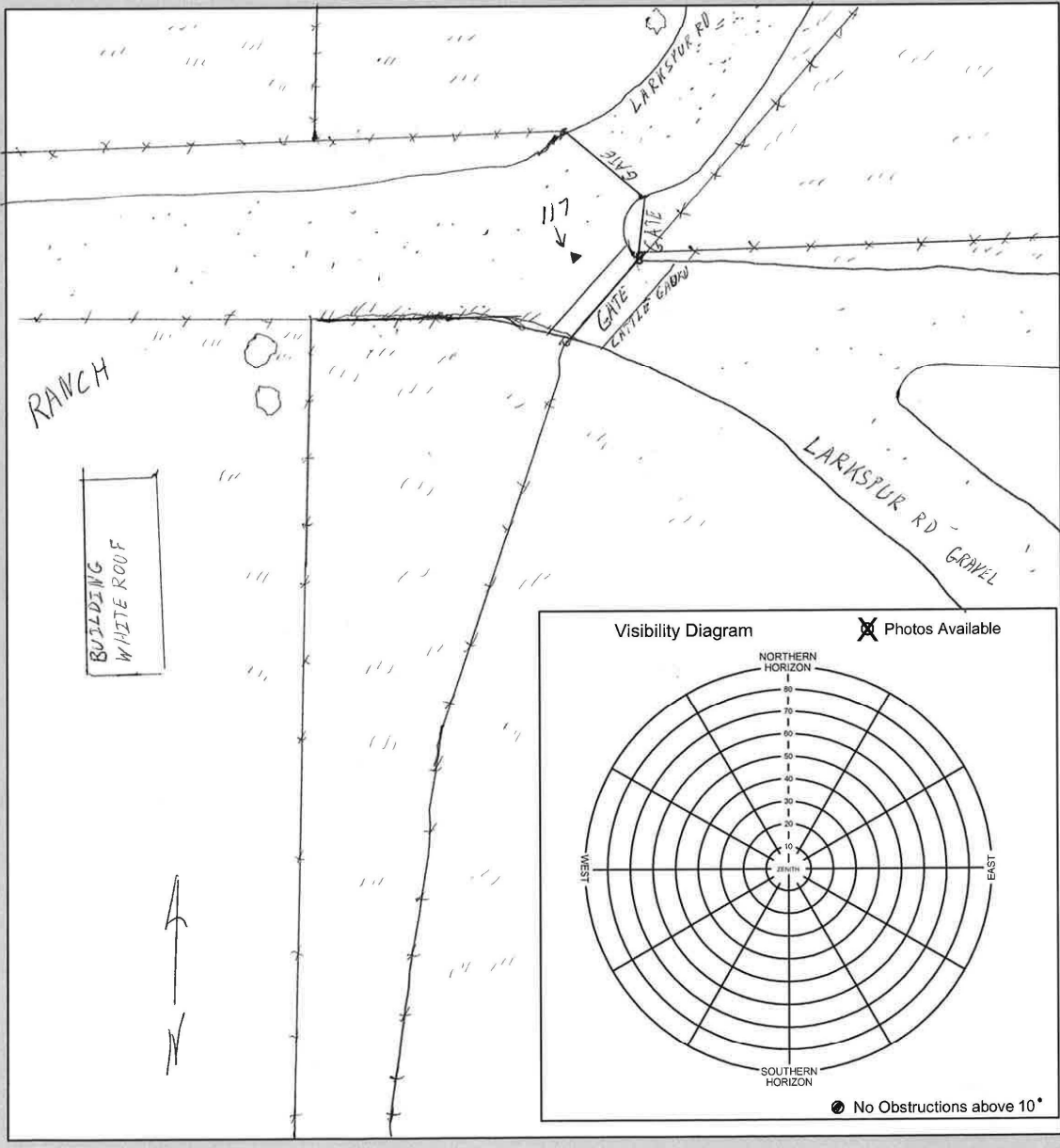


116, 2, 11JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point #	117	General location	ROSWELL, NM	Ground Class	
Latitude	N 33° 26' 58.04"	Longitude	W 104° 46' 26.00"	Calendar Date	11/4/2014
				Observer Initials	CPR



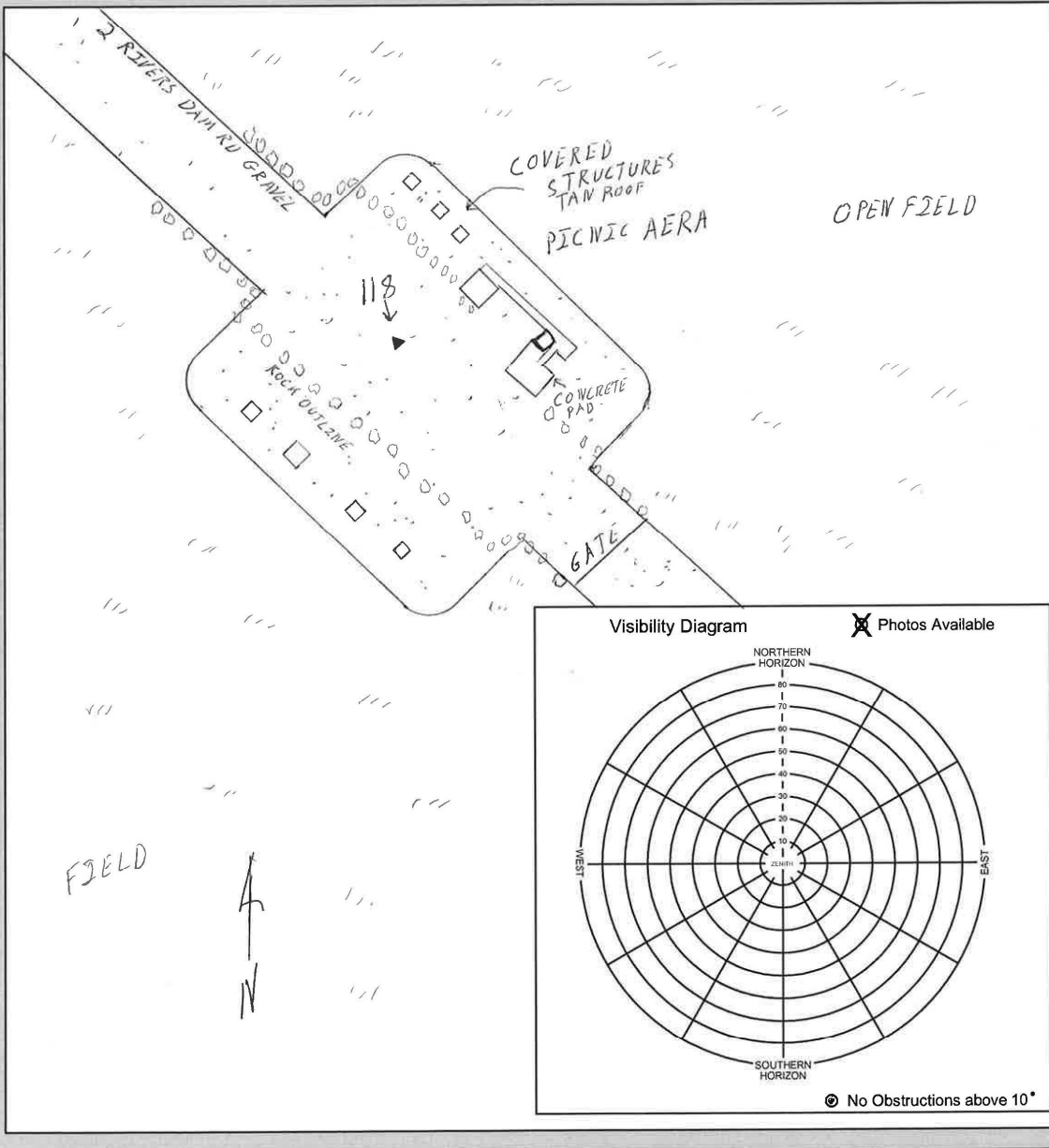


117, 2, 14JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 118	General location ROSWELL, NM	Ground Class
Latitude N 33° 18' 12.90"	Longitude W 104° 43' 50.55"	Calendar Date 1/14/2015
		Observer Initials CPR



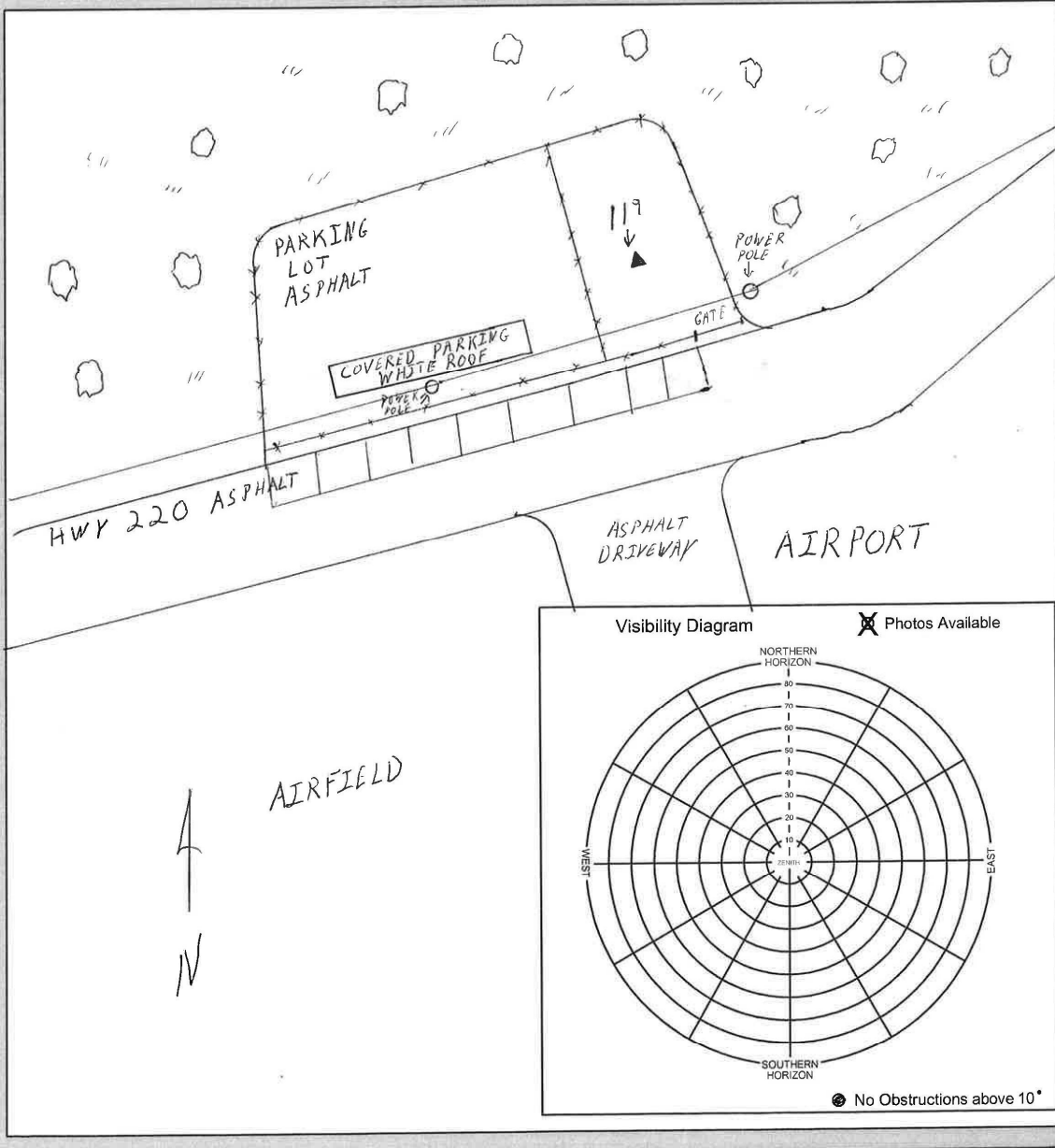


118, 2, 14JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 119	General location SIERRA BLANCA REGIONAL AIRPORT, NM	Ground Class
Latitude N 33° 27' 58.08"	Longitude W 105° 32' 20.69"	Calendar Date 1/11/2015
		Observer Initials CPR



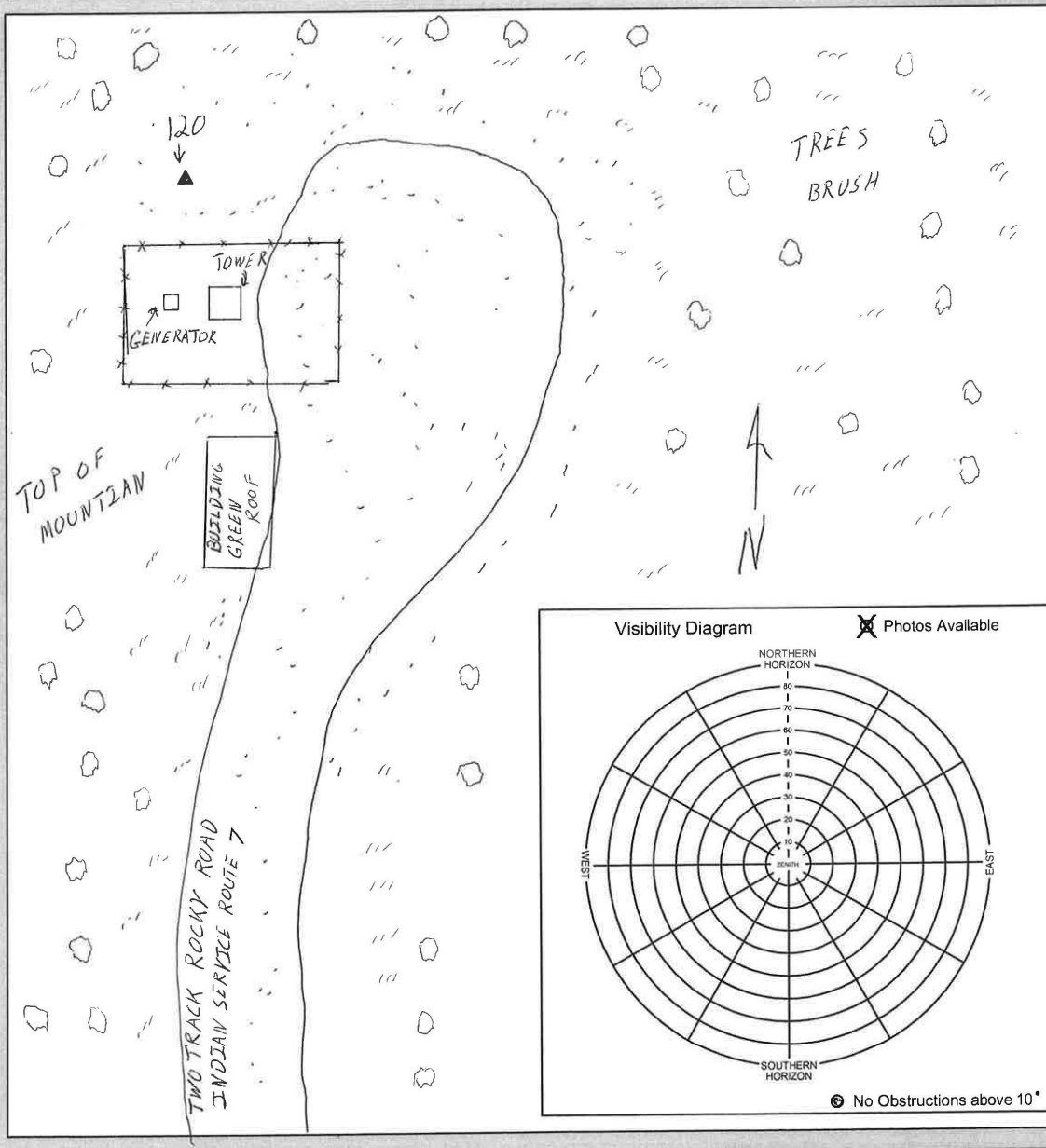


119, 2, 11JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point #	General location	Ground Class
120	PAJARITA MOUNTAIN NM	
Latitude	Longitude	Calendar Date
N 33° 14' 13.79"	W 105° 25' 49.91"	1/11/2015
		Observer Initials
		CPR



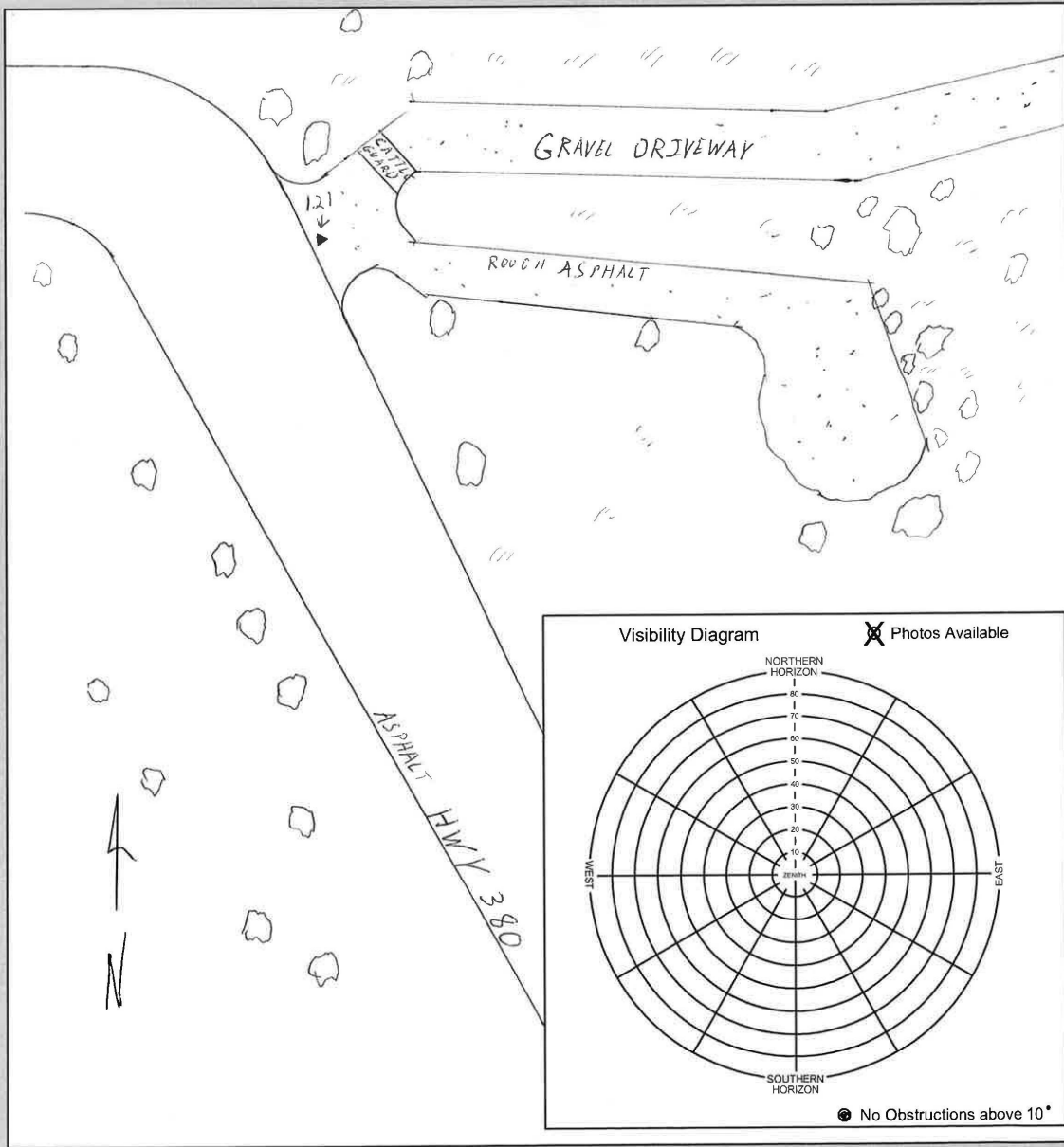


20, 2, 11JAN2015

LiDAR Survey - LiDAR Control



LiDAR Control point # 121	General location LINCOLN, NM	Ground Class
Latitude N 33 ° 31 ' 35.53 "	Longitude W 105 ° 26 ' 23.14 "	Calendar Date 11/9/2015
		Observer Initials CPR



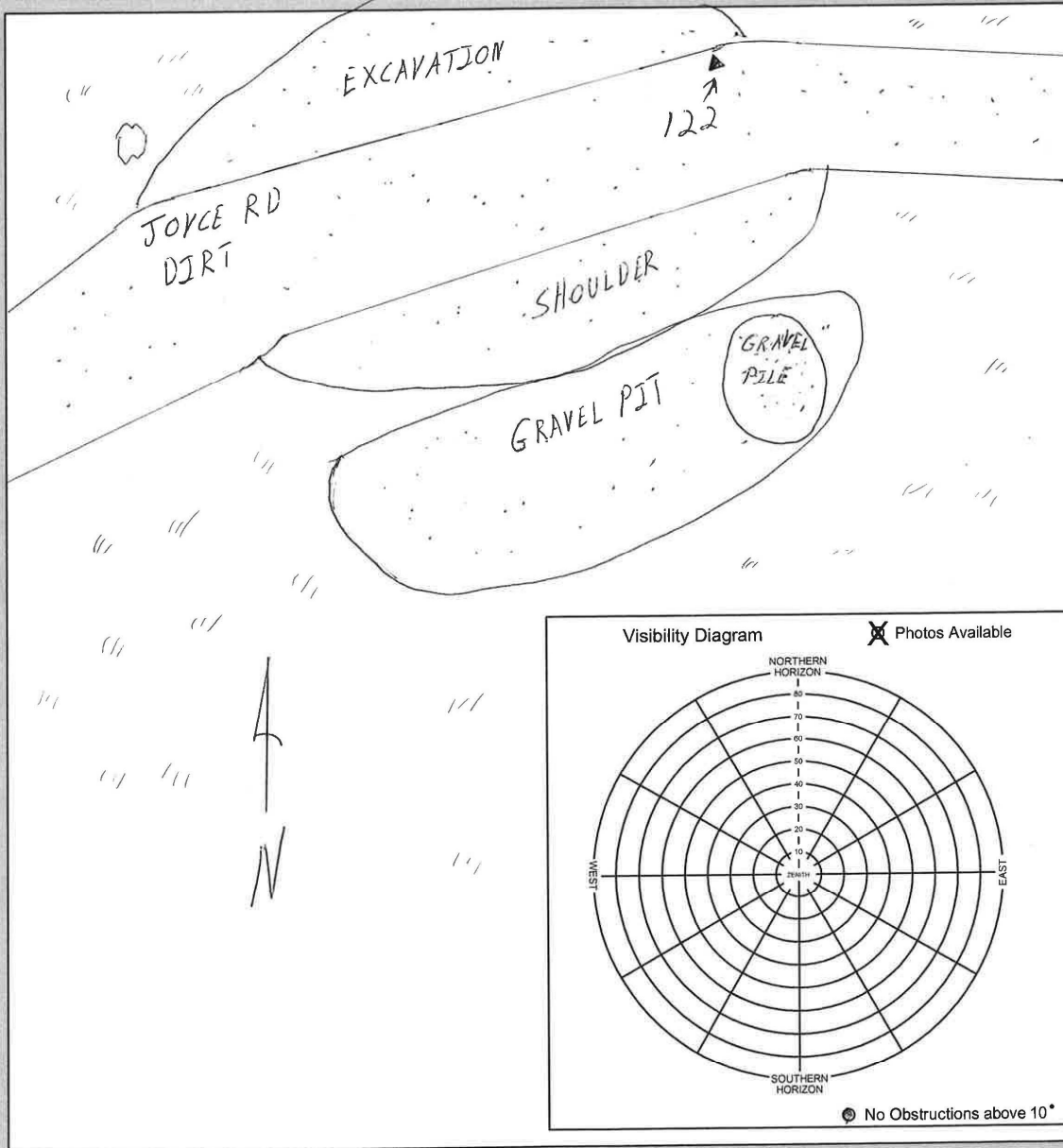


121, 2, 09JAN2015

LiDAR Survey - LiDAR Control



LIDAR Control point # 122	General location HONDO, NM	Ground Class
Latitude N 33° 13' 34.17"	Longitude W 105° 15' 43.93 "	Calendar Date 11/01/2015
		Observer Initials CPR





122, 2, 10JAN2015

LiDAR Control Points:

SECTION 5: EXISTING NGS DATA SHEETS

This section contains the published National Geodetic Survey (NGS) Data Sheets used in the final control network for this project.

```
PROGRAM = datasheet95, VERSION = 8.7.1
1      National Geodetic Survey,      Retrieval Date = AUGUST 14, 2015
DK7580
*****
DK7580  CORS          -   This is a GPS Continuously Operating Reference
Station.
DK7580  DESIGNATION  -   APACHEPNT_NM2007 CORS ARP
DK7580  CORS_ID      -   P027
DK7580  PID           -   DK7580
DK7580  STATE/COUNTY-   NM/OTERO
DK7580  COUNTRY       -   US
DK7580  USGS QUAD     -   SACRAMENTO PEAK (1981)
DK7580
DK7580                                     *CURRENT SURVEY CONTROL
DK7580
-----
DK7580* NAD 83(2011) POSITION- 32 48 06.67485(N) 105 48 14.93505(W)
ADJUSTED
DK7580* NAD 83(2011) ELLIP HT- 2897.769 (meters)          (08/??/11)
ADJUSTED
DK7580* NAD 83(2011) EPOCH   - 2010.00
DK7580* NAVD 88 ORTHO HEIGHT -          ** (meters)          ** (feet)
DK7580
-----
DK7580 NAD 83(2011) X   - -1,462,205.041 (meters)          COMP
DK7580 NAD 83(2011) Y   - -5,165,895.334 (meters)          COMP
DK7580 NAD 83(2011) Z   -  3,437,078.095 (meters)          COMP
DK7580 GEOID HEIGHT    -          -20.62 (meters)
GEOID12B
DK7580
DK7580. Formal positional accuracy estimates are not available for this CORS
DK7580. because its coordinates were determined in part using modeled
DK7580. velocities. Approximate one-sigma accuracies for latitude, longitude,
DK7580. and ellipsoid height can be obtained from the short-term time series.
DK7580. Additional information regarding modeled velocities is available on
DK7580. the CORS Coordinates and Multi-Year CORS Solution FAQ web pages.
DK7580
DK7580. The coordinates were established by GPS observations
DK7580. and adjusted by the National Geodetic Survey in August 2011.
DK7580
DK7580. NAD 83(2011) refers to NAD 83 coordinates where the reference
DK7580. frame has been affixed to the stable North American Tectonic Plate.
DK7580
DK7580. The coordinates are valid at the epoch date displayed above
DK7580. which is a decimal equivalence of Year/Month/Day.
DK7580
DK7580. The PID for the CORS L1 Phase Center is DK7581.
```


DG6517 COUNTRY - US
 DG6517 USGS QUAD - ROSWELL NORTH (1975)
 DG6517
 DG6517 *CURRENT SURVEY CONTROL
 DG6517

DG6517* NAD 83(2011) POSITION- 33 23 41.83424(N) 104 35 20.73727(W)
 ADJUSTED
 DG6517* NAD 83(2011) ELLIP HT- 1095.735 (meters) (08/??/11)
 ADJUSTED
 DG6517* NAD 83(2011) EPOCH - 2010.00
 DG6517* [NAVD 88](#) ORTHO HEIGHT - ** (meters) ** (feet)
 DG6517

DG6517 NAD 83(2011) X - -1,342,902.011 (meters) COMP
 DG6517 NAD 83(2011) Y - -5,159,506.254 (meters) COMP
 DG6517 NAD 83(2011) Z - 3,491,215.967 (meters) COMP
 DG6517 GEOID HEIGHT - -23.15 (meters)

GEOID12B

DG6517
 DG6517 Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DG6517 Standards:

DG6517	FGDC (95% conf, cm)	Standard deviation (cm)			CorrNE
DG6517	Horiz Ellip	SD_N	SD_E	SD_h	(unitless)
DG6517	-----	-----	-----	-----	-----
DG6517	NETWORK 1.66 5.72	0.72	0.64	2.92	0.07506399
DG6517	-----	-----	-----	-----	-----

DG6517 Click [here](#) for local accuracies and other accuracy information.
 DG6517
 DG6517

DG6517.The coordinates were established by GPS observations
 DG6517.and adjusted by the National Geodetic Survey in August 2011.
 DG6517
 DG6517.NAD 83(2011) refers to NAD 83 coordinates where the reference
 DG6517.frame has been affixed to the stable North American Tectonic Plate.
 DG6517

DG6517.The coordinates are valid at the epoch date displayed above
 DG6517.which is a decimal equivalence of Year/Month/Day.
 DG6517

DG6517.The PID for the CORS L1 Phase Center is DG6518.
 DG6517

DG6517.The XYZ, and position/ellipsoidal ht. are equivalent.
 DG6517

DG6517.The ellipsoidal height was determined by GPS observations
 DG6517.and is referenced to NAD 83.
 DG6517

DG6517. The following values were computed from the NAD 83(2011) position.
 DG6517

DG6517;		North	East	Units	Scale	Factor
Converg.						
DG6517;SPC NM E	-	265,582.349	141,207.564	MT	0.99991607	-0 08
26.8						
DG6517;SPC NM E	-	871,331.42	463,278.48	sFT	0.99991607	-0 08
26.8						
DG6517;UTM 13	-	3,695,148.388	538,213.353	MT	0.99961800	+0 13

34.2

```

DG6517
DG6517!          - Elev Factor x Scale Factor = Combined Factor
DG6517!SPC NM E  - 0.99982801 x 0.99991607 = 0.99974409
DG6517!UTM 13    - 0.99982801 x 0.99961800 = 0.99944607
DG6517
DG6517                                SUPERSEDED SURVEY CONTROL
DG6517
DG6517 NAD 83(CORS)- 33 23 41.83400(N)      104 35 20.73760(W) AD(2002.00) c
DG6517 ELLIP H (08/??/04) 1095.732 (m)      GP(2002.00) c

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c

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DG6517
DG6517.Superseded values are not recommended for survey control.
DG6517
DG6517.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DG6517.See file dsdata.txt to determine how the superseded data were derived.
DG6517
DG6517_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SES3821395148(NAD 83)
DG6517
DG6517_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DG6517
DG6517                                STATION DESCRIPTION
DG6517
DG6517'DESCRIBED BY NATIONAL GEODETIC SURVEY 2011
DG6517'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DG6517'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
DG6517'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DG6517' ftp://cors.ngs.noaa.gov/cors/README.txt
DG6517' ftp://cors.ngs.noaa.gov/cors/coord/coord_08
DG6517' ftp://cors.ngs.noaa.gov/cors/station_log
DG6517' http://geodesy.noaa.gov/CORS

```

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1 National Geodetic Survey, Retrieval Date = AUGUST 14, 2015
DR0090

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DR0090 DESIGNATION - B 254
DR0090 PID - DR0090
DR0090 STATE/COUNTY- NM/CHAVES
DR0090 COUNTRY - US
DR0090 USGS QUAD - SOUTH SPRING (1975)
DR0090
DR0090                                *CURRENT SURVEY CONTROL
DR0090

```

```

DR0090* NAD 83(1986) POSITION- 33 20 46. (N) 104 28 52. (W) SCALED
DR0090* NAVD 88 ORTHO HEIGHT - 1088.187 (meters) 3570.16 (feet)
ADJUSTED
DR0090

```

```

DR0090 GEOID HEIGHT - -23.23 (meters)
GEOID12B
DR0090 DYNAMIC HEIGHT - 1086.705 (meters) 3565.30 (feet) COMP
DR0090 MODELED GRAVITY - 979,238.7 (mgal) NAVD

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88

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DR0090
DR0090 VERT ORDER - FIRST CLASS II

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DR0090
 DR0090 STATION RECOVERY (1982)
 DR0090
 DR0090'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1982
 DR0090'RECOVERED IN GOOD CONDITION. NEW DESCRIPTION FOLLOWS. 6.9 KM (4.3
 MI
 DR0090'SOUTHERLY ALONG THE SANTA FE RAILROAD FROM THE RAILROAD STATION IN
 DR0090'ROSWELL, 0.5 KM (0.3 MI) SOUTH OF A CROSSROADS, 0.2 KM (0.1 MI) SOUTH
 DR0090'OF RAILROAD MILEPOST 112 AND HIGHWAY MILEPOST 39, 13.9 METERS (45.6
 DR0090'FT) SOUTHWEST OF THE NEAR RAIL, 2.7 METERS (8.9 FT) SOUTH OF A

UTILITY
 DR0090'POLE AND 0.5 METER (1.6 FT) NORTHEAST OF A FENCE.
 DR0090'THE MARK IS 0.3 METERS SE FROM A WITNESS POST.
 DR0090'THE MARK IS 0.6 M BELOW THE TRACKS.

DR0090
 DR0090 STATION RECOVERY (2005)
 DR0090
 DR0090'RECOVERY NOTE BY US POWER SQUADRON 2005 (BJK)
 DR0090'RECOVERED IN GOOD CONDITION.

1 National Geodetic Survey, Retrieval Date = AUGUST 14, 2015

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 LAPLACE CORR - 0.54 (seconds)
 DEFLEC12B
 DR0764 GEOID HEIGHT - -23.27 (meters)
 GEOID12B
 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.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

	Primary Azimuth Mark	Grid Az
DR0764:SPC NM E	- MELENA	001 59 57.4
DR0764:UTM 13	- MELENA	001 37 52.6

 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
 DR0764
 DR0764
 DR0764

SUPERSEDED SURVEY CONTROL					
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.txt](#) to determine how the superseded data were derived.
DR0764

DR0764_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SET5250607294(NAD 83)
DR0764

DR0764_MARKER: DS = TRIANGULATION STATION DISK
DR0764_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
DR0764_SP_SET: CONCRETE POST
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

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

DR0764

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

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.

1 National Geodetic Survey, Retrieval Date = AUGUST 14, 2015

DR0720

DR0720 DESIGNATION - X 50

DR0720 PID - DR0720

DR0720 STATE/COUNTY- NM/LINCOLN

DR0720 COUNTRY - US

DR0720 USGS QUAD - CAPITAN (1973)

DR0720

DR0720 *CURRENT SURVEY CONTROL

DR0720

DR0720* NAD 83(1986) POSITION- 33 32 36. (N) 105 32 31. (W) SCALED

DR0720* [NAVD 88](#) ORTHO HEIGHT - 1901.641 (meters) 6238.97 (feet)

ADJUSTED

DR0720

DR0720 GEOID HEIGHT - -19.75 (meters)

GEOID12B

DR0720 DYNAMIC HEIGHT - 1898.803 (meters) 6229.66 (feet) COMP

DR0720 MODELED GRAVITY - 979,075.6 (mgal) NAVD

88

DR0720

DR0720 VERT ORDER - SECOND CLASS 0
DR0720
DR0720.The horizontal coordinates were scaled from a topographic map and have
DR0720.an estimated accuracy of +/- 6 seconds.
DR0720.
DR0720.The orthometric height was determined by differential leveling and
DR0720.adjusted by the NATIONAL GEODETIC SURVEY
DR0720.in June 1991.
DR0720
DR0720.The dynamic height is computed by dividing the NAVD 88
DR0720.geopotential number by the normal gravity value computed on the
DR0720.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DR0720.degrees latitude (g = 980.6199 gals.).
DR0720
DR0720.The modeled gravity was interpolated from observed gravity values.
DR0720
DR0720;
DR0720;SPC NM C - North East Units Estimated Accuracy
DR0720; 282,230. 565,760. MT (+/- 180 meters
Scaled)
DR0720
DR0720 SUPERSEDED SURVEY CONTROL
DR0720
DR0720 NGVD 29 (??/??/92) 1900.902 (m) 6236.54 (f) ADJ UNCH 2
0
DR0720
DR0720.Superseded values are not recommended for survey control.
DR0720
DR0720.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DR0720.[See file dsdata.txt](#) to determine how the superseded data were derived.
DR0720
DR0720_U.S. NATIONAL GRID SPATIAL ADDRESS: 13SDT496116(NAD 83)
DR0720
DR0720_MARKER: DB = BENCH MARK DISK
DR0720_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
DR0720_SP_SET: SET IN TOP OF CONCRETE MONUMENT
DR0720_STAMPING: X-50 1934
DR0720_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
DR0720+STABILITY: SURFACE MOTION
DR0720
DR0720 HISTORY - Date Condition Report By
DR0720 HISTORY - 1934 MONUMENTED CGS
DR0720 HISTORY - 1985 GOOD NMHD
DR0720 HISTORY - 20050704 POOR USPSQD
DR0720 HISTORY - 20140810 POOR GEOCAC
DR0720
DR0720 STATION DESCRIPTION
DR0720
DR0720'DESCRIBED BY COAST AND GEODETIC SURVEY 1934
DR0720'2.1 MI E FROM CAPITAN.
DR0720'2.1 MI EAST ON US HWY NO. 380 70 YDS EAST OF A WOODEN BRIDGE, 37 FEET
DR0720'WEST OF A CATTLE GUARD, 34 FEET NORTH OF THE CENTERLINE OF THE
DR0720'HIGHWAY, AND 2 FEET SOUTH OF A FENCE LINE.
DR0720
DR0720 STATION RECOVERY (1985)

DR0720

DR0720'RECOVERY NOTE BY NM HIGHWAY DEPT 1985

DR0720'TO REACH THE MARK FROM THE INTERSECTION OF U.S. 380 AND STATE ROAD 48

DR0720'IN CAPITAN, N.M. PROCEED EAST ALONG U.S. 380 FOR 2.0 MILES TO THE

DR0720'MARK ON THE LEFT, 40' NORTH OF THE CENTERLINE OF THE HIGHWAY, 9'

DR0720'SOUTH OF THE RIGHT OF WAY FENCE AND 45' WEST OF THE CENTERLINE OF

DR0720'FOREST ROAD 56 (LINCOLN COUNTY B-77).

DR0720

DR0720 STATION RECOVERY (2005)

DR0720

DR0720'RECOVERY NOTE BY US POWER SQUADRON 2005 (BJK)

DR0720'FOREST ROAD 56 IS NOW C001 LEADING TO THE LONE TREE RANCH. HALF OF

DR0720'THE DISK IS GONE, THE X IS THERE BUT THE NUMBER WAS ON THE PART THAT

DR0720'IS GONE.

DR0720

DR0720 STATION RECOVERY (2014)

DR0720

DR0720'RECOVERY NOTE BY GEOCACHING 2014 (LPC)

DR0720'1/4 OF DISK REMAINS - VERY DAMAGED. ONLY THE X IS VISIBLE ON THE
DISK.

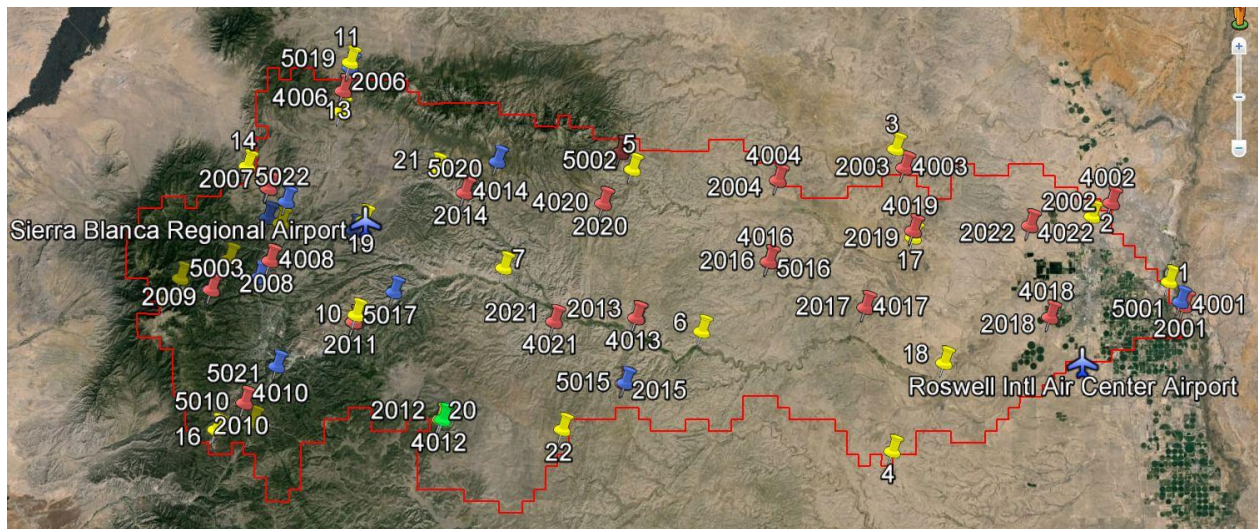
DR0720'

*** retrieval complete.

Elapsed Time = 00:00:04

SECTION 6: GPS CONTROL DIAGRAM

This section contains a graphical representation of the new and existing control stations used for the project.



Not to Scale