REPORT OF SURVEY

TWDB 580170828

LiDAR IN EAST TEXAS

INTRODUCTION

Gorrondona & Associates, Inc. was tasked by Fugro Geospatial, Inc. to perform a control survey in support of LiDAR data collection of two separate areas in Texas: Sulphur Springs and San Jacinto. The Global Positioning System used was the Western Data System Virtual Reference Station (VRS) Network. The map in figure 1 shows the location of the two surveys. Each site was processed independently of the others.

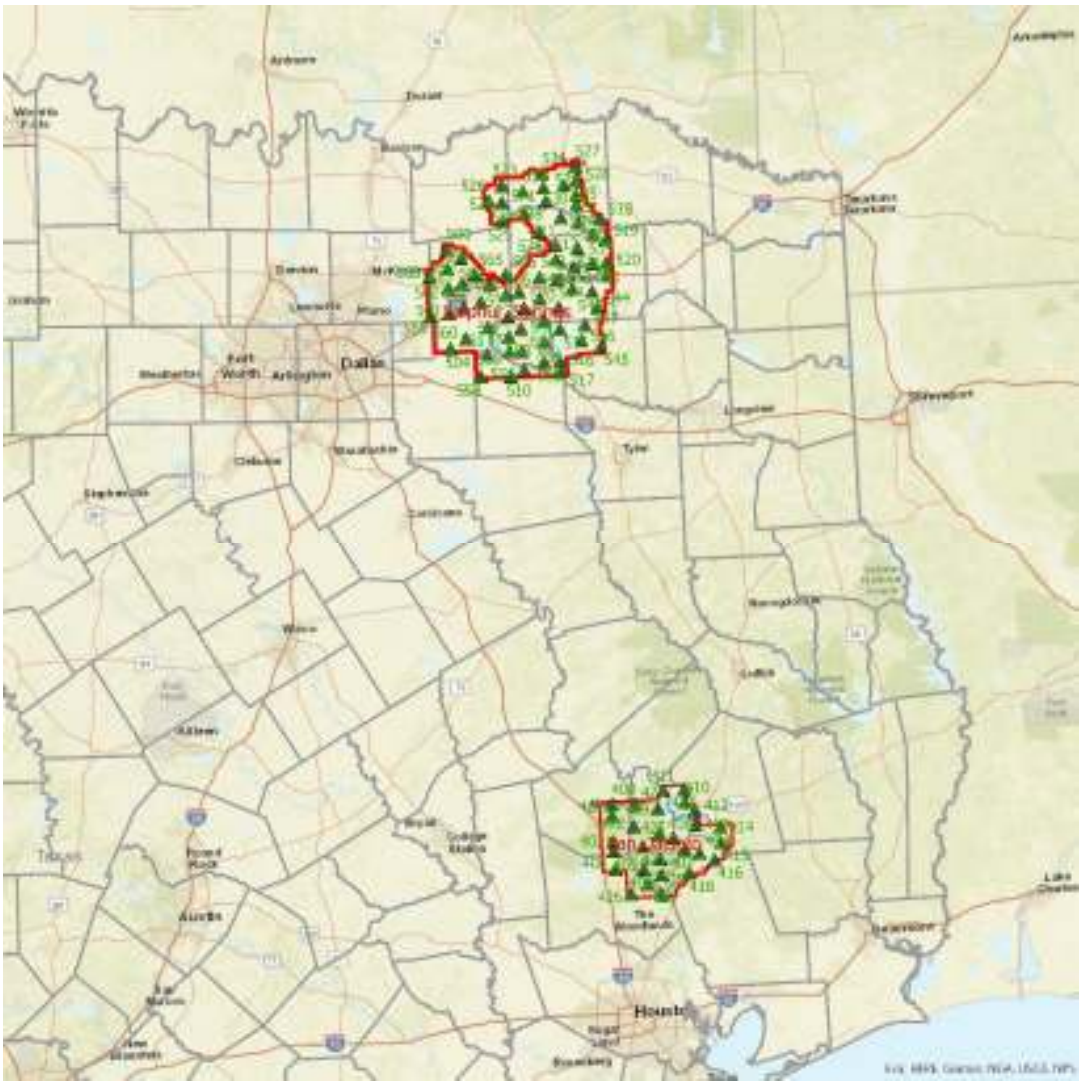

Figure 1: The above map indicates the two survey areas being San Jacinto twenty-eight (28) LiDAR points (400's) and Sulphur Springs seventy-two (72) points (500's).

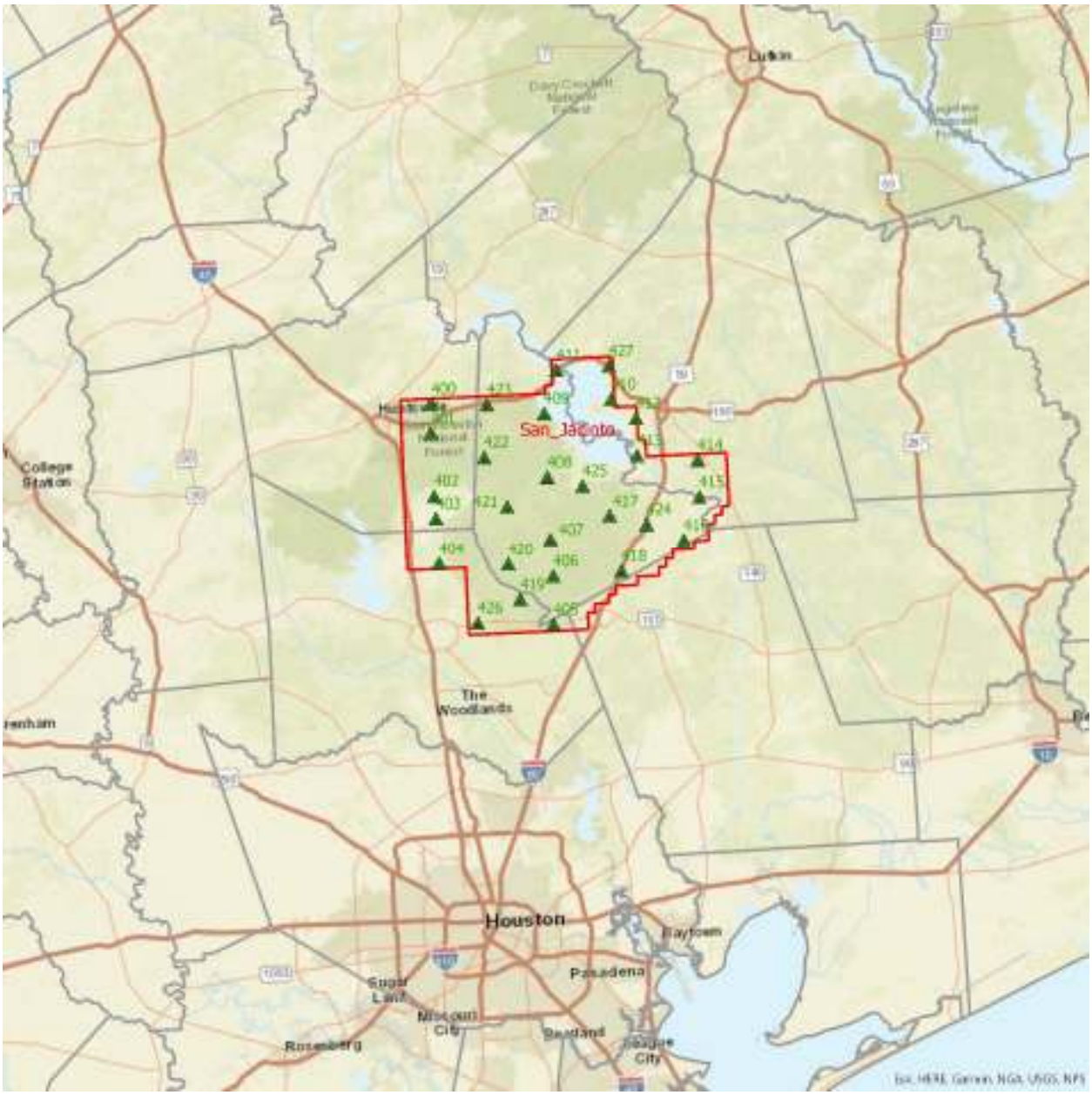

Figure 2: The above map indicates the San Jacinto twenty-eight (28) points (400's)

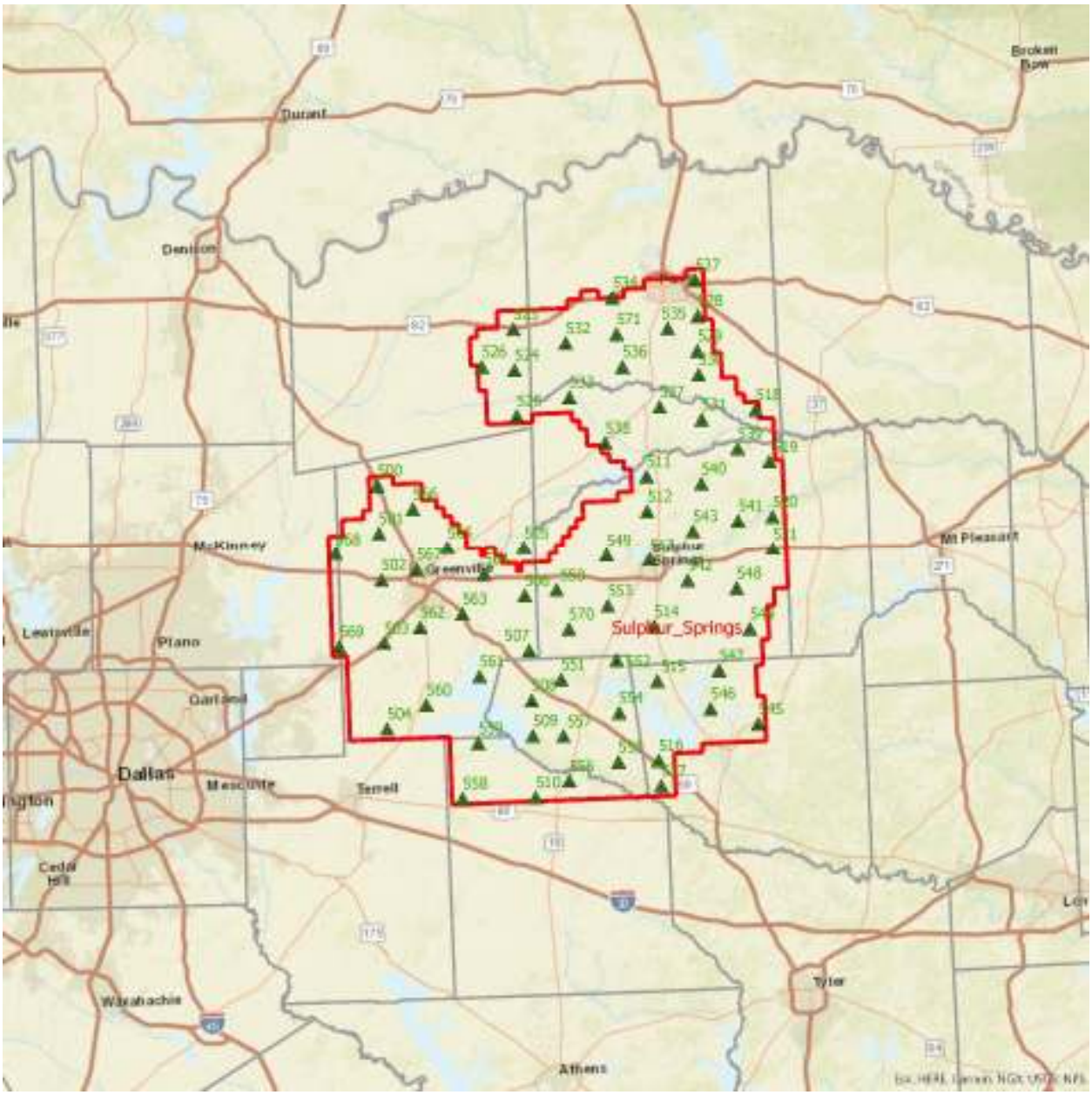

Figure 3: the above map indicates the Sulphur Springs seventy-two (72) LiDAR points (500's)

CONTROL

The Western Data System VRS Network was used to provide control for the survey. The Virtual Reference Station (VRS) base stations used for the San Jacinto twenty-eight (28) LiDAR points (400's) are listed in the table below:

SITE	VRS NETWORK NAME	CORS ID	PID	LATITUDE	LONGITUDE	ELLIPSOIDAL HEIGHT
LIVINGSTON	HLWA_g1012	HLWA_g1012	HLWA	30d44'44.95427"	-94d55'18.08691"	101.513
HUNTSVILLE	HMIT_g0416	HMIT_g1012	HMIT	30d38'18.05962"	-95d29'36.27903"	353.995
CONROE	HWEE_g1012	HWEE_g1012	HWEE	30d18'46.14816"	-95d27'29.82228"	218.284

The Western Data System VRS Network was used to provide control for the survey. The Virtual Reference Station (VRS) base stations used for the Sulphur Springs seventy-two (72) LiDAR points (500's) are listed in the table below:

SITE	VRS NETWORK NAME	CORS ID	PID	LATITUDE	LONGITUDE	ELLIPSOIDAL HEIGHT
YUBA	PRS241969719561	DARI_g1012	DARI	33d48'30.28094"	-96d10'10.13520"	476.567
GREENVILLE	PRS453121982090	DCOE_g0414	DCOE	33d06'18.06216"	-96d06'33.66763"	488.287
SULPHUR SPRINGS	PRS535359007828	DSIB_g1112	DSIB	33d07'04.54831"	-95d36'59.87376"	465.215
CLARKSVILLE	PRS870560569652	DWEB_g1012	DWEB	33d36'35.88294"	-95d03'18.79194"	361.233
KAUFMAN	PRS871574869583	DPKC_g1012	DPKC	32d33'36.18793"	-96d17'40.32390"	375.993

The horizontal Datum was the North American Datum of 1983 NAD 83 (2011). The vertical datum was the North American Datum of 1988 (NAVD 1988). The geoid model GEOID12B was used to obtain the NAVD 1988 orthometric heights from the GRS 1980 ellipsoidal heights.

SAN JACINTO STATIONS

The twenty-eight (28) newly surveyed LiDAR control points were a combination of gravel, asphalt and concrete all in open terrain. The below table summarizes the new stations:

Station Name	GPSID	USGS Quad	Description
400	1400	PHELPS	Gravel, west side of gravel driveway at address 376 Paul Dixon Rd.
401	1401	PHELPS	Asphalt, at intersection of Pine Gully St. and Main St.
402	1402	NEW WAVERLY	Asphalt, centerline Waverly Manor Residential area and FM Highway No. 1375
403	1403	NEW WAVERLY	Asphalt, centerline intersection of Pondersoa D. and Gibb St. at Waverly Estates Residential Airport
404	1404	WILLIS	Asphalt, in draiveway of address 14371 FM 1097 north side of FM 1097
405	1405	FOSTORIA	Apshalt, centerline of Lee turner Rd. at intersection of SH 105 north side of SH 105
406	1406	BEAR CREEK	Concrete, centerline of driveway at address 12681 FM 1725 north side of FM 1725
407	1407	BEAR CREEK	Gravel, center of driveway north side of Lily Yeager Dr. east of FM 945
408	1408	COLD SPRING	Asphalt, at driveway to address 2160 FM Highway No. 945 north
409	1409	STEPHENS CREEK	Gravel, centerline of gravel and asphalt driveway on SH Highway No. 156
410	1410	BLANCHARD	Asphalt, centerline of interestion of FM Highway no. 3126 and FM Highway No. 2457 east, east of Blanchard Baptist Church
411	1411	CARLISLE	Asphalt, centerline intersection of Cook-James Rd.and SH Highway No. 190 at Entrance to Holiday Villages Subdivision
412	1412	LIVINGSTON	Asphalt, centerline of Fredrick Dr. and SH Highway No. 350
413	1413	BLANCHARD	Asphalt, centerline of FM Highway no. 3278 at intersection pf FM Highway No. 1988
414	1414	SCHWAB CITY	Asphalt, centerline of Woodhaven at intersection of Maple Ridge
415	1415	SCHWAB CITY	Gravel, in parking lot of Holiday Lake Estaates Park on River Road
416	1416	RAYBURN	Gravel, at the intersection of E. Main St and Big Creek Rd. and Francis Ave. in Lake Water Wheel Estates
417	1417	CAMILLA	Gravel, centerline intersection of FST No. 217 and SH 150
418	1418	WESTCOTT	Asphalt, center of "U" turn lane east of Sherwood Dr on US highway No. 59
419	1419	CUT AND SHOOT	Asphalt, centerline of cul d' sac on North Longhorn Trail
420	1420	CONROE NE	Asphalt, in driveway of Boggy Creek Ln. west side of FM 3081
421	1421	MAYNARD	Asphalt, centerline intersection pf FM highway No. 2693 and SH highway No. 150 east of Punkin-Evergreen Volunteer Fire Department
422	1422	OAKHURST	Dirt, east side of dirt driveway on FSR 207 east side of FSR 207
423	1423	OAKHURST	Asphalt, north side of Oakhurst Dr. at intersection of FM Highway No. 946
424	1424	GOODRICH	Concrete, centerline of driveway at woodland park retirement home, east shighway No. ide of US 59
425	1425	CAMILLA	Asphalt, centerline Cochran Ln. and Slade St. northwest of San Jancinto County Headstart
426	1426	CUT AND SHOOT	Asphalt, north side of State Highway No. 105 in post office parking lot at address 13985 TX-105
427	1427	ONALASKA	Gravel, south side of Sandydale Ln. on gravel road

SULPHUR SPRINGS STATIONS

The seventy-two (72) newly surveyed LiDAR control points were a combination of gravel, asphalt and concrete all in open terrain. The below table summarizes the new stations:

Station Name	GPSID	USGS Quad	DESCRIPTION
500	1500	CELESTE	Asphalt, center of CR 1050 at edge of US Highway No. 69
501	1501	GREENVILLE NW	Asphalt, center of CR 1076 at edge of CR 2194
502	1502	GREENVILLE NW	Asphalt, center of turnaround lane for CR 1065 on US Highway No. 380
503	1503	GREENVILLE SW	Gravel, center of gravel driveway at edge of east bound frontage road of IH No. 30 at address No. 3857
504	1504	POETRY	Gravel, center of gravel driveway at edge of cry 2316at address 10750 CR 2316
505	1505	COMMERCE SOUTH	Asphalt, intersection of Highway No. 1658 and CR 4212 east side of Highway No. 1568
506	1506	LONE OAK NORTH	Asphalt, intersection of Highway no. 2649 at CR 3206 east side of Highway No. 2649
507	1507	LONE OAK SOUTH	Gravel, center of CR 3223 at field entrance south side of CR 3223
508	1508	LONE OAK SOUTH	Asphalt, intersection of CR 1430 at Highway No. 47 east side of Highway No. 47
509	1509	IRON BRIDGE DAM	Asphalt, intersection of Highway No. 47 and Highway No. 2374 at end of white paint stripe
510	1510	EDGEWOOD	Asphalt, center of driveway at edge of Highway no. 1395 at address 360 FM Highway No. 1395
511	1511	TIRA	Asphalt, cooper lake boat ramp parking lot at corner of double yellow paint stripe
512	1512	SULPHUR SPRINGS	Concrete, in Cherry Grove Church parking lot on yellow paint stripe corner of parking space
513	1513	SULPHUR SPRINGS	Concrete, center of concrete driveway of address 528 FM Highway No. 2285
514	1514	SULPHUR SPRINGS SE	Asphalt, edge of Highway No. 154 at center of driveway for address 7089 SH Highway No. 154
515	1515	YANTIS	Asphalt, intersection of Highway No. 514 at FM Highway No. 17
516	1516	CALVARY	Concrete, edge of CR 1600 at center of driveway for address 4135 CR 1606
517	1517	GOLDEN	Asphalt, center of road where CR 2980 "Y" intersects before Highway No. 779 intersection
518	1518	CUNNINGHAM	Asphalt, end of first white parking stripe at Cunningham Baptist Church parking lot
519	1519	MITCHELL CREEK	Asphalt, at the intersection of CR 3547 and Highway No. 71
520	1520	SALTILLO	Asphalt, at intersection of FM Highway No. 900 and CR 3543
521	1521	SALTILLO	Asphalt, center of IH 30 west frontage road near address 12525 IH 30 frontage road
522	1522	PUREY	Asphalt, at intersection of FN Highway No. 3105 and CR 2375
523	1523	HONEY GROVE	Gravel, center of driveway at edge of Highway No. 82
524	1524	HONEY GROVE	Gravel, at intersection of CR 3545 and CR 3540
525	1525	LADONIA	Gravel, at center of driveway address 2962 FM Highway No. 64
526	1526	HONEY GROVE	Gravel, at intersection of CR 3455 and CR 3489
527	1527	BLOSSOM	Concrete, at intersection of Addison Ln. and Libby Ln.
528	1528	PATTONVILLE	Concrete, center of driveway at edge of Highway No. 905 for address 6180 FM Highway No. 905
529	1529	PATTONVILLE	Gravel, center of driveway at edge of Highway No. 3426 at address 1550 Highway No. 3426
530	1530	MINTER	Asphalt, at center of Highway No. 1497 near Field entrance
531	1531	MINTER	Gravel, at center of driveway for address 8969 Highway No. 895 at edge of Highway No. 895
532	1532	PETTY	Gravel, at intersection of CR 25500 and CR 25440
533	1533	PECAN GAP	Gravel, at center of CR 3360 at edge of highway No. 128
534	1534	TOCO	Asphalt, at edge of US Highway No. 82 near address 8915 US Highway No. 82
535	1535	BIARDSTOWN	Asphalt, at center of CR 12650 at edge of Highway No. 1497
536	1536	ROXTON	Gravel, at intersection of CR 24200 and CR 24210
537	1537	CHARLESTON	Concrete, at center of bridge over creek on CR 4380
538	1538	COOPER NORTH	Gravel, at intersection of 11th St. and Wilson St.
539	1539	SULPHUR BLUFF	Asphalt, at intersection of Highway No. 69and Dunham Ranch Rd.
540	1540	SULPHUR BLUFF	Concrete, at edge of Highway No. 71 at center of driveway for Aero Space Aluminum Products

541	1541	DIKE	Asphalt, at center of CR 3520 near address 3814 CR 3520
542	1542	SULPHUR SPRINGS SE	Concrete, at center of driveway at edge of Highway No. 1870 at address 5218 Highway No. 1870
543	1543	SULPHUR SPRINGS	Asphalt, at edge of Highway 1537 at center of CR 3638
544	1544	COMO	Asphalt, at intersection of Highway No. 269 at CR 2145
545	1545	QUITMAN	Asphalt, at center of driveway of address 2534 SH Highway No. 37
546	1546	QUITMAN	Concrete, at center of driveway at edge of Highway No. 2225 at address 4300 Highway No. 2225
547	1547	PLEASANT GROVE	Asphalt, at center of Highway No. 2966 across from a gravel gated driveway
548	1548	COMO	Dirt, at center of CR 2346 across from a field gate
549	1549	GAFFORD CHAPEL	Asphalt, at center of CR 4711 at center of railroad tracks
550	1550	MILLER GROVE	Gravel, at center of CR 4129 across from gated field entrance
551	1551	EMORY NORTH	Asphalt, at center of bridge on Highway No. 514
552	1552	ARBALA	Asphalt, at intersection of CR 3410 and CR 3411
553	1553	BRASHEAR	Asphalt, at center of CR 4711 and center of railroad tracks
554	1554	ALBA	Asphalt, at end of double yellow stripes near intersection of Highway No. 515 and Highway No. 2946
555	1555	ALBA	Asphalt, at intersection of CR 2450 and Highway No. 779
556	1556	EMORY SOUTH	Asphalt, at center of CR 1903 across from gated field entrance
557	1557	EMORY SOUTH	Asphalt, at intersection of Highway No. 2324 and CR 1278
558	1558	WILLS POINT	Gravel, at center of CR YZ3824 near address 1105 CR 3824
559	1559	ABLES SPRINGS	Asphalt, at center of Queen City Rd. and powerline right-of-way line
560	1560	WEST TAWAKONI	Gravel, on driveway off of East Quinian Parkway
561	1561	LONE OAK SOUTH	Asphalt, at white parking stripe corner in asphalt parking lot of West Point Park entrance
562	1562	GREENVILLE SE	Gravel, at center of driveway at edge of CR 2184 at address 3852 CR 2184
563	1563	GREENVILLE SE	Asphalt, at corner of parking stripe at parking lot
564	1564	COMMERCE SOUTH	Asphalt, at center of turn around lane on Highway No. 24
565	1565	GREENVILLE ENE	Gravel, at intersection of CR 4307 and CR 4200
566	1566	CELESTE	Asphalt, at center of CR 1040 near address 4050 CR 1040
567	1567	GREENVILLE NE	Gravel, a center of CR 677 at edge of CR 678
568	1568	FARMERSVILLE	Gravel, at center of gravel driveway at edge of CR 700 at address 3004 CR 700
569	1569	JOSEPHINE	Asphalt, at edge of South Rees St. on white stripe across from address 3904 Rees St.
570	1570	MILLER GROVE	Gravel, at center of CR 1142 at a 90 degrees bend in the road
571	1571	ROXTON	Asphalt, at intersection of CR 24200 and Highway No. 2111

GPS DATA PROCESSING

The data was downloaded to a PC and processed using Trimble Business center, version 3.80. All of the lines between the VRS base stations and the newly surveyed stations were processed using the single baseline method with precise ephemeris. All of the baselines were integer bias fixed solutions. The table below shows the result of the baseline processing:

From Point ID	To Point ID	H. Precision (95%)	V. Precision (95%)	Satellites	Epochs	Vector Length (meters)
HMIT_g0416	1400	0.011	0.014	15	31	12970.196
HMIT_g0416	1401	0.013	0.017	14	32	7750.694
PRS608893055581	1402	0.011	0.017	14	30	8889.23
PRS608893055581	1403	0.011	0.015	14	32	12981.742
HWEE_g1012	1404	0.014	0.020	14	32	15001.094
HWEE_g1012	1405	0.017	0.025	12	61	21647.607
HWEE_g1012	1405	0.023	0.029	10	26	25220.574
HWEE_g1012	1406	0.019	0.024	11	31	27927.059
HWEE_g1012	1407	0.019	0.025	13	32	31636.175
HMIT_g0416	1408	0.021	0.024	13	29	28941.76
HLWA_g1012	1409	0.017	0.020	11	22	26389.489
HLWA_g1012	1410	0.015	0.022	12	31	12389.439
HLWA_g1012	1411	0.018	0.021	13	26	23906.495
PRS749387302094	1412	0.013	0.020	12	31	8955.971
HLWA_g1012	1413	0.016	0.018	9	31	14760.792
HLWA_g1012	1414	0.015	0.017	11	26	14951.625
PRS749387302094	1415	0.015	0.022	16	32	22325.433
HLWA_g1012	1416	0.017	0.024	14	31	30539.56
HLWA_g1012	1417	0.021	0.035	12	32	28301.847
HLWA_g1012	1418	0.023	0.032	13	32	38392.638
HWEE_g1012	1419	0.023	0.025	9	26	19735.675
HWEE_g1012	1420	0.019	0.028	12	32	21647.615
HMIT_g0416	1421	0.028	0.038	12	31	22483.8
HMIT_g0416	1422	0.012	0.018	14	32	15851.903
HMIT_g0416	1423	0.017	0.025	15	32	20176.386
HLWA_g1012	1424	0.026	0.040	13	29	27606.983
HLWA_g1012	1425	0.017	0.020	12	27	26464.986
HWEE_g1012	1426	0.013	0.015	15	32	9938.697
HLWA_g1012	1427	0.017	0.021	12	27	26464.984
HLWA_g1012	1427	0.015	0.024	11	27	13797.606
PRS453121982090	1500	0.021	0.027	14	30	24934.338
PRS453121982090	1501	0.017	0.024	15	31	16077.003
PRS453121982090	1502	0.013	0.019	16	31	9385.052
PRS453121982090	1503	0.018	0.028	16	31	12705.898
PRS453121982090	1504	0.023	0.032	14	31	28349.511
PRS453121982090	1505	0.015	0.026	14	31	22840.039
PRS453121982090	1506	0.017	0.028	16	31	20625.573
PRS453121982090	1507	0.022	0.034	14	30	24259.087
PRS453121982090	1508	0.019	0.030	15	31	30733.781
PRS453121982090	1509	0.022	0.032	16	31	36366.49
PRS871574869583	1510	0.024	0.028	13	31	42770.238
PRS535359007828	1511	0.020	0.028	16	31	21566.458
PRS535359007828	1512	0.017	0.035	13	31	14375.358
PRS535359007828	1513	0.013	0.015	17	31	4304.955

PRS535359007828	1514	0.017	0.021	15	30	9625.692
PRS535359007828	1515	0.017	0.023	13	31	20804.203
PRS535359007828	1516	0.036	0.042	14	31	37026.573
PRS535359007828	1517	0.023	0.032	13	31	42385.696
PRS870560569652	1518	0.018	0.027	15	31	35014.947
PRS535359007828	1519	0.018	0.029	14	6	35059.005
PRS535359007828	1519	0.018	0.026	15	31	35059.011
PRS535359007828	1520	0.019	0.025	16	30	28841.459
PRS535359007828	1521	0.020	0.025	16	31	26528.065
PRS535359007828	1522	0.020	0.025	14	30	26304.921
PRS241969719561	1523	0.026	0.030	14	31	35135.172
PRS241969719561	1524	0.023	0.025	14	30	41215.564
PRS453121982090	1525	0.019	0.026	16	31	41815.002
PRS241969719561	1526	0.022	0.024	15	31	36602.79
PRS870560569652	1527	0.030	0.037	13	31	40363.049
PRS870560569652	1528	0.025	0.035	12	31	39526.823
PRS870560569652	1529	0.029	0.034	14	31	40699.126
PRS870560569652	1530	0.022	0.026	15	31	41880.731
PRS535359007828	1531	0.026	0.036	14	31	35031.732
PRS241969719561	1532	0.023	0.030	15	31	45404.604
PRS535359007828	1533	0.018	0.027	15	31	41103.229
PRS241969719561	1534	0.021	0.031	13	31	49830.559
PRS870560569652	1535	0.027	0.033	13	31	45916.78
PRS535359007828	1536	0.022	0.028	15	31	44374.706
PRS535359007828	1537	0.029	0.038	13	30	35830.508
PRS535359007828	1538	0.023	0.034	14	31	29749.084
PRS535359007828	1539	0.019	0.028	15	30	32932.695
PRS535359007828	1540	0.018	0.027	15	31	22873.623
PRS535359007828	1541	0.029	0.041	14	31	21587.356
PRS535359007828	1542	0.020	0.026	14	31	8063.076
PRS535359007828	1543	0.015	0.022	15	31	12726.329
PRS535359007828	1544	0.032	0.040	13	31	23533.555
PRS535359007828	1545	0.026	0.028	13	31	37223.077
PRS535359007828	1546	0.029	0.034	12	31	29372
PRS535359007828	1547	0.031	0.055	11	31	23843.394
PRS535359007828	1548	0.017	0.024	14	31	18446.007
PRS535359007828	1549	0.016	0.018	13	31	9982.453
PRS535359007828	1550	0.026	0.042	12	31	18471.14
PRS535359007828	1551	0.021	0.033	13	31	26188.225
PRS535359007828	1552	0.019	0.027	13	31	17648.551
PRS535359007828	1553	0.014	0.018	16	31	9760.26
PRS535359007828	1554	0.024	0.033	14	31	27872.173
PRS535359007828	1555	0.020	0.027	15	31	37787.368
PRS535359007828	1556	0.045	0.056	12	6	44284.548
PRS535359007828	1556	0.037	0.043	11	30	44284.548
PRS535359007828	1557	0.024	0.041	14	31	36206.654
PRS871574869583	1558	0.024	0.028	13	31	30107.306
PRS453121982090	1559	0.018	0.028	13	31	32542.152
PRS453121982090	1560	0.024	0.033	13	31	22374.879
PRS453121982090	1561	0.018	0.027	15	31	19342.698
PRS453121982090	1562	0.012	0.017	16	31	6516.719
PRS453121982090	1563	0.017	0.031	14	31	8630.348
PRS453121982090	1564	0.013	0.023	15	31	13126.913
PRS453121982090	1565	0.013	0.019	16	31	11211.61
PRS453121982090	1566	0.018	0.024	16	31	18279.537

PRS453121982090	1567	0.013	0.019	16	31	5732.738
PRS453121982090	1568	0.020	0.026	15	31	20247.394
PRS453121982090	1569	0.020	0.041	14	31	20389.762
PRS535359007828	1570	0.042	0.074	11	30	19024.687
PRS535359007828	1571	0.027	0.034	15	31	51163.533

SUMMARY

The one hundred (100) LiDAR ground control points surveyed were positioned at two areas in Texas. The estimated accuracy of the adjusted coordinates is ±0.005m with respect to the NAD 1983 (2011) and NAVD 1988 datums.

SAN JACINTO

Adjusted Coordinates – NAD 1983 (2011) / NAVD 1988

UTM Zone 14 & 15

NAVD 1988 orthometric height – ellipsoidal height + GEOID12B

Station Name	GPSID	Latitude	Longitude	UTM 14 N m	UTM 14 E m	UTM 15 N m	UTM 15 E m	Ellip H m
400	1400	30°44'41.19560" N	95°26'13.91565" W	3,406,743.812	841,134.771	3,403,855.136	266,679.031	68.297
401	1401	30°41'26.56980" N	95°26'23.38304" W	3,400,738.979	841,073.399	3,397,866.756	266,296.738	83.938
402	1402	30°34'24.32691" N	95°26'20.46465" W	3,387,731.385	841,563.641	3,384,861.458	266,092.193	86.696
403	1403	30°31'54.27425" N	95°26'14.72480" W	3,383,112.869	841,862.992	3,380,237.095	266,145.154	63.495
404	1404	30°26'47.65764" N	95°26'04.67509" W	3,373,674.048	842,429.706	3,370,788.767	266,209.366	75.493
405	1405	30°19'24.82958" N	95°11'46.85182" W	3,360,775.539	865,790.152	3,356,683.814	288,832.374	21.085
406	1406	30°24'48.67395" N	95°11'31.20779" W	3,370,768.924	865,872.548	3,366,647.822	289,443.250	40.413
407	1407	30°29'00.47767" N	95°11'39.93408" W	3,378,520.505	865,377.920	3,374,406.180	289,360.924	58.674
408	1408	30°35'57.48583" N	95°11'41.86694" W	3,391,369.135	864,892.025	3,387,248.356	289,559.482	56.439
409	1409	30°43'03.12323" N	95°11'43.03029" W	3,404,484.502	864,416.217	3,400,356.063	289,784.699	26.705
410	1410	30°44'16.20849" N	95°03'02.65998" W	3,407,216.524	878,191.892	3,402,344.416	303,670.324	14.548
411	1411	30°47'46.47303" N	95°09'52.16711" W	3,413,317.093	867,068.531	3,409,024.229	292,902.918	25.220
412	1412	30°42'01.88791" N	94°59'56.81192" W	3,403,252.548	883,287.336	3,398,119.026	308,539.875	10.908
413	1413	30°37'52.92841" N	95°00'01.45669" W	3,395,575.349	883,437.262	3,390,455.210	308,279.718	2.694
414	1414	30°37'05.89232" N	94°52'15.21551" W	3,394,575.506	895,916.951	3,388,793.148	320,670.303	43.791
415	1415	30°32'57.01806" N	94°52'17.45705" W	3,386,902.609	896,138.912	3,381,131.115	320,483.209	-3.783
416	1416	30°28'14.01046" N	94°54'33.42444" W	3,378,047.656	892,828.604	3,372,477.880	316,712.290	-2.893

417	1417	30°31'22.26640" N	95°03'55.64541" W	3,383,315.386	877,617.205	3,378,538.546	301,823.064	51.520
418	1418	30°24'59.97155" N	95°02'45.87500" W	3,371,598.975	879,891.638	3,366,733.075	303,469.737	23.280
419	1419	30°22'22.01676" N	95°15'54.09474" W	3,366,015.520	859,000.716	3,362,269.925	282,336.645	39.770
420	1420	30°26'22.82300" N	95°17'13.44253" W	3,373,365.877	856,636.982	3,369,727.886	280,367.897	63.365
421	1421	30°32'51.96377" N	95°17'01.19368" W	3,385,367.610	856,568.790	3,381,704.594	280,937.225	49.898
422	1422	30°38'28.10963" N	95°19'41.09614" W	3,395,585.501	851,965.935	3,392,143.486	276,889.512	84.111
423	1423	30°44'17.84825" N	95°19'02.74212" W	3,406,395.803	852,633.808	3,402,892.724	278,133.253	89.328
424	1424	30°30'11.93577" N	94°59'13.61298" W	3,381,413.332	885,219.240	3,376,237.865	309,303.222	14.924
425	1425	30°34'48.59673" N	95°07'13.86623" W	3,389,490.420	872,109.554	3,384,990.133	296,658.447	77.425
426	1426	30°19'58.19606" N	95°21'27.18305" W	3,361,293.970	850,243.966	3,358,022.537	273,350.707	29.499
427	1427	30°47'59.40261" N	95°03'05.53860" W	3,414,092.382	877,872.371	3,409,218.663	303,719.704	47.072

SAN JACINTO

State Plane Coordinates – NAD 1983 (2011) / NAVD 1988

Station Name	GPSID	SPC N m	SPC E m	NAVD88 m	SPC N ft	SPC E ft	NAVD88 ft
400	1400	3,129,828.875	1,168,640.343	95.472	10,268,446.902	3,834,114.192	313.229
401	1401	3,123,830.589	1,168,652.335	111.136	10,248,767.524	3,834,153.536	364.618
402	1402	3,110,844.748	1,169,301.784	113.988	10,206,163.143	3,836,284.269	373.974
403	1403	3,106,235.491	1,169,657.856	90.828	10,191,040.941	3,837,452.483	297.992
404	1404	3,096,815.025	1,170,341.111	102.907	10,160,133.960	3,839,694.127	337.619
405	1405	3,084,225.853	1,193,833.166	48.524	10,118,830.985	3,916,767.646	159.200
406	1406	3,094,206.418	1,193,789.904	67.837	10,151,575.556	3,916,625.710	222.562
407	1407	3,101,940.989	1,193,199.205	86.062	10,176,951.394	3,914,687.726	282.354
408	1408	3,114,765.529	1,192,554.800	83.735	10,219,026.572	3,912,573.540	274.721
409	1409	3,127,856.500	1,191,918.698	53.925	10,261,975.867	3,910,486.597	176.919
410	1410	3,130,752.626	1,205,640.624	41.802	10,271,477.573	3,955,505.948	137.145
411	1411	3,136,708.735	1,194,459.674	52.423	10,291,018.574	3,918,823.114	171.993
412	1412	3,126,857.120	1,210,776.513	38.200	10,258,697.067	3,972,355.942	125.329
413	1413	3,119,193.951	1,211,020.435	30.046	10,233,555.489	3,973,156.210	98.577
414	1414	3,118,349.516	1,223,491.921	71.173	10,230,785.038	4,014,073.079	233.506
415	1415	3,110,692.419	1,223,808.411	23.648	10,205,663.377	4,015,111.428	77.587
416	1416	3,101,811.111	1,220,613.874	24.552	10,176,525.288	4,004,630.686	80.550
417	1417	3,106,881.052	1,205,361.010	78.901	10,193,158.919	3,954,588.579	258.860
418	1418	3,095,210.841	1,207,778.145	50.698	10,154,870.900	3,962,518.796	166.332
419	1419	3,089,373.348	1,186,986.999	67.223	10,135,719.060	3,894,306.513	220.549
420	1420	3,096,684.409	1,184,534.394	90.784	10,159,705.432	3,886,259.925	297.847

421	1421	3,108,669.403	1,184,317.123	77.231	10,199,026.200	3,885,547.093	253.381
422	1422	3,118,817.092	1,179,594.345	111.348	10,232,319.075	3,870,052.445	365.315
423	1423	3,129,621.422	1,180,129.064	116.499	10,267,766.283	3,871,806.771	382.214
424	1424	3,105,076.464	1,212,974.888	42.343	10,187,238.366	3,979,568.446	138.920
425	1425	3,112,978.618	1,199,785.107	104.750	10,213,164.017	3,936,294.972	343.668
426	1426	3,084,547.849	1,178,300.811	56.991	10,119,887.402	3,865,808.576	186.977
427	1427	3,137,613.970	1,205,237.946	74.295	10,293,988.499	3,954,184.827	243.751

SULPHUR SPRINGS

Adjusted Coordinates – NAD 1983 (2011) / NAVD 1988

UTM Zone 14 & 15

NAVD 1988 orthometric height – ellipsoidal height + GEOID12B

Station Name	GPSID	Latitude	Longitude	UTM 14 N m	UTM 14 E m	UTM 15 N m	UTM 15 E m	Ellip H m
500	1500	33°18'55.14917" N	96°12'13.97161" W	3,689,734.503	760,310.022	3,690,827.655	201,713.796	185.331
501	1501	33°13'34.59715" N	96°12'13.62807" W	3,679,858.366	760,583.544	3,680,949.533	201,419.355	179.111
502	1502	33°08'15.78078" N	96°12'07.56378" W	3,670,039.773	761,003.313	3,671,120.456	201,275.600	149.361
503	1503	33°01'14.55902" N	96°12'05.30155" W	3,657,063.571	761,408.201	3,658,138.951	200,937.988	130.680
504	1504	32°51'41.71204" N	96°12'06.76476" W	3,639,413.546	761,839.289	3,640,488.417	200,363.038	127.769
505	1505	33°11'22.71007" N	95°53'10.22323" W	3,676,631.958	790,314.549	3,676,022.817	230,918.053	135.308
506	1506	33°05'55.75121" N	95°53'18.67458" W	3,666,550.666	790,395.018	3,665,954.919	230,421.194	151.448
507	1507	32°59'48.01689" N	95°53'01.41050" W	3,655,232.860	791,179.192	3,654,612.466	230,557.663	126.709
508	1508	32°54'15.43257" N	95°52'57.41911" W	3,644,988.020	791,586.405	3,644,362.615	230,380.645	124.519
509	1509	32°50'18.53092" N	95°52'57.95105" W	3,637,688.032	791,788.344	3,637,064.060	230,167.330	104.567
510	1510	32°43'28.13529" N	95°52'55.96539" W	3,625,044.286	792,212.930	3,624,418.511	229,874.301	110.179
511	1511	33°18'44.25610" N	95°36'35.13297" W	3,691,041.198	815,655.377	3,688,948.894	257,036.066	110.226
512	1512	33°14'50.90722" N	95°36'41.82803" W	3,683,844.349	815,715.779	3,681,764.060	256,682.940	118.017
513	1513	33°09'23.07935" N	95°36'38.13863" W	3,673,744.715	816,138.962	3,671,661.832	256,526.278	120.172
514	1514	33°01'53.53534" N	95°36'24.41025" W	3,659,902.696	816,943.325	3,657,803.459	256,537.745	127.047
515	1515	32°55'50.17153" N	95°36'18.07175" W	3,648,710.393	817,469.472	3,646,605.068	256,424.980	120.299
516	1516	32°47'02.93166" N	95°36'29.87788" W	3,632,453.016	817,685.092	3,630,369.986	255,716.801	116.811
517	1517	32°44'09.05863" N	95°36'22.71473" W	3,627,100.959	818,043.490	3,625,008.954	255,771.268	108.357

518	1518	33°25'36.96343" N	95°21'44.28356" W	3,704,538.690	838,262.616	3,701,113.590	280,367.970	92.474
519	1519	33°19'47.06032" N	95°20'14.83581" W	3,693,835.440	840,954.091	3,690,282.054	282,436.489	104.379
520	1520	33°13'38.54234" N	95°20'10.07854" W	3,682,481.648	841,476.260	3,678,926.688	282,305.384	88.131
521	1521	33°10'03.04884" N	95°20'18.56369" W	3,675,832.254	841,489.178	3,672,293.152	281,937.265	111.394
522	1522	33°04'57.09830" N	95°20'16.79444" W	3,666,404.279	841,864.839	3,662,867.170	281,772.818	137.047
523	1523	33°35'40.29222" N	95°53'23.77943" W	3,721,536.072	788,620.207	3,720,943.499	231,814.648	174.938
524	1524	33°31'06.91590" N	95°53'28.97924" W	3,713,107.952	788,739.005	3,712,523.810	231,445.395	150.145
525	1525	33°26'02.92128" N	95°53'25.63304" W	3,703,743.033	789,106.077	3,703,154.630	231,270.887	157.772
526	1526	33°31'37.58133" N	95°57'47.34173" W	3,713,855.203	782,042.838	3,713,657.002	224,804.275	161.773
527	1527	33°40'16.59969" N	95°29'02.65484" W	3,731,258.907	826,013.191	3,728,477.892	269,693.575	142.748
528	1528	33°36'18.75338" N	95°28'51.87650" W	3,723,937.893	826,540.655	3,721,143.440	269,795.338	120.095
529	1529	33°32'24.75738" N	95°29'08.11552" W	3,716,711.896	826,366.794	3,713,944.386	269,203.646	117.484
530	1530	33°29'46.44029" N	95°29'06.90203" W	3,711,833.656	826,563.605	3,709,066.134	269,118.052	107.822
531	1531	33°24'47.16407" N	95°28'58.12919" W	3,702,617.750	827,102.667	3,699,840.564	269,124.102	104.838
532	1532	33°33'53.72535" N	95°46'33.07071" W	3,718,576.344	799,314.210	3,717,370.048	242,317.015	151.883
533	1533	33°27'52.56358" N	95°46'21.38620" W	3,707,456.092	799,962.174	3,706,234.144	242,320.845	132.184
534	1534	33°38'44.88498" N	95°40'05.81362" W	3,727,865.605	809,015.842	3,726,078.252	252,537.167	154.971
535	1535	33°35'02.04971" N	95°32'56.12208" W	3,721,361.633	820,320.726	3,718,933.323	263,440.495	137.470
536	1536	33°31'00.73114" N	95°39'09.79405" W	3,713,608.039	810,922.513	3,711,740.383	253,614.246	119.968
537	1537	33°26'20.58101" N	95°34'28.56369" W	3,705,211.424	818,467.319	3,702,926.265	260,657.883	104.447
538	1538	33°22'38.73080" N	95°41'50.66952" W	3,698,004.716	807,261.778	3,696,380.774	249,060.812	126.624
539	1539	33°21'22.83082" N	95°24'21.64297" W	3,696,564.635	834,466.652	3,693,377.709	276,122.014	98.910
540	1540	33°17'40.05812" N	95°29'23.24370" W	3,689,432.719	826,897.488	3,686,697.881	268,160.647	126.025
541	1541	33°13'10.97633" N	95°25'09.71572" W	3,681,362.831	833,743.919	3,678,253.991	274,527.802	96.096
542	1542	33°06'41.13241" N	95°31'50.12018" W	3,668,998.531	823,770.293	3,666,489.416	263,869.323	119.401
543	1543	33°11'45.52875" N	95°30'59.88438" W	3,678,422.736	824,760.893	3,675,835.675	265,397.165	112.361
544	1544	33°01'01.21673" N	95°23'41.83548" W	3,658,950.100	836,794.661	3,655,720.624	276,289.606	126.668
545	1545	32°50'35.71997" N	95°23'16.06294" W	3,639,695.703	838,125.406	3,636,436.884	276,521.698	122.844
546	1546	32°52'30.10838" N	95°29'29.02235" W	3,642,893.467	828,305.428	3,640,184.815	266,906.299	113.636
547	1547	32°56'17.33175" N	95°28'36.07606" W	3,649,941.967	829,448.090	3,647,152.222	268,447.148	102.706
548	1548	33°05'46.81575" N	95°25'14.47270" W	3,667,669.772	834,089.032	3,664,573.864	274,088.249	136.601
549	1549	33°10'07.55155" N	95°42'17.72019" W	3,674,834.017	807,293.577	3,673,255.401	247,761.689	141.811

550	1550	33°06'25.25690" N	95°48'50.77570" W	3,667,668.592	797,315.549	3,666,675.033	237,393.002	152.801
551	1551	32°57'13.15116" N	95°49'04.80857" W	3,650,644.929	797,467.163	3,649,674.515	236,572.725	107.077
552	1552	32°58'19.76136" N	95°41'32.62847" W	3,653,059.828	809,150.042	3,651,419.192	248,370.498	112.789
553	1553	33°04'24.86109" N	95°42'24.94658" W	3,664,267.868	807,438.306	3,662,702.285	247,301.686	144.304
554	1554	32°52'29.04296" N	95°41'30.52077" W	3,642,254.074	809,544.331	3,640,612.822	248,149.122	113.683
555	1555	32°47'02.76256" N	95°41'50.90313" W	3,632,183.171	809,328.859	3,630,574.377	247,362.478	105.684
556	1556	32°45'07.69323" N	95°48'23.41727" W	3,628,323.557	799,219.076	3,627,295.109	237,053.485	100.570
557	1557	32°50'16.72878" N	95°48'57.19885" W	3,637,819.437	798,052.545	3,636,839.533	236,427.660	111.657
558	1558	32°43'33.41191" N	96°02'25.94618" W	3,624,780.851	777,363.510	3,624,996.237	215,034.532	135.701
559	1559	32°49'32.91165" N	96°00'08.40925" W	3,635,958.136	780,631.440	3,635,970.566	218,931.034	130.498
560	1560	32°54'11.91622" N	96°06'50.26992" W	3,644,263.033	769,942.290	3,644,870.210	208,730.388	127.281
561	1561	32°57'37.22262" N	95°59'37.43015" W	3,650,903.374	781,011.746	3,650,869.942	220,160.761	115.479
562	1562	33°02'49.69689" N	96°07'16.94539" W	3,660,197.052	768,812.366	3,660,845.158	208,510.554	129.572
563	1563	33°04'08.99880" N	96°01'38.31300" W	3,662,885.375	777,530.269	3,663,031.249	217,368.651	128.198
564	1564	33°08'30.00158" N	95°58'32.18755" W	3,671,065.520	782,126.854	3,670,935.082	222,425.639	145.270
565	1565	33°11'41.54294" N	96°03'15.47615" W	3,676,757.897	774,617.427	3,677,048.499	215,254.573	145.827
566	1566	33°16'08.95401" N	96°07'37.53992" W	3,684,808.261	767,602.035	3,685,489.227	208,712.037	171.952
567	1567	33°09'19.55190" N	96°07'22.47832" W	3,672,204.844	768,339.115	3,672,862.252	208,724.906	137.915
568	1568	33°11'25.37693" N	96°18'04.24494" W	3,675,638.442	751,607.318	3,677,250.232	192,212.866	179.738
569	1569	33°00'59.06317" N	96°18'02.32022" W	3,656,343.706	752,154.047	3,657,948.330	191,654.826	148.764
570	1570	33°01'36.55867" N	95°47'21.31946" W	3,658,843.306	799,907.785	3,657,718.330	239,476.161	125.967
571	1571	33°34'39.39230" N	95°39'45.36434" W	3,720,317.055	809,787.149	3,718,500.912	252,869.409	137.560

SULPHUR SPRINGS

State Plane Coordinates – NAD 1983 (2011) / NAVD 1988

Station Name	GPSID	SPC N m	SPC E m	NAVD88 m	SPC N ft	SPC E ft	NAVD88 ft
500	1500	2,185,155.989	813,771.179	210.954	7,169,132.606	2,669,847.609	692.104
501	1501	2,175,284.117	813,995.875	204.654	7,136,744.640	2,670,584.800	671.435
502	1502	2,165,469.126	814,367.637	174.853	7,104,543.292	2,671,804.489	573.663
503	1503	2,152,498.507	814,710.114	156.116	7,061,988.851	2,672,928.100	512.190
504	1504	2,134,856.695	815,058.123	153.120	7,004,109.008	2,674,069.858	502.361
505	1505	2,171,914.440	843,691.126	161.099	7,125,689.292	2,768,009.969	528.538
506	1506	2,161,840.590	843,722.638	177.223	7,092,638.668	2,768,113.354	581.440
507	1507	2,150,527.878	844,452.173	152.481	7,055,523.546	2,770,506.838	500.265
508	1508	2,140,289.151	844,810.957	150.273	7,021,931.988	2,771,683.948	493.022

509	1509	2,132,993.934	844,978.916	130.312	6,997,997.599	2,772,234.995	427.533
510	1510	2,120,358.083	845,345.498	135.886	6,956,541.476	2,773,437.688	445.819
511	1511	2,186,185.898	869,081.278	136.438	7,172,511.567	2,851,310.828	447.629
512	1512	2,178,995.657	869,105.790	144.195	7,148,921.585	2,851,391.246	473.081
513	1513	2,168,903.699	869,478.960	146.330	7,115,811.554	2,852,615.554	480.083
514	1514	2,155,071.278	870,215.844	153.177	7,070,429.685	2,855,033.149	502.548
515	1515	2,143,887.434	870,688.642	146.418	7,033,737.356	2,856,584.319	480.374
516	1516	2,127,644.914	870,829.049	142.899	6,980,448.354	2,857,044.973	468.829
517	1517	2,122,296.425	871,162.860	134.434	6,962,900.854	2,858,140.150	441.054
518	1518	2,199,554.708	891,733.376	119.055	7,216,372.405	2,925,628.584	390.601
519	1519	2,188,850.012	894,367.277	130.935	7,181,252.081	2,934,269.975	429.576
520	1520	2,177,506.853	894,832.073	114.682	7,144,037.068	2,935,794.893	376.252
521	1521	2,170,865.196	894,812.235	137.922	7,122,246.898	2,935,729.808	452.498
522	1522	2,161,446.492	895,141.669	163.526	7,091,345.698	2,936,810.627	536.502
523	1523	2,216,793.284	842,224.664	201.435	7,272,929.298	2,763,198.751	660.876
524	1524	2,208,370.693	842,299.749	176.389	7,245,296.183	2,763,445.095	578.702
525	1525	2,199,010.844	842,618.668	183.794	7,214,588.078	2,764,491.414	602.996
526	1526	2,209,151.862	835,612.187	187.966	7,247,859.069	2,741,504.317	616.684
527	1527	2,226,310.705	879,636.921	169.776	7,304,154.373	2,885,942.132	557.006
528	1528	2,218,994.218	880,124.987	146.897	7,280,150.197	2,887,543.395	481.944
529	1529	2,211,776.455	879,913.361	144.133	7,256,469.920	2,886,849.085	472.877
530	1530	2,206,902.172	880,084.595	134.399	7,240,478.210	2,887,410.877	440.941
531	1531	2,197,693.005	880,575.683	131.315	7,210,264.467	2,889,022.054	430.824
532	1532	2,213,780.174	852,895.100	178.401	7,263,043.786	2,798,206.675	585.304
533	1533	2,202,665.636	853,485.168	158.402	7,226,578.840	2,800,142.588	519.692
534	1534	2,223,010.828	862,637.325	181.861	7,293,328.025	2,830,169.289	596.655
535	1535	2,216,453.247	873,897.624	164.208	7,271,813.693	2,867,112.454	538.739
536	1536	2,208,755.867	864,467.734	146.460	7,246,559.875	2,836,174.558	480.512
537	1537	2,200,328.242	871,962.263	130.851	7,218,910.239	2,860,762.857	429.302
538	1538	2,193,185.219	860,730.454	152.768	7,195,475.171	2,823,913.163	501.207
539	1539	2,191,608.919	887,900.985	125.411	7,190,303.594	2,913,055.147	411.453
540	1540	2,184,522.773	880,304.071	152.399	7,167,055.131	2,888,130.940	499.997
541	1541	2,176,427.553	887,103.011	122.548	7,140,496.062	2,910,437.129	402.058
542	1542	2,164,125.215	877,079.622	145.654	7,100,134.142	2,877,552.059	477.866
543	1543	2,173,534.853	878,115.132	138.670	7,131,005.597	2,880,949.395	454.953
544	1544	2,154,025.205	890,041.690	153.052	7,066,997.692	2,920,078.444	502.139
545	1545	2,134,786.517	891,280.915	149.189	7,003,878.764	2,924,144.136	489.464
546	1546	2,138,026.034	881,486.488	139.882	7,014,507.080	2,892,010.254	458.930
547	1547	2,145,061.689	882,660.736	128.981	7,037,589.892	2,895,862.765	423.164
548	1548	2,162,748.025	887,380.879	162.990	7,095,615.813	2,911,348.767	534.742
549	1549	2,170,035.107	860,647.155	167.828	7,119,523.513	2,823,639.875	550.615
550	1550	2,162,924.272	850,642.998	178.667	7,096,194.049	2,790,817.902	586.178
551	1551	2,145,913.990	850,713.446	132.928	7,040,386.149	2,791,049.031	436.113
552	1552	2,148,271.811	862,397.509	138.811	7,048,121.768	2,829,382.495	455.415
553	1553	2,159,477.795	860,740.633	170.306	7,084,886.733	2,823,946.559	558.745
554	1554	2,137,474.105	862,740.955	139.688	7,012,696.292	2,830,509.283	458.293
555	1555	2,127,413.360	862,479.429	131.663	6,979,688.667	2,829,651.261	431.965
556	1556	2,123,603.028	852,360.872	126.390	6,967,187.601	2,796,453.960	414.666
557	1557	2,133,096.384	851,238.690	137.490	6,998,333.720	2,792,772.270	451.082
558	1558	2,120,161.985	830,505.601	161.184	6,955,898.112	2,724,750.459	528.817
559	1559	2,131,316.689	833,822.310	156.065	6,992,494.837	2,735,632.027	512.022
560	1560	2,139,665.570	823,178.767	152.728	7,019,886.124	2,700,712.336	501.076
561	1561	2,146,249.602	834,271.890	141.105	7,041,487.236	2,737,107.027	462.941
562	1562	2,155,594.850	822,124.714	155.070	7,072,147.437	2,697,254.166	508.758
563	1563	2,158,239.744	830,849.720	153.801	7,080,824.892	2,725,879.456	504.595

564	1564	2,166,391.996	835,482.466	170.949	7,107,571.073	2,741,078.723	560.854
565	1565	2,172,116.951	828,005.921	171.450	7,126,353.698	2,716,549.426	562.498
566	1566	2,180,196.584	821,034.526	197.566	7,152,861.627	2,693,677.439	648.180
567	1567	2,167,597.382	821,709.510	163.460	7,111,525.743	2,695,891.950	536.284
568	1568	2,171,110.302	805,003.936	205.244	7,123,051.049	2,641,083.746	673.372
569	1569	2,151,822.976	805,457.646	174.172	7,059,772.549	2,642,572.293	571.430
570	1570	2,154,093.962	853,190.785	151.869	7,067,223.273	2,799,176.768	498.256
571	1571	2,215,464.816	863,368.284	164.217	7,268,570.818	2,832,567.447	538.769