American Samoa
Mobile LiDAR Mapping Program
Ground Control Survey Report
November, 2011

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Prepared By:

Sanborn
1935 Jamboree Drive, Suite 100
Colorado Springs, CO 80920
(719) 593-0093

SANBORN

EXECUTIVE SUMMARY

Sanborn Map Company was contracted by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center to perform LiDAR mobile mapping surveys of American Samoa's' contractually chosen seven villages. Lynx Optech Mobile mapping system was used to collect 3-D point cloud in the project areas.

A network of ground control points, has been design and implemented into the project process to establish common datum for geo-referencing of LiDAR data. These control points are also used in conjunction with mobile GPS trajectory collected during the LiDAR point cloud acquisition. Additionally, a number photo identifiable, targeted control points and Quality Control checkpoints were collected based on the same ground control network.

The local network was designed, processed and adjusted using Trimble Geomatics Office (TGO) version 1.62. Final horizontal coordinates are provided in meters on UTM Zone 2 coordinate system, on the North American Datum of 1983, 2002 epoch. Furthermore, orthometric elevations were estimated for all points in the network using sophisticated geoidal modeling techniques based on American Samoa GEOID 09 and are provided on the ASVD02 Vertical Datum, in meters.

Seven sets, one for each village, of ground control points have been collected. Each set consists of NGS monuments, semi-permanent GPS stations, photo ID targets and LiDAR check points. Closed loops surveys have been used for Network points establishment. RTK surveys were performed to establish photo ID targets and check points. In addition conventional surveys have been used for check point densification in obscured and inaccessible areas. S8 Trimble Robotic total station was implemented in all conventional surveys.

TABLE OF CONTENTS

1. INTRODUCTION

This report contains the technical write-up of the differential GPS surveys and conventional surveys performed for the ground control LiDAR, in support of high-resolution digital elevation model developed for American Samoa program.

Sanborn was responsible for the preparation of this report, all fieldwork including reconnaissance of existing control points, establishment of additional control points, LiDAR check points, GPS surveys, conventional surveys, all GPS data processing and reductions.

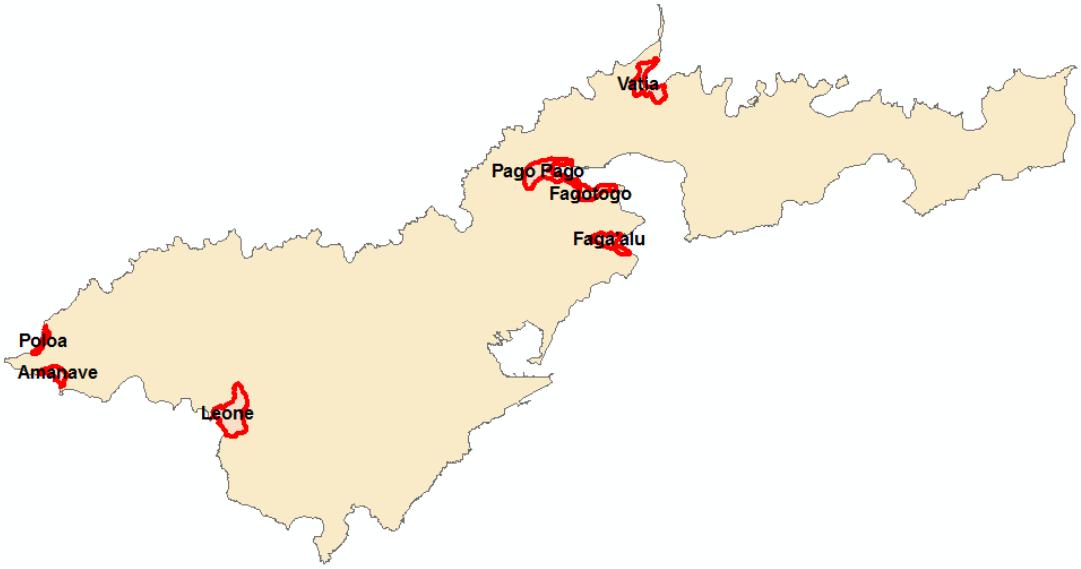

Figure 1: LiDAR Project Layout.

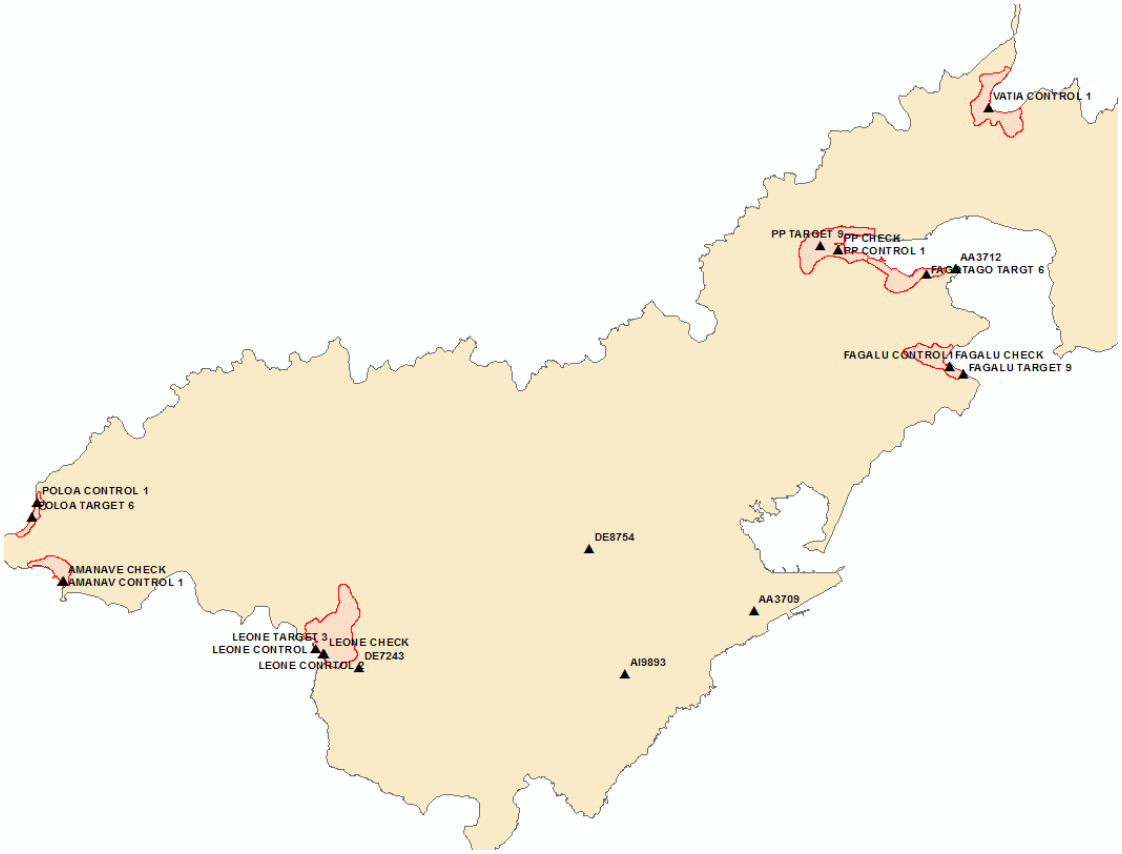

Figure 2: Ground Control Layout.

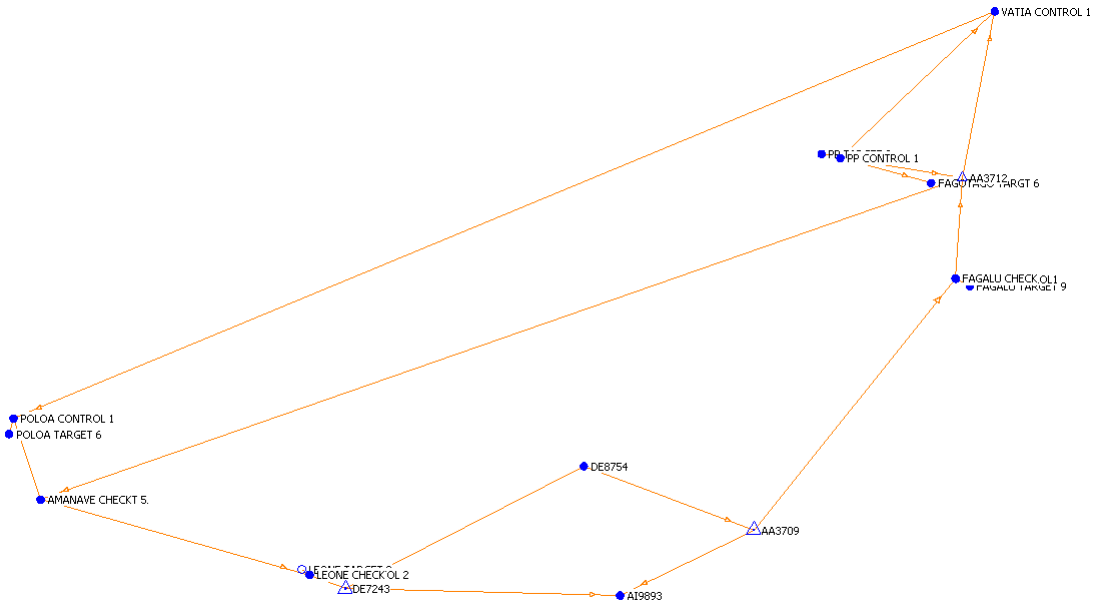

Figure 3: Network of Ground Control Points.

1.1 Purpose and Distribution of the Survey

The GPS Network surveys were designed to provide ground control for high-accuracy LiDAR data collection of American Samoa seven villages. GPS stations were strategically placed within each village so the LiDAR collection occurs within the closest possible distance from any base station. It ensures best computed trajectory accuracy possible. Multiple receivers were used to achieve this requirement. The GPS control network consists of twenty one control stations. The network includes five NGS monuments: AA3712, AA3709, AI9893, DE8754 and DE7243. The other sixteen control points are semi-permanent 12" spikes, serving as: base stations, RTK QA/QC points or Conventional Surveys control. The horizontal and vertical datum of the local GPS network is based on these NGS monuments.

Total of 610 RTK LiDAR Targets or Check Points control points have been collected throughout seven villages, to serve as LiDAR data adjustments and Quality Control points. In addition total of 283 Check Points have been collected where high obscurity or inaccessibility was the issue. Two villages: Pago Pago and Fagatogo, had no conventional surveys done due to satisfactory RTK point distribution. Control Points were positioned with the intent of accomplishing even and random point distribution over the area of interest. Very dense vegetation and abrupt terrain variations were two main issues influencing point distributions. In addition to that, due to heavy canopy and terrain, as well as poor satellite constellation (high PDOP), many points needed to be moved or abandoned. See APPENDIX C for point pictures and shape files.

Village	# of RTK Control Points	# of Conventional Control Points
Amanave	77	38
Poloa	53	61
Leone	82	66
Fagaalu	103	42
Vatia	85	76
Pago Pago	124	0
Fagatogo	86	0
Total	**610**	**283**

Table 1: Control Points Distribution.

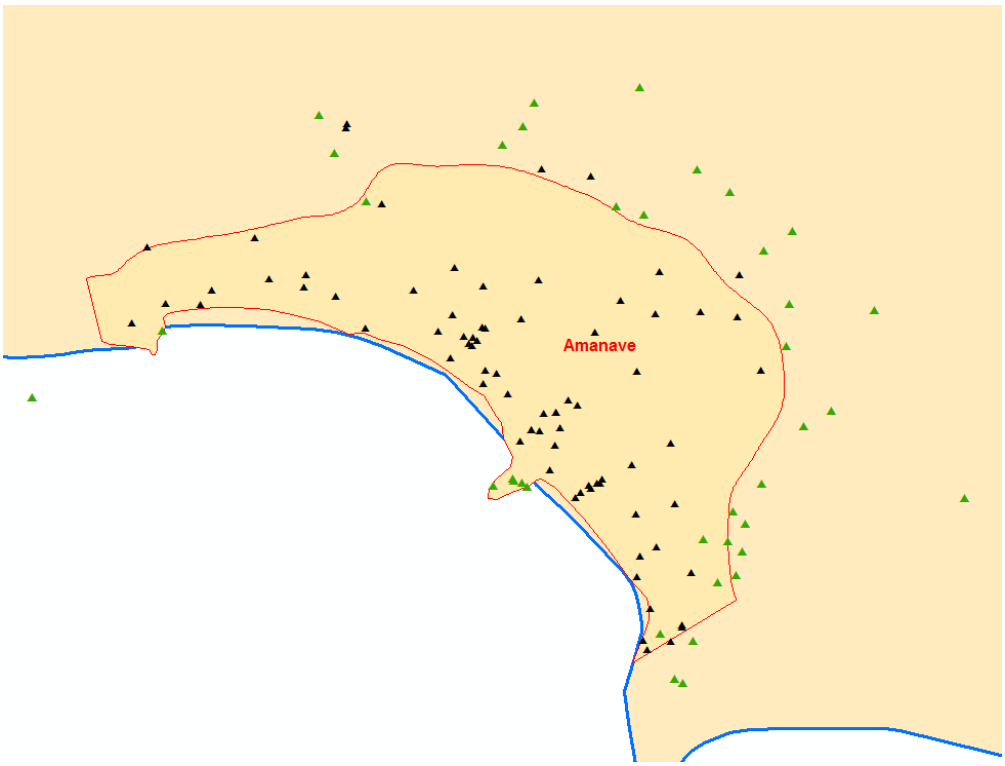

Figure 4: Control Points Distribution for Amanave.

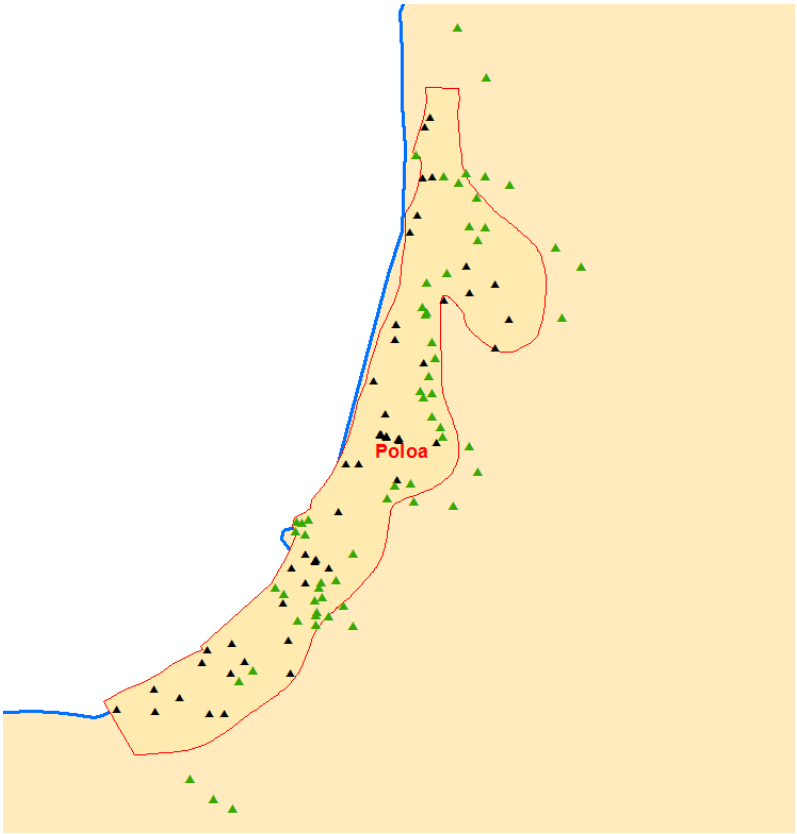

Figure 5: Control Points Distribution for Poloa.

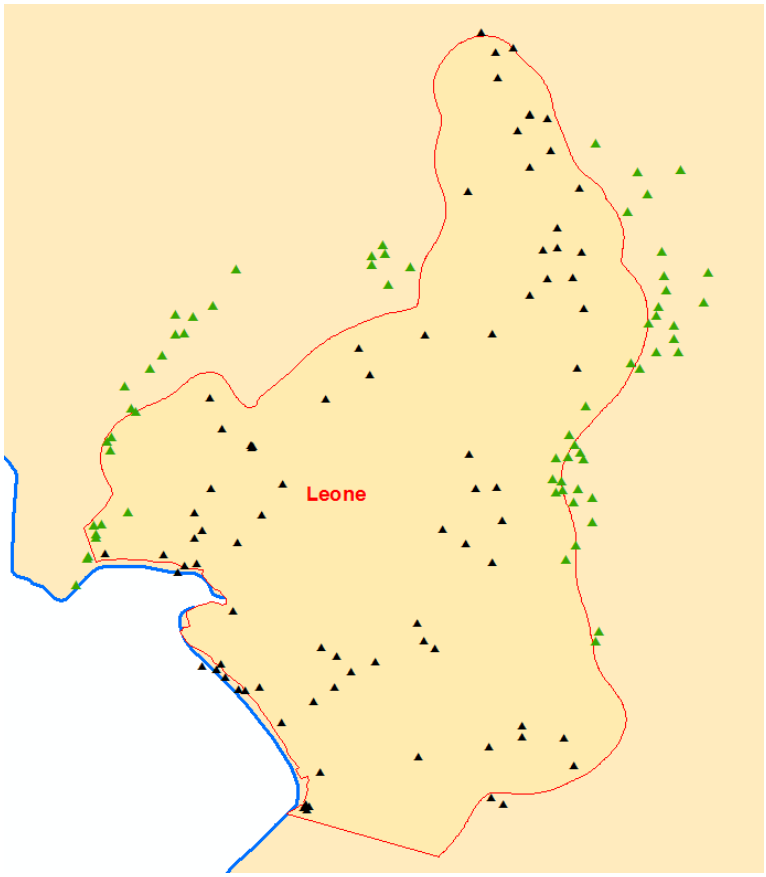

Figure 6: Control Points Distribution for Leone.

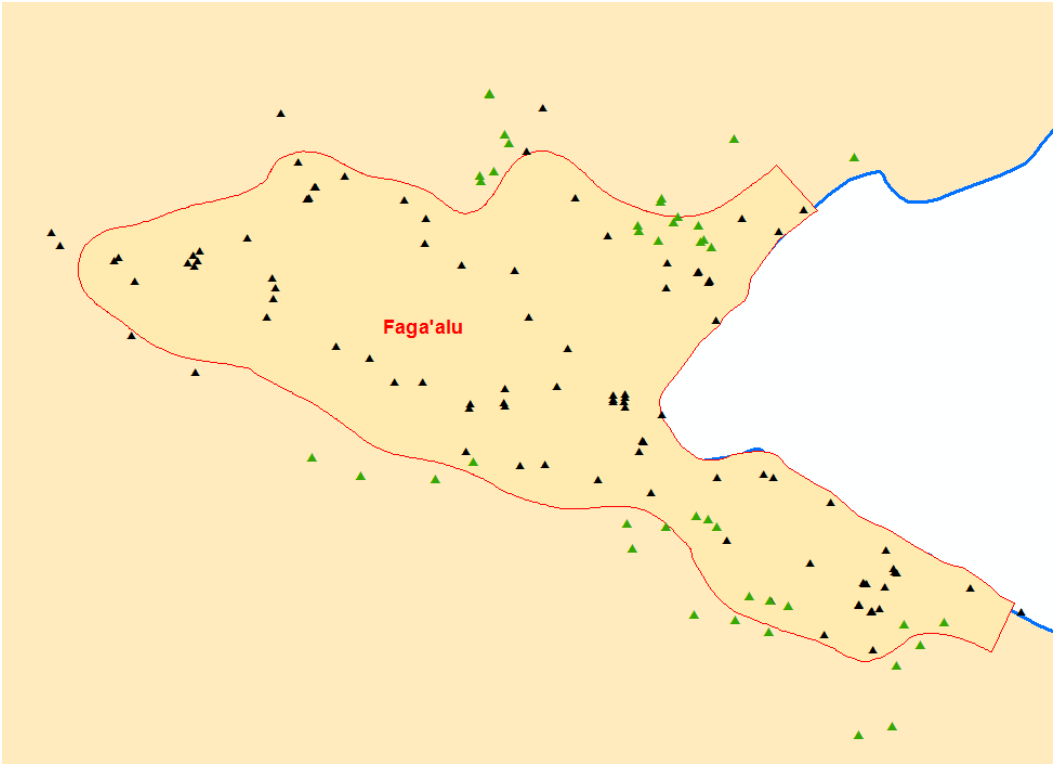

Figure 7: Control Points Distribution for Fagaalu.

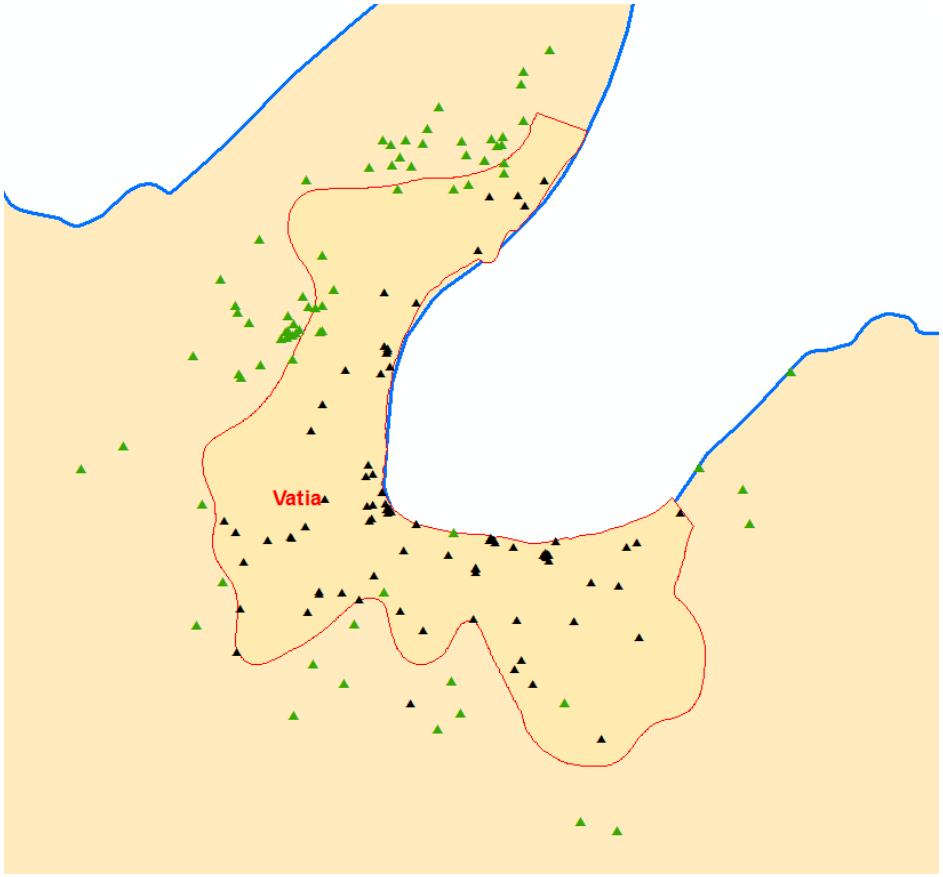

Figure 8: Control Points Distribution for Vatia.

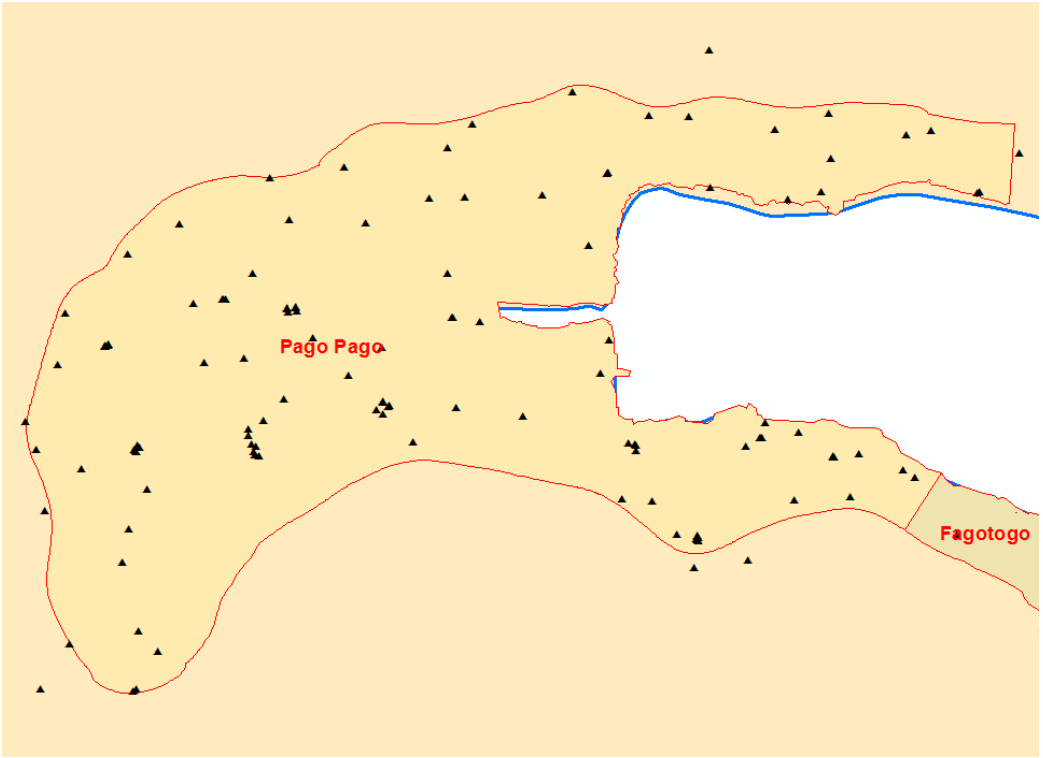

Figure 9: Control Points Distribution for Pago Pago.

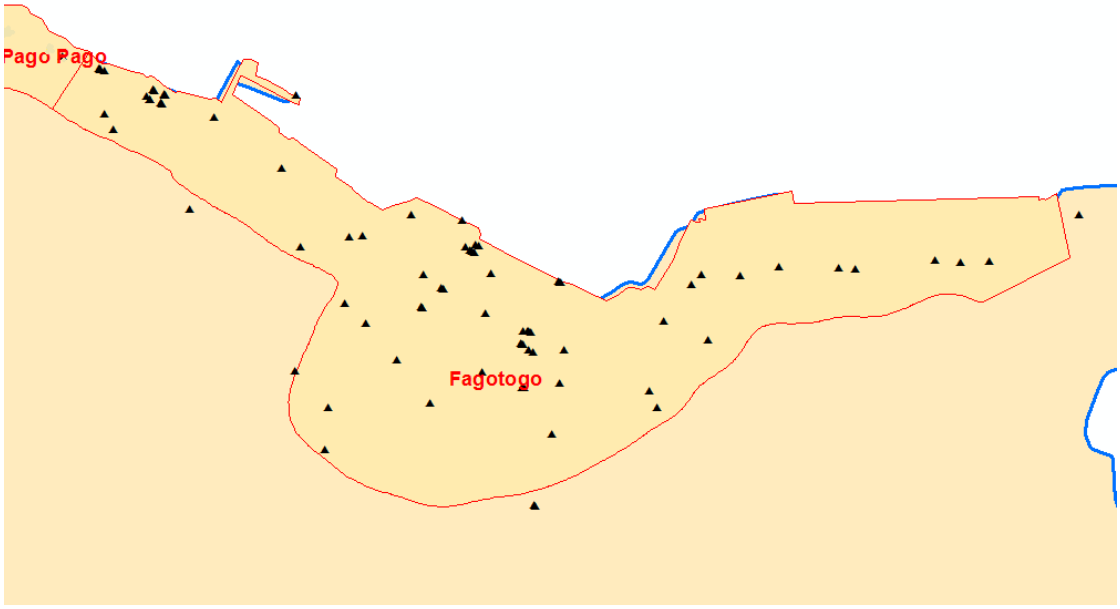

Figure 10: Control Points Distribution for Fago Togo.

1.2 Duration/Time Period

The acquisition of Network ground control points was completed between August 11, 2011 (Julian day 223) and August 20, 2011 (Julian day 232). Furthermore, target points and check points for villages were completed in the following time sequence: Poloa - August 12 ,2011 (Julian day 224), Amanave – August 13, 2011 (Julian day 225), Vatia – August 14, 2011 (Julian day 226), Fagaalu – August 16, 2011 (Julian day 228), Fagatogo – August 17, 2011 (Julian day 229), Pago Pago – August 18 (Julian day 230) and Leone – between August 19, 2011 (Julian day 231) and August 22, 2011 (Julian day 234). Conventional surveys were performed between August 18, 2011 (Julian day 230) and August 21, 2011 (Julian day 233).

1.3 Field Procedures

A careful reconnaissance was undertaken prior to the monumentation and subsequent GPS surveys. Many of the points have good satellite visibility, but number of points had moderate to high obscurity. The satellite window provided 24–hour coverage, and GPS observation sessions were scheduled between 7:00 am and 9:00 PM, local time, each day. No difficulties were experienced with solar storm activity. All baseline processing, analysis, and preliminary reductions were performed on a daily basis, thus allowing for continuous quality control.

The Network GPS control survey was set up as a fast static at 1s logging rate. RTK surveys were collected with fixed ambiguity resolution mode, with 5s per point collection duration. Personnel navigated to points using RTK GPS receiver sets. The hand-held GPS receivers had approximate geodetic coordinates loaded for the required observation points. Upon arriving at the desired location, the field personnel initiated a search for an adequate check point location that was in a GPS "friendly" spot. The receiver was set on the bipod and leveled over the point. The following information was recorded: control point name and code, stamping if available, date, Julian date, observer name, receiver model & serial number, antenna type' antenna height, start time, end time and site picture.

Digital photographs were taken at each point showing the targeted point and its relationship to its surroundings, see Appendix C for details.

1.4 Contact

Questions regarding the technical aspects of this report should be addressed to:

Sanborn
1935 Jamboree Drive, Suite 100
Colorado Springs, Colorado, 80920

Attention:	Alistair Strachan	Project Manager
	Karol Szczubelek	Geodetic Engineer
Telephone:	(719) 593-0093	
FAX:	(719) 528-5093	

1.5 Accuracy requirements

The American Samoa GPS network meets the current Federal Geodetic Control Subcommittee (FGCS) accuracy standard for horizontal *Second order* GPS surveys. All baselines meet the required relative horizontal positional accuracy of 20 mm + 20 ppm, at the 95% level of confidence**.**

1.6 GPS Network Diagram

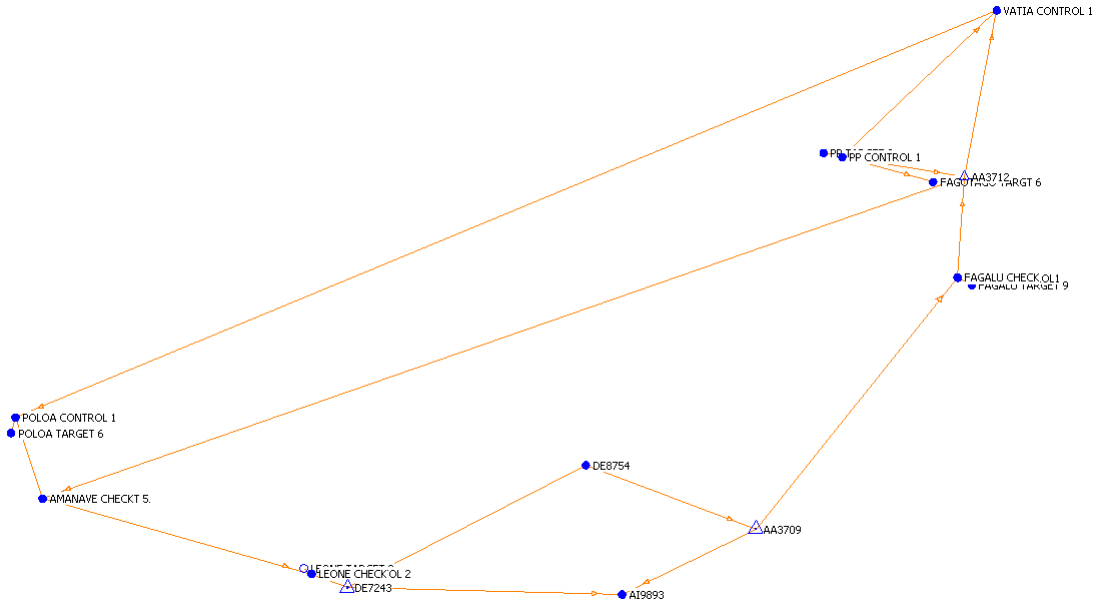

Figure 11: Network Diagram

2. PROJECT AREA SCOPE AND DETAILS

Sanborn Map Company was contracted by the National Oceanic and Atmospheric Administration (NOAA) Costal Services Center to perform LiDAR mobile mapping surveys of American Samoa's' contractually chosen seven villages. Lynx Optech Mobile mapping system was used to collect 3-D point cloud in the project areas.

A network of ground control points, has been design and implemented into the project process to establish common datum for geo-referencing of LiDAR data. These control points are also used in conjunction with mobile GPS trajectory collected during the LiDAR point cloud acquisition. Additionally, a number photo identifiable, targeted control points and Quality Control checkpoints were collected based on the same ground control network.

2.1 Monuments and Station Discrimination

The American Samoa network contains a total of twenty one Control Stations. The network includes five NGS monuments: AA3712, AA3709, AI9893, DE8754 and DE7243. The other sixteen control points are semi-permanent 12" spikes, serving as: base stations, RTK QA/QC points or Conventional Surveys control. The horizontal and vertical datum of the local GPS network is based on the above NGS monuments.

Total of 610 RTK LiDAR Targets or Check Points control points have been collected throughout seven villages, to serve as LiDAR data adjustments and Quality Control points. In addition total of 283 Check Points have been collected where high obscurity or inaccessibility was the issue. Two villages: Pago Pago and Fagatogo, had no conventional surveys done due to satisfactory RTK point distribution.

Four types of control points have been collected throughout the project. Target points were the pre-designed 4'X4' wooden-painted targets, placed in strategically chosen locations, boldly visible in LiDAR point cloud. These targets were used in LiDAR data adjustments. Photo ID control points were picked while performing surveys. These points are also boldly visible in the LiDAR data. The existing features, such as center of the manhole, sidewalk painted pad or corner of the curb are good examples of photo ID control points. In the areas where there was lack of photo identifiable features panel panels have been set. Chevron shaped, vinyl target was set over the 12" spike. Majority of the control points consisted of blind check points. These were set on flat, or evenly sloping and possibly un-obscured locations. These points were primarily used as interpolation and extrapolation control points for terrain with no LiDAR point cloud.

Station images and shape files for all control points are posted in APPENDIX C.

3. CONDITIONS AFFECTING PROGRESS

A careful reconnaissance was undertaken prior to target control selection and subsequent GPS surveys. Reasonable effort was put into even and random control point distribution and placement in un-obscured and boldly visible locations. Many of the points have good satellite visibility, but number of points had moderate to high obscurity. The satellite window provided 24–hour coverage, and GPS observation sessions were scheduled between 7:00 am and 9:00 PM, local time, each day. No difficulties were experienced with solar storm activity.

4. POST PROCESSING

4.1 Baseline Processing

All static baseline vectors for American Samoa Project were processed using Trimble Geomatics Office (Ver. 1.62) software. Fixed solutions were adopted for all baselines. The broadcast ephemeris was used, since the accuracy and extent of the network does not warrant the use of the precise ephemeris. GEOID09 of American Samoa was incorporated into the reductions, thereby allowing rigorous interpolation of the geoidal undulation values (*N*) at each point in the network. This provides a useful method of estimating the elevations at all points in the network. Project network was surveyed using closed loop GPS survey method, while Check Points were collected using differential RTK survey method. For baseline processing reports, loop closures, minimally and fully constrained adjustments see APPENDIX B1 and APPENDIX B2.

4.2 Minimally Constrained Network Adjustment

A minimally constrained least squares adjustment for Gwinnett Co project was performed using Trimble Geomatics Office (Ver. 1.62) 3-dimensional adjustment software. The published latitude and longitude of the NGS point 'DF2766', and the orthometric elevation of the NGS point 'DE7243' were held fixed in the minimally constrained adjustment. The adjustment comprised twenty one stations and 72 baseline vector components. *A priori* weights for the observations were based on the (scaled 12.55) variance-covariance sub-matrices to obtain realistic solution.

None of the standardized residual was flagged for possible rejection under the Tau$_{max}$–test (τ_{MAX}–test), at the 0.05 level of significance. The histogram of standardized residuals indicates that the observations are well distributed. The *a posteriori* variance factor (σ_o^2= 1.00) indicates that the scaled *a priori* standard deviations of the vector components are realistic. The absolute and relative confidence regions were not scaled by the *a posteriori* variance factor.

The relative confidence regions and the associated relative horizontal and vertical precision were computed for all pairs of points that were directly connected by vectors. All station pairings meet the horizontal positioning standard for *first order class one* surveys, i.e., the relative horizontal precision between each pair of points does not exceed 20 mm + 20 ppm of their horizontal separation, at the 95 percent level of confidence. The network is therefore classified as *second order class one* in terms of its *internal* accuracy.

4.3 Constrained Network Adjustment

A subset of well distributed throughout the network existing NGS control points provide a basis for the constrained network adjustment. Since network has a high internal accuracy, and since the fit of the network to the existing control is good, a strategy was devised in which the networks would be constrained tightly to the existing control stations. This would further ensure a smooth integration between the newly established control and the existing framework.

The constraints assigned for the final network adjustment are shown in Table 1. Three NGS control points were used to constrain the network horizontally. The network was further constrained to the orthometric height of two vertical control points, which were occupied during the GPS survey, see table 1 for details. GEOID09 od American Samoa was incorporated into the adjustment, thereby allowing rigorous interpolation of the geoidal undulation values (*N*) at each point in the network. This provides a useful method of estimating the elevations at all points in the network.

The adjustment was constrained to the NAD83 (2002) NGS control values to ensure the mapping datum for American Samoa project agrees with the previous control framework established within the area on previous projects.

A full listing of the constrained adjustment is contained in APPENDIX B1 and APPENDIX B2. The residuals and the standardized residuals are also listed in the adjustment results section. The slight increase in the *a posteriori* variance factor indicates that the network is not being unduly distorted by the imposition of the constraints. The absolute and relative confidence regions were not scaled by the *a posteriori* variance factor.

TABLE 1. ADJUSTMENT CONSTRAINTS

Horizontal

Station Name	PID	Order
SATELLITE TRIANG STATION 022	AA3709	A
13 RNG	DE7243	A
NO 1	AA3712	A

Vertical

Station Name	PID	Order
SATELLITE TRIANG STATION 022	AA3709	I
13 RNG	DE7243	I

5. FINAL COORDINATES AND ELEVATIONS

The final NAD83 UTM Zone 02 South, are presented in meters in APPENDIX A1 and APPENDIX A2. Final orthometric elevations, referenced to the American Samoa Vertical Datum of 2002 (ASVD02) in meters, are also presented in the above given APPENDICES. All final coordinates are derived from the constrained adjustments shown in APPENDIX B1 and APPENDIX B2.

APPENDIX A1

Network Adjusted Coordinates

Sanborn Map Company

Network Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02
Projection: UTM 2

	Geographic Coordinates			UTM 2		
Name	Latitude (Deg)	Longitude (Deg)	Ellipsoidal Ht meters	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
AA3709	14°19'54.38461"S	170°42'51.13897"W	37.171	8415561.660	530818.516	3.823
AA3712	14°16'35.07062"S	170°40'50.64719"W	36.521	8421680.275	534436.190	3.064
AI9893	14°20'31.55781"S	170°44'08.61102"W	62.684	8414422.383	528496.598	29.338
AMANAV CONTROL 1	14°19'37.74501"S	170°49'44.70516"W	38.102	8416085.080	518430.883	4.946
AMANAVE CHECK	14°19'37.68449"S	170°49'44.53143"W	38.585	8416086.936	518436.089	5.429
AMANAVE TARGET 5	14°19'37.67262"S	170°49'44.61136"W	38.370	8416087.302	518433.695	5.214
DE7243	14°20'27.70836"S	170°46'47.73626"W	65.681	8414545.635	523730.469	32.382
DE8754	14°19'18.58294"S	170°44'29.68804"W	78.691	8416665.027	527867.785	45.248
FAGALU CHECK	14°17'32.10768"S	170°40'54.35760"W	37.494	8419928.136	534322.618	4.005
FAGALU CONTROL1	14°17'32.35300"S	170°40'54.27844"W	35.491	8419920.596	534324.980	2.002
FAGALU TARGET 9	14°17'36.59023"S	170°40'46.14869"W	36.063	8419790.084	534568.363	2.579
FAGOTAGO TARGT 6	14°16'38.37406"S	170°41'08.56926"W	36.216	8421579.519	533899.078	2.756
LEONE CHECK	14°20'19.96633"S	170°47'08.79043"W	36.799	8414784.077	523100.057	3.536
LEONE CONRTOL 2	14°20'20.07262"S	170°47'08.54884"W	36.758	8414780.805	523107.290	3.495
LEONE CONTROL 1	14°20'20.08834"S	170°47'08.69485"W	36.847	8414780.326	523102.916	3.584
LEONE TARGET 3	14°20'16.89119"S	170°47'13.13936"W	35.910	8414878.672	522969.879	2.648
POLOA CONTROL 1	14°18'51.94308"S	170°50'00.35195"W	39.554	8417492.539	517963.201	6.444
POLOA TARGET 6	14°19'00.60354"S	170°50'02.94550"W	38.193	8417226.530	517885.318	5.077
PP CHECK	14°16'24.45877"S	170°42'01.23853"W	34.596	8422009.109	532321.579	1.199
PP CONTROL 1	14°16'24.30697"S	170°42'01.24906"W	34.564	8422013.772	532321.270	1.167
PP TARGET 9	14°16'22.10341"S	170°42'12.06362"W	35.480	8422081.886	531997.330	2.098
VATIA CONTROL 1	14°15'01.33338"S	170°40'31.74809"W	35.350	8424559.282	535006.457	2.129

APPENDIX A2

Check Points Adjusted Coordinates

Sanborn Map Company

Amanave Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
ama-35-chk	8416057.629	518473.394	6.637
ama-37-chk	8415996.769	518461.833	7.735
ama-50-chk	8415978.006	518449.353	11.078
ama-44-chk	8415968.258	518422.188	5.332
ama-51-chk	8415979.380	518418.185	1.315
ama-100-cpk	8416016.431	518426.306	1.687
ama-45-cpt	8416053.552	518411.103	1.092
ama-33-chk	8416138.188	518454.145	6.586
ama-103-chk	8416156.081	518358.517	3.846
ama-104-chk	8416158.970	518356.422	4.006
ama-105-chk	8416166.668	518371.242	4.360
ama-106-chk	8416161.926	518365.417	2.825
ama-107-chk	8416161.468	518369.070	3.945
ama-45-chk	8416145.249	518341.325	2.131
ama-108-chk	8416150.973	518346.712	2.563
ama-32-chk	8416183.001	518405.109	5.578
ama-109-chk	8416208.384	518449.102	6.647
ama-110-chk	8416177.571	518312.466	2.451
ama-112-chk	8416226.153	518324.051	4.072
ama-113-upper	8416222.765	518300.867	3.438
ama-114a-upper	8416244.684	518319.716	3.924
ama-114-upper	8416244.688	518319.713	3.933
ama-115-upper	8416252.559	518343.359	4.097
ama-117-upper	8416243.628	518305.548	3.957
ama-118-upper	8416259.157	518333.036	3.896
ama-119-upper	8416223.490	518290.870	3.405
ama-120-lower	8416223.482	518290.864	3.408

ama-122	8416210.912	518278.243	1.692
ama-122	8416265.766	518264.359	4.125
ama-123	8416289.727	518252.036	3.924
ama-22	8416278.081	518237.053	3.512
ama-40	8416338.686	518185.024	4.110
ama-125-upper	8416332.136	518225.039	3.954
ama-126-upper	8416327.451	518229.923	3.903
ama-127-upper	8416341.797	518238.729	4.058
ama-128-upper	8416343.907	518235.385	4.137
ama-200-chk	8416332.778	518214.097	3.847
ama-201-chk	8416321.962	518223.830	3.748
ama-202-chk	8416323.988	518220.693	1.218
ama-203-chk	8416307.924	518199.710	1.878
ama-204-chk	8416358.737	518431.723	9.929
ama-205-chk	8416407.400	518436.463	13.706
ama-206-chk	8416361.163	518483.474	10.678
ama-207-chk	8416355.839	518525.130	22.012
ama-208-chk	8416403.773	518527.992	35.103
ama-42-chk	8416292.892	518552.052	16.901
ama-41-chk	8416292.052	518411.140	5.760
ama-25-chk	8416337.080	518363.432	6.069
ama-8-chk	8416374.517	518392.166	8.298
ama-21-chk	8416398.077	518299.229	5.528
ama-20-chk	8416527.768	518303.494	26.292
ama-19-chk	8416518.661	518358.440	30.964
ama-17-chk	8416412.890	518204.245	6.038
ama-210-chk	8416486.959	518121.817	17.266
ama-14-chk	8416404.275	518034.816	4.812
ama-11-chk	8416399.251	517993.139	4.571
ama-38-chk	8416386.579	517927.478	4.566
ama-211-chk	8416348.099	517837.315	13.851
ama-212-chk	8416447.369	517977.368	28.305
ama-213-chk	8416575.294	518080.898	58.134
ama-13-chk	8416436.876	517854.743	30.537
ama-47-chk	8416369.535	517915.086	2.003
ama-215-chk	8416342.309	518102.635	1.364
ama-101-pnl	8416076.870	518414.614	4.271
ama-102-ckpt	8416125.747	518410.128	5.107
ama-111-panel	8416206.403	518317.560	3.912
ama-214-photoID	8416378.907	518068.577	4.770
ama-39-photoID	8416386.440	518156.859	5.361
ama-16-photoID	8416357.547	518201.303	5.043

ama-6-photoID	8416391.352	518237.002	5.314
ama-5-photoID	8416353.065	518279.611	4.957
ama-5-tgt	8416087.436	518433.526	5.196
ama-6-tgt	8415993.949	518462.415	7.987
ama-1-tgt	8416579.641	518081.372	58.405
ama-3-tgt	8416390.069	518032.311	4.884
ama-2-tgt	8416370.872	517875.543	6.232
ama-4-tgt	8416293.285	518238.977	3.885

Sanborn Map Company

Poloa Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
pol-50-chk	8417376.834	517927.673	4.906
pol-51-chk	8417260.531	517910.752	6.423
pol-52-chk	8417262.137	517911.358	6.340
pol-53-chk	8417261.513	517911.111	5.322
pol-54-chk	8417259.805	517918.203	6.504
pol-55-chk	8417258.207	517917.507	6.518
pol-56-chk	8417258.983	517918.011	5.569
pol-57-chk	8417256.610	517933.155	7.702
pol-58-chk	8417253.902	517933.688	8.274
pol-59-chk	8417256.061	517932.498	7.035
pol-60-chk	8417109.299	517834.683	4.327
pol-61-chk	8417108.295	517833.268	3.590
pol-62-chk	8417107.137	517833.540	4.480
pol-100-chk	8417007.073	517735.568	4.327
pol-24-chk	8416984.937	517749.924	4.637
pol-63-chk	8416971.114	517733.218	4.436
pol-25-chk	8416922.018	517708.193	15.698
pol-64-chk	8416921.769	517725.604	17.176
pol-65-chk	8416941.705	517673.628	3.690
pol-66-chk	8416924.526	517644.065	4.639
pol-27-chk	8416927.483	517598.749	2.385
pol-67-chk	8416951.921	517643.303	1.527
pol-26-chk	8416984.186	517699.772	1.559
pol-68-chk	8416999.723	517706.153	4.172
pol-69-chk	8417098.642	517805.648	2.149
pol-70-chk	8417115.327	517822.210	2.028
pol-71-chk	8417226.138	517869.975	1.445
pol-72-chk	8417326.441	517902.704	1.969
pol-73-chk	8417507.241	517946.584	1.628
pol-74-chk	8417528.292	517955.304	1.526
pol-12-chk	8417573.577	517960.980	2.154
pol-75-chk	8417574.523	517972.831	10.163
pol-11-chk	8417635.196	517963.952	2.120
pol-29-chk	8417647.899	517970.340	5.654

pol-77-chk	8417401.601	518063.566	14.364
pol-78-chk	8417444.772	518046.779	12.047
pol-79-chk	8417433.397	518016.285	22.653
pol-17-chk	8417424.446	517986.010	36.206
pol-20-chk	8417348.430	517961.893	11.290
pol-22-chk	8417252.039	517977.840	13.852
pol-23-chk	8417206.717	517930.209	11.600
pol-101-chk	8417098.508	517849.814	8.235
pol-102-chk	8416971.039	517804.703	21.320
pol-4-tgt	8417394.873	517930.008	5.259
pol-5-tgt	8417286.724	517916.294	6.337
pol-6-tgt	8417226.289	517884.947	5.088
pol-7-tgt	8417168.097	517861.023	4.525
pol-8-tgt	8417081.602	517821.721	4.655
pol-9-tgt	8417056.065	517795.080	4.637
pol-10-tgt	8417011.026	517801.996	9.474
pol-4-tgt	8417394.875	517930.004	5.283
pol-2-tgt	8417465.695	518012.756	11.833
pol-1-tgt	8417366.076	518046.292	25.630

Sanborn Map Company

Leone Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
leo-100-chk	8416003.561	523464.528	17.094
leo-103-chk	8415858.987	523503.462	11.265
leo-41-chk	8415791.613	523525.253	8.778
leo-32-chk	8415635.344	523619.345	5.811
leo-45-chk	8415639.796	523548.763	6.218
leo-65-chk	8415263.507	523415.657	2.301
leo-54-chk	8414809.213	523136.067	2.403
leo-61-chk	8414881.083	523246.896	2.683
leo-109-chk	8414613.185	523118.509	3.108
leo-110-chk	8414619.272	523122.378	3.182
leo-111-chk	8414615.067	523127.881	3.223
leo-24-chk	8414705.847	523324.249	7.921
leo-60-chk	8414723.798	523450.734	13.287
leo-26-chk	8414689.983	523604.984	15.606
leo-112-chk	8414741.311	523586.188	11.916
leo-113-chk	8414742.903	523510.791	12.896
leo-115-chk	8414829.686	523012.759	2.270
leo-116-chk	8414831.485	523001.957	0.454
leo-117-chk	8414854.041	522977.647	0.969
leo-118-chk	8414867.262	522962.661	2.859
leo-119-chk	8414874.204	522935.937	0.355
leo-121-chk	8415588.094	523602.402	5.109
leo-67-chk	8415532.454	523623.605	4.011
leo-74-chk	8415753.881	523615.694	7.692
leo-122-chk	8415822.544	523562.719	10.186
leo-34-chk	8415880.480	523558.273	15.779
leo-36-chk	8415956.532	523468.166	15.170
leo-123-chk	8415141.793	523476.004	2.377
leo-124-chk	8415126.035	523367.965	1.079
leo-125-chk	8414919.372	523334.420	2.874
leo-21-chk	8414908.587	523150.933	2.197
leo-22-chk	8414976.156	522990.924	1.759
leo-52-chk	8415151.315	523043.796	2.057

leo-127-chk	8415208.205	523082.187	1.924
leo-128-chk	8415100.343	523000.410	1.754
leo-53-chk	8415157.204	522923.211	3.335
leo-178-chk	8414906.615	523353.793	3.332
leo-179-chk	8415063.659	523457.541	2.558
leo-180-chk	8415200.132	523428.768	2.177
leo-46-chk	8415556.123	523526.524	5.739
leo-130-chk	8415484.986	523458.006	4.158
leo-132-chk	8415277.427	523027.871	3.928
leo-133-chk	8415280.328	523026.385	3.936
leo-134-chk	8415279.668	523024.736	4.034
leo-135-chk	8415365.925	523158.252	2.752
leo-136-chk	8415409.329	523238.057	2.764
leo-137-chk	8415057.844	522904.239	1.981
leo-138-chk	8415046.614	522891.965	0.774
leo-140-chk	8416039.794	523438.370	18.196
leo-40-chk	8415747.374	523414.376	8.300
leo-141-chk	8415422.172	523611.411	2.225
leo-13-chk	8415366.794	522949.745	8.626
leo-142-chk	8415457.896	523218.810	5.482
leo-143-chk	8415482.524	523336.760	3.448
leo-101-pid	8415889.711	523524.956	14.173
leo-102-pid	8415888.380	523525.593	14.154
leo-105-pid	8415680.580	523576.148	6.367
leo-106-pid	8415643.358	523575.560	5.989
leo-107-pid	8415098.943	523411.090	1.858
leo-78-pid	8414769.086	523079.625	3.454
leo-77-pid	8414863.547	523203.636	2.411
leo-55-pid	8414678.899	523148.397	3.331
leo-108-pid	8414609.071	523124.127	3.120
leo-81-pid	8414763.404	523511.724	12.130
leo-114-pid	8414618.253	523476.459	20.148
leo-120-pid	8414834.234	523040.106	2.924
leo-126-pid	8414891.769	523177.585	2.592
leo-177-pid	8414834.321	523174.890	2.561
leo-129-pid	8415110.231	522922.099	2.802
leo-71-pid	8415200.034	522951.451	3.952
leo-70-pid	8415309.915	522972.386	6.125
leo-131-pid	8415276.814	523026.171	3.991
leo-68-pid	8415062.304	522925.706	1.799
leo-138-pid	8415081.097	522761.765	5.183
leo-8-tgt	8414953.395	523323.757	2.276

leo-9-tgt	8415203.222	523466.259	2.447
leo-2-tgt	8414630.994	523454.782	18.661
leo-3-tgt	8414878.683	522969.876	2.639
leo-5-tgt	8415078.113	522867.664	2.484
leo-6-tgt	8415124.381	522936.194	2.956
leo-7-tgt	8415586.489	523557.012	5.325
leo-10-tgt	8416012.303	523495.917	19.743

Sanborn Map Company

Fagaalu Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
flu-42-chk	8419897.678	534398.707	1.094
flu-50-chk	8419838.419	534465.751	1.663
flu-201-chk	8419796.053	534441.339	2.923
flu-202-chk	8419796.915	534438.306	3.017
flu-203-chk	8419796.465	534439.644	1.542
flu-41-chk	8419809.845	534479.208	2.468
flu-204-chk	8419811.317	534476.080	2.358
flu-205-chk	8419815.033	534474.407	1.229
flu-40-chk	8419760.305	534630.336	2.330
flu-39-chk	8419764.997	534457.493	7.628
flu-207-chk	8419769.972	534432.755	4.487
flu-208-chk	8419768.833	534432.234	4.507
flu-209-chk	8419769.295	534433.048	3.525
flu-210-chk	8419761.542	534448.277	6.922
flu-211-chk	8419761.085	534447.707	5.827
flu-212-chk	8419760.959	534447.184	6.888
flu-38-chk	8419713.302	534449.009	17.754
flu-37-chk	8419731.924	534389.784	25.327
flu-36-chk	8419774.238	534325.022	17.188
flu-35-chk	8419850.959	534271.852	8.766
flu-206-chk	8419928.969	534259.008	2.371
flu-43-chk	8419910.394	534179.123	16.841
flu-34-chk	8419927.235	534114.708	8.242
flu-26-chk	8419946.149	534048.749	9.622
flu-33-chk	8420007.432	534191.810	1.578
flu-215-chk	8420023.918	534146.497	1.464
flu-216-chk	8420033.178	534146.734	1.698
flu-217-chk	8420029.284	534146.655	0.693
flu-218-chk	8419975.354	534168.859	1.901
flu-219-chk	8419974.106	534170.073	1.992
flu-220-chk	8419974.694	534169.788	0.941
flu-221-chk	8420032.836	534132.474	2.375
flu-222-chk	8420023.945	534132.930	2.003
flu-223-chk	8420027.292	534132.908	1.587

flu-28-chk	8420090.673	534076.656	1.906
flu-27-chk	8420042.764	534063.862	2.440
flu-30-chk	8420231.353	534125.769	6.263
flu-31-chk	8420197.120	534199.048	2.444
flu-225-chk	8420126.238	534258.733	0.580
flu-226-chk	8420176.050	534251.081	1.832
flu-227-chk	8420173.755	534249.628	1.836
flu-228-chk	8420175.074	534250.667	0.759
flu-229-chk	8420184.885	534235.904	2.347
flu-230-chk	8420186.447	534237.290	2.395
flu-231-chk	8420185.874	534236.482	1.000
flu-32-chk	8420253.071	534290.656	16.401
flu-230-chk	8420279.236	534087.155	8.999
flu-29-chk	8420336.935	534027.982	20.605
flu-231-chk	8420391.178	534046.975	40.508
flu-52-chk	8420254.142	533904.178	6.687
flu-232-chk	8420276.770	533877.345	33.371
flu-21-chk	8420306.259	533805.622	13.788
flu-233-chk	8420324.045	533748.738	21.884
flu-234-chk	8420385.503	533727.084	28.810
flu-236-chk	8420293.085	533769.629	11.842
flu-237-chk	8420292.506	533768.292	10.457
flu-238-chk	8420278.207	533759.119	10.907
flu-239-chk	8420279.225	533761.603	10.834
flu-240-chk	8420278.748	533760.414	9.715
flu-242-chk	8420201.864	533523.958	15.739
flu-243-chk	8420205.421	533528.136	13.049
flu-250-chk	8420198.643	533613.771	12.219
flu-251-chk	8420193.994	533621.679	11.873
flu-252-chk	8420201.094	533625.597	11.674
flu-253-chk	8420207.439	533620.019	12.007
flu-246-chk	8420060.951	533622.964	20.818
flu-244-chk	8419962.496	533952.425	22.785
flu-245-chk	8419944.161	534018.542	13.056
flu-100-chk	8420041.062	534000.200	3.332
flu-101-chk	8420019.502	534001.070	3.690
flu-102-chk	8420016.404	533956.910	4.288
flu-103-chk	8420021.891	533958.658	4.359
flu-104-chk	8420049.541	533900.704	4.603
flu-18-chk	8420093.534	533795.001	6.913
flu-105-chk	8420079.007	533835.904	6.004
flu-16-chk	8420153.544	533717.185	8.598

flu-106-chk	8420130.817	533710.351	9.032
flu-107-chk	8420178.866	533716.735	8.904
flu-108-chk	8420108.019	533544.673	19.381
flu-109-chk	8420175.375	533548.978	14.876
flu-110-chk	8420220.490	533457.799	17.586
flu-200-photoID	8419933.706	534316.257	2.051
flu-51-photoID	8419792.053	534463.667	2.931
flu-214-photoID	8419962.043	534164.714	2.205
flu-48-photoID	8420166.089	534197.944	1.903
flu-229-photoID	8420236.191	534335.131	3.419
flu-25-photoID	8420129.703	534030.035	4.655
flu-46-photoID	8420189.124	534013.018	4.929
flu-23-photoID	8420195.286	533948.018	5.111
flu-45-photoID	8420222.265	533902.527	5.713
flu-235-photoID	8420292.639	533769.527	11.740
flu-44-photoID	8420229.514	533685.788	10.357
flu-241-photoID	8420213.397	533627.898	12.119
flu-247-photoID	8420166.795	533720.006	8.566
flu-1-pid	8420049.097	533865.925	5.396
flu-8-tgt	8419929.760	534327.812	2.065
flu-9-tgt	8419790.080	534568.338	2.587
flu-10-tgt	8419684.333	534794.834	3.167
flu-target-10	8419822.316	534372.898	2.322
flu-7-tgt	8420016.934	534146.648	1.818
flu-3-tgt	8420263.819	534365.295	3.914
flu-5-tgt	8420237.067	533446.273	18.188
flu-6-tgt	8420023.344	533998.817	3.492

Sanborn Map Company

Vatia Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
vat-22-chk	8424498.824	534873.424	3.347
vat-100-chk	8424478.823	534846.746	4.354
vat-101-chk	8424476.672	534848.875	2.355
vit-103-chk	8424488.055	534743.748	7.656
vat-21-chk	8424510.915	534720.876	29.635
vat-24-chk	8424429.929	534757.890	6.494
vat-104-chk	8424340.799	534751.030	8.705
vat-26-chk	8424255.235	534743.898	16.346
vat-28-chk	8424333.667	534879.192	4.307
vat-105-chk	8424372.691	534900.670	1.873
vat-106-chk	8424368.494	534899.501	3.080
vat-27-chk	8424371.276	534943.402	4.455
vat-29-chk	8424404.496	535004.452	2.960
vat-107-chk	8424356.619	534974.672	24.845
vat-108-chk	8424336.153	535052.620	10.858
vat-31-chk	8424155.285	535072.240	23.431
vat-42-chk	8424565.012	535019.313	0.534
vat-110-chk	8424531.752	535027.798	2.640
va-111-chk	8424525.860	535030.210	2.455
vat-112-chk	8424527.540	535035.805	2.298
vat-113-chk	8424533.929	535031.543	2.571
vat-114-chk	8424532.864	535034.446	-0.025
vat-115-chk	8424540.092	535001.868	2.444
vat-116-chk	8424538.710	534991.028	2.131
vat-118-chk	8424510.361	534995.269	2.086
vat-119-chk	8424513.183	534998.628	0.091
vat-120-chk	8424502.838	535084.227	1.821
vat-32-chk	8424296.525	535096.289	9.591
vat-33-chk	8424409.266	535196.366	1.999
vat-121-chk	8424447.483	535327.676	1.578
vat-122-chk	8424442.677	535332.606	1.625
vat-123-chk	8424445.371	535330.346	0.954
vat-124-chk	8424440.945	535325.992	0.983
vat-125-chk	8424438.566	535328.477	1.618

vat-126-chk	8424443.532	535323.632	1.568
vat-30-chk	8424470.021	535346.079	0.272
vat-34-chk	8424316.673	535272.373	-11.043
vat-35-chk	8424315.481	535380.357	2.292
vat-39-chk	8424283.262	535503.175	4.795
vat-41-chk	8424524.364	535580.333	11.914
vat-213-chk	8424318.809	535191.899	31.439
vat-36-chk	8424222.801	535267.299	16.727
vat-44-chk	8424239.408	535282.332	8.982
vat-214-chk	8424192.324	535303.767	3.782
vat-37-chk	8424086.511	535432.551	10.500
vat-217-chk	8424419.321	535194.518	1.783
vat-218-chk	8424417.016	535196.042	1.717
vat-219-chk	8424417.847	535194.670	0.849
vat-220-chk	8424475.389	535222.667	2.673
vat-221-chk	8424471.914	535221.660	2.702
vat-222-chk	8424472.623	535230.845	2.523
vat-223-chk	8424468.067	535231.605	2.370
vat-224-chk	8424474.435	535226.415	1.268
vat-20-chk	8424685.342	534886.168	1.975
vat-19-chk	8424735.421	534906.769	1.807
vat-18-chk	8424802.310	534949.129	2.192
vat-229-chk	8424834.506	535028.069	1.673
vat-230-chk	8424809.106	535034.994	1.022
vat-23-chk	8424595.678	534989.443	2.237
vat-11-chk	8425166.956	535324.765	4.246
vat-14-chk	8425140.320	535276.479	2.733
vat-13-chk	8425137.593	535221.316	2.940
vat-314-chk	8424951.086	535022.831	1.583
vat-215-chk	8424847.252	535023.974	1.407
vat-216-chk	8424842.590	535030.174	1.924
vat-217-chk	8424840.069	535029.573	1.036
vat-48-panel	8424389.684	535413.914	2.866
vat-49-panel	8424383.485	535465.604	2.458
vat-102-photoID	8424472.482	534803.050	5.379
vat-117-photoID	8424552.193	534911.497	3.096
vat-43-photoID	8424452.893	535059.226	3.579
vat-46-photoID	8424444.428	535143.569	3.198
vat-47-photoID	8424459.401	535267.298	1.995
vat-211-photoID	8424472.607	535230.888	2.496
vat-225-photoID	8424617.732	534993.154	2.473
vat-228-photoID	8424835.506	535028.756	1.619

vat-210-tgt	8424468.093	535498.351	2.974
vat-2-tgt	8425120.346	535288.251	2.584
vat-3-tgt	8425032.699	535199.840	1.766
vat-6-tgt	8424794.815	535016.137	1.833
vat-5-tgt	8424931.843	535082.987	1.668
vat-9-tgt	8424601.126	535001.944	2.269
vat-7-tgt	8424542.535	535025.352	2.341
vat-8-tgt	8424432.097	535333.381	1.605
vat-10-tgt	8424457.753	535480.494	2.597

Sanborn Map Company

Pago Pago Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
pag-104-chk	8421866.669	531767.648	8.506
pag-105-chk	8421919.944	531751.912	6.892
pag-106-chk	8421922.881	531749.056	6.576
pag-107-chk	8421920.730	531750.218	6.069
pag-108-chk	8421928.932	531754.428	7.108
pag-109-chk	8421926.137	531757.313	7.419
pag-111-chk	8421835.289	531624.969	30.021
pag-13-chk	8421810.042	531741.106	10.190
pp-25	8422104.014	532228.543	0.950
pp-200	8422109.534	532190.454	1.176
pp-201	8422109.714	532190.041	0.330
pp-202	8422053.052	531902.241	2.736
pp-32	8421962.020	531598.672	20.443
pp-203	8422043.625	531643.165	20.304
pp-205	8422069.280	531709.627	7.610
pp-206	8422071.382	531708.694	7.629
pp-207	8422072.989	531713.495	7.588
pp-208	8422070.969	531714.203	7.591
pp-209	8422072.145	531713.866	6.325
pp-210	8422070.054	531709.119	6.252
pp-18	8422130.067	531832.064	5.020
pp-211	8422136.330	531872.218	3.757
pp-212	8422136.438	531875.895	3.648
pp-213	8422136.103	531873.847	2.503
pp-30	8422201.505	531740.790	19.293
pp-215	8422123.873	531961.198	2.505
pp-216	8422121.970	531961.142	1.122
pp-217	8422117.977	531962.319	2.497
pp-218	8422118.977	531975.110	2.402
pp-219	8422125.877	531973.417	2.310
pp-220	8422123.619	531974.005	0.816
pp-57	8422045.849	531845.887	3.696
pp-221	8422249.637	531963.852	13.220
pp-28	8422324.959	532041.294	20.924

pp-33	8422385.884	532217.815	25.501
pp-34	8422430.460	532356.380	20.186
pp-35	8422396.540	532462.375	21.914
pp-36	8422395.158	532518.406	14.811
pp-68	8422376.952	532637.877	12.445
pp-37	8422489.803	532546.729	37.608
pp-40	8422336.051	532714.480	9.186
pp-42	8422369.532	532819.446	9.072
pp-41	8422343.539	532975.140	12.168
pp-26	8422078.128	532406.577	0.926
pp-228	8421930.198	532433.774	1.808
pp-229	8421927.695	532444.798	1.494
pp-230	8421929.373	532442.120	0.309
pp-44	8421848.179	532467.164	16.166
pp-43	8421851.857	532424.991	27.202
pp-230	8421794.815	532527.919	13.429
pp-231	8421792.282	532530.488	13.517
pp-232	8421796.629	532530.755	13.432
pp-233	8421798.537	532529.032	13.569
pp-234	8421797.782	532529.589	12.033
pp-235	8421793.732	532528.852	12.098
pp-46	8421764.412	532599.261	32.987
pp-50	8421960.144	532624.041	2.542
pp-235	8421937.884	532618.429	2.560
pp-236	8421937.910	532616.251	2.622
pp-237	8421937.830	532617.305	1.534
pp-47	8421850.266	532662.697	14.679
pp-239	8421911.513	532716.619	3.168
pp-240	8421910.453	532718.094	3.273
pp-241	8421911.287	532717.304	2.111
pp-48	8421853.628	532741.518	23.129
pp-250	8421973.212	532093.418	2.521
pp-251	8421978.225	532085.362	2.540
pp-252	8421988.998	532093.261	2.466
pp-253	8421983.699	532101.489	2.757
pp-255	8421926.289	531917.488	4.875
pp-256	8421929.741	531912.557	4.740
pp-257	8421919.998	531915.576	4.907
pp-258	8421914.420	531915.949	3.420
pag-100-pid	8421985.070	532103.053	2.998
pag-101-pid	8421991.115	532094.384	2.869
pag-102-pid	8421963.591	531928.447	4.165

pag-103-pid	8421942.510	531907.996	5.046
pag-110-pid	8421894.913	531676.331	10.050
pag-112-pid	8421923.025	531613.170	20.707
pag-113-pid	8421761.822	531732.569	11.340
pga-114-pid	8421646.139	531659.229	16.744
pag-115-pid	8421582.383	531619.518	20.975
pag-116-pid	8421664.058	531754.617	13.553
pag-53-pid	8421634.470	531781.626	14.252
pag-117-pid	8421581.457	531751.861	17.182
pag-118-pid	8421578.609	531747.483	17.184
pp-310	8422067.203	532092.533	2.280
pp-59	8422028.325	532046.739	2.072
pp-19	8421993.983	531957.171	3.356
pp-58	8421951.764	531906.972	4.548
pp-204	8422069.392	531709.883	7.410
pp-31	8422116.583	531653.653	24.068
pp-214	8422172.987	531914.274	3.552
pp-29	8422243.645	531812.228	13.346
pp-226	8422308.835	531938.001	24.735
pp-62	8422245.151	532069.819	2.541
pp-222	8422280.212	532158.421	3.739
pp-223	8422173.468	532184.377	1.528
pp-60	8422280.978	532208.395	2.473
pp-61	8422351.415	532183.551	14.133
pp-27	8422284.949	532315.707	2.320
pp-63	8422211.717	532379.700	2.648
pp-52	8422315.911	532405.987	1.949
pp-224	8422294.574	532548.091	2.018
pp-38	8422277.882	532654.945	1.901
pp-70	8422288.572	532701.060	2.227
pp-39	8422399.835	532711.539	20.067
pp-227	8422287.748	532919.996	2.227
pp-69	8422375.929	532853.207	13.848
pp-24	8421969.779	532287.648	1.627
pp-6	8421981.490	532195.049	1.702
pp-22	8421932.175	532135.133	15.717
pp-64	8422030.539	532395.744	0.668
pp-65	8421920.565	532444.070	1.890
pp-229	8421801.233	532500.739	15.707
pp-45	8421753.838	532524.868	19.007
pp-67	8421926.247	532596.877	2.845
pp-238	8421945.221	532669.177	2.870

pp-49	8421915.202	532752.385	3.063
pp-240	8421891.389	532813.965	2.673
pp-259	8421913.311	531922.030	5.091
pag-9-tgt	8422081.864	531997.324	2.122
pag-7-tgt	8422315.053	532405.106	1.921
pag-10-tgt	8422287.265	532918.238	2.235

Sanborn Map Company

Fago Togo Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
fag-11	8421799.717	532888.409	13.087
fag-201	8421819.686	532950.014	2.767
fag-202	8421819.243	532951.333	2.802
fag-203	8421819.244	532950.903	1.461
fag-204	8421833.176	532954.798	2.663
fag-205	8421832.563	532956.466	2.707
fag-206	8421833.104	532955.392	1.505
fag-207	8421826.458	532970.237	2.727
fag-208	8421825.713	532971.827	2.739
fag-209	8421826.039	532971.160	1.438
fag-210	8421813.417	532966.789	2.896
fag-211	8421814.169	532965.213	2.878
fag-212	8421813.864	532965.743	1.723
fag-213	8421776.770	532900.656	22.869
fag-12	8421664.785	533005.570	33.821
fag-13	8421610.724	533158.470	21.631
fag-220	8421552.912	533351.293	2.263
fag-221	8421550.462	533355.040	2.282
fag-222	8421550.516	533353.964	0.689
fag-224	8421605.714	533391.100	1.781
fag-225	8421602.738	533396.911	1.582
fag-226	8421604.634	533394.458	0.631
fag-227	8421614.459	533398.584	1.771
fag-228	8421612.573	533403.350	1.780
fag-20	8421647.645	533381.197	2.009
fag-230	8421526.518	533323.737	2.809
fag-231	8421524.716	533325.778	2.863
fag-232	8421525.096	533325.617	1.327
fag-14	8421531.460	533218.662	22.686
fag-18	8421573.388	533419.497	1.639
fag-236	8421472.669	533464.592	1.742
fag-237	8421474.391	533461.662	1.800
fag-238	8421473.246	533462.972	0.870
fag-239	8421491.853	533470.874	1.701

fag-240	8421489.415	533475.259	1.744
fag-241	8421491.654	533471.757	0.519
fag-242	8421561.605	533512.668	1.468
fag-243	8421559.839	533515.826	1.654
fag-244	8421560.704	533514.283	0.140
fag-245	8421411.880	533462.101	1.864
fag-246	8421411.304	533465.151	1.938
fag-247	8421411.100	533464.260	1.067
fag-17	8421451.709	533290.300	4.850
fag-48	8421435.557	533150.557	35.331
fag-311-chk	8421862.529	532880.039	2.572
fag-100-chk	8421861.719	532882.145	2.569
fag-101-chk	8421863.588	532881.671	1.029
fag-104-chk	8421418.643	533515.016	2.233
fag-108-chk	8421406.602	533637.877	6.549
fag-109-chk	8421383.924	533648.883	13.459
fag-26-chk	8421478.048	533718.822	2.146
fag-110-chk	8421581.871	533816.954	2.856
fag-111-chk	8421578.909	533921.661	2.608
fag-28-chk	8421590.848	534031.970	2.033
fag-200	8421880.882	532830.332	2.629
fag-33	8421824.172	532945.340	2.643
fag-21	8421794.679	533038.713	2.523
fag-214	8421825.386	533152.120	1.354
fag-321	8421722.651	533132.743	2.379
fag-35	8421625.340	533224.524	2.430
fag-36	8421656.146	533309.726	1.322
fag-37	8421572.266	533326.474	2.128
fag-223	8421611.398	533384.626	1.751
fag-235	8421517.267	533412.628	1.783
fag-42	8421462.415	533478.450	1.842
fag-41	8421433.306	533407.855	2.266
fag-248	8421502.230	533248.165	4.919
fag-38	8421384.048	533196.321	12.718
fag-250	8421324.294	533190.323	18.360
fag-39	8421389.921	533335.724	4.928
fag-102-pid	8421491.865	533464.784	1.562
fag-103-pid	8421465.023	533471.384	1.873
fag-105-pid	8421345.451	533503.484	6.912
fag-106-pid	8421245.130	533481.291	22.834
fag-107-pid	8421245.272	533479.119	22.855
fag-45-pid	8421557.245	533696.465	1.366

fag-27-chkpid	8421569.858	533763.978	3.008
fag-113-pid	8421587.476	534066.632	1.970
fag-114-pid	8421588.732	534107.659	1.962
fag-117-pid	8421654.330	534230.726	1.968
fag-118-pid	8421505.369	533657.891	1.963
fag-2-tgt	8421859.332	532888.302	2.367
fag-3-tgt	8421627.135	533242.553	2.781
fag-5-tgt	8421465.487	533521.517	1.851
fag-8-tgt	8421570.893	533710.241	1.847
fag-6-tgt	8421579.544	533899.085	2.709

Sanborn Map Company

Conventional Ground Control for American Samoa Project

Final Coordinate List

Horizontal Datum: NAD83 (2002)

Vertical Datum: ASVD02

Projection: UTM 2

POINT NO.	NORTH (Y) meters	EAST (X) meters	ELEV (Z) meters
1000	8416545.647	518066.092	49.422
1001	8416489.766	518102.705	32.918
1002	8416590.137	518049.313	76.457
1003	8416339.476	517871.308	8.892
1004	8416261.178	517722.872	21.490
1005	8416554.423	518257.406	43.136
1006	8416576.205	518281.122	48.114
1007	8416604.164	518293.893	74.203
1008	8416483.271	518386.372	40.167
1009	8416622.164	518413.673	109.891
1010	8416473.346	518418.741	40.384
1011	8416526.694	518479.508	60.288
1012	8416499.631	518516.818	64.943
1013	8416431.647	518554.813	47.129
1014	8416369.665	518583.678	48.395
1015	8416320.255	518580.772	42.566
1016	8416362.374	518680.577	74.696
1017	8416245.641	518631.241	66.071
1018	8416227.798	518600.377	46.114
1019	8416143.535	518783.148	109.142
1020	8416160.439	518552.313	43.446
1021	8416127.994	518519.385	45.860
1022	8416113.884	518533.671	65.721
1023	8416081.117	518530.103	58.003
1024	8416166.313	518268.958	1.916
1025	8416157.620	518284.972	2.014
1026	8416161.577	518279.460	8.670
1027	8416163.767	518270.355	8.924
1028	8416158.629	518246.907	2.952
1029	8415986.264	518436.272	5.484
1030	8415933.646	518452.599	50.638
1031	8415928.649	518461.888	65.604
1032	8415978.149	518473.821	19.827
1033	8416045.801	518501.840	23.039

1034	8416054.402	518522.576	50.608
1035	8416093.356	518513.315	35.976
1036	8416095.675	518485.852	14.020
1037	8416454.012	518587.231	67.832
1038	8417567.112	518003.143	26.024
1039	8417578.807	518012.099	44.722
1040	8417600.657	517952.858	2.537
1041	8417575.328	517985.187	23.335
1042	8417574.422	518033.781	57.426
1043	8417549.445	518024.314	27.834
1044	8417564.846	518062.923	53.400
1045	8417513.954	518014.825	15.009
1046	8417488.461	518117.181	52.062
1047	8417464.294	518147.216	61.128
1048	8417497.299	518025.328	9.675
1049	8417403.054	518125.112	48.263
1050	8417456.598	517988.497	14.116
1051	8417445.164	517965.389	15.210
1052	8417512.189	518033.972	21.190
1053	8417694.712	518036.156	83.835
1054	8417755.463	518001.768	57.481
1055	8417409.867	517964.935	27.804
1056	8417415.535	517959.686	25.804
1057	8417406.910	517963.940	17.962
1058	8417373.458	517971.114	21.082
1059	8417354.405	517974.297	21.125
1060	8417331.381	517966.920	17.605
1061	8417313.716	517956.940	14.525
1062	8417305.475	517960.678	13.604
1063	8417310.462	517971.423	24.522
1064	8417283.276	517971.603	21.931
1065	8417269.647	517980.853	19.966
1066	8417257.964	517983.826	18.324
1067	8417215.848	518024.680	45.430
1068	8417245.996	518015.487	45.420
1069	8417174.228	517996.036	55.104
1070	8417179.639	517949.169	33.749
1071	8417200.850	517946.013	20.889
1072	8417198.594	517926.757	13.280
1073	8417183.104	517918.433	31.692
1074	8417154.292	517811.310	2.647
1075	8417152.952	517816.940	15.221

1076	8417156.741	517824.827	15.239
1077	8417039.389	517848.515	20.442
1078	8417052.684	517866.010	26.147
1079	8417062.438	517841.111	12.479
1080	8417080.937	517840.115	8.930
1081	8417116.524	517877.150	12.661
1082	8417074.877	517836.676	8.459
1083	8417040.828	517833.117	18.277
1084	8417034.075	517812.071	9.707
1085	8416806.170	517735.519	69.523
1086	8416817.125	517712.070	64.919
1087	8416974.233	517758.466	20.167
1088	8416842.262	517684.730	52.307
1089	8416960.449	517742.811	19.075
1090	8417029.843	517833.010	31.443
1091	8417027.824	517876.994	50.224
1092	8417142.659	517809.981	8.040
1093	8417138.629	517820.600	17.784
1094	8417066.831	517795.754	4.113
1095	8417074.654	517785.555	2.410
1096	8417083.709	517857.106	21.753
1097	8417045.141	517834.560	12.624
1098	8417058.438	517831.999	9.121
1099	8414936.332	523647.419	57.314
1100	8414917.433	523642.624	45.945
1101	8415093.697	523606.744	44.198
1102	8415067.773	523589.121	51.039
1103	8415138.017	523636.639	66.230
1104	8415173.958	523602.995	49.047
1105	8415198.959	523611.471	59.332
1106	8415182.155	523636.545	81.787
1107	8415191.258	523570.794	15.086
1108	8415195.846	523582.415	24.671
1109	8415211.928	523581.463	28.744
1110	8415216.608	523564.410	15.252
1111	8415278.930	523604.998	52.237
1112	8415298.190	523594.201	35.326
1113	8415473.660	523782.619	98.124
1114	8415503.360	523738.627	51.666
1115	8415450.697	523790.541	105.521
1116	8415499.598	523784.021	80.285
1117	8415256.435	523591.893	48.138

1118	8415255.965	523570.130	28.412
1119	8415265.375	523614.322	66.694
1120	8415518.090	523752.468	55.557
1121	8415564.861	523769.199	58.510
1122	8415596.551	523843.901	111.072
1123	8415253.275	523621.268	84.612
1124	8415575.706	523270.031	83.198
1125	8415610.430	523240.501	109.272
1126	8415647.433	523259.112	99.295
1127	8415627.520	523240.989	109.505
1128	8415607.530	523310.129	65.392
1129	8415630.792	523265.007	92.692
1130	8415834.686	523643.725	75.844
1131	8415781.156	523718.580	63.911
1132	8415708.326	523699.784	41.653
1133	8415741.379	523734.965	73.181
1134	8415786.561	523794.495	113.514
1135	8415635.386	523761.016	65.948
1136	8415589.610	523765.547	67.664
1137	8415533.584	523756.004	52.792
1138	8415542.323	523836.981	107.652
1139	8415450.999	523751.715	78.685
1140	8415429.458	523705.269	43.986
1141	8415420.221	523722.170	67.980
1142	8415350.735	523625.016	32.561
1143	8415420.273	522840.820	61.054
1143	8424795.676	535788.057	5.439
1144	8424609.864	535616.988	8.277
1144	8415347.870	522807.953	38.649
1145	8415388.561	522795.635	57.933
1145	8424569.088	535697.132	74.426
1146	8415131.893	522740.575	40.599
1146	8424502.500	535710.144	108.204
1147	8415110.036	522743.463	26.525
1147	8423908.003	535459.724	54.851
1148	8423926.520	535391.327	50.516
1148	8415516.699	522918.305	71.707
1149	8424155.340	535361.743	21.005
1149	8415520.699	522887.678	84.866
1150	8415484.418	522887.119	75.003
1150	8425217.906	535176.438	80.548
1151	8415444.910	522862.658	70.655

1151	8425243.711	535169.523	112.408
1152	8425268.388	535103.925	137.864
1152	8415341.994	522815.916	43.050
1153	8425245.565	535062.703	102.516
1153	8415295.616	522772.104	40.237
1154	8425213.287	535052.323	70.335
1154	8415134.351	522755.097	20.965
1155	8415071.686	522728.413	20.723
1155	8425151.301	535046.715	29.411
1156	8415022.106	522709.237	3.592
1156	8425246.504	535020.064	100.225
1157	8415074.506	522731.261	6.986
1157	8424944.161	534868.292	69.600
1158	8424924.279	534879.935	60.722
1158	8415115.905	522743.465	25.101
1159	8415156.146	522802.095	12.113
1159	8424868.572	534849.369	66.098
1160	8424862.349	534827.273	89.745
1160	8415269.616	522769.984	23.920
1161	8415285.596	522763.688	40.004
1161	8424890.504	534851.469	99.367
1162	8424912.373	534746.077	203.215
1162	8415484.621	522903.644	64.332
1163	8415535.748	522954.261	66.169
1163	8424926.121	534740.960	194.804
1164	8415602.849	522995.596	76.101
1164	8424976.150	534713.628	188.967
1165	8424485.588	535151.307	2.285
2000	8425150.910	535153.058	15.511
2001	8425158.355	535180.498	14.677
2002	8425234.428	535234.814	47.680
2003	8425246.728	535223.546	80.934
2004	8425205.486	535210.841	51.993
2005	8425239.130	535094.215	99.468
2006	8425310.293	535125.974	176.519
2007	8425377.303	535284.902	74.205
2008	8425283.153	535284.410	39.128
2009	8425419.973	535334.623	63.217
2010	8425353.669	535281.429	64.579
2011	8425202.204	535247.428	24.034
2012	8425182.080	535248.196	8.959
2013	8425206.327	535211.389	51.567

2014	8425252.004	535245.504	65.806
2015	8425237.273	535243.038	38.818
2016	8425193.293	534994.717	59.511
2017	8425196.491	535036.496	61.086
2018	8425237.303	535034.712	98.165
2019	8425195.865	535073.435	53.186
2020	8425168.956	534876.019	44.562
2021	8425023.415	534905.738	24.725
2022	8424957.338	534926.431	28.882
2023	8425053.701	534786.984	69.519
2024	8424924.830	534904.337	39.370
2025	8424921.637	534892.157	51.512
2026	8424873.189	534854.629	61.779
2027	8424863.582	534837.570	76.807
2028	8424874.411	534835.152	93.248
2029	8424905.158	534841.365	111.458
2030	8424892.624	534766.937	179.378
2031	8424794.122	534747.234	91.682
2032	8424875.959	534905.149	27.368
2033	8424197.293	535148.501	39.418
2034	8424135.593	535165.762	80.252
2035	8424106.083	535122.632	64.046
2036	8424371.645	535020.301	31.723
2037	8424309.169	534965.287	44.005
2038	8424193.090	534945.638	103.888
2039	8424232.037	534885.739	58.036
2040	8424132.549	534849.042	108.222
2041	8424307.465	534666.383	94.133
2042	8424390.691	534716.583	46.102
2043	8424541.228	534678.980	54.917
2044	8424654.882	534530.219	116.184
2045	8424609.822	534448.793	172.129
2046	8424785.866	534752.420	77.144
2047	8424810.438	534788.477	74.155
2048	8424829.090	534661.436	177.645
2049	8424820.906	534848.363	31.581
2050	8424880.063	534862.005	59.838
2051	8424873.737	534899.688	40.212
2052	8424877.278	534840.232	90.358
2053	8420328.397	534426.790	3.899
2100	8419746.744	534535.809	34.534
2101	8419718.433	534505.904	55.251

2102	8419693.105	534477.075	31.432
2103	8419745.047	534486.956	25.901
2104	8419616.936	534471.886	78.929
2105	8419606.744	534430.382	80.795
2106	8419768.000	534344.545	16.540
2107	8419774.059	534323.163	16.147
2108	8419735.755	534321.620	46.949
2109	8419779.535	534297.899	21.171
2110	8419749.671	534280.742	56.642
2111	8419756.665	534230.098	67.510
2112	8419866.950	534257.459	13.386
2113	8419875.951	534247.786	16.048
2114	8419880.742	534233.236	23.005
2115	8420254.636	534211.626	49.524
2116	8420352.392	534279.751	75.314
2117	8419926.501	533914.912	58.966
2118	8419948.578	533961.340	34.767
2119	8419931.360	533822.781	77.280
2120	8419954.113	533763.602	98.726
2121	8420357.344	533999.846	47.049
2122	8420408.077	533981.778	52.516
2123	8420346.851	534004.506	32.851
2124	8420409.063	533981.544	55.568
2125	8420312.359	533986.582	51.084
2126	8420305.780	533969.596	64.264
2127	8420243.439	534162.215	26.020
2128	8420225.455	534187.649	24.821
2129	8420278.165	534190.657	61.542
2130	8420223.888	534239.079	15.039
2131	8420226.346	534242.688	15.058
2132	8420216.388	534252.248	12.684
2133	8420244.404	534235.941	41.651
2134	8420273.935	534189.789	59.175
2135	8420248.222	534205.960	49.430
2136	8419870.882	534148.934	56.108
2137	8419839.265	534155.567	84.822
2138	8419866.869	534196.369	49.937
2139	8420237.564	534163.388	15.981
2140	8420300.227	533970.343	63.006

APPENDIX B1

Network Adjustment Reports

(Electronically Attached)

APPENDIX B2

RTK Reductions Reports

(Electronically Attached)

APPENDIX C

Station Pictures and Shape Files

(Electronically Attached)

APPENDIX D

NGS Sheets

(Electronically Attached)