Ground Control Survey Report

Big Island, Hawaii LiDAR Data Collection

NOAA Contract Number: EA133C33CQ0010
USGS Task Order Number: G17PD01221-MODP00001

Contractor: Woolpert, Inc.
Woolpert Project # 77027 & 78014

February 2020

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AFCEC Installation Aerial Imagery Data Collection

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Section 1: Survey Report

Introduction

This report contains a comprehensive outline of the Ground Control Survey that supported the Lidar collection on the Big Island of Hawaii. All surveys were performed in such a way as to achieve ground control accuracies that meet or exceed the National Mapping Accuracy Standards.

Project Area

The project area consists of approximately 10,500 square kilometers encompassing the Big Island of Hawaii.

Purpose

The purpose of this survey was to establish three-dimensional coordinates for 41 photo control points and 33 LiDAR control points. The points were collected per the flight layout and were uniformly dispersed over the project area. Woolpert was also provided with 159 NVA points and 112 VVA points from NOAA. These points are listed in section 2 of this report. Pictures of the NOAA provided points can be found attached to the kmz that is also being delivered.

Date of Survey

Ground control field operations took place January 16th, 2018 thru December 15rd of 2019.

Monumentation

Prior to aerial imagery acquisition, Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing NSRS control stations were utilized as checks to ensure that quality x, y, and z coordinate values were computed for each of the newly established photogrammetric control stations. Recovery information sheets for the existing NGS control stations can be found in Section 4 of this report. A control diagram showing the ground control stations used to support this mapping project can be found in Section 5 of this report.

Accuracy Standards

The relative vertical accuracy of the LiDAR data will be 10 cm RMSEz with swath overlap (between adjacent swaths) and an absolute vertical accuracy of 15cm RMSE.

GPS Equipment

Woolpert utilized 2 Trimble Navigation R10 Model GNSS dual-frequency GPS receivers, 2 Trimble Navigation R8 Model 3 GNSS dual frequency GPS receivers and 2 TSC3 data collector for this project.

Methodology

Static GPS

Eleven temporary control points were established around the island by static observations. The CORS station "MKEA" was used to establish the temporary control points. The field crew utilized Static GPS surveying throughout the ground control data collection process. Using Static GPS techniques, observations were performed on a total of 5 ground control points. The survey was conducted using a 1-second epoch rate, in a fixed solution, with each observation lasting at least 20 minutes. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this photogrammetric project.

Real-Time Kinematic (RTK) GPS

The field crew utilized Real-Time Kinematic (RTK) GPS surveying throughout the ground control data collection process. RTK surveys were run from the eleven temporary control points created by static observations. Measurements between the eleven temporary control points and recovered NGS monuments were used to check the setup each day. Using RTK GPS techniques, observations were performed on a total of 69 photo control points and LiDAR control points. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting between 60 to 180 seconds. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this LiDAR / photogrammetric project.

GPS Data Analysis and Processing

The field crew chief processed all session baselines each day using Trimble Navigation's Trimble Business Center (TBC) Version 5.20 baseline processor with the accompanying broadcast ephemeris. Daily processing ensured the integrity of the network as it was constructed and allowed the field crews to immediately reschedule observations of poor baselines.

The 159 NVA points and 112 VVA points provided by NOAA were delivered to Woolpert in a latitude, longitude, and ellipsoid height. Woolpert applied Geoid12B to reduce the ellipsoid heights to orthometric heights.

Datum Reference and Final Coordinates

The spatial reference system for the Big Island AOI is UTM 5N. The datum is NAD83 (PA11) 2010.00 horizontal. Orthometric heights referenced to Geoid 12B Hawaii. Units for both the horizontal and vertical datums will be expressed in Meters to three (3) decimal places.

Quality Assurance

Existing NGS published benchmarks were surveyed to assure that there were no discrepancies in the field observation data. Close examinations of the residuals showed no distortions in orientation or scale. The ground control data meets positional accuracies necessary to support 1.0 point per 0.3 meters squared (1' GSD) data at 95% confidence level as outlined in the Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA), published by the Federal Geographic Data Committee (FGDC-STD-007.3-1998).

The ground control data was originally collected between January 16th, 2018 and January 30th, 2018. However not all of the Lidar was collected during this season. After the ground control was completed, the Kilauea Volcano erupted in December of 2018. The

ground control was checked or re-established in December of 2019 to ensure the volcanic activity did not affect any of the ground control.

Section 2: Ground Control / Geodetic Control Coordinate Listings

Coordinate System: Grid

HORIZONTAL DATUM: NAD83 (PA11) Epoch 2010.00
PROJECTION: UTM 5 North
VERTICAL DATUM: NAVD88
GEOID MODEL:Geod12B Hawaii
UNITS: METER

Ground Control

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
2008A_2019_HI	2,216,282.308	220,506.371	813.308	PID
2093_2019_HI	2,217,579.745	252,502.214	215.255	PID
6001_2019_HI	2,182,787.870	285,030.626	5.539	PID
6002_2019_HI	2,182,947.637	285,680.441	4.357	PID
6003_2019_HI	2,183,265.292	286,013.186	3.686	PID
7001_2019_HI	2,150,228.980	261,182.974	1,218.917	PID
7002_2019_HI	2,162,906.423	278,847.668	457.740	PID
7003_2019_HI	2,169,347.044	285,092.577	175.972	PID
7004_2019_HI	2,170,284.149	286,826.061	91.870	PID
7005_2019_HI	2,156,585.848	296,082.070	204.824	PID
7006_2019_HI	2,222,259.691	241,752.467	329.669	PID
7007_2019_HI	2,240,486.262	204,667.140	159.987	PID
7008_2019_HI	2,177,812.945	275,457.935	349.092	PID
7009_2019_HI	2,194,533.373	279,352.857	163.162	PID
7010_2019_HI	2,198,526.641	278,613.556	86.833	PID
7011_2019_HI	2,186,763.989	234,634.267	1,955.225	PID
7012_2019_HI	2,198,563.647	222,156.597	1,377.941	PID
7012A_2019_HI	2,198,631.679	222,112.153	1,371.963	PID
7013_2019_HI	2,205,536.471	207,513.790	268.633	PID
7014_2019_HI	2,216,183.961	220,296.730	807.566	PID

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
7015_2019_HI	2,220,990.028	242,922.083	391.228	PID
7016_2019_HI	2,218,373.986	203,810.461	2.396	PID
7017_2019_HI	2,207,715.791	200,335.480	8.961	PID
7018_2019_HI	2,179,295.804	183,423.040	33.189	PID
7019_2019_HI	2,193,821.475	202,511.261	663.415	PID
7020_2019_HI	2,159,413.585	193,463.891	432.849	PID
7021_2019_HI	2,149,450.330	197,505.021	291.466	PID
7022_2019_HI	2,145,558.285	197,555.327	263.052	PID
7023_2019_HI	2,124,692.973	239,915.187	245.295	PID
7024_2019_HI	2,109,502.017	227,954.449	202.412	PID
7025_2019_HI	2,160,923.792	276,324.664	597.649	PID
7026_2019_HI	2,142,698.589	293,510.474	23.504	PID
7027_2019_HI	2,133,652.522	197,813.839	380.943	PID
7028_2019_HI	2,216,997.484	215,816.539	670.976	PID
7029_2019_HI	2,118,200.178	235,276.321	43.195	PID
7030_2019_HI	2,164,741.975	290,509.554	107.728	PID
7031_2019_HI	2,193,383.265	240,868.089	4,039.700	PID
7032_2019_HI	2,184,739.022	182,318.057	50.087	PID
7033_2019_HI	2,175,181.574	186,372.434	66.295	PID
7034_2019_HI	2,150,408.216	265,817.676	1,125.869	PID
8001_2019_HI	2,216,491.332	206,187.041	109.339	VERTICAL CHECK
8002_2019_HI	2,192,389.249	241,502.319	3,905.907	VERTICAL CHECK
8003_2019_HI	2,186,711.619	242,615.032	2,804.189	VERTICAL CHECK
8004_2019_HI	2,217,818.060	251,835.440	240.370	VERTICAL CHECK
8005_2019_HI	2,113,278.726	206,164.332	592.448	VERTICAL CHECK
8006_2019_HI	2,216,461.105	212,387.262	507.328	VERTICAL CHECK
8007_2019_HI	2,221,464.796	243,445.635	337.517	VERTICAL CHECK
8008_2019_HI	2,182,069.718	282,694.039	2.899	VERTICAL CHECK
8009_2019_HI	2,157,042.195	294,809.896	198.427	VERTICAL CHECK
8010_2019_HI	2,151,019.517	260,604.770	1,221.861	VERTICAL CHECK
8011_2019_HI	2,157,015.656	195,067.406	441.397	VERTICAL CHECK
8012_2019_HI	2,124,670.935	239,877.612	246.773	VERTICAL CHECK
8013_2019_HI	2,183,376.059	187,505.894	475.103	VERTICAL CHECK

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
8014_2019_HI	2,165,188.136	281,616.130	336.508	VERTICAL CHECK
8015_2019_HI	2,149,490.955	197,509.191	290.215	VERTICAL CHECK
8016_2019_HI	2,133,506.881	198,044.184	433.037	VERTICAL CHECK
8017_2019_HI	2,217,942.389	204,342.659	3.968	VERTICAL CHECK
8018_2019_HI	2,240,230.199	205,801.935	155.949	VERTICAL CHECK
8019_2019_HI	2,193,834.453	202,521.309	663.444	VERTICAL CHECK
8020_2019_HI	2,206,666.866	208,207.039	292.210	VERTICAL CHECK
8021_2019_HI	2,186,787.510	234,611.003	1,954.797	VERTICAL CHECK
8022_2019_HI	2,199,472.069	278,293.646	60.649	VERTICAL CHECK
8023_2019_HI	2,178,399.107	271,577.715	567.528	VERTICAL CHECK
8024_2019_HI	2,141,971.091	293,038.493	5.889	VERTICAL CHECK
8025_2019_HI	2,171,103.989	285,972.359	104.859	VERTICAL CHECK
8026_2019_HI	2,139,378.461	248,078.609	808.006	VERTICAL CHECK
8027_2019_HI	2,197,835.564	222,552.863	1,445.643	VERTICAL CHECK
8028_2019_HI	2,110,013.672	229,403.502	157.915	VERTICAL CHECK
8029_2019_HI	2,192,850.495	186,666.003	62.455	VERTICAL CHECK
8030_2019_HI	2,210,752.167	267,156.133	98.941	VERTICAL CHECK
8031_2019_HI	2,174,044.784	277,931.446	295.248	VERTICAL CHECK
8032_2019_HI	2,152,193.462	270,027.529	915.537	VERTICAL CHECK
8033_2019_HI	2,168,971.927	189,564.721	129.127	VERTICAL CHECK

Geodetic Control

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
102_2019_HI	2,140,615.712	248,913.301	843.581	TSM
103_2018_HI	2,121,066.538	208,519.788	1,427.948	TSM
104_2018_HI	2,164,798.141	191,846.597	390.736	TSM
105_018_HI	2,202,783.616	197,422.820	24.988	TSM
107_2018_HI	2,187,515.735	231,098.486	1,829.384	TSM
108_2019_HI	2,221,829.142	242,109.233	351.602	TSM
110_2019_HI	2,214,161.610	262,152.913	132.418	TSM

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
111_2019_HI	2,116,835.961	234,449.144	47.261	TSM
112_2019_HI	2,206,618.492	218,684.143	787.321	TSM
113_2019_HI	2,141,179.004	198,135.959	328.222	TSM
151_2019_HI	2,155,994.600	274,113.826	704.480	TSM
152_2019_HI	2,199,420.441	278,300.274	63.365	TSM
153_2019_HI	2,218,143.138	227,784.199	864.401	TSM
154_2019_HI	2,222,933.952	210,966.045	1,084.009	TSM
155_2019_HI	2,109,643.058	220,928.981	577.069	TSM
H 13	2,217,964.002	204,341.083	4.097	DO7803
MKEA	2,191,367.901	242,674.343	3,728.032	DE6589
MKVISITBASE_2019	2,186,709.857	242,662.549	2,801.574	PMK
NPS KONA	2,178,747.231	183,184.972	13.146	BOLT
NUNUKI	2,177,661.739	183,238.667	6.515	DM4611
PAAHANA	2,179,675.077	281,568.822	53.844	DL6334
PENO	2,212,194.983	265,628.667	3.342	DM4606
PI MON	2,177,561.312	182,832.467	5.083	DM4612
PT MON	2,177,582.380	182,980.322	5.777	DM4613

NOAA Provided NVA and VVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
1	2,147,902.763	263,722.334	1,144.875	NVA
3	2,182,634.827	283,119.138	2.145	NVA
3a	2,182,543.538	283,139.483	1.720	NVA
5	2,093,567.376	217,477.923	13.079	NVA
7	2,175,088.005	183,909.356	1.790	NVA
8	2,216,228.620	220,481.428	811.747	NVA
8a	2,216,209.636	220,529.578	812.397	NVA
8b	2,216,196.413	220,438.816	810.703	NVA
10	2,141,381.977	291,330.188	20.265	NVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
10a	2,141,142.743	291,013.944	25.731	NVA
11	2,134,827.788	279,534.098	18.484	NVA
13	2,190,604.513	223,022.325	1,576.451	NVA
14	2,221,656.105	241,979.365	355.353	NVA
14 bs	2,221,599.052	241,982.388	355.199	NVA
14 occ	2,221,685.340	242,026.651	355.217	NVA
14 val	2,221,635.999	241,924.695	355.170	NVA
16	2,160,503.530	192,630.925	370.905	NVA
17	2,121,414.507	208,520.883	1,456.759	NVA
17a	2,121,423.825	208,545.695	1,458.728	NVA
17b	2,121,405.342	208,488.150	1,454.407	NVA
17c	2,121,404.065	208,535.164	1,456.092	NVA
18	2,173,141.712	239,751.943	2,150.694	NVA
20	2,185,714.338	235,221.251	1,980.069	NVA
21	2,177,815.571	275,616.935	340.473	NVA
21a	2,177,815.436	275,608.152	340.747	NVA
25	2,140,821.570	249,056.069	848.918	NVA
28 TS BS	2,170,985.774	285,879.482	110.499	NVA
28 TS OCC	2,171,041.821	285,804.981	113.180	NVA
28 TS VAL	2,171,016.290	285,830.464	112.457	NVA
30	2,223,847.603	210,517.081	1,072.766	NVA
30a	2,223,846.769	210,462.801	1,066.830	NVA
31	2,194,491.649	186,214.112	2.678	NVA
32	2,184,808.272	181,888.007	32.418	NVA
33	2,141,204.832	198,126.735	326.053	NVA
35	2,162,914.199	278,913.361	455.993	NVA
37	2,189,149.314	193,593.740	595.969	NVA
39	2,208,293.535	219,392.776	776.664	NVA
39a	2,208,235.066	219,407.161	777.368	NVA
39b	2,208,193.629	219,415.505	777.830	NVA
41	2,176,709.162	251,924.575	1,693.388	NVA
42	2,179,263.665	264,811.865	945.708	NVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
44	2,151,724.537	277,078.603	703.833	NVA
45	2,154,216.702	272,773.922	772.340	NVA
46a	2,149,032.372	259,887.582	1,245.138	NVA
46b	2,149,035.683	259,867.155	1,245.467	NVA
46c	2,149,166.203	259,986.328	1,233.953	NVA
46d	2,149,020.966	259,864.163	1,245.405	NVA
46e	2,149,054.051	259,852.346	1,244.639	NVA
48	2,101,471.914	219,211.810	276.916	NVA
52	2,115,017.146	197,750.063	198.307	NVA
53	2,121,836.361	198,831.895	501.364	NVA
53a	2,121,831.364	198,827.295	501.412	NVA
54	2,167,226.689	242,478.629	2,528.960	NVA
54a	2,167,210.796	242,521.623	2,530.368	NVA
54b	2,167,271.873	242,621.260	2,526.566	NVA
54c	2,167,254.312	242,544.933	2,527.046	NVA
55	2,162,449.905	229,755.487	3,355.734	NVA
55a	2,162,373.854	229,743.762	3,364.253	NVA
55b	2,162,329.426	229,747.775	3,372.052	NVA
55c	2,162,380.722	229,733.247	3,361.575	NVA
55d	2,162,319.077	229,611.210	3,372.855	NVA
56	2,169,119.328	240,519.999	2,430.338	NVA
57	2,149,481.316	197,517.215	290.564	NVA
57a	2,149,491.584	197,518.021	290.364	NVA
57b	2,149,479.990	197,501.601	289.714	NVA
57c	2,149,519.975	197,453.767	286.241	NVA
62a	2,107,785.207	208,819.771	282.067	NVA
62b	2,107,683.512	208,797.669	273.891	NVA
62c	2,107,741.499	208,915.968	279.259	NVA
63	2,178,908.748	241,409.240	2,005.465	NVA
64	2,135,473.439	198,020.307	374.642	NVA
64a	2,135,454.390	198,020.234	375.262	NVA
64b	2,135,478.550	198,025.489	374.526	NVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
64c	2,135,423.749	198,003.130	374.507	NVA
65	2,109,559.538	216,813.155	629.822	NVA
67	2,107,512.657	206,291.795	182.127	NVA
67c	2,107,281.086	206,190.184	166.998	NVA
67d	2,107,408.962	206,244.850	176.308	NVA
68	2,107,777.349	208,838.468	282.351	NVA
69	2,117,429.179	236,432.806	3.664	NVA
72	2,138,554.688	269,606.314	747.040	NVA
74	2,135,144.880	257,550.830	696.964	NVA
77	2,148,412.819	264,530.934	1,180.972	NVA
79	2,145,509.385	263,972.615	1,094.118	NVA
80	2,137,712.123	259,076.709	854.728	NVA
83	2,147,593.902	255,563.753	1,087.599	NVA
83a	2,147,553.256	255,523.758	1,086.079	NVA
84a	2,143,306.331	251,345.729	929.171	NVA
85	2,135,302.884	245,667.632	689.342	NVA
86	2,115,499.984	233,681.836	16.258	NVA
87	2,114,218.845	232,910.716	32.153	NVA
88b TS OCC	2,110,112.590	225,593.394	307.989	NVA
88c TS VAL	2,110,086.682	225,572.166	307.937	NVA
89 BS	2,189,368.759	280,398.317	73.195	NVA
89 OCC	2,189,402.395	280,343.010	73.639	NVA
89 VAL	2,189,379.748	280,410.257	73.029	NVA
90	2,194,627.663	279,430.773	157.932	NVA
94	2,219,301.315	232,524.898	794.450	NVA
101	2,172,316.796	190,777.636	439.768	NVA
104	2,118,967.546	213,828.790	1,383.178	NVA
104a	2,118,972.592	213,844.229	1,383.403	NVA
104b	2,118,951.812	213,783.463	1,380.703	NVA
105	2,150,097.292	294,827.914	353.553	NVA
105a	2,150,107.157	294,870.675	353.407	NVA
105b	2,150,078.514	294,767.600	355.616	NVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
106	2,152,735.495	306,633.149	5.289	NVA
106a	2,152,696.988	306,664.170	4.667	NVA
106b	2,152,484.310	306,626.121	2.751	NVA
107	2,149,484.416	302,934.163	9.936	NVA
107occ	2,149,496.750	302,938.953	10.014	NVA
107val	2,149,481.040	302,933.242	9.926	NVA
108	2,147,211.725	300,091.287	7.721	NVA
108a	2,147,199.397	300,079.243	5.185	NVA
108b	2,147,220.774	300,110.279	7.583	NVA
108c	2,147,201.376	300,201.816	8.433	NVA
110	2,163,960.462	301,845.444	11.215	NVA
110a	2,164,013.652	301,861.432	8.043	NVA
111	2,183,308.389	289,397.013	4.298	NVA
111a	2,183,491.096	289,309.353	3.359	NVA
113	2,156,581.839	282,110.007	476.127	NVA
168 BS	2,177,822.067	275,612.235	340.409	NVA
168 OCC	2,177,815.847	275,634.356	340.141	NVA
168 VAL	2,177,808.841	275,612.608	340.472	NVA
184	2,149,615.189	259,115.995	1,195.476	NVA
196	2,174,846.757	186,186.494	31.775	NVA
196b	2,174,759.506	186,137.886	30.887	NVA
196c	2,174,739.397	186,116.044	28.332	NVA
198	2,175,701.035	185,409.997	41.986	NVA
198a	2,175,722.726	185,417.962	42.395	NVA
198b	2,175,759.120	185,413.958	42.807	NVA
198c	2,175,796.337	185,398.945	42.794	NVA
198e	2,175,728.511	185,382.284	41.258	NVA
200	2,175,888.989	284,861.011	61.424	NVA
200a	2,175,886.090	284,839.094	61.403	NVA
200c	2,175,879.461	284,905.281	61.366	NVA
2008	2,216,266.145	220,403.152	811.079	NVA
2093	2,217,579.771	252,502.103	215.121	NVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
AF01	2,196,765.859	274,621.519	367.232	NVA
dm4612	2,177,561.307	182,832.447	5.054	NVA
dm4613	2,177,582.359	182,980.298	5.774	NVA
do7804	2,217,060.810	204,304.142	2.940	NVA
DO8010	2,152,647.503	306,697.174	3.652	NVA
hb base	2,213,062.931	204,585.189	26.162	NVA
hb bs	2,213,042.648	204,533.510	24.399	NVA
hb occ	2,213,048.611	204,594.248	27.066	NVA
hb val	2,213,087.380	204,564.901	25.791	NVA
kohp	2,234,281.555	196,747.362	4.121	NVA
kohp01	2,234,296.635	196,788.310	4.839	NVA
kohp02	2,234,312.122	196,759.752	4.034	NVA
kona pier	2,174,246.735	185,701.357	1.985	NVA
kw 01	2,217,095.990	204,248.617	3.424	NVA
LP02	2,212,261.689	265,529.621	5.596	NVA
MK approach	2,192,389.331	241,504.243	3,906.014	NVA
MK KECK	2,194,265.005	240,648.483	4,116.534	NVA
MK VISIT BASE	2,186,709.863	242,662.561	2,801.506	NVA
MKV01	2,186,702.948	242,704.859	2,798.873	NVA
MKV02	2,186,727.899	242,797.742	2,801.146	NVA
PA01	2,210,331.574	268,013.761	86.374	NVA
upo	2,241,368.320	198,214.182	8.105	NVA
upo01	2,241,376.418	198,185.600	5.902	NVA
41v	2,176,693.377	251,977.975	1,691.411	VVA
45b	2,154,206.159	272,786.656	772.675	VVA
46f	2,149,106.828	259,925.398	1,241.468	VVA
67a	2,107,420.242	206,247.068	176.402	VVA
67b	2,107,360.450	206,228.467	173.240	VVA
83b	2,147,551.667	255,500.589	1,083.729	VVA
88 veg-1	2,110,114.729	225,542.870	308.063	VVA
88 veg-2	2,110,164.135	225,584.308	308.366	VVA
88 veg-3	2,110,182.619	225,596.077	308.687	VVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
88 veg-4	2,110,181.092	225,609.268	308.879	VVA
88 veg-5	2,110,165.246	225,637.947	308.466	VVA
88 veg-6	2,110,133.525	225,669.811	308.031	VVA
88 veg-7	2,110,114.409	225,686.212	307.936	VVA
88 veg-8	2,110,079.060	225,654.865	307.656	VVA
116a	2,221,635.399	241,906.599	357.955	VVA
116b	2,221,605.782	241,907.914	355.258	VVA
116c	2,221,575.782	241,929.024	356.538	VVA
116d	2,221,583.090	241,982.902	355.472	VVA
116e	2,221,595.074	241,994.392	355.674	VVA
116f	2,221,616.881	242,006.587	354.979	VVA
116g	2,221,692.264	242,058.791	355.770	VVA
116h	2,221,681.396	242,049.893	355.345	VVA
116i	2,221,624.532	242,014.515	355.585	VVA
116j	2,221,582.898	241,983.048	355.495	VVA
116k	2,221,571.868	241,967.044	356.287	VVA
116l	2,221,573.896	241,932.301	356.568	VVA
116m	2,221,602.360	241,912.186	355.100	VVA
116n	2,221,616.517	241,906.888	355.417	VVA
116o	2,221,635.550	241,906.861	357.913	VVA
116p	2,221,644.648	241,915.332	357.029	VVA
116q	2,221,702.415	241,962.750	355.129	VVA
116r	2,221,716.186	241,965.874	356.588	VVA
120a	2,183,299.339	289,392.664	4.437	VVA
121	2,168,758.730	295,804.648	11.540	VVA
123-m-1	2,149,487.113	302,965.960	7.015	VVA
123-m-2	2,149,497.125	302,971.370	7.319	VVA
123-m-3	2,149,502.303	302,953.273	7.575	VVA
123-m-4	2,149,467.767	302,933.496	8.312	VVA
123-m-5	2,149,480.015	302,912.364	10.168	VVA
123-m-6	2,149,517.565	302,924.300	9.280	VVA
125	2,141,235.798	291,098.201	20.666	VVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
126	2,156,601.969	282,130.338	474.939	VVA
127	2,148,492.684	264,492.656	1,182.269	VVA
133	2,093,557.858	217,480.676	13.209	VVA
134	2,101,484.404	219,226.107	277.126	VVA
136a	2,118,955.249	213,806.753	1,382.005	VVA
136b	2,118,962.501	213,846.375	1,382.206	VVA
137	2,117,380.571	201,286.858	518.270	VVA
138a	2,121,844.702	198,830.979	501.282	VVA
139	2,125,869.616	196,267.817	245.452	VVA
140	2,141,217.935	198,175.776	336.566	VVA
141	2,160,447.708	192,645.330	370.832	VVA
142	2,172,338.316	190,777.176	439.478	VVA
148a	2,208,227.404	219,382.772	776.932	VVA
148b	2,208,284.954	219,370.566	776.378	VVA
149	2,216,367.408	220,456.137	813.764	VVA
150	2,223,838.072	210,517.670	1,073.431	VVA
151	2,219,304.303	232,551.213	793.805	VVA
151a	2,223,842.533	210,412.829	1,062.290	VVA
159	2,198,221.619	278,768.342	96.280	VVA
162	2,150,079.594	294,826.100	353.345	VVA
163	2,151,730.809	277,105.659	703.879	VVA
164	2,162,908.447	278,981.344	454.265	VVA
165a-m	2,170,960.861	285,894.383	110.937	VVA
165b-m	2,170,922.878	285,859.916	111.723	VVA
165c-m	2,170,956.656	285,726.731	114.665	VVA
165d-m	2,171,039.151	285,740.338	114.115	VVA
165e-m	2,171,052.372	285,756.718	113.757	VVA
165f-m	2,171,083.217	285,771.670	116.621	VVA
165g-m	2,171,118.802	285,775.795	114.959	VVA
165h-m	2,171,144.720	285,804.272	110.797	VVA
165i-m	2,171,133.584	285,838.538	109.480	VVA
168_M1	2,177,831.505	275,662.583	339.812	VVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
168_M2	2,177,816.040	275,666.483	339.607	VVA
168_M3	2,177,801.397	275,677.503	338.722	VVA
168_M4	2,177,817.592	275,679.026	337.947	VVA
168_M5	2,177,842.067	275,674.679	335.617	VVA
168a	2,177,800.474	275,603.357	341.088	VVA
169	2,179,279.218	264,795.627	947.217	VVA
170	2,185,707.590	235,126.441	1,975.737	VVA
171	2,190,618.250	223,000.950	1,574.311	VVA
176a	2,149,520.408	197,470.326	289.915	VVA
177	2,109,561.625	216,793.709	629.481	VVA
178	2,106,295.911	222,925.624	309.645	VVA
180	2,112,367.077	231,735.203	3.073	VVA
181	2,114,204.629	232,909.804	30.476	VVA
182	2,117,431.345	236,420.169	3.740	VVA
183	2,142,015.416	250,017.610	884.170	VVA
185	2,145,513.080	263,975.702	1,092.996	VVA
189a	2,147,220.289	300,127.165	7.699	VVA
189b	2,147,227.605	300,108.014	8.064	VVA
191a	2,164,018.205	301,855.805	7.831	VVA
191b	2,163,989.335	301,845.465	10.475	VVA
192a	2,182,504.476	283,137.802	1.917	VVA
193	2,135,416.365	198,003.577	374.601	VVA
194a	2,175,030.980	183,954.145	1.392	VVA
195	2,184,780.458	181,919.974	33.970	VVA
196a	2,174,831.071	186,184.042	31.569	VVA
196d	2,174,833.182	186,231.486	32.703	VVA
198d	2,175,742.550	185,367.420	40.803	VVA
200b	2,175,929.679	284,775.757	61.580	VVA
hb vva 01	2,213,082.519	204,614.208	28.202	VVA
hb vva 02	2,213,072.388	204,626.536	28.811	VVA
hb vva 03	2,213,037.940	204,607.680	26.629	VVA
hb vva 04	2,213,020.472	204,616.423	24.140	VVA

Point No.	UTM Zone 5 North NAD83(PA11) 2010.00 Epoch		Ortho Height (Geoid12B Hawaii) (m)	Description
	UTM Northing (m)	UTM Easting (m)		
hb vva 05	2,213,007.727	204,601.991	23.202	VVA
hb vva 06	2,212,997.205	204,580.280	22.166	VVA
hb vva 07	2,212,996.115	204,544.001	21.882	VVA
kohp vva01	2,234,226.480	196,849.976	12.996	VVA
LP01	2,212,308.446	265,462.319	5.797	VVA
upo vva01	2,241,353.387	198,196.351	7.733	VVA
upo vva02	2,241,363.650	198,226.474	8.676	VVA

Coordinate System: Geodetic

HORIZONTAL DATUM: NAD83 (PA11) Epoch 2010.00
Ellipsoid: GRS80
UNITS: METER

GROUND CONTROL

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
2008A_2019_HI	20°01'23.56787"	-155°40'17.52706"	836.093	PID
2093_2019_HI	20°02'21.40395"	-155°21'57.91219"	235.130	PID
6001_2019_HI	19°43'44.25677"	-155°03'04.40857"	22.958	PID
6002_2019_HI	19°43'49.70621"	-155°02'42.16351"	21.608	PID
6003_2019_HI	19°44'00.16424"	-155°02'30.86999"	20.836	PID
7001_2019_HI	19°25'55.94612"	-155°16'28.26251"	1241.903	PID
7002_2019_HI	19°32'55.42098"	-155°06'28.24967"	477.418	PID
7003_2019_HI	19°36'27.28820"	-155°02'56.72420"	194.046	PID
7004_2019_HI	19°36'58.43016"	-155°01'57.63317"	109.495	PID
7005_2019_HI	19°29'36.53971"	-154°56'34.70386"	220.337	PID
7006_2019_HI	20°04'48.45484"	-155°28'10.00578"	350.035	PID
7007_2019_HI	20°14'21.54370"	-155°49'36.22123"	178.096	PID
7008_2019_HI	19°40'58.67398"	-155°08'30.91797"	369.138	PID
7009_2019_HI	19°50'03.85104"	-155°06'24.36903"	181.145	PID
7010_2019_HI	19°52'13.37311"	-155°06'51.48839"	104.527	PID
7011_2019_HI	19°45'31.35863"	-155°31'56.47004"	1982.292	PID
7012_2019_HI	19°51'48.61538"	-155°39'11.15834"	1402.862	PID
7012A_2019_HI	19°51'50.80351"	-155°39'12.72175"	1396.871	PID
7013_2019_HI	19°55'27.49852"	-155°47'38.06119"	290.712	PID
7014_2019_HI	20°01'20.26308"	-155°40'24.68097"	830.351	PID
7015_2019_HI	20°04'07.75024"	-155°27'29.12675"	411.795	PID
7016_2019_HI	20°02'22.60444"	-155°49'52.75039"	23.044	PID
7017_2019_HI	19°56'34.38140"	-155°51'45.95893"	29.786	PID
7018_2019_HI	19°41'01.45687"	-156°01'09.56130"	51.743	PID
7019_2019_HI	19°49'04.12425"	-155°50'23.14608"	685.718	PID
7020_2019_HI	19°30'21.16721"	-155°55'13.48344"	453.653	PID

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
7021_2019_HI	19°24'59.65626"	-155°52'49.29033"	312.703	PID
7022_2019_HI	19°22'53.21955"	-155°52'45.34080"	283.928	PID
7023_2019_HI	19°11'56.38100"	-155°28'24.47975"	265.895	PID
7024_2019_HI	19°03'36.99667"	-155°35'05.98595"	220.390	PID
7025_2019_HI	19°31'49.94748"	-155°07'53.92894"	617.928	PID
7026_2019_HI	19°22'04.04467"	-154°57'57.43807"	37.978	PID
7027_2019_HI	19°16'26.50196"	-155°52'29.71376"	400.698	PID
7028_2019_HI	20°01'44.35241"	-155°42'59.17161"	693.369	PID
7029_2019_HI	19°08'23.18138"	-155°30'59.98117"	62.661	PID
7030_2019_HI	19°33'59.64832"	-154°59'49.02417"	124.608	PID
7031_2019_HI	19°49'09.49460"	-155°28'25.78572"	4066.084	PID
7032_2019_HI	19°43'57.65403"	-156°01'50.79452"	68.464	PID
7033_2019_HI	19°38'49.48518"	-155°59'25.91723"	85.660	PID
7034_2019_HI	19°26'03.74463"	-155°13'49.52366"	1147.971	PID
8001_2019_HI	20°01'22.73540"	-155°48'29.95149"	130.468	VERTICAL CHECK
8002_2019_HI	19°48'37.48826"	-155°28'03.50506"	3932.346	VERTICAL CHECK
8003_2019_HI	19°45'33.47644"	-155°27'22.46084"	2831.049	VERTICAL CHECK
8004_2019_HI	20°02'28.84285"	-155°22'20.96164"	260.307	VERTICAL CHECK
8005_2019_HI	19°05'28.86828"	-155°47'32.79603"	610.848	VERTICAL CHECK
8006_2019_HI	20°01'25.10139"	-155°44'56.77378"	529.381	VERTICAL CHECK
8007_2019_HI	20°04'23.43148"	-155°27'11.35755"	357.875	VERTICAL CHECK
8008_2019_HI	19°43'19.98500"	-155°04'24.33231"	20.919	VERTICAL CHECK
8009_2019_HI	19°29'50.90805"	-154°57'18.50084"	214.261	VERTICAL CHECK
8010_2019_HI	19°26'21.39640"	-155°16'48.43450"	1245.047	VERTICAL CHECK
8011_2019_HI	19°29'04.13918"	-155°54'17.14795"	462.533	VERTICAL CHECK
8012_2019_HI	19°11'55.64734"	-155°28'25.75462"	267.372	VERTICAL CHECK
8013_2019_HI	19°43'16.36141"	-155°58'51.97758"	495.036	VERTICAL CHECK
8014_2019_HI	19°34'10.70582"	-155°04'54.25657"	355.501	VERTICAL CHECK
8015_2019_HI	19°25'00.97855"	-155°52'49.17078"	311.458	VERTICAL CHECK
8016_2019_HI	19°16'21.89361"	-155°52'21.74937"	452.859	VERTICAL CHECK
8017_2019_HI	20°02'08.87370"	-155°49'34.20157"	24.723	VERTICAL CHECK
8018_2019_HI	20°14'13.85237"	-155°48'57.00535"	174.14	VERTICAL CHECK
8019_2019_HI	19°49'04.55144"	-155°50'22.80856"	685.748	VERTICAL CHECK
8020_2019_HI	19°56'04.60334"	-155°47'14.88733"	314.3	VERTICAL CHECK
8021_2019_HI	19°45'32.11175"	-155°31'57.28074"	1981.862	VERTICAL CHECK
8022_2019_HI	19°52'43.97857"	-155°07'02.88998"	78.293	VERTICAL CHECK

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
8023_2019_HI	19°41'16.12707"	-155°10'44.35380"	588.556	VERTICAL CHECK
8024_2019_HI	19°21'40.21517"	-154°58'13.32382"	20.339	VERTICAL CHECK
8025_2019_HI	19°37'24.75400"	-155°02'27.26100"	122.659	VERTICAL CHECK
8026_2019_HI	19°19'57.45952"	-155°23'52.11697"	831.199	VERTICAL CHECK
8027_2019_HI	19°51'25.15702"	-155°38'57.15407"	1470.695	VERTICAL CHECK
8028_2019_HI	19°03'54.31929"	-155°34'16.71114"	175.865	VERTICAL CHECK
8029_2019_HI	19°48'23.69068"	-155°59'26.53519"	81.781	VERTICAL CHECK
8030_2019_HI	19°58'46.00225"	-155°13'30.75239"	117.281	VERTICAL CHECK
8031_2019_HI	19°38'57.17494"	-155°07'04.40990"	314.857	VERTICAL CHECK
8032_2019_HI	19°27'03.54102"	-155°11'26.03653"	936.887	VERTICAL CHECK
8033_2019_HI	19°35'29.54729"	-155°57'32.74880"	149.216	VERTICAL CHECK

Geodetic Control

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
102_2019_HI	19°20'38.05314"	-155°23'24.12024"	866.921	TSM
103_2018_HI	19°09'43.16496"	-155°46'16.50284"	1,448.551	TSM
104_2018_HI	19°33'15.21852"	-155°56'12.06290"	411.361	TSM
105_018_HI	19°53'52.50925"	-155°53'23.12071"	45.700	TSM
107_2018_HI	19°45'54.06090"	-155°33'58.24024"	1,856.213	TSM
108_2019_HI	20°04'34.63294"	-155°27'57.51389"	372.041	TSM
110_2019_HI	20°00'34.64833"	-155°16'24.37403"	151.136	TSM
111_2019_HI	19°07'38.45155"	-155°31'27.59618"	66.464	TSM
112_2019_HI	19°56'08.58176"	-155°41'14.85041"	810.898	TSM
113_2019_HI	19°20'31.23702"	-155°52'22.96523"	348.875	TSM
151_2019_HI	19°29'08.79675"	-155°09'07.61837"	725.123	TSM
152_2019_HI	19°52'42.30283"	-155°07'02.63989"	81.015	TSM
153_2019_HI	20°02'27.77115"	-155°36'08.28508"	886.952	TSM
154_2019_HI	20°04'54.66800"	-155°45'49.31899"	1,105.421	TSM
155_2019_HI	19°03'38.17066"	-155°39'06.19383"	595.613	TSM
H 13	20°02'09.57509"	-155°49'34.26835"	24.851	DO7803
MKEA	19°48'04.84676"	-155°27'22.74528"	3,754.485	DE6589
MKVISITBASE_2019	19°45'33.44158"	-155°27'20.82862"	2,828.430	PMK
NPS KONA	19°40'43.49747"	-156°01'17.39232"	31.596	BOLT

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
NUNUKI	19°40'08.26322"	-156°01'14.88922"	24.931	DM4611
PAAHANA	19°42'01.68355"	-155°05'01.95485"	72.266	DL6334
PENO	19°59'32.24267"	-155°14'23.93657"	21.713	DM4606
PI MON	19°40'04.76601"	-156°01'28.75896"	23.356	DM4612
PT MON	19°40'05.53587"	-156°01'23.70101"	24.101	DM4613

NOAA Provided NVA and VVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
1	19°24'41.40830"	-155°15'00.20485"	1,167.097	NVA
3	19°43'38.52638"	-155°04'09.97413"	20.031	NVA
3a	19°43'35.56648"	-155°04'09.23738"	19.606	NVA
5	18°54'54.00657"	-155°40'55.77392"	27.409	NVA
7	19°38'45.03417"	-156°00'50.32382"	20.299	NVA
8	20°01'21.81027"	-155°40'18.35516"	834.536	NVA
8a	20°01'21.21835"	-155°40'16.68922"	835.191	NVA
8b	20°01'20.74153"	-155°40'19.80257"	833.494	NVA
10	19°21'20.42414"	-154°59'11.61554"	35.051	NVA
10a	19°21'12.52722"	-154°59'22.35477"	40.548	NVA
11	19°17'42.79685"	-155°05'52.97782"	34.539	NVA
13	19°47'30.40263"	-155°38'37.14005"	1,602.188	NVA
14	20°04'28.94656"	-155°28'01.89328"	375.863	NVA
14 bs	20°04'27.09370"	-155°28'01.76026"	375.724	NVA
14 occ	20°04'29.91947"	-155°28'00.28154"	375.712	NVA
14 val	20°04'28.26680"	-155°28'03.76366"	375.693	NVA
16	19°30'56.11914"	-155°55'42.66261"	391.502	NVA
17	19°09'54.47341"	-155°46'16.65447"	1,477.441	NVA
17a	19°09'54.78903"	-155°46'15.81101"	1,479.416	NVA
17b	19°09'54.15868"	-155°46'17.76889"	1,475.081	NVA
17c	19°09'54.14146"	-155°46'16.16042"	1,476.774	NVA
18	19°38'11.06375"	-155°28'53.94822"	2,177.992	NVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
20	19°44'57.52864"	-155°31'35.78181"	2,007.187	NVA
21	19°40'58.82446"	-155°08'25.46180"	360.477	NVA
21a	19°40'58.81648"	-155°08'25.76320"	360.754	NVA
25	19°20'44.80891"	-155°23'19.32851"	872.281	NVA
28 TS BS	19°37'20.87438"	-155°02'30.39925"	128.326	NVA
28 TS OCC	19°37'22.66761"	-155°02'32.97857"	131.023	NVA
28 TS VAL	19°37'21.84745"	-155°02'32.09370"	130.294	NVA
30	20°05'24.11383"	-155°46'05.28182"	1,094.031	NVA
30a	20°05'24.05743"	-155°46'07.14827"	1,088.089	NVA
31	19°49'16.74854"	-155°59'43.04606"	21.831	NVA
32	19°43'59.65383"	-156°02'05.59168"	50.669	NVA
33	19°20'32.07126"	-155°52'23.29567"	346.706	NVA
35	19°32'55.70009"	-155°06'26.00001"	475.654	NVA
37	19°46'27.37900"	-155°55'26.52654"	617.107	NVA
39	19°57'03.38288"	-155°40'51.41884"	800.149	NVA
39a	19°57'01.49032"	-155°40'50.89237"	800.860	NVA
39b	19°57'00.14809"	-155°40'50.58287"	801.327	NVA
41	19°40'12.65336"	-155°21'58.05197"	1,719.085	NVA
42	19°41'41.37106"	-155°14'36.96372"	968.423	NVA
44	19°26'51.17074"	-155°07'24.17371"	723.584	NVA
45	19°28'10.44848"	-155°09'52.78291"	793.205	NVA
46a	19°25'16.48870"	-155°17'12.10649"	1,268.211	NVA
46b	19°25'16.58751"	-155°17'12.80791"	1,268.544	NVA
46c	19°25'20.88191"	-155°17'08.78391"	1,257.026	NVA
46d	19°25'16.10780"	-155°17'12.90373"	1,268.481	NVA
46e	19°25'17.17823"	-155°17'13.32368"	1,267.721	NVA
48	18°59'11.76060"	-155°40'00.64576"	293.342	NVA
52	19°06'20.93240"	-155°52'21.37856"	215.409	NVA
53	19°10'03.09479"	-155°51'48.22056"	519.884	NVA
53a	19°10'02.92996"	-155°51'48.37506"	519.930	NVA
54	19°35'00.08901"	-155°27'17.48969"	2,556.190	NVA
54a	19°34'59.59251"	-155°27'16.00742"	2,557.594	NVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
54b	19°35'01.62425"	-155°27'12.62055"	2,553.779	NVA
54c	19°35'01.01782"	-155°27'15.22946"	2,554.268	NVA
55	19°32'18.75157"	-155°34'31.32839"	3,383.668	NVA
55a	19°32'16.27413"	-155°34'31.69112"	3,392.188	NVA
55b	19°32'14.83215"	-155°34'31.53064"	3,399.987	NVA
55c	19°32'16.49220"	-155°34'32.05513"	3,389.509	NVA
55d	19°32'14.42901"	-155°34'36.20690"	3,400.788	NVA
56	19°36'00.68733"	-155°28'25.59873"	2,457.710	NVA
57	19°25'00.66970"	-155°52'48.89047"	311.809	NVA
57a	19°25'01.00378"	-155°52'48.86874"	311.610	NVA
57b	19°25'00.61813"	-155°52'49.42444"	310.953	NVA
57c	19°25'01.89136"	-155°52'51.08552"	307.468	NVA
62a	19°02'31.71420"	-155°45'59.06205"	299.470	NVA
62b	19°02'28.39806"	-155°45'59.76254"	291.265	NVA
62c	19°02'30.34308"	-155°45'55.75118"	296.662	NVA
63	19°41'19.29185"	-155°27'59.96264"	2,032.538	NVA
64	19°17'25.78121"	-155°52'23.68162"	394.669	NVA
64a	19°17'25.16221"	-155°52'23.67331"	395.287	NVA
64b	19°17'25.95008"	-155°52'23.50718"	394.555	NVA
64c	19°17'24.15736"	-155°52'24.24123"	394.522	NVA
65	19°03'33.41822"	-155°41'26.82597"	648.350	NVA
67	19°02'21.55645"	-155°47'25.30111"	199.136	NVA
67c	19°02'13.97864"	-155°47'28.64747"	183.936	NVA
67d	19°02'18.16244"	-155°47'26.84895"	193.285	NVA
68	19°02'31.46842"	-155°45'58.41888"	299.754	NVA
69	19°07'58.66140"	-155°30'20.05119"	22.749	NVA
72	19°19'39.96555"	-155°11'34.53030"	766.332	NVA
74	19°17'44.02245"	-155°18'25.81764"	717.530	NVA
77	19°24'58.33247"	-155°14'32.72725"	1,203.108	NVA
79	19°23'23.70796"	-155°14'50.56048"	1,115.940	NVA
80	19°19'08.13772"	-155°17'34.73900"	875.735	NVA
83	19°24'27.84496"	-155°19'39.59017"	1,111.210	NVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
83a	19°24'26.50611"	-155°19'40.94160"	1,109.691	NVA
84a	19°22'06.60362"	-155°22'02.08261"	952.690	NVA
85	19°17'43.88976"	-155°25'12.72394"	711.944	NVA
86	19°06'54.66705"	-155°31'53.17413"	35.195	NVA
87	19°06'12.66256"	-155°32'18.90616"	50.841	NVA
88b TS OCC	19°03'55.70496"	-155°36'27.00031"	326.376	NVA
88c TS VAL	19°03'54.85264"	-155°36'27.71275"	326.318	NVA
89 BS	19°47'16.36814"	-155°05'46.25002"	91.351	NVA
89 OCC	19°47'17.43940"	-155°05'48.16392"	91.807	NVA
89 VAL	19°47'16.73021"	-155°05'45.84460"	91.181	NVA
90	19°50'06.94807"	-155°06'21.73258"	175.886	NVA
94	20°03'07.78995"	-155°33'25.86676"	816.528	NVA
101	19°37'18.90458"	-155°56'53.14975"	460.482	NVA
104	19°08'37.66771"	-155°43'13.82576"	1,403.966	NVA
104a	19°08'37.83952"	-155°43'13.30051"	1,404.193	NVA
104b	19°08'37.13343"	-155°43'15.36733"	1,401.483	NVA
105	19°26'05.10131"	-154°57'15.17539"	368.891	NVA
105a	19°26'05.43785"	-154°57'13.71363"	368.734	NVA
105b	19°26'04.46847"	-154°57'17.23530"	370.967	NVA
106	19°27'35.12097"	-154°50'31.51267"	17.735	NVA
106a	19°27'33.87964"	-154°50'30.43508"	17.099	NVA
106b	19°27'26.95071"	-154°50'31.66135"	15.170	NVA
107	19°25'48.10608"	-154°52'37.10327"	22.959	NVA
107occ	19°25'48.50884"	-154°52'36.94370"	23.038	NVA
107val	19°25'47.99598"	-154°52'37.13357"	22.949	NVA
108	19°24'33.19197"	-154°54'13.68075"	21.175	NVA
108a	19°24'32.78679"	-154°54'14.08883"	18.640	NVA
108b	19°24'33.49303"	-154°54'13.03332"	21.033	NVA
108c	19°24'32.89515"	-154°54'09.88901"	21.854	NVA
110	19°33'38.42441"	-154°53'19.87960"	25.291	NVA
110a	19°33'40.15967"	-154°53'19.35132"	22.112	NVA
111	19°44'02.87937"	-155°00'34.70017"	20.585	NVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
111a	19°44'08.78593"	-155°00'37.78447"	19.658	NVA
113	19°29'31.09055"	-155°04'33.73911"	494.913	NVA
168 BS	19°40'59.03373"	-155°08'25.62592"	360.414	NVA
168 OCC	19°40'58.84057"	-155°08'24.86398"	360.141	NVA
168 VAL	19°40'58.60390"	-155°08'25.60741"	360.478	NVA
184	19°25'35.10130"	-155°17'38.81017"	1,218.767	NVA
196	19°38'38.50124"	-155°59'32.09175"	51.059	NVA
196b	19°38'35.63881"	-155°59'33.70600"	50.150	NVA
196c	19°38'34.97302"	-155°59'34.44287"	47.586	NVA
198	19°39'05.81162"	-155°59'59.23508"	61.049	NVA
198a	19°39'06.52089"	-155°59'58.97504"	61.461	NVA
198b	19°39'07.70099"	-155°59'59.13435"	61.874	NVA
198c	19°39'08.90152"	-155°59'59.67168"	61.858	NVA
198e	19°39'06.68841"	-156°00'00.20204"	60.312	NVA
200	19°39'59.89230"	-155°03'07.37153"	79.268	NVA
200a	19°39'59.78946"	-155°03'08.12255"	79.252	NVA
200c	19°39'59.59988"	-155°03'05.84818"	79.200	NVA
2008	20°01'22.98905"	-155°40'21.06710"	833.861	NVA
2093	20°02'21.40476"	-155°21'57.91604"	234.997	NVA
AF01	19°51'14.48773"	-155°09'07.89436"	386.201	NVA
dm4612	19°40'04.76585"	-156°01'28.75963"	23.327	NVA
dm4613	19°40'05.53519"	-156°01'23.70183"	24.098	NVA
do7804	20°01'40.20812"	-155°49'35.01326"	23.733	NVA
DO8010	19°27'32.28203"	-154°50'29.28547"	16.066	NVA
hb base	19°59'30.46199"	-155°49'23.03192"	47.229	NVA
hb bs	19°59'29.77463"	-155°49'24.79644"	45.458	NVA
hb occ	19°59'30.00166"	-155°49'22.71225"	48.135	NVA
hb val	19°59'31.24528"	-155°49'23.74341"	46.853	NVA
kohp	20°10'55.50251"	-155°54'05.11249"	22.393	NVA
kohp01	20°10'56.01571"	-155°54'03.71252"	23.114	NVA
kohp02	20°10'56.50266"	-155°54'04.70454"	22.304	NVA
kona pier	19°38'18.73014"	-155°59'48.36572"	21.067	NVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
kw 01	20°01'41.32069"	-155°49'36.94261"	24.206	NVA
LP02	19°59'34.36801"	-155°14'27.37315"	23.975	NVA
MK approach	19°48'37.49184"	-155°28'03.43902"	3,932.453	NVA
MK KECK	19°49'38.04848"	-155°28'33.77190"	4,142.847	NVA
MK VISIT BASE	19°45'33.44176"	-155°27'20.82822"	2,828.362	NVA
MKV01	19°45'33.23694"	-155°27'19.37263"	2,825.725	NVA
MKV02	19°45'34.09168"	-155°27'16.19624"	2,827.989	NVA
PA01	19°58'32.69920"	-155°13'01.07185"	104.604	NVA
upo	20°14'46.58109"	-155°53'18.88990"	25.697	NVA
upo01	20°14'46.82797"	-155°53'19.87870"	23.491	NVA
41v	19°40'12.16440"	-155°21'56.21203"	1,717.099	VVA
45b	19°28'10.11094"	-155°09'52.34188"	793.537	VVA
46f	19°25'18.92544"	-155°17'10.84463"	1,264.544	VVA
67a	19°02'18.53015"	-155°47'26.77929"	193.382	VVA
67b	19°02'16.57749"	-155°47'27.38242"	190.203	VVA
83b	19°24'26.44429"	-155°19'41.73463"	1,107.344	VVA
88 veg-1	19°03'55.75005"	-155°36'28.72841"	326.455	VVA
88 veg-2	19°03'57.37586"	-155°36'27.33710"	326.768	VVA
88 veg-3	19°03'57.98230"	-155°36'26.94421"	327.093	VVA
88 veg-4	19°03'57.93905"	-155°36'26.49254"	327.284	VVA
88 veg-5	19°03'57.43790"	-155°36'25.50417"	326.864	VVA
88 veg-6	19°03'56.42232"	-155°36'24.39886"	326.417	VVA
88 veg-7	19°03'55.80895"	-155°36'23.82852"	326.315	VVA
88 veg-8	19°03'54.64489"	-155°36'24.88206"	326.028	VVA
116a	20°04'28.23860"	-155°28'04.38584"	378.480	VVA
116b	20°04'27.27664"	-155°28'04.32553"	375.792	VVA
116c	20°04'26.31174"	-155°28'03.58410"	377.077	VVA
116d	20°04'26.57516"	-155°28'01.73446"	376.002	VVA
116e	20°04'26.97018"	-155°28'01.34531"	376.199	VVA
116f	20°04'27.68480"	-155°28'00.93691"	375.496	VVA
116g	20°04'30.15995"	-155°27'59.17947"	376.255	VVA
116h	20°04'29.80245"	-155°27'59.48003"	375.838	VVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
116i	20°04'27.93728"	-155°28'00.66808"	376.099	VVA
116j	20°04'26.56899"	-155°28'01.72934"	376.025	VVA
116k	20°04'26.20281"	-155°28'02.27425"	376.822	VVA
116l	20°04'26.25202"	-155°28'03.47041"	377.107	VVA
116m	20°04'27.16747"	-155°28'04.17684"	375.634	VVA
116n	20°04'27.62505"	-155°28'04.36629"	375.948	VVA
116o	20°04'28.24363"	-155°28'04.37690"	378.438	VVA
116p	20°04'28.54341"	-155°28'04.09014"	377.551	VVA
116q	20°04'30.44372"	-155°28'02.48838"	375.624	VVA
116r	20°04'30.89280"	-155°28'02.38793"	377.079	VVA
120a	19°44'02.58345"	-155°00'34.84582"	20.726	VVA
121	19°36'12.23697"	-154°56'48.96313"	26.959	VVA
123-m-1	19°25'48.20505"	-154°52'36.01444"	20.029	VVA
123-m-2	19°25'48.53252"	-154°52'35.83275"	20.334	VVA
123-m-3	19°25'48.69448"	-154°52'36.45496"	20.595	VVA
123-m-4	19°25'47.56448"	-154°52'37.11991"	21.333	VVA
123-m-5	19°25'47.95525"	-154°52'37.84878"	23.197	VVA
123-m-6	19°25'49.18048"	-154°52'37.45371"	22.311	VVA
125	19°21'15.58441"	-154°59'19.50510"	35.482	VVA
126	19°29'31.75302"	-155°04'33.05044"	493.721	VVA
127	19°25'00.91261"	-155°14'34.07443"	1,204.422	VVA
133	18°54'53.69859"	-155°40'55.67497"	27.537	VVA
134	18°59'12.17357"	-155°40'00.16378"	293.555	VVA
136a	19°08'37.25692"	-155°43'14.57276"	1,402.788	VVA
136b	19°08'37.51267"	-155°43'13.22175"	1,402.994	VVA
137	19°07'39.60871"	-155°50'21.79147"	536.614	VVA
138a	19°10'03.36533"	-155°51'48.25657"	519.803	VVA
139	19°12'12.77515"	-155°53'18.18685"	263.772	VVA
140	19°20'32.52351"	-155°52'21.62437"	357.238	VVA
141	19°30'54.31342"	-155°55'42.13631"	391.430	VVA
142	19°37'19.60351"	-155°56'53.17829"	460.193	VVA
148a	19°57'01.22866"	-155°40'51.72633"	800.422	VVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
148b	19°57'03.09250"	-155°40'52.17741"	799.861	VVA
149	20°01'26.30725"	-155°40'19.30098"	836.538	VVA
150	20°05'23.80445"	-155°46'05.25612"	1,094.697	VVA
151	20°03'07.90016"	-155°33'24.96330"	815.881	VVA
151a	20°05'23.89281"	-155°46'08.86460"	1,083.544	VVA
159	19°52'03.51986"	-155°06'46.03796"	113.975	VVA
162	19°26'04.52519"	-154°57'15.23068"	368.681	VVA
163	19°26'51.38551"	-155°07'23.24907"	723.624	VVA
164	19°32'55.54029"	-155°06'23.66610"	473.909	VVA
165a-m	19°37'20.07019"	-155°02'29.87774"	128.762	VVA
165b-m	19°37'18.82184"	-155°02'31.04476"	129.557	VVA
165c-m	19°37'19.86820"	-155°02'35.62849"	132.530	VVA
165d-m	19°37'22.55563"	-155°02'35.19551"	131.973	VVA
165e-m	19°37'22.99186"	-155°02'34.63891"	131.611	VVA
165f-m	19°37'24.00053"	-155°02'34.13856"	134.470	VVA
165g-m	19°37'25.15910"	-155°02'34.01164"	132.806	VVA
165h-m	19°37'26.01286"	-155°02'33.04518"	128.636	VVA
165i-m	19°37'25.66414"	-155°02'31.86486"	127.311	VVA
168_M1	19°40'59.36117"	-155°08'23.90192"	359.804	VVA
168_M2	19°40'58.85999"	-155°08'23.76138"	359.598	VVA
168_M3	19°40'58.38845"	-155°08'23.37681"	358.711	VVA
168_M4	19°40'58.91558"	-155°08'23.33154"	357.935	VVA
168_M5	19°40'59.70949"	-155°08'23.49131"	355.605	VVA
168a	19°40'58.32810"	-155°08'25.92131"	361.097	VVA
169	19°41'41.86969"	-155°14'37.52810"	969.935	VVA
170	19°44'57.26336"	-155°31'39.03293"	2,002.853	VVA
171	19°47'30.83819"	-155°38'37.88130"	1,600.045	VVA
176a	19°25'01.91443"	-155°52'50.51867"	311.147	VVA
177	19°03'33.47635"	-155°41'27.49170"	648.009	VVA
178	19°01'50.36305"	-155°37'56.23181"	327.189	VVA
180	19°05'11.91901"	-155°32'58.17656"	21.400	VVA
181	19°06'12.20006"	-155°32'18.93029"	49.160	VVA

Point No.	Geodetic Coordinates NAD83 (PA11)2010.00 Epoch		Ellipsoid Height (m)	Description
	Latitude (N)	Longitude (W)		
182	19°07'58.72591"	-155°30'20.48442"	22.827	VVA
183	19°21'24.04743"	-155°22'46.96267"	907.637	VVA
185	19°23'23.82939"	-155°14'50.45637"	1,114.818	VVA
189a	19°24'33.48333"	-154°54'12.45445"	21.144	VVA
189b	19°24'33.71434"	-154°54'13.11353"	21.516	VVA
191a	19°33'40.30569"	-154°53'19.54607"	21.901	VVA
191b	19°33'39.36325"	-154°53'19.88982"	24.549	VVA
192a	19°43'34.29584"	-155°04'09.27874"	19.806	VVA
193	19°17'23.91766"	-155°52'24.22175"	394.616	VVA
194a	19°38'43.20729"	-156°00'48.75334"	19.913	VVA
195	19°43'58.76882"	-156°02'04.47784"	52.229	VVA
196a	19°38'37.99022"	-155°59'32.16638"	50.851	VVA
196d	19°38'38.08589"	-155°59'30.54072"	52.002	VVA
198d	19°39'07.13600"	-156°00'00.72026"	59.853	VVA
200b	19°40'01.18180"	-155°03'10.31440"	79.442	VVA
hb vva 01	19°59'31.11435"	-155°49'22.04584"	49.272	VVA
hb vva 02	19°59'30.79192"	-155°49'21.61624"	49.884	VVA
hb vva 03	19°59'29.66229"	-155°49'22.24439"	47.700	VVA
hb vva 04	19°59'29.09950"	-155°49'21.93376"	45.214	VVA
hb vva 05	19°59'28.67748"	-155°49'22.42242"	44.274	VVA
hb vva 06	19°59'28.32370"	-155°49'23.16256"	43.235	VVA
hb vva 07	19°59'28.26841"	-155°49'24.40888"	42.946	VVA
kohp vva01	20°10'53.77144"	-155°54'01.54836"	31.286	VVA
LP01	19°59'35.85867"	-155°14'29.70899"	24.181	VVA
upo vva01	20°14'46.08580"	-155°53'19.49475"	25.325	VVA
upo vva02	20°14'46.43633"	-155°53'18.46394"	26.270	VVA

Section 3: Ground/Geodetic Control Logs and Photos

This section contains the station recovery information sheets and photographs regarding the ground control positions established for the project. The data is assembled on the following pages.

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

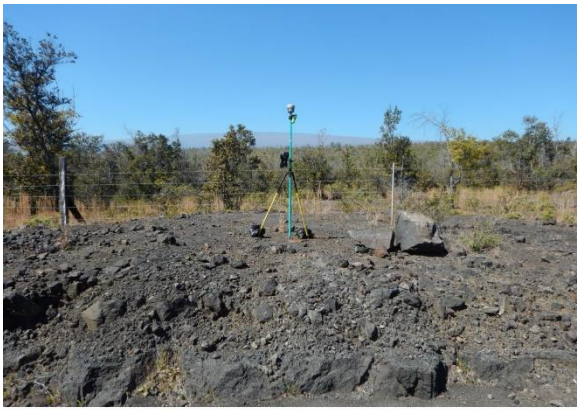
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
102_2019_HI	2140615.712	248913.301	843.581

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°20'38.07133"	W155°23'24.18252"	867.088

Location Photo

NORTH



102_2019_HI,3W,20191210

102_2019_HI,3N,20191210

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

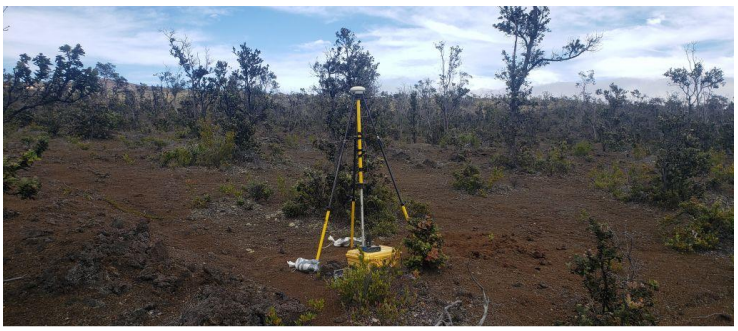
Station ID	Northing (m)	Easting (m)	Elevation (M)
103_2018_HI	2121066.538	208519.788	1427.948

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°09'43.18321"	W155°46'16.56515"	1448.731

Location Photo

NORTH

103_2018_HI, 3SW, 20180113



103_2018_HI, 3SE, 20180113

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
104_2018_HI	2164798.141	191846.597	390.736

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°33'15.23676"	W155°56'12.12516"	411.550

Location Photo

NORTH

104_2018_HI, 3W, 20180122

104_2018_HI, 3S, 20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

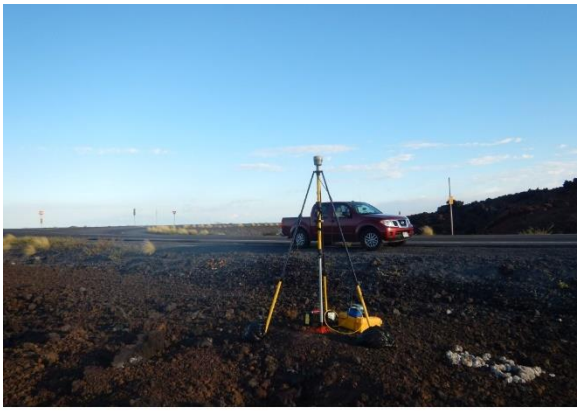
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
105_2018_HI	2202783.616	197422.820	24.988

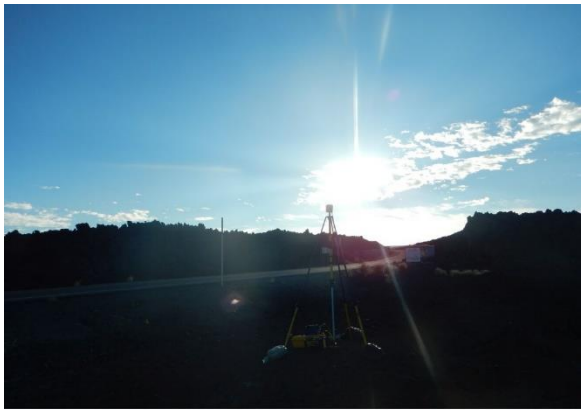
Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°53'52.52745"	W155°53'23.18293"	45.890

Location Photo

NORTH



105_2018_HI, 3N, 20180124



105_2018_HI, 3E, 20180124

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

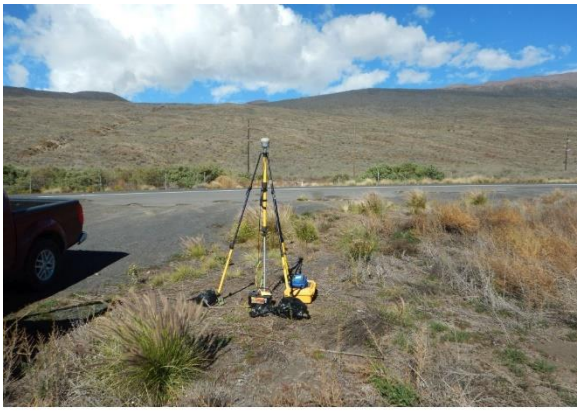
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
107_2018_HI	2187515.735	231098.486	1829.384

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°45'54.07906"	W155°33'58.30246"	1856.390

Location Photo

NORTH



107_2018_HI, 3N, 20180120

107_2018_HI, 3E, 20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
108_2019_HI	2221829.142	242109.233	351.602

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N20°04'34.65107"	W155°27'57.57608"	372.217

Location Photo

NORTH

108_2019_HI, 3SW, 20191208

108_2019_HI, 3SE, 20191208

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
110_2019_HI	2214161.610	262152.913	132.418

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N20°00'34.66644"	W155°16'24.43623"	151.305

Location Photo

NORTH

110_2019_HI, 3N, 20191210

110_2019_HI, 3E, 20191210

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
111_2019_HI	2116835.961	234449.144	47.261

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°07'38.46978"	W155°31'27.65850"	66.634

Location Photo

NORTH

111_2019_HI, 3N, 20191210

111_2019_HI, 3E, 20191210

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
112_2019_HI	2206618.492	218684.143	787.321

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°56'08.59992"	W155°41'14.91262"	811.081

Location Photo

NORTH

112_2019_HI, 3N, 20191210

112_2019_HI, 3E, 20191210

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
113_2019_HI	2141179.004	198135.959	328.222

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°20'31.25527"	W155°52'23.02752"	349.060

Location Photo

NORTH

113_2019_HI, 3W, 20191210

113_2019_HI, 3N, 20191210

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
151_2019_HI	2155994.600	274113.826	704.480

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°29'08.81490"	W155°09'07.68063"	725.283

Location Photo

NORTH

151_2019_77027, 3SW, 20191205

151_2019_77027, 3SE, 201912050102

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
152_2019_HI	2199420.441	278300.274	63.365

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°52'42.32094"	W155°07'02.70211"	81.177

Location Photo

NORTH

152_2019_77027, 3SE, 20191207

152_2019_77027, 3NW, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
153_2019_HI	2218143.138	227784.199	864.401

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N20°02'27.78930"	W155°36'08.34727"	887.133

Location Photo

NORTH

153_2019_HI, 3NW, 20191208

153_2019_HI, 3SE, 20191208

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
154_2019_HI	2222933.952	210966.045	1084.009

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N20°04'54.68615"	W155°45'49.38118"	1105.608

Location Photo

NORTH

154_2019_HI, 3SE, 20191211

154_2019_HI, 3NW, 20191211

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
155_2019_HI	2109643.058	220928.981	577.069

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
TSM	N19°03'38.18891"	W155°39'06.25616"	595.787

Location Photo

NORTH

155_2019_HI, 3SW, 20191213

155_2019_HI, 3NW, 20191213

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
303_2019_HI	2182634.810	283119.125	2.219

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
Lidar Check	N19°43'38.54395"	W155°04'10.03681"	20.264

Location Photo

NORTH

303_2019_HI, 3W, 20191207

303_2019_HI, 3S, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

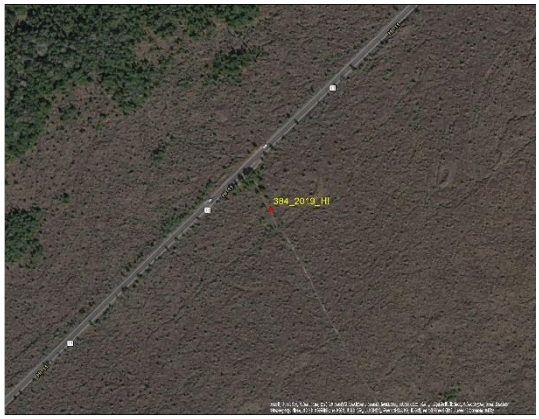
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
384_2019_HI	2143296.632	251351.152	928.924

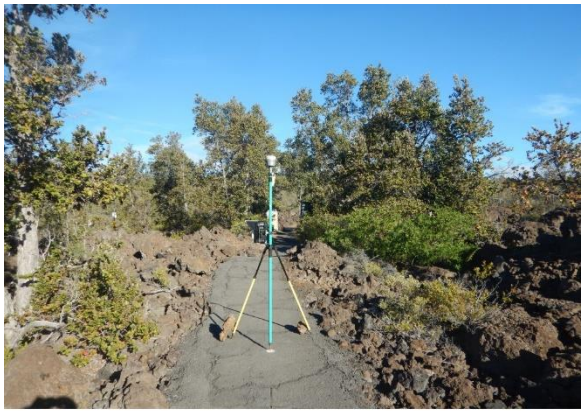
Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
Lidar Check	N19°22'06.30895"	W155°22'01.95460"	952.606

Location Photo

NORTH



384_2019_HI, 3SE, 20191207



384_2019_HI, 3NW, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
388A_2019_HI	2110112.409	225663.564	307.937

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
Lidar Check	N19°03'55.75124"	W155°36'24.66400"	326.489

Location Photo

NORTH

388A_2019_HI, 3N, 20191207

388A_2019_HI, 3E, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
2008A_2019_HI	2216282.308	220506.371	813.308

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°01'23.58603"	W155°40'17.58926"	836.277

Location Photo

NORTH

2008A_2019_HI, 3N, 20191214

2008A_2019_HI, 3E, 20191214

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
2093_2019_HI	2217579.745	252502.214	215.255

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°02'21.42207"	W155°21'57.97439"	235.303

Location Photo

NORTH

2093_2019_HI, 3W, 20191207

2093_2019_HI, 3S, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
6001_2019_HI	2182787.870	285030.626	5.539

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°43'44.27489"	W155°03'04.47081"	23.116

Location Photo

NORTH

6001_2019_HI, 3N, 20191207

6001_2019_HI, 3E, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
6002_2019_HI	2182947.637	285680.441	4.357

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°43'49.72433"	W155°02'42.22574"	21.766

Location Photo

NORTH

6002_2019_HI, 3N, 20191207

6002_2019_HI, 3E, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
6003_2019_HI	2183265.292	286013.186	3.686

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°44'00.18235"	W155°02'30.93222"	20.994

Location Photo

NORTH

6003_2019_HI, 3N, 20191207

6003_2019_HI, 3E, 20191207

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7001_2019_HI	2150228.980	261182.974	1218.917

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°25'55.96429"	W155°16'28.32477"	1242.067

Location Photo

NORTH

7001_2018_HI,3N,20180116

7001_2018_HI,3E,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7002_2019_HI	2162906.423	278847.668	457.740

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°32'55.43912"	W155°06'28.31192"	477.576

Location Photo

NORTH

7002_2018_HI,3N,20180116

7002_2018_HI,3E,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7003_2019_HI	2169347.044	285092.577	175.972

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°36'27.30632"	W155°02'56.78645"	194.203

Location Photo

NORTH

7003_2019_HI, 3SW, 20191205

7003_2019_HI, 3NE, 20191205

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7004_2019_HI	2170284.149	286826.061	91.870

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°36'58.44829"	W155°01'57.69541"	109.652

Location Photo

NORTH

7004_2018_HI,3SE,20180116

7004_2018_HI,3NE,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7005_2019_HI	2156585.848	296082.070	204.824

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°29'36.55784"	W154°56'34.76612"	220.490

Location Photo

NORTH

7005_2018_HI,3N,20180117

7005_2018_HI,3E,20180117

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7006_2019_HI	2222259.691	241752.467	329.669

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°04'48.47296"	W155°28'10.06797"	350.211

Location Photo

NORTH

7006_2018_HI,3N,20180126

7006_2018_HI,3E,20180126

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7007_2019_HI	2240486.262	204667.140	159.987

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°14'21.56184"	W155°49'36.28341"	178.288

Location Photo

NORTH

7007_2018_HI,3W,20180125

7007_2018_HI,3S,20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7008_2019_HI	2177812.945	275457.935	349.092

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°40'58.69211"	W155°08'30.98021"	369.299

Location Photo

NORTH

7008_2018_HI,3W,01172018

7008_2018_HI,3N,01172018

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7009_2019_HI	2194533.373	279352.857	163.162

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°50'03.86916"	W155°06'24.43125"	181.307

Location Photo

NORTH

7009_2018_HI,3N,20180118

7009_2018_HI,3E,20180118

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7010_2019_HI	2198526.641	278613.556	86.833

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°52'13.39122"	W155°06'51.55061"	104.689

Location Photo

NORTH

7010_2018_HI,3W,20180118

7010_2018_HI,3N,20180118

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7011_2019_HI	2186763.989	234634.267	1955.225

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°45'31.37679"	W155°31'56.53226"	1982.468

Location Photo

NORTH

7011_2018_HI,3N,20180120

7011_2018_HI,3E,20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7012_2019_HI	2198563.647	222156.597	1377.941

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°51'48.63354"	W155°39'11.22055"	1403.044

Location Photo

NORTH

7012_2018_HI,3W,20180119

7012_2018_HI,3N,20180119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

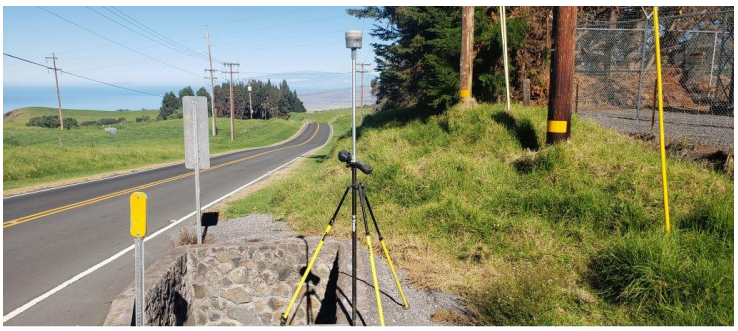
Station ID	Northing (m)	Easting (m)	Elevation (M)
7012A_2019_HI	2198631.679	222112.153	1371.963

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°51'50.82168"	W155°39'12.78396"	1397.053

Location Photo

NORTH

7012A_2019_77027, 3SW, 20191209



7012A_2019_77027, 3NW, 20191209

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7013_2019_HI	2205536.471	207513.790	268.633

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°55'27.51670"	W155°47'38.12340"	290.899

Location Photo

NORTH

7013_2018_HI,3W 20180124

7013_2018_HI,3N,20180124

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7014_2019_HI	2216183.961	220296.730	807.566

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°01'20.28123"	W155°40'24.74317"	830.535

Location Photo

NORTH

7014_2018_HI,3N,20180125

7014_2018_HI,3E,20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7015_2019_HI	2220990.028	242922.083	391.228

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°04'07.76837"	W155°27'29.18894"	411.971

Location Photo

NORTH

7015_2018_HI,3N,20180126

7015_2018_HI,3E,20180126

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7016_2019_HI	2218373.986	203810.461	2.396

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°02'22.62261"	W155°49'52.81259"	23.233

Location Photo

NORTH

7016_2018_HI,3N,20100125

7016_2018_HI,3E,20100125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7017_2019_HI	2207715.791	200335.480	8.961

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°56'34.39959"	W155°51'46.02115"	29.976

Location Photo

NORTH

7017_2018_HI,3N,20180124

7017_2018_HI,3E,20180124

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7018_2019_HI	2179295.804	183423.040	33.189

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°41'01.47510"	W156°01'09.62355"	51.936

Location Photo

NORTH

7018_2018_HI,3W,20180122

7018_2018_HI,3N,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7019_2019_HI	2193821.475	202511.261	663.415

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°49'04.14245"	W155°50'23.20830"	685.906

Location Photo

NORTH

7019_2018_HI,3N,20180124

7019_2018_HI,3E,20180124

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7020_2019_HI	2159413.585	193463.891	432.849

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°30'21.18545"	W155°55'13.54571"	453.841

Location Photo

NORTH

7020_2018_HI,3N,20180122

7020_2018_HI,3E,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7021_2019_HI	2149450.330	197505.021	291.466

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°24'59.67451"	W155°52'49.35261"	312.889

Location Photo

NORTH

7021_2018_HI,3W,20180122

7021_2018_HI,3N,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7022_2019_HI	2145558.285	197555.327	263.052

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°22'53.23780"	W155°52'45.40308"	284.113

Location Photo

NORTH

7022_2018_HI,3W,20180122

7022_2018_HI,3N,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7023_2019_HI	2124692.973	239915.187	245.295

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°11'56.39922"	W155°28'24.54206"	266.063

Location Photo

NORTH

7023_2018_HI,3N,20180119

7023_2018_HI,3E,20180119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7024_2019_HI	2109502.017	227954.449	202.412

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°03'37.01492"	W155°35'06.04829"	220.562

Location Photo

NORTH

7024_2018_HI,3W,20100119

7024_2018_HI,3N,20100119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7025_2019_HI	2160923.792	276324.664	597.649

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°31'49.96563"	W155°07'53.99120"	618.087

Location Photo

NORTH

7025_2018_HI,3N,20180116

7025_2018_HI,3E,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7026_2019_HI	2142698.589	293510.474	23.504

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°22'04.06281"	W154°57'57.50035"	38.130

Location Photo

NORTH

7026_2018_HI,3N,20180117

7026_2018_HI,3E,20180117

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7027_2019_HI	2133652.522	197813.839	380.943
Point Type	**Latitude (N)**	**Longitude (W)**	**Ellipsoid Height (m)**
PID	N19°16'26.52022"	W155°52'29.77606"	400.882

Location Photo

NORTH

7027_2018_HI,3W,20180121

7027_2018_HI,3N,20180121

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7028_2019_HI	2216997.484	215816.539	670.976

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N20°01'44.37057"	W155°42'59.23380"	693.554

Location Photo

NORTH

7028_2018_HI,3W,20180125

7028_2018_HI,3N,20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7029_2019_HI	2118200.178	235276.321	43.195

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°08'23.19961"	W155°31'00.04349"	62.830

Location Photo

NORTH

7029_2018_HI,3N,20180119

7029_2018_HI,3E,20180119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7030_2019_HI	2164741.975	290509.554	107.728

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°33'59.66644"	W154°59'49.08642"	124.763

Location Photo

NORTH

7030_2018_HI,3N,20180117

7030_2018_HI,3E,20180117

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

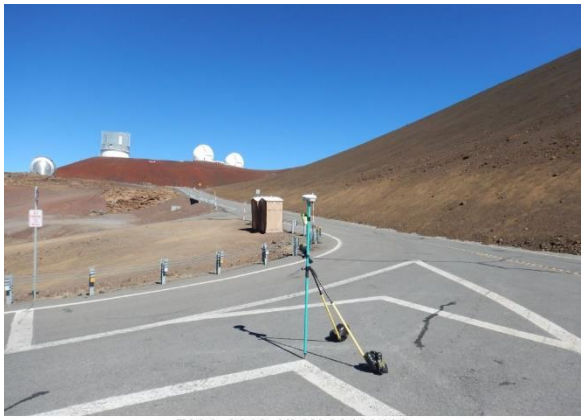
Station ID	Northing (m)	Easting (m)	Elevation (M)
7031_2019_HI	2193383.265	240868.089	4039.700

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°49'09.51274"	W155°28'25.84790"	4066.259

Location Photo

NORTH

7031_2018_HI,3W,20180120



7031_2018_HI,3N,20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7032_2019_HI	2184739.022	182318.057	50.087

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°43'57.67225"	W156°01'50.85676"	68.658

Location Photo

NORTH

7032_2019_HI, 3SW, 20191212

7032_2019_HI, 3E, 20191212

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

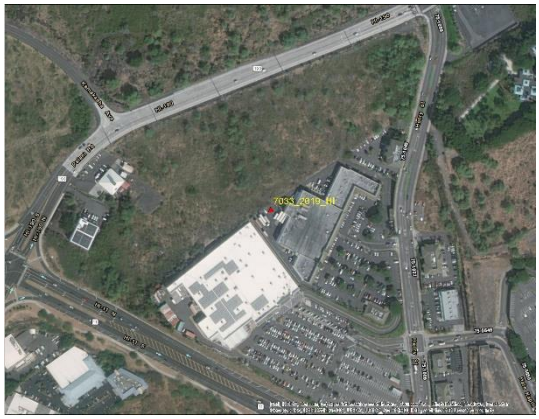
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7033_2019_HI	2175181.574	186372.434	66.295

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°38'49.50342"	W155°59'25.97948"	85.852

Location Photo

NORTH



7033_2018_HI,3W,20180122

7033_2018_HI,3S,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

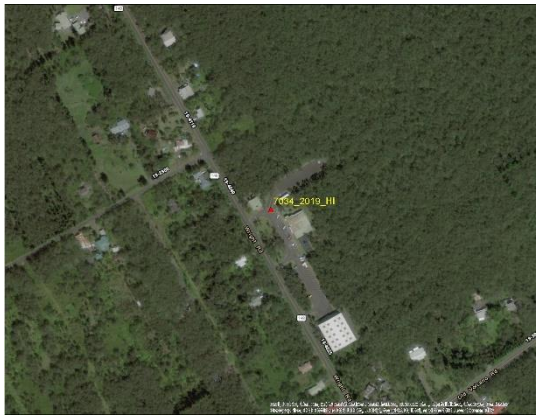
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
7034_2019_HI	2150408.216	265817.676	1125.869

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PID	N19°26'03.76279"	W155°13'49.58592"	1148.133

Location Photo

NORTH



7034_2018_HI,3W,20180116

7034_2018_HI,3N,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8001_2019_HI	2216491.332	206187.041	109.339

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N20°01'22.75357"	W155°48'30.01369"	130.657

Location Photo

NORTH

8001_2018_HI,3W,20180125

8001_2018_HI,3N,20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

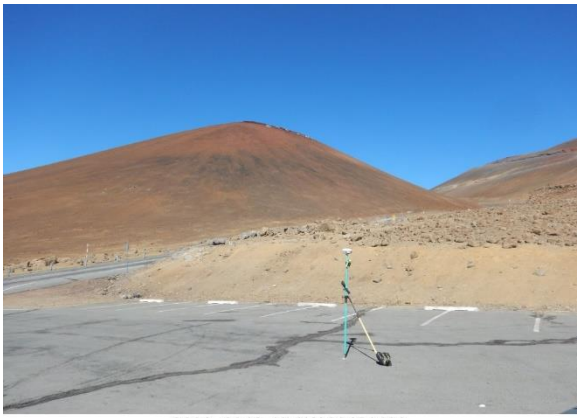
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8002_2019_HI	2192389.249	241502.319	3905.907

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°48'37.50641"	W155°28'03.56725"	3932.521

Location Photo

NORTH



8002_2018_HI,3W,20180120

8002_2018_HI,3N,20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8003_2019_HI	2186711.619	242615.032	2804.189

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°45'33.49459"	W155°27'22.52304"	2831.223

Location Photo

NORTH

8003_2018_HI,3N,20180120

8003_2018_HI,3E,20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8004_2019_HI	2217818.060	251835.440	240.370

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N20°02'28.86097"	W155°22'21.02384"	260.480

Location Photo

NORTH

8004_2018_HI,3W,20180126

8004_2018_HI,3N,20180126

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

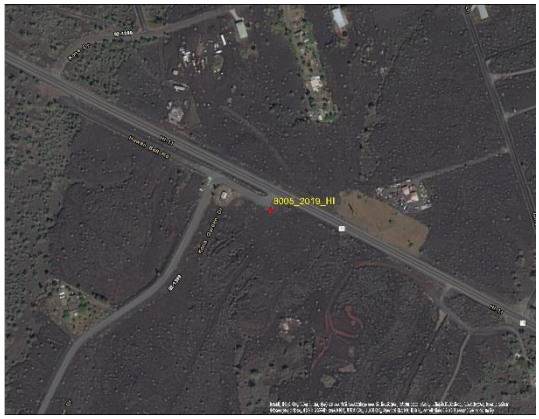
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8005_2019_HI	2113278.726	206164.332	592.448

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°05'28.88655"	W155°47'32.85836"	611.027

Location Photo

NORTH



8005_2018_HI,3N,20100119

8005_2018_HI,3E,20100119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8006_2019_HI	2216461.105	212387.262	507.328

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N20°01'25.11955"	W155°44'56.83598"	529.567

Location Photo

NORTH

8006_2018_HI,3W,20180125

8006_2018_HI,3N,20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8007_2019_HI	2221464.796	243445.635	337.517

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N20°04'23.44961"	W155°27'11.41974"	358.052

Location Photo

NORTH

8007_2018_HI,3W,20180126

8007_2018_HI,3S,20180126

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8008_2019_HI	2182069.718	282694.039	2.899

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°43'20.00312"	W155°04'24.39455"	21.078

Location Photo

NORTH

8008_2018_HI,3W,20180118

8008_2018_HI,3N,20180118

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8009_2019_HI	2157042.195	294809.896	198.427

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°29'50.92618"	W154°57'18.56311"	214.414

Location Photo

NORTH

8009_2018_HI,3N,20180117

8009_2018_HI,3E,20180117

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8010_2019_HI	2151019.517	260604.770	1221.861

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°26'21.41457"	W155°16'48.49676"	1245.211

Location Photo

NORTH

8010_2018_HI,3NW,20180116

8010_2018_HI,3E,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8011_2019_HI	2157015.656	195067.406	441.397

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°29'04.15743"	W155°54'17.21022"	462.720

Location Photo

NORTH

8011_2018_HI,3W,20180122

8011_2018_HI,3N,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8012_2019_HI	2124670.935	239877.612	246.773

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°11'55.66556"	W155°28'25.81693"	267.541

Location Photo

NORTH

8012_2018_HI,3N,20180119

8012_2018_HI,3E,20180119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8013_2019_HI	2183376.059	187505.894	475.103

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°43'16.37963"	W155°58'52.03982"	495.228

Location Photo

NORTH

8013_2018_HI,3N,20180122

8013_2018_HI,3E,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8014_2019_HI	2165188.136	281616.130	336.508

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°34'10.72395"	W155°04'54.31883"	355.659

Location Photo

NORTH

8014_2018_HI,3NW,20180116

8014_2018_HI,3NE,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8015_2019_HI	2149490.955	197509.191	290.215

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°25'00.99679"	W155°52'49.23306"	311.643

Location Photo

NORTH

8015_2018_HI,3W,20180122

8015_2018_HI,3N,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

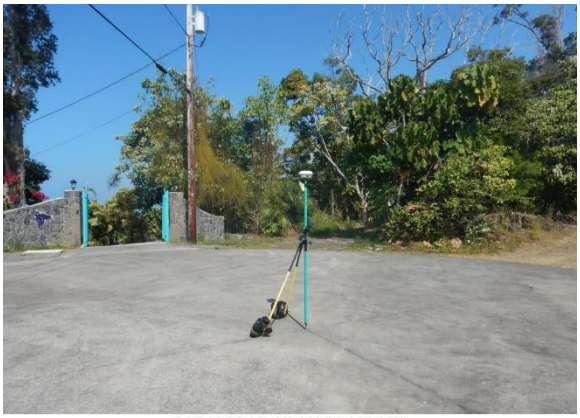
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8016_2019_HI	2133506.881	198044.184	433.037

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°16'21.91187"	W155°52'21.81167"	453.043

Location Photo

NORTH



8016_2018_HI,3N,20180121

8016_2018_HI,3E,20180121

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8017_2019_HI	2217942.389	204342.659	3.968

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N20°02'08.89188"	W155°49'34.26378"	24.912

Location Photo

NORTH

8017_2018_HI,3S ,20100125

8017_2018_HI,3N,20100125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8018_2019_HI	2240230.199	205801.935	155.949

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N20°14'13.87051"	W155°48'57.06753"	174.331

Location Photo

NORTH

8018_2018_HI,3W,20180125

8018_2018_HI,3N,20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8019_2019_HI	2193834.453	202521.309	663.444

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°49'04.56963"	W155°50'22.87079"	685.936

Location Photo

NORTH

8019_2018_HI,3W,20180124

8019_2018_HI,3S,20180124

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8020_2019_HI	2206666.866	208207.039	292.210

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°56'04.62152"	W155°47'14.94954"	314.487

Location Photo

NORTH

8020_2018_HI,3W,20180124

8020_2018_HI,3N,20180124

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8021_2019_HI	2186787.510	234611.003	1954.797

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°45'32.12991"	W155°31'57.34295"	1982.038

Location Photo

NORTH

8021_2018_HI,3N,20180120

8021_2018_HI,3E,20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8022_2019_HI	2199472.069	278293.646	60.649

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°52'43.99668"	W155°07'02.95220"	78.455

Location Photo

NORTH

8022_2018_HI,3N,20180118

8022_2018_HI,3E,20180118

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8023_2019_HI	2178399.107	271577.715	567.528

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°41'16.14520"	W155°10'44.41604"	588.718

Location Photo

NORTH

8023_2019_HI, 3SW, 20191206

8023_2019_HI, 3NW, 20191206

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8024_2019_HI	2141971.091	293038.493	5.889

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°21'40.23331"	W154°58'13.38611"	20.490

Location Photo

NORTH

8024_2019_HI, 3SW, 20191206

8024_2019_HI, 3SE, 20191206

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8025_2019_HI	2171103.989	285972.359	104.859

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°37'24.77213"	W155°02'27.32325"	122.816

Location Photo

NORTH

8025_2018_HI,3N,20180116

8025_2018_HI,3E,20180116

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8026_2019_HI	2139378.461	248078.609	808.006

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°19'57.47771"	W155°23'52.17925"	831.366

Location Photo

NORTH

8026_2018_HI,3W,20180119

8026_2018_HI,3S,20180119

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8027_2019_HI	2197835.564	222552.863	1445.643

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°51'25.17519"	W155°38'57.21628"	1470.877

Location Photo

NORTH

8027_2018_HI,3W,20180120

8027_2018_HI,3N,20180120

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8028_2019_HI	2110013.672	229403.502	157.915

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°03'54.33754"	W155°34'16.77347"	176.036

Location Photo

NORTH

8028_2018_HI,3W,20180121

8028_2018_HI,3N,20180121

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8029_2019_HI	2192850.495	186666.003	62.455

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°48'23.70890"	W155°59'26.59743"	81.974

Location Photo

NORTH

8029_2019_HI, 3N, 20191210

8029_2019_HI, 3E, 20191210

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8030_2019_HI	2210752.167	267156.133	98.941

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°58'46.02036"	W155°13'30.81460"	117.448

Location Photo

NORTH

8030_2018_HI,3W,20180118

8030_2018_HI,3S, 20180118

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8031_2019_HI	2174044.784	277931.446	295.248

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°38'57.19307"	W155°07'04.47215"	315.017

Location Photo

NORTH

8031_2019_HI, 3WNW 20191205

8031_2019_HI, 3NWN, 20191205

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8032_2019_HI	2152193.462	270027.529	915.537

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°27'03.55917"	W155°11'26.09880"	937.048

Location Photo

NORTH

8032_2019_HI, 3N, 20191205

8032_2019_HI, 3E, 20191205

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

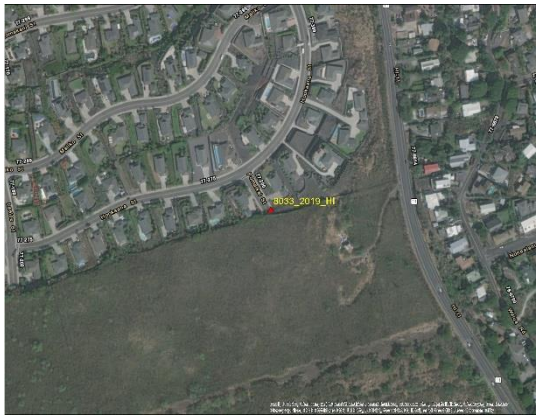
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
8033_2019_HI	2168971.927	189564.721	129.127

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
LCP	N19°35'29.56552"	W155°57'32.81106"	149.406

Location Photo

NORTH



8033_2018_HI,3S,20180122

8033_2018_HI,3E,20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
H 13	2217964.002	204341.083	4.097

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
DO7803	N20°02'09.59326"	W155°49'34.33056"	25.040

DO7803, H13, 1, 20180125

DO7803, H13, 3E, 20180125

DO7803, H13, 3N, 20180125

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
MKVISITBASE_2019	2186709.857	242662.549	2801.574

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
PMK	N19°45'33.45973"	W155°27'20.89082"	2828.604

MKVISITBASE_2019_HI, 1, 20191209

MKVISITBASE_2019_HI, 3E, 20191209

MKVISITBASE_2019_HI, 3N, 20191209

GCP OBSERVATION LOG

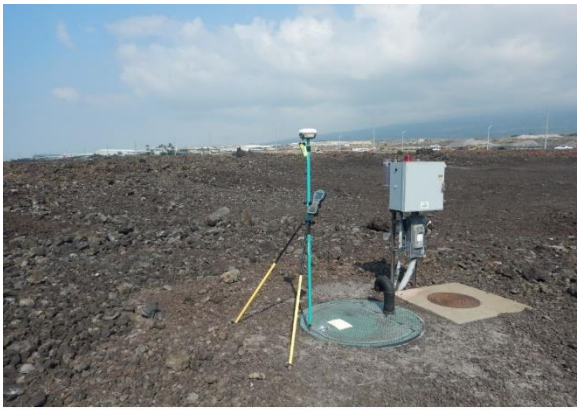
Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
NPS-KONA	2178747.231	183184.972	13.146

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
BOLT	N19°40'43.51570"	W156°01'17.45457"	31.789

NPS-KONA_2018_HI, 1, 20180122



NPS-KONA_2018_HI, 3N, 20180122

NPS-KONA_2018_HI, 3W, 20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
NUNUKI	2177661.739	183238.667	6.515

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
DM4611	N19°40'08.28146"	W156°01'14.95147"	25.124

DM4611, NUNUKI, 1, 20180122

DM4611, NUNUKI, 3N, 20180122

DM4611, NUNUKI, 3W, 20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
PAAHANA	2179675.077	281568.822	53.844

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
DL6334	N19°42'01.70167"	W155°05'02.01709"	72.425

DL6334, PAAHANA, 1, 20180117


DL6334, PAAHANA, 3E, 20180117


DL6334, PAAHANA, 3N, 20180117

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
PENO	2212194.983	265628.667	3.342

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
DM4606	N19°59'32.26078"	W155°14'23.99877"	21.881

DM4606, PENO, 1, 20180118

DM4606, PENO, 3N, 20180118

DM4606, PENO, 3W, 20180118

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
PI MON	2177561.312	182832.467	5.083

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
DM4612	N19°40'04.78425"	W156°01'28.82121"	23.549

DM4612, PI MON, 1, 20180122

DM4612, PI MON, 3E, 20180122

DM4612, PI MON, 3N, 20180122

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
77027	Big Island Lidar Control	Woolpert Inc	B. Christie

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 (PA11)	NAVD88	5 North	GEOID12B (Hawaii)

Station ID	Northing (m)	Easting (m)	Elevation (M)
PT MON	2177582.380	182980.322	5.777

Point Type	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
DM4613	N19°40'05.55411"	W156°01'23.76326"	24.294

DM4613, PT MON, 1, 20180122

DM4613, PT MON, 3E, 20180122

DM4613, PT MON, 3N, 20180122

Section 4: Geodetic Control Information and Resources

This section contains the National Geodetic Survey (NGS) Control datasheets that was used to establish 3-dimensional coordinates for each of the newly established ground control survey points for the project.

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.5.6
Starting Datasheet Retrieval...
1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DO7803 ***********************************************************************
 DO7803  DESIGNATION -  H 13
 DO7803  PID         -  DO7803
 DO7803  STATE/COUNTY-  HI/HAWAII
 DO7803  COUNTRY     -  US
 DO7803  USGS QUAD   -  KAWAIHAE (2017)
 DO7803
 DO7803                        *CURRENT SURVEY CONTROL
 DO7803  ______________________________________________________________________
 DO7803* NAD 83(PA11) POSITION- 20 02 09.57509(N) 155 49 34.26835(W)   ADJUSTED
 DO7803* NAD 83(PA11) ELLIP HT-    24.851 (meters)        (05/31/13)   ADJUSTED
 DO7803* NAD 83(PA11) EPOCH    -  2010.00
 DO7803* LMSL     ORTHO HEIGHT -     3.5   (meters)       11.    (feet) GPS OBS
 DO7803  ______________________________________________________________________
 DO7803  LMSL orthometric height was determined with geoid model       GEOID12A
 DO7803  GEOID HEIGHT    -         20.755 (meters)                     GEOID12A
 DO7803  GEOID HEIGHT    -         20.755 (meters)                     GEOID12B
 DO7803  NAD 83(PA11) X  - -5,468,822.623 (meters)                     COMP
 DO7803  NAD 83(PA11) Y  - -2,454,782.744 (meters)                     COMP
 DO7803  NAD 83(PA11) Z  -  2,171,449.170 (meters)                     COMP
 DO7803  LAPLACE CORR    -         12.41  (seconds)                    DEFLEC12B
 DO7803
 DO7803  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DO7803  Standards:
 DO7803         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DO7803            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DO7803  ------------------------------------------------------------------
 DO7803  NETWORK    1.31   3.61           0.52   0.55   1.84     -0.00034216
 DO7803  ------------------------------------------------------------------
 DO7803  Click here for local accuracies and other accuracy information.
 DO7803
 DO7803
 DO7803.The horizontal coordinates were established by GPS observations
 DO7803.and adjusted by the National Geodetic Survey in May 2013.
 DO7803
 DO7803.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DO7803.been affixed to the stable Pacific tectonic plate.
 DO7803
 DO7803.The horizontal coordinates are valid at the epoch date displayed above
 DO7803.which is a decimal equivalence of Year/Month/Day.
 DO7803
 DO7803.The orthometric height was determined by GPS observations and a
 DO7803.high-resolution geoid model.
 DO7803
 DO7803.Significant digits in the geoid height do not necessarily reflect accuracy.
```

```
DO7803.GEOID12B height accuracy estimate available here.
DO7803
DO7803.Click photographs - Photos may exist for this station.
DO7803
DO7803.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DO7803
DO7803.The Laplace correction was computed from DEFLEC12B derived deflections.
DO7803
DO7803.The ellipsoidal height was determined by GPS observations
DO7803.and is referenced to NAD 83.
DO7803
DO7803. The following values were computed from the NAD 83(PA11) position.
DO7803
DO7803;                    North         East     Units Scale Factor Converg.
DO7803;SPC HI 1     -   133,160.088   465,874.383   MT  0.99998105   -0 06 42.3
DO7803;UTM  05      - 2,217,964.002   204,341.083   MT  1.00068056   -0 58 08.4
DO7803
DO7803!             -  Elev Factor  x  Scale Factor =   Combined Factor
DO7803!SPC HI 1     -   0.99999609  x   0.99998105  =   0.99997714
DO7803!UTM  05      -   0.99999609  x   1.00068056  =   1.00067665
DO7803
DO7803_U.S. NATIONAL GRID SPATIAL ADDRESS: 5QKC0434117964(NAD 83)
DO7803
DO7803|---------------------------------------------------------------------|
DO7803| PID    Reference Object                    Distance      Geod. Az  |
DO7803|                                                          dddmmss.s |
DO7803| DK3434 161 7433 B                        319.696 METERS 28110     |
DO7803|---------------------------------------------------------------------|
DO7803
DO7803                          SUPERSEDED SURVEY CONTROL
DO7803
DO7803.No superseded survey control is available for this station.
DO7803
DO7803_MARKER: DD = SURVEY DISK
DO7803_SETTING: 4 = OBJECT SURROUNDED BY MASS OF CONCRETE
DO7803_MARK LOGO: HIDT
DO7803_MAGNETIC: N = NO MAGNETIC MATERIAL
DO7803_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
DO7803_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DO7803+SATELLITE: SATELLITE OBSERVATIONS - March 11, 2013
DO7803
DO7803  HISTORY     - Date     Condition        Report By
DO7803  HISTORY     - UNK      MONUMENTED       HIDT
DO7803  HISTORY     - 20130311 GOOD             USACE
DO7803
DO7803                          STATION DESCRIPTION
DO7803
DO7803'DESCRIBED BY US ARMY CORPS OF ENGINEERS 2013 (MWH)
DO7803'THE MARK IS LOCATED ON THE ISLAND OF HAWAII, HAWAII AT THE KAWAIHAE
DO7803'HARBOR.
DO7803'
DO7803'THE MARK IS A BRASS DISK SET IN A 1 FT (0.3 M) SQUARE CONCRETE PAD
DO7803'NORTH-NORTHWEST OF THE FLAGPOLE AT THE ENTRANCE TO THE KAWAIHAE DEEP
DO7803'DRAFT HARBOR ALONG AKONI PULE HIGHWAY.
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```
 DO7803'
 DO7803'THE MARK IS ON THE RIGHT OF THE ENTRANCE ROAD, APPROXIMATELY 4 FT (1.2
 DO7803'M) NORTH NORTHWEST OF THE FLAGPOLE.  6 FT (1.8 M) SOUTHWEST OF UTILITY
 DO7803'POLE AND 6 FT SOUTHWEST OF HARBOR SIGN.  THE DISK IS IN GOOD CONDITION
 DO7803'AND HAD NO VISIBLE STAMPING.
1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DE6589 ***********************************************************************
 DE6589  CORS        -  This is a GPS Continuously Operating Reference Station.
 DE6589  DESIGNATION -  MAUNA KEA CORS ARP
 DE6589  CORS_ID     -  MKEA
 DE6589  PID         -  DE6589
 DE6589  STATE/COUNTY-  HI/HAWAII
 DE6589  COUNTRY     -  US
 DE6589  USGS QUAD   -  MAUNA KEA (2017)
 DE6589
 DE6589                        *CURRENT SURVEY CONTROL
 DE6589 ______________________________________________________________________
 DE6589* NAD 83(PA11) POSITION- 19 48 04.84676(N) 155 27 22.74528(W)   ADJUSTED
 DE6589* NAD 83(PA11) ELLIP HT-  3754.485 (meters)        (06/??/19)   ADJUSTED
 DE6589* NAD 83(PA11) EPOCH   -  2010.00
 DE6589 ______________________________________________________________________
 DE6589  GEOID HEIGHT    -         26.452 (meters)                     GEOID12B
 DE6589  NAD 83(PA11) X  - -5,464,104.333 (meters)                     COMP
 DE6589  NAD 83(PA11) Y  - -2,495,168.527 (meters)                     COMP
 DE6589  NAD 83(PA11) Z  -  2,148,290.345 (meters)                     COMP
 DE6589
 DE6589  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DE6589  Standards:
 DE6589         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DE6589            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DE6589  ------------------------------------------------------------------
 DE6589  NETWORK    0.14   0.14           0.06   0.05   0.07      0.05934100
 DE6589  ------------------------------------------------------------------
 DE6589
 DE6589
 DE6589.The coordinates were established by GPS observations
 DE6589.and adjusted by the National Geodetic Survey in June 2019.
 DE6589
 DE6589.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DE6589.been affixed to the stable Pacific Tectonic Plate.
 DE6589
 DE6589.The coordinates are valid at the epoch date displayed above
 DE6589.which is a decimal equivalence of Year/Month/Day.
 DE6589
 DE6589.Due to the release of the International GNSS Service (IGS) 2014
 DE6589.realization of the International Terrestrial Reference Frame of 2014
 DE6589.(ITRF2014), NGS reprocessed all NOAA CORS Network and some IGS stations
 DE6589.using data collected between 1/1/1996 and 1/30/2017. The resulting ITRF2014
 DE6589.epoch 2010.00 coordinates, referred to as Multi-Year CORS Solution 2
 DE6589.(MYCS2), were transformed to NAD 83 (2011/PA11/MA11) maintaining the
 DE6589.currently published epoch of 2010.00.
 DE6589
 DE6589.Additional information on MYCS2 is available at
 DE6589.https://geodesy.noaa.gov/CORS/coords.shtml
 DE6589
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DE6589.Significant digits in the geoid height do not necessarily reflect accuracy.
DE6589.GEOID12B height accuracy estimate available here.
DE6589
DE6589.The PID for the CORS L1 Phase Center is DE6590.
DE6589
DE6589.Click photographs - Photos may exist for this station.
DE6589
DE6589.The XYZ, and position/ellipsoidal ht. are equivalent.
DE6589
DE6589.The ellipsoidal height was determined by GPS observations
DE6589.and is referenced to NAD 83.
DE6589
DE6589. The following values were computed from the NAD 83(PA11) position.
DE6589
DE6589;                    North         East     Units Scale Factor Converg.
DE6589;SPC HI 1     -   107,152.099   504,576.735   MT  0.99996693   +0 00 53.3
DE6589;UTM  05      - 2,191,367.901   242,674.343   MT  1.00041852   -0 49 57.2
DE6589
DE6589!             -  Elev Factor  x  Scale Factor =   Combined Factor
DE6589!SPC HI 1     -   0.99941017  x   0.99996693  =   0.99937712
DE6589!UTM  05      -   0.99941017  x   1.00041852  =   0.99982844
DE6589
DE6589_U.S. NATIONAL GRID SPATIAL ADDRESS: 5QKB4267491367(NAD 83)
DE6589
DE6589                           SUPERSEDED SURVEY CONTROL
DE6589
DE6589  NAD 83(PA11)-  19 48 04.84680(N)    155 27 22.74526(W) AD(2010.00) c
DE6589  ELLIP H (08/??/11) 3754.486  (m)                       GP(2010.00) c c
DE6589  NAD 83(CORS)-  19 48 04.84728(N)    155 27 22.74483(W) AD(2002.00) c
DE6589  ELLIP H (06/??/07) 3754.494  (m)                       GP(2002.00) c c
DE6589  NAD 83(CORS)-  19 48 04.84666(N)    155 27 22.74500(W) AD(2002.00) c
DE6589  ELLIP H (08/??/02) 3754.511  (m)                       GP(2002.00) c c
DE6589.No superseded survey control is available for this station.
DE6589
DE6589_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DE6589
DE6589                           STATION DESCRIPTION
DE6589
DE6589'DESCRIBED BY NATIONAL GEODETIC SURVEY 2019
DE6589'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
DE6589'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
DE6589'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DE6589'   ftp://cors.ngs.noaa.gov/cors/README.txt
DE6589'   ftp://cors.ngs.noaa.gov/cors/coord/coord_14
DE6589'   ftp://cors.ngs.noaa.gov/cors/station_log
DE6589'   https://geodesy.noaa.gov/CORS
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1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DM4611 ***********************************************************************
 DM4611  DESIGNATION -  NUNUKI
 DM4611  PID         -  DM4611
 DM4611  STATE/COUNTY-  HI/HAWAII
 DM4611  COUNTRY     -  US
 DM4611  USGS QUAD   -  KEAHOLE POINT (2017)
 DM4611
 DM4611                        *CURRENT SURVEY CONTROL
 DM4611  ______________________________________________________________________
 DM4611* NAD 83(PA11) POSITION- 19 40 08.26322(N) 156 01 14.88922(W)   ADJUSTED
 DM4611* NAD 83(PA11) ELLIP HT-    24.931 (meters)        (06/27/12)   ADJUSTED
 DM4611* NAD 83(PA11) EPOCH    -  2010.00
 DM4611* LMSL     ORTHO HEIGHT -     6.0   (meters)       20.    (feet) GPS OBS
 DM4611  ______________________________________________________________________
 DM4611  LMSL orthometric height was determined with geoid model       GEOID09
 DM4611  GEOID HEIGHT    -         18.241 (meters)                     GEOID09
 DM4611  GEOID HEIGHT    -         18.415 (meters)                     GEOID12B
 DM4611  NAD 83(PA11) X  - -5,489,736.789 (meters)                     COMP
 DM4611  NAD 83(PA11) Y  - -2,441,800.398 (meters)                     COMP
 DM4611  NAD 83(PA11) Z  -  2,133,232.581 (meters)                     COMP
 DM4611  LAPLACE CORR    -         24.98  (seconds)                    DEFLEC12B
 DM4611
 DM4611  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DM4611  Standards:
 DM4611         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DM4611            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DM4611  ---------------------------------------------------------------------
 DM4611  NETWORK    3.98   4.78           1.47   1.76   2.44     -0.01676770
 DM4611  ---------------------------------------------------------------------
 DM4611  Click here for local accuracies and other accuracy information.
 DM4611
 DM4611
 DM4611.The horizontal coordinates were established by GPS observations
 DM4611.and adjusted by the National Geodetic Survey in June 2012.
 DM4611
 DM4611.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DM4611.been affixed to the stable Pacific tectonic plate.
 DM4611
 DM4611.The horizontal coordinates are valid at the epoch date displayed above
 DM4611.which is a decimal equivalence of Year/Month/Day.
 DM4611
 DM4611.The orthometric height was determined by GPS observations and a
 DM4611.high-resolution geoid model.
 DM4611
 DM4611.Significant digits in the geoid height do not necessarily reflect accuracy.
 DM4611.GEOID12B height accuracy estimate available here.
 DM4611
 DM4611.Click photographs - Photos may exist for this station.
 DM4611
 DM4611.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 DM4611
 DM4611.The Laplace correction was computed from DEFLEC12B derived deflections.
```

```
DM4611
DM4611.The ellipsoidal height was determined by GPS observations
DM4611.and is referenced to NAD 83.
DM4611
DM4611. The following values were computed from the NAD 83(PA11) position.
DM4611
DM4611;                    North         East     Units Scale Factor Converg.
DM4611;SPC HI 1     -    92,580.464   445,387.740   MT  1.00000352   -0 10 31.1
DM4611;UTM  04      - 2,177,584.727   812,395.535   MT  1.00080646   +1 00 12.9
DM4611;UTM  05      - 2,177,661.739   183,238.667   MT  1.00084042   -1 01 03.4
DM4611
DM4611!             -  Elev Factor  x  Scale Factor =   Combined Factor
DM4611!SPC HI 1     -   0.99999608  x   1.00000352  =   0.99999960
DM4611!UTM  04      -   0.99999608  x   1.00080646  =   1.00080254
DM4611!UTM  05      -   0.99999608  x   1.00084042  =   1.00083650
DM4611
DM4611_U.S. NATIONAL GRID SPATIAL ADDRESS: 4QHG1239577584(NAD 83)
DM4611
DM4611                           SUPERSEDED SURVEY CONTROL
DM4611
DM4611  NAD 83(1993)-  19 40 08.26266(N)    156 01 14.89068(W) AD(2002.00) B
DM4611  ELLIP H (12/08/10)   24.879  (m)                       GP(2002.00) 4 2
DM4611.No superseded survey control is available for this station.
DM4611
DM4611_MARKER: DD = SURVEY DISK
DM4611_SETTING: 0 = UNSPECIFIED SETTING
DM4611_STAMPING: NUNUKI 2010
DM4611_MARK LOGO: USACE
DM4611_MAGNETIC: N = NO MAGNETIC MATERIAL
DM4611_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
DM4611_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DM4611+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2010
DM4611
DM4611  HISTORY     - Date     Condition        Report By
DM4611  HISTORY     - 20100306 MONUMENTED       USACE
DM4611
DM4611                           STATION DESCRIPTION
DM4611
DM4611'DESCRIBED BY US ARMY CORPS OF ENGINEERS 2010 (JDP)
DM4611'THE STATION IS LOCATED AT HONOK HAU SMALL BOAT HARBOR IN HONOK HAU
DM4611'(KAILUA-KONA), HAWAI'I.
DM4611'
DM4611'OWNERSHIP - U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT, BUILDING.
DM4611'230, FORT SHAFTER, HI 96858 AND STATE OF HAWAI'I, DEPARTMENT OF LAND
DM4611'AND NATURAL RESOURCES (DLNR), DIVISION OF BOATING AND OCEAN RECREATION
DM4611'TO REACH THE STATION FROM THE KE HOLE-KONA INTERNATIONAL AIRPORT,
DM4611'DEPART THE AIRPORT AND TRAVEL EAST ALONG KE HOLE AIRPORT ROAD FOR 0.5
DM4611'MI (0.8 KM) UNTIL YOU REACH THE INTERSECTION WITH QUEEN KA'AHUMANU
DM4611'HIGHWAY (STATE ROUTE 19).  AT THE INTERSECTION WITH QUEEN KA'AHUMANU
DM4611'HIGHWAY (STATE ROUTE 19), TURN RIGHT AND PROCEED SOUTH FOR 4.5 MI (7.2
DM4611'KM) UNTIL YOU REACH THE INTERSECTION WITH KEALAKEHE PARKWAY.  TURN
DM4611'RIGHT ONTO KEALAKEHE PARKWAY, WHICH IS ALSO THE ENTRANCE TO THE HONOK
DM4611'HAU SMALL BOAT HARBOR AND PROCEED WEST FOR 0.5 MI (0.8 KM) UNTIL YOU
DM4611'REACH THE SECOND INTERSECTION TO THE RIGHT THAT LEADS YOU NORTH TO THE
DM4611'STATE OF HAWAI'I, DEPARTMENT OF LAND AND NATURAL RESOURCES (DLNR),
```

DM4611'DIVISION OF BOATING AND OCEAN RECREATION OFFICE. TURN RIGHT AT THE
DM4611'INTERSECTION (NO ROAD NAME POSTED) AND PROCEED NORTH APPROXIMATELY 200
DM4611'FT (61.0 M) THE BENCH MARK IS INSTALLED FLUSH ON THE EAST SIDE OF THE
DM4611'ROAD IN THE CENTER OF THE SOUTHERN END OF A SIDEWALK FRONTING THE
DM4611'STATE OF HAWAI'I HARBORMASTER'S OFFICE.   THE STATION IS INSTALLED
DM4611'FLUSH NEAR THE SOUTHERN END OF A 1.83-METER WIDE SIDEWALK FRONTING THE
DM4611'STATE OF HAWAI'I, DLNR, DIVISION OF BOATING AND OCEAN RECREATION
DM4611'HARBORMASTER'S OFFICE. THE STATION IS APPROXIMATELY 4.13 M (13.5 FT)
DM4611'NORTH FROM THE SOUTHERN EDGE OF THE 6-INCH ELEVATED SIDEWALK. THE
DM4611'STATION IS APPROXIMATELY 0.91 M (3.0 FT) EAST FROM THE WEST EDGE OF
DM4611'THE 6-INCH ELEVATED SIDEWALK. THE STATION IS APPROXIMATELY 11.48 M
DM4611'(37.7 FT) SOUTH FROM THE SOUTHWEST CORNER OF THE STATE OF HAWAI'I
DM4611'HARBORMASTER'S OFFICE BUILDING. THE STATION IS APPROXIMATELY 26.52 M
DM4611'(87.0 FT) EAST/SOUTHEAST OF A WOODEN UTILITY POLE NUMBERED '10'. THE
DM4611'3 INCH DIAMETER BRASS DISK WITH A 2.75 INCH (7 CM) ROD IS INSTALLED
DM4611'FLUSH IN THE CONCRETE SIDEWALK. THE MARK IS A STANDARD U.S. ARMY
DM4611'CORPS OF ENGINEERS SURVEY DISK.

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1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DL6334 ***********************************************************************
 DL6334  HT_MOD      -  This is a Height Modernization Survey Station.
 DL6334  DESIGNATION -  PAAHANA
 DL6334  PID         -  DL6334
 DL6334  STATE/COUNTY-  HI/HAWAII
 DL6334  COUNTRY     -  US
 DL6334  USGS QUAD   -  HILO (2017)
 DL6334
 DL6334                        *CURRENT SURVEY CONTROL
 DL6334  ______________________________________________________________________
 DL6334* NAD 83(PA11) POSITION- 19 42 01.68355(N) 155 05 01.95485(W)   ADJUSTED
 DL6334* NAD 83(PA11) ELLIP HT-    72.266 (meters)        (06/27/12)   ADJUSTED
 DL6334* NAD 83(PA11) EPOCH   -  2010.00
 DL6334* LMSL     ORTHO HEIGHT -    53.41  (meters)      175.2   (feet) GPS OBS
 DL6334  ______________________________________________________________________
 DL6334  LMSL orthometric height was determined with geoid model       GEOID09
 DL6334  GEOID HEIGHT    -         18.245 (meters)                     GEOID09
 DL6334  GEOID HEIGHT    -         18.422 (meters)                     GEOID12B
 DL6334  NAD 83(PA11) X  - -5,448,050.138 (meters)                     COMP
 DL6334  NAD 83(PA11) Y  - -2,530,764.401 (meters)                     COMP
 DL6334  NAD 83(PA11) Z  -  2,136,532.419 (meters)                     COMP
 DL6334  LAPLACE CORR    -        -17.87  (seconds)                    DEFLEC12B
 DL6334
 DL6334  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DL6334  Standards:
 DL6334         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DL6334            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DL6334  ---------------------------------------------------------------------
 DL6334  NETWORK    0.65   1.76           0.26   0.27   0.90      0.06995010
 DL6334  ---------------------------------------------------------------------
 DL6334  Click here for local accuracies and other accuracy information.
 DL6334
 DL6334
 DL6334.The horizontal coordinates were established by GPS observations
 DL6334.and adjusted by the National Geodetic Survey in June 2012.
 DL6334
 DL6334.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DL6334.been affixed to the stable Pacific tectonic plate.
 DL6334
 DL6334.The horizontal coordinates are valid at the epoch date displayed above
 DL6334.which is a decimal equivalence of Year/Month/Day.
 DL6334
 DL6334.The orthometric height was determined by GPS observations and a
 DL6334.high-resolution geoid model using precise GPS observation and
 DL6334.processing techniques.
 DL6334
 DL6334.Significant digits in the geoid height do not necessarily reflect accuracy.
 DL6334.GEOID12B height accuracy estimate available here.
 DL6334
 DL6334.Click photographs - Photos may exist for this station.
 DL6334
 DL6334.The X, Y, and Z were computed from the position and the ellipsoidal ht.
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DL6334
DL6334.The Laplace correction was computed from DEFLEC12B derived deflections.
DL6334
DL6334.The ellipsoidal height was determined by GPS observations
DL6334.and is referenced to NAD 83.
DL6334
DL6334. The following values were computed from the NAD 83(PA11) position.
DL6334
DL6334;                    North         East     Units Scale Factor Converg.
DL6334;SPC HI 1     -    96,037.897   543,626.747   MT  0.99999018   +0 08 25.0
DL6334;UTM  05      - 2,179,675.077   281,568.822   MT  1.00018977   -0 42 09.9
DL6334
DL6334!             -  Elev Factor  x  Scale Factor =   Combined Factor
DL6334!SPC HI 1     -   0.99998864  x   0.99999018  =   0.99997882
DL6334!UTM  05      -   0.99998864  x   1.00018977  =   1.00017841
DL6334
DL6334_U.S. NATIONAL GRID SPATIAL ADDRESS: 5QKB8156879675(NAD 83)
DL6334
DL6334                           SUPERSEDED SURVEY CONTROL
DL6334
DL6334  NAD 83(1993)-  19 42 01.68386(N)    155 05 01.95451(W) AD(2002.00) B
DL6334  ELLIP H (02/05/10)   72.258  (m)                       GP(2002.00) 3 1
DL6334.No superseded survey control is available for this station.
DL6334
DL6334_MARKER: DD = SURVEY DISK
DL6334_SETTING: 0 = UNSPECIFIED SETTING
DL6334_STAMPING: PAAHANA 2009
DL6334_MARK LOGO: USACE
DL6334_MAGNETIC: N = NO MAGNETIC MATERIAL
DL6334_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
DL6334_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DL6334+SATELLITE: SATELLITE OBSERVATIONS - November 02, 2009
DL6334
DL6334  HISTORY     - Date     Condition        Report By
DL6334  HISTORY     - 20091102 MONUMENTED       USACE
DL6334
DL6334                           STATION DESCRIPTION
DL6334
DL6334'DESCRIBED BY US ARMY CORPS OF ENGINEERS 2009
DL6334'THE STATION IS LOCATED ON THE SOUTHEAST CORNER OF A CONCRETE PAD
DL6334'SUPPORTING A UTILITY BOX ADJACENT TO THE NOWELO STREET BRIDGE CROSSING
DL6334'OF WAIAKEA STREAM ON THE UNIVERSITY OF HAWAI'I - HILO CAMPUS IN HILO,
DL6334'HAWAI'I.
DL6334'
DL6334'TO REACH THE STATION FROM THE HILO INTERNATIONAL AIRPORT, DEPART THE
DL6334'AIRPORT AND TRAVEL WEST ALONG AIRPORT ROAD FOR 2.25 KM (1.4 MI) UNTIL
DL6334'YOU REACH THE INTERSECTION WITH KANOELEHUA AVENUE (STATE ROUTE 11).
DL6334'TURN LEFT, AND PROCEED SOUTH ALONG KANOELEHUA AVENUE (STATE ROUTE 11)
DL6334'FOR 0.48 KM (0.3 MI) UNTIL YOU REACH THE INTERSECTION WITH (E)
DL6334'LANIKAULA STREET.  TURN RIGHT ON (E) LANIKAULA STREET AND PROCEED WEST
DL6334'FOR 1.93 KM (1.2 MI) UNTIL YOU REACH THE UNIVERSITY OF HAWAI'I - HILO
DL6334'CAMPUS.  TURN LEFT INTO THE CAMPUS ON NOWELO STREET AND PROCEED SOUTH
DL6334'FOR 0.48 KM (0.3 MI) UNTIL YOU REACH THE BRIDGE CROSSING WAIAKEA
DL6334'STREAM.  PROCEED ON FOOT ACROSS THE BRIDGE TO THE UPSTREAM SIDE OF THE
DL6334'RIGHT BANK OF WAIAKEA STREAM.  THERE, A CONCRETE PAD SUPPORTING AN
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DL6334'ELECTRICAL UTILITY BOX CAN BE FOUND, AND THE BENCH MARK IS INSTALLED
DL6334'FLUSH IN THE SOUTHEAST CORNER OF THE CONCRETE PAD. THE STATION IS
DL6334'INSTALLED FLUSH IN THE SOUTHEAST CORNER OF A CONCRETE ELECTRICAL BOX
DL6334'PAD ON THE UPSTREAM PORTION OF THE RIGHT BANK OF WAIAKEA STREAM
DL6334'ADJACENT TO THE NOWELO STREET BRIDGE. THE STATION IS 4 M (13.1 FT) AT
DL6334'AN ANGLE OF 198 DEGREES FROM THE SOUTH EDGE OF THE SIDEWALK RUNNING
DL6334'PARALLEL TO NOWELO STREET. THE STATION IS 8.74 M (28.7 FT) AT AN
DL6334'ANGLE OF 252 DEGREES FROM THE SOUTHWEST NOWELO STREET BRIDGE ABUTMENT.
DL6334'THE STATION IS 11.58 M (38.0 FT) AT AN ANGLE OF 138 FROM A LIGHT POLE
DL6334'NUMBERED 25. THE LIGHT POLE IS INSTALLED IN THE SIDEWALK ON THE SOUTH
DL6334'SIDE OF NOWELO STREET. THE 3 INCH (8 CM) DIAMETER BRASS DISK WITH A
DL6334'2.75 INCH (7 CM) ROD IS INSTALLED FLUSH IN THE CONCRETE ELECTRICAL BOX
DL6334'PAD. THE MARK IS DESIGNATED PA'AHANA HAS A YEAR NOTATION OF 2009, AND
DL6334'IS A STANDARD U.S. ARMY CORPS OF ENGINEERS SURVEY DISK.

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1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DM4606 ***********************************************************************
 DM4606  HT_MOD      -  This is a Height Modernization Survey Station.
 DM4606  DESIGNATION -  PENO
 DM4606  PID         -  DM4606
 DM4606  STATE/COUNTY-  HI/HAWAII
 DM4606  COUNTRY     -  US
 DM4606  USGS QUAD   -  PAPAALOA (2017)
 DM4606
 DM4606                        *CURRENT SURVEY CONTROL
 DM4606  ______________________________________________________________________
 DM4606* NAD 83(PA11) POSITION- 19 59 32.24267(N) 155 14 23.93657(W)   ADJUSTED
 DM4606* NAD 83(PA11) ELLIP HT-    21.713 (meters)        (06/27/12)   ADJUSTED
 DM4606* NAD 83(PA11) EPOCH   -  2010.00
 DM4606* LMSL     ORTHO HEIGHT -     2.83  (meters)        9.3   (feet) GPS OBS
 DM4606  ______________________________________________________________________
 DM4606  LMSL orthometric height was determined with geoid model       GEOID09
 DM4606  GEOID HEIGHT    -         18.213 (meters)                     GEOID09
 DM4606  GEOID HEIGHT    -         18.370 (meters)                     GEOID12B
 DM4606  NAD 83(PA11) X  - -5,444,922.493 (meters)                     COMP
 DM4606  NAD 83(PA11) Y  - -2,511,298.061 (meters)                     COMP
 DM4606  NAD 83(PA11) Z  -  2,166,902.098 (meters)                     COMP
 DM4606  LAPLACE CORR    -        -19.14  (seconds)                    DEFLEC12B
 DM4606
 DM4606  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DM4606  Standards:
 DM4606         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DM4606            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DM4606  ---------------------------------------------------------------------
 DM4606  NETWORK    0.82   4.10           0.31   0.36   2.09     -0.09689420
 DM4606  ---------------------------------------------------------------------
 DM4606  Click here for local accuracies and other accuracy information.
 DM4606
 DM4606
 DM4606.The horizontal coordinates were established by GPS observations
 DM4606.and adjusted by the National Geodetic Survey in June 2012.
 DM4606
 DM4606.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DM4606.been affixed to the stable Pacific tectonic plate.
 DM4606
 DM4606.The horizontal coordinates are valid at the epoch date displayed above
 DM4606.which is a decimal equivalence of Year/Month/Day.
 DM4606
 DM4606.The orthometric height was determined by GPS observations and a
 DM4606.high-resolution geoid model using precise GPS observation and
 DM4606.processing techniques.
 DM4606
 DM4606.Significant digits in the geoid height do not necessarily reflect accuracy.
 DM4606.GEOID12B height accuracy estimate available here.
 DM4606
 DM4606.Click photographs - Photos may exist for this station.
 DM4606
 DM4606.The X, Y, and Z were computed from the position and the ellipsoidal ht.
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DM4606
DM4606.The Laplace correction was computed from DEFLEC12B derived deflections.
DM4606
DM4606.The ellipsoidal height was determined by GPS observations
DM4606.and is referenced to NAD 83.
DM4606
DM4606. The following values were computed from the NAD 83(PA11) position.
DM4606
DM4606;                    North         East     Units Scale Factor Converg.
DM4606;SPC HI 1     -   128,309.911   527,210.576   MT  0.99997581   +0 05 20.0
DM4606;UTM  05      - 2,212,194.983   265,628.667   MT  1.00027897   -0 45 58.3
DM4606
DM4606!             -  Elev Factor  x  Scale Factor =   Combined Factor
DM4606!SPC HI 1     -   0.99999659  x   0.99997581  =   0.99997240
DM4606!UTM  05      -   0.99999659  x   1.00027897  =   1.00027556
DM4606
DM4606_U.S. NATIONAL GRID SPATIAL ADDRESS: 5QKC6562812194(NAD 83)
DM4606
DM4606|---------------------------------------------------------------------|
DM4606| PID    Reference Object                    Distance      Geod. Az  |
DM4606|                                                          dddmmss.s |
DM4606| DM4607 UAHANAI                           107.583 METERS 25232     |
DM4606|---------------------------------------------------------------------|
DM4606
DM4606                          SUPERSEDED SURVEY CONTROL
DM4606
DM4606  NAD 83(1993)-  19 59 32.24317(N)    155 14 23.93590(W) AD(2002.00) B
DM4606  ELLIP H (12/08/10)   21.685  (m)                       GP(2002.00) 1 2
DM4606.No superseded survey control is available for this station.
DM4606
DM4606_MARKER: DD = SURVEY DISK
DM4606_SETTING: 0 = UNSPECIFIED SETTING
DM4606_STAMPING: PENO 2010
DM4606_MARK LOGO: USACE
DM4606_MAGNETIC: N = NO MAGNETIC MATERIAL
DM4606_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
DM4606_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DM4606+SATELLITE: SATELLITE OBSERVATIONS - March 02, 2010
DM4606
DM4606  HISTORY     - Date     Condition        Report By
DM4606  HISTORY     - 20100302 MONUMENTED       USACE
DM4606
DM4606                          STATION DESCRIPTION
DM4606
DM4606'DESCRIBED BY US ARMY CORPS OF ENGINEERS 2010 (JDP)
DM4606'THE STATION IS LOCATED NEAR THE NORTHEAST CORNER OF A LARGE CONCRETE
DM4606'SLAB AT THE LAUPHOEHOE POINT PARK LAUNCH RAMP IN LAUPHOEHOE, HAWAI'I.
DM4606'
DM4606'OWNERSHIP - U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT, BUILDING.
DM4606'230, FORT SHAFTER, HI 96858.
DM4606'
DM4606'TO REACH THE STATION FROM THE HILO INTERNATIONAL AIRPORT, DEPART THE
DM4606'AIRPORT AND TRAVEL WEST ALONG AIRPORT ROAD FOR 1.4 MI (2.3 KM) UNTIL
DM4606'YOU REACH THE INTERSECTION WITH KANOELEHUA AVENUE (STATE ROUTE 11).
DM4606'AT THE INTERSECTION WITH KANOELEHUA AVENUE (STATE ROUTE 11).  TURN
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DM4606'RIGHT AND PROCEED NORTH FOR 0.7 MI (1.1 KM) UNTIL YOU REACH THE
DM4606'INTERSECTION WITH KAMEHAMEHA AVENUE (STATE ROUTE 19). TURN LEFT ONTO
DM4606'KAMEHAMEHA AVENUE (STATE ROUTE 19) AND PROCEED WEST FOR 0.9 MI (1.4
DM4606'KM) UNTIL YOU REACH THE INTERSECTION WITH BAYFRONT HIGHWAY/HAWAI'I
DM4606'BELT ROAD (STATE ROUTE 19). BEAR RIGHT ONTO BAYFRONT HIGHWAY/HAWAI'I
DM4606'BELT ROAD AND PROCEED WEST/NORTHWEST OUT OF HILO TOWN. PROCEED ALONG
DM4606'STATE ROUTE 19 (HAWAI'I BELT ROAD) FOR 25.2 MI (40.5 KM) UNTIL YOU
DM4606'REACH THE TOWN OF LAUP HOEHOE. TURN RIGHT (EAST) ONTO LAUPHOEHOE
DM4606'POINT ROAD AND DESCEND FOR 1.3 MI (2.1 KM) UNTIL YOU REACH THE
DM4606'LAUPHOEHOE POINT PARK AT THE END OF THE ROAD. THE BENCH MARK IS
DM4606'INSTALLED FLUSH IN A LARGE CONCRETE SLAB ADJACENT TO THE BOAT LAUNCH
DM4606'RAMP FACILITY. THE STATION IS INSTALLED FLUSH NEAR THE NORTHEAST
DM4606'CORNER OF A LARGE CONCRETE SLAB WHICH SITS ON THE EAST SIDE OF THE
DM4606'HARBOR FACILITY BETWEEN THE LAUNCH RAMP AND THE BREAKWATER. THE
DM4606'STATION IS APPROXIMATELY 0.53 M (1.7 FT) WEST FROM THE EASTERN EDGE OF
DM4606'THE 8.84 M (29.0 FT) X 29.11 M (95.5 FT) CONCRETE SLAB. THE STATION
DM4606'IS APPROXIMATELY 1.18 M (3.9 FT) SOUTH OF AN U.S. ARMY CORPS OF
DM4606'ENGINEERS' PROJECT SIGN READING 'LAUPHOEHOE HARBOR'. THE STATION IS
DM4606'APPROXIMATELY 8.23 M (27.0 FT) EAST OF THE EASTERN EDGE OF THE LAUNCH
DM4606'RAMP. THE STATION IS APPROXIMATELY 25.91 M (85.0 FT) EAST/SOUTHEAST
DM4606'FROM A WATER FAUCET/HOSE BIB.
DM4606'
DM4606'THE 3 INCH (8 CM) DIAMETER BRASS DISK WITH A 2.75 INCH (7 CM) ROD IS
DM4606'INSTALLED FLUSH IN THE CONCRETE SLAB. THE MARK IS DESIGNATED 'PENO'
DM4606'HAS A YEAR NOTATION OF '2010' AND IS A STANDARD U.S. ARMY CORPS OF
DM4606'ENGINEERS SURVEY DISK.

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1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DM4612 ***********************************************************************
 DM4612  DESIGNATION -  PI MON
 DM4612  PID         -  DM4612
 DM4612  STATE/COUNTY-  HI/HAWAII
 DM4612  COUNTRY     -  US
 DM4612  USGS QUAD   -  KEAHOLE POINT (2017)
 DM4612
 DM4612                        *CURRENT SURVEY CONTROL
 DM4612  ______________________________________________________________________
 DM4612* NAD 83(PA11) POSITION- 19 40 04.76601(N) 156 01 28.75896(W)   ADJUSTED
 DM4612* NAD 83(PA11) ELLIP HT-    23.356 (meters)        (06/27/12)   ADJUSTED
 DM4612* NAD 83(PA11) EPOCH    -  2010.00
 DM4612* LMSL     ORTHO HEIGHT -     4.6   (meters)       15.    (feet) GPS OBS
 DM4612  ______________________________________________________________________
 DM4612  LMSL orthometric height was determined with geoid model       GEOID09
 DM4612  GEOID HEIGHT    -         18.099 (meters)                     GEOID09
 DM4612  GEOID HEIGHT    -         18.273 (meters)                     GEOID12B
 DM4612  NAD 83(PA11) X  - -5,489,932.686 (meters)                     COMP
 DM4612  NAD 83(PA11) Y  - -2,441,445.355 (meters)                     COMP
 DM4612  NAD 83(PA11) Z  -  2,133,130.785 (meters)                     COMP
 DM4612  LAPLACE CORR    -         24.94  (seconds)                    DEFLEC12B
 DM4612
 DM4612  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DM4612  Standards:
 DM4612         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DM4612            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DM4612  ---------------------------------------------------------------------
 DM4612  NETWORK    5.69   6.74           2.03   2.56   3.44      0.03390470
 DM4612  ---------------------------------------------------------------------
 DM4612  Click here for local accuracies and other accuracy information.
 DM4612
 DM4612
 DM4612.The horizontal coordinates were established by GPS observations
 DM4612.and adjusted by the National Geodetic Survey in June 2012.
 DM4612
 DM4612.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DM4612.been affixed to the stable Pacific tectonic plate.
 DM4612
 DM4612.The horizontal coordinates are valid at the epoch date displayed above
 DM4612.which is a decimal equivalence of Year/Month/Day.
 DM4612
 DM4612.The orthometric height was determined by GPS observations and a
 DM4612.high-resolution geoid model.
 DM4612
 DM4612.Significant digits in the geoid height do not necessarily reflect accuracy.
 DM4612.GEOID12B height accuracy estimate available here.
 DM4612
 DM4612.Click photographs - Photos may exist for this station.
 DM4612
 DM4612.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 DM4612
 DM4612.The Laplace correction was computed from DEFLEC12B derived deflections.
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DM4612
DM4612.The ellipsoidal height was determined by GPS observations
DM4612.and is referenced to NAD 83.
DM4612
DM4612. The following values were computed from the NAD 83(PA11) position.
DM4612
DM4612;                    North         East     Units Scale Factor Converg.
DM4612;SPC HI 1     -    92,474.165   444,983.398   MT  1.00000406   -0 10 35.7
DM4612;UTM  04      - 2,177,470.040   811,993.144   MT  1.00080335   +1 00 08.0
DM4612;UTM  05      - 2,177,561.312   182,832.467   MT  1.00084360   -1 01 07.9
DM4612
DM4612!             -  Elev Factor  x  Scale Factor =   Combined Factor
DM4612!SPC HI 1     -   0.99999633  x   1.00000406  =   1.00000039
DM4612!UTM  04      -   0.99999633  x   1.00080335  =   1.00079968
DM4612!UTM  05      -   0.99999633  x   1.00084360  =   1.00083993
DM4612
DM4612_U.S. NATIONAL GRID SPATIAL ADDRESS: 4QHG1199377470(NAD 83)
DM4612
DM4612|---------------------------------------------------------------------|
DM4612| PID    Reference Object                    Distance      Geod. Az  |
DM4612|                                                          dddmmss.s |
DM4612| DM4609 LOLOLO                            253.922 METERS 30544     |
DM4612|---------------------------------------------------------------------|
DM4612
DM4612                          SUPERSEDED SURVEY CONTROL
DM4612
DM4612  NAD 83(1993)-  19 40 04.76580(N)    156 01 28.76087(W) AD(2002.00) 1
DM4612  ELLIP H (12/08/10)   23.308  (m)                       GP(2002.00) 4 2
DM4612.No superseded survey control is available for this station.
DM4612
DM4612_MARKER: DD = SURVEY DISK
DM4612_SETTING: 4 = OBJECT SURROUNDED BY MASS OF CONCRETE
DM4612_STAMPING: PI MON
DM4612_MARK LOGO: NONE
DM4612_MAGNETIC: N = NO MAGNETIC MATERIAL
DM4612_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
DM4612_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DM4612+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2010
DM4612
DM4612  HISTORY     - Date     Condition        Report By
DM4612  HISTORY     - UNK      MONUMENTED       NONE
DM4612  HISTORY     - 20100306 GOOD             USACE
DM4612
DM4612                          STATION DESCRIPTION
DM4612
DM4612'DESCRIBED BY US ARMY CORPS OF ENGINEERS 2010 (JDP)
DM4612'THE STATION IS LOCATED AT HONOK HAU SMALL BOAT HARBOR AREA IN HONOK
DM4612'HAU (KAILUA-KONA), HAWAI'I.
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1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DM4613 ***********************************************************************
 DM4613  DESIGNATION -  PT MON
 DM4613  PID         -  DM4613
 DM4613  STATE/COUNTY-  HI/HAWAII
 DM4613  COUNTRY     -  US
 DM4613  USGS QUAD   -  KEAHOLE POINT (2017)
 DM4613
 DM4613                        *CURRENT SURVEY CONTROL
 DM4613  ______________________________________________________________________
 DM4613* NAD 83(PA11) POSITION- 19 40 05.53587(N) 156 01 23.70101(W)   NO CHECK
 DM4613* NAD 83(PA11) ELLIP HT-    24.101 (meters)        (06/27/12)   NO CHECK
 DM4613* NAD 83(PA11) EPOCH    -  2010.00
 DM4613* LMSL     ORTHO HEIGHT -     5.3   (meters)       17.    (feet) GPS OBS
 DM4613  ______________________________________________________________________
 DM4613  LMSL orthometric height was determined with geoid model       GEOID09
 DM4613  GEOID HEIGHT    -         18.150 (meters)                     GEOID09
 DM4613  GEOID HEIGHT    -         18.324 (meters)                     GEOID12B
 DM4613  NAD 83(PA11) X  - -5,489,866.177 (meters)                     COMP
 DM4613  NAD 83(PA11) Y  - -2,441,577.023 (meters)                     COMP
 DM4613  NAD 83(PA11) Z  -  2,133,153.328 (meters)                     COMP
 DM4613  LAPLACE CORR    -         24.96  (seconds)                    DEFLEC12B
 DM4613
 DM4613  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DM4613  Standards:
 DM4613         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DM4613            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DM4613  ------------------------------------------------------------------
 DM4613  NETWORK   10.82  10.33           4.32   4.52   5.27      0.10545720
 DM4613  ------------------------------------------------------------------
 DM4613  Click here for local accuracies and other accuracy information.
 DM4613
 DM4613
 DM4613.The horizontal coordinates were established by GPS observations
 DM4613.and adjusted by the National Geodetic Survey in June 2012.
 DM4613
 DM4613.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DM4613.been affixed to the stable Pacific tectonic plate.
 DM4613
 DM4613.The horizontal coordinates are valid at the epoch date displayed above
 DM4613.which is a decimal equivalence of Year/Month/Day.
 DM4613
 DM4613.No horizontal observational check was made to the station.
 DM4613.
 DM4613.The orthometric height was determined by GPS observations and a
 DM4613.high-resolution geoid model.
 DM4613
 DM4613.Significant digits in the geoid height do not necessarily reflect accuracy.
 DM4613.GEOID12B height accuracy estimate available here.
 DM4613
 DM4613.Click photographs - Photos may exist for this station.
 DM4613
 DM4613.The X, Y, and Z were computed from the position and the ellipsoidal ht.
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DM4613
DM4613.The Laplace correction was computed from DEFLEC12B derived deflections.
DM4613
DM4613.The ellipsoidal height was determined by GPS observations
DM4613.and is referenced to NAD 83.
DM4613
DM4613. The following values were computed from the NAD 83(PA11) position.
DM4613
DM4613;                    North         East     Units Scale Factor Converg.
DM4613;SPC HI 1     -    92,497.385   445,130.804   MT  1.00000386   -0 10 34.0
DM4613;UTM  04      - 2,177,496.308   812,140.159   MT  1.00080448   +1 00 09.7
DM4613;UTM  05      - 2,177,582.380   182,980.322   MT  1.00084244   -1 01 06.2
DM4613
DM4613!             -  Elev Factor  x  Scale Factor =   Combined Factor
DM4613!SPC HI 1     -   0.99999621  x   1.00000386  =   1.00000007
DM4613!UTM  04      -   0.99999621  x   1.00080448  =   1.00080069
DM4613!UTM  05      -   0.99999621  x   1.00084244  =   1.00083865
DM4613
DM4613_U.S. NATIONAL GRID SPATIAL ADDRESS: 4QHG1214077496(NAD 83)
DM4613
DM4613|---------------------------------------------------------------------|
DM4613| PID    Reference Object                    Distance      Geod. Az  |
DM4613|                                                          dddmmss.s |
DM4613| DM4609 LOLOLO                            374.778 METERS 28925     |
DM4613|---------------------------------------------------------------------|
DM4613
DM4613                          SUPERSEDED SURVEY CONTROL
DM4613
DM4613  NAD 83(1993)-  19 40 05.53565(N)    156 01 23.70292(W) AD(2002.00) 1
DM4613  ELLIP H (12/08/10)   24.053  (m)                       GP(2002.00) 4 2
DM4613.No superseded survey control is available for this station.
DM4613
DM4613_MARKER: DD = SURVEY DISK
DM4613_SETTING: 4 = OBJECT SURROUNDED BY MASS OF CONCRETE
DM4613_STAMPING: PT MON
DM4613_MARK LOGO: NONE
DM4613_MAGNETIC: N = NO MAGNETIC MATERIAL
DM4613_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
DM4613_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DM4613+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2010
DM4613
DM4613  HISTORY     - Date     Condition        Report By
DM4613  HISTORY     - UNK      MONUMENTED       NONE
DM4613  HISTORY     - 20100306 GOOD             USACE
DM4613
DM4613                          STATION DESCRIPTION
DM4613
DM4613'DESCRIBED BY US ARMY CORPS OF ENGINEERS 2010 (JDP)
DM4613'THE STATION IS LOCATED AT HONOK HAU SMALL BOAT HARBOR AREA IN HONOK
DM4613'HAU (KAILUA-KONA), HAWAI'I.
```

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1        National Geodetic Survey,   Retrieval Date = FEBRUARY 20, 2020
 DE6589 ***********************************************************************
 DE6589  CORS         -  This is a GPS Continuously Operating Reference Station.
 DE6589  DESIGNATION -  MAUNA KEA CORS ARP
 DE6589  CORS_ID      -  MKEA
 DE6589  PID          -  DE6589
 DE6589  STATE/COUNTY-  HI/HAWAII
 DE6589  COUNTRY      -  US
 DE6589  USGS QUAD    -  MAUNA KEA (2017)
 DE6589
 DE6589                         *CURRENT SURVEY CONTROL
 DE6589  ______________________________________________________________________
 DE6589* NAD 83(PA11) POSITION- 19 48 04.84676(N) 155 27 22.74528(W)   ADJUSTED
 DE6589* NAD 83(PA11) ELLIP HT-  3754.485 (meters)        (06/??/19)   ADJUSTED
 DE6589* NAD 83(PA11) EPOCH   -  2010.00
 DE6589  ______________________________________________________________________
 DE6589  GEOID HEIGHT    -         26.452 (meters)                     GEOID12B
 DE6589  NAD 83(PA11) X  - -5,464,104.333 (meters)                     COMP
 DE6589  NAD 83(PA11) Y  - -2,495,168.527 (meters)                     COMP
 DE6589  NAD 83(PA11) Z  -  2,148,290.345 (meters)                     COMP
 DE6589
 DE6589  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DE6589  Standards:
 DE6589         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DE6589            Horiz  Ellip          SD_N   SD_E   SD_h      (unitless)
 DE6589  ---------------------------------------------------------------------
 DE6589  NETWORK    0.14   0.14           0.06   0.05   0.07      0.05934100
 DE6589  ---------------------------------------------------------------------
 DE6589
 DE6589
 DE6589.The coordinates were established by GPS observations
 DE6589.and adjusted by the National Geodetic Survey in June 2019.
 DE6589
 DE6589.NAD 83(PA11) refers to NAD 83 coordinates where the reference frame has
 DE6589.been affixed to the stable Pacific Tectonic Plate.
 DE6589
 DE6589.The coordinates are valid at the epoch date displayed above
 DE6589.which is a decimal equivalence of Year/Month/Day.
 DE6589
 DE6589.Due to the release of the International GNSS Service (IGS) 2014
 DE6589.realization of the International Terrestrial Reference Frame of 2014
 DE6589.(ITRF2014), NGS reprocessed all NOAA CORS Network and some IGS stations
 DE6589.using data collected between 1/1/1996 and 1/30/2017. The resulting ITRF2014
 DE6589.epoch 2010.00 coordinates, referred to as Multi-Year CORS Solution 2
 DE6589.(MYCS2), were transformed to NAD 83 (2011/PA11/MA11) maintaining the
 DE6589.currently published epoch of 2010.00.
 DE6589
 DE6589.Additional information on MYCS2 is available at
 DE6589.https://geodesy.noaa.gov/CORS/coords.shtml
 DE6589
 DE6589.Significant digits in the geoid height do not necessarily reflect accuracy.
 DE6589.GEOID12B height accuracy estimate available here.
 DE6589
```

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DE6589.The PID for the CORS L1 Phase Center is DE6590.
DE6589
DE6589.Click photographs - Photos may exist for this station.
DE6589
DE6589.The XYZ, and position/ellipsoidal ht. are equivalent.
DE6589
DE6589.The ellipsoidal height was determined by GPS observations
DE6589.and is referenced to NAD 83.
DE6589
DE6589. The following values were computed from the NAD 83(PA11) position.
DE6589
DE6589;                    North         East     Units Scale Factor Converg.
DE6589;SPC HI 1     -   107,152.099   504,576.735   MT  0.99996693   +0 00 53.3
DE6589;UTM  05      - 2,191,367.901   242,674.343   MT  1.00041852   -0 49 57.2
DE6589
DE6589!             -  Elev Factor  x  Scale Factor =   Combined Factor
DE6589!SPC HI 1     -   0.99941017  x   0.99996693  =   0.99937712
DE6589!UTM  05      -   0.99941017  x   1.00041852  =   0.99982844
DE6589
DE6589_U.S. NATIONAL GRID SPATIAL ADDRESS: 5QKB4267491367(NAD 83)
DE6589
DE6589                           SUPERSEDED SURVEY CONTROL
DE6589
DE6589  NAD 83(PA11)-  19 48 04.84680(N)    155 27 22.74526(W) AD(2010.00) c
DE6589  ELLIP H (08/??/11) 3754.486  (m)                       GP(2010.00) c c
DE6589  NAD 83(CORS)-  19 48 04.84728(N)    155 27 22.74483(W) AD(2002.00) c
DE6589  ELLIP H (06/??/07) 3754.494  (m)                       GP(2002.00) c c
DE6589  NAD 83(CORS)-  19 48 04.84666(N)    155 27 22.74500(W) AD(2002.00) c
DE6589  ELLIP H (08/??/02) 3754.511  (m)                       GP(2002.00) c c
DE6589.No superseded survey control is available for this station.
DE6589
DE6589_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DE6589
DE6589                           STATION DESCRIPTION
DE6589
DE6589'DESCRIBED BY NATIONAL GEODETIC SURVEY 2019
DE6589'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
DE6589'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
DE6589'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DE6589'   ftp://cors.ngs.noaa.gov/cors/README.txt
DE6589'   ftp://cors.ngs.noaa.gov/cors/coord/coord_14
DE6589'   ftp://cors.ngs.noaa.gov/cors/station_log
DE6589'   https://geodesy.noaa.gov/CORS

*** retrieval complete.
Elapsed Time = 00:00:03
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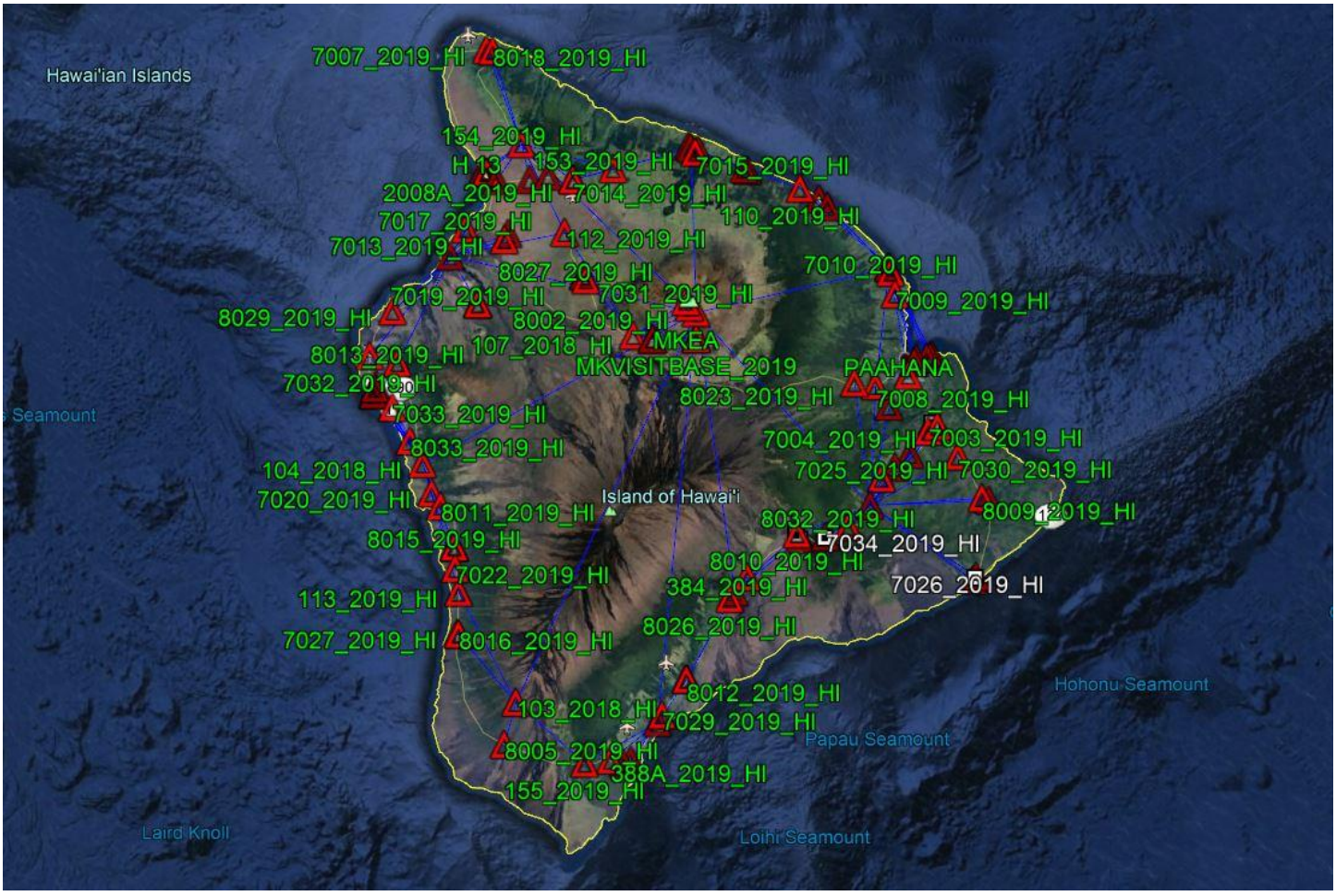
Section 5: GPS Control Diagram

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

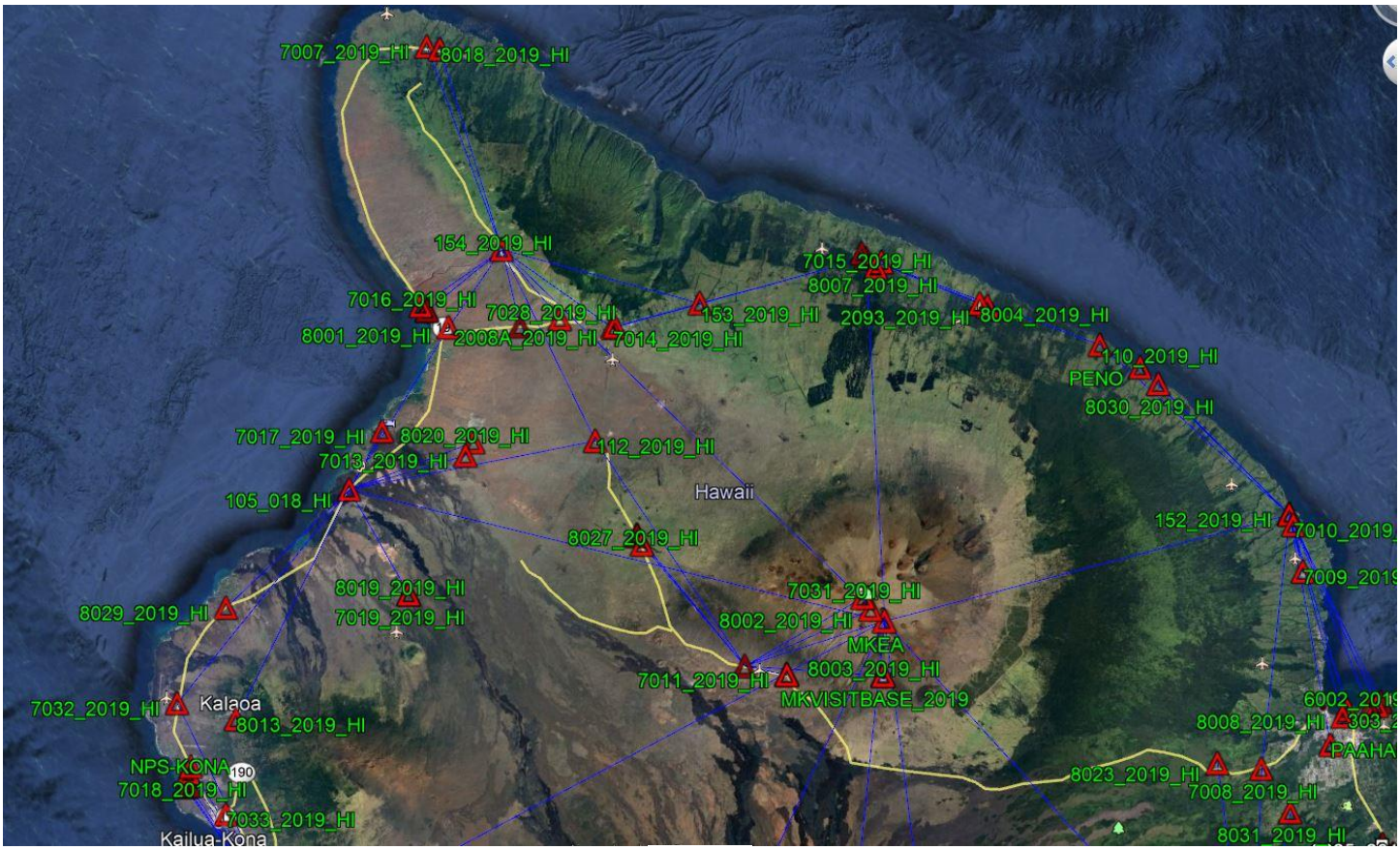
Overview of Control Network:



N

Not to Scale

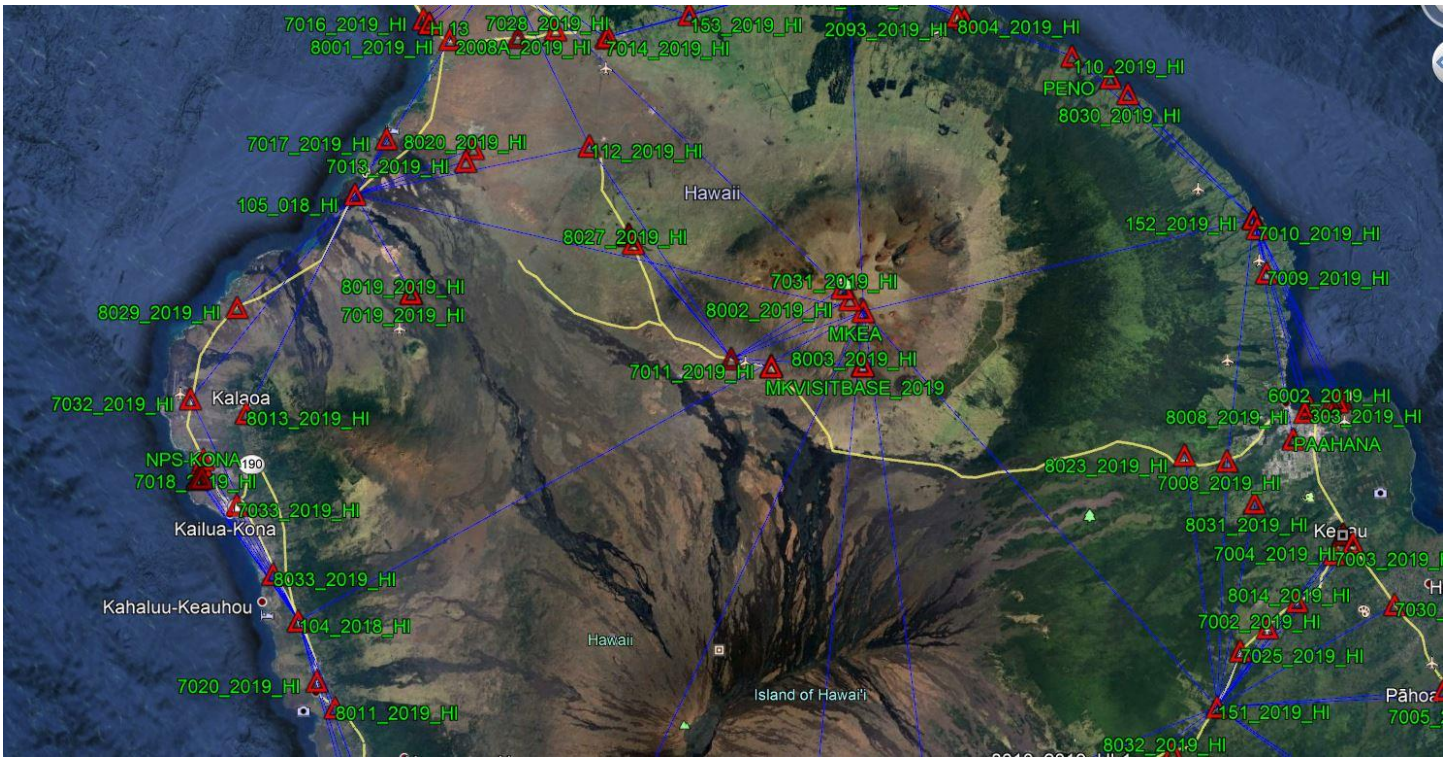
North:



N

Not to Scale

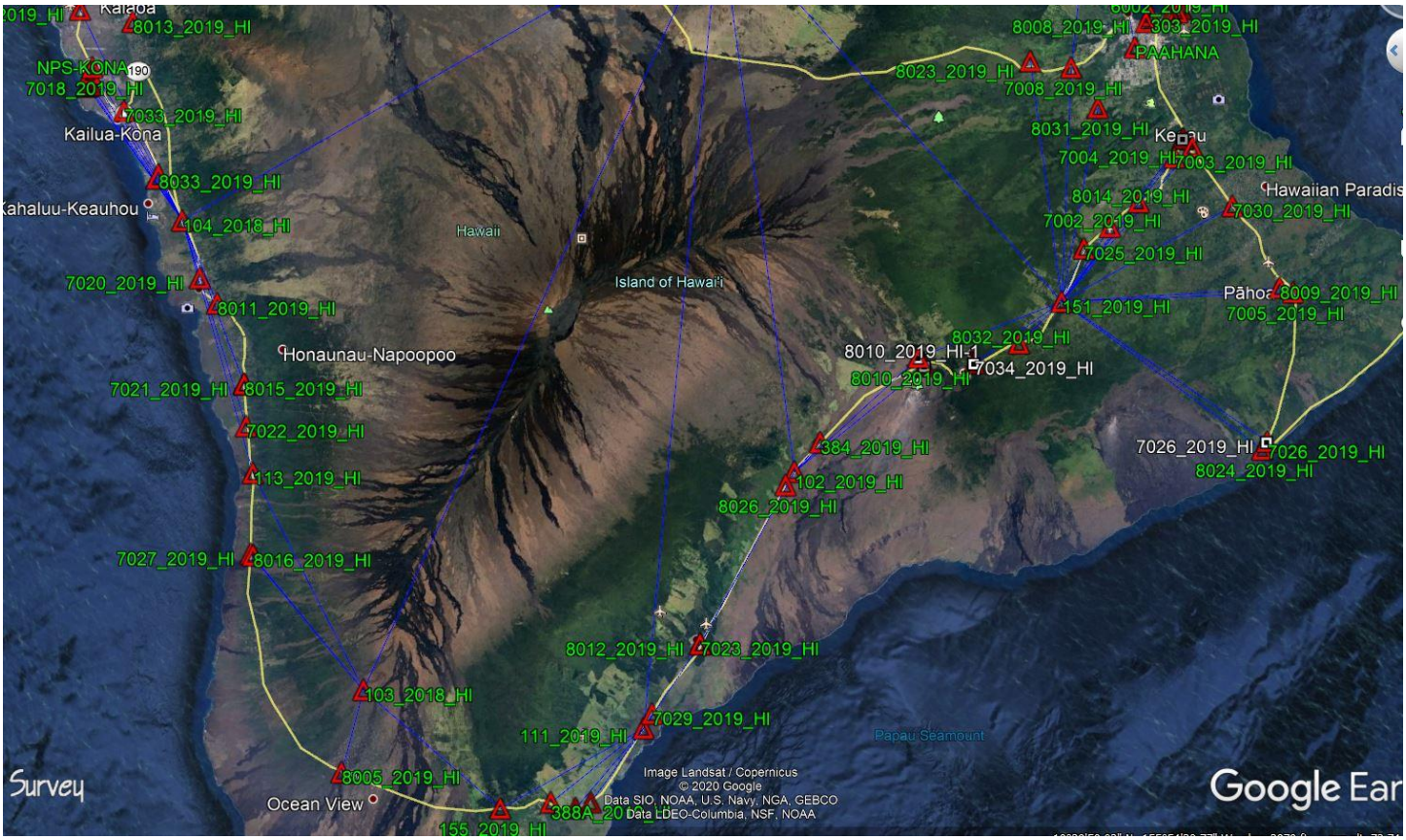
Central:



N

Not to Scale

South:



N

Not to Scale