

New York State Airborne LiDAR Processing Report

For

Madison County and Otsego County, 2016

Prepared For



**New York State
Office of Information Technology Services
GIS Program Office
10B Airline Drive,
Albany, New York 12235**

Axis Project Number 15002-2
Lot 15, Area 2

By

**Axis Geospatial, LLC
101 Bay Street
Easton, Maryland 21601**



Section 1: Table of Contents

Section 1: Table of Contents.....2

Section 2: Introduction3

Section 3: Summary of Results.....3

Section 4: Merging.....4

Section 5: Classification.....12

Section 6: Hydro Flattened DEM Creation & Breaklines.....13

Section 7: Final QA/QC.....13

List of Tables

Table 1: Point Cloud Statistics.....4

Table 2: Average Magnitude per Line (m).....5

Table 3: Overall Relative Accuracy (m).....6

Table 4: Internal Observations Statistics (m).....6

Table 5: TerraMatch Tie Lines.....6

Table 6: Control Point Assessment (Swath) (m).....7

Table 7: Control Point Error Statistics (m).....8

Table 8: NVA Check Point Error Statistics (m).....12

Table 9: VVA Check Point Error Statistics (m)12

Table 10: NVA Check Point Assessment (DEM) (m).....13

Table 11: VVA Check Point Assessment (DEM) (m).....20

Section 2: Introduction

The New York State Office of Information Technology Services, GIS Program Office requested delivery of three-dimensional classified point cloud and terrain data derived from LiDAR (Light Detection and Ranging) technology for the New York LiDAR project area covering portions of Madison, Chenango, Oneida, Herkimer, Delaware and Otsego Counties, in central New York State. The project area covered approximately 1,844 square miles or 4,776 square kilometers.

Quality Level 2 LiDAR data was processed and projected to UTM Zone 18 North, referenced to the North American Datum 1983 (NAD83) (2011), in units of meters. The vertical datum used for the project was the North American Vertical Datum 1988 (NAVD88) with units expressed in meters. Orthometric heights were referenced to Geoid 12A.

The primary data deliverables discussed and tested in this report include USGS compliant:

- 1) Version 1.4 LAS LiDAR Tiles;
- 2) 3D Breaklines delivered as 3D Shapefiles; and
- 3) 1 meter bare-earth, hydro-flattened DEM Tiles in ERDAS Imagine format;

The deliverables are based on a 1,500 m x 1,500 m tile index provided by the State. This document explains the process and procedures used to adjust, classify and verify the deliverables. For a more detailed report on the LiDAR acquisition, see two reports: *“New York State Airborne LiDAR Acquisition Report; Project Number 15002-2; Lot 15, Madison-Otsego (Axis Acquisition)”* and *“New York State Airborne LiDAR Acquisition Report; Project Number 15002-2; Lot 15, Madison-Otsego (KAS Acquisition)”*; Both reports delivered under separate covers. A thorough review of the survey techniques and parameters surrounding the field work and processing of the ground control points can be found in a report entitled: *“Survey Report LiDAR Project Control; Primary Ground Control for Madison-Otsego Blocks 1, 2, 3 & 4”*. This report was delivered under a separate cover.

Section 3: Summary of Results

A brief summary of four accuracy assessments performed with the LiDAR data is discussed below. The first of the four assessments involves the relative match of the LiDAR points in the overlap areas of the acquisition swaths. The second assessment provides an analysis of the adjusted LiDAR points with surveyed ground control points. The third and fourth assessments compares the DEM data with independent surveyed check points located in non-vegetated and vegetated areas.

An initial analysis of the swath data involves comparing the elevation of points from one swath to points from a neighboring swath. Points within the overlapping swath areas are observed and compared. Swaths are adjusted with the intent of reducing the elevation differences between points within the overlapping swaths.

USGS publication *“LiDAR Base Specification”*, ver. 1.2, Page 8, Table 2 identifies that QL2 data will have a swath overlap difference of ≤ 8 cm with a maximum swath difference of ± 16 cm. For this dataset, the RMSE_z of the relative adjustment is 2.4 cm and the maximum difference between points observed is 31.4 cm.

A second analysis provides a statistical measure of how well the adjusted swath point cloud data have been merged together and adjusted to ground control points whose coordinates have been surveyed. Forty-seven (47) control points were surveyed. For this dataset, the average difference of the LiDAR data with the ground control points is 1.2 cm, with a standard deviation of 4.7 cm and an RMSE_z of 4.8 cm.

Non-Vegetated Vertical Accuracy (NVA) Check Points and Vegetated Vertical Accuracy (VVA) Check Points were also independently surveyed and compared to the DEM data. For the NVA checkpoints, the overall RMSE_z is 6.7 centimeters. This compares favorably to the USGS specification of ≤ 10 cm. (USGS *“LiDAR Base Specification”*, Page 10, Table 5;). The NVA at the 95% confidence interval is 13.0 centimeters which is within the USGS specification of < 19.6 cm. (USGS *“LiDAR Base Specification”*, Page 10, Table 5;)

Vegetated Vertical Accuracy (VVA) Check Point RMSEz is 7.3 centimeters and the VVA at the 95% confidence interval is 14.3 centimeters. The USGS specification for VVA at the 95th percentile is < 29.4 cm. (USGS “LiDAR Base Specification”, Page 10, Table 5;)

Section 4: Merging

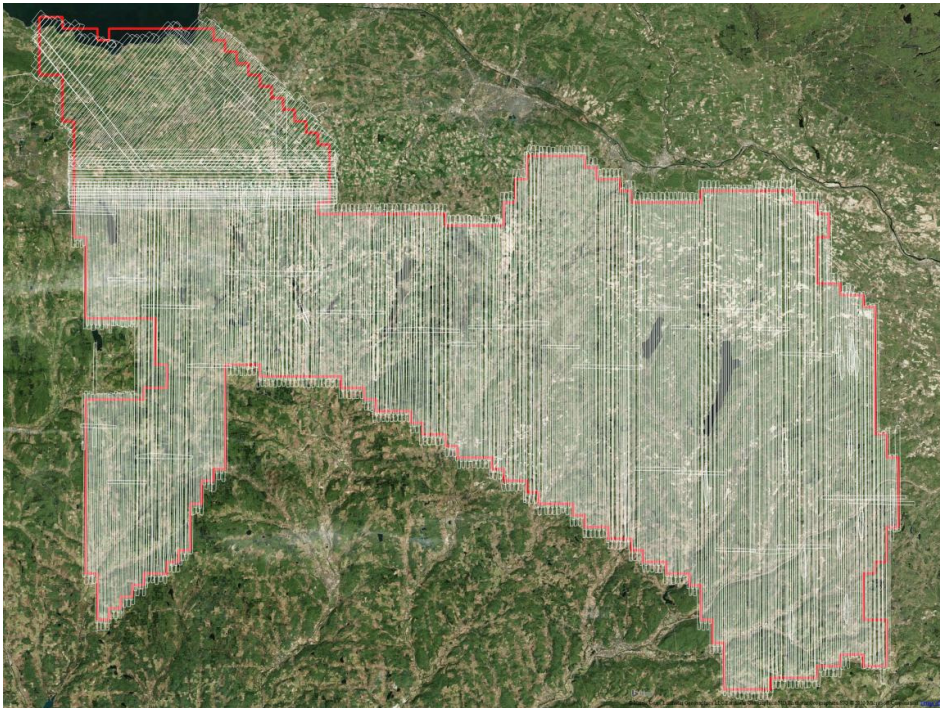
Generation and Calibration of Laser Points

The initial step of calibration is to verify availability and status of all needed GPS and Laser data against field notes and compile any data if not complete. Subsequently, the mission points are output using Leica’s CloudPro post processor with the most recent boresight values. The initial point generation for each mission calibration is verified within TerraScan using distance colored points to identify errors. If a calibration error greater than specification is observed within the mission, the roll, pitch and scanner scale corrections that need to be applied are calculated. Once validated each output mission is imported into the GeoCue software package. Here a project level supplementary coverage check is carried out to ensure no data voids unreported by Field Operations are present.

The Aggregate Nominal Pulse Spacing for the Madison Otsego project is 0.542 m with an Aggregate Nominal Pulse Density of 3.6 pts/m². See Table 1: Point Cloud Statistics.

Table 1: Point Cloud Statistics		
Madison Otsego Statistics:	Total	33,856,079,262
	Aggregate Nominal Pulse Spacing (m)	0.542
	Aggregate Nominal Pulse Density (pts/m ²)	3.62

The Madison Otsego LiDAR Swath Coverage Plot is displayed below:



Madison Otsego LiDAR Swath Coverage

Relative Accuracy Assessment

For effective data management, each imported mission is tiled out in GeoCue to a project specific tile scheme or index. Relative accuracy and internal quality are then checked using a number of carefully selected tiles in which points from all lines are loaded and inspected. Vertical differences between ground surfaces of each line are displayed by the generation of Z-Difference colored intensity orthos in GeoCue. The color scale of these orthos are adjusted so that errors greater than the specifications are flagged. Cross sections are visually inspected across each block to validate point to point, flight line to flight line and mission to mission alignment. When available, surveyed control points are used to supplement and verify the calibration of the data.

The Relative and Absolute Adjustment Workflows are summarized below:

- a. Search for Tie Lines for Relative Adjustments –To find the difference between flightlines, Axis utilizes a function in TerraMatch called Search Tie Line. The automatic tie line search provides a statistical report of the average mismatch between flightlines.
- b. Find Tie Line Match & Generate Correction Values - Find Tie Line Match tool analyzes the mismatch in the tie lines and provides correction values.
- c. Apply Correction Values to the LiDAR – Utilizing the correction values that were calculated, a macro applies the corrections.
- d. Analyze and Fit Data to Control for Absolute Adjustment –For the absolute adjustments, the LiDAR data is adjusted to known control points. LiDAR is adjusted using average Dz mismatches to the control.
- e. Gather Intensity Images of Horizontal Alignment of Control – Axis generates intensity imagery to check the horizontal accuracy of the LiDAR.
- f. Create a Report of Relative and Absolute Adjustments – Terrascan provides:
 - i. Tie-line Output Report – Average Z mismatch between each strip.
 - ii. Output Control Report – Match between the control and the LiDAR.

Relative Adjustment Accuracy Results

An overall statistical assessment of the relative accuracy, using TerraMatch Tie Line Report between LiDAR swaths, can be found in Table 2 below. The values provided are in Meters.

Table 2: Average Magnitudes Per Line (m)

Line	X	Y	Z	Line	X	Y	Z	Line	X	Y	Z
1	-0.005	0.07	0.022	45	-0.006	-0.003	0.012	88	0	-0.001	0.012
2	-0.001	0.046	0.017	46	-0.017	0.01	0.009	89	-0.004	0.005	0.011
3	-0.003	-0.008	0.012	47	0	0	0.013	90	-0.014	0.013	0.012
4	0.003	0.001	0.012	48	-0.031	0.019	0.013	91	0	0.011	0.011
5	-0.006	0.002	0.011	49	-0.055	0.043	0.012	92	0.007	0.003	0.011
6	0.003	0.019	0.013	50	-0.009	0.019	0.013	93	0.005	0	0.012
7	-0.002	0.02	0.014	51	0.065	-0.006	0.009	94	0.005	-0.008	0.012
8	-0.019	0	0.014	52	0.441	-0.081	0.012	95	-0.004	-0.002	0.011
9	-0.019	0	0.011	53	-0.018	0.021	0.011	96	-0.001	0.011	0.011
10	-0.018	-0.005	0.01	54	0.001	0.006	0.011	97	-0.006	0.055	0.016
11	-0.002	0.003	0.011	55	-0.014	0.008	0.012	98	0.001	0.021	0.015
12	0.001	0.014	0.01	56	-0.02	0.013	0.012	99	-0.007	0.034	0.018
13	0.016	0	0.01	57	-0.011	0.012	0.012	100	-0.004	0.064	0.017
14	-0.024	0.007	0.011	58	-0.021	0.012	0.013	101	0.009	0.072	0.017
15	-0.033	0.012	0.01	59	-0.005	0.004	0.013	102	0.003	0.036	0.014
16	-0.011	0.009	0.011	60	0	-0.015	0.012	103	-0.005	0.071	0.013
17	-0.01	0.006	0.011	61	0.01	-0.022	0.011	104	0.005	0.065	0.015
18	-0.013	-0.006	0.011	62	0.017	-0.026	0.012	105	-0.006	0.047	0.012
19	-0.007	0.004	0.011	63	-0.015	0.013	0.011	106	-0.004	0.02	0.013
20	-0.019	0.016	0.011	64	-0.004	-0.008	0.012	107	-0.008	0.019	0.011
21	-0.001	0.001	0.011	65	-0.003	-0.001	0.012	108	0.002	0.01	0.012
22	-0.001	0.002	0.012	66	-0.001	-0.009	0.01	109	-0.009	0.009	0.012
23	0.01	-0.002	0.011	67	-0.023	0.007	0.011	110	-0.003	-0.008	0.012
24	0.008	-0.01	0.011	68	-0.022	0.013	0.011	111	-0.003	-0.002	0.012
25	0.001	0.012	0.012	69	-0.015	0.008	0.01	112	-0.016	0.019	0.014
26	-0.008	0.008	0.011	70	0.006	-0.01	0.011	113	0.032	-0.01	0.013
27	0.024	0.058	0.023	71	-0.002	-0.011	0.011	114	0.019	0.008	0.013
28	-0.002	-0.005	0.01	72	-0.002	-0.002	0.011	115	-0.086	0.014	0.014
30	-0.004	0.001	0.007	73	0.007	0.002	0.01	116	-0.004	0.032	0.017
31	-0.025	0.028	0.009	74	0.014	-0.011	0.011	117	-0.015	0.014	0.018
32	-0.03	0.022	0.008	75	-0.001	-0.012	0.012	118	-0.001	0.034	0.019
33	0	0.005	0.011	76	0.002	-0.003	0.011	119	0.107	0.014	0.018
34	0.031	-0.014	0.011	77	-0.005	0.006	0.012	120	0.068	0.002	0.018
35	0.03	-0.024	0.009	78	-0.003	-0.002	0.013	121	0.012	-0.003	0.019
36	0.046	-0.025	0.01	79	0.008	-0.011	0.013	122	-0.06	-0.017	0.02
37	0.039	-0.022	0.012	80	-0.001	-0.005	0.013	123	-0.069	-0.018	0.018
38	0.048	-0.008	0.013	81	-0.013	0.012	0.013	124	0	0.007	0.014
39	0.079	-0.02	0.013	82	-0.019	0.017	0.012	125	0.02	0.013	0.016
40	0.033	-0.001	0.011	83	-0.034	0.02	0.012	126	-0.008	0.004	0.018
41	0.002	0.016	0.011	84	-0.01	0.013	0.012	127	-0.038	-0.022	0.017
42	0.016	0.001	0.012	85	0.01	-0.01	0.012	128	0.048	0.013	0.017
43	0.024	-0.014	0.011	86	0.009	-0.008	0.012	129	0.005	-0.009	0.019
44	0.004	-0.016	0.011	87	0.008	-0.011	0.012	130	-0.027	-0.001	0.019

131	-0.062	0	0.021	176	-0.008	-0.01	0.026	221	0.007	-0.002	0.024
132	-0.011	0.01	0.021	177	-0.045	-0.014	0.023	222	0.017	-0.012	0.02
133	-0.011	0.001	0.02	178	-0.057	-0.021	0.022	223	-0.016	-0.007	0.02
134	-0.05	0.015	0.023	179	-0.064	-0.013	0.02	224	0.018	0.001	0.019
135	0.002	-0.033	0.024	180	-0.018	-0.014	0.019	225	-0.024	0.008	0.021
136	0.023	0.022	0.03	181	0.033	0.005	0.018	226	0.01	-0.013	0.021
137	0.097	0.039	0.018	182	0.007	-0.002	0.016	227	0.013	0.003	0.023
138	0	-0.001	0.015	183	-0.016	-0.004	0.016	228	-0.056	0.003	0.023
139	0	-0.062	0.027	184	0.007	-0.008	0.017	229	-0.001	-0.01	0.021
140	-0.053	-0.025	0.019	185	-0.011	0.004	0.016	230	0.014	-0.013	0.022
141	-0.013	-0.005	0.019	186	0.037	0.009	0.016	231	0.003	-0.025	0.02
142	-0.044	-0.012	0.019	187	0.032	0.009	0.016	232	0.074	0.002	0.019
143	-0.016	-0.013	0.018	188	0.01	0.005	0.015	233	0.04	-0.007	0.018
144	0.007	-0.019	0.02	189	-0.008	0.043	0.022	234	-0.002	-0.025	0.021
145	-0.013	0.006	0.022	190	-0.051	-0.017	0.019	235	0.037	-0.005	0.024
146	-0.014	0.006	0.022	191	-0.028	-0.004	0.014	236	0.091	0.015	0.02
147	-0.049	0.015	0.022	192	-0.007	0.008	0.013	237	0.111	-0.001	0.019
148	-0.008	0.01	0.021	193	-0.006	-0.003	0.013	238	0.024	0.015	0.023
149	-0.03	0.003	0.018	194	0.044	0.008	0.014	239	0	0.031	0.023
150	-0.075	-0.02	0.022	195	0.062	-0.005	0.013	240	-0.062	0.001	0.02
151	-0.022	0.019	0.022	196	0.008	-0.013	0.015	241	-0.052	0.024	0.021
152	-0.04	-0.013	0.022	197	0.01	0.002	0.015	242	-0.06	0.015	0.024
153	0.004	0.014	0.016	198	-0.021	-0.01	0.015	243	0.023	0.024	0.023
154	-0.001	0.014	0.017	199	0.043	0.012	0.015	244	-0.056	-0.001	0.022
155	0.019	0.001	0.017	200	0.019	-0.012	0.015	245	0.027	0	0.023
156	-0.014	0.001	0.017	201	0.051	0.002	0.015	246	0.006	0	0.024
157	-0.016	-0.009	0.019	202	-0.011	-0.002	0.015	247	-0.186	-0.01	0.021
158	0.029	0.012	0.022	203	-0.089	-0.003	0.016	248	-0.088	-0.007	0.019
159	-0.009	0.005	0.023	204	-0.009	-0.004	0.016	249	-0.082	-0.006	0.017
160	-0.034	-0.004	0.021	205	0.061	0.01	0.017	250	0	-0.053	0.015
161	-0.044	-0.003	0.02	206	-0.01	-0.011	0.017	251	0.018	0.038	0.026
162	-0.078	0.009	0.022	207	0.013	-0.007	0.015	252	-0.118	0.006	0.025
163	-0.056	0.007	0.024	208	-0.047	0.009	0.016	253	0.018	-0.004	0.016
164	0.004	0.012	0.023	209	-0.031	0.024	0.018	254	-0.035	0.001	0.014
165	0.024	0.041	0.029	210	0.007	-0.023	0.014	255	-0.015	-0.003	0.013
166	-0.076	0.015	0.031	211	-0.002	-0.013	0.013	256	0.022	-0.007	0.016
167	-0.022	-0.014	0.024	212	0.001	-0.014	0.014	257	0.034	-0.01	0.018
168	0.034	-0.002	0.025	213	0.013	-0.005	0.015	258	0.009	-0.016	0.015
169	-0.071	-0.027	0.028	214	0.006	-0.024	0.018	259	-0.026	-0.01	0.019
170	-0.003	-0.005	0.023	215	0.055	-0.002	0.018	260	-0.009	0.002	0.018
171	0.045	0.01	0.021	216	0.034	-0.007	0.019	261	-0.032	0.004	0.016
172	-0.042	-0.059	0.03	217	0.041	0.007	0.019	262	-0.041	-0.008	0.017
173	-0.01	-0.033	0.026	218	0.089	-0.009	0.02	263	-0.047	0.001	0.019
174	-0.022	0.017	0.025	219	0.043	-0.001	0.019	264	-0.041	-0.007	0.022
175	-0.064	0.003	0.026	220	-0.002	-0.019	0.023	265	-0.148	0.017	0.022

266	-0.061	-0.001	0.02	311	-0.036	-0.003	0.016	356	0.072	-0.029	0.014
267	-0.048	-0.023	0.023	312	0.03	0.001	0.017	357	0.004	0.007	0.013
268	-0.059	-0.005	0.025	313	0.011	-0.005	0.017	358	0.004	-0.009	0.014
269	-0.038	-0.012	0.025	314	-0.026	0.003	0.015	359	0	-0.002	0.014
270	0.136	-0.012	0.029	315	0.012	0.007	0.017	360	-0.079	-0.009	0.013
271	0.075	0.018	0.028	316	-0.013	0.011	0.017	361	0.02	-0.008	0.016
272	-0.009	0.013	0.021	317	0.015	0.017	0.016	362	-0.056	-0.001	0.016
273	0.008	0.001	0.021	318	0.018	0.022	0.018	363	0.027	-0.015	0.014
274	-0.061	0.003	0.023	319	0.012	0.014	0.02	364	0.07	-0.025	0.014
275	-0.055	-0.01	0.026	320	0.021	0.004	0.02	365	-0.005	-0.008	0.015
276	-0.081	0.006	0.026	321	0.031	-0.007	0.019	366	0.014	0.006	0.015
277	-0.014	0.016	0.024	322	0.006	0.015	0.022	367	0.03	-0.001	0.015
278	0.009	0.008	0.027	323	-0.016	-0.025	0.022	368	0.009	0.004	0.016
279	0.007	-0.012	0.028	324	-0.053	-0.002	0.023	369	-0.074	-0.004	0.017
280	-0.023	-0.005	0.024	325	-0.04	-0.021	0.022	370	-0.053	0.026	0.018
281	-0.074	-0.026	0.023	326	-0.095	0	0.022	371	0.014	0.033	0.016
282	-0.056	-0.019	0.022	327	-0.013	-0.01	0.026	372	-0.061	-0.001	0.014
283	-0.041	0.009	0.031	328	0.039	0.001	0.023	373	-0.036	0.003	0.014
284	-0.057	-0.017	0.022	329	-0.036	0.008	0.025	374	-0.013	-0.009	0.016
285	0.037	0.007	0.025	330	0.174	-0.015	0.027	375	-0.021	0.004	0.017
286	0.048	0.018	0.026	331	0.146	-0.003	0.022	376	-0.058	-0.018	0.015
287	0.072	-0.002	0.021	332	-0.033	-0.017	0.02	377	0	-0.009	0.015
288	0.078	-0.065	0.027	333	0.028	-0.008	0.02	378	0.075	0.023	0.015
289	0.013	-0.016	0.026	334	-0.008	0.004	0.022	379	0.05	0.018	0.015
290	0.032	-0.001	0.022	335	-0.011	0.006	0.026	380	0.084	-0.014	0.016
291	0.034	0.016	0.026	336	-0.021	0.013	0.024	381	0.055	-0.006	0.017
292	-0.042	0.018	0.03	337	-0.125	0.01	0.022	382	0.011	-0.015	0.023
293	-0.069	0.033	0.029	338	-0.103	-0.01	0.024	383	0.098	-0.005	0.019
294	-0.087	0.055	0.025	339	0.018	-0.015	0.02	384	0.095	0.009	0.019
295	0.106	0.006	0.026	340	-0.039	-0.004	0.026	385	-0.1	-0.018	0.021
296	-0.013	-0.012	0.029	341	0.062	-0.021	0.027	386	0.007	0.001	0.019
297	-0.05	0.011	0.026	342	0.098	-0.004	0.029	387	0.006	-0.004	0.018
298	-0.023	0.006	0.019	343	0.052	-0.005	0.03	388	-0.029	0	0.02
299	0.024	0.037	0.029	344	0.035	-0.003	0.021	389	0.013	-0.018	0.021
300	-0.121	0.012	0.02	345	0.069	0.001	0.019	390	0.016	-0.001	0.021
301	-0.178	0.013	0.022	346	0.018	-0.028	0.028	391	0.043	-0.004	0.02
302	-0.136	0.006	0.023	347	-0.137	0.008	0.021	392	0.015	-0.001	0.021
303	-0.148	-0.007	0.021	348	-0.003	0.004	0.016	393	-0.038	0.006	0.021
304	-0.054	-0.013	0.023	349	-0.045	0.012	0.015	394	0.031	-0.012	0.02
305	0.009	0.006	0.025	350	-0.042	-0.005	0.014	395	0.04	-0.02	0.02
306	0.017	0.021	0.023	351	0.025	-0.001	0.014	396	0.058	0.002	0.02
307	-0.025	0.012	0.02	352	0.024	-0.011	0.015	397	0.059	0.005	0.018
308	0.002	0.035	0.026	353	0.016	0.011	0.014	398	-0.081	0.012	0.019
309	0.024	-0.03	0.016	354	0.167	0.009	0.015	399	-0.042	-0.012	0.021
310	-0.085	0.007	0.017	355	0.054	-0.005	0.016	400	-0.1	0.003	0.02

401	-0.117	0.004	0.015	446	-0.073	0.037	0.02	491	0.015	-0.005	0.022
402	-0.018	0.018	0.017	447	-0.005	0.018	0.016	492	-0.139	0.021	0.021
403	-0.047	0.02	0.018	448	0.01	-0.005	0.016	493	-0.025	0.015	0.021
404	-0.038	0.01	0.016	449	0.078	0.004	0.019	494	-0.032	0.015	0.022
405	0.013	0.014	0.018	450	0.057	0.006	0.02	495	-0.001	-0.023	0.019
406	0.022	0.019	0.02	451	0.116	0.007	0.019	496	0.055	-0.015	0.02
407	0.031	0.008	0.019	452	0.096	0.004	0.02	497	-0.021	-0.013	0.021
408	0.052	0.021	0.019	453	0.09	0.022	0.02	498	0.053	-0.011	0.023
409	0.083	-0.005	0.018	454	0.106	0.03	0.021	499	-0.022	-0.01	0.024
410	0.053	-0.012	0.017	455	0.137	0.008	0.02	500	-0.023	-0.004	0.023
411	0.057	-0.022	0.019	456	0.078	0.023	0.02	501	-0.003	-0.016	0.02
412	0.088	0.003	0.017	457	-0.054	0.028	0.02	502	-0.021	-0.054	0.026
413	-0.015	-0.003	0.024	458	0.03	0.01	0.019	503	0.04	0.027	0.03
414	0.001	0.092	0.011	459	0.038	-0.016	0.021	504	-0.053	0.008	0.015
415	0	0.027	0.014	460	0.032	-0.047	0.024	505	0.032	0.006	0.013
416	-0.074	0.001	0.017	461	0.09	-0.037	0.021	506	0.027	-0.011	0.014
417	0.06	-0.012	0.015	462	-0.024	-0.02	0.02	507	-0.022	0.003	0.015
418	0.047	-0.023	0.013	463	-0.051	-0.009	0.019	508	-0.023	0.018	0.021
419	-0.047	-0.025	0.013	464	-0.008	-0.002	0.02	509	0.026	0.016	0.015
420	-0.006	-0.03	0.015	465	0.014	0.005	0.022	510	-0.042	0.004	0.016
421	-0.031	0.002	0.014	466	-0.012	0.015	0.021	511	-0.016	0.005	0.015
422	-0.099	-0.001	0.015	467	-0.002	-0.013	0.022	512	0.126	-0.014	0.017
423	-0.128	0	0.014	468	0.022	-0.007	0.023	513	0.09	-0.02	0.014
424	-0.053	-0.018	0.015	469	0.041	-0.011	0.025	514	0.002	0.001	0.014
425	-0.139	-0.002	0.017	470	-0.061	0.004	0.024	515	-0.035	0.019	0.014
426	-0.082	-0.002	0.015	471	0.007	-0.015	0.022	516	0.105	-0.004	0.014
427	-0.079	0.006	0.014	472	-0.027	0.013	0.021	517	0.037	-0.001	0.015
428	-0.032	0	0.016	473	0.033	-0.001	0.021	518	0.025	-0.003	0.015
429	-0.03	0	0.018	474	0.022	0.012	0.023	519	0.004	0.028	0.014
430	-0.022	-0.001	0.019	475	0.038	0.005	0.023	520	0.019	0.002	0.015
431	-0.11	-0.002	0.017	476	0.024	0	0.023	521	-0.048	0.004	0.015
432	-0.005	-0.013	0.016	477	-0.087	-0.024	0.021	522	0.006	-0.001	0.014
433	0.074	0.001	0.016	478	-0.005	-0.006	0.025	523	0.048	0.026	0.015
434	0.125	0.003	0.017	479	0.031	-0.01	0.017	524	-0.036	-0.001	0.015
435	0.09	0.003	0.016	480	-0.012	-0.005	0.016	525	-0.069	-0.021	0.015
436	-0.03	0.004	0.018	481	0.058	-0.018	0.018	526	-0.006	0.005	0.016
437	-0.038	0.009	0.018	482	0.003	0.019	0.019	527	-0.03	0.012	0.014
438	0.004	0.002	0.018	483	0.004	0.004	0.02	528	-0.051	-0.02	0.015
439	0.092	0.011	0.018	484	0.005	0.008	0.019	529	0.027	-0.007	0.016
440	0.022	-0.001	0.021	485	-0.021	-0.008	0.019	530	-0.04	0.012	0.013
441	0.022	0.008	0.02	486	0.007	0.023	0.02	531	-0.017	0.003	0.017
442	0.021	0.001	0.021	487	0.054	0.008	0.019	532	0.054	-0.003	0.024
443	-0.02	0.025	0.022	488	0.007	0.015	0.021	533	0.035	-0.008	0.012
444	-0.037	-0.002	0.018	489	-0.001	-0.017	0.022	534	0.178	-0.001	0.016
445	-0.049	0.026	0.019	490	-0.044	0.003	0.021	535	0.011	0.028	0.014

536	-0.045	-0.005	0.011	581	-0.059	0.057	0.032			
537	-0.063	-0.007	0.012	582	0	0.026	0.023			
538	0.118	-0.023	0.014	583	-0.002	0.052	0.013			
539	0.194	-0.027	0.017	584	-0.3	0.043	0.03			
540	-0.004	-0.006	0.015	585	0	0.108	0.053			
541	-0.046	0.012	0.015	586	0	-0.021	0.006			
542	0.097	0.014	0.016	587	0	0.13	0.023			
543	-0.009	-0.004	0.017	588	0	0.088	0.051			
544	0.018	0.017	0.016	589	0	0.093	0.035			
545	0.05	0.016	0.017	590	-0.417	-0.032	0.039			
546	-0.092	0.022	0.017	591	0	0.081	0.022			
547	-0.258	0.046	0.019	592	-0.214	0.038	0.041			
548	-0.005	-0.041	0.019	593	-0.055	0.082	0.018			
549	-0.03	-0.017	0.014	594	0	0	0.003			
550	-0.03	-0.002	0.016	595	0	0.008	0.017			
551	-0.142	0.03	0.016	596	0.372	0.352	0.064			
552	0.027	0.006	0.016							
553	-0.004	0.003	0.015							
554	0.05	-0.001	0.014							
555	0.091	0.004	0.016							
556	0.007	-0.02	0.016							
557	0.008	0.019	0.015							
558	-0.015	0.019	0.015							
559	0.031	-0.016	0.016							
560	0	0.003	0.021							
561	0.066	0.051	0.017							
562	0.159	-0.015	0.027							
563	0.086	0.003	0.025							
564	0.01	-0.025	0.015							
565	0.008	0.006	0.016							
566	0.051	-0.009	0.018							
567	-0.028	-0.016	0.03							
568	0	0.268	0.048							
569	0	0.147	0.036							
570	0	0.083	0.048							
571	0	0.04	0.038							
572	0	0.188	0.041							
573	0	-0.008	0.013							
574	0	-0.091	0.04							
575	0.234	0.072	0.032							
576	0	-0.124	0.06							
577	0	-0.087	0.021							
578	0	0.103	0.032							
579	0.154	0.048	0.012							
580	0.273	-0.145	0.09							

Table 3: Overall Relative Accuracy (m)	
Category	Mismatch
Average 3D Mismatch	0.01812
Average Z Mismatch	0.01812

Table 4: Internal Observation Statistics (m)			
Category	X	Y	Z
Average Magnitude	0.00067	0.00408	0.01862
RMS Values	0.06248	0.03128	0.01993
Maximum Values	0.44100	0.35200	0.09
Observation Weight	-	-	284007

Table 5: TerraMatch Tie Lines	
Category	Observations
Surface Lines	137,407

Absolute Adjustment Accuracy Results

A vertical accuracy assessment of the forty-seven (47) control points against the LiDAR point cloud swath data can be found in the table below. The coordinates provided are in NAD83 (2011), UTM Zone 18N, NAVD88 (Geoid12A), Meters.

Table 6: Control Point Assessment (Swath) (m)						
Point ID	Easting	Northing	Known Z	Laser Z	Description	Delta Z
701	421130.421	4779342.289	117.56	117.55	CP01	-0.01
702	429115.272	4777298.384	118.93	118.94	CP02	0.01
703	439577.423	4778376.87	118.38	118.34	CP03	-0.04
704	449269.648	4771646.965	135.65	slope	CP04	*
705	438831.874	4768806.305	147.56	147.58	CP05	0.02
706	431744.348	4758765.952	286.43	286.4	CP06	-0.03
707	444489.156	4759379.787	411	411.04	CP07	0.04
708	425124.698	4761747.225	375.02	375.01	CP08	-0.01
709	456566.609	4759417.939	411.87	411.88	CP09	0.01
717	504826.878	4751408.749	465.47	465.54	CP17	0.07
718	502763.251	4744186.191	459.61	459.58	CP18	-0.03
719	525430.172	4744931.659	227.7	slope	CP19	*
720	485930.492	4721642.616	396.65	396.74	CP20	0.09
721	498629.413	4731470.317	399.36	399.35	CP21	-0.01
722	511660.156	4737241.262	387.33	387.36	CP22	0.03
723	493654.370	4717478.768	390.84	390.91	CP23	0.07
724	512246.585	4726837.328	393.82	393.88	CP24	0.06
725	523728.314	4728366.907	478.54	478.56	CP25	0.02
726	429501.604	4744296.949	390.6	390.5	CP26	-0.1
727	442017.761	4751352.663	476.2	476.14	CP27	-0.06
728	443524.060	4745553.877	437.9	437.88	CP28	-0.02

Point ID	Easting	Northing	Known Z	Laser Z	Description	Delta Z
729	442178.062	4735446.064	517.44	517.33	CP29	-0.11
730	427379.183	4730022.986	403.46	403.48	CP30	0.02
731	434469.955	4724705.743	415.68	415.7	CP31	0.02
732	438766.950	4716784.332	545.84	545.84	CP32	0
733	429227.629	4705594.698	488.86	488.93	CP33	0.07
734	453662.851	4748249.826	363.74	363.73	CP34	-0.01
735	453424.116	4735554.998	331.27	331.35	CP35	0.08
736	465668.670	4753294.59	417.76	417.71	CP36	-0.05
737	466972.865	4744568.849	371.93	371.94	CP37	0.01
738	466824.847	4738722.885	462.88	462.89	CP38	0.01
739	490738.155	4737734.142	472.61	472.68	CP39	0.07
740	465539.032	4732345.359	414.4	414.51	CP40	0.11
741	473999.216	4728725.737	374.23	374.26	CP41	0.03
742	473944.268	4740082.152	414.11	414.19	CP42	0.08
745	479474.762	4753945.738	393.28	393.31	CP45	0.03
746	485557.272	4762852.266	398.9	398.91	CP46	0.01
747	490735.354	4753123.257	369.66	369.7	CP47	0.04
748	498185.671	4755519.616	435.17	435.12	CP48	-0.05
749	513452.925	4758810.974	204.85	204.86	CP49	0.01
751	504496.158	4715393.242	367.67	367.71	CP51	0.04
752	515766.08	4721097.357	459	459.02	CP52	0.02
753	526950.511	4719096.593	445.26	445.28	CP53	0.02
754	509307.986	4709372.194	376.16	376.16	CP54	0
755	521031.658	4707187.744	421.15	421.1	CP55	-0.05
756	528506.332	4699393.14	588.83	588.87	CP56	0.04
757	509308.938	4696642.671	424.71	424.72	CP57	0.01

An overall statistical assessment of the control points can be found in the table below. The coordinates provided are in NAD83 (2011), UTM Zone 18N, NAVD88 (Geoid12A), Meters.

Category	# of Points	Min (m)	Max (m)	Mean (m)	Std Dev (m)	RMSE _Z (m)
Control Points	47	-0.110	0.110	0.012	0.047	0.048

Section 5: Classification

Classification was conducted in accordance with USGS publication “LiDAR Base Specification”, Version 1.2 November 2014; Table 6. “Minimum classified point cloud classification scheme”; Page 11.

Code	Description
1	Processed, but unclassified.
2	Bare earth.
7	Low noise.
9	Water
10	Ignored Ground
17	Bridge decks.
18	High noise.

The calibrated dataset, omitting any crosslines used in the calibration process, was used to create the classification point cloud dataset. The classification point cloud was produced with GeoCue in Log ASCII Standard (LAS) file format with attributes for each return including but not limited to time, easting, northing, elevation, intensity, return number, and return classification. Utilizing both automated and manual methods the point cloud was filtered to identify bare-earth surface points removing above ground features and erroneous noise.

The combination of GeoCue and TerraScan software packages were used for the automated method of macro based bare-earth filtering. Multiple iterations of automated filtering were utilized to address the ever changing terrain while retaining a homogenous surface. After automated filtering, manual editing was completed using TerraScan and TerraModeler in MicroStation. Editing was performed to ensure that 100% of the identified bare-earth surface was visually inspected for errors, completeness, and accuracy. In addition, hydro features were classified but not verified against vector features. Bridge decks were also classified. Points floating above or positioned below the bare earth surface were designated as low noise and high noise.

Section 6: Hydro-Flattened DEM Creation & Breaklines

Digital Elevation Models (DEMs) are defined by USGS as “... a digital cartographic representation of the elevation of the land at regularly spaced intervals in x and y directions, using z values referenced to a common vertical datum.” and having “...bare-earth z values at regularly spaced intervals in x and y directions; however, grid spacing, datum coordinate systems, data formats and other characteristics may vary widely.”

DEMs were created using the “Blast2Dem” tool in “LAS-Tools”. Class 2 bare-earth and Class 9 water points were imported and a large raster DEM file was created. The large file was loaded into “Global Mapper” and DEM tiles were exported to raster tiles measuring 1,500 m x 1,500 m in ERDAS Imagine Format.

Breaklines, generated from the LiDAR point cloud, were incorporated into the DEM surfaces. To prevent unnatural surface artifacts from being created between mass points and breakline vertices, ground points located near the breaklines were classified to Class 10 Ignored Ground.

Final DEM files were checked and reviewed using “Global Mapper” to verify:

- 1) edge match,
- 2) geo-referencing and;
- 3) to check for data voids.

Section 7: Final QA/QC

Both automated and manual procedures were utilized to check the final products prior to delivery. Using TerraScan and LP360, the completeness, classification, headers, and attributes were checked for consistency and compliance with project specifications. GeoCue and Global Mapper were used for a final bare earth surface review.

TerraScan:

- 1) Generates relative and absolute adjustment reports;
 - a) The Ground Control and/or Check Points are loaded into Terrascan using a function called “Output Control Report”. Using the ground class, a control report is generated and examined to determine whether the Dz is within tolerance of the specifications.

LP 360

- 1) Check header format;
 - a) Files are loaded into LP360 and the header information displayed. The data is checked to validate correctness and consistency.
- 2) Check version numbers;

- 3) Review the project parameters in the header;

LASTools

- 1) LAS Info used to check completeness of data;
 - a) LASinfo provides additional details in the header to validate project parameters. If an error is discovered, then changes can be made
- 2) Validate project classifications;
 - a) "lasinfo" creates text files that are reviewed to check that only project classifications are populated.
- 3) Using Las-to-Las in "LAS-Tools" data are converted to LAS version 1.4.
 - a) lastolas is used to convert the LAS v1.2 files to LAS v1.4. The data is exported with the Point Data Record Format (PDRF) changed for each file from 1 to 6 in order for the file to be converted correctly. Changing the PDRF to 6 is necessary because it supports added elements such as "Overlap" bit flags, Coordinate Reference Systems (CRS) and Well Known Text (WKT). The new version number is also specified in the line of code in order to export tiles whose headers read "1.4".
- 4) Overlap Points flagged to adhere to specifications.
 - a) "lasoverage" is used to create "Overlap" bit flags along the edges of crossing flightlines.

Global Mapper

- 1) Final DEMs checked for edge-matching, geo-referencing and data voids
 - a. Map catalog is created to load all the data at one time and then is examined using traditional QC/QA methods to validate correctness.
- 2) Overlap points checked for correct classification flag
 - a. LiDAR tiles are loaded into global mapper and points are tag/selected in overlap regions in order to see in the attribute table that the Overlap bit read "Y" for "Yes".
- 3) Tile names checked to coincide with tile index.
 - a. A tile grid is loaded with labels of the "Photohead" turned on and the corresponding tile is then loaded. If the lidar tile appears in the correct tile, then the tile is named in accordance with the tile grid.
- 4) Calculating NVA and VVA Reports
 - a. The NVA, VVA and Final DEMs of the LiDAR are loaded into Global Mapper to run a statistical report of the elevation differences between features. The elevation difference between the QA points and the DEMs is calculated and embedded, via attribute, to both the NVA and VVA files. These files are then exported from Global Mapper and statistics are calculated.

A summary of the vertical accuracy assessment of the Non-Vegetated Vertical Accuracy (NVA) check points against the final DEM surface can be found in Table 8 below. The coordinates provided are in NAD83 (2011), UTM Zone 18N, NAVD88 (Geoid12A), Meters. Overall, the results proved to be satisfactory. The overall RMSE_z for the NVA checkpoints was 6.7 cm and compared favorably to the USGS specification of < 10 cm, (USGS "LiDAR Base Specification", Page 10, Table 5;). The NVA at the 95% confidence interval was 13.0 cm which is less than the USGS specification of < 19.6 cm. (USGS "LiDAR Base Specification", Page 10, Table 5;).

For a complete listing of the NVA points, see Table 10.

Table 8: NVA Check Point Error Statistics (m)						
Category	# of Points	Min (m)	Max (m)	Mean (m)	Std Dev (m)	RMSE _z (m)
Check Points	380	-0.184	0.922	-0.002	0.066	0.067

A summary of the vertical accuracy assessment of the Vegetated Vertical Accuracy (VVA) check points against the final DEM surface can be found in Table 9, below. The coordinates provided are in NAD83 (2011), UTM Zone 18N, NAVD88 (Geoid12A), Meters. Overall, the results proved to be satisfactory. The overall RMSE_z for the VVA checkpoints was 7.3 cm and the VVA at the 95% confidence interval was 14.3 cm. The USGS specification for the VVA at the 95% confidence level is < 29.4 cm. (USGS "LiDAR Base Specification", Page 10, Table 5;).

For a complete listing of the VVA points, see Table 11.

Table 9: VVA Check Point Error Statistics (m)						
Category	# of Points	Min (m)	Max (m)	Mean (m)	Std Dev (m)	RMSE _z (m)
Check Points	381	-0.238	0.260	-0.040	0.061	0.073

Table 10: NVA Check Point Assessment (DEM) (m)

Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
1088	439449.732	4778392.213	119.2519	119.202	0.0499	BARE EARTH
1089	439455.648	4778397.232	119.3027	119.307	-0.0043	LAWN
1090	439452.759	4778372.169	118.7512	118.737	0.0142	BLACKTOP
1094	439485.806	4778328.062	119.3237	119.347	-0.0233	LAWN
1095	439487.347	4778347.635	119.7011	119.687	0.0141	BLACKTOP
2011	449217.848	4771653.519	135.8916	135.896	-0.0044	BARE EARTH
2012	449236.857	4771650.193	135.8128	135.837	-0.0242	LAWN
2013	449256.926	4771633.522	135.6314	135.596	0.0354	BLACKTOP
2014	449257.158	4771626.417	135.882	135.86	0.022	BLACKTOP
2015	449258.272	4771626.494	135.9091	135.876	0.0331	BLACKTOP
2016	449260.536	4771623.792	135.9584	135.937	0.0214	BLACKTOP
2017	449262.402	4771621.549	135.9758	135.959	0.0168	BLACKTOP
2018	449262.271	4771620.372	135.9766	135.952	0.0246	BLACKTOP
2019	449259.928	4771618.377	135.9305	135.924	0.0065	BLACKTOP
2020	449256.852	4771616.001	135.9391	135.923	0.0161	BLACKTOP
2021	449252.289	4771621.279	135.8149	135.823	-0.0081	BLACKTOP
2022	449252.419	4771622.437	135.8234	135.801	0.0224	BLACKTOP
2023	449254.839	4771624.517	135.8431	135.83	0.0131	BLACKTOP
2042	449292.685	4771722.079	136.3818	136.354	0.0278	BLACKTOP
3013	455927.343	4759411.395	443.8152	443.817	-0.0018	BLACKTOP
3020	455985.488	4759402.879	440.4574	440.498	-0.0406	LAWN
3021	455985.467	4759407.515	440.8343	440.841	-0.0067	BARE EARTH
3022	455985.461	4759408.434	440.943	440.898	0.045	BARE EARTH
3023	455985.569	4759414.586	440.9266	440.901	0.0256	BLACKTOP
3024	455985.549	4759415.374	440.8465	440.854	-0.0075	BARE EARTH
3026	455946.325	4759414.455	442.8028	442.784	0.0188	BLACKTOP
3027	455946.145	4759408.405	442.8595	442.825	0.0345	BLACKTOP
3028	455927.667	4759402.423	443.5558	443.545	0.0108	BLACKTOP
3029	455931.360	4759420.251	443.321	443.314	0.007	BLACKTOP
3030	455906.945	4759414.323	444.5883	444.594	-0.0057	BLACKTOP
3031	455907.210	4759408.156	444.6851	444.648	0.0371	BLACKTOP
3032	455876.176	4759408.084	446.0988	446.058	0.0408	BLACKTOP
3033	455875.461	4759414.277	446.0893	446.075	0.0143	BLACKTOP
3037	455839.005	4759414.170	447.8125	447.805	0.0075	BLACKTOP
3038	455838.502	4759408.077	447.9026	447.845	0.0576	BLACKTOP
3039	455845.224	4759406.857	447.4899	447.485	0.0049	BARE EARTH
3040	455845.420	4759404.550	447.2351	447.261	-0.0259	LAWN
4006	444485.972	4759385.672	411.2014	411.192	0.0094	BLACKTOP
4007	444489.425	4759385.667	411.129	411.132	-0.003	BLACKTOP
4013	444490.877	4759359.376	410.8052	410.803	0.0022	BARE EARTH
4018	444466.468	4759293.978	409.535	409.56	-0.025	LAWN
4019	444483.426	4759305.021	409.9077	409.904	0.0037	BLACKTOP
4020	444493.786	4759325.641	410.0534	410.048	0.0054	BARE EARTH
4021	444494.658	4759343.150	410.7643	410.788	-0.0237	LAWN

Table 10: NVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
4022	444499.225	4759385.742	411.0319	411.023	0.0089	BLACKTOP
4023	444519.871	4759385.293	410.4917	410.479	0.0127	BLACKTOP
4024	444537.776	4759384.951	409.977	409.963	0.014	BLACKTOP
4025	444558.911	4759384.887	409.5654	409.581	-0.0156	BLACKTOP
4026	444577.055	4759384.092	409.2809	409.275	0.0059	BLACKTOP
4048	444475.599	4759444.212	411.781	411.791	-0.01	LAWN
5011	425074.293	4761218.749	360.8655	360.836	0.0295	BARE EARTH
5012	425059.121	4761217.225	360.337	360.356	-0.019	LAWN
5073	425141.636	4761218.325	367.6108	367.585	0.0258	BLACKTOP
5074	425146.413	4761220.440	368.3179	368.283	0.0349	BLACKTOP
5075	425144.316	4761227.616	368.6011	368.58	0.0211	BLACKTOP
6013	431736.595	4758788.016	286.1108	286.102	0.0088	BARE EARTH
6014	431736.400	4758778.593	286.3412	286.351	-0.0098	LAWN
6015	431736.459	4758770.597	286.4389	286.448	-0.0091	LAWN
6026	431753.931	4758746.656	286.6923	286.663	0.0293	BLACKTOP
6027	431748.800	4758750.125	286.5141	286.517	-0.0029	BLACKTOP
6028	431744.490	4758754.944	286.3655	286.333	0.0325	BLACKTOP
6051	431766.153	4758751.126	287.3966	287.385	0.0116	BLACKTOP
6058	431744.902	4758721.663	285.2602	285.294	-0.0338	LAWN
6059	431754.729	4758706.605	285.3937	285.351	0.0427	BLACKTOP
6084	431739.194	4758909.895	286.5473	286.54	0.0073	BLACKTOP
6085	431736.558	4758909.422	286.5177	286.518	-0.0003	BLACKTOP
6086	431730.529	4758909.409	286.1107	286.106	0.0047	BLACKTOP
6087	431735.382	4758904.407	286.3341	286.327	0.0071	BLACKTOP
6088	431734.639	4758913.534	286.5713	286.582	-0.0107	BLACKTOP
6089	431727.170	4758922.491	286.6752	286.662	0.0132	LAWN
6090	431724.123	4758932.302	287.4689	287.489	-0.0201	LAWN
7025	429115.834	4777299.240	118.9699	118.98	-0.0101	BLACKTOP
7026	429114.515	4777298.260	118.9145	118.916	-0.0015	BLACKTOP
7030	429090.102	4777344.752	119.4818	119.549	-0.0672	LAWN
7031	429091.882	4777356.445	119.5213	119.536	-0.0147	BARE EARTH
7032	429098.955	4777358.944	119.5908	119.594	-0.0032	BLACKTOP
7033	429051.389	4777348.795	119.6673	119.669	-0.0017	BLACKTOP
7034	429050.998	4777328.262	119.3135	119.358	-0.0445	LAWN
7035	429078.573	4777322.720	119.5055	119.542	-0.0365	LAWN
7036	429085.548	4777320.668	119.6632	119.657	0.0062	BARE EARTH
8003	421246.625	4778548.899	119.8743	119.848	0.0263	BLACKTOP
8004	421243.308	4778549.610	119.9066	119.872	0.0346	BLACKTOP
8005	421244.035	4778556.139	120.0663	120.04	0.0263	BLACKTOP
8006	421247.553	4778555.817	120.0548	120.04	0.0148	BLACKTOP
8007	421245.431	4778553.067	119.9548	119.934	0.0208	BLACKTOP
8008	421241.516	4778555.170	120.0528	120.02	0.0328	BLACKTOP
8009	421239.831	4778555.194	120.039	120.006	0.033	BLACKTOP
8010	421239.719	4778550.321	119.9069	119.892	0.0149	BLACKTOP

Table 10: NVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
8011	421241.357	4778550.406	119.9253	119.906	0.0193	BLACKTOP
8012	421240.555	4778552.646	119.9807	119.962	0.0187	BLACKTOP
8013	421245.516	4778520.554	119.3214	119.331	-0.0096	LAWN
8014	421233.401	4778518.907	119.2998	119.289	0.0108	BARE EARTH
8015	421231.178	4778514.580	119.2489	119.235	0.0139	BARE EARTH
8016	421231.171	4778502.005	119.137	119.125	0.012	BARE EARTH
8039	421220.002	4778588.828	119.63	119.648	-0.018	LAWN
8040	421216.833	4778578.387	119.7574	119.755	0.0024	BARE EARTH
9040	438907.647	4768849.638	149.6869	149.65	0.0369	BLACKTOP
9044	438930.923	4768846.058	150.4743	150.494	-0.0197	BARE EARTH
9045	438925.837	4768844.936	150.4465	150.464	-0.0175	LAWN
9052	438933.375	4768759.362	149.9583	149.971	-0.0127	BLACKTOP
9053	438929.314	4768758.777	149.9266	149.909	0.0176	BLACKTOP
9054	438931.289	4768747.339	149.8894	149.89	-0.0006	BLACKTOP
9055	438935.237	4768747.998	149.8973	149.887	0.0103	BLACKTOP
9056	438932.766	4768752.324	149.9276	149.917	0.0106	BLACKTOP
9057	438928.429	4768735.199	149.5594	149.57	-0.0106	BLACKTOP
9058	438933.241	4768736.038	149.7399	149.718	0.0219	BLACKTOP
9059	438934.680	4768727.529	149.5438	149.548	-0.0042	BLACKTOP
9060	438929.712	4768726.770	149.3785	149.382	-0.0035	BLACKTOP
9061	438931.684	4768731.027	149.5818	149.558	0.0238	BLACKTOP
10013	527884.343	4719263.816	446.158	446.193	-0.035	GRAVEL
10014	527895.911	4719290.370	445.6095	445.657	-0.0475	BLACKTOP
10015	527907.667	4719312.663	445.32	445.368	-0.048	BLACKTOP
11003	509509.604	4696769.826	419.2762	419.306	-0.0298	GRAVEL
11004	509527.898	4696785.435	419.4369	419.486	-0.0491	GRAVEL
11005	509557.284	4696778.408	419.3859	419.436	-0.0501	LAWN
11006	509579.815	4696780.910	419.2556	419.322	-0.0664	LAWN
11009	509588.111	4696824.106	421.0525	420.131	0.9215	BLACKTOP
11010	509610.195	4696829.066	421.2043	421.174	0.0303	BLACKTOP
11013	509601.334	4696849.558	421.2453	418.17	3.0753	BLACKTOP (on Bridge)
11014	509587.239	4696846.414	421.0393	417.246	3.7933	BLACKTOP (on Bridge)
12003	528508.599	4699406.640	589.6509	589.73	-0.0791	BLACKTOP
12004	528500.878	4699440.615	591.7396	591.794	-0.0544	BLACKTOP
12007	528469.278	4699487.998	596.683	596.867	-0.184	LAWN
12008	528442.862	4699467.680	597.2329	597.298	-0.0651	LAWN
12015	528530.843	4699543.820	593.1517	593.219	-0.0673	BLACKTOP
12016	528546.679	4699555.351	593.3664	593.437	-0.0706	BLACKTOP
13004	521118.371	4707457.178	432.4646	432.474	-0.0094	BLACKTOP
13005	521096.119	4707432.795	431.6169	431.617	-0.0001	BLACKTOP
13014	521086.855	4707429.550	431.2622	431.295	-0.0328	LAWN
13015	521098.305	4707444.331	431.3655	431.405	-0.0395	LAWN
14005	508156.153	4708910.227	373.5358	373.504	0.0318	LAWN
14006	508136.995	4708930.220	375.5743	375.577	-0.0027	LAWN

Table 10: NVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
14007	508133.303	4708996.631	376.856	376.838	0.018	BLACKTOP
14012	508169.840	4708956.248	373.6546	373.656	-0.0014	BLACKTOP
14013	508200.294	4708965.064	371.8791	371.918	-0.0389	BLACKTOP
15004	520027.629	4752497.732	190.8197	190.839	-0.0193	BLACKTOP
15005	519988.901	4752481.651	190.2658	190.283	-0.0172	BLACKTOP
15012	519865.301	4752430.662	192.145	192.209	-0.064	BLACKTOP
15013	519863.156	4752452.035	192.3945	192.439	-0.0445	BLACKTOP
15014	519848.499	4752442.809	192.8691	192.965	-0.0959	LAWN
16003	525363.394	4744897.202	227.0224	227.006	0.0164	BLACKTOP
16004	525391.531	4744913.827	227.4135	227.416	-0.0025	BLACKTOP
16013	525428.355	4744936.108	227.9261	227.952	-0.0259	BLACKTOP
16014	525430.070	4744946.897	228.1994	228.182	0.0174	BLACKTOP
16015	525418.317	4744970.968	228.3532	228.317	0.0362	BLACKTOP
16017	525395.686	4744912.320	227.329	227.313	0.016	GRAVEL
16018	525425.807	4744941.815	227.7792	227.82	-0.0408	GRAVEL
17007	512208.292	4726797.183	392.2114	392.235	-0.0236	GRAVEL
17010	512204.857	4726826.308	393.0413	393.007	0.0343	LAWN
17011	512241.296	4726845.027	393.6807	393.699	-0.0183	LAWN
17012	512259.225	4726854.294	393.9587	393.988	-0.0293	GRAVEL
17013	512246.597	4726837.334	393.8317	393.811	0.0207	BLACKTOP
18003	515584.559	4720869.037	452.5675	452.553	0.0145	BLACKTOP
18004	515612.669	4720911.372	454.2399	454.24	-0.0001	BLACKTOP
18005	515601.583	4720917.247	455.0263	455.073	-0.0467	LAWN
18006	515588.635	4720897.394	454.6372	454.716	-0.0788	LAWN
18011	515636.156	4720939.489	455.9693	455.966	0.0033	GRAVEL
18012	515652.139	4720964.186	457.2869	457.314	-0.0271	GRAVEL
18013	515656.150	4720998.880	458.8295	458.842	-0.0125	BLACKTOP
18014	515680.407	4721004.216	457.5857	457.607	-0.0213	BLACKTOP
19003	521912.214	4727143.710	593.9618	593.982	-0.0202	BLACKTOP
19004	521910.475	4727186.426	593.2341	593.28	-0.0459	BLACKTOP
19006	521903.946	4727231.761	593.146	593.211	-0.065	GRAVEL
19007	521901.742	4727260.086	594.2867	594.246	0.0407	GRAVEL
19009	521842.634	4727269.924	600.9716	600.989	-0.0174	BLACKTOP
19011	521894.236	4727275.860	596.3312	596.338	-0.0068	BLACKTOP
19012	521915.046	4727312.591	597.0179	597.002	0.0159	LAWN
19014	521923.686	4727293.799	594.7398	594.761	-0.0212	LAWN
19016	521917.669	4727282.525	594.6906	594.698	-0.0074	BLACKTOP
20005	504486.615	4715186.730	364.9813	364.981	0.0003	BLACKTOP
20006	504477.176	4715193.926	365.6205	365.63	-0.0095	LAWN
20007	504511.079	4715198.954	364.7759	364.84	-0.0641	LAWN
20008	504533.356	4715221.023	365.4816	365.466	0.0156	BLACKTOP
20009	504543.748	4715251.755	365.6544	365.634	0.0204	BLACKTOP
20011	504574.816	4715189.339	364.9419	364.956	-0.0141	DIRT
20012	504595.443	4715172.306	364.8664	364.901	-0.0346	DIRT

Table 10: NVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
20013	504603.686	4715217.640	365.0485	365.029	0.0195	GRAVEL
21003	498329.151	4755418.878	437.9227	437.862	0.0607	BLACKTOP
21009	498132.629	4755428.174	436.788	436.727	0.061	BLACKTOP
21010	498140.758	4755463.645	435.8667	435.827	0.0397	LAWN
21011	498166.356	4755477.872	436.1119	436.065	0.0469	BLACKTOP
21012	498179.501	4755505.459	435.3583	435.291	0.0673	GRAVEL
21014	498208.362	4755496.363	435.6353	435.601	0.0343	BLACKTOP
22003	504832.644	4751410.500	465.7165	465.756	-0.0395	BLACKTOP
22004	504846.660	4751430.569	466.57	466.6	-0.03	BLACKTOP
22010	504829.163	4751398.975	465.3118	465.38	-0.0682	GRAVEL
23003	512968.510	4758874.269	214.8286	214.843	-0.0144	BLACKTOP
23004	513000.484	4758864.169	215.7899	215.823	-0.0331	BLACKTOP
23006	513053.797	4758850.954	216.4701	216.464	0.0061	LAWN
23014	513111.182	4758829.725	216.8842	216.91	-0.0258	LAWN
24003	511653.592	4737256.371	386.6803	386.691	-0.0107	GRAVEL
24004	511634.493	4737271.120	386.0915	386.158	-0.0665	GRAVEL
24008	511620.896	4737390.560	384.1575	384.156	0.0015	LAWN
24009	511609.442	4737423.629	384.1156	384.121	-0.0054	LAWN
24014	511619.460	4737363.191	384.7665	384.786	-0.0195	BLACKTOP
24015	511631.487	4737328.996	385.071	385.07	0.001	BLACKTOP
25003	498588.202	4731522.033	398.676	398.719	-0.043	GRAVEL
25004	498617.252	4731494.264	399.0873	399.077	0.0103	BLACKTOP
25005	498627.646	4731469.807	399.3269	399.335	-0.0081	BLACKTOP
25006	498637.128	4731442.555	400.3809	400.405	-0.0241	GRAVEL
25007	498630.302	4731407.958	402.6795	402.683	-0.0035	BLACKTOP
25010	498697.771	4731415.281	398.9858	398.967	0.0188	BLACKTOP
25012	498732.093	4731435.984	398.2089	398.275	-0.0661	LAWN
25013	498688.933	4731490.716	398.6239	398.696	-0.0721	LAWN
26010	490683.567	4737656.748	464.7122	464.704	0.0082	BLACKTOP
26011	490729.745	4737728.809	472.0086	472.009	-0.0004	BLACKTOP
26012	490723.303	4737742.492	473.3234	473.334	-0.0106	BLACKTOP
26015	490684.570	4737787.206	476.5288	476.593	-0.0642	LAWN
26017	490768.017	4737718.141	470.6782	470.723	-0.0448	BLACKTOP
26018	490828.430	4737690.942	467.8523	467.903	-0.0507	GRAVEL
27003	479444.236	4739953.700	350.1425	350.173	-0.0305	BLACKTOP
27004	479411.867	4739952.937	350.5202	350.574	-0.0538	BLACKTOP
27005	479394.531	4739945.590	350.7116	350.783	-0.0714	GRAVEL
27006	479375.633	4739935.474	351.4347	351.492	-0.0573	BLACKTOP
27007	479357.892	4739943.464	352.341	352.49	-0.149	LAWN
27008	479340.381	4739950.252	353.2912	353.368	-0.0768	BLACKTOP
27011	479342.479	4740016.994	354.3327	354.4	-0.0673	LAWN
27015	479431.649	4739972.977	349.7768	349.842	-0.0652	LAWN
29003	492345.333	4717837.289	483.7702	483.86	-0.0898	LAWN
29004	492326.814	4717827.741	485.1166	485.15	-0.0334	LAWN

Table 10: NVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
29005	492309.581	4717829.096	486.2418	486.281	-0.0392	BLACKTOP
29006	492269.682	4717824.474	488.4237	488.449	-0.0253	BLACKTOP
29014	492178.116	4717813.515	492.1631	492.225	-0.0619	BLACKTOP
30008	483618.941	4722351.307	481.5239	481.553	-0.0291	LAWN
30009	483641.416	4722377.100	481.982	481.991	-0.009	LAWN
30010	483666.429	4722367.522	482.4808	482.429	0.0518	GRAVEL
30011	483691.820	4722355.711	482.576	482.566	0.01	LAWN
30012	483694.436	4722330.022	482.1745	482.138	0.0365	LAWN
30015	483662.140	4722248.450	478.9316	478.859	0.0726	GRAVEL
31003	473738.228	4727727.970	373.673	373.673	0	GRAVEL
31004	473743.981	4727752.594	374.6791	374.674	0.0051	GRAVEL
31005	473728.046	4727776.304	376.127	376.148	-0.021	LAWN
31006	473720.476	4727800.692	376.307	376.323	-0.016	LAWN
31011	473760.330	4727827.090	376.6231	376.648	-0.0249	BLACKTOP
31012	473768.353	4727860.947	377.0042	377.012	-0.0078	BLACKTOP
31013	473778.879	4727878.610	376.5701	376.599	-0.0289	LAWN
31014	473775.435	4727891.388	377.3858	377.419	-0.0332	BLACKTOP
31015	473779.150	4727923.921	377.9469	377.962	-0.0151	BLACKTOP
32008	480768.962	4753327.336	383.0309	383.022	0.0089	BLACKTOP
32009	480733.755	4753329.283	383.1031	383.088	0.0151	BLACKTOP
32010	480664.176	4753332.943	383.2189	383.216	0.0029	BLACKTOP
32018	480594.503	4753336.819	383.5194	383.534	-0.0146	BLACKTOP
32020	480665.219	4753329.013	383.0394	383.045	-0.0056	GRAVEL
32021	480723.861	4753338.088	382.8688	382.906	-0.0372	LAWN
32022	480757.496	4753331.923	382.7927	382.838	-0.0453	GRAVEL
33003	485877.405	4762725.120	403.7656	403.858	-0.0924	BLACKTOP
33004	485866.577	4762710.755	403.8602	403.952	-0.0918	LAWN
33006	485818.547	4762716.060	403.0381	403.159	-0.1209	LAWN
33007	485766.250	4762743.893	401.1455	401.192	-0.0465	GRAVEL
33010	485741.603	4762805.996	401.5286	401.568	-0.0394	BLACKTOP
33011	485698.152	4762832.672	400.4957	400.548	-0.0523	BLACKTOP
33014	485773.366	4762792.722	402.5666	402.585	-0.0184	GRAVEL
33017	485820.579	4762759.362	403.9155	403.981	-0.0655	BLACKTOP
34011	491244.941	4753872.721	381.3079	381.318	-0.0101	GRAVEL
34012	491230.612	4753857.826	381.4286	381.462	-0.0334	BLACKTOP
34015	491191.292	4753791.491	380.6888	380.658	0.0308	GRAVEL
34016	491162.777	4753755.362	378.9182	378.917	0.0012	BLACKTOP
36003	504411.935	4741448.019	497.5897	497.604	-0.0143	BLACKTOP
36009	504309.067	4741534.674	500.4673	500.483	-0.0157	BLACKTOP
36010	504273.461	4741497.241	498.7923	498.829	-0.0367	BLACKTOP
36012	504307.018	4741471.980	498.6342	498.665	-0.0308	GRAVEL
36014	504294.273	4741424.532	498.8626	498.89	-0.0274	LAWN
36015	504315.867	4741423.887	499.4339	499.489	-0.0551	LAWN
36016	504355.614	4741427.086	499.8554	499.9	-0.0446	LAWN

Table 10: NVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
37008	465675.747	4753204.735	419.2044	419.266	-0.0616	BLACKTOP
37011	465676.660	4753287.054	418.056	418.039	0.017	BLACKTOP
37012	465723.335	4753285.806	419.1544	419.184	-0.0296	BLACKTOP
37013	465749.465	4753277.426	419.3315	419.393	-0.0615	LAWN
37015	465679.890	4753297.285	417.5736	417.643	-0.0694	LAWN
37018	465648.166	4753327.914	416.5496	416.66	-0.1104	LAWN
38009	466354.751	4744595.594	363.3193	363.326	-0.0067	LAWN
38010	466369.230	4744640.538	363.5158	363.493	0.0228	GRAVEL
38012	466394.270	4744607.569	363.0761	363.115	-0.0389	LAWN
38013	466397.460	4744648.466	363.7035	363.679	0.0245	BLACKTOP
38014	466363.808	4744654.199	363.6064	363.561	0.0454	BLACKTOP
38015	466320.911	4744664.619	363.2908	363.273	0.0178	BLACKTOP
38016	466296.134	4744665.790	363.2735	363.257	0.0165	BLACKTOP
39008	464451.680	4736804.040	440.8512	440.881	-0.0298	BLACKTOP
39010	464474.113	4736834.123	440.1014	440.14	-0.0386	GRAVEL
39013	464534.246	4736876.899	439.3905	439.396	-0.0055	BLACKTOP
39015	464492.053	4736839.049	439.6118	439.607	0.0048	BLACKTOP
41003	479829.430	4747383.744	362.3057	362.35	-0.0443	BLACKTOP
41004	479828.218	4747376.869	362.3228	362.345	-0.0222	BLACKTOP
41005	479850.547	4747377.124	362.1556	362.189	-0.0334	BLACKTOP
41006	479875.186	4747400.583	361.6968	361.762	-0.0652	GRAVEL
41007	479892.197	4747398.496	362.3471	362.464	-0.1169	LAWN
41011	479975.286	4747356.220	361.9449	361.949	-0.0041	BLACKTOP
41013	479947.202	4747373.177	362.0823	362.19	-0.1077	GRAVEL
41014	479904.024	4747342.163	361.7597	361.827	-0.0673	GRAVEL
41015	479893.315	4747320.902	361.4321	361.514	-0.0819	LAWN
41020	479840.284	4747455.817	362.6641	362.727	-0.0629	BLACKTOP
42003	474003.430	4739775.897	410.4562	410.478	-0.0218	BLACKTOP
42006	473966.596	4739837.131	410.8226	410.861	-0.0384	BLACKTOP
42008	473929.175	4739936.858	411.3075	411.373	-0.0655	LAWN
42009	473967.517	4739941.030	411.9174	411.984	-0.0666	LAWN
42010	473989.707	4739922.054	411.5326	411.59	-0.0574	LAWN
42014	474063.307	4739889.649	412.144	412.224	-0.08	BLACKTOP
42017	474066.764	4739814.943	411.6443	411.732	-0.0877	GRAVEL
42018	474037.884	4739868.080	411.0192	411.085	-0.0658	LAWN
42019	474040.897	4739841.512	411.0134	411.034	-0.0206	BLACKTOP
42020	474023.403	4739836.211	411.1923	411.208	-0.0157	RUBBER
42021	474036.807	4739803.360	410.7249	410.767	-0.0421	LAWN
43008	464562.564	4732385.259	396.6462	396.661	-0.0148	BLACKTOP
43011	464457.519	4732343.314	396.5758	396.588	-0.0122	BLACKTOP
43016	464395.476	4732323.955	395.6157	395.63	-0.0143	LAWN
44003	453712.257	4748076.716	361.8927	361.861	0.0317	BLACKTOP
44007	453607.746	4748174.578	362.9489	362.981	-0.0321	LAWN
44008	453599.395	4748210.944	363.7033	363.742	-0.0387	LAWN

Table 10: NVA Check Point Assessment (DEM) (m)

Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
44009	453705.141	4748277.834	363.4103	363.413	-0.0027	BLACKTOP
44010	453709.704	4748268.155	363.3282	363.313	0.0152	BLACKTOP
44013	453766.825	4748293.442	363.1761	363.146	0.0301	BLACKTOP
44017	453709.779	4748140.327	362.6503	362.6	0.0503	BLACKTOP
45007	442014.760	4752502.364	437.1416	437.123	0.0186	GRAVEL
45009	442014.532	4752437.496	438.4413	438.4	0.0413	BLACKTOP
45010	442016.469	4752400.523	439.1807	439.121	0.0597	BLACKTOP
45017	442008.452	4752547.084	437.1793	437.119	0.0603	BLACKTOP
45018	442006.445	4752583.755	437.1817	437.123	0.0587	BLACKTOP
45019	442002.233	4752608.775	437.1995	437.111	0.0885	BLACKTOP
46005	433895.296	4727852.958	487.2064	487.199	0.0074	GRAVEL
46006	433889.673	4727886.989	488.057	488.002	0.055	BLACKTOP
46007	433861.520	4727880.210	489.3085	489.26	0.0485	BLACKTOP
46008	433825.245	4727877.847	491.85	491.838	0.012	BLACKTOP
46013	433868.207	4727961.373	489.6275	489.585	0.0425	BLACKTOP
48004	442262.918	4735475.182	519.7577	519.634	0.1237	BLACKTOP
48005	442238.144	4735463.962	519.2485	519.082	0.1665	GRAVEL
48006	442214.477	4735461.697	518.9438	518.798	0.1458	BLACKTOP
48009	442183.349	4735384.301	511.4869	511.348	0.1389	BLACKTOP
48010	442176.253	4735422.451	514.7292	514.582	0.1472	GRAVEL
48013	442085.914	4735442.277	515.8051	515.703	0.1021	BLACKTOP
48014	442122.568	4735478.150	520.0124	519.976	0.0364	LAWN
48018	442169.420	4735491.420	522.7429	522.635	0.1079	LAWN
48020	442182.102	4735473.191	519.9922	519.813	0.1792	GRAVEL
48022	442182.452	4735453.352	518.0174	517.893	0.1244	BLACKTOP
49003	426925.832	4744561.037	396.6025	396.559	0.0435	BLACKTOP
49004	426960.016	4744550.104	398.7514	398.735	0.0164	LAWN
49007	427041.734	4744442.876	401.9853	401.91	0.0753	LAWN
49010	427002.798	4744405.093	397.584	397.52	0.064	BLACKTOP
49011	427000.341	4744399.275	397.3743	397.334	0.0403	BLACKTOP
49012	427011.690	4744364.751	397.2581	397.202	0.0561	BLACKTOP
49016	427014.958	4744347.652	397.0518	396.988	0.0638	GRAVEL
49019	426917.382	4744421.214	397.5401	397.481	0.0591	BLACKTOP
49020	426939.711	4744453.379	394.8154	394.811	0.0044	LAWN
49021	426910.747	4744519.126	393.9432	393.924	0.0192	LAWN
50003	444694.962	4745746.651	433.3908	433.404	-0.0132	BLACKTOP
50004	444691.654	4745727.227	432.0115	432.054	-0.0425	BLACKTOP
50005	444684.748	4745709.190	430.6352	430.675	-0.0398	GRAVEL
50006	444666.218	4745704.058	428.4902	428.562	-0.0718	LAWN
50013	444667.988	4745601.592	426.1096	426.137	-0.0274	BLACKTOP
50014	444650.527	4745559.797	423.653	423.69	-0.037	LAWN
51010	427020.204	4730197.756	398.9776	398.922	0.0556	GRAVEL
51011	427043.657	4730201.302	399.9466	399.928	0.0186	LAWN
51012	426953.703	4730215.703	396.9478	396.889	0.0588	GRAVEL

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
1091	439429.836	4778264.584	119.027	119.112	-0.085	CONIFEROUS AND DECIDUOUS
1092	439448.609	4778259.917	119.1607	119.395	-0.2343	CONIFEROUS AND DECIDUOUS
1093	439483.090	4778315.899	119.1539	119.24	-0.0861	DECIDUOUS TREES
2036	449290.705	4771634.400	135.9677	135.988	-0.0203	DECIDUOUS TREES
2037	449183.696	4771727.887	136.0847	136.096	-0.0113	CONIFEROUS AND DECIDUOUS
2038	449198.115	4771741.274	136.0358	136.064	-0.0282	CONIFEROUS AND DECIDUOUS
2039	449275.214	4771789.695	137.0235	137.067	-0.0435	BRUSH
2040	449275.446	4771797.423	137.325	137.312	0.013	BRUSH
2041	449275.768	4771807.045	137.6491	137.646	0.0031	AGRICULTURAL FIELD
3025	455985.109	4759425.714	439.7583	439.749	0.0093	AGRICULTURAL FIELD
3034	455877.515	4759429.423	445.5093	445.556	-0.0467	AGRICULTURAL FIELD
3035	455861.947	4759420.987	446.4249	446.45	-0.0251	CONIFEROUS TREES
3036	455834.050	4759437.049	447.1238	447.161	-0.0372	AGRICULTURAL FIELD
3041	455845.329	4759401.408	447.6751	447.708	-0.0329	AGRICULTURAL FIELD
4027	444576.916	4759402.431	407.6131	407.674	-0.0609	AGRICULTURAL FIELD
4028	444598.043	4759393.191	407.4599	407.57	-0.1101	DECIDUOUS TREES
4029	444595.489	4759374.913	407.4738	407.478	-0.0042	AGRICULTURAL FIELD
4046	444507.414	4759474.430	411.2353	411.29	-0.0547	AGRICULTURAL FIELD
4047	444475.121	4759447.596	411.8627	411.952	-0.0893	BRUSH
5048	425154.805	4761316.010	372.6178	372.623	-0.0052	AGRICULTURAL FIELD
5049	425153.540	4761317.287	372.5856	372.599	-0.0134	AGRICULTURAL FIELD
5050	425161.501	4761242.363	373.2131	373.236	-0.0229	BRUSH
5051	425156.731	4761243.419	372.6382	372.554	0.0842	DECIDUOUS TREES
5052	425158.042	4761239.028	371.5706	371.556	0.0146	BRUSH
5061	425188.199	4761237.632	374.7108	374.718	-0.0072	CONIFEROUS AND DECIDUOUS
5062	425182.313	4761219.883	374.5007	374.507	-0.0063	CONIFEROUS AND DECIDUOUS
5063	425171.736	4761213.638	372.8092	372.849	-0.0398	CONIFEROUS AND DECIDUOUS
5064	425167.025	4761200.672	370.8358	370.886	-0.0502	CONIFEROUS AND DECIDUOUS
5065	425156.230	4761192.788	368.3629	368.411	-0.0481	CONIFEROUS AND DECIDUOUS
5066	425155.576	4761205.968	369.2821	369.305	-0.0229	CONIFEROUS AND DECIDUOUS
6052	431757.410	4758760.852	287.2644	287.313	-0.0486	CONIFEROUS AND DECIDUOUS
6053	431757.789	4758763.215	287.3872	287.508	-0.1208	CONIFEROUS AND DECIDUOUS
6054	431756.985	4758766.762	287.3608	287.451	-0.0902	CONIFEROUS AND DECIDUOUS
6055	431759.532	4758774.659	287.4585	287.522	-0.0635	BRUSH
6056	431756.435	4758788.462	286.4043	286.452	-0.0477	DECIDUOUS TREES
6057	431735.167	4758745.266	285.6307	285.703	-0.0723	CONIFEROUS AND DECIDUOUS
6060	431763.055	4758708.361	285.3645	285.404	-0.0395	BRUSH
6061	431762.802	4758712.420	285.4913	285.588	-0.0967	BRUSH
6062	431762.283	4758727.188	285.9859	286.082	-0.0961	BRUSH
6063	431761.266	4758726.897	285.9567	286.03	-0.0733	BRUSH
6081	431752.789	4758890.450	285.9108	286.015	-0.1042	AGRICULTURAL FIELD
6082	431759.968	4758899.619	286.284	286.403	-0.119	AGRICULTURAL FIELD
6083	431754.927	4758908.060	286.4618	286.575	-0.1132	AGRICULTURAL FIELD
8017	421224.081	4778487.154	118.9502	118.918	0.0322	BRUSH

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
8018	421218.018	4778487.279	118.8921	118.908	-0.0159	BRUSH
8038	421222.308	4778596.320	119.6942	119.718	-0.0238	DECIDUOUS TREES
9043	438939.155	4768847.275	150.8684	150.854	0.0144	DECIDUOUS TREES
9046	438941.424	4768832.298	151.2229	151.291	-0.0681	DECIDUOUS TREES
9047	438941.272	4768831.295	151.2124	151.268	-0.0556	BRUSH
9048	438943.564	4768821.044	151.3575	151.368	-0.0105	BRUSH
9049	438947.331	4768804.044	151.3219	151.369	-0.0471	CONIFEROUS AND DECIDUOUS
9050	438957.355	4768770.367	152.3725	152.418	-0.0455	BRUSH
9051	438957.978	4768755.747	152.2898	152.376	-0.0862	BRUSH
10004	527967.328	4719408.188	444.5665	444.687	-0.1205	PASTURE
10005	527985.430	4719400.964	446.9664	447.095	-0.1286	PASTURE
10006	528016.116	4719389.680	447.9363	448.009	-0.0727	DECIDUOUS TREES
10007	527993.430	4719362.117	447.8601	447.935	-0.0749	PASTURE
10008	527986.993	4719340.776	447.6116	447.726	-0.1144	PASTURE
10009	527944.607	4719310.161	445.3885	445.496	-0.1075	CONIFEROUS TREES
10010	527932.499	4719299.908	444.7186	444.844	-0.1254	DECIDUOUS TREES
10011	527906.119	4719278.299	444.0531	444.158	-0.1049	BRUSH
10012	527897.485	4719272.997	445.1926	445.297	-0.1044	BRUSH
10016	527884.374	4719314.740	440.341	440.366	-0.025	CONIFEROUS TREES
11007	509590.593	4696795.481	418.9944	419.076	-0.0816	WEEDS
11008	509590.607	4696765.869	419.2742	419.241	0.0332	WEEDS
11011	509635.830	4696850.229	420.7005	420.769	-0.0685	BRUSH
11012	509654.163	4696859.208	421.0065	421.061	-0.0545	BRUSH
11015	509553.321	4696841.846	420.4423	420.494	-0.0517	DECIDUOUS TREES
11016	509516.396	4696841.210	419.7866	419.825	-0.0384	DECIDUOUS TREES
12005	528488.201	4699439.099	592.4667	592.541	-0.0743	CONIFEROUS TREES
12006	528476.786	4699470.402	595.3471	595.458	-0.1109	CONIFEROUS TREES
12009	528438.407	4699484.027	598.3069	598.416	-0.1091	CONIFEROUS AND DECIDUOUS
12010	528467.444	4699504.890	597.0148	597.029	-0.0142	CONIFEROUS AND DECIDUOUS
12011	528509.527	4699494.271	593.0461	593.148	-0.1019	PASTURE
12012	528533.531	4699500.424	591.7216	591.861	-0.1394	PASTURE
12013	528494.401	4699536.872	594.9423	595.08	-0.1377	DECIDUOUS TREES
12014	528511.209	4699541.513	593.3397	593.522	-0.1823	DECIDUOUS TREES
13006	521105.995	4707411.404	430.8389	430.856	-0.0171	AGRICULTURAL FIELD
13007	521116.639	4707385.864	430.2446	430.318	-0.0734	AGRICULTURAL FIELD
13008	521101.815	4707367.650	429.7782	429.88	-0.1018	DECIDUOUS TREES
13009	521074.640	4707341.107	428.8429	428.874	-0.0311	CONIFEROUS TREES
13010	521033.731	4707368.448	428.8524	428.922	-0.0696	DECIDUOUS TREES
13011	521035.288	4707375.975	428.9164	429.024	-0.1076	DECIDUOUS TREES
13012	521044.281	4707384.086	429.9303	430.021	-0.0907	BRUSH
13013	521052.521	4707396.828	430.4016	430.444	-0.0424	DECIDUOUS TREES
14003	508219.529	4708935.667	370.7859	370.841	-0.0551	AGRICULTURAL FIELD
14004	508198.996	4708921.146	370.9758	370.98	-0.0042	AGRICULTURAL FIELD
14008	508134.017	4709070.693	378.7132	378.75	-0.0368	CONIFEROUS AND DECIDUOUS

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
14009	508140.252	4709112.358	380.9909	381.014	-0.0231	CONIFEROUS TREES
14010	508182.612	4709052.870	377.5316	377.499	0.0326	DECIDUOUS TREES
14011	508171.224	4709032.087	377.273	377.273	0	DECIDUOUS TREES
15006	519996.867	4752462.410	189.476	189.506	-0.03	AGRICULTURAL FIELD
15007	519976.890	4752434.097	189.67	189.698	-0.028	AGRICULTURAL FIELD
15008	519971.940	4752404.824	189.431	189.516	-0.085	BRUSH
15009	519928.832	4752402.405	189.9323	190.014	-0.0817	DECIDUOUS TREES
15010	519906.714	4752409.037	190.2168	190.314	-0.0972	WEEDS
15011	519893.261	4752414.865	190.6035	190.572	0.0315	WEEDS
15015	519828.804	4752442.566	192.3677	192.455	-0.0873	PASTURE
16005	525353.313	4744917.014	226.7141	226.712	0.0021	AGRICULTURAL FIELD
16006	525325.376	4744939.304	226.7793	226.766	0.0133	AGRICULTURAL FIELD
16007	525304.975	4744938.427	227.0359	227.046	-0.0101	BRUSH
16008	525310.541	4744970.205	227.0015	226.998	0.0035	BRUSH
16009	525350.412	4744871.014	226.0433	226.222	-0.1787	DECIDUOUS TREES
16010	525420.659	4744826.745	225.5475	225.545	0.0025	DECIDUOUS TREES
16011	525410.951	4744852.261	226.2609	226.293	-0.0321	PASTURE
16012	525412.197	4744881.357	226.7253	226.754	-0.0287	PASTURE
16016	525445.317	4744986.644	228.1693	228.228	-0.0587	PASTURE
17003	512177.690	4726730.903	389.3732	389.443	-0.0698	AGRICULTURAL FIELD
17004	512202.958	4726742.930	389.3615	389.453	-0.0915	AGRICULTURAL FIELD
17005	512181.360	4726776.373	390.9983	391.152	-0.1537	DECIDUOUS TREES
17006	512176.621	4726764.371	390.833	390.893	-0.06	DECIDUOUS TREES
17008	512180.132	4726791.892	392.2902	392.43	-0.1398	WEEDS
17009	512186.988	4726808.337	392.461	392.497	-0.036	WEEDS
18007	515572.341	4720888.282	455.5596	455.564	-0.0044	DECIDUOUS TREES
18008	515567.955	4720867.088	453.1703	453.221	-0.0507	DECIDUOUS TREES
18009	515554.724	4720868.833	455.901	455.838	0.063	CONIFEROUS TREES
18010	515557.165	4720889.905	459.7539	459.669	0.0849	CONIFEROUS TREES
18015	515642.870	4720923.535	454.2579	454.332	-0.0741	AGRICULTURAL FIELD
18016	515631.586	4720905.937	453.4052	453.459	-0.0538	AGRICULTURAL FIELD
19005	521903.234	4727206.033	592.6774	592.724	-0.0466	WEEDS
19008	521866.149	4727267.715	598.7768	598.809	-0.0322	CONIFEROUS AND DECIDUOUS
19010	521850.629	4727268.225	600.2531	600.201	0.0521	CONIFEROUS TREES
19013	521915.221	4727333.851	596.7392	596.78	-0.0408	DECIDUOUS TREES
19015	521930.821	4727281.468	593.8793	593.851	0.0283	DECIDUOUS TREES
20003	504493.930	4715148.217	364.8075	364.868	-0.0605	DECIDUOUS TREES
20004	504476.058	4715162.002	365.9809	366.01	-0.0291	DECIDUOUS TREES
20010	504564.268	4715225.508	365.2134	365.208	0.0054	CONIFEROUS TREES
21004	498327.443	4755428.302	437.6652	437.65	0.0152	DECIDUOUS TREES
21005	498294.618	4755404.736	438.3737	438.359	0.0147	AGRICULTURAL FIELD
21006	498242.058	4755413.157	437.4051	437.441	-0.0359	AGRICULTURAL FIELD
21007	498152.369	4755401.343	437.3213	437.33	-0.0087	BRUSH
21008	498135.740	4755413.613	437.0729	437.108	-0.0351	BRUSH

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
21013	498202.659	4755518.846	435.141	435.116	0.025	DECIDUOUS TREES
22005	504858.358	4751430.886	466.9869	467.043	-0.0561	DECIDUOUS TREES
22006	504856.468	4751405.457	466.8536	466.864	-0.0104	DECIDUOUS TREES
22007	504891.808	4751405.887	468.1984	468.191	0.0074	CONIFEROUS AND DECIDUOUS
22008	504889.976	4751417.910	468.0922	468.129	-0.0368	CONIFEROUS TREES
22009	504897.977	4751432.554	468.2339	468.243	-0.0091	DECIDUOUS TREES
22011	504841.501	4751372.641	464.4889	464.578	-0.0891	AGRICULTURAL FIELD
22012	504887.399	4751375.049	466.4021	466.457	-0.0549	AGRICULTURAL FIELD
22013	504887.606	4751376.720	466.5053	466.556	-0.0507	AGRICULTURAL FIELD
22014	504902.682	4751382.168	467.1241	467.142	-0.0179	WEEDS
23005	513033.066	4758847.240	215.3817	215.418	-0.0363	WEEDS
23007	513085.121	4758829.452	215.9047	215.934	-0.0293	WEEDS
23008	513104.884	4758873.039	211.6008	211.669	-0.0682	AGRICULTURAL FIELD
23009	513144.719	4758879.187	207.6892	207.686	0.0032	DECIDUOUS TREES
23010	513157.646	4758873.091	207.7284	207.755	-0.0266	DECIDUOUS TREES
23011	513178.876	4758864.117	207.0479	207.109	-0.0611	DECIDUOUS TREES
23012	513173.101	4758846.371	210.2768	210.376	-0.0992	AGRICULTURAL FIELD
23013	513169.892	4758809.963	215.9588	216.007	-0.0482	WEEDS
24005	511659.914	4737290.403	386.8242	386.844	-0.0198	PASTURE
24006	511657.444	4737314.970	385.0122	385.041	-0.0288	PASTURE
24007	511644.743	4737339.445	384.3669	384.401	-0.0341	DECIDUOUS TREES
24010	511613.212	4737431.786	384.4552	384.473	-0.0178	CONIFEROUS TREES
24011	511594.741	4737423.737	383.9496	383.894	0.0556	DECIDUOUS TREES
24012	511593.658	4737391.582	384.6623	384.675	-0.0127	BRUSH
24013	511600.218	4737375.262	384.5586	384.633	-0.0744	BRUSH
25008	498657.568	4731398.771	401.682	401.58	0.102	CONIFEROUS TREES
25009	498685.439	4731402.890	400.11	400.126	-0.016	CONIFEROUS TREES
25011	498738.104	4731403.930	398.0895	398.092	-0.0025	DECIDUOUS TREES
25014	498610.071	4731451.059	400.5072	400.62	-0.1128	BRUSH
25015	498605.487	4731480.489	399.6775	399.761	-0.0835	BRUSH
26003	490820.839	4737660.463	464.622	464.678	-0.056	PASTURE
26004	490758.934	4737657.665	462.5994	462.655	-0.0556	PASTURE
26005	490718.206	4737648.908	462.2845	462.32	-0.0355	PASTURE
26006	490688.520	4737624.201	461.8138	461.854	-0.0402	BRUSH
26007	490704.295	4737606.002	460.8905	460.934	-0.0435	DECIDUOUS TREES
26008	490681.179	4737634.433	462.3363	462.359	-0.0227	BRUSH
26009	490663.368	4737635.233	462.9879	463.037	-0.0491	CONIFEROUS TREES
26013	490709.811	4737743.790	473.632	473.677	-0.045	DECIDUOUS TREES
26014	490681.432	4737763.981	475.1099	475.141	-0.0311	WEEDS
26016	490722.530	4737752.352	474.2878	474.268	0.0198	DECIDUOUS TREES
27009	479344.593	4739970.358	352.5082	352.562	-0.0538	CONIFEROUS TREES
27010	479345.106	4739983.962	352.4136	352.507	-0.0934	DECIDUOUS TREES
27012	479362.781	4740013.127	352.8081	352.905	-0.0969	DECIDUOUS TREES
27013	479399.794	4739999.095	351.4628	351.53	-0.0672	DECIDUOUS TREES

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
27014	479415.665	4739993.700	351.0342	351.112	-0.0778	CONIFEROUS TREES
29007	492278.840	4717820.003	487.7397	487.803	-0.0633	DECIDUOUS TREES
29008	492286.799	4717790.122	488.3126	488.362	-0.0494	PASTURE
29009	492253.809	4717767.272	489.5973	489.631	-0.0337	PASTURE
29010	492191.298	4717776.307	489.2877	489.335	-0.0473	PASTURE
29011	492165.498	4717801.672	491.3671	491.449	-0.0819	DECIDUOUS TREES
29012	492144.824	4717817.203	492.7734	492.796	-0.0226	DECIDUOUS TREES
29013	492128.405	4717803.451	492.8913	492.875	0.0163	DECIDUOUS TREES
29015	492218.951	4717822.595	490.524	490.455	0.069	CONIFEROUS TREES
29016	492241.388	4717854.247	488.4482	488.548	-0.0998	BRUSH
29017	492294.334	4717845.991	485.7336	485.754	-0.0204	BRUSH
30003	483636.373	4722432.311	482.0688	482.077	-0.0082	WEEDS
30004	483618.983	4722420.282	481.8507	481.851	-0.0003	WEEDS
30005	483619.895	4722404.785	481.8994	481.835	0.0644	DECIDUOUS TREES
30006	483612.650	4722388.401	481.3122	481.249	0.0632	CONIFEROUS TREES
30007	483612.131	4722369.077	481.3666	481.394	-0.0274	WEEDS
30013	483712.227	4722322.869	481.7155	481.729	-0.0135	BRUSH
30014	483747.272	4722249.941	480.0872	480.075	0.0122	DECIDUOUS TREES
31007	473726.462	4727879.326	376.333	376.426	-0.093	WEEDS
31008	473746.633	4727898.329	376.9035	376.952	-0.0485	CONIFEROUS TREES
31009	473745.060	4727913.692	377.4168	377.443	-0.0262	CONIFEROUS TREES
31010	473761.437	4727909.478	377.3292	377.338	-0.0088	DECIDUOUS TREES
32003	480790.856	4753351.075	382.4078	382.475	-0.0672	AGRICULTURAL FIELD
32004	480760.849	4753359.913	382.4516	382.529	-0.0774	AGRICULTURAL FIELD
32005	480717.900	4753369.491	382.6435	382.686	-0.0425	AGRICULTURAL FIELD
32006	480680.146	4753370.847	382.7264	382.785	-0.0586	AGRICULTURAL FIELD
32007	480705.740	4753336.912	382.7043	382.798	-0.0937	DECIDUOUS TREES
32011	480640.464	4753329.702	383.1109	383.092	0.0189	DECIDUOUS TREES
32012	480609.811	4753328.493	383.1854	383.248	-0.0626	DECIDUOUS TREES
32013	480585.735	4753343.056	383.269	383.298	-0.029	DECIDUOUS TREES
32014	480582.916	4753362.578	383.0523	383.123	-0.0707	DECIDUOUS TREES
32015	480585.147	4753374.030	382.9819	383.073	-0.0911	CONIFEROUS AND DECIDUOUS
32016	480589.809	4753378.015	383.0167	383.055	-0.0383	CONIFEROUS AND DECIDUOUS
32017	480596.010	4753396.892	383.0687	383.107	-0.0383	DECIDUOUS TREES
32019	480636.327	4753300.733	382.7252	382.725	0.0002	AGRICULTURAL FIELD
32023	480783.206	4753295.868	382.4353	382.438	-0.0027	AGRICULTURAL FIELD
33005	485869.581	4762689.891	403.2919	403.38	-0.0881	AGRICULTURAL FIELD
33008	485736.307	4762761.832	399.3409	399.46	-0.1191	WEEDS
33009	485743.254	4762787.683	400.792	400.853	-0.061	DECIDUOUS TREES
33012	485673.441	4762826.337	400.0167	400.097	-0.0803	CONIFEROUS TREES
33013	485657.639	4762802.958	400.6759	400.778	-0.1021	DECIDUOUS TREES
33015	485817.979	4762837.073	403.0929	403.183	-0.0901	BRUSH
33016	485804.885	4762799.149	403.1936	403.249	-0.0554	AGRICULTURAL FIELD
34003	491122.173	4753750.948	377.0433	377.1	-0.0567	WEEDS

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
34004	491104.141	4753765.967	376.7603	376.79	-0.0297	WEEDS
34005	491106.000	4753789.500	376.5389	376.625	-0.0861	PASTURE
34006	491110.471	4753832.610	378.13	378.184	-0.054	PASTURE
34007	491128.041	4753889.616	379.0089	379.081	-0.0721	PASTURE
34008	491135.112	4753907.904	380.2515	380.28	-0.0285	DECIDUOUS TREES
34009	491110.107	4753922.153	378.7626	378.889	-0.1264	BRUSH
34010	491227.439	4753873.311	380.7592	380.851	-0.0918	CONIFEROUS TREES
34013	491237.351	4753835.487	380.7615	380.842	-0.0805	PASTURE
34014	491220.437	4753802.500	381.5968	381.729	-0.1322	PASTURE
36004	504409.963	4741473.218	497.4328	497.548	-0.1152	AGRICULTURAL FIELD
36005	504362.593	4741484.642	498.9942	499.074	-0.0798	AGRICULTURAL FIELD
36006	504363.427	4741527.863	500.8938	500.971	-0.0772	AGRICULTURAL FIELD
36007	504346.671	4741532.562	500.9887	501.026	-0.0373	WEEDS
36008	504318.145	4741529.434	500.5174	500.608	-0.0906	WEEDS
36011	504260.257	4741477.478	496.6724	496.644	0.0284	DECIDUOUS TREES
36013	504304.605	4741447.832	498.6582	498.738	-0.0798	DECIDUOUS TREES
37003	465549.949	4753271.456	418.8183	418.869	-0.0507	AGRICULTURAL FIELD
37004	465550.381	4753246.194	418.8193	418.91	-0.0907	AGRICULTURAL FIELD
37005	465584.116	4753234.466	417.9054	418.055	-0.1496	WEEDS
37006	465613.777	4753223.156	417.7414	417.821	-0.0796	WEEDS
37007	465666.463	4753197.298	419.2039	419.269	-0.0651	DECIDUOUS TREES
37009	465685.169	4753208.948	418.5454	418.705	-0.1596	CONIFEROUS TREES
37010	465682.940	4753270.783	417.6574	417.759	-0.1016	CONIFEROUS TREES
37014	465714.839	4753291.484	418.8976	418.969	-0.0714	DECIDUOUS TREES
37016	465665.898	4753338.521	416.8696	416.911	-0.0414	CONIFEROUS TREES
37017	465629.537	4753355.545	416.8938	417.059	-0.1652	AGRICULTURAL FIELD
38003	466200.732	4744659.000	361.7109	361.767	-0.0561	PASTURE
38004	466236.556	4744631.723	361.9285	361.996	-0.0675	PASTURE
38005	466275.473	4744599.043	362.0767	362.131	-0.0543	PASTURE
38006	466296.663	4744570.294	361.9101	361.784	0.1261	BRUSH
38007	466322.904	4744567.815	362.202	362.105	0.097	CONIFEROUS TREES
38008	466351.838	4744568.794	362.3691	362.392	-0.0229	DECIDUOUS TREES
38011	466394.337	4744636.986	363.3928	363.416	-0.0232	DECIDUOUS TREES
39003	464361.608	4736720.532	434.7295	434.835	-0.1055	CONIFEROUS TREES
39004	464392.669	4736754.646	437.8851	437.856	0.0291	CONIFEROUS TREES
39005	464398.684	4736763.454	438.6522	438.737	-0.0848	CONIFEROUS TREES
39006	464409.388	4736787.296	439.7943	439.902	-0.1077	DECIDUOUS TREES
39007	464432.245	4736798.708	441.338	441.327	0.011	DECIDUOUS TREES
39009	464462.696	4736820.318	440.4388	440.463	-0.0242	CONIFEROUS TREES
39011	464488.858	4736861.901	439.1853	439.255	-0.0697	PASTURE
39012	464519.312	4736882.816	438.9763	439.037	-0.0607	PASTURE
39014	464523.264	4736849.965	438.2988	438.322	-0.0232	PASTURE
39016	464470.306	4736811.005	440.015	440.088	-0.073	WEEDS
39017	464460.665	4736782.047	438.5491	438.582	-0.0329	AGRICULTURAL FIELD

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
39018	464424.905	4736744.380	439.7717	439.865	-0.0933	AGRICULTURAL FIELD
39019	464405.314	4736713.520	439.8499	439.917	-0.0671	AGRICULTURAL FIELD
41008	479915.249	4747401.896	362.0019	362.048	-0.0461	DECIDUOUS TREES
41009	479922.234	4747418.266	362.3845	362.458	-0.0735	DECIDUOUS TREES
41010	479992.513	4747371.595	361.0913	361.242	-0.1507	CONIFEROUS TREES
41012	479958.068	4747381.386	361.8134	361.895	-0.0816	DECIDUOUS TREES
41016	479885.227	4747308.740	361.2511	361.489	-0.2379	WEEDS
41017	479856.371	4747327.416	361.3136	361.404	-0.0904	WEEDS
41018	479815.216	4747331.360	362.1424	362.184	-0.0416	WEEDS
41019	479858.474	4747445.564	362.7275	362.904	-0.1765	BRUSH
41021	479837.527	4747466.663	363.1817	363.224	-0.0423	DECIDUOUS TREES
42004	473964.431	4739778.850	410.4475	410.472	-0.0245	DECIDUOUS TREES
42005	473967.841	4739802.867	410.4072	410.488	-0.0808	DECIDUOUS TREES
42007	473931.493	4739901.751	410.9791	411.014	-0.0349	DECIDUOUS TREES
42011	473999.284	4739905.067	411.4619	411.445	0.0169	CONIFEROUS TREES
42012	474014.720	4739906.280	411.4007	411.472	-0.0713	CONIFEROUS TREES
42013	474062.026	4739918.165	414.2164	414.286	-0.0696	DECIDUOUS TREES
42015	474069.693	4739882.386	412.2871	412.232	0.0551	CONIFEROUS TREES
42016	474073.482	4739844.042	412.2423	412.427	-0.1847	WEEDS
43003	464412.476	4732297.543	395.1155	395.2	-0.0845	AGRICULTURAL FIELD
43004	464448.208	4732292.214	394.9918	395.067	-0.0752	AGRICULTURAL FIELD
43005	464486.275	4732301.890	395.5331	395.6	-0.0669	AGRICULTURAL FIELD
43006	464538.720	4732335.594	395.6259	395.688	-0.0621	DECIDUOUS TREES
43007	464542.145	4732371.042	396.045	396.061	-0.016	DECIDUOUS TREES
43009	464516.492	4732395.082	396.5468	396.587	-0.0402	BRUSH
43010	464490.415	4732408.593	398.1723	398.267	-0.0947	BRUSH
43012	464424.249	4732361.204	396.2923	396.35	-0.0577	BRUSH
43013	464419.463	4732376.471	396.501	396.581	-0.08	BRUSH
43014	464412.094	4732353.071	396.0736	396.109	-0.0354	CONIFEROUS TREES
43015	464403.420	4732339.394	395.787	395.877	-0.09	BRUSH
44004	453689.582	4748097.900	362.4235	362.446	-0.0225	AGRICULTURAL FIELD
44005	453663.666	4748138.879	362.6412	362.649	-0.0078	AGRICULTURAL FIELD
44006	453628.563	4748187.134	363.312	363.316	-0.004	CONIFEROUS TREES
44011	453743.034	4748317.523	364.7905	364.794	-0.0035	DECIDUOUS TREES
44012	453736.211	4748338.370	368.6018	368.583	0.0188	DECIDUOUS TREES
44014	453801.087	4748259.914	361.8016	361.853	-0.0514	BRUSH
44015	453799.487	4748236.386	361.7862	361.844	-0.0578	AGRICULTURAL FIELD
44016	453772.544	4748174.389	362.6811	362.753	-0.0719	AGRICULTURAL FIELD
45003	442049.097	4752581.174	435.3658	435.344	0.0218	AGRICULTURAL FIELD
45004	442076.548	4752556.024	433.9599	433.94	0.0199	AGRICULTURAL FIELD
45005	442041.703	4752518.080	435.0722	434.908	0.1642	WEEDS
45006	442019.022	4752516.945	436.4522	436.489	-0.0368	WEEDS
45008	442025.059	4752457.757	437.2405	437.279	-0.0385	AGRICULTURAL FIELD
45011	442025.770	4752331.139	440.8879	440.894	-0.0061	DECIDUOUS TREES

Table 11: VVA Check Point Assessment (DEM) (m)						
Point ID	Easting	Northing	Known Z	DEM Z	Delta Z	Description
45012	442000.056	4752384.280	439.5627	439.578	-0.0153	PASTURE
45013	441985.084	4752413.144	439.5145	439.557	-0.0425	PASTURE
45014	442004.846	4752441.433	438.3568	438.349	0.0078	WEEDS
45015	441973.326	4752507.699	438.3737	438.414	-0.0403	WEEDS
45016	441987.835	4752539.349	437.1229	437.117	0.0059	PASTURE
46003	433932.621	4727790.030	484.8218	484.872	-0.0502	AGRICULTURAL FIELD
46004	433912.413	4727844.075	485.4771	485.488	-0.0109	AGRICULTURAL FIELD
46009	433793.064	4727896.387	493.8664	493.888	-0.0216	DECIDUOUS TREES
46010	433757.772	4727903.987	497.8172	497.829	-0.0118	DECIDUOUS TREES
46011	433805.434	4727930.099	493.0805	493.089	-0.0085	PASTURE
46012	433866.248	4727932.259	489.1342	489.113	0.0212	BRUSH
46014	433894.440	4727962.213	486.8362	486.851	-0.0148	PASTURE
46015	433924.619	4727917.758	484.2744	484.257	0.0174	PASTURE
46016	433929.960	4727885.529	483.8211	483.863	-0.0419	BRUSH
48003	442303.628	4735495.299	519.7874	519.585	0.2024	CONIFEROUS TREES
48007	442235.925	4735447.131	516.0771	515.974	0.1031	PASTURE
48008	442209.925	4735405.940	512.7	512.626	0.074	PASTURE
48011	442145.707	4735405.120	512.6177	512.552	0.0657	PASTURE
48012	442096.939	4735420.084	513.535	513.467	0.068	PASTURE
48015	442103.603	4735515.796	522.9692	522.916	0.0532	WEEDS
48016	442175.307	4735539.988	528.9845	528.968	0.0165	DECIDUOUS TREES
48017	442164.042	4735514.424	524.8621	524.775	0.0871	WEEDS
48019	442204.459	4735496.192	524.3599	524.22	0.1399	WEEDS
48021	442232.490	4735481.364	521.4337	521.278	0.1557	DECIDUOUS TREES
48023	442290.186	4735493.210	520.5919	520.332	0.2599	CONIFEROUS TREES
49005	427011.258	4744532.201	403.1879	403.122	0.0659	DECIDUOUS TREES
49006	427036.036	4744481.073	402.2421	402.234	0.0081	DECIDUOUS TREES
49008	427001.900	4744430.588	396.8182	396.83	-0.0118	WEEDS
49009	427021.063	4744414.231	397.9431	397.96	-0.0169	WEEDS
49013	427045.967	4744357.442	397.0638	397.092	-0.0282	DECIDUOUS TREES
49014	427056.113	4744342.081	397.3327	397.132	0.2007	CONIFEROUS TREES
49015	427046.160	4744330.086	396.4891	396.519	-0.0299	WEEDS
49017	426974.700	4744401.828	395.7357	395.763	-0.0273	AGRICULTURAL FIELD
49018	426919.289	4744410.389	397.059	397.038	0.021	AGRICULTURAL FIELD
50007	444707.893	4745708.185	431.253	431.272	-0.019	AGRICULTURAL FIELD
50008	444714.021	4745738.096	433.3961	433.508	-0.1119	AGRICULTURAL FIELD
50009	444712.962	4745666.889	430.1818	430.268	-0.0862	DECIDUOUS TREES
50010	444741.864	4745669.115	431.2818	431.337	-0.0552	DECIDUOUS TREES
50011	444736.690	4745627.421	428.8107	428.941	-0.1303	AGRICULTURAL FIELD
50012	444689.667	4745613.464	427.4911	427.671	-0.1799	AGRICULTURAL FIELD
51003	426820.140	4730275.758	395.0316	395.079	-0.0474	AGRICULTURAL FIELD
51004	426863.760	4730283.659	394.61	394.63	-0.02	AGRICULTURAL FIELD
51005	426928.696	4730286.359	395.6939	395.723	-0.0291	DECIDUOUS TREES
51006	426947.411	4730275.440	395.9943	395.991	0.0033	DECIDUOUS TREES

