C-4.1 Report on Nominal Pulse Spacing (NPS)

The USGS Lidar Base Specification Version 2.1 states: "The required ANPS and ANPD by QL are listed in table 1. Aggregate Nominal Pulse Density (ANPD) and Aggregate Nominal Pulse Spacing (ANPS) shall meet the requirements of the Quality Level (QL) of the project with a minimum of QL2 for 3DEP collections. Aggregate Nominal Pulse Density (ANPD) shall be no less than 2 points per square meter (QL2); assessment to be made against single swath, first return data located within the geometrically usable center portion (typically ~95%) of each swath. Aggregate Nominal Pulse Spacing (ANPS) shall be no greater than 0.70 meters (QL2); assessment to be made against single swath, first return data located within the geometrically usable center portion (typically ~95%) of each swath. Dependent on the local terrain and land cover conditions in a project, a greater pulse density may be required on specific projects."

Table 1. Aggregate nominal pulse spacing and density.

[QL, quality level; pls/m^2, pulses per square meter; m, meter; $\leq$, less than or equal to; $\geq$, greater than or equal to]

Quality level	Aggregate nominal pulse spacing (m)	Aggregate nominal pulse density (pls/m²)
QL0	$\leq$0.35	$\geq$8.0
QL1	$\leq$0.35	$\geq$8.0
QL2	$\leq$0.71	$\geq$2.0
QL3	$\leq$1.41	$\geq$0.5

The purpose of this section is to report on the lidar point density and nominal point spacing by LAS file. Averages by files (not including overlap), project boundary polygons (including overlap), and aggregate project boundary polygons (including overlap) are reported.

Data Source - D:\00_Cherry\swaths

Quality level tested: QL2

File	Number of First Returns	Area	Point Density	NPS
CS_01000.las	133,919,477	41,566,708	3.222/0.299	0.557/1.827
CS_01001.las	342,694,182	96,586,104	3.548/0.330	0.531/1.742
CS_01002.las	300,107,015	96,390,011	3.113/0.289	0.567/1.860
CS_01003.las	345,414,265	96,421,317	3.582/0.333	0.528/1.732
CS_01004.las	296,452,002	96,339,487	3.077/0.286	0.570/1.870
CS_01005.las	345,491,342	96,349,154	3.586/0.333	0.528/1.732

C-4.1 Report on Nominal Pulse Spacing (NPS) - continued

File	Number of First Returns	Area	Point Density	NPS
CS_01006.las	291,320,317	96,254,916	3.027/0.281	0.575/1.886
CS_01007.las	203,409,315	56,027,899	3.631/0.337	0.525/1.722
CS_01008.las	133,156,767	36,180,435	3.680/0.342	0.521/1.709
CS_01009.las	143,298,448	48,431,642	2.959/0.275	0.581/1.906
CS_01010.las	22,240,214	5,869,498	3.789/0.352	0.514/1.686
CS_01011.las	152,682,151	51,465,114	2.967/0.276	0.581/1.906
CS_01012.las	354,780,089	96,059,795	3.693/0.343	0.520/1.706
CS_01013.las	278,408,901	95,840,092	2.905/0.270	0.587/1.926
CS_01014.las	357,003,806	95,975,759	3.720/0.346	0.518/1.699
CS_01015.las	273,741,983	95,740,382	2.859/0.266	0.591/1.939
CS_01016.las	272,122,009	76,493,055	3.557/0.330	0.530/1.739
CS_01017.las	16,591,305	3,368,589	4.925/0.458	0.451/1.480
CS_01018.las	53,769,815	17,150,157	3.135/0.291	0.565/1.854
CS_01019.las	75,401,062	18,181,309	4.147/0.385	0.491/1.611
CS_01020.las	46,197,420	16,168,454	2.857/0.265	0.592/1.942
Average			3.380/0.314	0.544/1.785
			pp Square Meter/ pp Square US Survey Foot	Meter/ US Survey Feet
3183.64719649	4,437,997,450	1,019,518,931	4.353/0.404	0.479/1.572
Aggregate	4,437,997,450	1,019,518,931	4.353/0.404	0.479/1.572
			pp Square Meter/ pp Square US Survey Foot	Meter/ US Survey Feet

* - indicates a swath whose NPS and Point Density were brought up to specifications due to the inclusion of one or more re-flight swaths.