

C-2 Report on Multiple Discrete Returns

The USGS Lidar Base Specification Version 2.1 states: "Deriving and delivering multiple discrete returns are required in all conventional lidar data collection efforts. Data collection shall be capable of at least three returns per pulse. Full waveform collection is acceptable and is promoted; however, full waveform data are regarded as supplemental information."

The purpose of this section is to report on the presence and quantities of lidar returns in the LAS data. Empty return columns can indicate a collection or processing problem dealing with lidar return attribute information.

[Data Source - Y:\Mapping\Projects\65220595_CO_SanLuisJuanMiguel\Production\Final_Client_Deliverables\Block1_Surveys\point_cloud\Swaths](#)

| File | First return | Second return | Third return | Other returns | Total points |
|-----------|--------------|---------------|--------------|---------------|--------------|
| 00014.las | 219,464,989 | 73,538,932 | 18,434,190 | 3,137,205 | 314,575,316 |
| 00015.las | 28,446,381 | 4,666,294 | 1,328,891 | 177,108 | 34,618,674 |
| 00018.las | 244,825,395 | 37,107,592 | 5,314,741 | 766,373 | 288,014,101 |
| 00021.las | 237,177,260 | 110,519 | 7,071 | 312 | 237,295,162 |
| 00022.las | 233,201,592 | 1,188,030 | 88,916 | 7,164 | 234,485,702 |
| 00024.las | 242,820,813 | 4,634,924 | 778,917 | 64,058 | 248,298,712 |
| 00031.las | 253,075,760 | 6,017,751 | 621,784 | 20,821 | 259,736,116 |
| 00032.las | 56,296,332 | 1,097,980 | 127,680 | 11,346 | 57,533,338 |
| 00041.las | 224,896,081 | 5,920,479 | 595,870 | 51,534 | 231,463,964 |
| 00043.las | 232,238,144 | 87,580,800 | 24,743,857 | 3,963,291 | 348,526,092 |
| 00049.las | 239,224,905 | 3,932,910 | 570,081 | 47,653 | 243,775,549 |
| 00051.las | 52,849,929 | 1,886,014 | 209,240 | 10,079 | 54,955,262 |
| 00064.las | 243,577,998 | 439,027 | 41,521 | 3,569 | 244,062,115 |
| 00065.las | 215,068,772 | 12,084,461 | 1,341,959 | 56,752 | 228,551,944 |
| 00072.las | 221,476,056 | 93,807,484 | 27,493,177 | 4,331,446 | 347,108,163 |
| 00075.las | 255,347,195 | 876,063 | 64,417 | 3,506 | 256,291,181 |
| 00082.las | 191,119,822 | 85,064,640 | 26,397,550 | 4,413,109 | 306,995,121 |
| 00099.las | 216,162,015 | 3,994,122 | 261,380 | 17,483 | 220,435,000 |
| 00101.las | 205,597,990 | 8,282,034 | 1,021,691 | 42,995 | 214,944,710 |
| 00107.las | 204,435,825 | 1,486,031 | 71,334 | 2,877 | 205,996,067 |
| 00110.las | 290,975,634 | 439,202 | 46,340 | 4,513 | 291,465,689 |
| 00113.las | 197,030,452 | 77,863,996 | 24,250,570 | 4,354,239 | 303,499,257 |
| 00114.las | 230,292,269 | 8,547,816 | 399,029 | 20,719 | 239,259,833 |
| 00117.las | 240,641,070 | 3,373,416 | 300,738 | 13,906 | 244,329,130 |
| 00120.las | 221,131,009 | 12,056,483 | 1,215,263 | 45,957 | 234,448,712 |

C-2 Report on Multiple Discrete Returns - continued

| File | First return | Second return | Third return | Other returns | Total points |
|-----------|----------------|---------------|--------------|---------------|----------------|
| 00124.las | 236,024,908 | 4,390,906 | 596,686 | 57,745 | 241,070,245 |
| 00125.las | 239,983,725 | 96,032,095 | 31,105,490 | 5,629,005 | 372,750,315 |
| 00144.las | 224,401,660 | 6,264,978 | 357,878 | 23,012 | 231,047,528 |
| 00146.las | 285,584,136 | 18,066,821 | 2,119,833 | 92,595 | 305,863,385 |
| 00151.las | 225,227,558 | 3,740,375 | 484,809 | 39,616 | 229,492,358 |
| 00156.las | 263,747,879 | 76,792,071 | 15,632,630 | 1,860,234 | 358,032,814 |
| 00158.las | 202,250,816 | 12,368,053 | 1,565,512 | 77,143 | 216,261,524 |
| 00161.las | 259,981,739 | 94,078,776 | 25,550,174 | 4,353,496 | 383,964,185 |
| 00164.las | 239,064,156 | 13,411,121 | 1,551,507 | 58,943 | 254,085,727 |
| 00166.las | 219,086,645 | 5,483,513 | 573,292 | 54,892 | 225,198,342 |
| 00169.las | 229,561,330 | 3,345,756 | 482,281 | 39,812 | 233,429,179 |
| 00171.las | 241,419,012 | 432,254 | 21,229 | 781 | 241,873,276 |
| 00172.las | 278,861,865 | 1,075,177 | 112,828 | 10,428 | 280,060,298 |
| 00173.las | 237,412,063 | 737,299 | 50,330 | 3,133 | 238,202,825 |
| 00177.las | 218,188,550 | 4,490,080 | 653,825 | 51,243 | 223,383,698 |
| 00179.las | 238,919,047 | 12,152,254 | 907,896 | 47,422 | 252,026,619 |
| 00185.las | 231,862,660 | 89,756 | 4,731 | 460 | 231,957,607 |
| 00186.las | 215,942,799 | 48,005,459 | 8,205,862 | 736,615 | 272,890,735 |
| 00187.las | 243,473,863 | 4,561,710 | 362,144 | 12,845 | 248,410,562 |
| 00188.las | 226,851,891 | 499,599 | 26,425 | 2,444 | 227,380,359 |
| 00189.las | 212,034,391 | 479,857 | 52,529 | 4,114 | 212,570,891 |
| 00192.las | 220,593,270 | 64,541,880 | 22,433,921 | 4,680,890 | 312,249,961 |
| 00196.las | 233,334,172 | 80,395 | 6,222 | 547 | 233,421,336 |
| 00198.las | 114,252,092 | 21,719,462 | 6,680,204 | 1,156,795 | 143,808,553 |
| 00203.las | 165,393,060 | 56,774,609 | 18,463,918 | 3,394,664 | 244,026,251 |
| 00210.las | 227,320,675 | 3,590,260 | 338,700 | 25,217 | 231,274,852 |
| 00216.las | 215,919,514 | 10,858,966 | 765,019 | 43,236 | 227,586,735 |
| 00219.las | 224,232,123 | 95,944,027 | 30,888,586 | 5,774,823 | 356,839,559 |
| 00225.las | 231,464,446 | 3,234,541 | 427,761 | 30,785 | 235,157,533 |
| 00229.las | 208,638,676 | 9,810,292 | 1,069,830 | 35,261 | 219,554,059 |
| 00233.las | 245,414,487 | 6,584,257 | 628,348 | 26,608 | 252,653,700 |
| 00235.las | 222,676,915 | 11,426,491 | 883,535 | 50,282 | 235,037,223 |
| 00238.las | 205,115,607 | 6,919,637 | 318,473 | 19,308 | 212,373,025 |
| Total | 12,681,609,418 | 1,233,979,727 | 309,048,615 | 49,962,409 | 14,274,600,169 |