

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 - D:\00_San_Miguel\Client_LAS_Swaths](#)

File	First return	Second return	Third return	Other returns	Total points
CS_06001.las	26,709,983	6,294,439	1,450,308	176,924	34,631,654
CS_06002.las	117,910,152	16,378,214	3,586,023	492,294	138,366,683
CS_06003.las	159,461,669	18,935,010	4,165,909	595,182	183,157,770
CS_06004.las	193,461,600	24,474,994	5,795,843	922,652	224,655,089
CS_06005.las	81,263,351	10,225,165	2,358,137	341,904	94,188,557
CS_06038.las	3,138,481	1,580,304	546,086	145,794	5,410,665
CS_06039.las	10,115,664	3,659,051	1,332,096	429,089	15,535,900
CS_06040.las	13,179,823	3,378,460	1,206,565	348,954	18,113,802
CS_06041.las	20,377,670	5,076,055	2,190,774	864,337	28,508,836
CS_06042.las	22,927,485	4,367,736	1,961,215	855,872	30,112,308
CS_06043.las	30,220,512	9,512,401	4,635,543	2,142,250	46,510,706
CS_06044.las	33,335,447	13,774,319	6,882,500	3,156,420	57,148,686
CS_06045.las	42,350,332	20,057,058	9,955,473	4,706,945	77,069,808
CS_06062.las	44,743,953	13,202,020	4,170,977	1,180,982	63,297,932
CS_06063.las	146,393,322	38,122,848	12,568,753	3,812,811	200,897,734
CS_06064.las	206,557,630	50,103,417	14,064,051	3,580,604	274,305,702
CS_06065.las	200,039,154	54,324,317	16,303,089	4,465,900	275,132,460
CS_06066.las	206,517,467	57,710,484	19,542,336	6,450,924	290,221,211
CS_06067.las	198,482,748	61,167,625	21,476,568	7,523,573	288,650,514
CS_06068.las	208,962,432	72,456,170	27,029,544	11,323,466	319,771,612
CS_06071.las	197,891,236	71,523,791	26,950,037	12,176,062	308,541,126
CS_06072.las	207,840,760	87,452,753	34,757,877	17,289,901	347,341,291
CS_06073.las	199,860,038	86,351,343	33,169,765	16,561,209	335,942,355
CS_06074.las	184,454,921	83,069,759	30,053,022	12,456,178	310,033,880
CS_06075.las	152,243,966	69,604,142	23,064,767	7,435,486	252,348,361
CS_06076.las	147,602,819	60,027,707	20,223,300	6,560,988	234,414,814
CS_06077.las	140,953,110	57,489,838	18,319,793	4,976,271	221,739,012

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File	First return	Second return	Third return	Other returns	Total points
CS_06078.las	137,830,633	60,930,423	19,361,093	5,145,201	223,267,350
CS_06081.las	11,861,496	466,754	115,830	27,503	12,471,583
CS_06082.las	57,266,923	4,735,928	1,831,382	657,378	64,491,611
CS_06083.las	118,044,073	15,353,975	6,169,570	2,067,086	141,634,704
CS_06084.las	167,612,206	25,612,949	9,829,009	2,946,618	206,000,782
CS_06085.las	190,835,960	37,293,294	14,664,958	4,775,782	247,569,994
CS_06086.las	204,969,484	43,626,068	18,442,650	6,383,849	273,422,051
CS_06087.las	212,037,774	40,094,585	16,048,326	5,137,904	273,318,589
CS_06088.las	214,430,716	37,227,224	13,805,302	4,183,600	269,646,842
CS_06089.las	211,973,166	46,533,546	18,641,720	6,612,822	283,761,254
CS_06090.las	210,608,465	63,982,842	27,291,167	10,726,962	312,609,436
CS_06091.las	232,883,815	92,138,445	44,035,055	19,477,507	388,534,822
CS_06092.las	219,617,345	90,459,532	44,532,768	19,914,584	374,524,229
CS_06093.las	235,762,159	91,532,290	43,270,818	17,264,317	387,829,584
CS_06094.las	233,305,530	86,024,519	38,772,424	14,246,271	372,348,744
CS_06096.las	238,773,696	77,244,609	29,009,100	7,908,560	352,935,965
CS_06097.las	233,213,930	78,653,829	30,659,115	8,895,332	351,422,206
CS_06098.las	248,877,256	96,066,225	40,463,981	13,429,006	398,836,468
CS_06099.las	240,146,063	97,522,449	42,090,469	14,747,515	394,506,496
CS_06100.las	250,309,454	109,933,093	47,876,670	15,918,249	424,037,466
CS_06101.las	238,437,446	102,079,471	42,747,095	13,515,530	396,779,542
CS_06102.las	252,643,581	104,850,892	40,299,246	12,465,748	410,259,467
CS_06103.las	228,282,544	86,883,092	30,570,864	9,069,134	354,805,634
CS_06104.las	247,305,336	89,629,327	32,016,501	10,636,929	379,588,093
CS_06105.las	229,472,730	80,237,807	30,004,189	10,761,896	350,476,622
CS_06106.las	233,207,824	73,986,224	26,889,609	9,415,830	343,499,487
CS_06107.las	219,854,150	67,763,484	24,476,125	8,542,370	320,636,129
CS_06108.las	236,631,043	81,770,852	32,321,788	13,564,287	364,287,970
CS_06109.las	214,199,789	81,262,929	32,574,451	13,053,423	341,090,592
CS_06117.las	206,534,418	75,337,283	26,614,347	7,938,326	316,424,374
CS_06118.las	219,150,360	73,865,144	24,831,710	7,056,544	324,903,758
CS_06119.las	201,773,126	58,070,558	17,568,526	4,120,047	281,532,257
CS_06120.las	212,632,207	58,165,678	16,002,669	3,607,740	290,408,294
CS_06121.las	201,294,603	63,622,907	20,578,260	5,977,530	291,473,300

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<u>File</u>	<u>First return</u>	<u>Second return</u>	<u>Third return</u>	<u>Other returns</u>	<u>Total points</u>
CS_06122.las	214,392,492	76,537,998	25,707,243	8,021,836	324,659,569
CS_06123.las	202,443,513	76,816,213	26,954,106	8,355,193	314,569,025
CS_06125.las	44,204,002	17,397,859	7,820,347	3,104,178	72,526,386
CS_06126.las	55,513,189	13,124,273	5,996,452	2,199,732	76,833,646
CS_06127.las	53,350,701	9,415,239	3,972,942	1,319,617	68,058,499
CS_06128.las	66,923,245	10,610,187	3,603,475	875,015	82,011,922
CS_06129.las	64,905,921	11,075,138	3,902,255	1,218,180	81,101,494
CS_06130.las	76,340,086	15,070,960	5,253,535	1,436,028	98,100,609
CS_06131.las	74,675,689	23,488,936	8,129,041	2,010,462	108,304,128
CS_06132.las	86,412,893	35,063,828	15,907,967	6,487,834	143,872,522
CS_06133.las	83,367,096	26,015,113	12,149,224	5,399,017	126,930,450
CS_06135.las	87,927,218	19,225,379	8,027,600	3,082,322	118,262,519
CS_06136.las	106,818,392	24,548,581	9,631,775	3,337,481	144,336,229
CS_06137.las	99,483,400	26,113,093	9,710,489	3,305,972	138,612,954
CS_06138.las	116,156,239	38,307,638	13,726,125	4,071,178	172,261,180
CS_06139.las	103,576,481	35,381,170	13,161,357	4,109,470	156,228,478
CS_06140.las	126,575,598	44,870,317	16,244,105	4,874,270	192,564,290
CS_06141.las	117,729,658	44,958,935	16,139,249	4,563,312	183,391,154
CS_06142.las	137,852,827	55,688,504	19,484,017	5,296,644	218,321,992
CS_06143.las	128,202,146	53,500,358	17,183,579	4,614,714	203,500,797
Total	12,255,625,812	3,950,487,366	1,494,872,021	518,846,807	18,219,832,006