

C-2 Report on Multiple Discrete Returns

The USGS Lidar Base Specification Version 1.3 states: "Deriving and delivering multiple discrete returns is 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\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot10_utm13_point_cloud\Swaths](#)

File	First return	Second return	Third return	Other returns	Total points
CS_00176.las	30,410,124	1,979,899	85,694	2,266	32,477,983
CS_00177.las	60,231,784	3,534,966	227,987	10,601	64,005,338
CS_00182.las	23,849,410	1,439,017	104,852	4,771	25,398,050
CS_00226.las	72,194,300	4,709,337	312,086	11,201	77,226,924
CS_00243.las	209,945,798	12,684,058	870,228	33,346	223,533,430
CS_00245.las	104,708,760	5,909,620	406,911	15,946	111,041,237
CS_02002.las	67,585,677	1,002,330	21,540	430	68,609,977
CS_02032.las	91,373,401	864,117	16,376	284	92,254,178
CS_02034.las	108,116,877	394,964	2,540	01	108,514,382
CS_02037.las	393,973,384	1,556,501	35,137	2,521	395,567,543
CS_02040.las	388,360,050	2,121,762	29,713	404	390,511,929
CS_02043.las	381,820,901	1,943,075	26,171	301	383,790,448
CS_02045.las	384,624,843	3,049,643	45,480	844	387,720,810
CS_02049.las	381,442,218	2,857,153	45,245	623	384,345,239
CS_02059.las	394,872,435	8,842,881	336,076	9,774	404,061,166
CS_02063.las	238,635,696	13,196,357	592,174	13,608	252,437,835
CS_02073.las	84,408,901	761,824	13,585	230	85,184,540
CS_02075.las	264,278,852	1,145,492	7,077	33	265,431,454
CS_02077.las	423,853,803	1,623,659	15,320	217	425,492,999
CS_02083.las	382,431,530	2,051,217	29,126	451	384,512,324
CS_02088.las	382,436,873	1,957,074	32,701	714	384,427,362
CS_02090.las	378,854,196	2,981,062	47,854	943	381,884,055
CS_02097.las	221,971,234	3,303,408	70,322	612	225,345,576
CS_02107.las	354,689,123	8,921,395	322,849	7,058	363,940,425
CS_02114.las	244,507,831	14,002,167	644,900	14,710	259,169,608

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File	First return	Second return	Third return	Other returns	Total points
CS_02116.las	237,782,975	13,073,938	591,032	13,715	251,461,660
CS_02118.las	140,309,479	7,702,688	284,814	5,025	148,302,006
CS_02120.las	164,109,469	12,440,816	638,834	10,696	177,199,815
CS_02121.las	149,842,422	11,346,546	589,814	11,723	161,790,505
CS_02132.las	92,142,973	763,491	15,051	247	92,921,762
CS_02134.las	407,513,989	2,118,876	24,358	1,033	409,658,256
CS_02136.las	382,054,644	1,684,763	20,550	783	383,760,740
CS_02139.las	399,994,620	1,735,940	31,038	827	401,762,425
CS_02143.las	123,917,202	1,232,361	19,597	181	125,169,341
CS_02147.las	382,975,392	1,777,836	30,884	614	384,784,726
CS_02149.las	388,381,159	3,542,769	90,003	2,610	392,016,541
CS_02154.las	380,657,884	3,250,007	42,681	402	383,950,974
CS_02158.las	379,506,328	4,388,085	88,492	955	383,983,860
CS_02163.las	293,983,974	4,489,159	101,554	993	298,575,680
CS_02168.las	265,311,273	8,219,692	348,140	7,833	273,886,938
CS_02177.las	231,417,289	7,242,106	197,719	1,926	238,859,040
CS_02179.las	239,960,827	12,714,674	605,783	14,142	253,295,426
CS_02183.las	143,280,321	10,688,697	550,168	9,267	154,528,453
CS_02184.las	151,929,433	12,781,972	710,398	15,318	165,437,121
CS_02185.las	153,397,384	9,969,105	476,535	10,185	163,853,209
CS_02200.las	87,804,422	684,228	13,217	180	88,502,047
CS_02203.las	391,867,988	1,934,896	15,530	85	393,818,499
CS_02208.las	394,730,861	2,085,552	33,718	548	396,850,679
CS_02216.las	381,705,561	2,218,790	34,201	939	383,959,491
CS_02218.las	378,640,044	2,680,778	53,408	1,313	381,375,543
CS_02223.las	379,314,822	3,241,337	40,224	614	382,596,997
CS_02227.las	404,011,467	4,981,547	114,601	1,651	409,109,266
CS_02228.las	247,176,101	4,465,595	127,622	1,010	251,770,328
CS_02230.las	376,785,645	6,074,600	184,165	2,761	383,047,171
CS_02234.las	383,035,816	7,758,531	323,389	10,973	391,128,709
CS_02238.las	237,603,459	7,248,688	304,070	6,736	245,162,953
CS_02248.las	253,462,137	8,054,063	233,385	2,475	261,752,060
CS_02250.las	239,458,501	13,100,263	625,090	14,988	253,198,842
CS_02253.las	163,711,258	10,581,359	486,904	7,606	174,787,127

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File	First return	Second return	Third return	Other returns	Total points
CS_02254.las	141,443,930	11,695,623	650,487	12,357	153,802,397
CS_02256.las	149,679,161	9,182,354	415,524	8,366	159,285,405
CS_02268.las	7,099,109	123,988	2,576	47	7,225,720
CS_02271.las	89,690,198	890,852	15,169	259	90,596,478
CS_02274.las	412,827,725	1,649,932	13,505	163	414,491,325
CS_02280.las	363,511,137	2,155,009	31,138	575	365,697,859
CS_02283.las	389,369,848	3,673,989	260,801	7,559	393,312,197
CS_02289.las	381,331,187	2,556,516	69,043	1,924	383,958,670
CS_02290.las	391,585,060	2,863,695	57,380	1,846	394,507,981
CS_02295.las	376,041,639	3,146,646	36,523	418	379,225,226
CS_02296.las	388,502,796	4,060,584	56,056	547	392,619,983
CS_02299.las	380,174,833	5,723,141	184,466	4,222	386,086,662
CS_02300.las	219,051,068	3,278,033	84,564	768	222,414,433
CS_02302.las	386,757,511	7,345,271	287,803	6,040	394,396,625
CS_02306.las	395,490,231	8,339,684	353,656	12,706	404,196,277
CS_02308.las	244,265,463	8,032,582	302,050	5,267	252,605,362
CS_02316.las	233,539,597	8,326,087	254,889	3,452	242,124,025
CS_02317.las	240,929,982	12,935,356	637,519	15,479	254,518,336
CS_02319.las	157,603,193	8,231,228	312,428	5,255	166,152,104
CS_02320.las	135,651,917	8,262,021	385,888	6,323	144,306,149
CS_02323.las	161,754,089	8,728,164	400,480	9,847	170,892,580
CS_02338.las	84,826,611	795,409	12,027	139	85,634,186
CS_02341.las	372,393,281	1,736,722	19,943	413	374,150,359
CS_02350.las	387,563,932	3,444,682	186,221	3,568	391,198,403
CS_02355.las	379,644,453	3,133,029	162,239	4,395	382,944,116
CS_02356.las	378,720,653	3,777,611	191,228	9,192	382,698,684
CS_02360.las	385,498,128	4,330,970	94,793	2,133	389,926,024
CS_02362.las	213,832,512	12,858,608	305,990	714	226,997,824
CS_02363.las	334,096,936	6,219,715	189,709	2,771	340,509,131
CS_02364.las	234,031,337	13,754,950	310,774	594	248,097,655
CS_02368.las	229,879,732	6,108,819	104,230	284	236,093,065
CS_02369.las	44,376,186	66,464	233	03	44,442,886
CS_02371.las	237,594,952	7,939,780	300,719	4,728	245,840,179
CS_02379.las	252,018,048	10,345,724	358,265	6,052	262,728,089

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File	First return	Second return	Third return	Other returns	Total points
CS_02380.las	190,750,594	10,153,587	516,268	11,491	201,431,940
CS_02382.las	134,499,558	7,057,038	288,591	5,378	141,850,565
CS_02383.las	163,340,930	9,115,247	417,606	8,247	172,882,030
CS_02384.las	169,445,388	14,906,181	850,465	18,517	185,220,551
CS_02386.las	151,251,189	7,480,959	381,995	9,942	159,124,085
CS_02400.las	86,895,103	832,850	14,404	238	87,742,595
CS_02409.las	393,876,564	4,919,682	352,821	8,282	399,157,349
CS_02415.las	391,311,908	3,854,473	181,208	7,760	395,355,349
CS_02419.las	378,291,142	3,192,230	42,464	613	381,526,449
CS_02420.las	389,526,076	5,275,341	123,946	1,873	394,927,236
CS_02422.las	212,066,589	9,499,799	250,190	831	221,817,409
CS_02424.las	212,674,425	9,668,354	211,959	440	222,555,178
CS_02426.las	384,777,033	7,994,331	283,364	5,206	393,059,934
CS_02428.las	219,237,071	4,422,717	59,748	186	223,719,722
CS_02430.las	373,614,839	7,954,960	318,191	8,129	381,896,119
CS_02432.las	245,673,205	8,914,952	318,405	4,254	254,910,816
CS_02441.las	152,774,383	7,596,984	286,278	5,424	160,663,069
CS_02442.las	144,414,244	8,072,506	381,386	7,399	152,875,535
CS_02443.las	144,989,231	12,911,291	810,879	19,499	158,730,900
CS_02444.las	158,952,176	3,261,557	170,682	6,811	162,391,226
CS_02445.las	146,993,542	6,860,343	312,858	7,690	154,174,433
CS_02450.las	31,449,523	2,006,207	83,577	2,045	33,541,352
CS_02458.las	87,597,762	894,799	16,632	452	88,509,645
CS_02467.las	385,072,866	3,770,113	103,638	2,264	388,948,881
CS_02473.las	380,911,893	3,379,876	148,289	6,644	384,446,702
CS_02477.las	381,020,374	3,242,564	43,982	449	384,307,369
CS_02478.las	379,331,977	5,315,447	108,930	1,382	384,757,736
CS_02480.las	215,142,132	6,321,868	103,492	168	221,567,660
CS_02482.las	231,176,242	10,757,590	253,364	613	242,187,809
CS_02484.las	383,949,400	7,732,255	281,170	6,524	391,969,349
CS_02486.las	217,176,373	3,852,079	49,090	113	221,077,655
CS_02487.las	387,602,361	8,501,987	394,203	10,424	396,508,975
CS_02489.las	234,364,470	7,550,342	251,787	3,522	242,170,121
CS_02500.las	137,919,953	6,715,292	253,878	5,509	144,894,632

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File	First return	Second return	Third return	Other returns	Total points
CS_02501.las	165,430,626	9,999,747	476,342	8,430	175,915,145
CS_02502.las	163,001,747	13,346,549	868,841	24,128	177,241,265
CS_02503.las	155,461,221	4,299,763	254,179	10,080	160,025,243
CS_02504.las	21,452,223	39,293	56	00	21,491,572
CS_02515.las	89,933,242	431,177	3,930	45	90,368,394
CS_02529.las	387,526,803	3,672,390	122,057	4,181	391,325,431
CS_02531.las	30,635,353	738,983	20,338	186	31,394,860
CS_02533.las	377,025,418	3,397,688	54,572	590	380,478,268
CS_02534.las	393,837,775	5,166,339	103,384	1,444	399,108,942
CS_02536.las	214,296,502	5,163,974	84,372	148	219,544,996
CS_02538.las	217,449,784	9,410,276	203,786	458	227,064,304
CS_02540.las	385,554,735	8,778,427	347,080	9,283	394,689,525
CS_02542.las	207,445,084	3,379,728	31,356	70	210,856,238
CS_02543.las	379,094,163	8,667,567	415,835	11,255	388,188,820
CS_02545.las	240,628,556	8,297,858	272,286	3,551	249,202,251
CS_02554.las	122,513,715	8,184,433	490,714	16,415	131,205,277
CS_02556.las	148,302,275	8,495,931	344,976	6,867	157,150,049
CS_02557.las	135,910,366	9,101,299	453,074	7,738	145,472,477
CS_02558.las	150,493,683	12,056,672	803,612	25,984	163,379,951
CS_02559.las	152,671,060	4,754,461	338,536	13,816	157,777,873
CS_02583.las	383,301,382	3,600,457	126,641	4,540	387,033,020
CS_02585.las	184,551,360	4,859,195	208,945	3,923	189,623,423
CS_02587.las	380,606,735	3,938,747	66,095	861	384,612,438
CS_02588.las	374,938,602	5,431,552	154,057	3,787	380,527,998
CS_02590.las	219,520,162	5,842,701	121,314	301	225,484,478
CS_02591.las	222,581,515	8,068,758	153,034	362	230,803,669
CS_02593.las	388,600,418	8,888,782	328,827	8,450	397,826,477
CS_02595.las	218,552,219	3,777,853	39,198	53	222,369,323
CS_02596.las	384,600,768	8,469,281	407,218	10,968	393,488,235
CS_02598.las	237,541,207	9,619,015	284,132	3,614	247,447,968
CS_02599.las	230,000,730	4,136,222	107,280	718	234,244,950
CS_02606.las	140,704,412	9,765,958	588,480	21,088	151,079,938
CS_02608.las	138,286,093	7,695,700	314,289	6,168	146,302,250
CS_02609.las	164,537,259	10,181,856	501,134	7,415	175,227,664

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File	First return	Second return	Third return	Other returns	Total points
CS_02610.las	160,463,149	13,253,171	909,007	30,660	174,655,987
CS_02612.las	152,018,270	7,278,064	318,622	7,072	159,622,028
CS_02633.las	388,183,714	3,590,362	126,934	9,061	391,910,071
CS_02635.las	198,378,487	4,931,416	156,153	1,994	203,468,050
CS_02636.las	385,678,368	3,904,737	50,736	433	389,634,274
CS_02637.las	395,282,492	5,853,176	159,335	3,590	401,298,593
CS_02639.las	221,741,806	6,188,626	157,433	643	228,088,508
CS_02640.las	218,319,777	8,199,324	145,703	335	226,665,139
CS_02642.las	399,844,908	8,018,702	292,078	7,806	408,163,494
CS_02644.las	218,763,067	3,618,486	31,787	44	222,413,384
CS_02645.las	381,989,997	8,862,117	426,938	11,043	391,290,095
CS_02654.las	136,366,073	7,846,609	346,712	8,439	144,567,833
CS_02656.las	146,821,940	7,343,200	278,920	5,209	154,449,269
CS_02657.las	147,829,528	8,713,940	398,121	6,477	156,948,066
CS_02658.las	150,991,857	13,013,374	897,032	31,186	164,933,449
CS_02659.las	159,248,989	4,766,589	359,770	15,809	164,391,157
CS_02660.las	145,499,290	6,797,241	281,975	5,764	152,584,270
CS_02680.las	383,710,227	4,233,106	83,755	2,267	388,029,355
CS_02682.las	227,417,385	5,055,795	150,314	1,967	232,625,461
CS_02683.las	382,722,193	4,165,738	56,248	529	386,944,708
CS_02684.las	376,253,770	5,086,844	97,771	1,685	381,440,070
CS_02686.las	227,986,238	4,921,384	90,805	370	232,998,797
CS_02687.las	229,383,622	7,953,184	124,541	307	237,461,654
CS_02691.las	226,689,852	4,567,530	46,994	86	231,304,462
CS_02692.las	380,256,247	8,723,099	424,256	13,330	389,416,932
CS_02696.las	250,010,855	10,285,836	349,185	4,992	260,650,868
CS_02703.las	140,244,890	7,335,335	297,399	7,127	147,884,751
CS_02704.las	135,282,439	6,479,316	243,039	4,587	142,009,381
CS_02705.las	157,908,661	10,082,103	498,326	8,694	168,497,784
CS_02706.las	157,426,104	13,855,293	917,554	28,048	172,226,999
CS_02707.las	159,616,208	4,708,223	390,195	18,295	164,732,921
CS_02708.las	152,208,123	6,614,306	254,872	4,862	159,082,163
CS_02728.las	222,824,979	7,155,869	252,723	2,700	230,236,271
CS_02729.las	383,551,751	4,303,963	71,675	1,138	387,928,527

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File	First return	Second return	Third return	Other returns	Total points
CS_02732.las	224,863,866	3,381,916	77,243	462	228,323,487
CS_02733.las	214,937,305	6,981,554	87,757	170	222,006,786
CS_02738.las	385,527,351	8,683,450	406,374	12,007	394,629,182
CS_02747.las	130,959,374	7,107,214	268,460	5,609	138,340,657
CS_02749.las	148,144,844	6,953,686	292,147	6,324	155,397,001
CS_02750.las	143,024,443	10,678,128	521,856	7,944	154,232,371
CS_02751.las	147,801,344	11,914,021	717,143	18,913	160,451,421
CS_02752.las	158,612,776	4,257,151	360,116	17,626	163,247,669
CS_02753.las	151,064,167	5,448,131	198,876	3,973	156,715,147
CS_02773.las	224,943,500	6,934,752	242,060	1,896	232,122,208
CS_02781.las	224,784,668	5,214,711	55,910	123	230,055,412
CS_02782.las	381,789,672	8,299,213	348,376	9,220	390,446,481
CS_02785.las	234,755,123	8,648,995	291,728	4,955	243,700,801
CS_02792.las	138,565,979	7,130,726	303,047	5,547	146,005,299
CS_02793.las	172,110,902	12,915,202	635,514	9,789	185,671,407
CS_02794.las	153,071,876	11,653,747	628,575	14,867	165,369,065
CS_02795.las	161,788,897	3,924,042	263,919	10,819	165,987,677
CS_02796.las	152,983,296	4,869,772	191,457	3,920	158,048,445
CS_02815.las	219,882,958	4,790,161	98,915	565	224,772,599
CS_02816.las	383,892,456	4,066,405	62,324	831	388,022,016
CS_02822.las	228,764,273	5,662,587	59,727	80	234,486,667
CS_02823.las	390,764,785	8,441,600	346,918	12,230	399,565,533
CS_02834.las	149,275,546	7,929,650	339,512	5,462	157,550,170
CS_02835.las	147,308,318	10,762,897	526,708	8,471	158,606,394
CS_02836.las	151,806,867	11,736,204	679,968	16,886	164,239,925
CS_02837.las	143,047,660	4,705,133	173,932	3,985	147,930,710
CS_02853.las	224,855,104	3,985,688	78,874	642	228,920,308
CS_02859.las	214,151,921	4,868,443	48,427	90	219,068,881
CS_02860.las	377,488,362	8,366,379	317,604	10,764	386,183,109
CS_02863.las	248,211,831	9,623,018	361,746	5,551	258,202,146
CS_02867.las	234,431,447	9,164,853	350,741	6,094	243,953,135
CS_02873.las	151,860,763	12,284,305	702,568	16,097	164,863,733
CS_02900.las	255,656,182	8,915,643	316,409	5,212	264,893,446
CS_02927.las	234,967,752	8,172,240	284,574	4,596	243,429,162

C-2 Report on Multiple Discrete Returns - continued

File	First return	Second return	Third return	Other returns	Total points
CS_02933.las	379,236,941	7,347,957	241,932	3,607	386,830,437
CS_02979.las	101,755,352	2,723,187	10,537	69	104,489,145
CS_02990.las	61,709,528	1,509,323	4,499	02	63,223,352
CS_03036.las	233,925,330	10,646,289	354,973	5,340	244,931,932
CS_03040.las	255,539,803	10,129,968	389,092	6,820	266,065,683
Total	57,322,367,082	1,478,998,796	58,520,385	1,319,992	58,861,206,255