

QA REPORT

Worked example on public data

Hobart City 2023/24 as delivered, checked line by line against a published LiDAR specification.

Showcase: GroundMap processing of public survey data. An example of GroundMap's QA on a public survey: not client work, and not a statement about the supplier or about the specification the survey was bought to.

01 Dataset

SURVEY	Hobart City 2023/24: State of Tasmania (theLIST), via ELVIS.
LICENCE	CC BY 3.0 AU. Hobart City 2023/24 LiDAR from theLIST © State of Tasmania.
AREA	Hobart city centre, 12 tiles of 1 km: 12 km ² , 9.76 km ² of it land
FORMAT	LAS 1.4, point format 7 (RGB), LAZ, 0.001 m scale
COORDINATES	GDA2020 / MGA zone 55 (EPSG:7855); AHD heights, named in the tiles but not in the headers
POINTS	359,257,689 in the files; 334,665,829 kept; 23,515,388 low noise (class 7); 17 flight lines

02 Checked against

USGS Lidar Base Specification 2025 rev. A, Quality Level 1 (QL1). A published, numeric specification with density, distribution, void and relative-accuracy tests, open to anyone who wants to repeat them.

This example applies USGS QL1 because it publishes a numeric pass line for every test. Client QA runs against the specification in the contract, ICSM v2.0 in Australia.

03 In brief

01 Density comes from overlap

22.6 first returns per m² in aggregate, against 8.0 for QL1. Single lines average 8.46; 6 of 17 reach 8.0.

03 Classification is the main finding

55.2 % of kept returns sit in class 12 (overlap), with no ground, vegetation or building class.

02 Lines agree closely

Swath-to-swath RMSD 0.047 m on smooth open ground, against 0.08 m for QL1; 85.0 % of land is under two or more lines.

04 Vertical accuracy

Not judged: no levelled survey mark flush with the ground or set in rock, of those held out, lies in this survey. Not estimated.

04 Results

DETAIL ON PAGES 2 TO 4

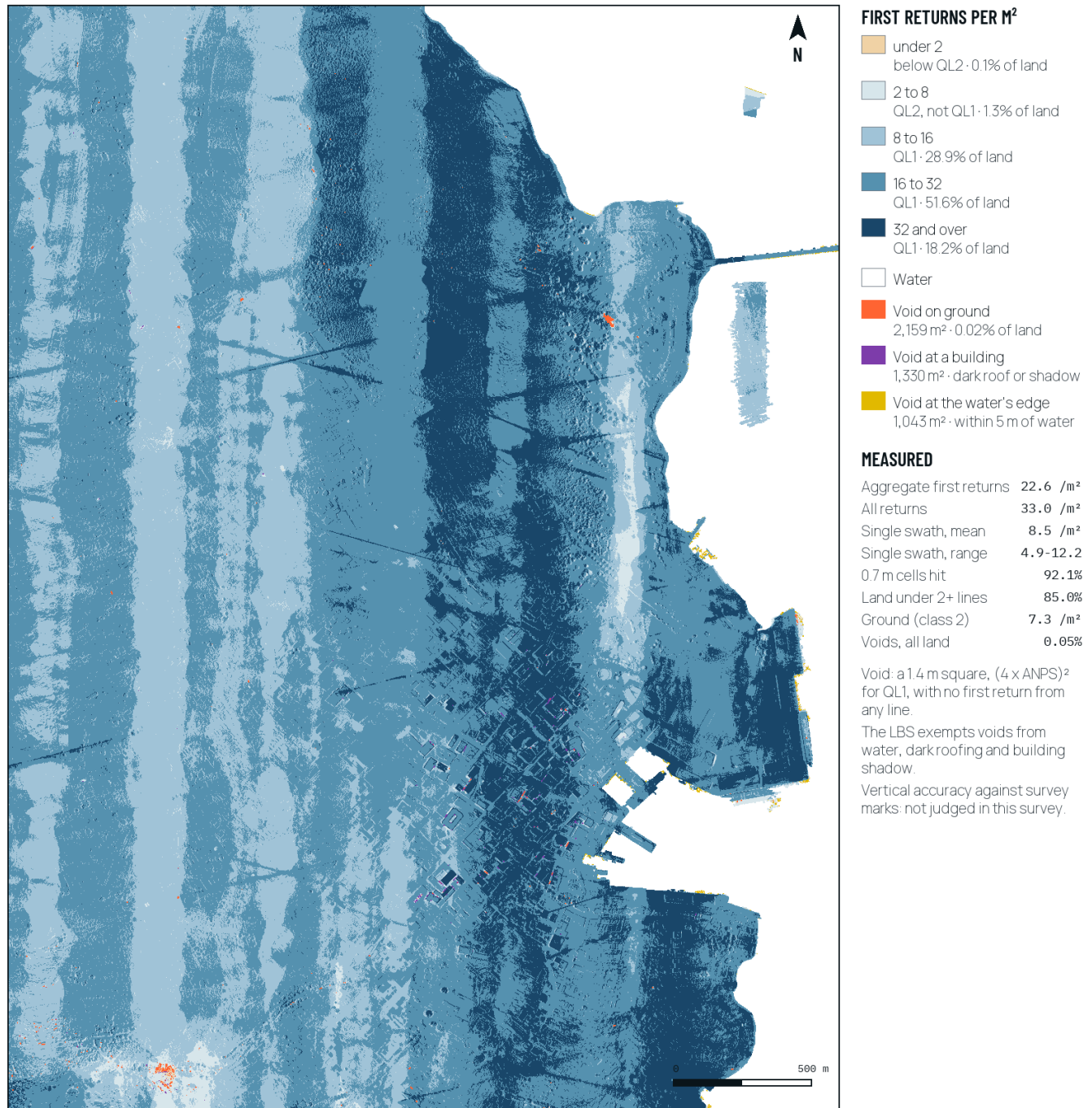
TEST	QL1 REQUIREMENT	RESULT	AGAINST QL1
Aggregate first-return density, land	≥ 8.0 per m ²	22.6 per m ² (all returns 33.0)	ABOVE
Single-swath first-return density, usable swath centre	≥ 8.0 per m ²	Mean 8.46 per m ² ; 4.91 to 12.20 by line	6 OF 17 LINES ABOVE
Spatial distribution: 0.70 m cells holding a single-swath first return	≥ 90 %	Pooled 92.1 %; 86.0 % to 98.0 % by line	11 OF 17 LINES ABOVE
Voids: 1.4 m windows with no first return, land	Void: 1.96 m ² or more; water, dark surfaces and shadow exempt	0.046 % of land; 0.022 % away from water and buildings (518 voids, largest 461.6 m ²)	FOR INFORMATION
Swath overlap difference, smooth open ground	RMSDv ≤ 0.08 m	0.047 m after removing 0.21 % of cells with objects in one pass only (0.095 m with them)	WITHIN
Smooth-surface precision, within one swath	RMSDv ≤ 0.06 m	Median scatter 0.010 m; 97.5 % of cells ≤ 0.06 m	INDICATIVE
Classification	Minimum scheme: classes 1, 2, 7, 9, 17, 18, 20, 21, 22	55.2 % of kept returns in class 12 (overlap); classes 8 and 10 with pre-LAS 1.4 or unstated meanings	OBSERVATIONS
Absolute vertical accuracy, non-vegetated	RMSEv ≤ 0.100 m	No levelled survey mark flush with the ground or set in rock, of those held out, lies in this survey	NOT JUDGED

05 First-return density and voids

HOBART CITY 2023/24 AS DELIVERED: FIRST-RETURN DENSITY AND VOIDS

Example QA, public data. Hobart city centre, 3 km x 4 km. 2.5 m pixels.

Aggregate first returns of all flight lines per m². Compared with USGS Lidar Base Specification 2025 rev. A (QL1: 8 per m², QL2: 2 per m²).



Survey data: Hobart City 2023/24, State of Tasmania (theLIST), via ELVIS; as delivered.

Analysis: GroundMap, 2026-10-16. Showcase: GroundMap processing of public survey data.

The striping follows the flight lines: density is highest where lines overlap, lowest in the centre of a single line.

Overlap

LINES PER 1 M CELL	0	1	2	3	4	5+
Share of land	0.0 %	15.0 %	36.6 %	17.0 %	22.8 %	8.6 %

85.0 % of land is covered by two or more flight lines.

06 Density and coverage in detail

Flight lines

LINE	KM ²	FIRST /M ²	0.7 M HIT
4	0.067	● 7.86	98.0 %
5	0.798	● 7.01	95.5 %
301	0.104	● 7.19	95.4 %
302	0.731	● 4.91	86.0 %
303	2.019	● 6.61	89.7 %
304	2.364	10.86	94.2 %
305	2.813	● 7.06	88.5 %
407	2.682	10.21	95.2 %
408	1.771	12.20	97.3 %
418	2.810	● 7.88	91.6 %
419	0.192	● 5.79	87.3 %
509	2.405	9.40	92.6 %
510	0.730	● 6.36	89.5 %
511	2.626	8.95	92.7 %
512	0.051	8.01	92.5 %
520	2.065	● 6.07	89.4 %
521	0.119	● 6.77	95.9 %

● below 8.0 per m². Per flight line (point source ID), inside its usable centre: 10 m blocks with at least one first return of the line per m², less 20 m at the swath edges, less water. km² = usable area; 0.7 m hit = share of 0.70 m cells holding a first return of the line.

Tiles

TILE	LAND KM ²	FIRST /M ²	ALL /M ²	GROUND
1	1.000	15.3	23.1	6.51
2	1.000	16.2	21.5	7.91
3	1.000	16.0	20.6	8.03
4	1.000	15.8	22.7	8.40
5	1.000	23.3	29.5	5.92
6	1.000	26.1	30.1	7.32
7	1.000	30.1	47.9	9.90
8	0.864	31.6	70.2	9.92
9	0.553	32.6	42.7	4.30
10	0.704	26.9	31.1	4.48
11	0.478	21.0	32.3	3.57
12	0.158	21.8	30.7	4.01

Per 1 km tile, on land. Ground = class 2 per m² of land outside building cells.

Ground

All open and vegetated land 7.26 per m² · 88.2 % of 1 m cells

Under high vegetation (all 12 tiles) 6.03 per m² · 81.3 %

Open ground 8.37 per m² · 92.8 %

Class 2 as delivered, over 7.33 km² of land outside building cells. The specification sets no ground density; reported for information.

Survey data and licences: Hobart City 2023/24, CC BY 3.0 AU: Hobart City 2023/24 LiDAR from theLIST © State of Tasmania. Climate Futures Derwent 2008, ACE CRC licence: The LiDAR Dataset was collected as part of the Climate Futures for Tasmania project; a project managed and delivered by the Antarctic Climate & Ecosystems Cooperative Research Centre. The dataset was funded primarily by the State Government of Tasmania through the State Emergency Service and the Commonwealth Natural Disaster Mitigation Program. Mount Wellington 2011, no licence on record: Mount Wellington 2011 LiDAR, flown 20 to 28 January 2011, obtained via ELVIS (Geoscience Australia). Processing: GroundMap.

07 Repeatability, classification and accuracy

Swath overlap difference

CELLS	N	MEDIAN	NMAD	RMSD	95TH PCT	≤ 0.15 M
All cells	859,347	0.001 m	0.021 m	1.861 m	0.140 m	95.2 %
Smooth cells	818,685	0.001 m	0.019 m	0.095 m	0.085 m	98.1 %
Smooth, objects removed	816,998	0.001 m	0.019 m	0.047 m	0.084 m	98.3 %

1 m cells of open, flat ground (slope 5° or less, no non-ground class within 1 m) where two flight lines each hold at least four single returns: difference of the two lines' mean heights, corrected for slope. Smooth = both lines' scatter 0.05 m or less. Objects removed = differences over 0.5 m (vehicles, people) left out.

Classification

CLASS	MEANING	POINTS	SHARE
1	Unclassified	3,646,546	1.09 %
2	Ground	55,002,465	16.44 %
3	Low vegetation	4,600,172	1.37 %
4	Medium vegetation	8,590,388	2.57 %
5	High vegetation	44,817,175	13.39 %
6	Building	24,235,889	7.24 %
8	Model key-point (LAS 1.2 meaning)	1,859,130	0.56 %
9	Water	7,024,055	2.10 %
10	Not stated in the files (LAS 1.4: rail)	97,341	0.03 %
12	Overlap (LAS 1.2 meaning)	184,792,668	55.22 %

Kept returns. Low noise (class 7): 23,515,388 points, removed.

- Class 12 (overlap) holds 55.2 % of kept returns. LAS 1.4 reserves class 12 for point formats 6-10 and marks overlap with the overlap flag, which is set on no point here; class 12 points are not classified as ground, vegetation or building.
- Class 8 (model key-points in LAS 1.2) is present (1,859,130 points); LAS 1.4 reserves class 8 for point formats 6-10 and uses the key-point flag.
- Class 10 is present (97,341 points); its meaning is not stated in the files (LAS 1.4: rail).
- No withheld or overlap flags are set; no vertical CRS is recorded in the headers.
- The LBS minimum scheme (Table 5) needs no building or vegetation classes; this delivery adds 3, 4, 5 and 6.

Relative agreement with older surveys

SURVEY	RETURNS	MEDIAN	NMAD	RMSE	WITHIN 0.15 M
Mount Wellington 2011	823,751	-0.006 m	0.064 m	0.095 m	94.4 %
Climate Futures Derwent 2008	1,036,026	0.020 m	0.125 m	0.154 m	73.3 %

Older class 2 returns on stable open ground, after alignment to Hobart City 2023/24, against its ground surface. Relative agreement between surveys, not absolute accuracy.

Absolute vertical accuracy

Against survey control: not judged. No levelled survey mark flush with the ground or set in rock, of those GroundMap held out of processing in its check of 20 October 2026, lies within Hobart City 2023/24. QL1 requires RMSEv (non-vegetated) ≤ 0.100 m. Nothing here is estimated from the relative figures above. Method and limits of the check: groundmap.com.au/accuracy/.

Specification: <https://www.usgs.gov/ngp-standards-and-specifications/lidar-base-specification-tables> · <https://www.usgs.gov/ngp-standards-and-specifications/lidar-base-specification-collection-requirements>. Analysis by GroundMap, 16 October 2026, on the 12 tiles as delivered through ELVIS.