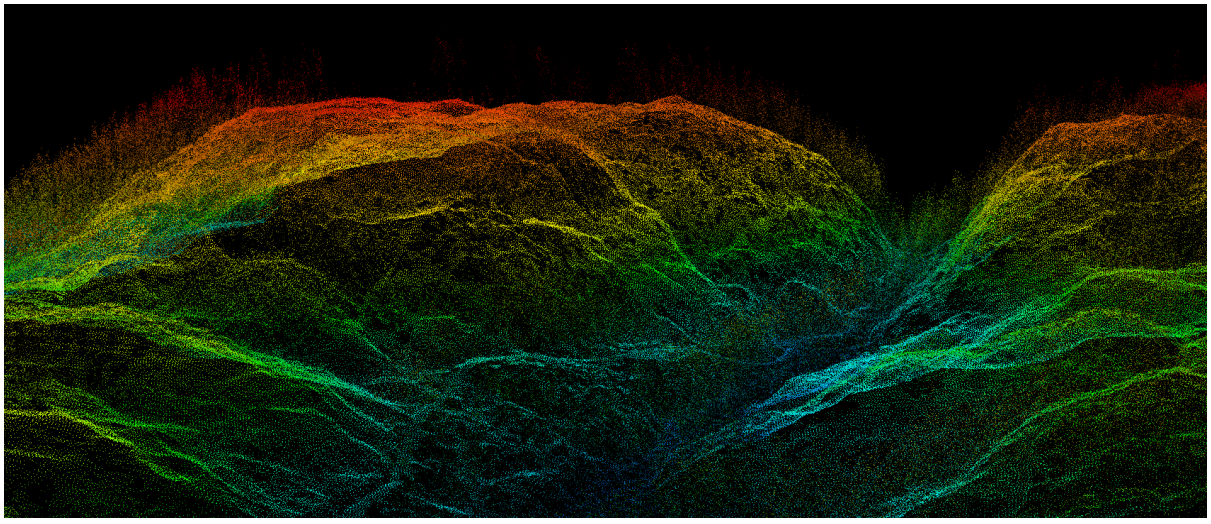
Date: 2019-06-11

Document version: 2.3

Product description:

Laser data - Laserdata NH



List of contents

1 General description

Laserdata NH consists of a point cloud with classified points captured through airborne laser scanning of the terrain.

1.1 Contents

The product contains a point cloud with a point density 0,5-1 point/m². Each point is classified as ground, water, bridge or unclassified.

The product is delivered with metadata that indicates the origin and status of the processing performed, in addition to a full set of metadata from the scan, including flight lines.

If required by the user, files with overlapping data, "border files", can be ordered. These files contain data in a zone that overlaps the neighbouring scanning area by approximately 200 metres. If these files are desired, this must be specified when placing an order.

1.2 Geographic coverage

The product will be nationwide.

1.3 Delivery tiles

The smallest unit for delivery corresponds to a tile measuring 2.5 x 2.5 km geographically adjusted to the index system in SWEREF 99 TM.

1.4 Reference system

In plane: SWEREF 99 TM

In height: RH 2000

2 Quality description

See the pdf-file *Quality description of laser data*, which can be found alongside this product description at the website Laserdata NH.

2.1 Data capture

Data capture for *Laserdata NH* began in 2009. Laser data is captured through airborne laser scanning of the terrain.

Most scanning areas are provided in classification level 3 which includes classification of bridges, refined ground classification of dams and improved classification of ground and water. Other classification levels can occur for some scanning areas. Classification level is presented in Planer och utfall - Produktionsstatus.

Each laser point is classified in any of the following classes

1 Unclassified, also includes any incorrect points

2	Point on ground
9	Point on water
11	Point on bridge

The progress of the production is presented on website Planer och utfall – Laserdata NH (only available in Swedish).

- **Leverantörens veckorapport** (The provider's weekly report) – A file which shows more detailed information about the scan, the time of the different steps, the equipment used and the number of flight lines.

- **Produktionsstatus och klart i lager** (Status of scanning and Ready for delivery) – Presented to give users the opportunity to undertake field surveys in close proximity to when scanning is taking place. The overview presents areas at three different status levels; where flight-line planning is approved, where scanning has started and where scanning is provisionally complete (re-scanning may be considered if the quality is not approved during the subsequent verification). Once scanning is completed, it may take up to approximately 6 months before the laser data is ready for delivery to end users.
  Ready for delivery shows those areas that are ready for delivery to end-users, with a classification level for each scanning area.

2.2 Maintenance

The point cloud is a snapshot without a plan for maintenance.

2.3 Metadata

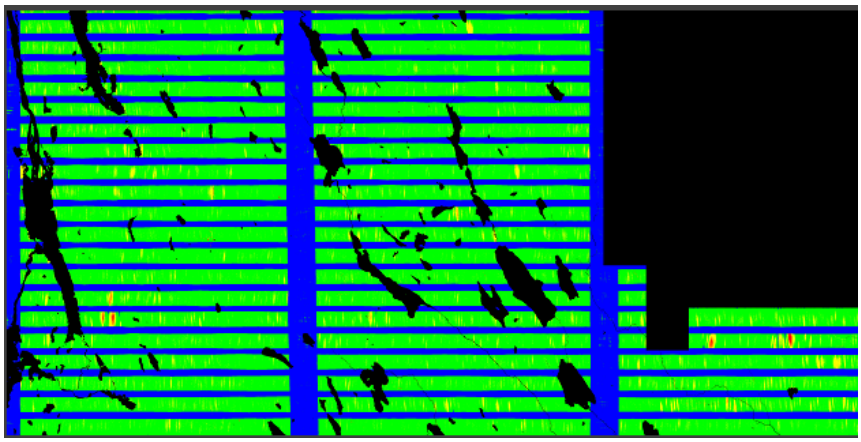
2.3.1 Description of image files

2.3.1.1 Point density - last and only return

For each scanning area the point density of the laser point cloud is presented as an image file with a resolution of 10 metres. Only points from the last of several returns or the only return are shown, i.e. points that may represent the ground surface. The file is named, for example, 09P001_coverage.tif.

The point density is illustrated with colours as per the table below

Colour	Point density	Comment
Blue	> 1 point/m^2	
Green	> 0.5 points/m^2	
Yellow	> 0.25 points/m^2	
Red	< 0.25 points/m^2	
Black	0 points/m^2	Black colour in the image is either due to the water surfaces having been removed by masking or holes in the laser point cloud resulting from poor reflection. Seas and areas outside the national boundary that have not been scanned are also presented as black.



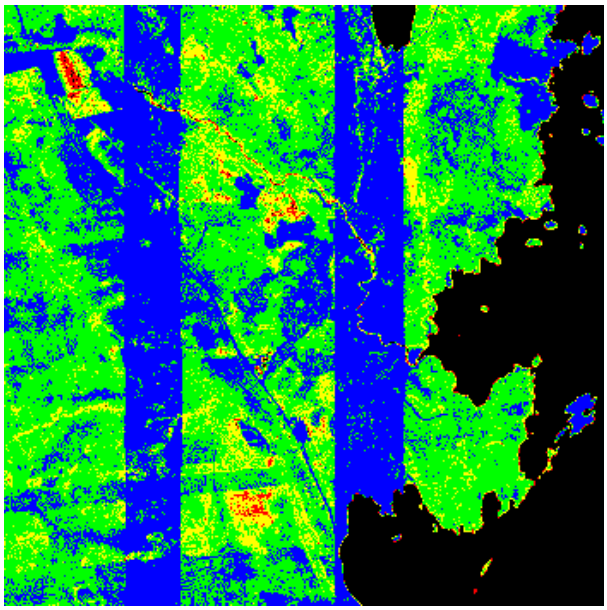
The image above shows point density in the laser point cloud, the last and only return, for all of the scanning area.

2.3.1.2 Point density – laser points classified as ground

For each scanning area the average point density of laser points that have been classified as ground is presented as an image file with a resolution of 10 metres.

The point density is illustrated with colours as per the table below.

Colour	**Point density**	**Comment**
Blue	> 0.5 points/m^2	On open areas and on overlaps between flight lines there might be more points on ground than the minimum requirement of 0.5 points/m^2.
Green	0.25-0.5 points/m^2	On average there is at least one point on ground within one area of 2 × 2 metres.
Yellow	0.0625-0.25 points/m^2	On average there is at least one point on ground within an area of 4 x 4 metres. The terrain model may have a diminished degree of detail in these areas.
Red	> 0.0625 points/m^2	On average there is less than one point on ground within an area of 4 x 4 metres. This might be caused by dense forest or water. The terrain model may have a significantly diminished degree of detail in these areas.
Black	0 points/m^2	Black colour in the image is due to either the water surfaces having been removed by masking or holes in the laser point cloud. Holes in the laser point cloud are due to poor reflection or dense vegetation, which may cause a total loss of points on ground. Poor reflection occurs on, for example, water surfaces and newly laid asphalt.



Example: The colours in the density image above represent varying point densities on ground in the laser data.

2.3.2 Description of contents in metadata files

Every delivered laser data file is accompanied by two metadata files (GeoJSON). The metadata files contains geometry and attributes according to descriptions and examples below.

The GeoJSON schemas is available here: http://namespace.lantmateriet.se/distribution/produkter/laserdata/v1/

Metadata presenting attributes grouped by flight line.

Field	Description	Example
	Geometry, polygon The approximate area of the flight line	
id	Identity of the flight line, Point Source ID	1
insamlingsdatum	Scanning date	2018-03-01
flyghojd	Planed flight altitude (metre)	2200
flyghastighet	Planed speed (knots)	135
punkttathet	Planed minimum point density inside a flight line (points/m2)	0.6
skannerid	Scanner ID	SN6114
skannerfabrikat	Scanner manufacturer	Leica
skannermodell	Scanner model	ALS60
oppningsvinkel	Field of view (degrees)	40
pulsfrekvens	Pulse frequency (Hertz)	104100
skanningsfrekvens	Scan frequency (Hertz)	39
trjfil	Trj-file	

Metadata presenting attributes grouped by tile.

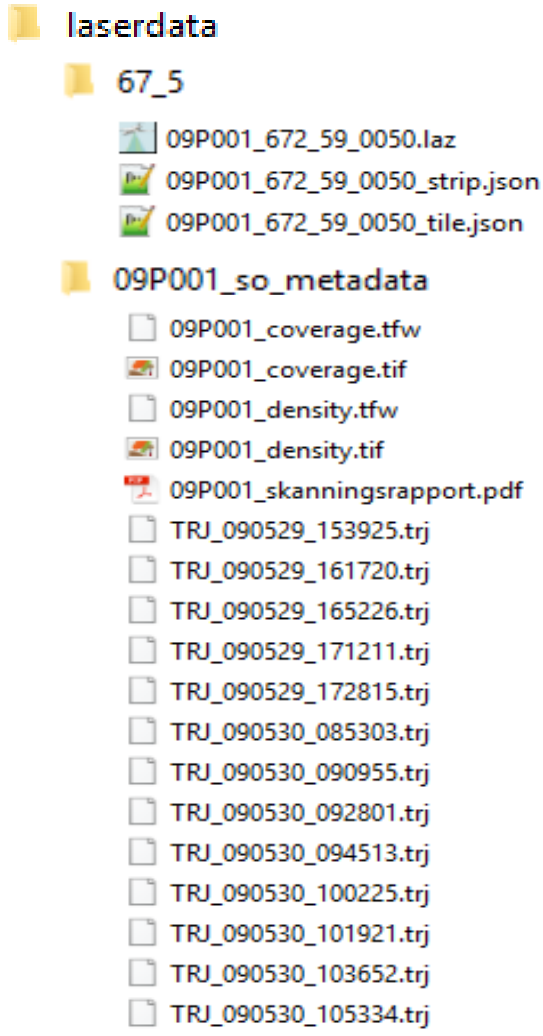
Field	Description	Example
	Geometry, polygon The approximate area of the tile	
id	Tile ID	672_59_0050
klasstatistik	Number of points for each class	1: 115706 2: 76985 9: 2321521
klassificeringsniva	Classification level	3
kommentar	Quality notes *Indicates that deviations or problems of which the user should be aware have been detected during processing.*	Utbredd felaktig mark-klassning av tät låg vegetation
senastAndrad	Date of the most recent update	2015-11-26

On the website Planer och utfall – Laserdata NH, *Läge och skanningsdatum för stråk*, there is a file to connect laser points to the date of the laser scanning.

3 Contents of the delivery

3.1 Folder structure at delivery

At delivery the LAZ files, including the metadata, is sorted into folders like the example below.



3.2 Delivery format

Laser data is supplied in LAS format, version 1.2, in point data record format 1. The LAS files, and any border files ordered, are supplied compressed with Laszip (software to unzip these files is free to download on the internet).

3.3 File sets and contents

File name (example)	Description
09P001_672_59_0050.las (supplied compressed in .laz)	The file name includes the identity of the scanning area, the co-ordinates of the lower left corner of the tile and the file format.
09P001_672_59_0050_strip.json	Metadata presenting attributes grouped by flight line, one file for each las-file
09P001_672_59_0050_tile.json	Metadata presenting attributes grouped by 2,5 kilometre tile, one file for each las-file
09P001_coverage.tif	A raster file presenting the point density of the laser point cloud, last and only return, for the entire scanning area.
09P001_coverage.tfw	Geo-referencing file for the image file above.
09P001_density.tif	A raster file for the entire scanning area presenting the point density of those laser points that have been classified as ground.
09P001_density.tfw	Geo-referencing file for the image file above.
TRJ_090529_153925.trj	Trajectory data, one file for each flight line included in current scanning area. The file name may vary depending on the equipment used, but it will always end with the extension .trj.
09P001_Skanningsrapport.pdf	The contractor´s report on collection.
09P001_672_59_0050.las (supplied compressed in .laz)	Border files. Contain laser data in a zone that overlaps neighbouring scanning areas by approximately 200 metres. The files have the same name as regular LAS files, but are kept in their own folder, named according to “09P001_kant”. PLEASE NOTE! The files must be ordered specially!