

An Introduction to Visualizing and Analyzing LiDAR Data

1. Start a blank project, name it something descriptive (e.g. LiDARExploration), and save it in a safe location.
2. Click New Map to start a new map.
3. We will need to first create a LAS dataset in order to visualize the points in the LAS files. Go to the Analysis tab, click tools, search for Create LAS Dataset (Data Management Tools). The data (Geodetics_Quarry_Sample_LLA_Ellipsoid.las) used in this exercise was collected by a LiDAR unit (Velodyne VLP-16) that was mount on the DJI Matrice 600 aircraft.

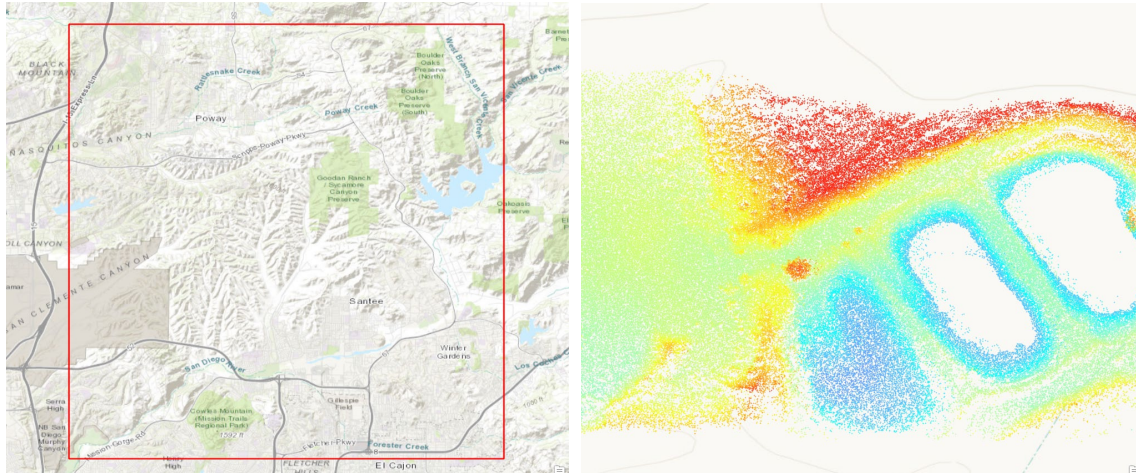
In the Create LAS Dataset window, enter the following:

- a. Input Files: Geodetics_Quarry_Sample_LLA_Ellipsoid.las
 - b. Output LAS Dataset: Quarry.lasd
 - c. Coordinate System: 4326 (This is the ID for the GCS_WGS_1984 coordinate system)
 - d. Make sure that Compute Statistics is checked**
 - e. Click Run
4. The Quarry.lasd LAS dataset should be automatically added to your map.

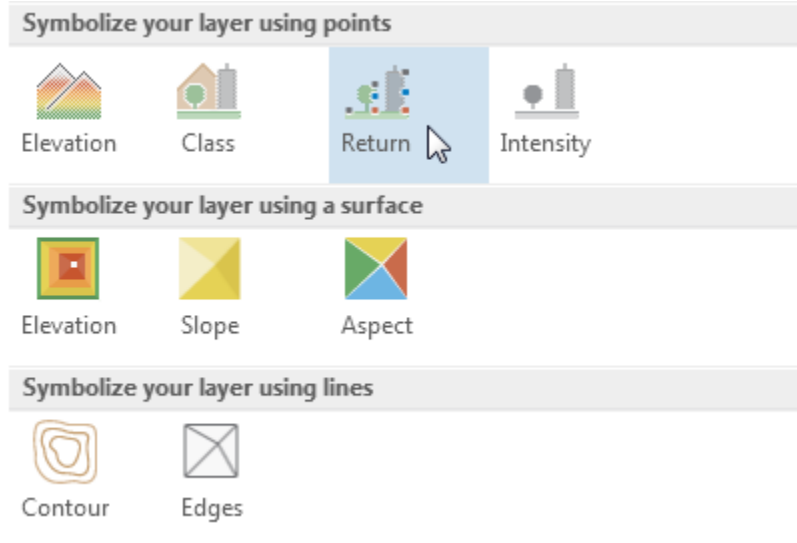
To see the layer, you will need to right click on the item in the contents pane, and select Zoom to Layer. This will allow you to see the footprint of the LAS dataset as a red box. (below left)

To see the points, go to the Map tab, select locate, and enter -117.037560, 32.928619. You will need to zoom in beyond the 1:792 map scale to see the points. (below right)

As you zoom in closer, you will see more of the points and it will take longer for the points to be rendered on your machine.



5. Explore different ways of visualizing your dataset by going to the Appearance tab (make sure that the Quarry.lasd is selected in the contents pane first), click on the Symbology icon, and under Symbolize your layer using points, click on Return.



Q1. What is the range of return values you see in the Symbology pane? (1 to 5)

6. Click on the Symbology icon (within the Appearance tab) again, and under Symbolize your layer using points, click on Elevation.

Q2. What is the range of elevation values you see in the Symbology pane? (146 to 180.84)

Q3. Compare the elevation values from your point layer with the elevation values as indicated by the contour line in the topographic basemap, what is likely to be the unit of measurement (feet? meter? miles? yards?) of the elevation values in the point layer? (meter)

7. Explore the LAS dataset's attributes. Right click on the Quarry.lasd and select properties. In the Layer Properties window, select Source, answer the following question:

Q4. How many points are in our LAS dataset? (11,425,698)

8. To cut down on data processing time, we will use a subset of the points from the Quarry.lasd LAS dataset to generate TIN (Triangulated Irregular Network) and raster layers in order to visualize our data in different ways and perform basic analyses.

Go to the Analysis tab, click tools, search for LAS Dataset To TIN (3D Analyst Tools).

In the LAS Dataset to TIN window, enter the following:

- a. Input LAS Dataset: Quarry.lasd
- b. Output TIN: TIN2000
- c. Thinning Type: Random
- d. Thinning Method: Node Count
- e. Thinning Value: 2000
- f. Z factor: 1

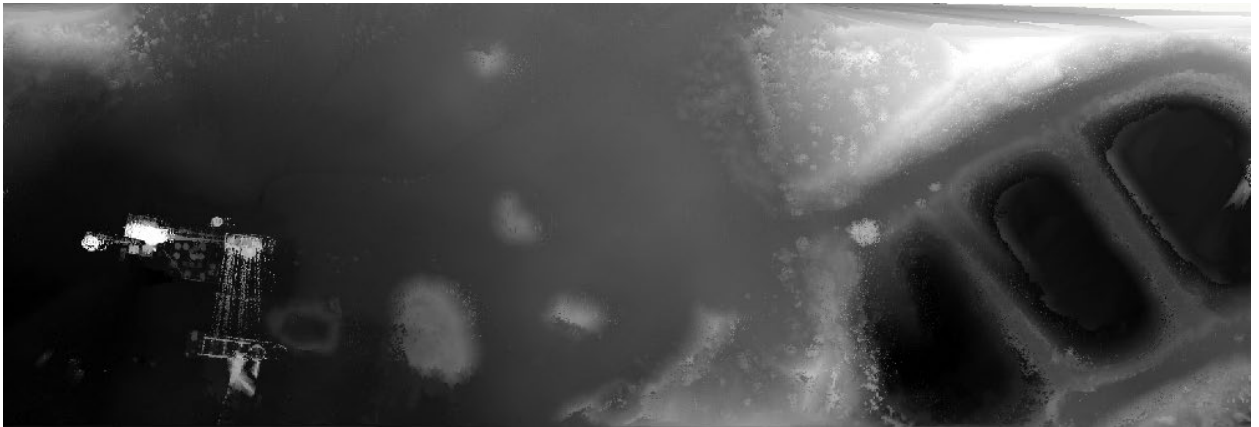
- g. Click Run
- 9. Repeat step 9 with the same settings, except change the Output TIN name to TIN200000, and change the Thinning Value to 200000.

Q5. Briefly comment on the visual differences between the TIN layer generated with 2000 points as opposed to the one generated with 200000 points. (The 200000 point layer has much more detail)

- 10. To perform simple raster analysis on our data, we need to first convert our LAS Dataset into a raster layer. Go to the Analysis tab, click Tools, and search for LAS Dataset To Raster (Conversion Tools).

In the LAS Dataset To Raster window, enter the following:

- a. Input LAS Dataset: Quarry.lasd
- b. Output Raster: Ras200000
- c. Value Field: Elevation
- d. Interpolation Type: Binning
 - i. Cell Assignment: Average
 - ii. Void Fill Method: Linear
- e. Output Data Type: Floating Point
- f. Sampling Type: Observations
- g. Sampling Value: 200000
- h. Z Factor: 1
- i. Click Run (This operation will take a few minutes)

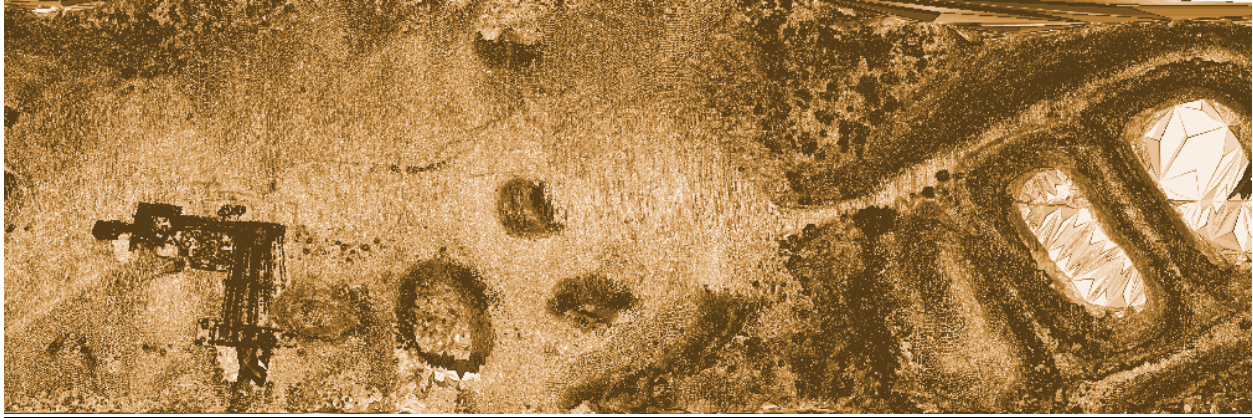


- 11. To analyze our raster layer, go to the Analysis tab, click Tools, and search for Slope (Spatial Analyst Tools).

In the Slope window, enter the following:

- a. Input raster: Ras200000
- b. Output raster: Slope200000
- c. Output measurement: Degree
- d. Method: Planar
- e. Z factor: 1
- f. Click Run (This operation will take a few minutes)

Q6. Produce a screenshot of the Slope200000 layer and include it in the space below. (Below is a sample output)



12. Feel free to experiment with other raster analysis tools such as Aspect (Spatial Analyst Tools) and Hillshade (Spatial Analyst Tools) using the Ras200000 layer as the Input raster.



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