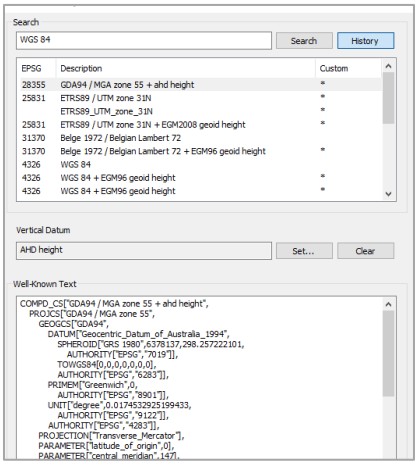
Getting the Most Out of Your Lidar Data in PhotoMesh

Lidar (light imaging, detection and ranging) is a remote sensing method that uses pulsed laser light to measure terrain and objects. This data together with other information recorded by the sensor system is used to generate a densely spaced point cloud of highly accurate georeferenced points. Lidar data can be loaded into a PhotoMesh project and integrated with project photos to supplement project data and increase model accuracy. PhotoMesh supports Lidar data in .las, .laz or .e57 formats. To improve the reconstruction of the model, Lidar data can be loaded together with a trajectory file that provides information about the scanner's position while capturing the point cloud. Some .e57 files include internal trajectory information and therefore do not require an external one.

Loading Lidar Data



1. Load a Lidar file.
2. Set the Lidar's coordinate system including its vertical datum.

   Note: If incorrect coordinate system information is entered, the *.CPT created for Lidar will need to be manually deleted from the project directory: PM_project\cpts\

Adding Trajectory Data

To improve the reconstruction of the model, Lidar data can be loaded together with a trajectory file that provides information about the scanner's position while capturing the point cloud. Trajectory data can only be imported in a tab delimited .trjt (text format) file. Some .e57 files include internal trajectory information and therefore do not require an external one. The file format should match that of the example below.

```
#version=1.0
#wkt=PROJCS["GDA94 / MGA zone 55 + AHD height",GEOGCS["GDA94",DATUM["Geocentric_Datum_of_Austra
1980",6378137,298.257222101,AUTHORITY["EPSG","7019"]],TOWGS84[0,0,0,0,0,0,0],AUTHORITY["EPSG","
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Datum",2005,EXTENSION["PROJ4_GRIDS","AUSGeoid2020_20180201.gtx"],AUTHORITY["EPSG","5111"]],UNIT
01"]],AXIS["Up",UP],AUTHORITY["EPSG","5711"]]]

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307858.6150 5806669.1440    369.9840    1257728428.3010
307908.3383 5806659.2941    370.1380    1257728429.0060
307952.2982 5806650.6884    370.3893    1257728429.6310
308001.7488 5806641.0667    370.9989    1257728430.3360
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308292.6039 5806583.4337    379.6411    1257728434.5411
308343.3743 5806573.7502    381.9531    1257728435.2811
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308415.8748 5806560.3156    383.5386    1257728436.3361
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308568.1678 5806531.7952    384.7675    1257728438.5461
308612.3747 5806523.8660    383.6527    1257728439.1861
308674.2423 5806512.6915    381.5519    1257728440.0811
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308956.6397 5806461.6033    376.0428    1257728444.1611
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309111.6364 5806433.1221    376.6570    1257728446.3961
```

Showing a Lidar Point Cloud on the Terrain

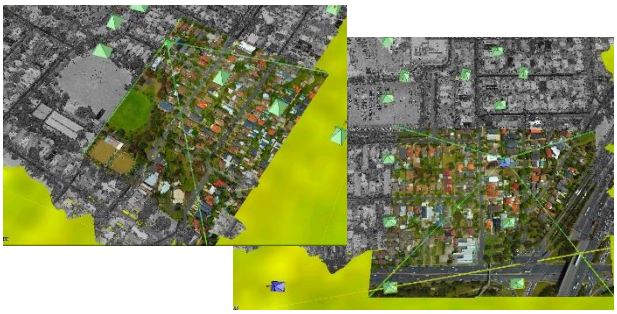
A Lidar point cloud can be shown on the terrain to see if it fits the terrain imagery or to better understand the position of the Lidar.

To show Lidar on the terrain:

- In the Project Tree, right click the Lidar and select **Show on Terrain**. The Lidar is projected on the terrain. If the Lidar file is large, this may take a while.

  Note: If you want to show more than one Lidar on the terrain, the conversion to CPT performed via "Show on Terrain" may take too long. So instead build the project, performing only the Data Preparation step. It is recommended to work with a single Lidar.

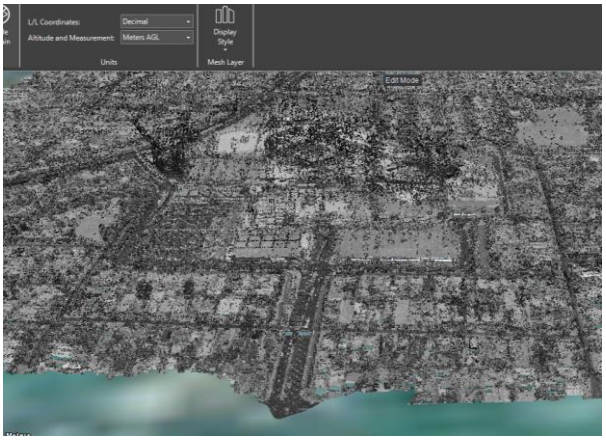
Showing Photos on the Lidar



- Select photos with orientation information, and select **Project on Terrain** to project them on top of the Lidar. Check that the photo is positioned correctly on the Lidar.

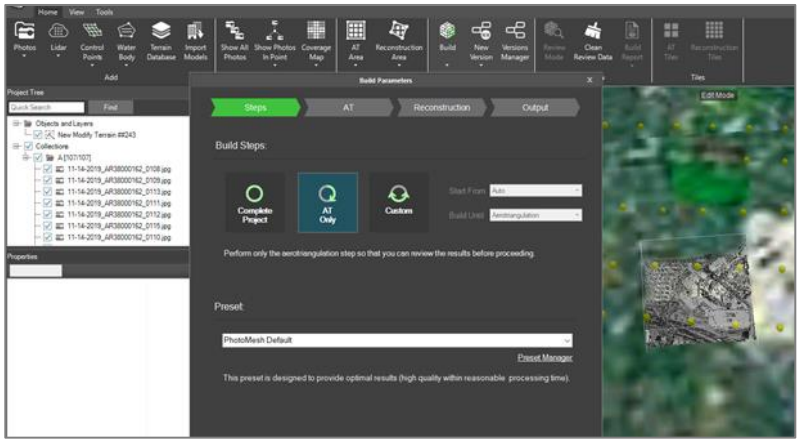
  Note: If the Lidar is under the terrain, turn on underground mode (see screenshots below). If the Lidar is partially under the terrain, use **Modify Terrain** to lower the elevation of the terrain below the Lidar.

Before Underground Mode was Activated



After Underground Mode was Activated

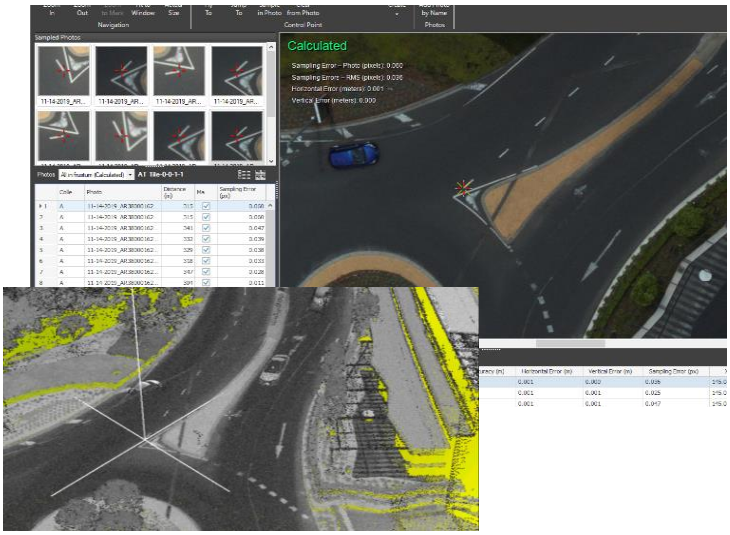
Adding Photos to Your Project



1. Add photos to your PM project
2. If your photos have orientation information, skip to the next step. Otherwise, perform an “AT Only” build to add position and orientation information.

Adding Ground Control Points (GCP)

Ground control points are used to align your Lidar data with the project’s photos.

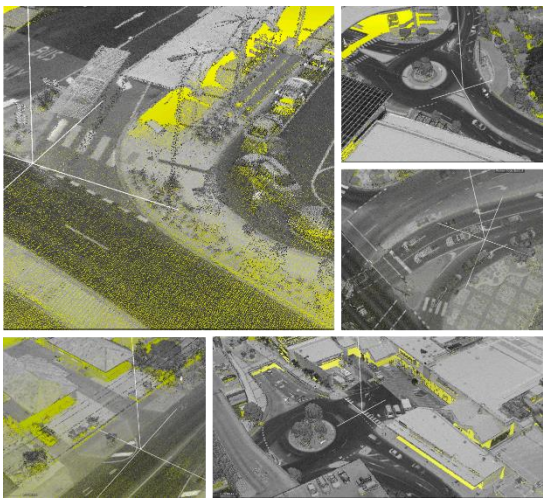


1. On the **Home** tab, select **Create Ground Control Point from Terrain**. Then click the Lidar feature in the **3D Window** that you want to sample.

   Note: You can enlarge the Lidar point size to find a clearly visible location on the Lidar ground level.

   Note: It is generally recommended to pick points in open areas that can be seen from all different photo combinations and properly referenced to the nadir camera and several oblique cameras.

2. The Control Point Editor lists all the photos in which the selected Lidar feature appears. Mark the control point in a few photos from each collection or photo direction. It is recommended to have at least 10 sampled photos for each GCP. The Control Point Editor calculates the sampling error. For best results, make sure the sampling error is small (1-2 pixel range).



GCP Scattering

It is recommended to add at least five control points evenly distributed around each AT tile (four in the corners and one in the center).

Verifying the Accuracy and Quality of Your Data

Perform a build on a single reconstruction tile, and examine the accuracy and overall quality of your point cloud, model, textured model build before building the full project.

Completing the Build

Select the reconstruction settings that best suit your Lidar data:

- The direction of Lidar collection assists in calculating surfaces from the point cloud. When there is no trajectory file and the Lidar collection is known to be airborne, select Lidar Collection Mode = Aerial. Otherwise, select Auto.
- The Use Lidar Colors setting enables you to select the data to use in texturing the model: only color from Lidar points, only texturing from photos, or Auto – supplement photo textures with color from Lidar points where photo texturing information is insufficient. Select **Only Photos**.