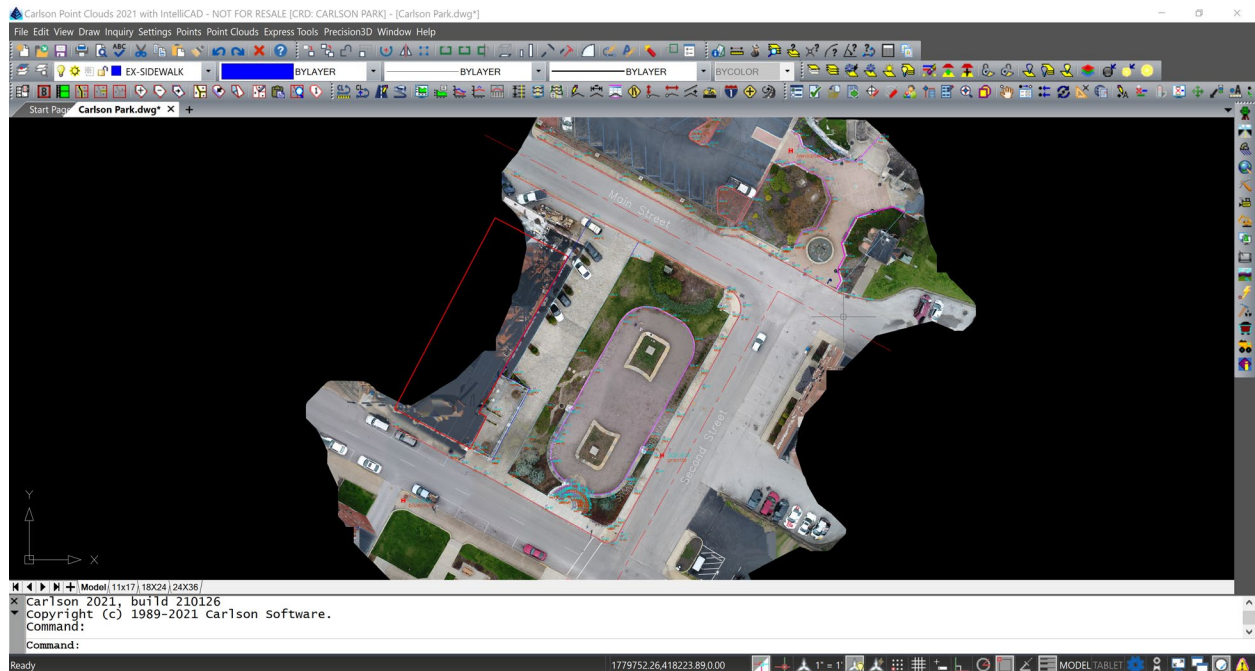# *Carlson PhotoCapture*

Quick Start Guide

Carlson PhotoCapture | Photogrammetry

Lesson Objectives

In this class, we will be discussing the basic procedures to obtain a point cloud and an orthoimage from a site flyover in PhotoCapture. These output products can then be used to generate a representative surface model (TIN) for the project using Carlson Point Cloud or Carlson Precision 3D. Note that PhotoCapture's Survey Canvas tools will be briefly touched.

The objectives for this class are:

- Creating a PhotoCapture site
- Uploading images and ground control points (GCP) for processing
- Reviewing and exporting the resulting output products

Carlson PhotoCapture General Considerations

Carlson PhotoCapture provides you with the ability to take the images from your drone flyovers and processing them with your ground control data to generate digital elevation models (DEM), dense and sparse point clouds, surface models, an orthomosaic and process report. As you probably have already obtained your drone pilot license (part 107), no need to cover planning and flight phases for the project.

But here are a few things to keep in mind to work with PhotoCapture:

Aerial Platforms Supported

- Drones/planes
- Drone cameras, DSLR, and large format aerial cameras

- Prefer Mechanical Shutter to Rolling Shutter

Radiometry

Take into consideration the radiometry or amount of light when planning for your flight. Weather, time of day will have an effect as there will be variable light and shadows. For example, flying between 10-2 pm on sunny days is best, overcast skies are great, try to avoid partially cloudy days.

Having a camera where you can control the lens opening (aperture), exposure time (shutter speed), and light sensitivity (ISO) will help you get better results as you will be able to compensate for the particular lighting conditions of the day at the site.
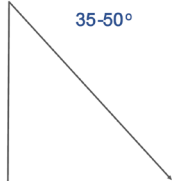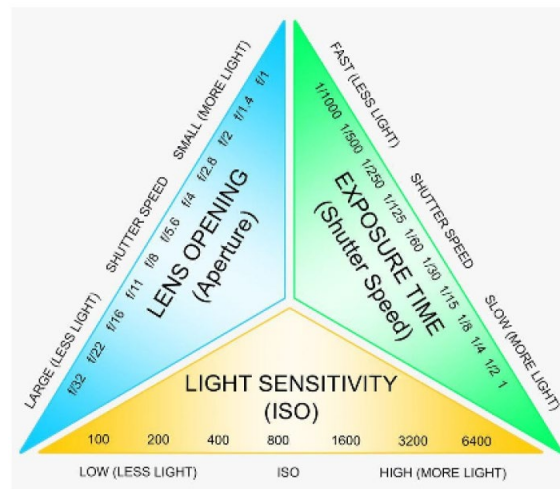

## Camera Angles and Flight Patterns

PhotoCapture supports images taken with nadir and oblique angles when processing. You want to be consistent though and not change the camera angle through the middle of the project. It's fine to take another set of images at a different angle and then process them separately. The resulting point clouds can be combined using your control points.

Common camera angles used to collect images:

0-10°	**Nadir –** Great for general ground mapping. For example: • Building sites • Topo surveys • Stockpiles
15-25°	**Low Oblique –** Great for general mapping and buildings. For example: • Urban/residential areas • Topo surveys • Some vegetation

	• Quarries
35-50°	**High Oblique –** Great for 3D modeling of buildings. For example: • 3D modeling • Facades

As you plan for your job, making sure you have a good pattern that will provide sufficient image overlap is important (below some examples). In all a *low oblique* camera angle with a cross flight pattern would give you the best results for both camera angle and image overlap. Keep in mind that the 3D generation is based on pixel correlation!
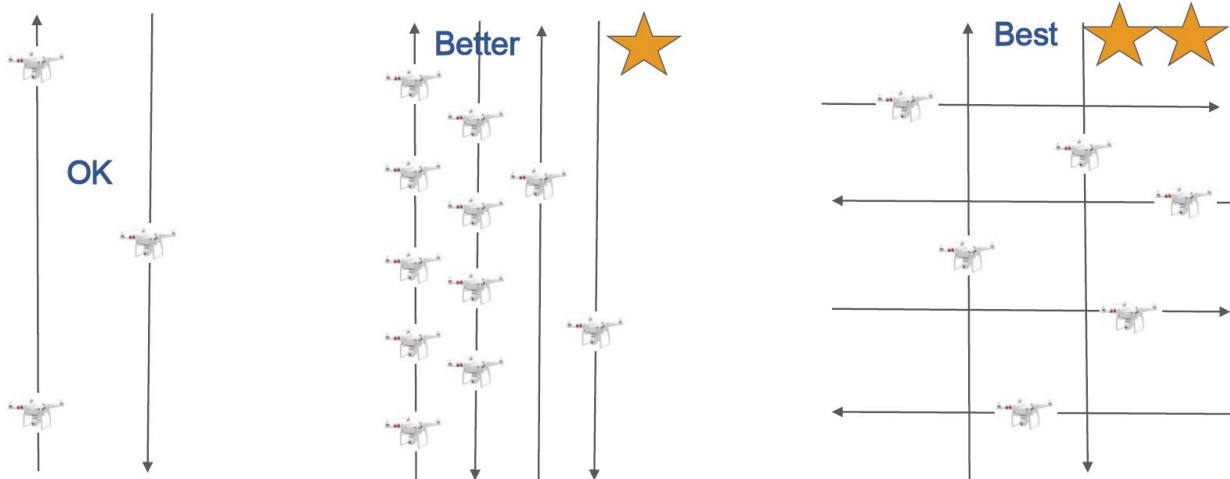

Ground Control Points (GCP)

Regardless of whether you have a standard or an RTK drone, make sure to set ground control points for the job as this will improve the accuracy of the results, particularly the elevations. Ideally, use targets and mark the GCPs on the ground. Be descriptive, it doesn't hurt. Best practice is to have a good spatial distribution of the control points. For example:
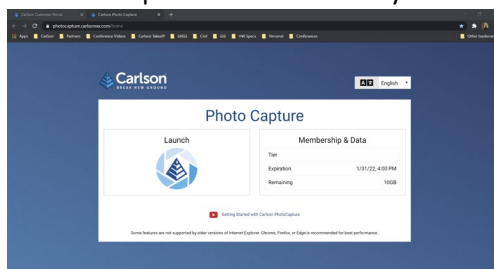
MAP / IMAGES

Legend:

- Included Image   - Ground Control Point

Working with PhotoCapture

Login to PhotoCapture

- Open your browser to the Carlson Customer Portal (account.carlsonsw.com/login) and sign in.
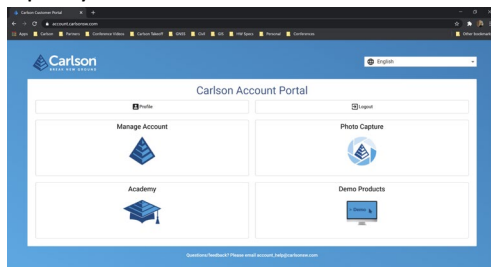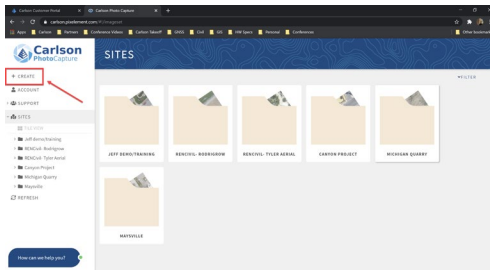

- Click on **PhotoCapture** and then click **Launch**. This page provides you with basic information on membership and data availability.
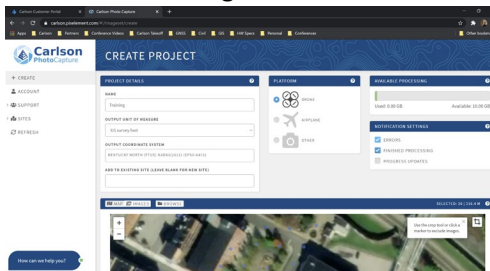

Create a Project

- The *Sites* page will open. Click on **Create**. On this page, you will find the sites that you have processed. You can have more than one project per site.

- In the *Project Details*, input the project name. For this lesson we will use **Training**. Set the *Output Unit of Measure* to **US survey foot**. Don't worry about *Coordinate System*, this will be read from the images.

- You can **drag-and-drop the images** into the PhotoCapture page from Windows Explorer or click **Browse**. Once read, a map preview will display with blue dots to help you verify that everything is in the right place. You will notice that the *Output Coordinate System* was updated. For this lesson, the images were taken in Maysville, KY, and the coordinate system is NAD83 KY North.
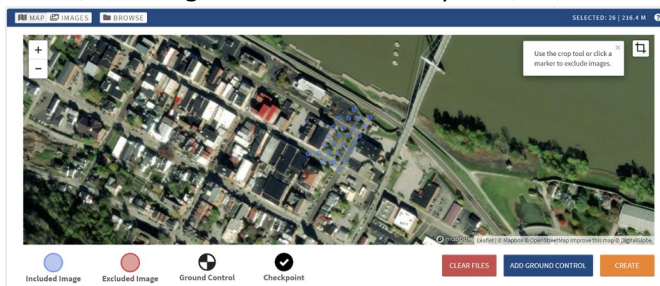
- As mentioned earlier, you want to add ground control to the processing. If you didn't have any, you can still process. Click **Add Ground Control**. The GCP data can be added in multiple formats including Carlson's CRD files or through text files. In this case, we'll use **Text File**.

- In the *Coordinate Format*, select **northing/easting**. Note that it could be lat/long.
- Then, in the *Ground Control Unit of Measure*, select **US survey foot**.

- Lastly, in the *Coordinate System*, select **Kentucky North**. Note that the coordinate system read from the images is the listed first in the pull-down.
- Once more you can **drag-and-drop** the GCP text file or click **Browse**. Once done, a listing of the GCPs will be displayed. In case you have some points listed that are not to be used during processing, check them as *Checkpoint*.
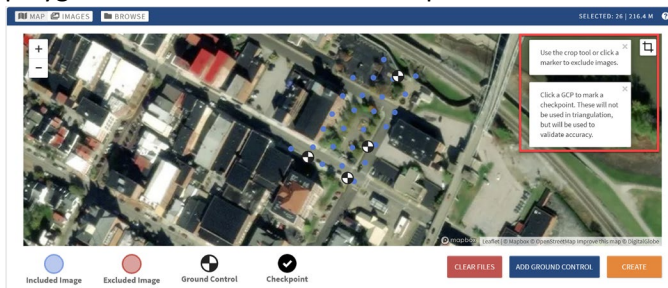

- Click **Finalize**. You will be prompted to confirm that you can see the GCPs in the map with the blue dots representing the images to be processed. Click **Yes**.
- If you didn't want to process all the images in a single run, you can use the *Crop* tool and draw a polygon to establish the area to be processed.

- In this map view, you can click on any image marker (blue dot) to exclude a given image. Clicking on the GCP will first make it a check point and another click will exclude altogether.
- When ready click the **Create**.
- In the *Confirm Project Creation* window, you will need to check **The coordinate system and unit of measure above are correct** to allow processing. If you click on *Advanced Fields (optional)*, you can access a few parameters that give you further control of processing – we are not covering those in this lesson.

CONFIRM PROJECT CREATION

Zone:	Kentucky North (ftUS)
Earth Model:	NAD83(NSRS2007)
Code:	EPSG:3545
Unit of Measure:	US Survey Feet

+ Advanced Fields (optional)

☑ The coordinate system and unit of measure above are correct.

**I acknowledge that my imagery must be within 60° of nadir and have at least 50% forward/side overlap

CANCEL   CREATE

- Click **Create**. Processing will begin, a site will be added to your *Sites* page. The first step is called Bundle Adjustment and will require you to adjust the ground control. Depending on the number of images, it may take a few minutes before you are prompted.

GROUND CONTROL ADJUSTMENT

Welcome to the Ground Control Adjustment tool!
Using this tool correctly will result in high accuracy for your project.

Instructions:
- To move a marker, click on the target area you designated as the point or drag the marker into place.
- To correct a point, simply move the marker or click the ✔ in the upper right hand corner of the map.
- If you don't see the ground control point in the image, make sure the ✖ is selected in the upper right hand corner of the map and move to another image instead.
- You only need to correct **3-10 images** per ground control point.

Tips:
- *Right-click* to move to the next image and speed up this process!
- Hold *shift*, mouse over the image thumbnails at the bottom of the map, and *scroll* to easily navigate back and forth.

☐ NEVER SHOW ME THIS AGAIN   GOT IT!

Note that you can turn the prompt off by checking Never Show Me This Again.

- To adjust the ground control, **click** on the location of your GCP. Notice how the marker will turn green also, checkmark will appear on the tiled image in the lower left. **Right-click** to adjust the next image for this GCP or click on the next image tile on the bottom. Note that hovering over the marker will display the GCP description.

Don't click the Next GCP blue button until you have adjusted all the images in listed in the lower left.
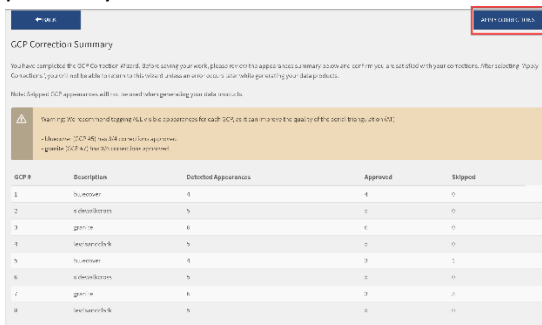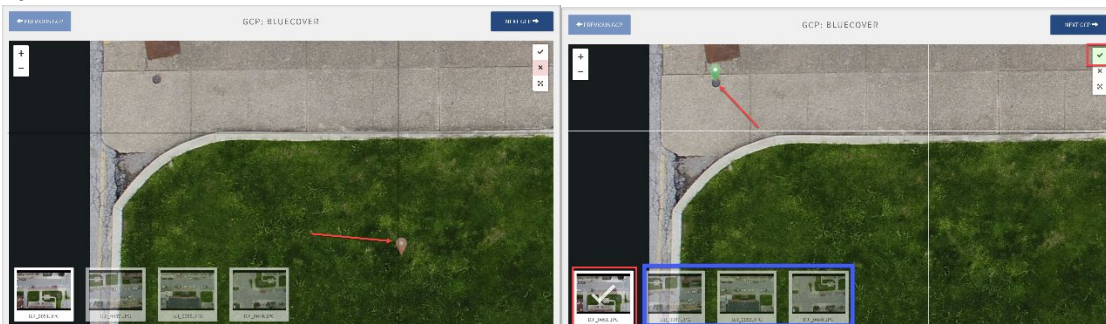
Note that once all the images for the GCP have been adjusted, PhotoCapture will display the images for the next GCP automatically until you are finished with all the adjustments.

- Repeat this step for all the GCPs.
- When done click **Finish**.
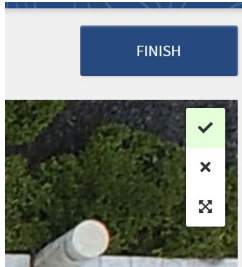
- You will receive a prompt if not all the images were adjusted. Click **Yes – Continue Anyways**.
- The summary correction page will display. Review and click **Apply Corrections** if you are ready to process your data.

PhotoCapture will now start the creation of the point cloud models, DEM, surface, orthoimage and project report. As PhotoCapture is a webservice, you can now close the browser and work on something else. Once completed, you will receive an email message advising that the processing has finished. Processing times will vary depending on the number of images in your project. An average 100 images project, small site, will take less than an hour whereas large sites say 600+ images may take 3-4 hours.

Reviewing the Results

With processing complete, your Output Products page will look like the image below.

IMAGE UPLOAD	VIEW		10/30/19 10:25PM
BUNDLE ADJUSTMENT	VIEW	DOWNLOAD	10/30/19 10:25PM
DENSE POINT CLOUD	VIEW	DOWNLOAD	10/30/19 10:31PM
SURFACE MODEL	VIEW	DOWNLOAD	10/30/19 10:31PM
DIGITAL ELEVATION MODEL	VIEW	DOWNLOAD	10/30/19 10:31PM
ORTHOIMAGE	VIEW	DOWNLOAD	10/30/19 10:31PM
PROJECT REPORT		DOWNLOAD	10/30/19 10:31PM

TRANSFORM FINISHED PRODUCTS

To review any of the results, click on the View icon or select from side panel.

Bundle Adjustment / Sparse Point Cloud

In this viewer you can verify that there weren't any issues with the drone images. If there were issues, you would see yellow or red flags in the viewer.
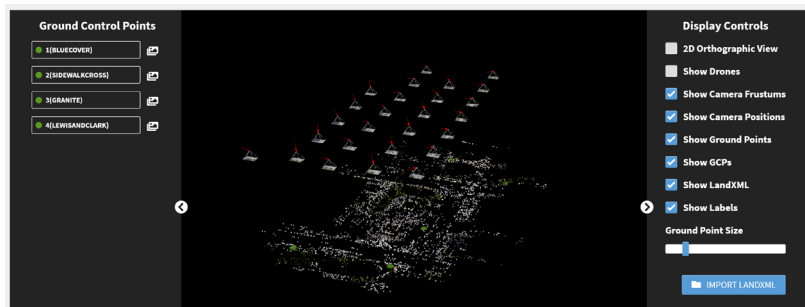
Dense Point Cloud

Use this viewer to review the resulting point cloud. The sidebar provides you with tools to measure angles, distances, and elevations. You can also measure areas and create profiles.

Survey Canvas

Survey Canvas will display an elevation mesh of your site and provides tools to place points, draw lines and create a TIN. As stated in the beginning, the intent is to create a representative surface of the site and we will do this in Carlson Point Cloud or Precision 3D where you will have full control of filters and decimation tools. But, it is good to know that you can extract some data directly from PhotoCapture.

1. You will find the place point, add polyline, add polygon, generate grid, generate tin. You have a drawing manager available to add and control the visibility of the layers.
2. You will find the save and export options (dxf, landxml, crd). The import function allows you to import references in dxg, landxml, and crd formats.
3. Create a screen capture and reset the camera view.

Export the Results

There are two ways to transfer the output products from PhotoCapture into Carlson Point Cloud and Precision 3D. Which one you use depends on your preferences.

- Get the files directly from PhotoCapture into the CAD software
- Download the individual products

For this lesson, we will follow use the Get command in the CAD software. To download, simply click on the *Download* icon in the Output Products pages.

## Getting Files Directly from Carlson PhotoCapture

- Start by creating the Carlson Project.
- From the *File* menu, select **Carlson PhotoCapture**.
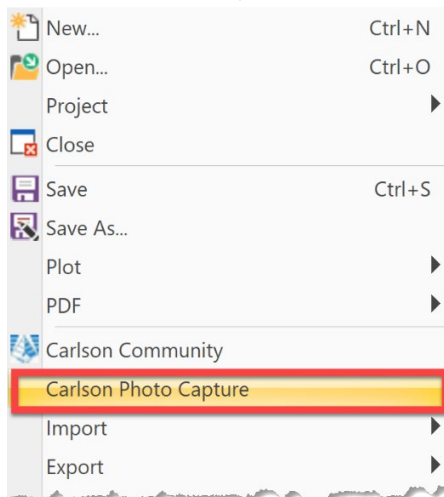

- In the *Carlson Customer Login* window, input your PhotoCapture credentials and click **Login**.
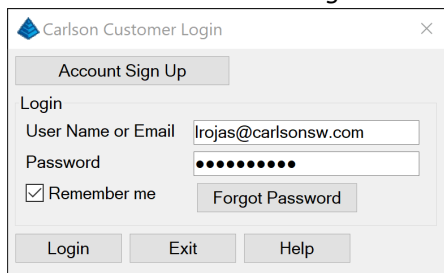

- The *Select PhotoCapture Project* window will display all the projects you have available on the web service. Select the project you will be working with and then click **OK**.
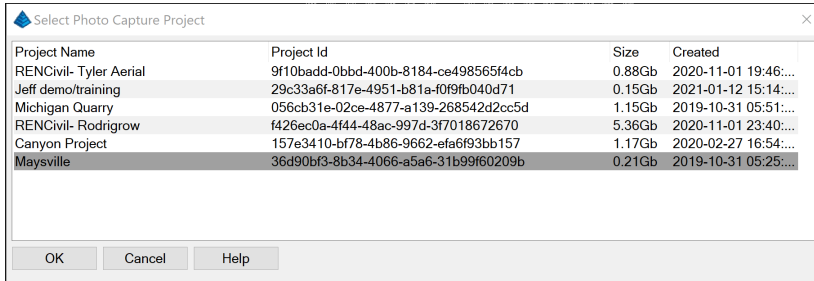
- After a moment, the *PhotoCapture Project Files* window will open with a listing of all the PhotoCapture output files that can be downloaded. You will want to download the orthoimage, dense point cloud data and project report. **Highlight the files** to download, check **Simplify File Names** and the click **Download**.
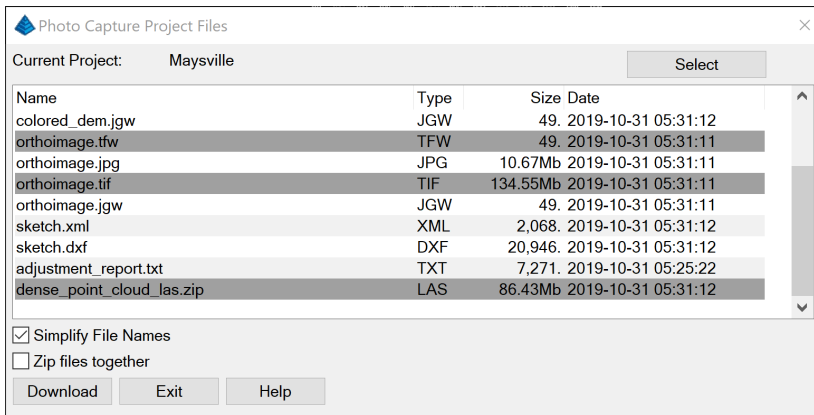
- Once the downloads are complete, click **Finish** in the PhotoCapture Download Queue window.
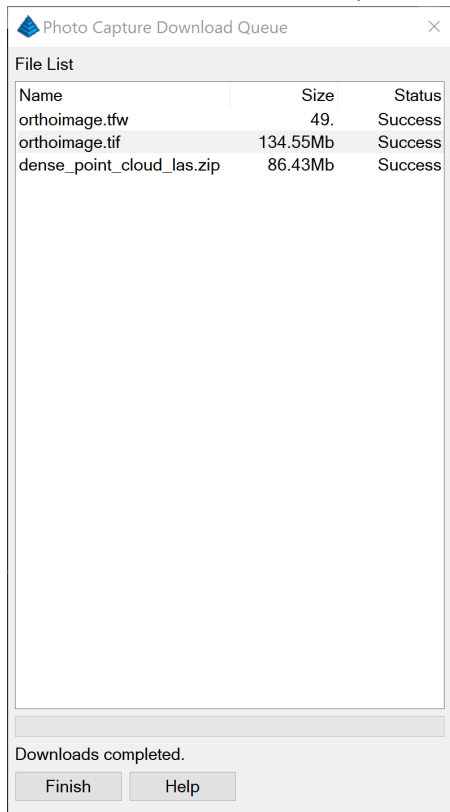
- A report window will open if you want to confirm and save the information regarding the downloaded project.
- The downloaded files will be found in the project folder.