Drone user manual

for

Forest monitoring

Compiled by: Forest resources management & Technical Services Division

Ministry of Forests and Research
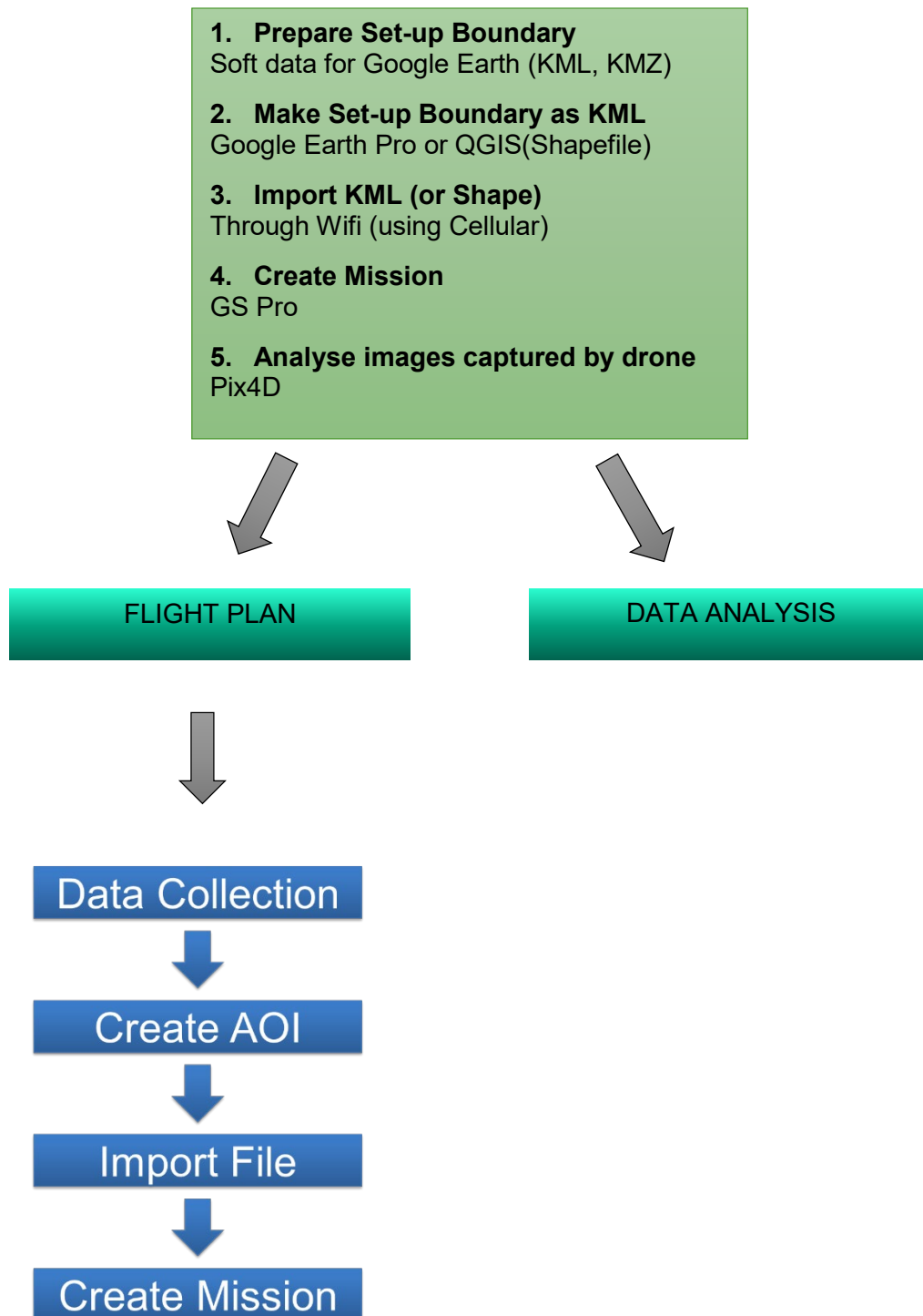Solomon Islands

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1. Preparation for Forest Monitoring

1.1 Preparation

Before acquiring the final data output for analysis, the following steps are important with regards to preparation of the area of interest for the flight mission. The diagram illustrate the methodology used in preparation for analyzing data in Forest Monitoring.

1. Prepare Set-up Boundary
Soft data for Google Earth (KML, KMZ)

2. Make Set-up Boundary as KML
Google Earth Pro or QGIS(Shapefile)

3. Import KML (or Shape)
Through Wifi (using Cellular)

4. Create Mission
GS Pro

5. Analyse images captured by drone
Pix4D

FLIGHT PLAN

DATA ANALYSIS

Data Collection

Create AOI

Import File

Create Mission

2. GS PRO for Ortho Photo

DJI GS PRO (also known as Ground Station Pro) is an iPad app designed for industrial applications including but limited to, aerial imaging, architecture, precision agriculture, electrical inspections, search and rescue, safe control, and more. It provides easy planning through different methods such as tapping on the map, setting points using the aircraft, or importing files, and automated aircraft control during the planned mission. DJI GS Pro is compatible with the iPad product line and many DJI aircraft, flight controllers, cameras and accessories.

Create AOI → Import File → Create Mission

Designing tool

Importing data

Flight mission develop
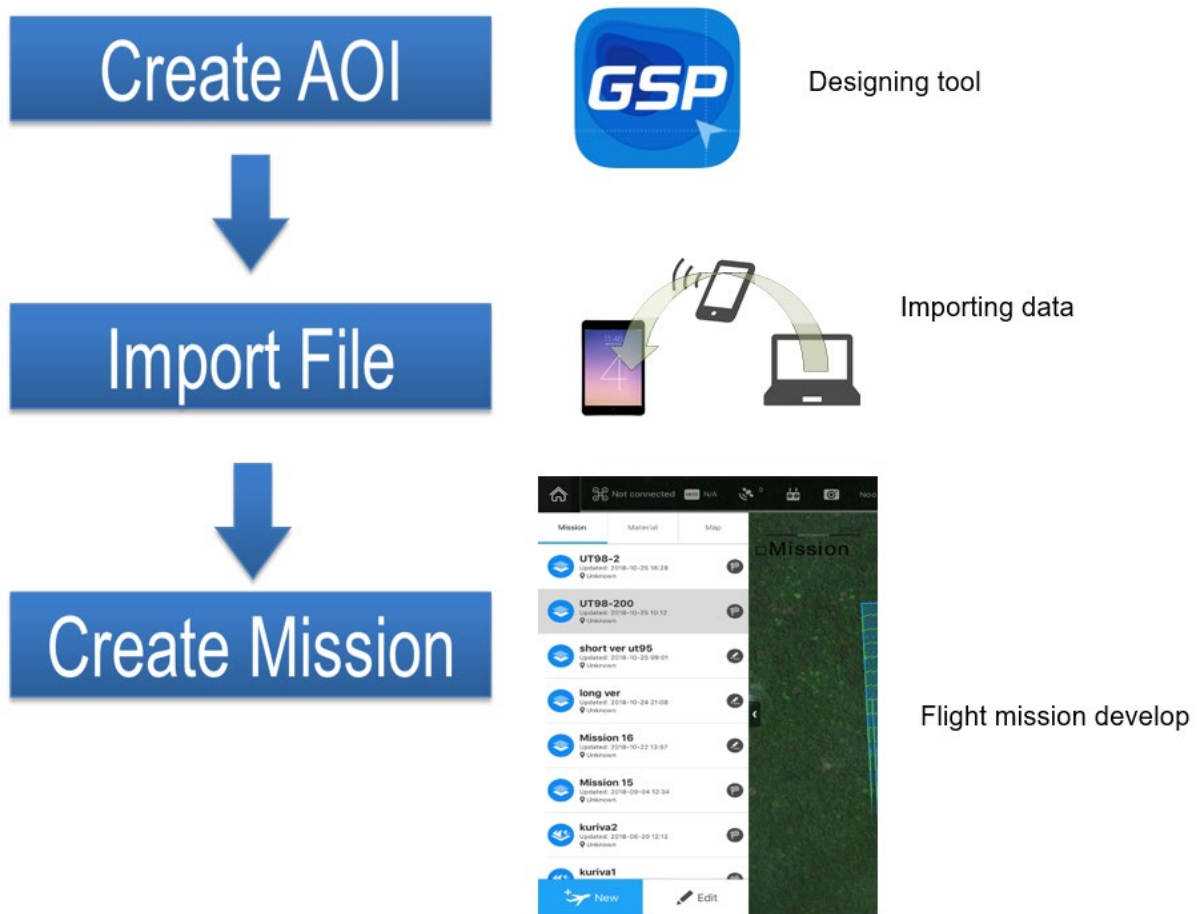
2.1 Create AOI

The DJI GS is collecting the GIS data around the area of interest (AOI). The AOI can be created using QGIS or Google Earth Pro. If the AOI is to be created from an available map over-layed onto Google Earth before drawing or the AOI can be drawn directly onto Google Earth Pro.
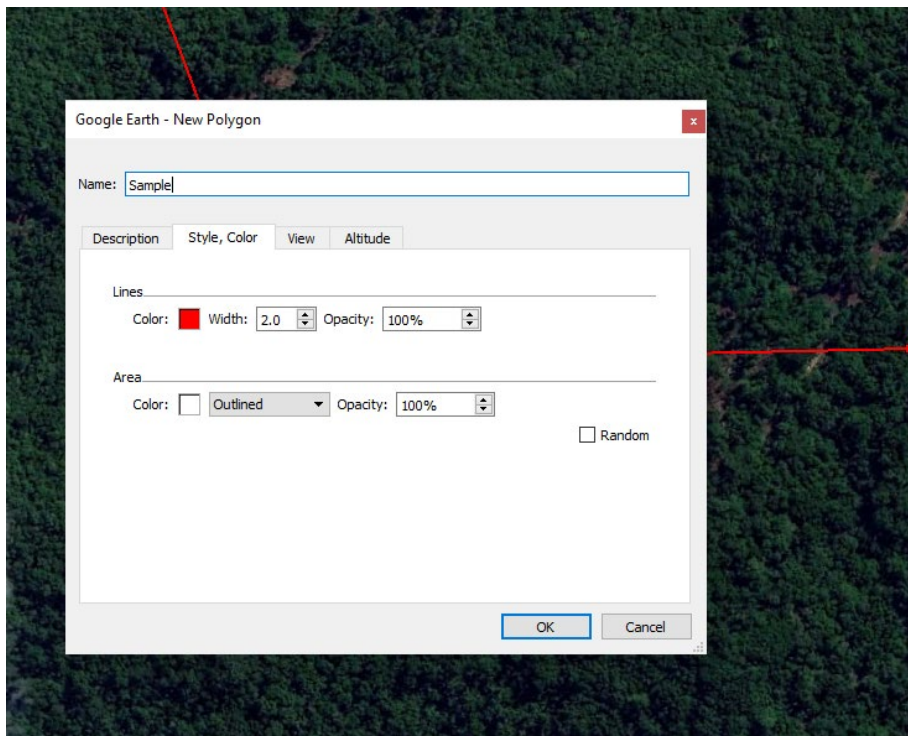
1. Open the Google Earth Pro
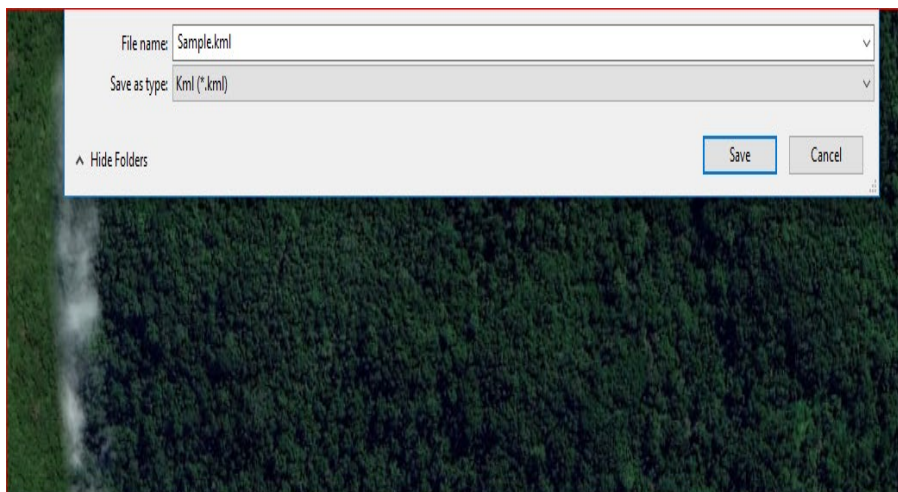2. Draw the area of interest
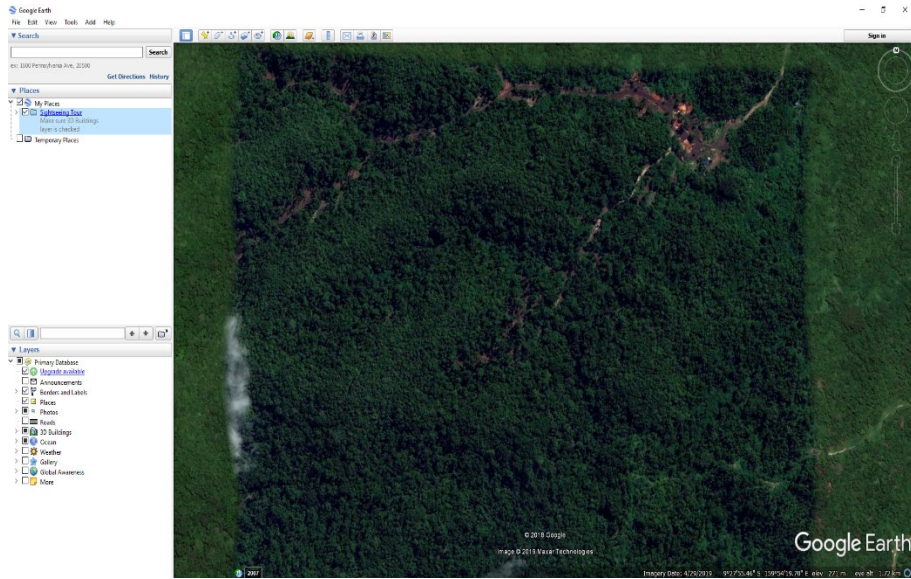
3. Go to *Add Polygon* and create the boundary on Google Map. Name the polygon (e.g. Sample), and click ok.
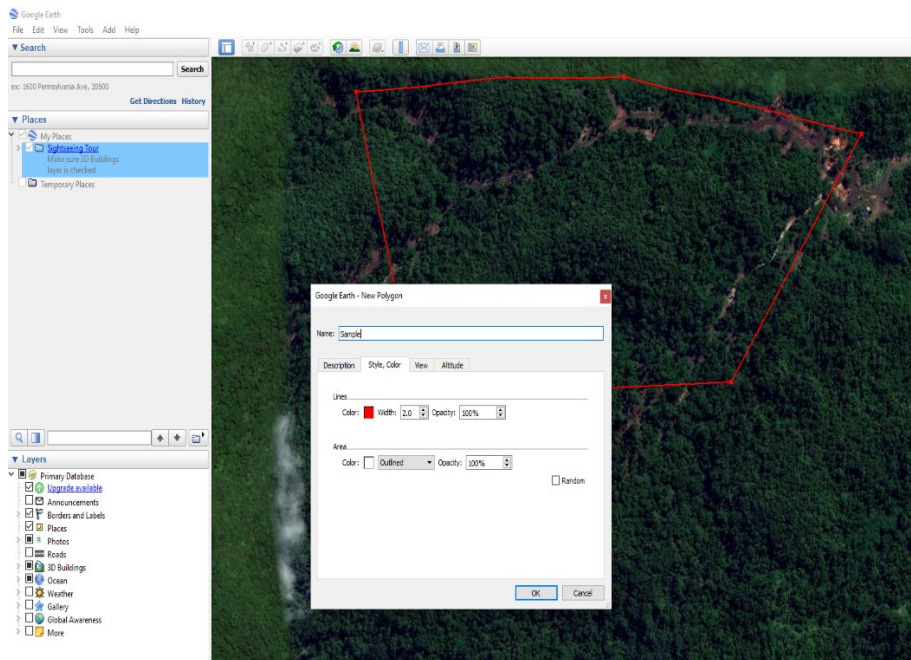
4. In the shape of the setup, *right click to add color* to the boundary/polygon created and adjust the thickness of the boundary. Then click OK
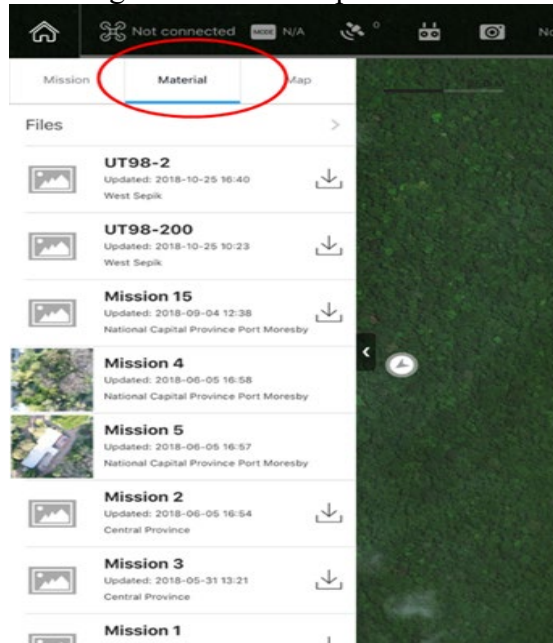

5. To save the file, right click on the named boundary (Sample), dropdown box appears and *save as kml* save.

Polygons can also be created using QGIS software, and save as *shapefiles*.
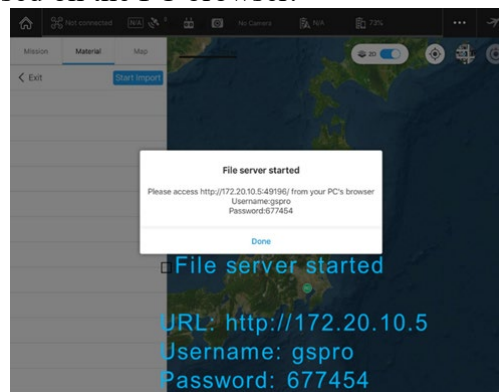
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2.2 Import File

I.   After saving the Polygon on the PC, click on *Material* on the iPad/tablet where a dropdown list showing files/folders. Tap "**files**".
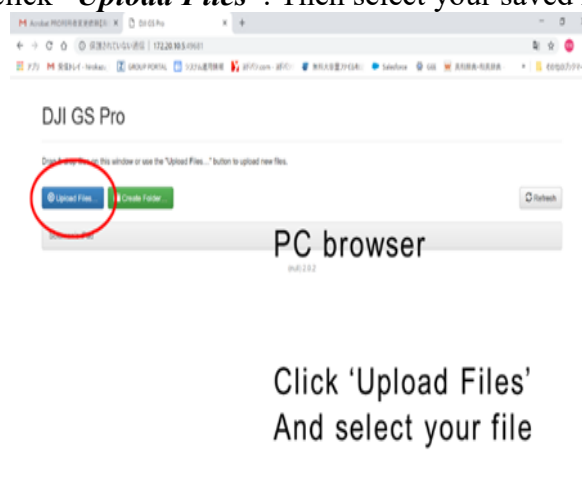

II.   Then go to *Start Import* to import *KML/SHP files*.

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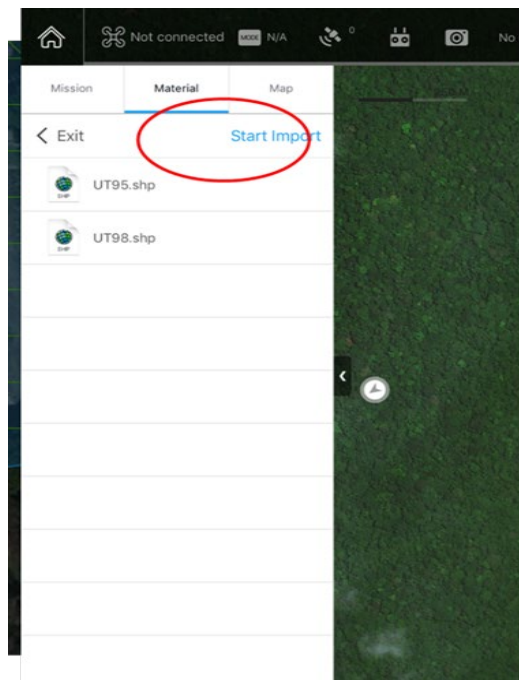
III.   File server will show on the screen on the iPad/tablet. A username and password will be given, to be used on the PC browser.
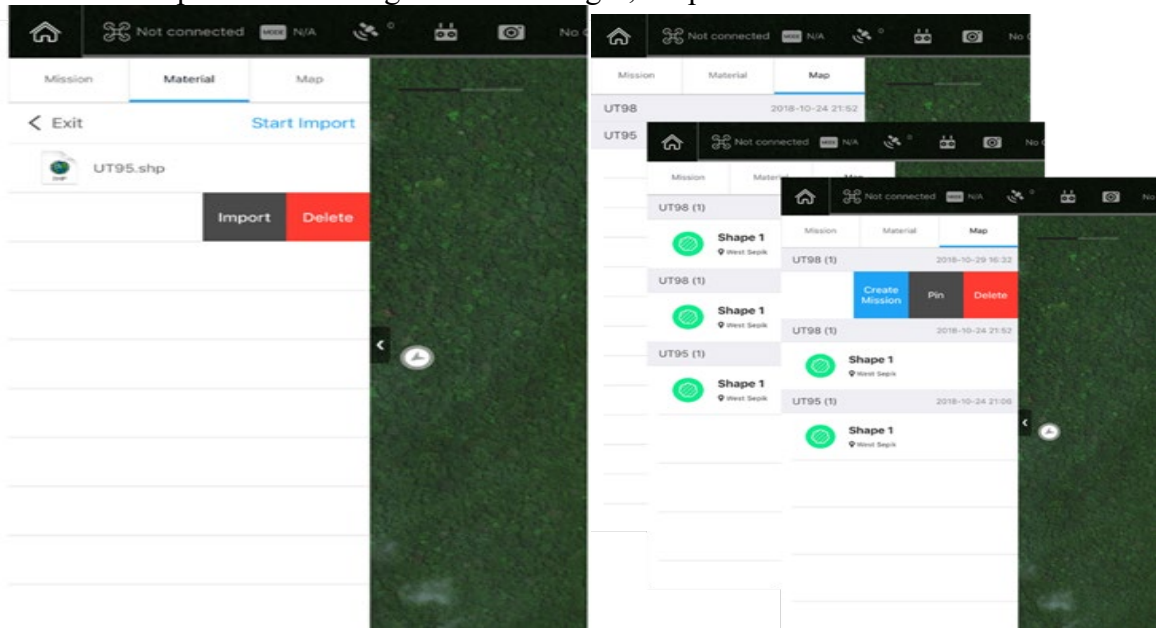

IV.   In PC browser, click *"Upload Files"*. Then select your saved KML file.

## 2.3 Create a Mission

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I.   The mission is created on the iPad/tablet. Open the DJI GS Pro on the iPad/tablet, your saved file will be shown under the Material tab. Click Import then go to Map and select images. On the images, swipe across to *Create a Mission.*

II.   On *settings* > named mission, important features are setup. For instance, the mission shows the waypoint quantity, flight length, main path (number of lines), cover area, camera model, shooting angle capture mode, speed, altitude etc.…*Select 3D Map Area* as mission type.

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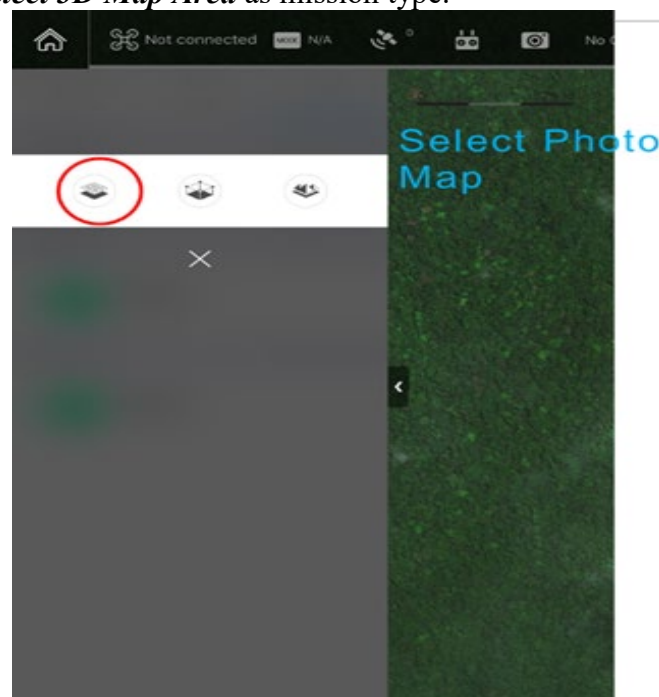
III.   An established mission to leave the home base is ready for the flight.
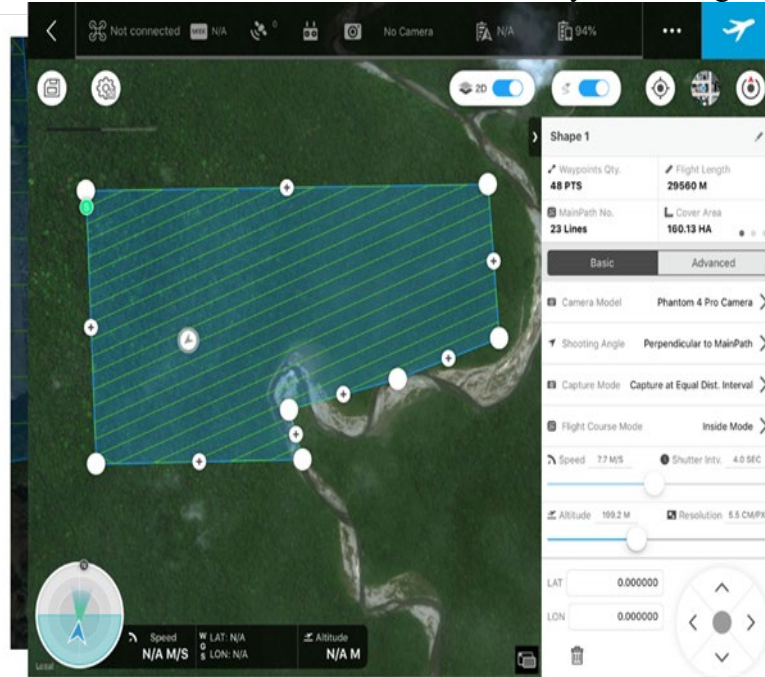

2.4 Mission Type

Under the Map tag, swipe the desired geometry file ("Create Mission"). Choose an appropriate mission type. Mission types will vary according to different geometries. Select Photo Map, Virtual or 3D Map Area for polygons or waypoints Flight for line strings. The mission's types are shown below. Hence the most preferred mission type to create 3D map during the training was 3D Map Area. The figure below shows the different mission types.


I.   Virtual Fence

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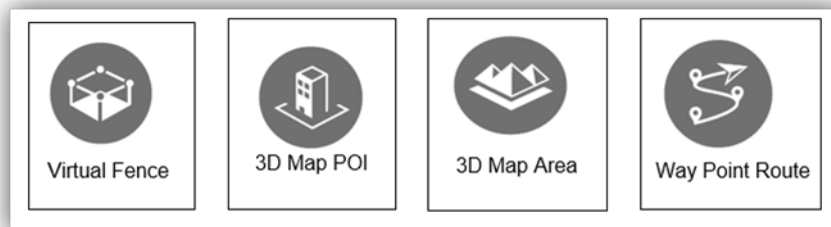
A virtual fence defines a specific area of flight and is useful in scenarios where some areas of a site are no-fly zones or if flight should only happen within one area, such as during manual pesticide spraying or flight training. As the aircraft approaches the boundaries of the virtual fences it will slow to the hover, ensuring it stays with the flight area.
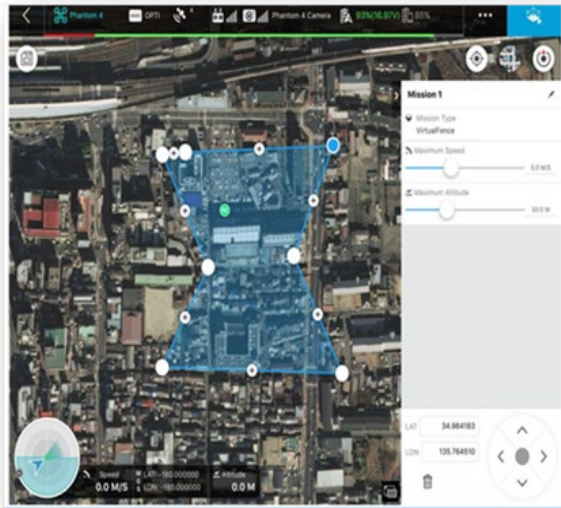
II.   3D map POI

3D Map POI excel at gathering critical data from the physical structures. Its parameters settings are similar to 3D Map Area, such as flight area and action, parameters, and over ratio. With new customizable features like Circle and Verticle,3D Map POI provides complete accuracy for effective structural management.
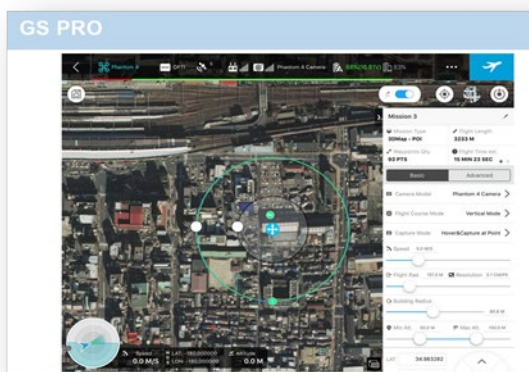
III.   3D Map Area

DJI GS Pro automatically generates efficient flight paths after the user has set their required flight area and camera parameters. The aircraft will then follow this route

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throughout its mission. The image data captured during these flights can be input into 3D reconstruction software to generate 3D maps.

Main Path: The flight path on which the shooting is required is called the Main Path in a 3D Map mission. Flight Path Display is generated when the path is enabled.

IV.   Way Point Route

Way Point Route is tap appearing is the Way Point Setting screen, All Points is selected. Automatically, the speed of the aircraft to fly at the constant speed during a Waypoint Flight mission is 5m/s and relative altitude between the aircraft and take off point during the flight is set to 50m.Images are checked after the flight. There could be some differences in images of cloud cover, noise, out of focus or blurring due to instability of drone. Hence, Each Point Setting also displayed to select a waypoint then set waypoint parameters. Tap "< or >" on the right of "Each Point" to switch to enable the altitude is set as 101.0m. Aircraft Heading is and Gimbal Pitch Angle is 0^0. There is no way point action.

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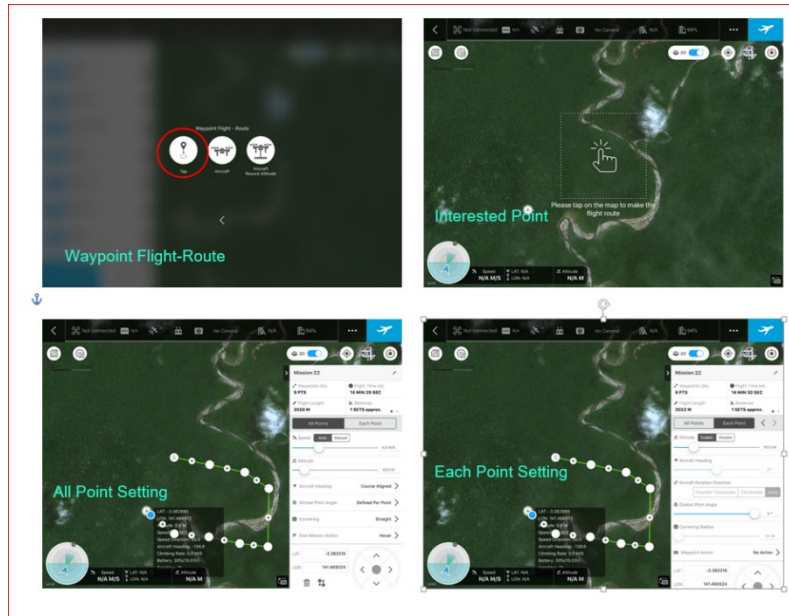
3. Pix4Dmapper for Data Analysis-Process

Pix4D Mapper is the only drone mapping and photogrammetry software tools with a flight app, desktop, and cloud platforms. It creates the 3D Models.
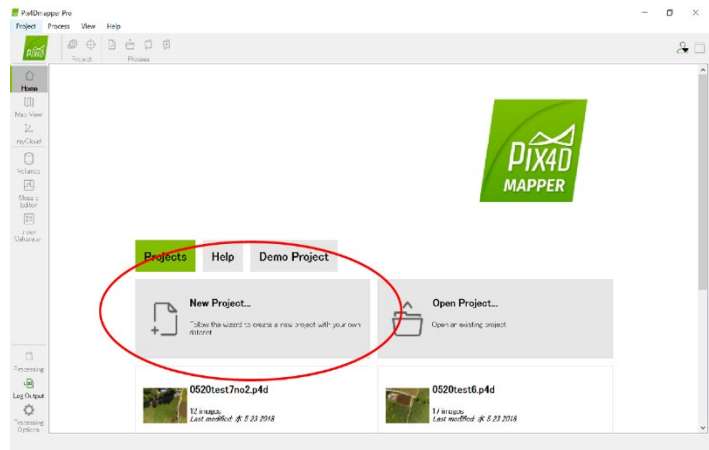
12.1 Pix 4Dmapper

Data Analysis is captured in a number of steps
using the Pix4D mapper. To create a new project:

1. To start Pix4Dmapper, it is needed to login.
   User name and Password is entered with
   the access of internet to open the Pix4D
   account.

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2. On the Menu bar of the Pix4D Mapper, Click **Projects** and create a **New Project.**

3. The **New Project** wizard opens
4. In *Name*: type a specific "Name" for the project (eg.test)
5. In *"Create in"*: click Browse… On the ***Select Project Location*** pop up, navigate to select the folder (your saved work)
6. Select the check box *Use As Default Location* to save all new projects in the selected folder
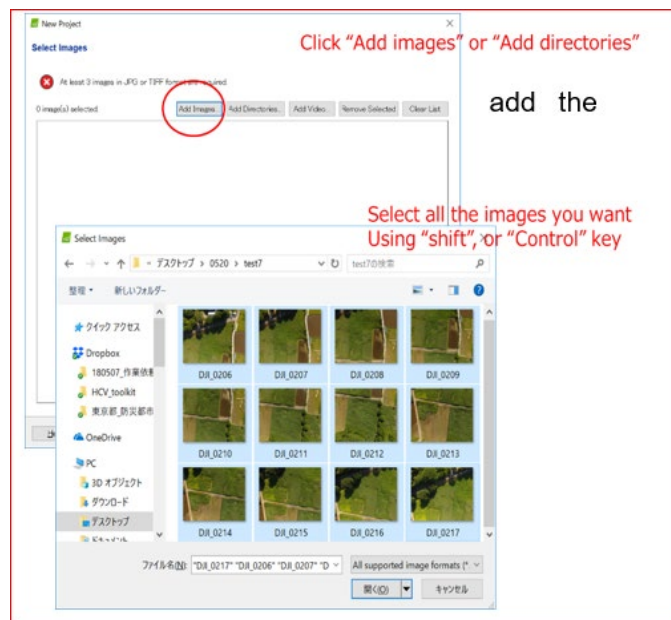7. In *Project Type*, keep the dealt option *New Project* selected.
8. Click *Next*
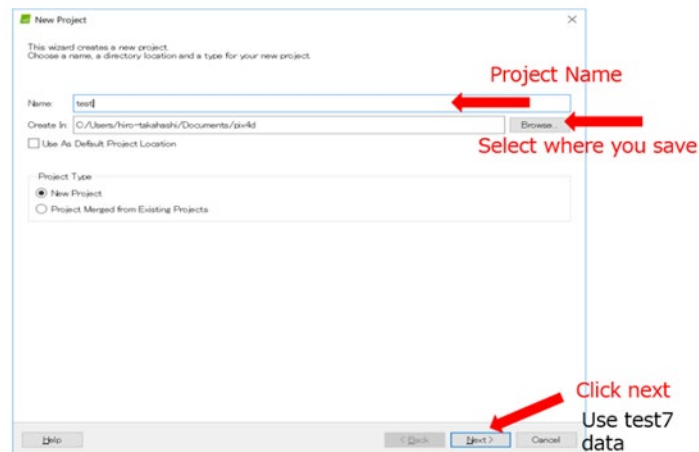
Open Browser, dropdown the folder where it's selected to save your work.
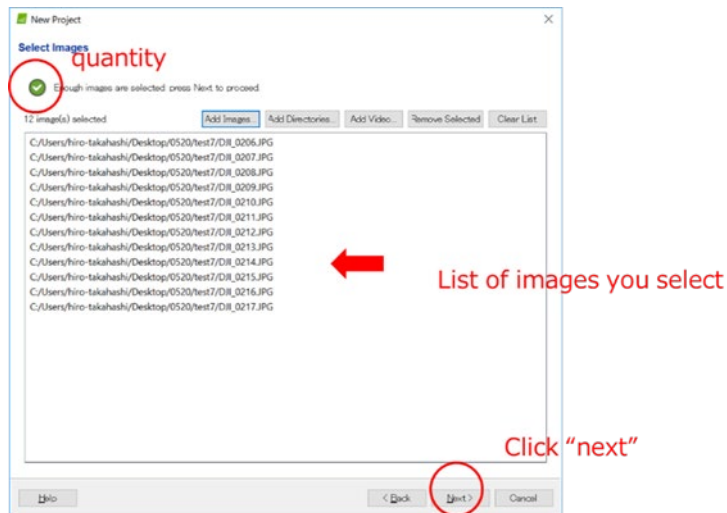
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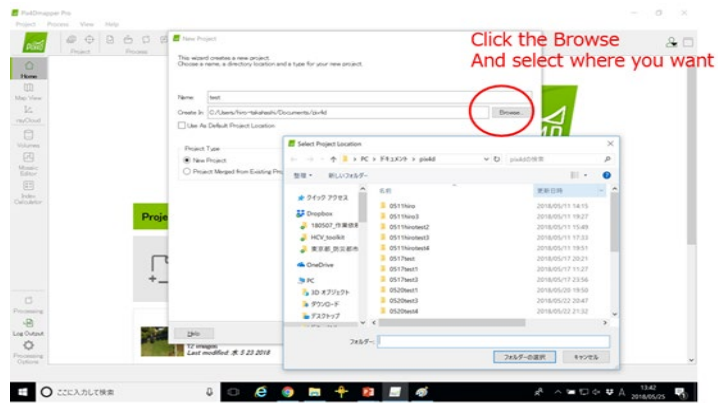
On the Select Images Window:

9. Click **Add Images** to images

10. On the **Select Images** pop up, navigate to select the folder where the images are stored, select the images to be imported and click ***Open***.

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11. Click *Next*
12. The *New Project* wizard displays the **Images Properties** window, click **From File**. In **Select Geolocation File** dialogue, click browser to find the CSV file (eg.GCP.csv) and select it and **open**. Then click **OK** (importing and exporting the coordinate (longitude & latitude)
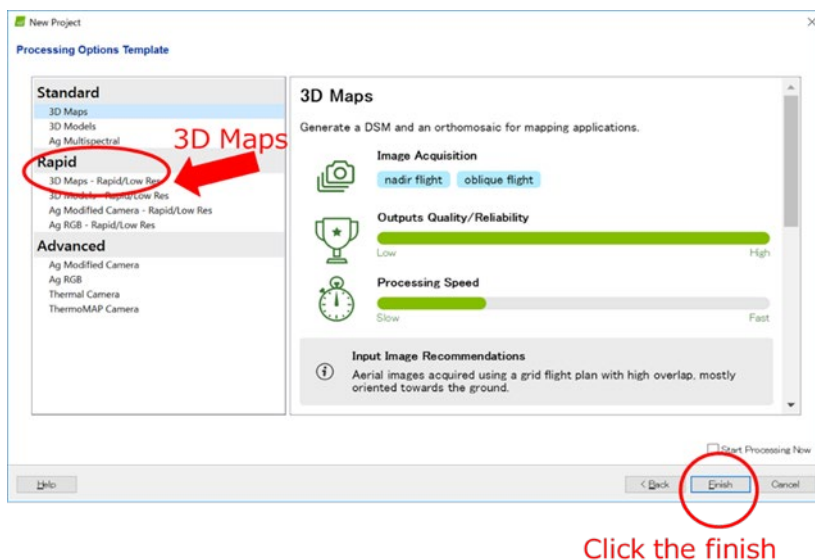13. Then click *Next*
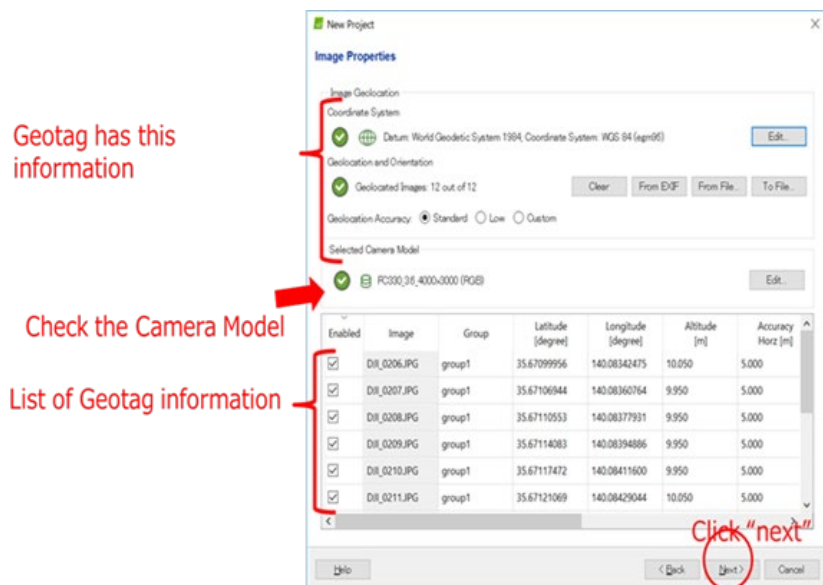
14. In the **Select Output Coordinate System** window:

   A. Change the output/GCP coordinate system to ***Auto Detect***
   B. Click *Next*

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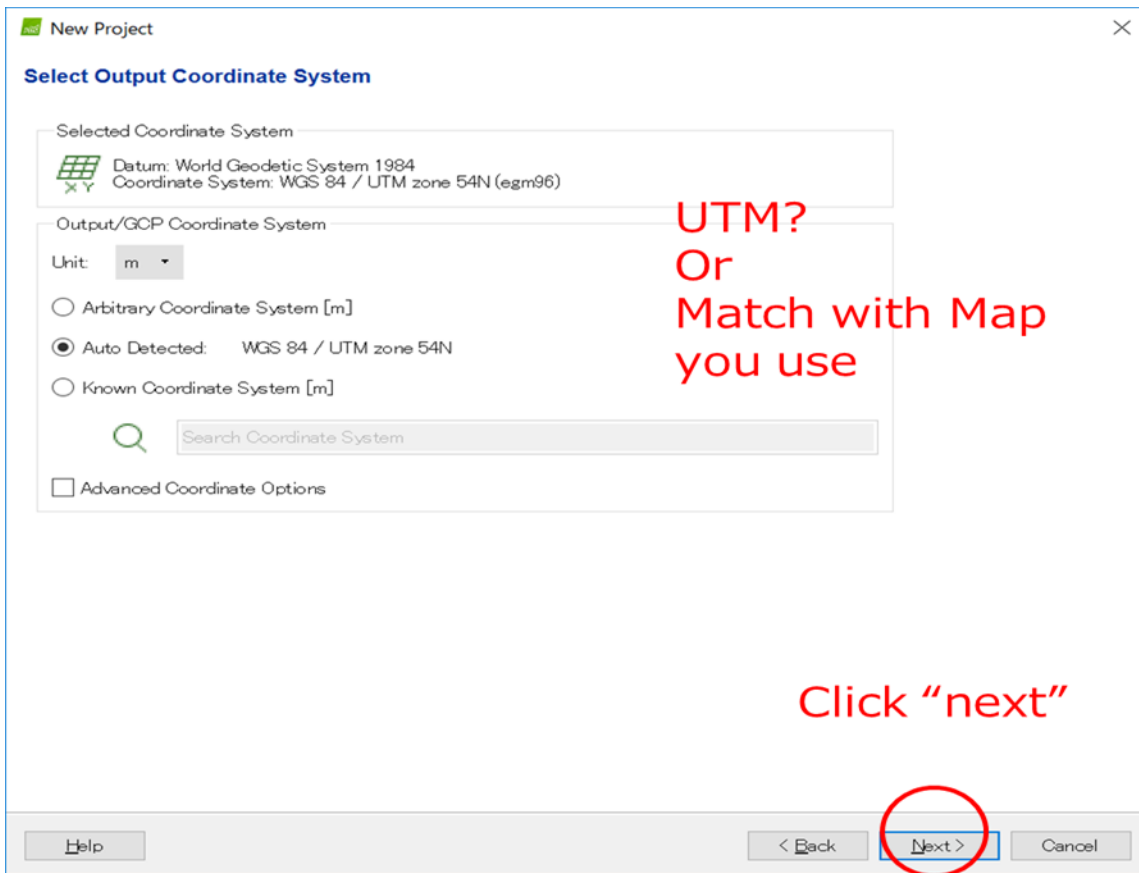
15. In the window *Processing Option* **Template**, dialog box, select **3D Maps-Rapid/Low Res in Rapid** options shown below
16. Click *Finish* to close the wizard and start the project

17. Once the project is developed after clicking finish, The Pix4D Mapper dialog box opens with the **Map View** displayed.

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You can see Camera Shooting Point
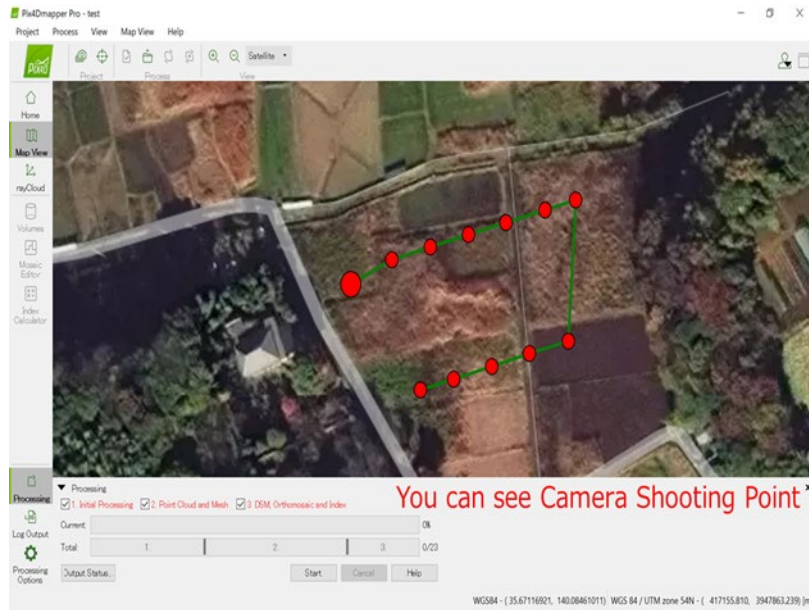
18. Pix 4D Processing

i.   Processing can be done one step at a time followed by checking Processing Option or all steps checked and processing option checked at the same time. Here, Processing is done with all steps checked at once, Step 1 **Initial Processing**, Step 2 **Point Cloud** and **Mesh** and Step 3.**DSM, Orthomasaic and Index,** then click **Processing Options**

Check Processing Option
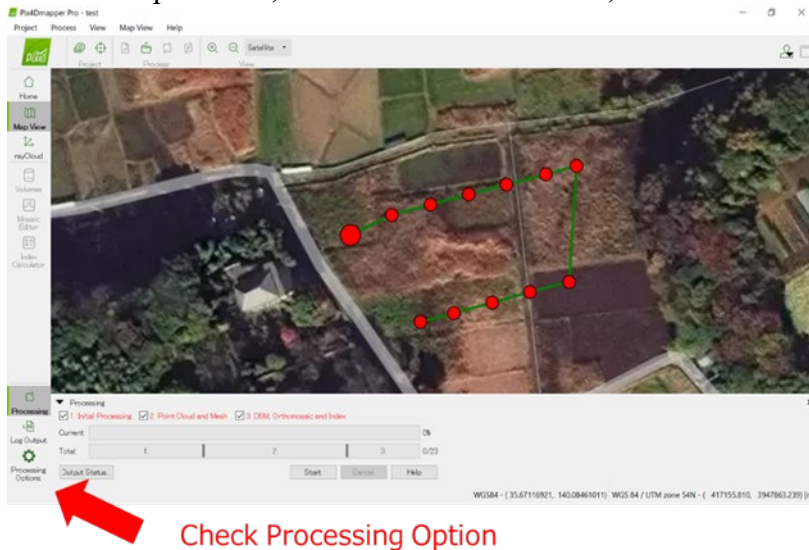
ii.   In the **Processing Option**, dialog Box, leave everything as *default* and click **ok**

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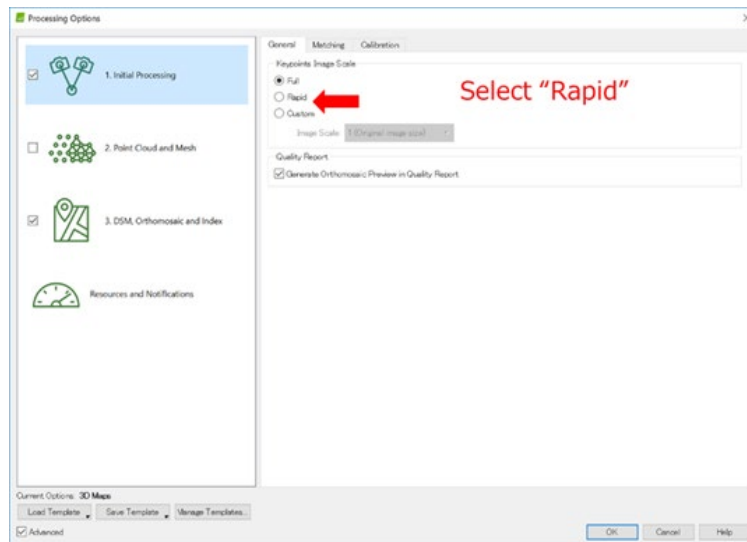
iii.   The Initial Processing, click in the checkbox *Geometrically Verified Matching* and click **ok**
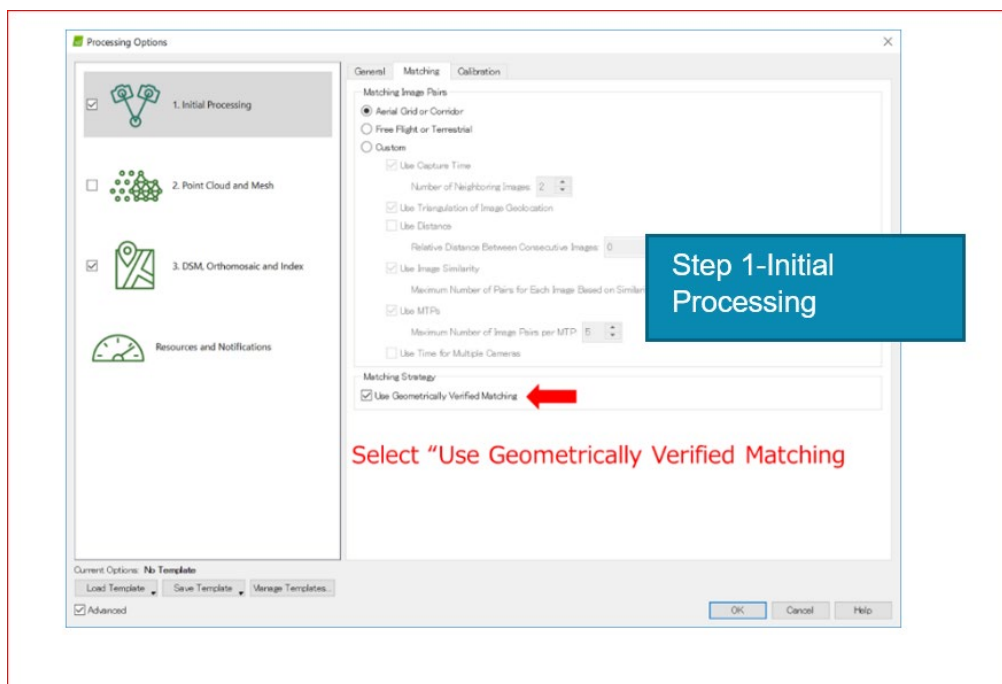
iv.   **Point Cloud and Mesh** processing option is checked and set image scale to ½ *Default, Point density to optimal that gives density effect processing speed* and checked the box of minimum number of matches to *3 images default* and click **ok**.

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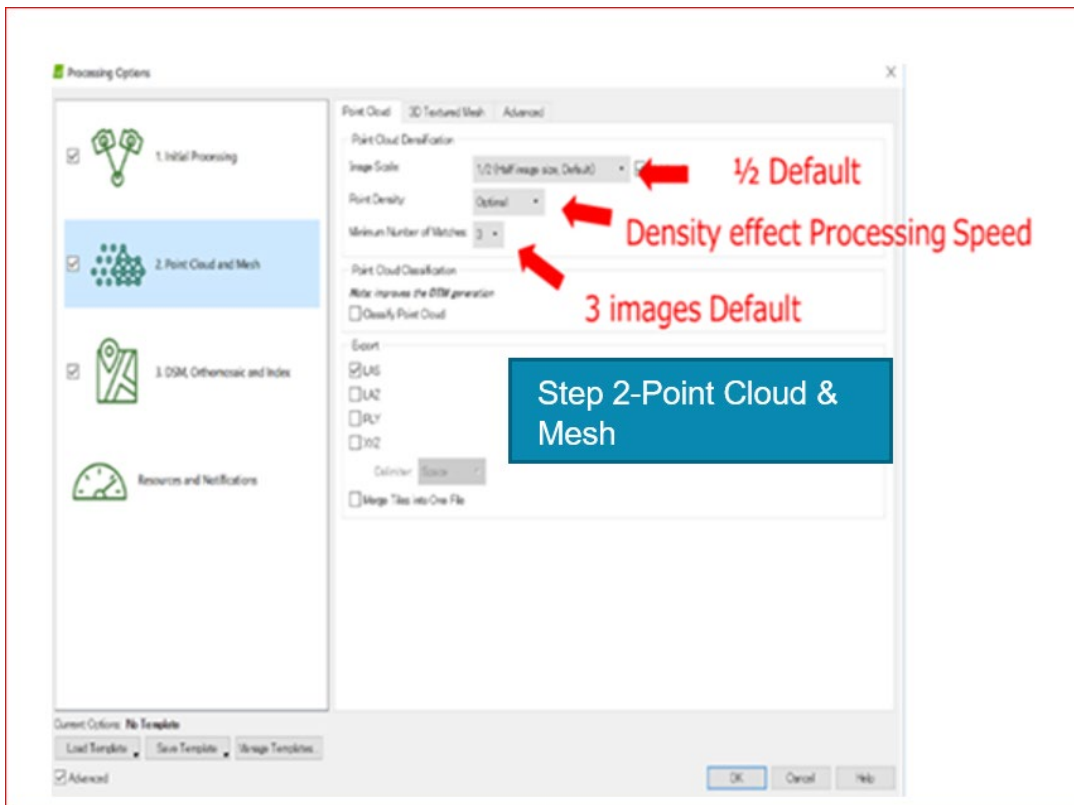
v. **DSM, Orthomasaic and index** is processing option *GeoTIFF* is checked and click **ok**.

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19. To start processing the project:

Once step 1. Initial Processing is completed, the Quality Report is automatically, unselect the Display Automatically after Processing box at the bottom of the Quality Report.

4. Reference

1. Takahashi H, 2019 October. Power Point Presentation-Drone Training, MOFR HQ

2. Utilization of UAV in the Forest Area. Compilation by Aida Kai, PNGFA/JICA

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