

## CompassTA™ v2.50 Quick Start Guide – CompassTA Demo (Airport)

### Purpose of this Document

This document is meant to introduce the new or beginning user to CompassTA™ v2.3. Its intent is that it be used as a guide to quickly open and use a set of known data to check the functionality of the newly installed CompassTA tool. It can also give the user a snapshot of the process and features of the tool.

### How Does CompassTA™ v2.50 Benefit You?

- Automatically tests, verifies, and reports the accuracy of elevation data. It requires valid DEM data and ground control points that are the same map projection with common datum and spheroid.
- CompassTA™ v2.50 lets you test
  - ✓ 1.1 through 1.4 LiDAR point cloud data
  - ✓ DEM data products
  - ✓ Other raster elevation data such as IFSAR elevation data products.
  - ✓ Makes available the PhotoBook tool for including up to 4 photos of cardinal points
- LiDAR Testing Extension, provides ‘dashboards’ for powerful and flexible LiDAR verification testing.

### Conventional Steps to Use CompassTA™ v2.50

- Open new or existing project.
- Setup metadata by using Project Information/Add Project Information.
- Select Project Information/Add Index and Data Sources.
- Add the checkpoint .CSV file by selecting Project Information/Add Surveyed Locations.
- Explore differences by comparing surveyed locations with map elevation data.
- Set Land Cover Types.
- Generate Report(s).

## First Steps

Open the CompassTA™ 2.50 application by clicking on the desktop icon.

Use the provided demo data (C:\CDIData\ CompassTA v2.4.1\_LAS 1.4\_Demo) that has been placed in the C:\CDIdata folder - by you, the user)

**\*\*\*Optional \*\*\*** To view the completed CompassTA QuickStart project, open **CompassTA™**, click on the menu command, **File -> Open -> Project**. Navigate to **C:\CDIData\ CompassTA v2.4.1\_LAS 1.4\_Demo\05\_Reports**, and select the **CompassTA\_Demo.TAP** file. This .TAP (Topo Analyst Project) file contains the saved project data, created from the CompassTA v2.50 QuickStart instructions below. (If queried about file existences click **No** and then go to Step 4 of this QuickStart document about how to display a DEM image.)

The folder structure in the demo data sets is the structure we use in production and recommend. However, CompassTA is a flexible tool and can be adapted to your own project data structure.

## Using CompassTA™ v2.50 for the first time

1. Double click on desktop icon CompassTA to open application. Select **File-> New-> Topo Data Project**
2. Select **Project Information-> Add Project Information**

Fill in the data as suggested in the graphic below. This becomes the metadata for the report. The units that the report statistics will be calculated are set at this window.

Project Information

Author's name: An Avid CompassTA User

Project name: LAS 1.4 Demo

Company name: CompassData, Inc

Sensor info.: Aerial

Required nominal pulse spacing: 0.3

Vendor name: Unknown

Data location: Centennial Airport, Colorado

Data acquisition start date: Tuesday, July 12, 2016

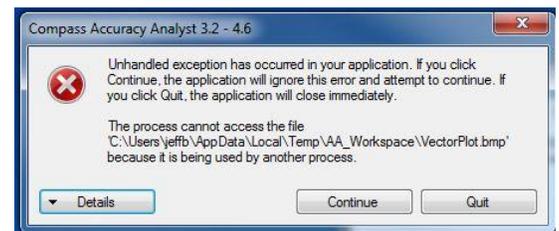
Data acquisition finish date: Tuesday, July 12, 2016

Units: US Survey Feet

OK

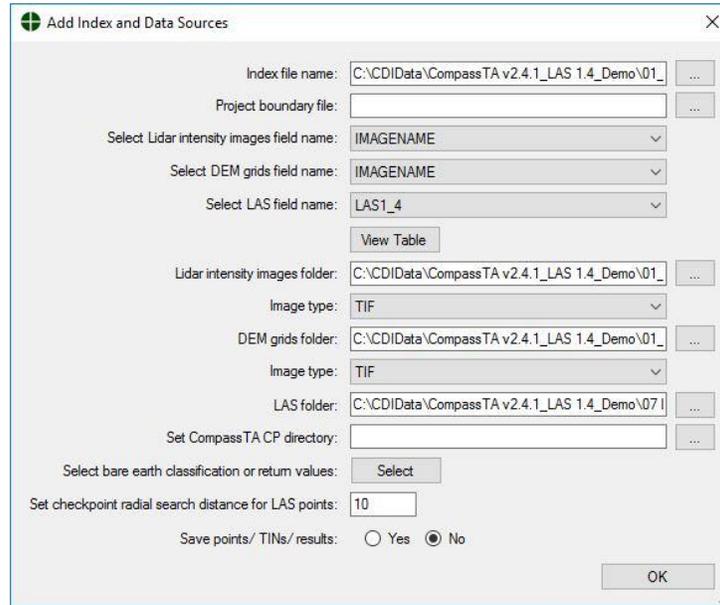
### NOTE

If at any given time you get an error window like below, please click on Continue and proceed with the operation of the tool.

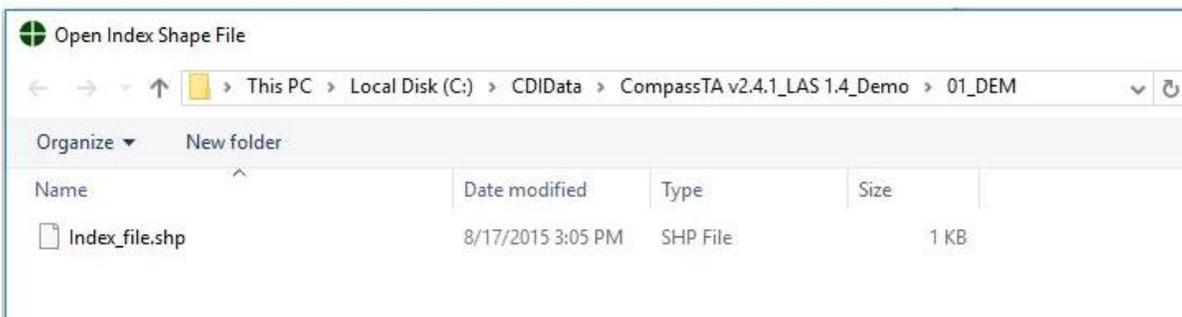


As a normal practice, it is always a good habit to save your work.

3. Select **Project Information -> Add Index and Data Sources**. The window below should appear. We will now add the imagery and data files required.



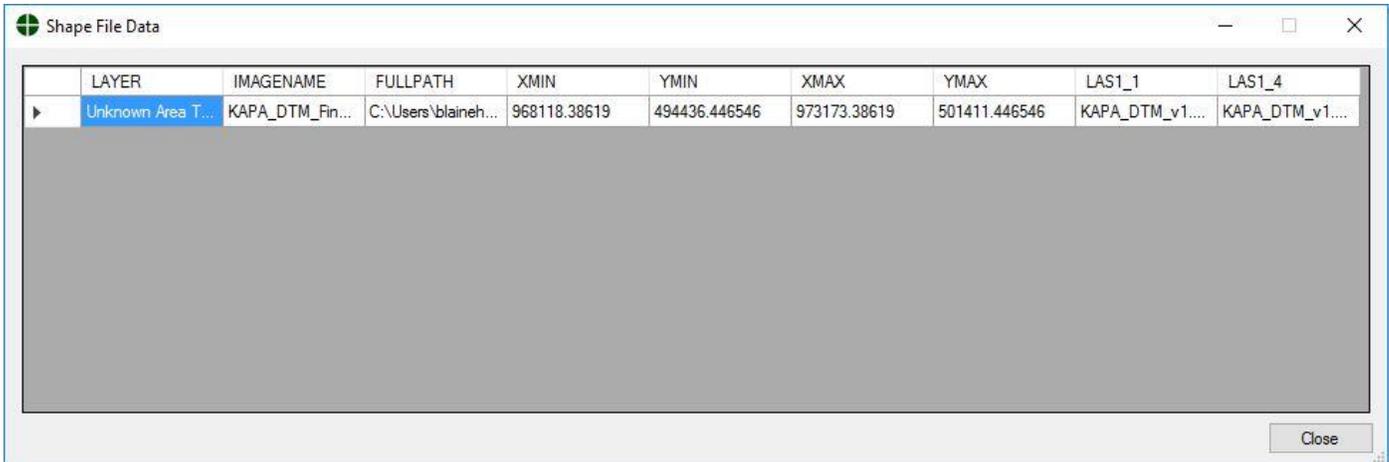
3a. Select the **Index File Name** button and browse to the location below. This is the location of the .shp (shapefile) that has the image index previously created. This shapefile is found in the **01\_DEM** folder for this demo data. Select and **Open** this .shp file.



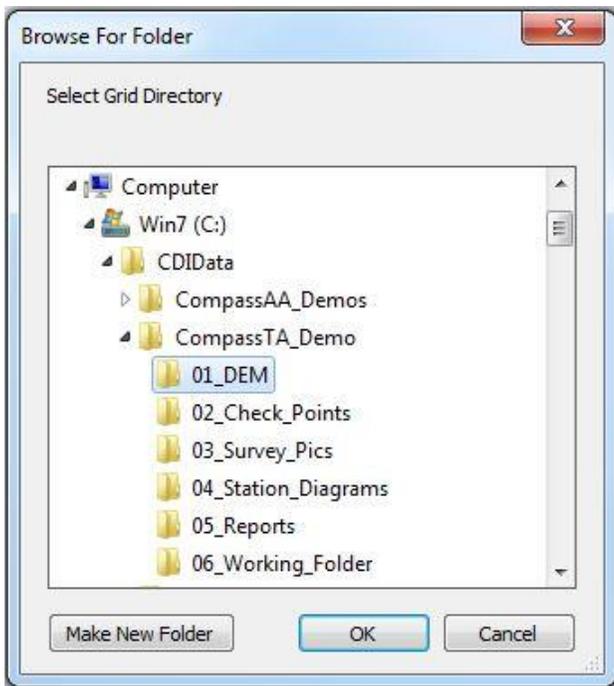
3b. After selecting the Index\_File.shp file, click on the **Select DEM Grids Field Name** pull down menu. This selection tells the program which column in the Tile Index contains the name of the images to be used.

For CompassTA™ there are three different Image types that can be selected: LiDAR, DEM and LAS. It is important to know which type of product is being used. By clicking the View Table tab, the table below is displayed and the user can see which Field Name and what file format (e.g. .TIF, .SID) to select. This Table is created and stored in the shapefile.

For this demo, we are working with a DEM and **IMAGENAME** is selected as the DEM grid field name. We are also demonstrating the new CompassTA v2.50 ability to handle LAS 1.4 files. Select the LAS Field Name, **LAS 1\_4**. Click **Close** on this Shape File Data window and select **IMAGENAME** from the drop down from **Select DEM Grids Field Name**. Next, select the LAS folder browse button.

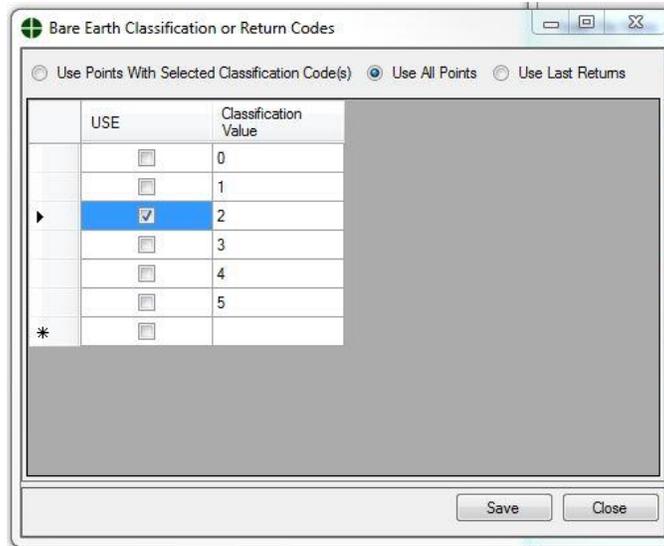


3c. Referring back to the Add Index and data Sources window, select the **DEMS Grids Folder** button and browse to the folder that contains the images used for this demo. Select the **01\_DEM** folder. Click **OK**.



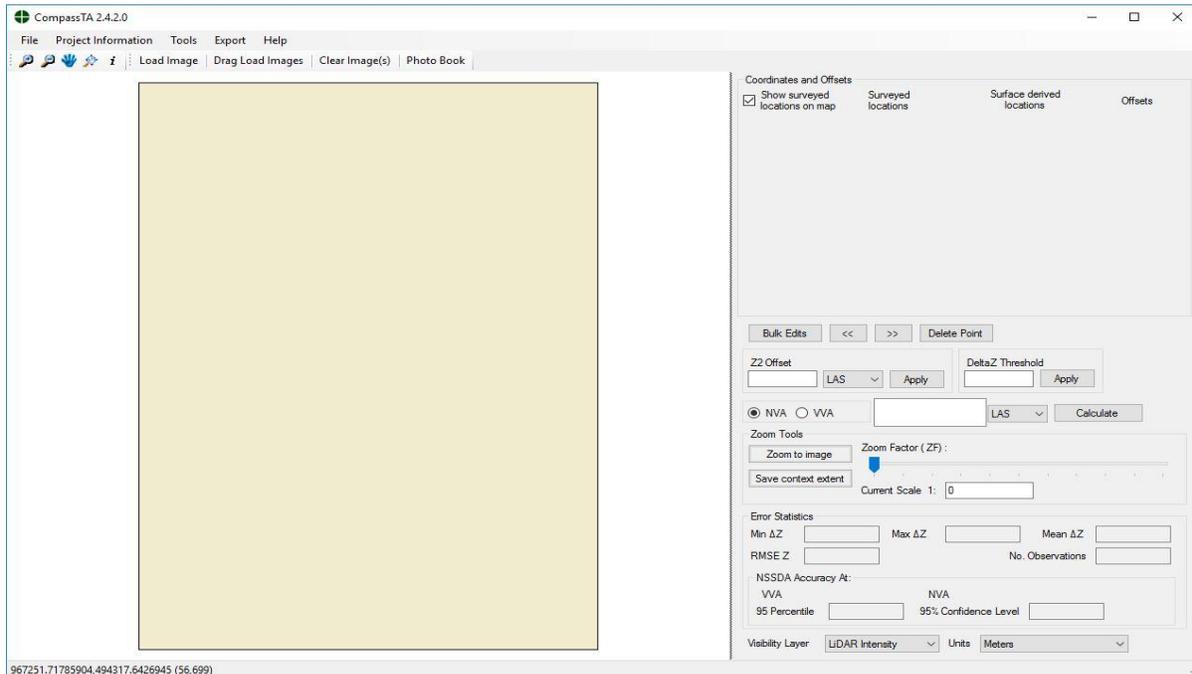
3d. Click and the Select the Image Type on the **Image Type** pull down menu. For this demo we are using TIF image files. Choose **TIF** for the file format.

3e. The next selection is the **Select Bare Earth Classification or Return Values**. In advanced projects this selection allows for different Land Classifications to be incorporated into the project. For this demo and most standard elevation models, select **Use All Points** and click **Save** and then **OK**.



3f. **Set CheckPoint Radial Search Distance for LAS Points** has a default value of 10. This defines the diameter that CompassTA will compare the current LAS point to other LAS points. This can be adjusted as needed.

3g. **Save Points/TINs/Results**. TIN'ing is not typically necessary. Select **No** for this field.

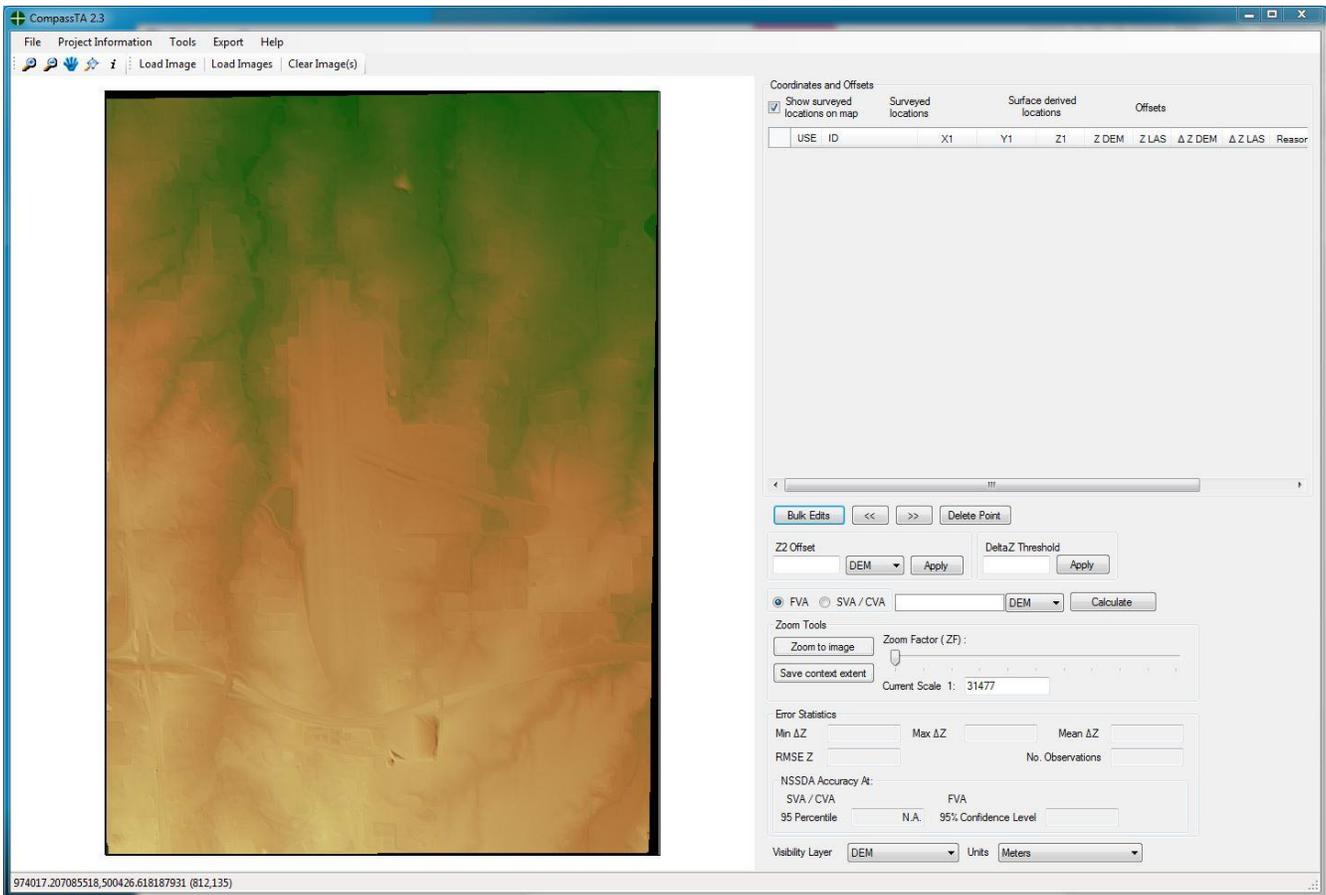


Click **OK** in the Add Tile Index and Images window. The window should close and you should see the application window view above.

4. To view the images and ensure they were properly imported we can load the image into the view screen. If necessary, we can switch the visibility layer from **LiDAR Intensity** to **DEM**. This switch can be made in the bottom right corner of the program window. You can then toggle back and forth to view the LAS 14 data and the DEM image.

Click **Load Image** in the upper left of the upper left of the application and then click inside the polygon. The image should load.

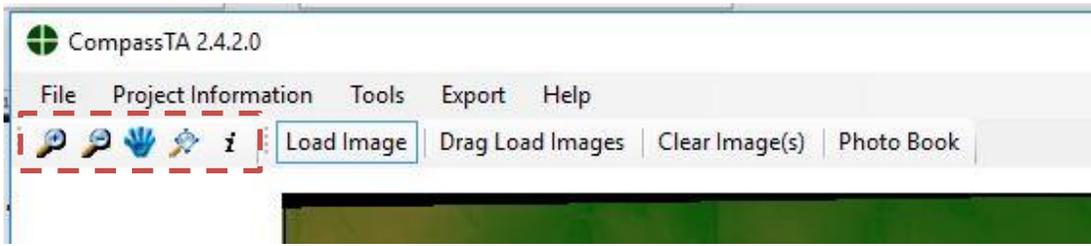
If zooming occurs during this process, clicking the **View Full Extent Icon**  to the right of the Pan blue hand icon. It will display the full extent of the image being analyzed.



You should now have your image displayed. It is not necessary to have the images themselves displayed when doing your analysis.

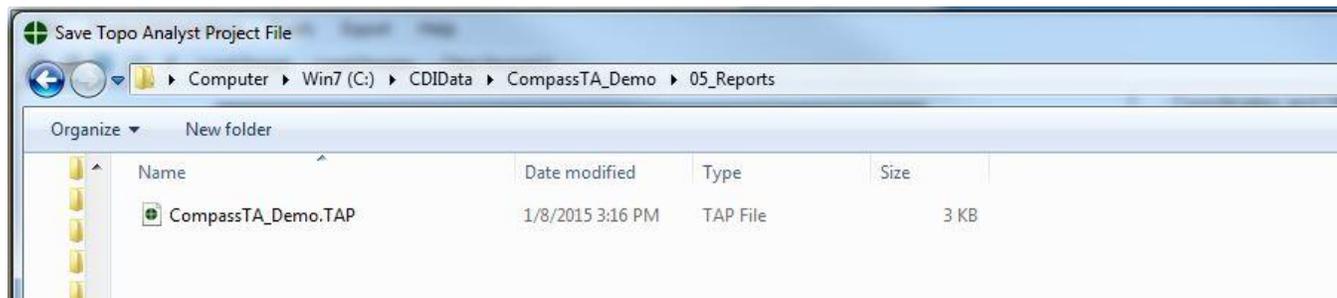
4a. Experiment with zooming, panning and viewing images using the interactive menu tools highlighted below. These tools are useful to explore the images. Try using more typical Windows adjustments using the mouse click and drag manipulations. Move mouse over the perimeter boundary of the application window. The mouse pointer will change to a respective resizing pointer that will allow you to stretch or shrink the application window. Similar features for modifying the view ports inside the application window are adjustable too. Grab the boundary edge between the Map Image area and the Coordinates and Offsets data display. If the left button is held down, then you can make the map area bigger or smaller by dragging and releasing. Always select the Full Extent graphic icon (magnifying glass) in the

main menu banner after resizing the map area to have the image refreshed to its maximum size for the new view port area



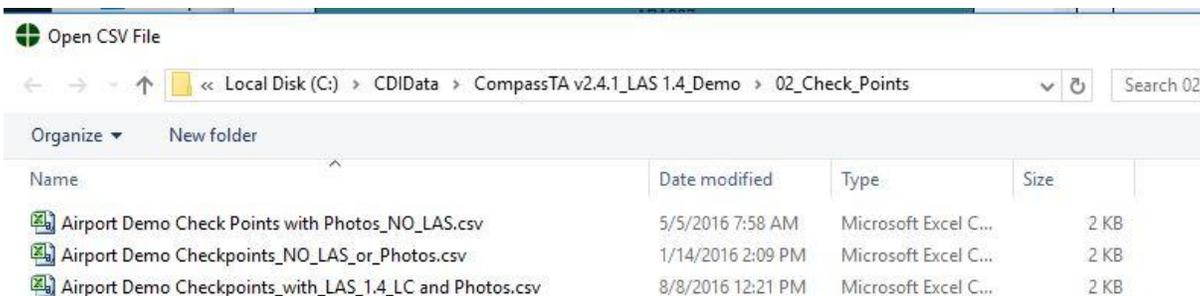
When you are ready to go to the next step, click on the Zoom to Full Extent tool (the Magnifying Glass) to reset the image view.

5. Save your project file to a .TAP (Topo Analyst Project) file for future use. Select **File -> Save As** and then browse to the **05\_Report** folder location below and save the project to a file named **CompassTA\_Demo.TAP**.



## Input of Ground Control Data

6. For the next step, we will add the survey ground control points using a .csv file. Select **Project Information -> Add Surveyed Locations -> CSV File**. Browse to the **02\_Check\_Points** folder location below and select the **Airport Demo Checkpoints\_with\_LAS\_1.4\_LC and Photos.csv** file.



You will also find variations of the same data with and without photos and land classes. These are for your use to explore CompassTA. After selecting and opening the .csv file **Airport Demo Checkpoints\_with\_LAS\_1.4\_LC and Photos.csv** the window below should appear.

Let's take a closer look at what is in the Airport Demo Checkpoints\_with\_LAS\_1.4\_LC and Photos.csv file.

	A	B	C	E	F	G	H	I	K
	Point ID	Northing	Easting	Z Value (NAVD88)	Photo E	Photo N	Photo S	Photo W	Land Class
2	APA001	500992.668	968780.454	1746.404	APA001_E	APA001_N	APA001_S	APA001_W	2
3	APA002	500882.146	972522.641	1728.324	APA002_E	APA002_N	APA002_S	APA002_W	2
4	APA003	496345.661	972571.992	1770.862	APA003_E	APA003_N	APA003_S	APA003_W	2
5	APA004	494912.113	968777.687	1806.378	APA004_E	APA004_N	APA004_S	APA004_W	2
6	APA005	495154.336	972521.862	1788.899	APA005_E	APA005_N	APA005_S	APA005_W	2
7	APA006	497117.035	970474.066	1784.92	APA006_E	APA006_N	APA006_S	APA006_W	2
8	APA007	499896.586	970598.051	1750.912	APA007_E	APA007_N	APA007_S	APA007_W	2
9	APA008	498592.384	969270.893	1756.311	APA008_E	APA008_N	APA008_S	APA008_W	2
10	APA009	495339.106	970696.568	1807.558	APA009_E	APA009_N	APA009_S	APA009_W	2
11	APA010	498135.476	972399.785	1760.17	APA010_E	APA010_N	APA010_S	APA010_W	2
12	APA011	496651.555	969475.277	1782.86	APA011_E	APA011_N	APA011_S	APA011_W	2
13	KAPA_CD_1	500534.455	973121.041	1730.867					1
14	KAPA_CD_2	498662.329	972717.604	1752.266	KAPA_CD_02_1_p_1	KAPA_CD_02_2_p_2			1
15	KAPA_CD_3	498691.034	971941.491	1746.954					7
16	KAPA_CD_4	499545.336	972735.276	1739.915					6
17	KAPA_CD_5	500224.456	971859.851	1739.89					1
18	KAPA_CD_6	498241.449	972424.567	1759.029	KAPA_CD_06_1_p_1	KAPA_CD_06_2_p_2			1
19	KAPA_CD_7	498601.26	968316.454	1780.815	KAPA_CD_07_1_p_1	KAPA_CD_07_2_p_2			1
20	KAPA_CD_8	498791.986	970498.307	1769.622	KAPA_CD_08_e_p_1	KAPA_CD_08_n_p_2	KAPA_CD_08_s_p_3	KAPA_CD_08_w_p_4	3
21	KAPA_CD_9	500808.353	972198.705	1727.352					3
22	KAPA_CD_10	498406.311	970685.988	1772.452	KAPA_CD_10_e_p_1	KAPA_CD_10_n_p_2	KAPA_CD_10_s_p_3	KAPA_CD_10_w_p_4	3
23	KAPA_CD_11	501294.244	972338.231	1722.353					3
24	KAPA_CD_12	497818.65	970580.79	1775.532	KAPA_CD_12_e_p_1	KAPA_CD_12_n_p_2	KAPA_CD_12_s_p_3	KAPA_CD_12_w_p_4	3
25	KAPA_CD_13	496724.594	969355.596	1779.881					3
26									

Because we are using a new CompassTA v2.50 ability to include photos with each point included with the final report document, we need to include the unique name of each photo for each point. These image files must be in a .jpg file type. We also have listed the land classes based on the USGS LAS 1.4 standards. (Note: there are not any sawgrass or mangrove swamps at the demo site. All the land classes shown here are for demonstration purposes). This is the recommended build of the .csv file. You can customize your .csv as needed.

**Column Identifier Form**

Please Assign Columns:

ID  
  X1  
  Y1  
  Z1  
  Land Cover Type  
  Ignore First Row

Photo North  
  Photo South  
  Photo East  
  Photo West

...

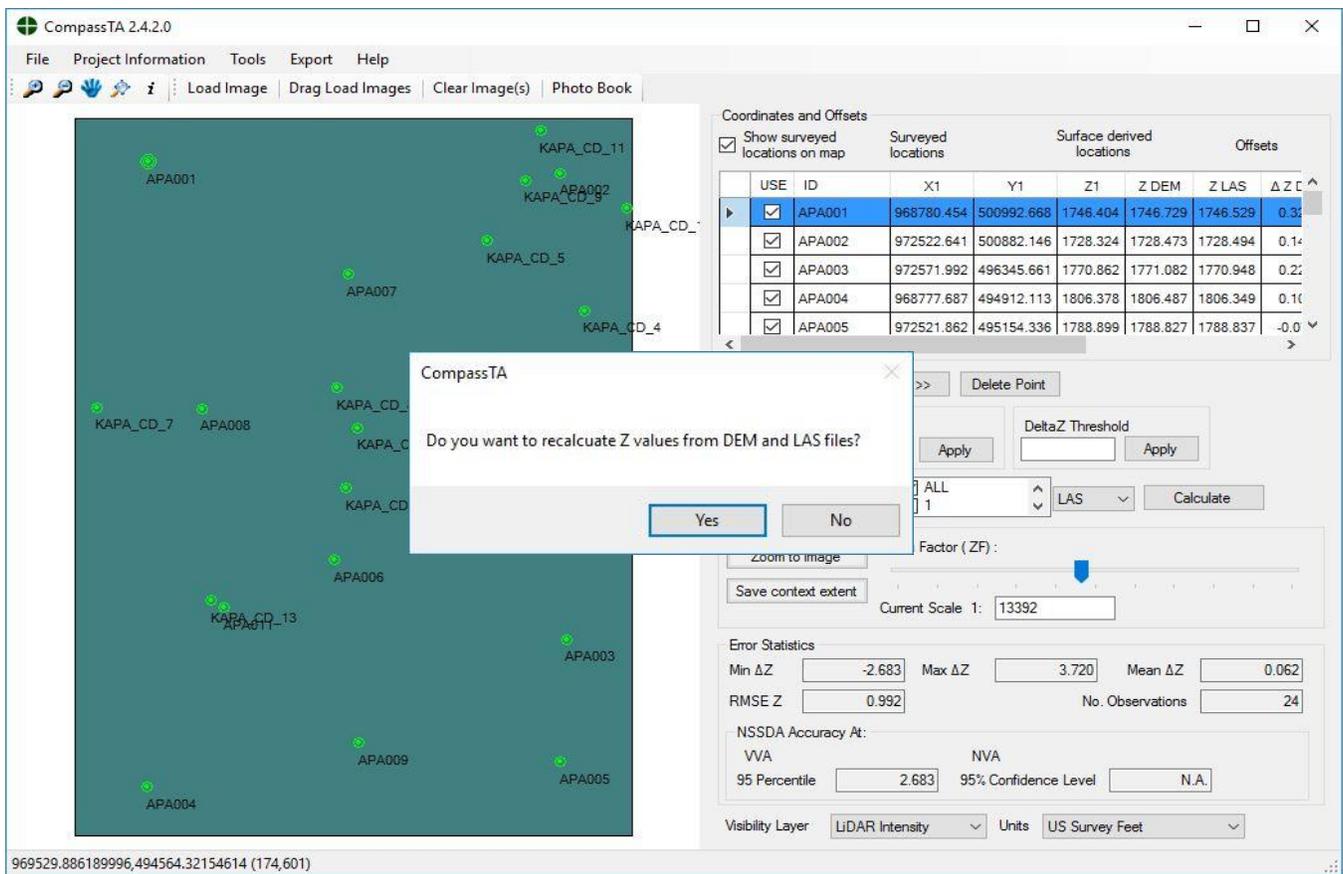
	ID	Y1	X1	Z1	PHOTO_2	PHOTO_0	PHOTO_1	PHOTO_3	LAND_COVER_TY
24	Point ID	Northing	Easting	Z Value (NAVD88)	Photo E	Photo N	Photo S	Photo W	Land Class
25	APA001	500992.668	968780.454	1746.404	APA001_E	APA001_N	APA001_S	APA001_W	2
26	APA002	500882.146	972522.641	1728.324	APA002_E	APA002_N	APA002_S	APA002_W	2
27	APA003	496345.661	972571.992	1770.862	APA003_E	APA003_N	APA003_S	APA003_W	2
28	APA004	494912.113	968777.687	1806.378	APA004_E	APA004_N	APA004_S	APA004_W	2
29	APA005	495154.336	972521.862	1788.899	APA005_E	APA005_N	APA005_S	APA005_W	2
30	APA006	497117.035	970474.066	1784.92	APA006_E	APA006_N	APA006_S	APA006_W	2
31	APA007	499896.586	970598.051	1750.912	APA007_E	APA007_N	APA007_S	APA007_W	2
32	APA008	498592.384	969270.893	1756.311	APA008_E	APA008_N	APA008_S	APA008_W	2
33	APA009	495339.106	970696.568	1807.558	APA009_E	APA009_N	APA009_S	APA009_W	2

Note: Select a column and then select the appropriate radio button.

The .csv file is a critical element of CompassTA and a successful user needs to understand it. Take time to look how this CompassTA Demo .csv file is set up and use it as an example for your own future projects. The .csv lists records that correspond to file names found in the demo data sets. Your file names don't need to use the same CompassData naming convention as shown, but a unique, identifying name should be used.

6a. Select the applicable fields to match the proper columns. Remember, Northing is always the Y axis and Easting is always the X axis. Switching these is a common error. Make sure to select the **Ignore First Row** radio button if there is header information in the .csv file.

6b. After confirming that the columns of data are selected as in the graphic above click **OK** again. The application window should appear as below. Click **Yes** to begin calculating the elevation difference between the DEM, LAS data and the elevations associated with the ground control points in the .csv.



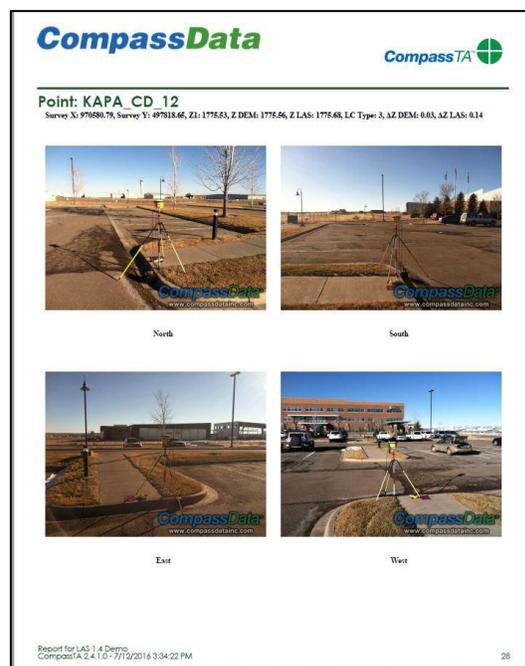
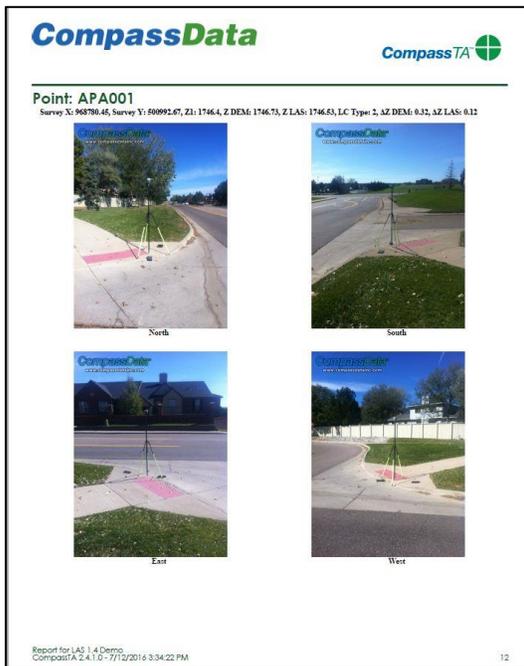
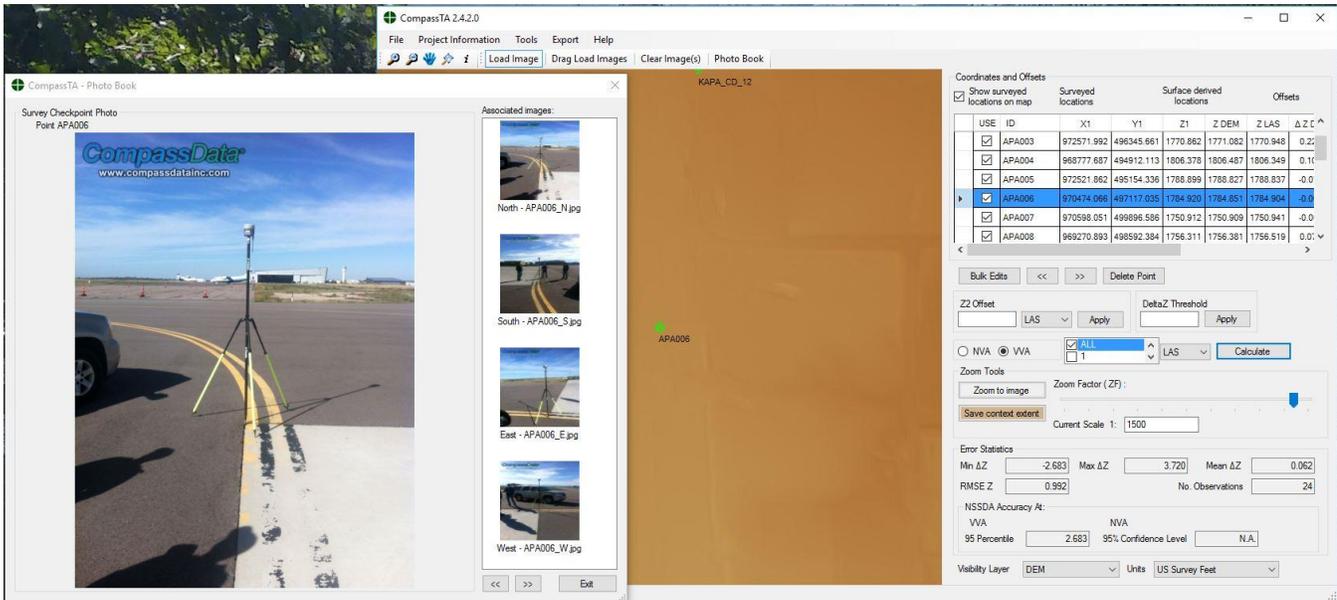
## Using Photo Book

7. Now, we will photo identify a point and use the provided tools to create a report.

If you have saved your work before, then do so again by clicking **File -> Save**.

7a. Use the **Zoom Factor (ZF)** slide bar to adjust the zoom. You can also type in the **Current Scale** by clicking on the value and entering **1500**. (For this demo, 1:1500 is a good scale for reviewing points.) Now left click on the **Save Context Extent** button on the right to stay at the same scale while going from point to point.

Select **Photo Book** from the application command menu. As you click through the different ground control points in the **Coordinates and Offset** table photos in the Photo Book will update itself to match the selected point. The main screen image will also swap out to match the ground control point selected. These photos were input using the .CSV file.



Unlike CompassAA, the CompassTA report will not include a scaled overhead view of the ground control point. It does place photos of the four cardinal compass points and labels them in that manner.

7b. At this point it is good idea to check that the check points and images are in the same coordinate system, that the check points are all within appropriate areas of the image and that none of the check points are damaged.

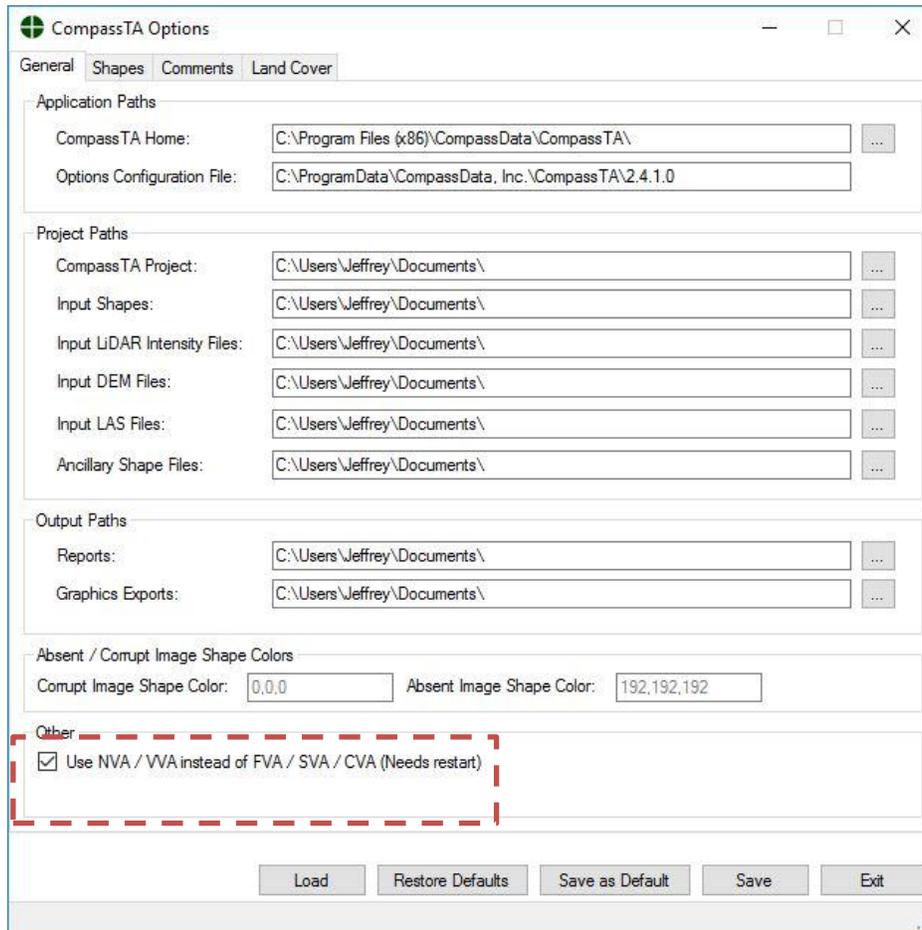
This is accomplished by panning to the right in the **Coordinates and Offsets** window and looking at the  $\Delta Z$  DEM and  $\Delta Z$  LAS column. It depends on the quality of the elevation model being used, but these values should make sense; 3,000 feet off could be an elevation conversion issue and not a problem with the DEM or LAS data. Along the edges of the images the data associated with the image is often corrupted, leading to a poor  $\Delta Z$  DEM value. This is also a good time to find mistakes made when creating DEM's (holes, large elevation spikes). When  $\Delta Z$  DEM or  $\Delta Z$  LAS values don't make sense, look at the point itself in the image and the photos. Any points that are not helping the processing for whatever reason can be removed from the calculations. Click on the **check mark box** and then select a reason for not using the point. A list of the points excluded in the analysis, and the reason for their exclusion, can be included in the final report.

8. The next step is to calculate the **Error Statistics**. A few settings require updating before this can be done. For DEMs or LAS, make sure **NVA** radio button is selected, make sure the **box** next to **ALL** is checked and Select **LiDAR Intensity** from the Visibility Layer drop down menu. Select **Calculate**. The accuracy fields will automatically populate.

Error Statistics			
Min $\Delta Z$	-2.683	Max $\Delta Z$	3.720
Mean $\Delta Z$	0.062	RMSE Z	0.992
No. Observations	24		
NSSDA Accuracy At:			
VVA		NVA	
95 Percentile	N.A.	95% Confidence Level	1.945
Visibility Layer	LiDAR Intensity	Units	US Survey Feet

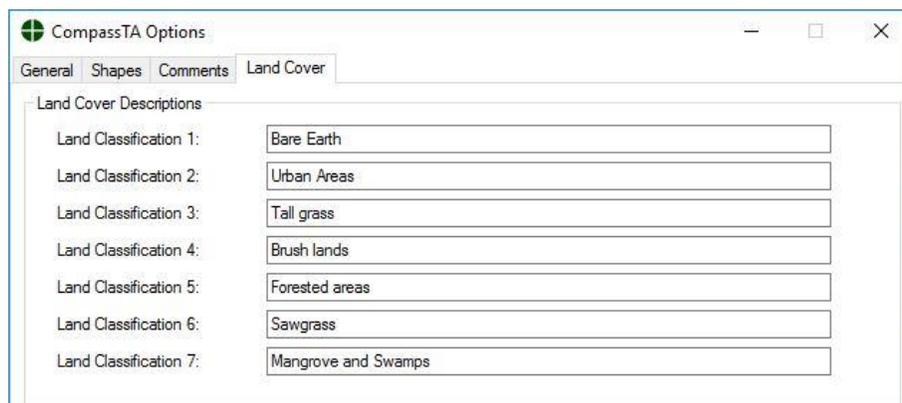
8a. This is a good point to save your project data. Select **File -> Save** to save the current project into the 05\_Report folder.

If there is a need to deliver data in another format (FVA, SVA and CVA) it is possible to switch back to that LAS Land Cover type method. Select **Tools -> Options** from the main application menu.



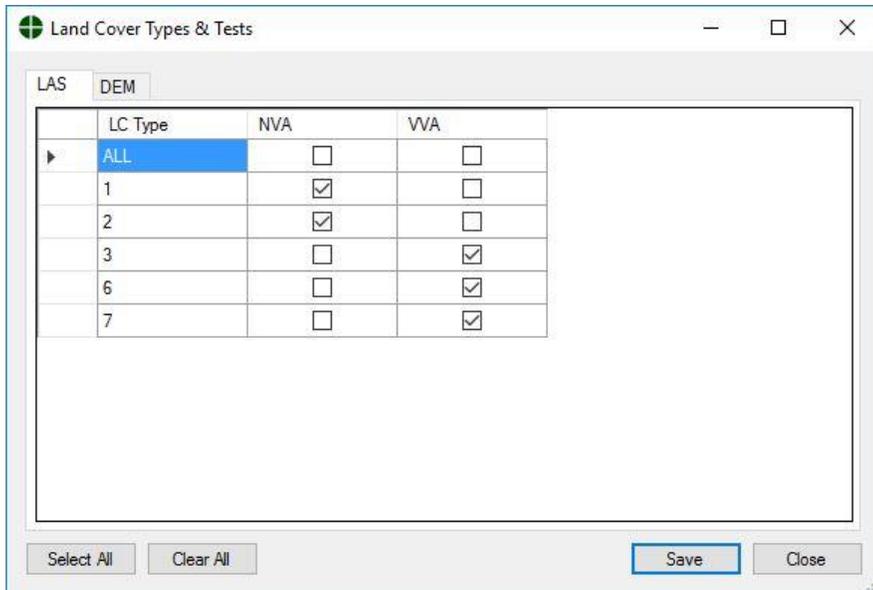
There is also LAS 1.1 data as part of the demo data to experiment with the FVA, SVA and CVA type of data. This lets you try a LAS 1.1 data set following a similar process as with LAS 1.4 data.

While the Options window is open, let's look at how we can edit the Land Class type labels. Select the tab labeled **Land Cover**. There are seven Land Classifications specified by the USGS LAS 1.4 standard that can be customized.



## Selecting Land Cover types

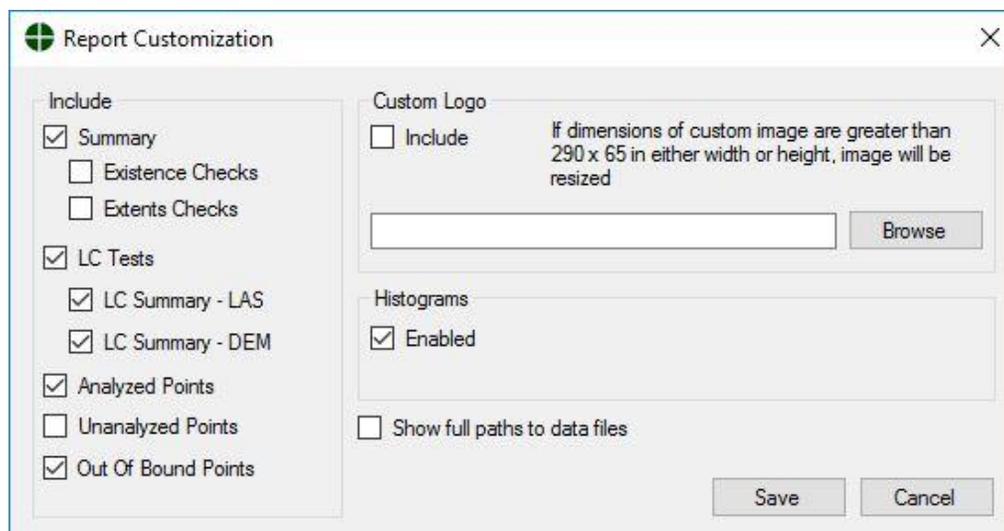
9. The next step will let us set the land cover types for project LAS and DEM data. CompassTA requires this step to be performed prior to creating a report. Select **Tools -> Set LCs**. For the purposes of this exercise, please select the **LAS** and then the **DEM** tab in the upper left corner of the window named **Land Cover Types & Tests**. Click on the appropriate **NVA** and **VVA** radio buttons as shown in the window below. Click on **Save** in the lower right corner of the window.

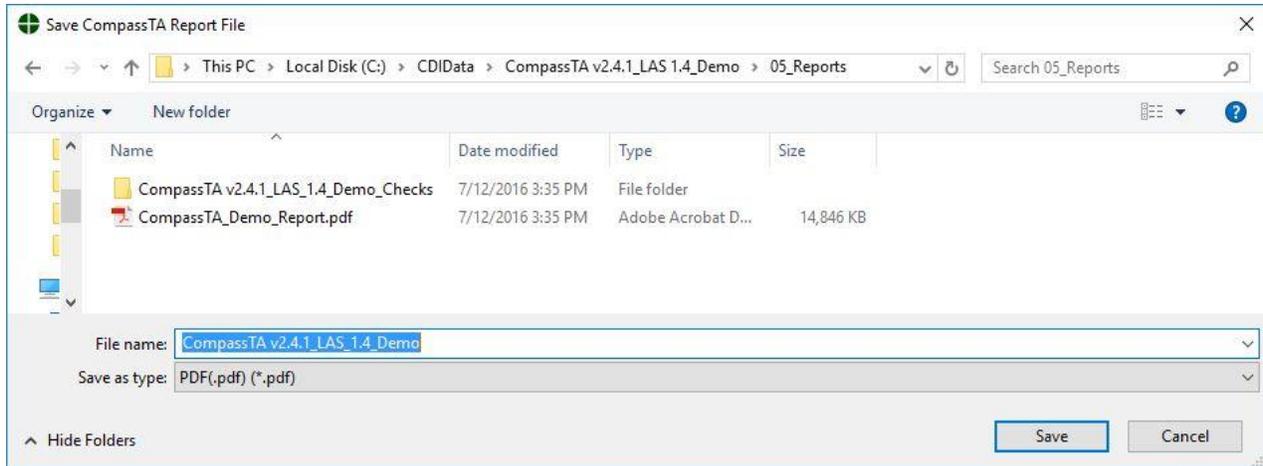


## Creating a CompassTA Data Verification and Validation Report

10. We can now create a report. Select **Tools -> Report** from the application menu.

A company or project logo can be easily added to the report. When finished, click on the **Save** button.





10a. Browse to the 05\_Reports folder location shown above and **Save** the report to **CompassTA v2.4.1\_LAS\_1.4\_Demo.pdf**. The .pdf file will either open automatically or you will need to browse to its saved 05\_Reports folder location and double click on it.

### **Congratulations!**

You have now successfully used CompassTA v2.50 as a solution to verify the accuracy and quality of DEM data. You verified the DEM and LAS 1.4 data by using collected control points. Lastly, you created a custom, meaningful report verifying DEM and LAS accuracy.