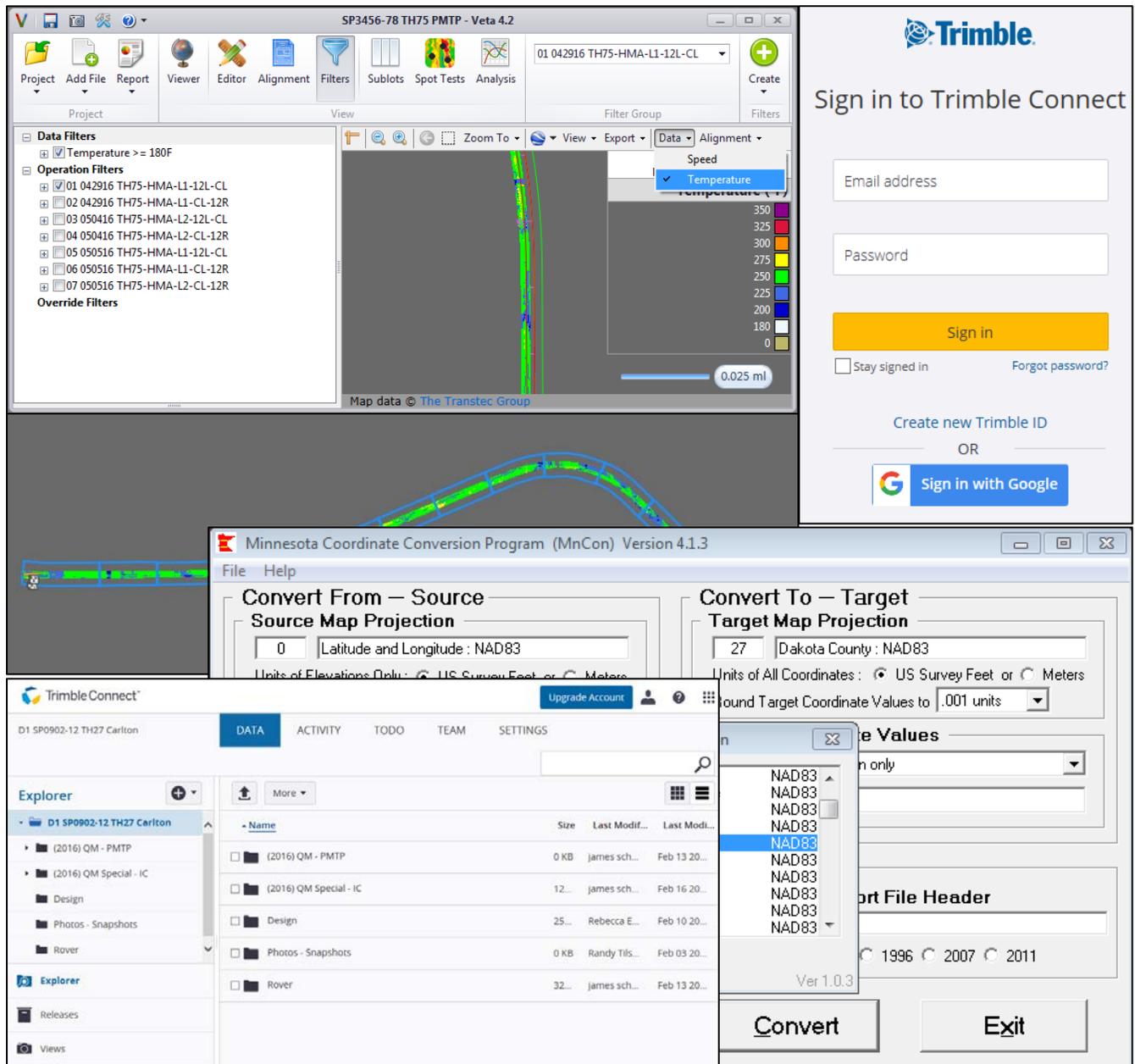


Chapter 5 – Software Programs

Advanced Materials and Technology Manual



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5.0 INTRODUCTION

This chapter contains instructions on how to use the given software as it relates to the technologies deployed by this unit (e.g., intelligent compaction, paver mounted thermal profiling, etc.). Instructions for the following software are currently contained within this chapter:

- Veta (Intelligent Construction Data Management Software),
- MnCon (coordinate conversions) and
- Trimble Connect (file sharing).

5.1 VETA (INTELLIGENT CONSTRUCTION DATA MANAGEMENT SOFTWARE)

Veta is a standardized intelligent construction data management (ICDM) software that stores, maps and analyzes geospatial data resulting from intelligent compaction, thermal profiling and spot test data (e.g., density, moisture). This software can perform standardized data processing, analysis and reporting to provide Project summary results quickly in the field from various intelligent compaction and thermal profiling manufacturers. In particular, the software can provide statistics, histograms, correlations for these measurements, document coverage area and evaluate the uniformity of compaction and surface temperature measurements as part of the project quality control operations.

5.1.1 Sample Veta Projects and Data

Sample files for different manufacturers are downloaded during the installation process of Veta. These samples files are installed to the following folders depending on the OS:

- Windows XP - C:\Documents and Settings\All Users\Shared Documents\Veta 4 Samples
- Windows 7+ - C:\Users\Public\Public Documents\Veta 4 Samples

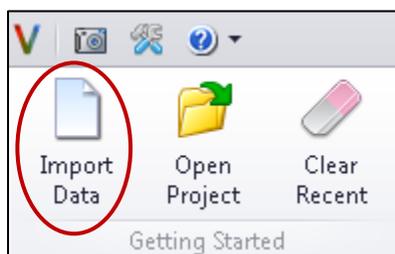
Sample projects and data can also be downloaded from the Advanced Materials and Technology Website at: <http://www.dot.state.mn.us/materials/amt/veta.html>.

5.1.2 Download and Open Veta Software

The Veta software can be downloaded from the Advanced Materials and Technology Website at: <http://www.dot.state.mn.us/materials/amt/veta.html>.

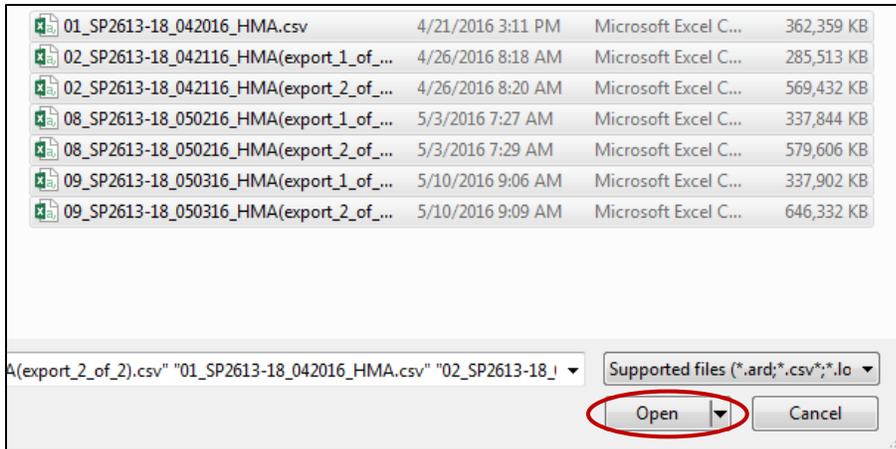
5.1.3 Creation of New Veta Project

Select **Import Data** to add data to a new project.



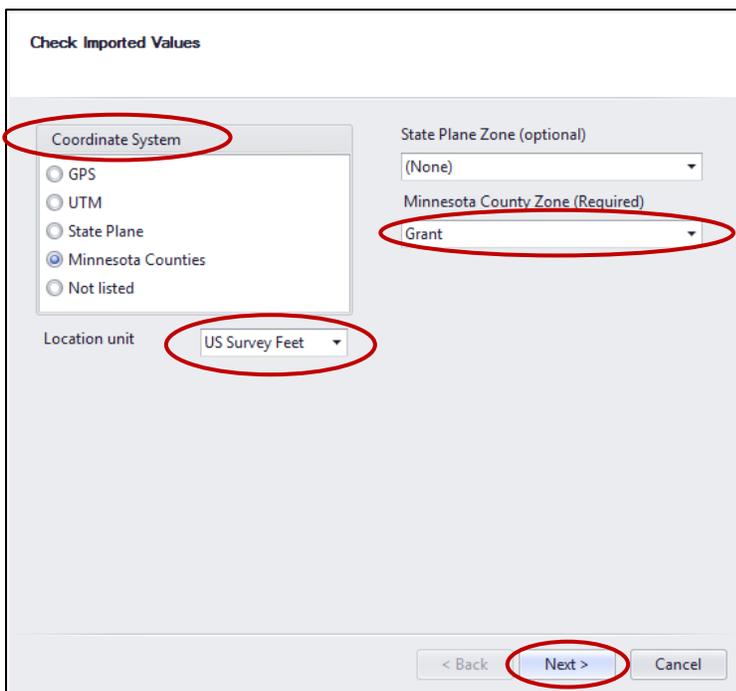
Navigate to and **select data file(s)** to be imported. Press **Left mouse button** to select desired file to import. To import multiple files, hold down the **Ctrl Key** and simultaneously **select the left mouse button** on the desired files to import.

Select **Open** at the bottom of the window to complete the initial data import process.

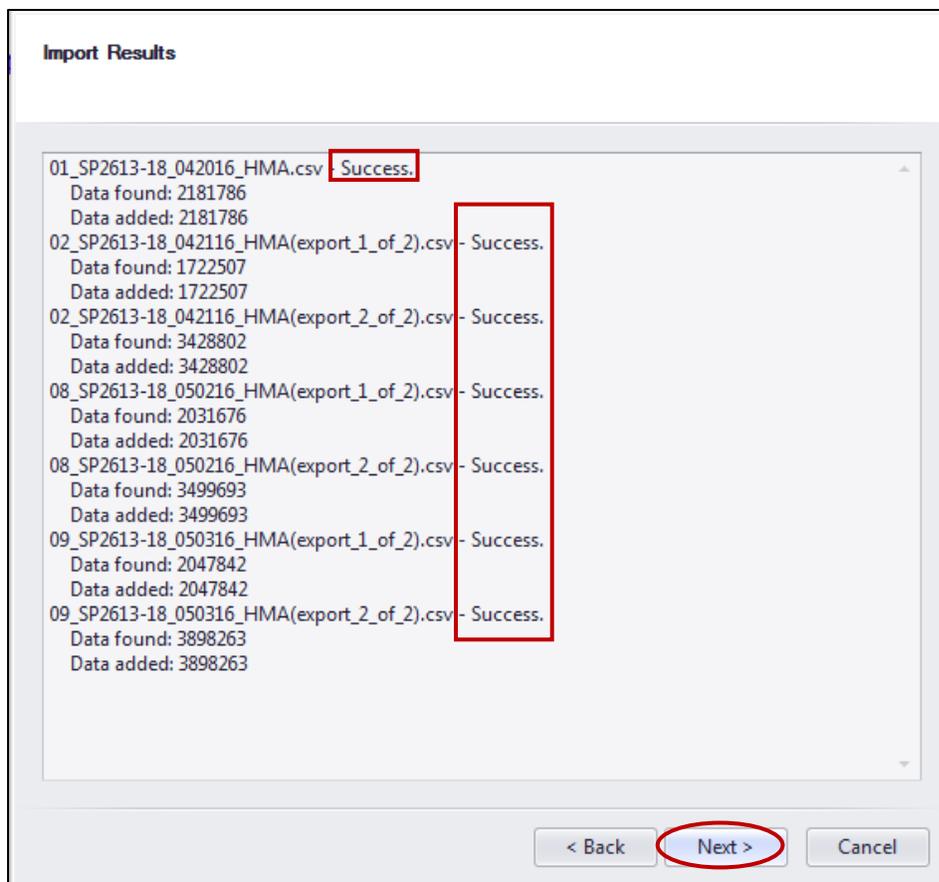


Select the **Coordinate System** and location unit used by the technology. Please note that **intelligent compaction (IC)** systems must be setup to collect data using the **Minnesota county coordinate system**. However, most **paver mounted thermal profiling (PMTP)** systems are collecting in **GPS**, as MnDOT currently does not have any coordinate requirements for these datasets.

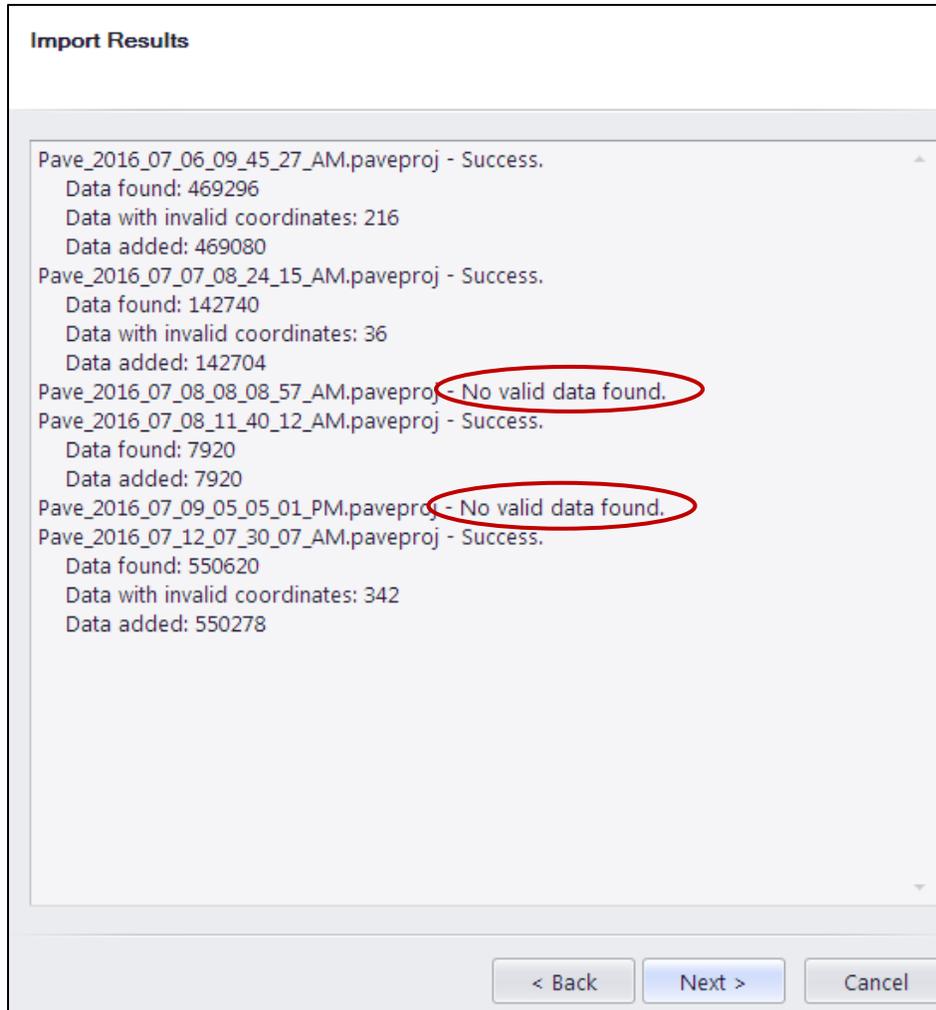
Select the **Minnesota County Zone** that the data was collected in and then select **Next**. Please note that MnDOT uses the County Coordinate system throughout the state and on all designs.



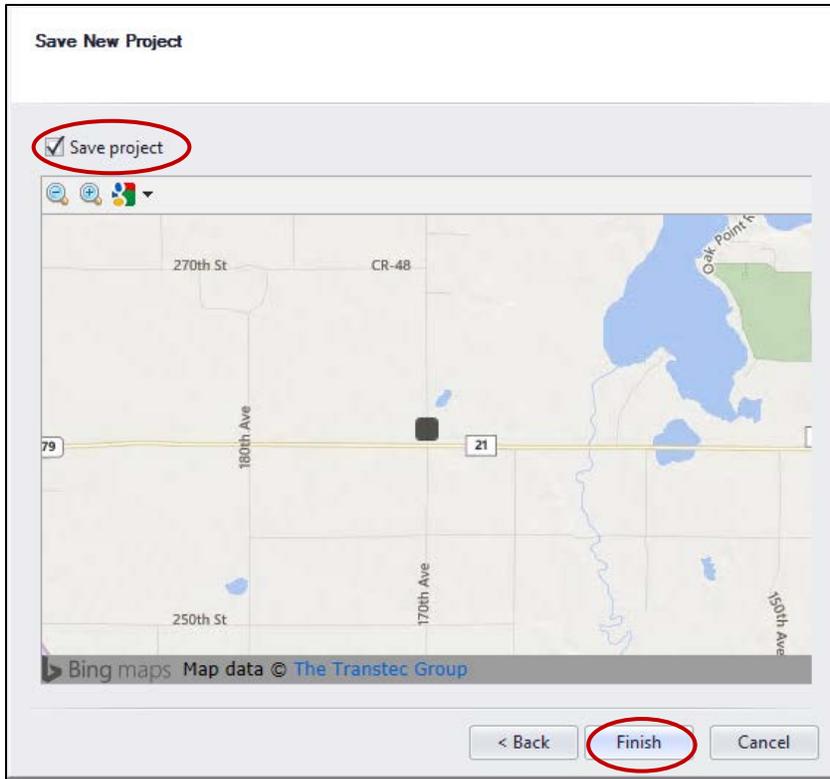
Review the **Import results** to ensure that all files were successfully imported into Veta. The word **“Success”** is listed behind files names that were successfully imported into Veta. **Select Next** to continue to next screen.



“No Valid Data Found” is listed behind the file name for cases of corrupt files or where no coordinates were collected. Re-import these files again to ensure that there was not an error in the import process. Troubleshooting may be needed to determine why the files do not import.



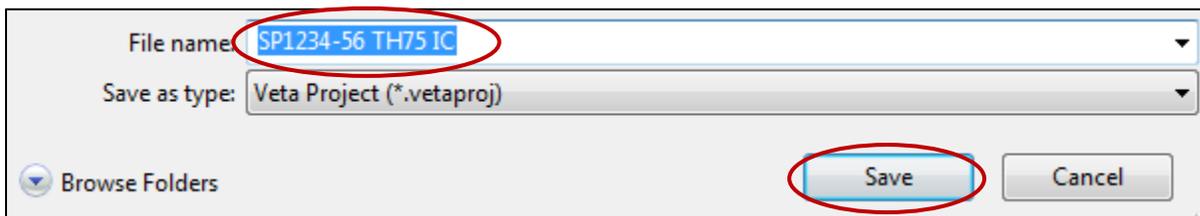
Ensure **check box** is select by **Save Project** and **Select Finish** to save project.



Navigate to the desired file **folder location** to save the file and type in the **required standardized Veta project name** into the text box by **File Name**. **Select Save**. The standardized naming convention requirements can be found at:

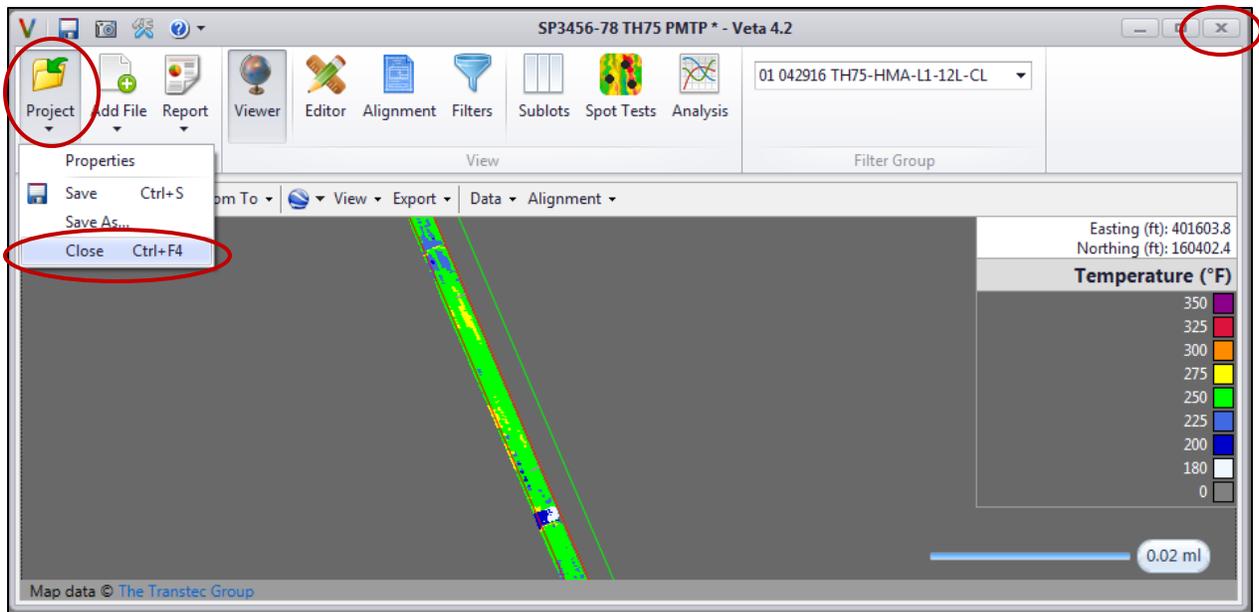
(2016) Quality Management – Paver Mounted Thermal Profile Method (S-xx.3.H | Table 2016-6 (PMTP))

(2016) Quality Management Special – Intelligent Compaction Method (S-xx.3.J | Table 2016-9 (IC))



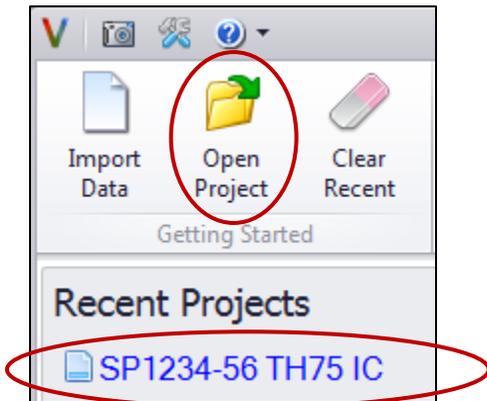
5.1.4 Close Project

The Veta project can be closed by either **selecting** the “X” in the top right corner of the software, or by selecting Project from the menus toolbar and selecting close project.



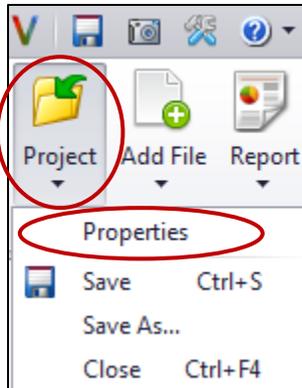
5.1.5 Opening an Existing Project

Select **Open Project** to navigate and open an existing project, or select the project name under **Recent Projects**.

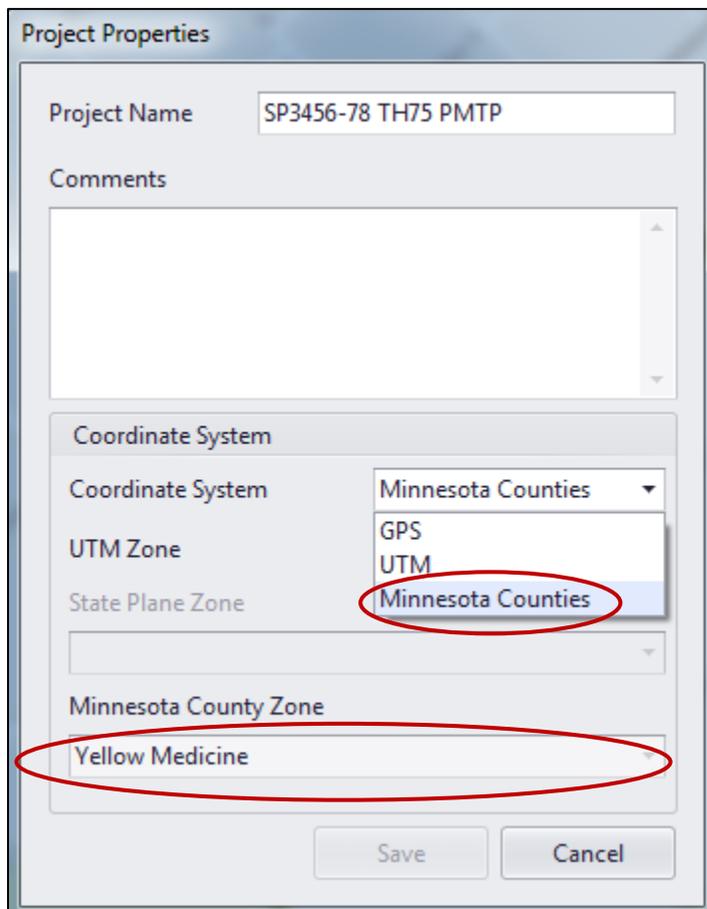


5.1.6 Set Displayed Coordinate System

The coordinate system that is displayed on the map and used for spot test locations can be converted to County Coordinates for PMTP systems that use a coordinate system other than County Coordinates. Select the **Project icon** in the **menus toolbar** and select **Properties** from the dropdown menu.



Within the **Project Properties** dialog choose the dropdown and select **Minnesota Counties** as the coordinate system. Select the desired **County** from the **Minnesota County Zone** dropdown menu.



5.1.7 Quick Access Toolbar

The quick access toolbar allows the user to use shortcuts to perform the following:

SAVE

Select the **disk icon** with the **left mouse button** in the quick access toolbar to save projects.



SNAPSHOT

Select the **camera icon** with the **left mouse button** in the quick access toolbar to take a screen shot of the entire Veta screen. The image is stored in a virtual clipboard that cannot be seen until the user pastes the image into the desired software platform (e.g., Microsoft Word, Excel, PowerPoint, etc.).



OPTIONS

Select the **tools icon** with the **left mouse button** in the quick access toolbar to change the units of measure displayed and used in Veta (i.e., Meters, Feet, US Survey Feet) and to change the default folder location for saving Veta projects.



HELP

Select the **help icon** with the **left mouse button** in the quick access toolbar to save logs (i.e., save a log of what occurred during a software crash), User’s Guide, Release Notes, Support information and “About” the software (i.e., the software version and copyright information).

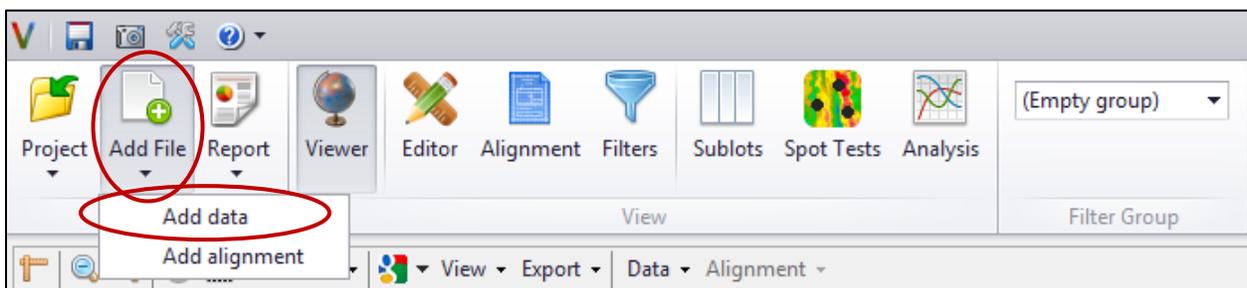


5.1.8 Add File (Data and/or Alignment)

The add file feature allows the user to add additional data (i.e., data files) to the Veta project and/or one or more alignment files.

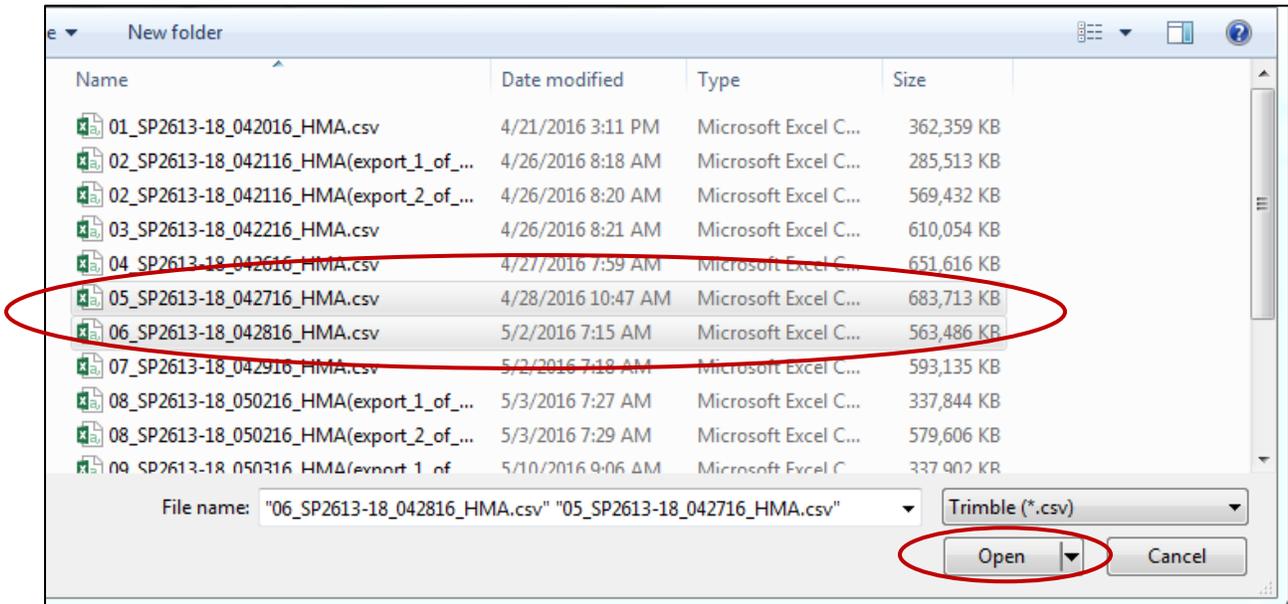
ADD DATA FILE(S)

Select the Add File icon in the menus toolbar and select Add data from the dropdown menu.

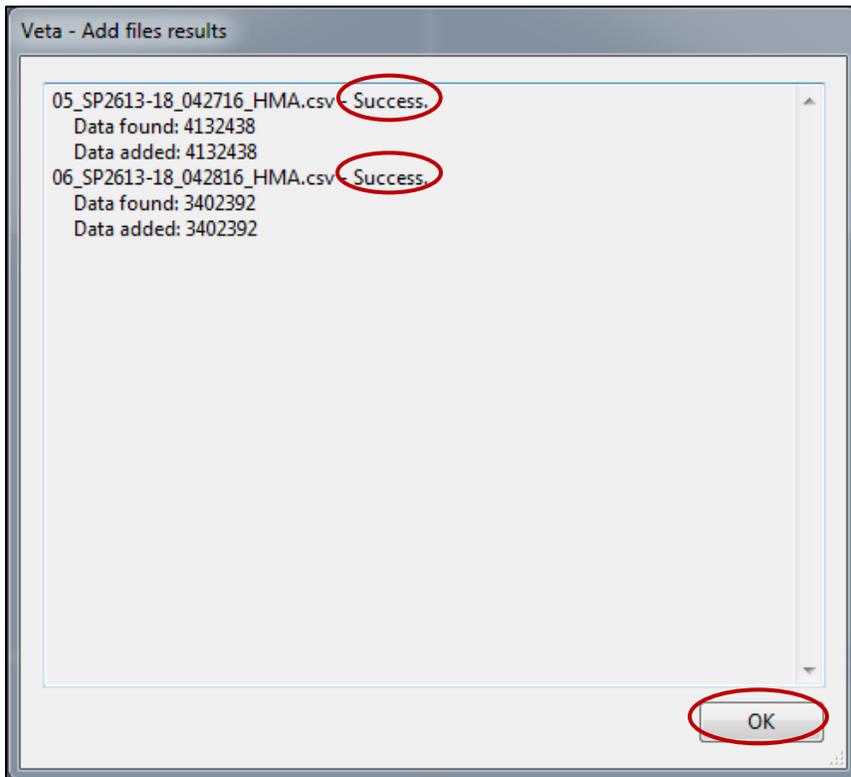


Navigate to and **select data file(s)** to be imported. Press **Left mouse button** to select desired file to import. To import multiple files, hold down the **Ctrl Key** and simultaneously **select the left mouse button** on the desired files to import.

Select **Open** at the bottom of the window to complete the initial data import process.



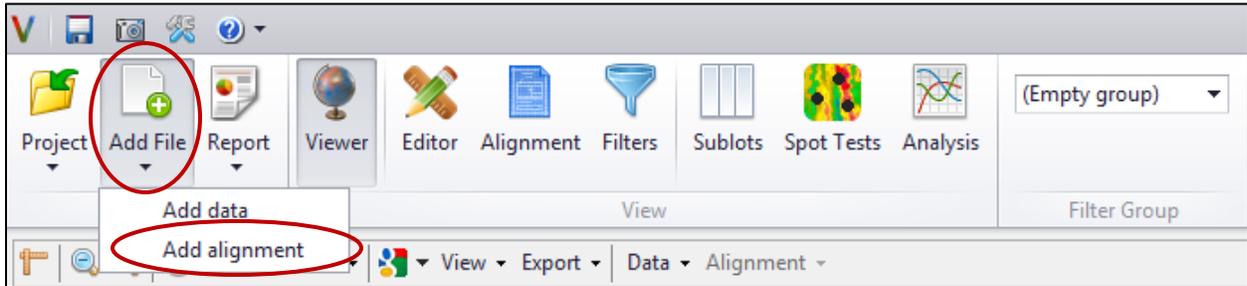
Review the Import results to ensure that all files were successfully imported into Veta. The word “**Success**” is listed behind files names that were successfully imported into Veta. **Select OK.**



“No Valid Data Found” is listed behind the file name for cases of corrupt files or where no coordinates were collected. Re-import these files again to ensure that there was not an error in the import process. Troubleshooting may be needed to determine why the files do not import.

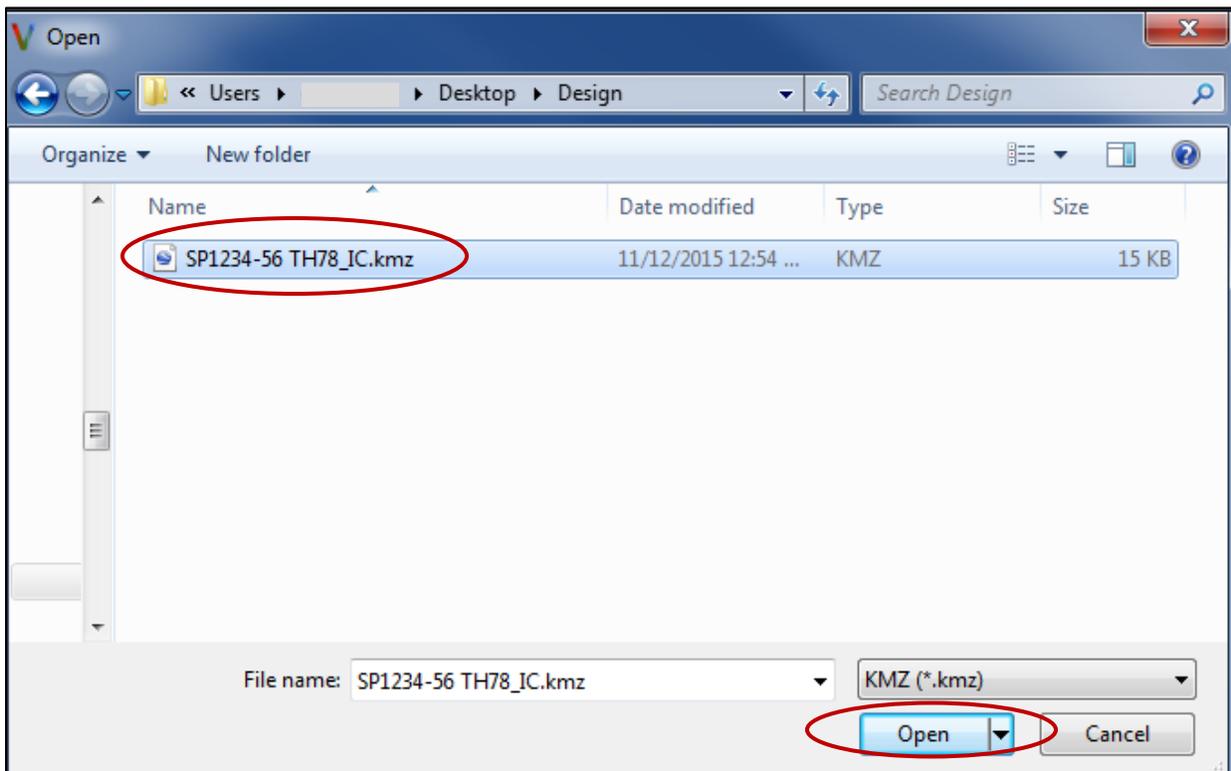
ADD ALIGNMENT FILE(S)

Select the Add File icon in the menus toolbar and select Add alignment from the dropdown menu.

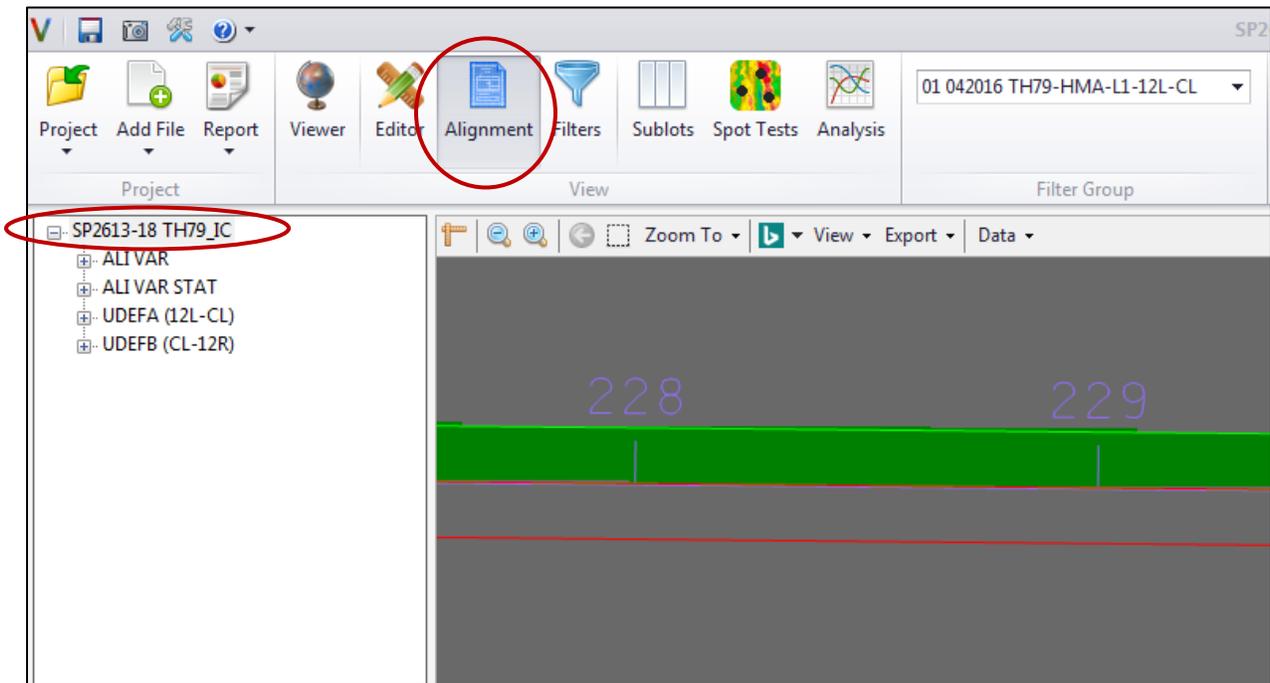


Navigate to and **select alignment file(s)** to be imported. Press **Left mouse button** to select desired file to import. To import multiple files, hold down the **Ctrl Key** and simultaneously **select the left mouse button** on the desired files to import.

Select **Open** at the bottom of the window to complete the initial data import process.



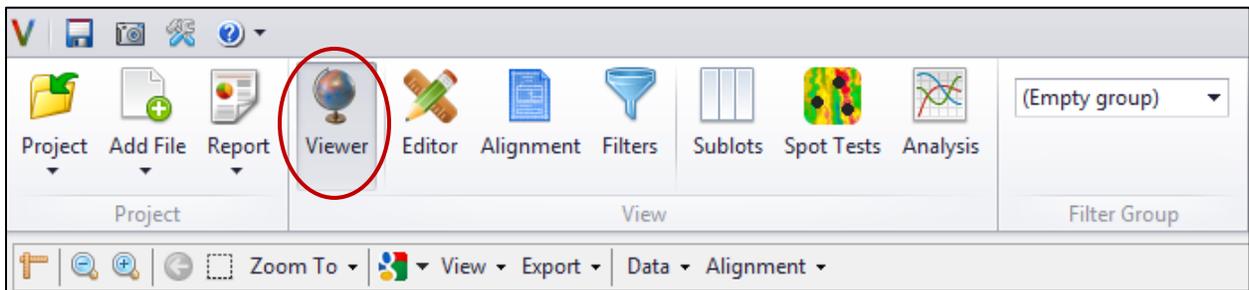
Select **Alignment** from the **menu toolbar** and then **select** the **alignment file name** in the left pane to confirm that the alignment file correctly imported. Individual layers of the design can also be viewed independently by selecting the layers listed below the alignment file name.



5.1.9 Viewer

The Viewer allows the user to view the measurements collected by the given technology on a larger screen. For instance, the user can view pass count, speed, frequency, amplitude, surface temperature, and CMV (stiffness) measurements for the IC technology and paver speed and mat surface temperature for the PMTP technology. These measurements can also be viewed in the following Menus: Editor, Alignment, Filters and Spot Tests.

Select **Viewer** from the menu toolbar to view maps of the data.



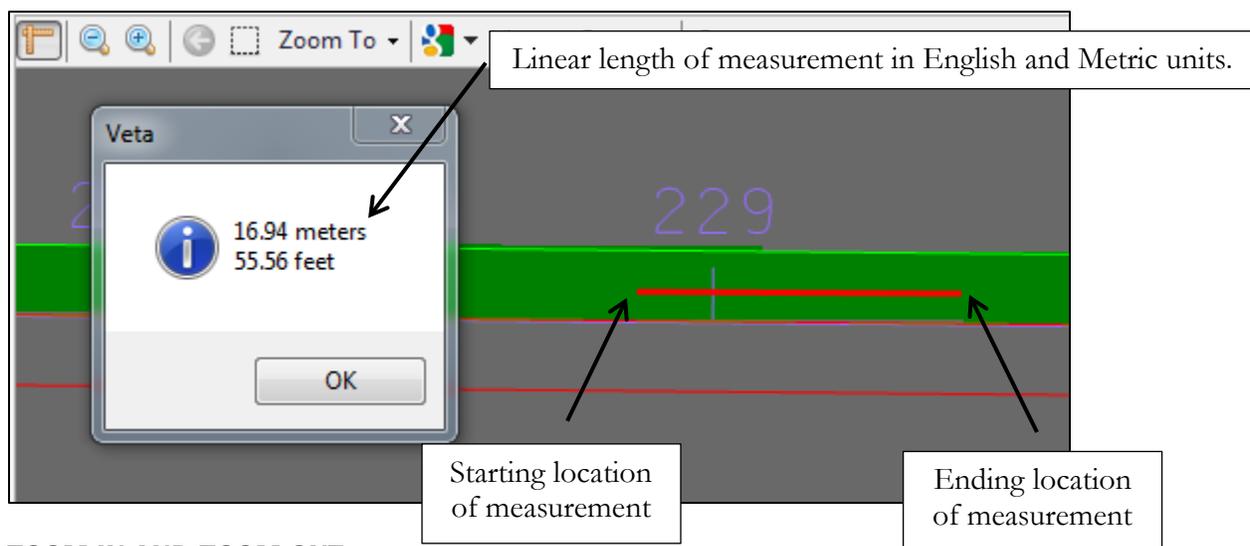
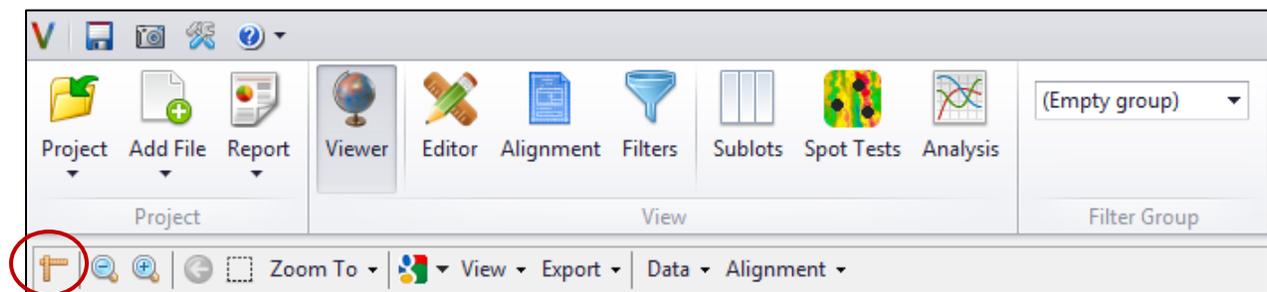
5.1.10 Panning the Map

Pan (move) the maps being viewed by **selecting and holding the left mouse button while dragging the map** to the desired location on the screen. Release the left mouse button to stop panning the map.

5.1.11 Command Toolbar

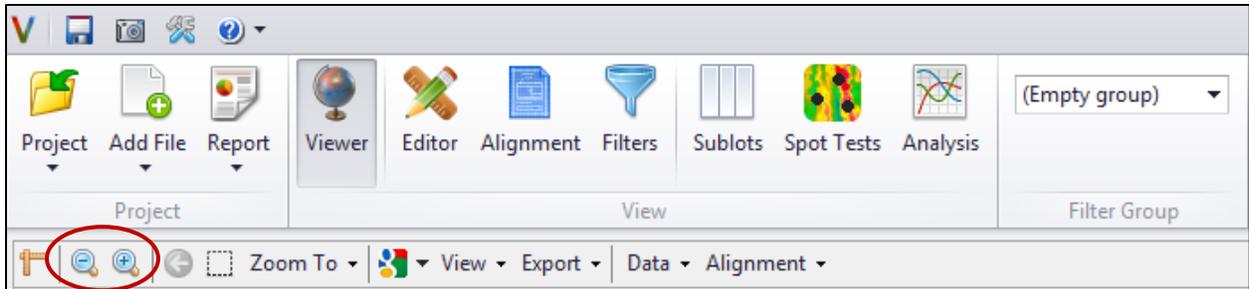
RULER

The ruler allows the user to measure distances of features on the displayed map. **Select the ruler icon** in the command toolbar. **Press and hold left mouse button** at the **starting location** of measurement and **drag mouse to the ending location**. **Release left mouse button** when the cursor is at the ending measurement location. A dialogue box containing the linear length will then appear on the screen.

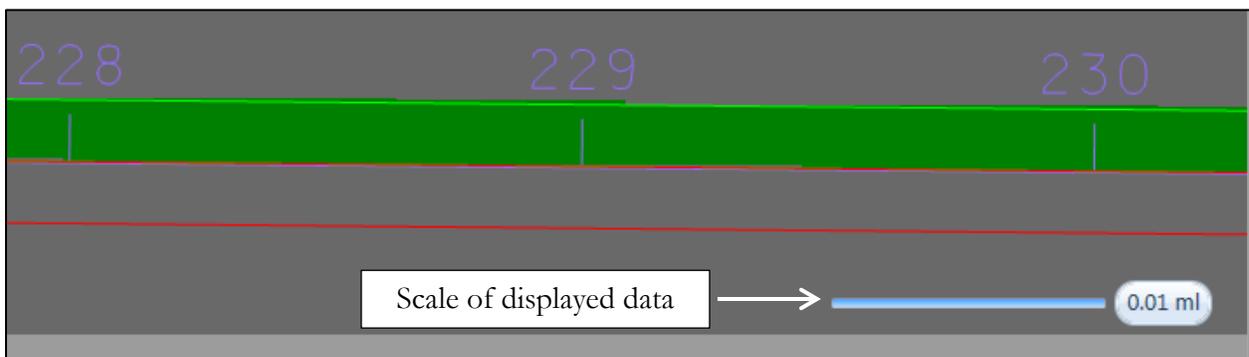
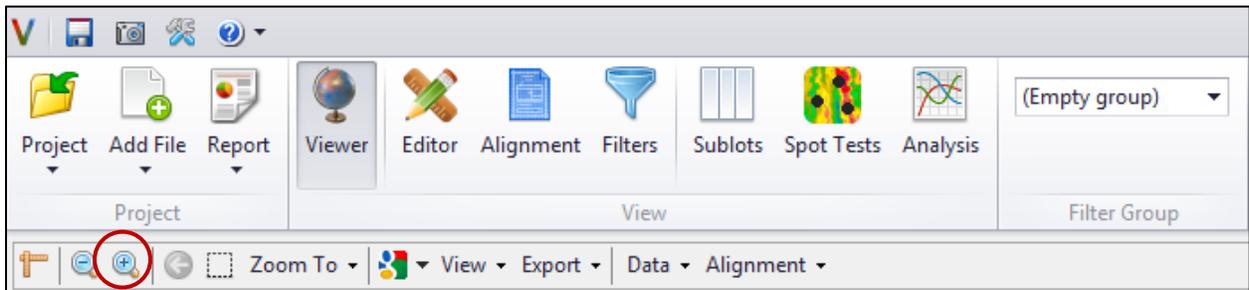


ZOOM IN AND ZOOM OUT

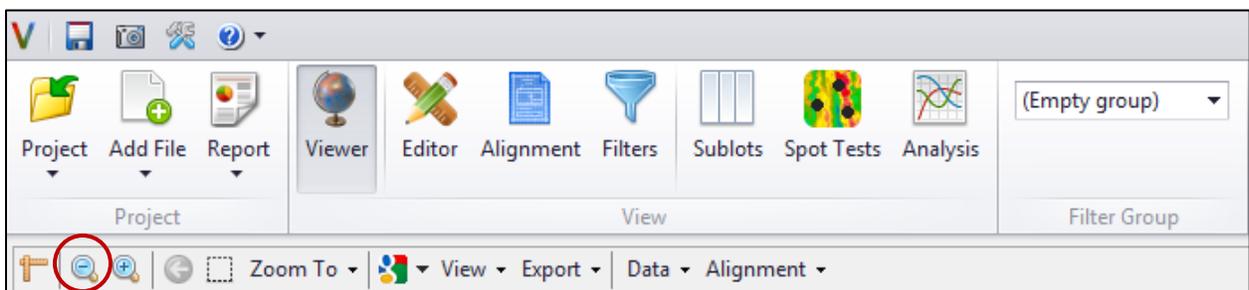
The zoom in and zoom out buttons allow the user to change the scale that the measurements are currently displayed. The zoom in button allows the user to increase the scale that the data is currently displayed on the map. Conversely, the zoom out button allows the user to decrease the scale that the data is currently displayed on the map.

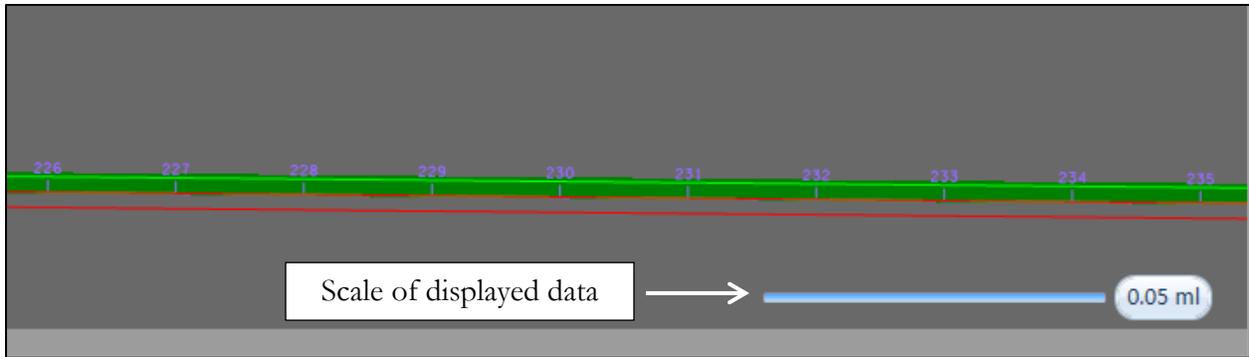


Select the **Zoom In** icon from the **command menu** to increase the scale (zoom into) the data that is currently displayed.



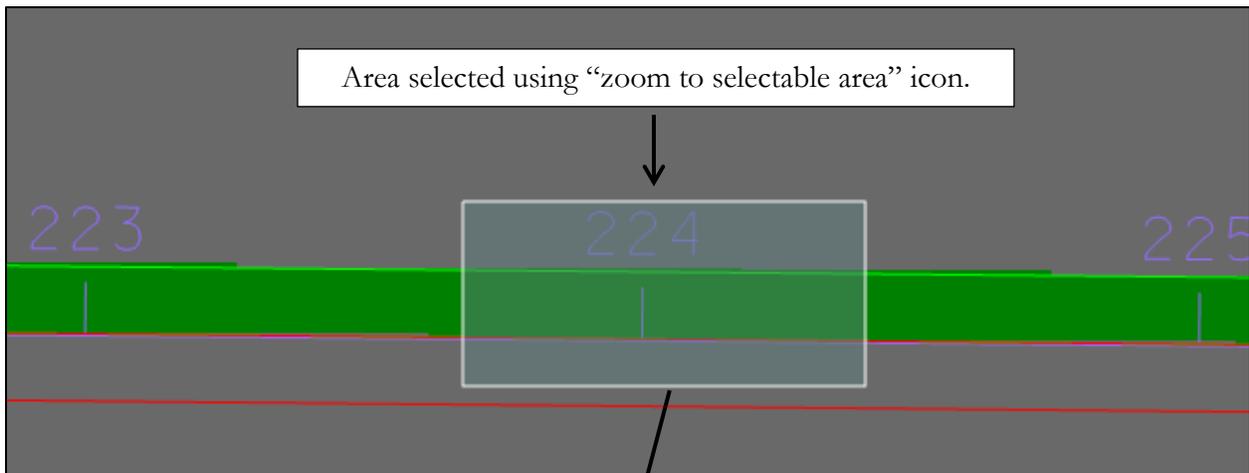
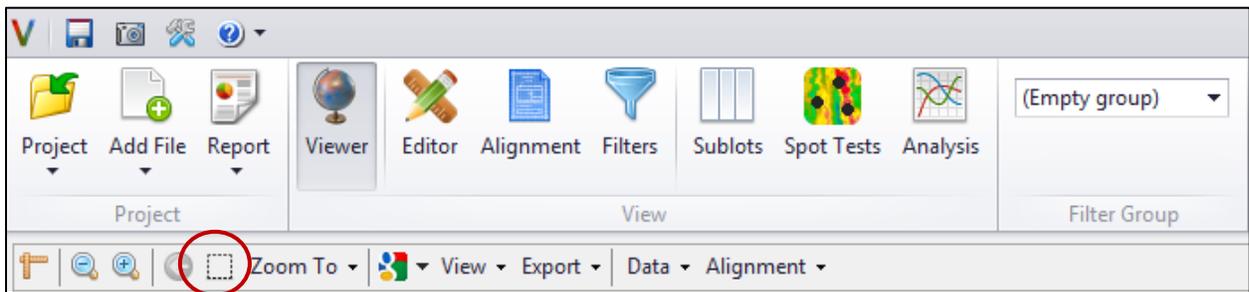
Select the **Zoom Out** icon from the **command menu** to decrease the scale (zoom out) the data that is currently displayed.

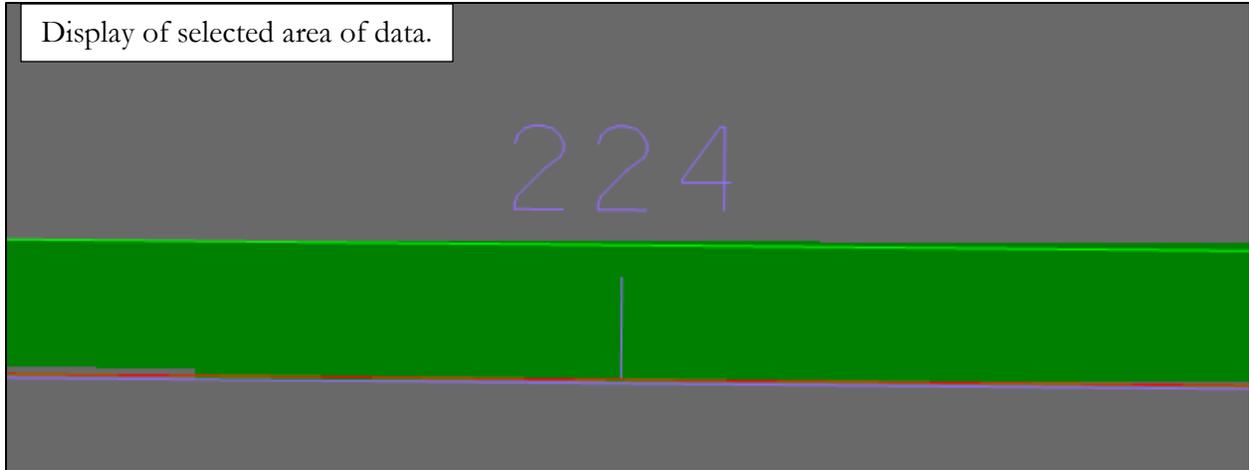




ZOOM TO SELECTABLE AREA

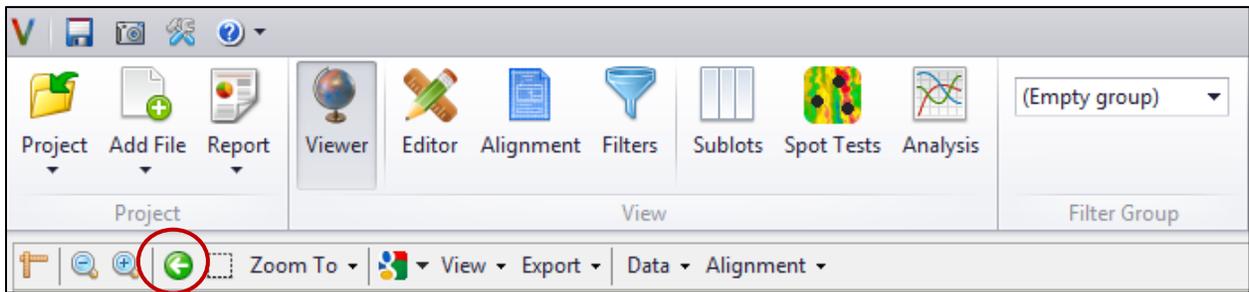
The zoom to selectable area icon allows the user to zoom in (i.e., decrease the scale) to a given area of data by drawing a box around the region. **Select the Zoom to Selectable Area icon** in the command toolbar and **press and hold left mouse button dragging the mouse** to select the desired region. **Release the left mouse button** after the desired area is drawn. The display will then zoom into the selected area.





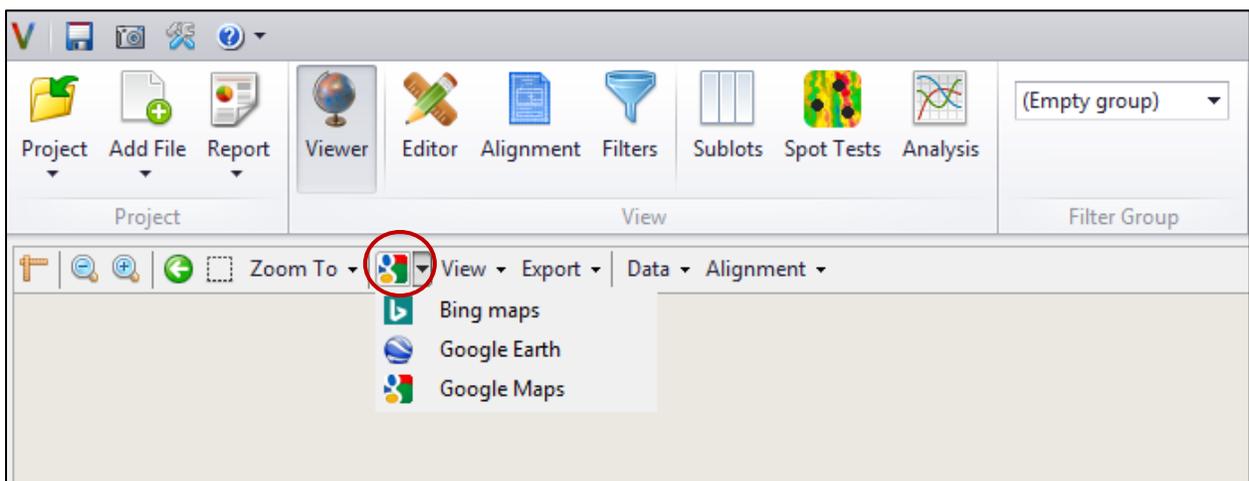
GO BACK TO PERVIOUS ZOOM AREA

The “Go back to Previous Zoom Area” icon in the command toolbar allows the user to update the displayed map to the previously displayed map prior to zooming to a selectable area.



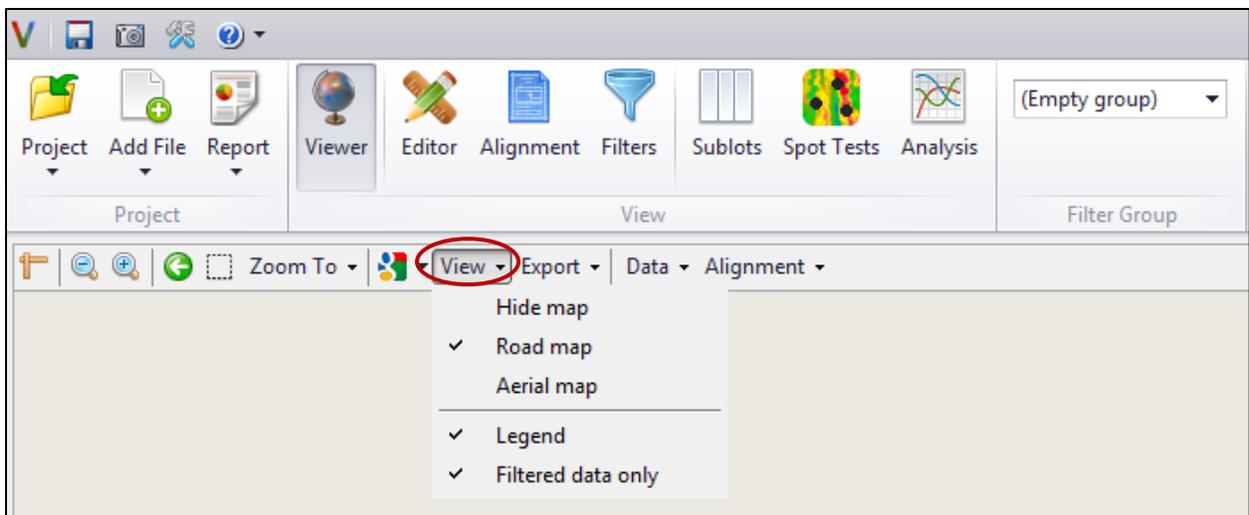
VIEW MAP CENTER

The View Map Center icon allows the user to view the location of the center of the map currently displayed in Veta in one of the following platforms: Bing, Google Earth or Google Maps. Please note that the IC and PMTP data is not mapped in these platforms.





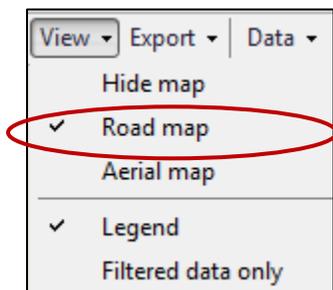
VIEW

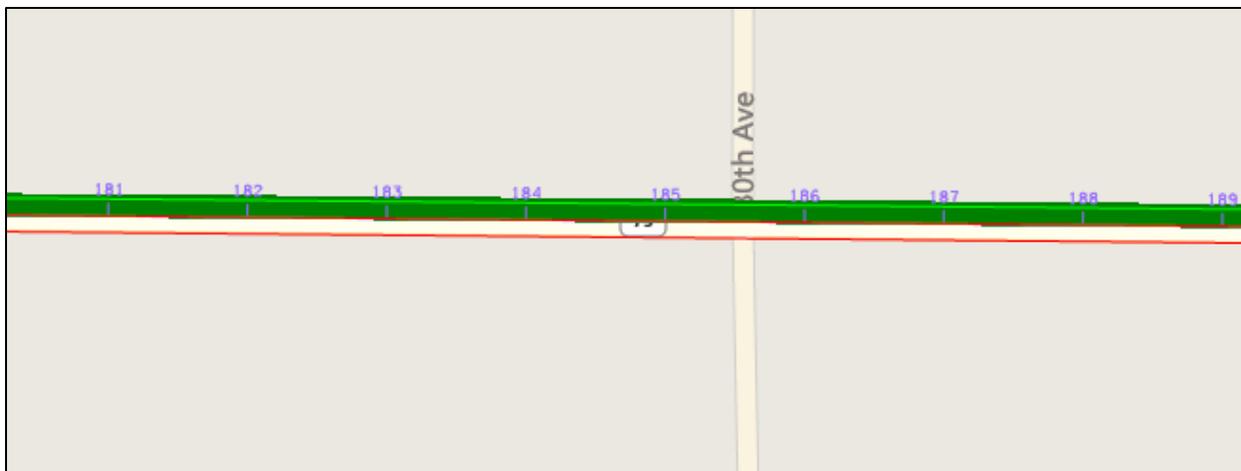


Select **View** in the command toolbar to toggle on and off the following:

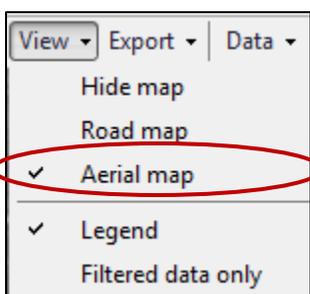
Hide Map – Hide Map allows the user to turn off the background maps when viewing IC or PMTP measurements.

Road Map – Road Map allows the user to turn on “Bing Maps” as a background layer when viewing IC or PMTP measurements. Please note that the accuracy and precision in Bing Maps is limited to the satellite imagery and the quality of the datum tie.

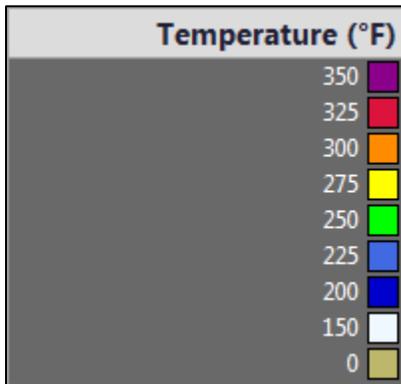
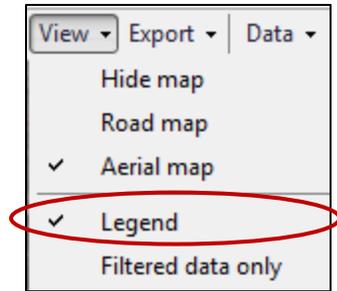




Aerial Map – Aerial Map allows the user to turn on “Bing Maps – Satellite Imagery” as a background layer when viewing intelligent compaction or thermal profiling measurements. Please note that the accuracy and precision in Bing Maps is limited to the satellite imagery and the quality of the datum tie.

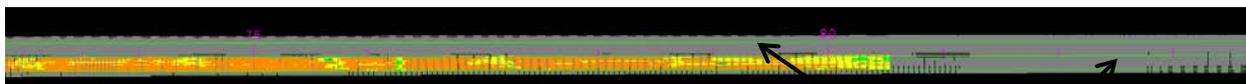
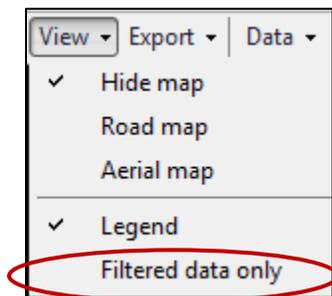


Legend – The Legend allows the user to toggle on or off the display of the legend. The legend explains the colors and values displayed by the maps. Section 5.1.12 describes how to edit (customize) the legend (i.e., modify values, colors, increments, etc.).



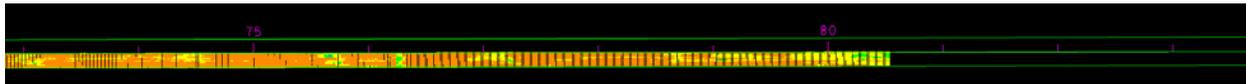
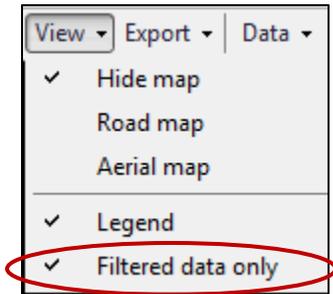
Filtered data only – The Filtered Data Only feature allows the user to toggle on and off the viewing of data that has been removed through the operation and/or data filters. Data removed by filters is colored in ‘gray’ to differentiate it from the remaining data.

Deselect (Uncheck) the **Filtered data only** with **left mouse button** from the **View dropdown menu** to view the data that was filtered out using operation and/or data filters (shown in gray) along with the filtered data.



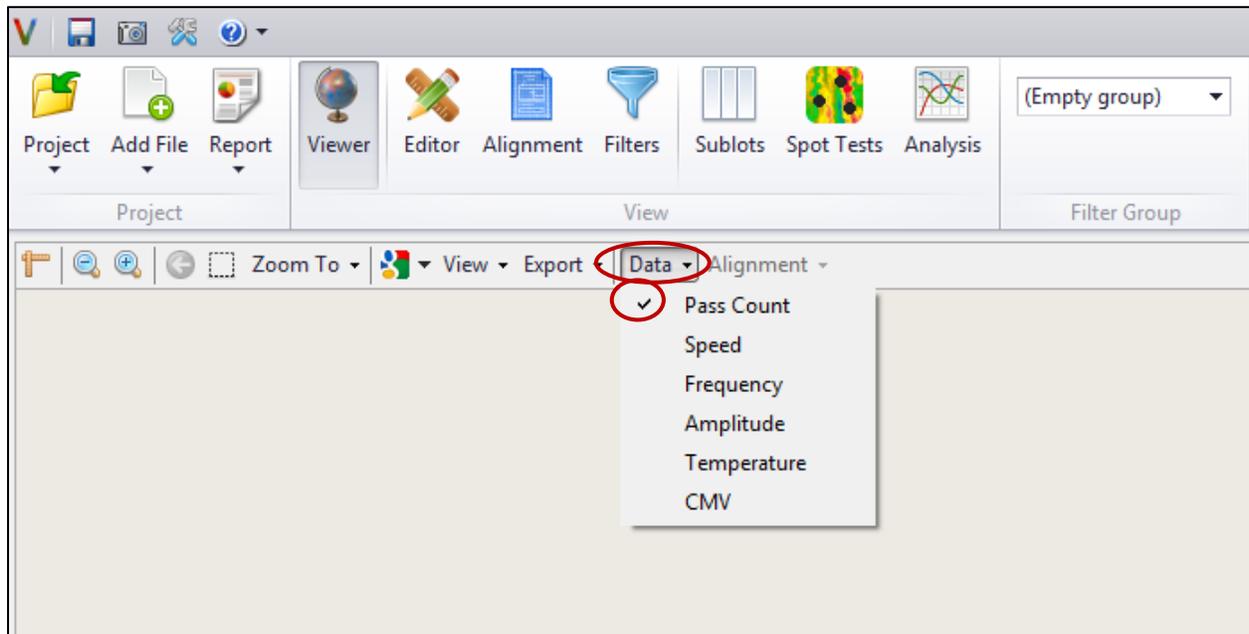
Data removed using operation/data filters.

Select (check) **Filtered data only** with the **left mouse button** from **View dropdown menu** to only view data selected through the operation and/or data filter(s).

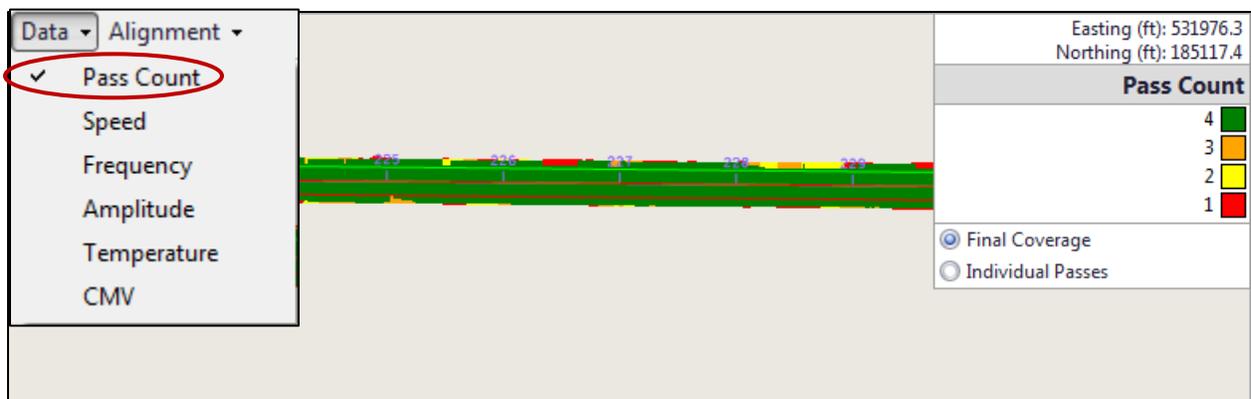


DATA

The Data dropdown menu allows the user to toggle between viewing different measurements collected by the intelligent compaction or thermal profiling systems (e.g., pass count, speed, frequency, amplitude, surface temperature, CMV, paver speed). The check to the left of the measurement indicates which parameter is currently selected and mapped. The following images show the example for viewing pass count.



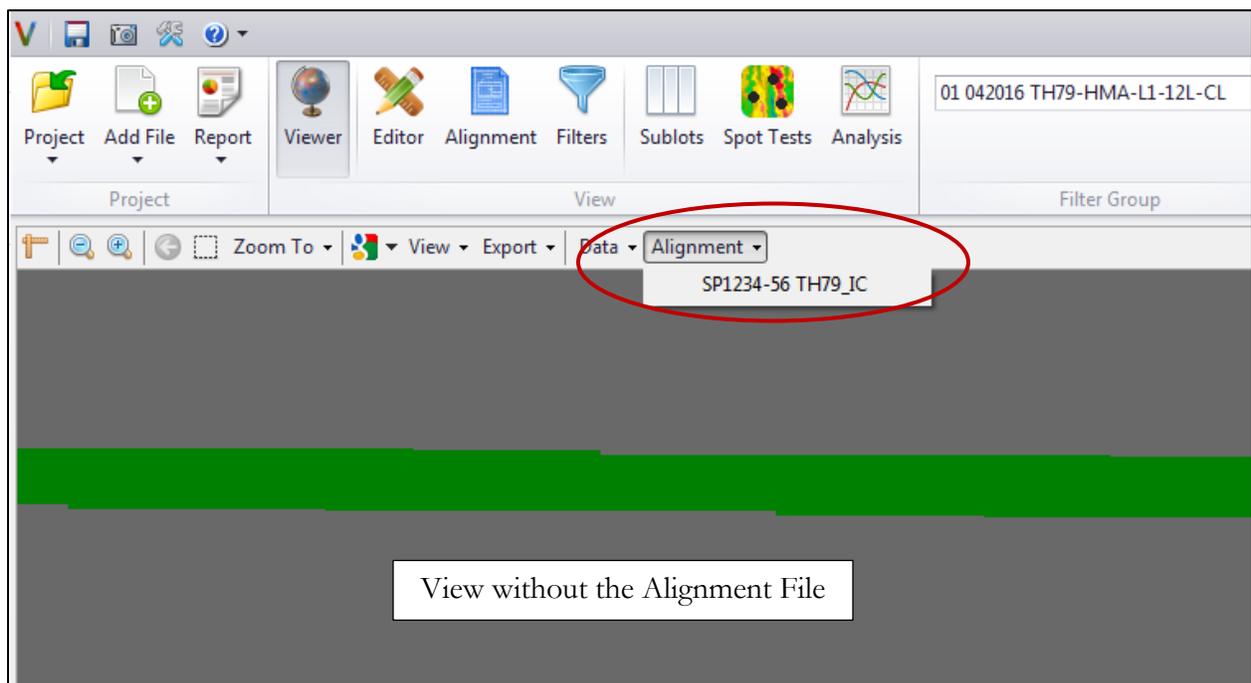
Select **Pass Count** with **left mouse button** to view Pass Count measurements.

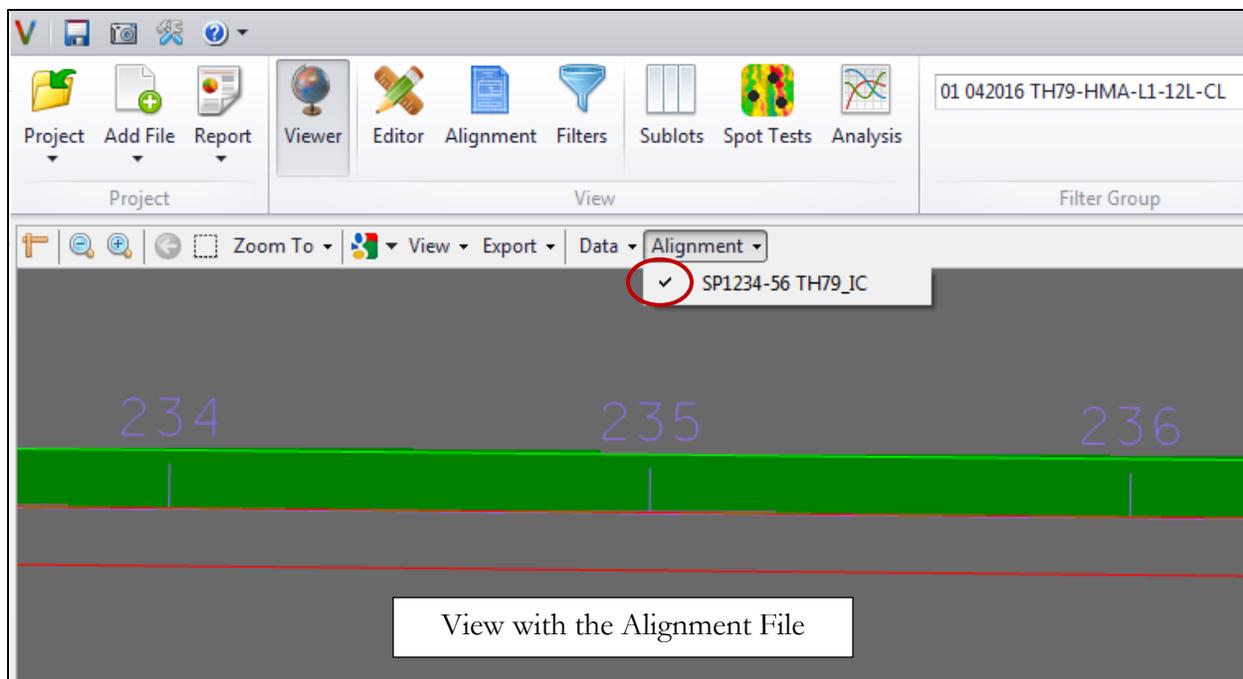


ALIGNMENT

Alignment allows the user to turn on or off the alignment layer from the background.

Select **Alignment** from the dropdown menu using the **left mouse button** to toggle on and off the alignment file by selecting or deselecting the given alignment file name.

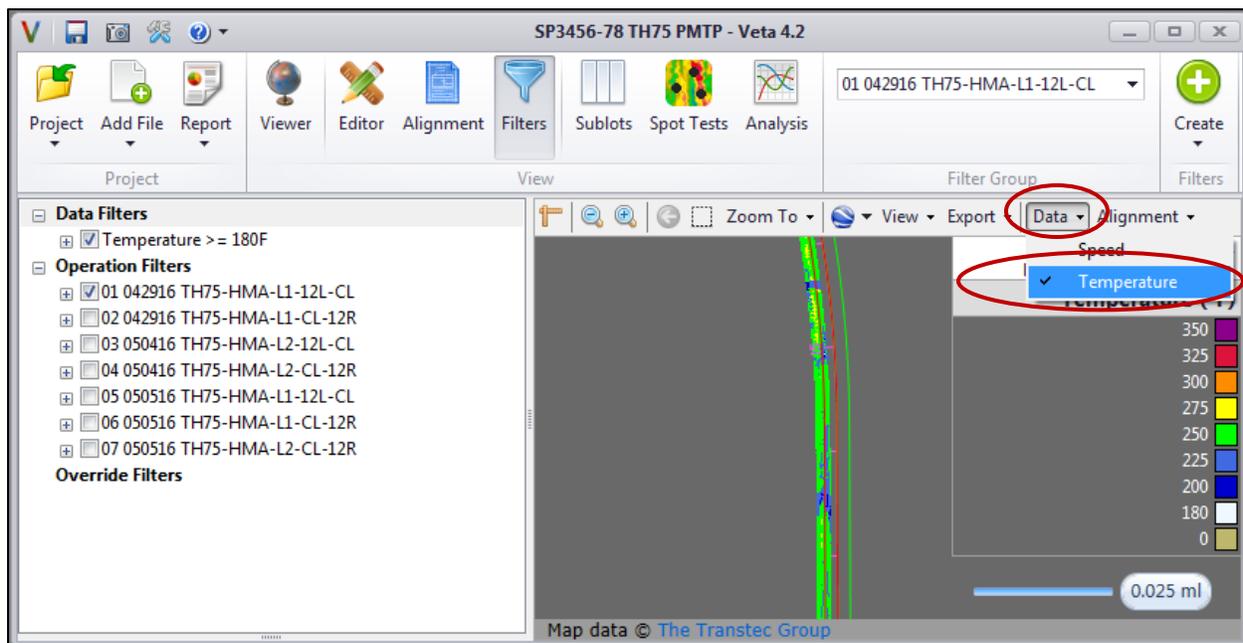




5.1.12 Customize Legend

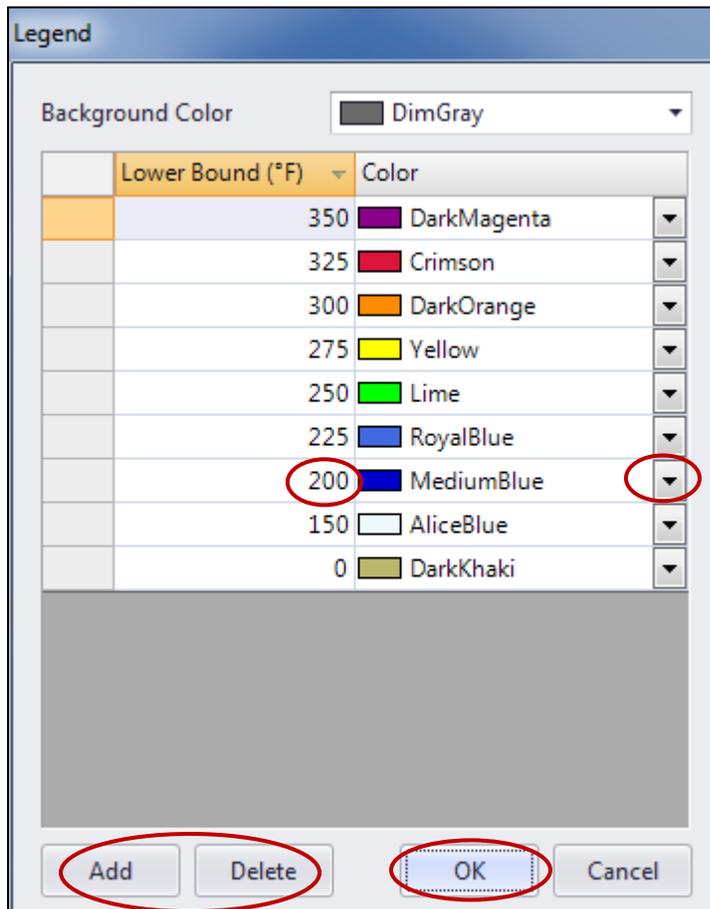
The user can edit the legend (change the scale interval, scale colors and background map color) for the intelligent compaction or thermal profiling measurements. The following is an example of how to change surface temperature measurements for the thermal profiling system.

Select the **Data** dropdown from the **command menu** and select **temperature**.



Right click on the **legend** and **select customize** to change the **color palette** for the surface temperature readings. Use the following color pallet for surface temperature measurements for the thermal profiling system. Darker background (e.g., black, DimGray) colors are recommended as these colors provide contrast assisting with viewing of the surface temperature measurements. **Select the Add** button with the left mouse button to add additional temperature levels. To delete a given temperature **select the temperature box** with the **left mouse button** and then **select Delete**. Select **OK** to save changes to color palette.

Select the given temperature value with the left mouse button to **edit the value shown**. Use the **dropdown** to the right of the color names to **change the color** for the given range.

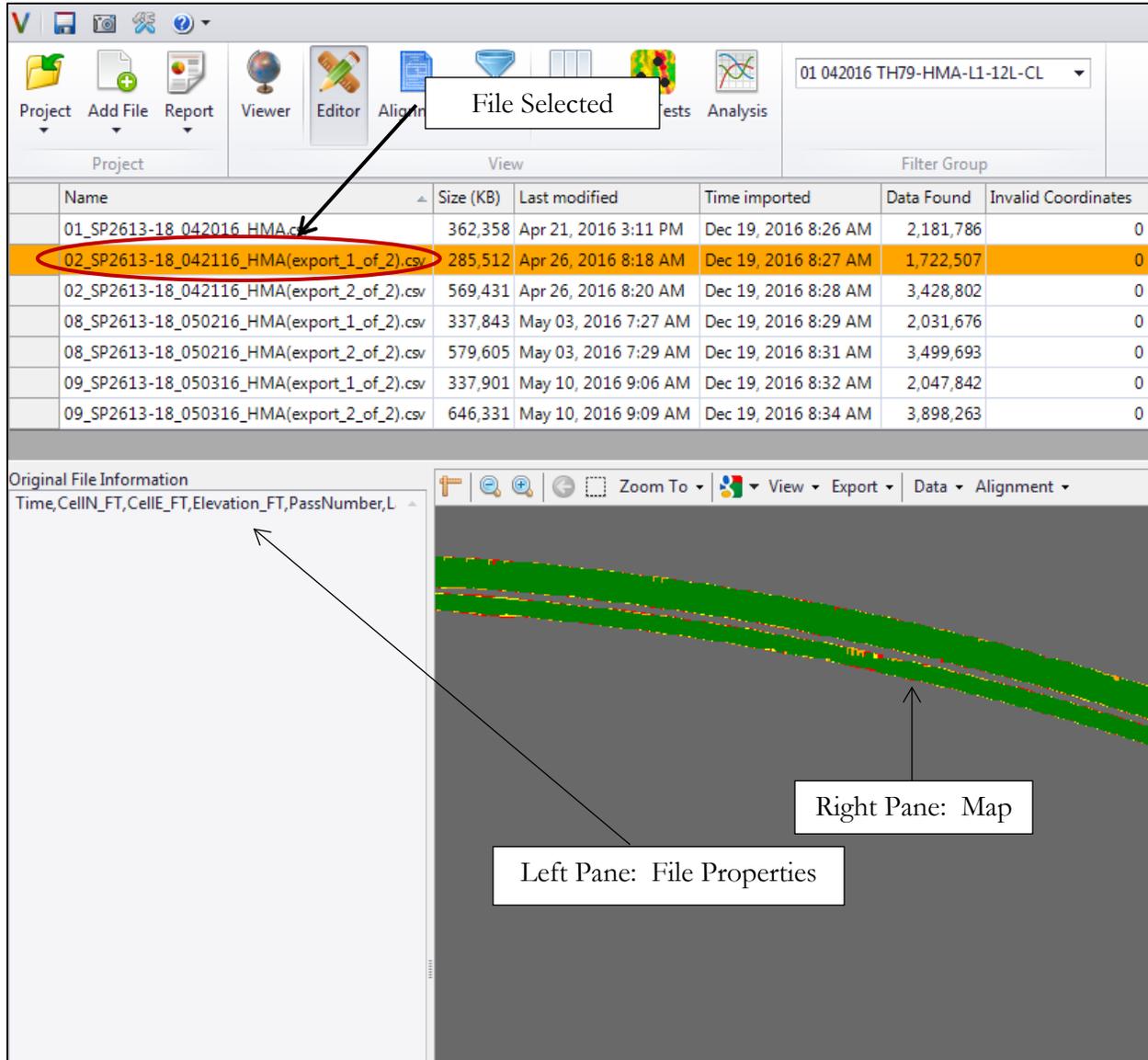


5.1.13 Editor

The editor menu allows the user to view the locations of data with respect to the given file name, to delete files and to view file properties (size, modification date, time imported, number of rows of data found in the file, number of invalid coordinates, number of rows of data imported, duplicate records and number of rows of data added to the Veta project).

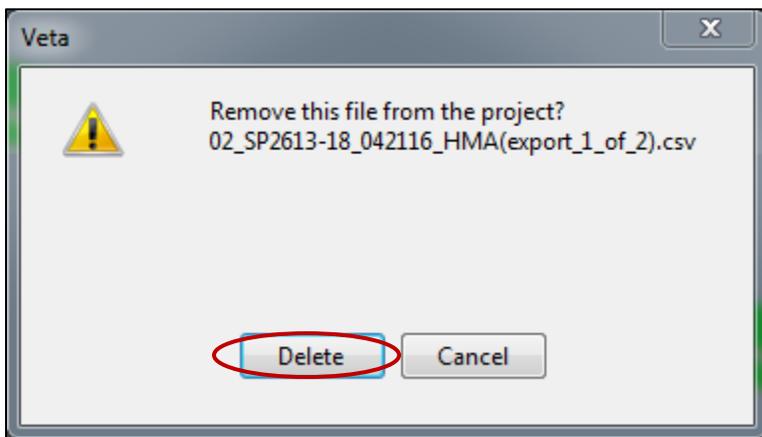
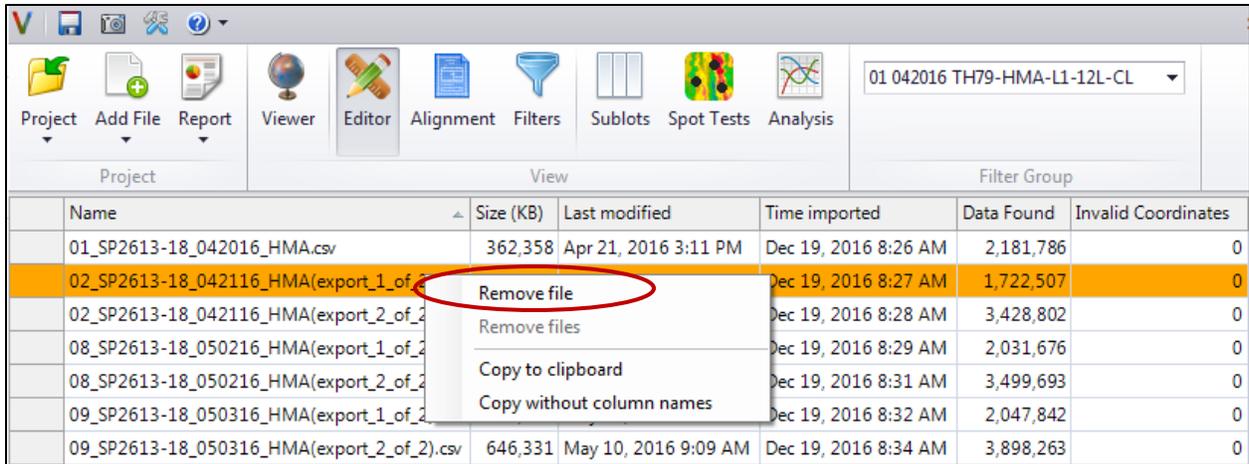
VIEW DATA ASSOCIATED WITH FILE AND FILE PROPERTIES

Select the **file name** with the **left mouse button** to view the map of the data associated with the given file selected and the file properties. The file properties are listed on the left pane and the map of the intelligent compaction or thermal measurements is presented in the right pane.



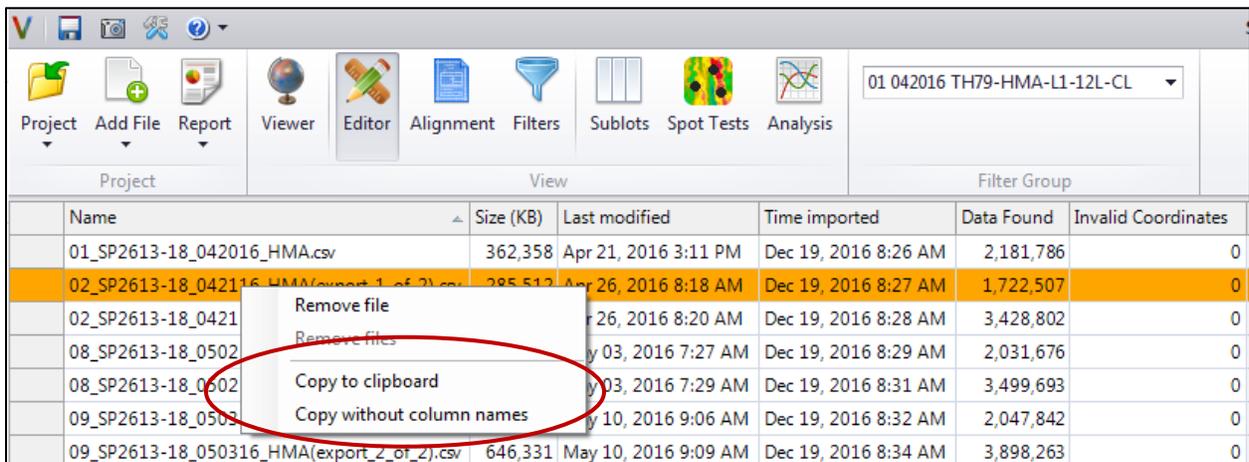
REMOVE (DELETE) FILE

Select the **right mouse button** on the name of the **file** to be removed from the Veta project. **Select remove file**. A popup window will appear to confirm the removal of the selected file. **Select delete** to remove the file **or cancel** to stop removal of the file.



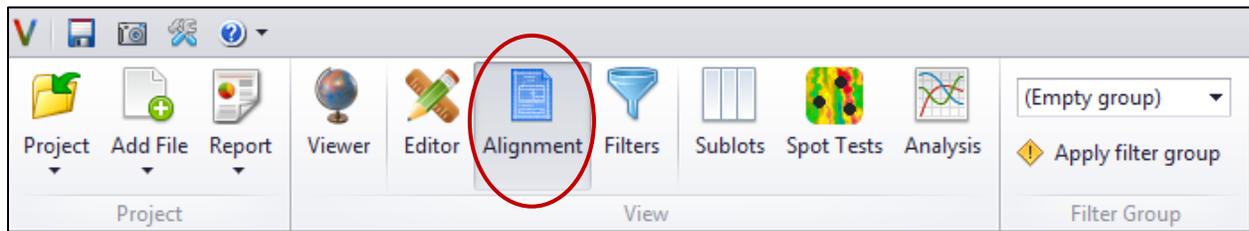
COPY TABLE OF IMPORTED FILES

Select anywhere on the table with the **right mouse button** and select **copy to clipboard**, or **copy without column names**, to copy the table of imported files to the clipboard. The table can then be pasted into another software package (e.g., Microsoft Word, Microsoft Excel, etc.) as desired.



5.1.14 Alignment

The **Alignment menu** allows the user to view and relabel, if needed, the individual layers within the alignment file. It is recommended that this feature is used to relabel the complex shape files to assist with the correct selection of shapes within the location filter. Complex shapes are polygons (typically polygon outlines of each traffic and required auxiliary lane) that are used to trim (exclude) data that is located outside of the required areas. **Complex shapes are currently only used with intelligent compaction data and not with the thermal profiling data. Thermal profiling data is sub-meter accuracy, and therefore, cannot be trimmed correctly using complex shapes.**

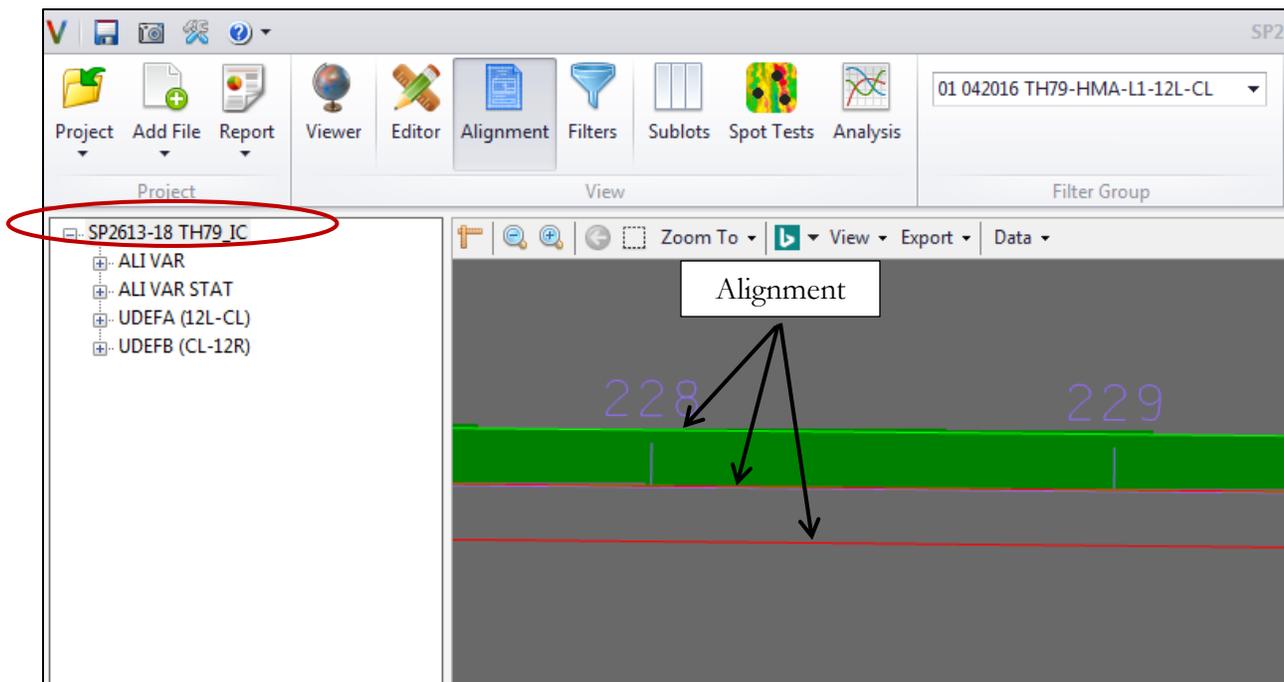


RE-LABELING OF COMPLEX SHAPES

The complex shapes are typically labeled (by default): UDEFA, UDEFB, UDEFC, ..., etc. This default labeling schema makes it difficult to remember which complex shape is for a given centerline offset (production/compaction area).

View Line-work for Entire Alignment File

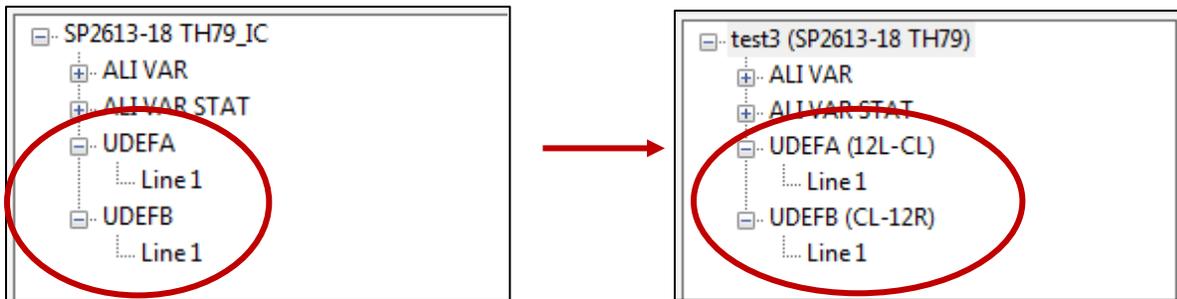
Selection of the layers in the left pane allows the user to view the given layer. For instance, **select** with the **left mouse button** the **alignment file name**, in the left pane, to **view the entire alignment**.



View and Re-Label Complex Shape Layers

Select each complex shape to visually determine which centerline offsets that the given shape represents. Centerline offset layer **lines** can be viewed by expanding each layer by **selecting** the “+” box with the **left mouse button**. **Label** each complex shape using the centerline offset naming convention by **selecting the complex shape name** with the **right mouse button** (see example below).

See (2016) Quality Management Special – Intelligent Compaction Method (Table 2016-7 (IC) for required standardized centerline offset labeling.



Default Complex Shapes Labeling

Re-Labeled Complex Shapes

5.1.15 Create Filter Combinations for Each Lot

Creation of filters allows the user to organize the data for mapping and analyses. Such as, by production/compaction day, location, lift, lane, roller, paver, etc. See the following tables for the required standardized naming conventions.

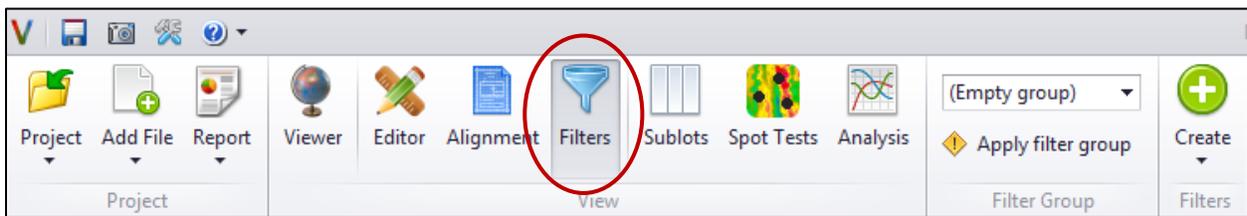
(2016) Quality Management Special – Intelligent Compaction (IC) Method (Table 2016-10 (IC))

(2016) Quality Management – Paver Mounted Thermal Profile Method (Table 2016-7 (PMTP))

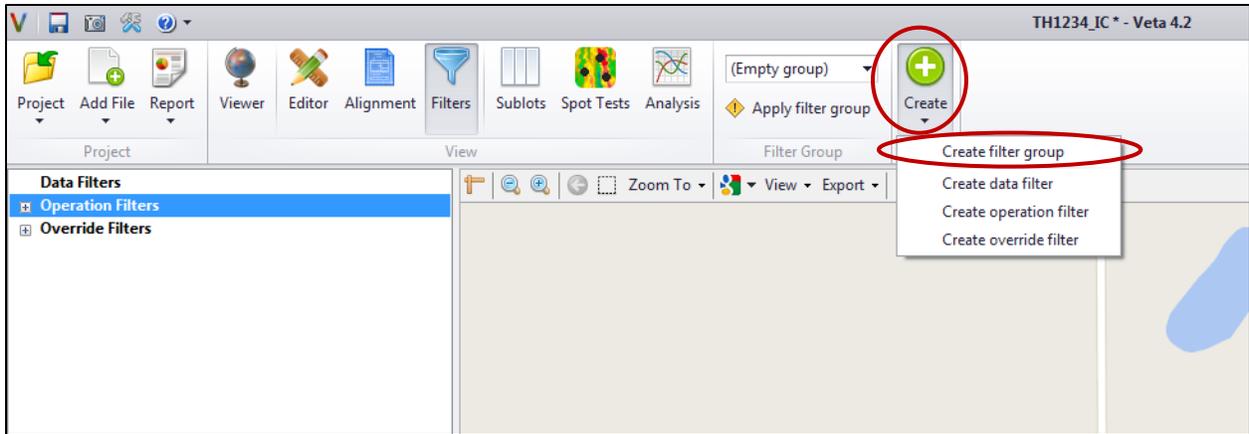
FILTER GROUP MANAGER

The **Filter Group Manager** will assist with creation of the required standardized naming convention for each filter group.

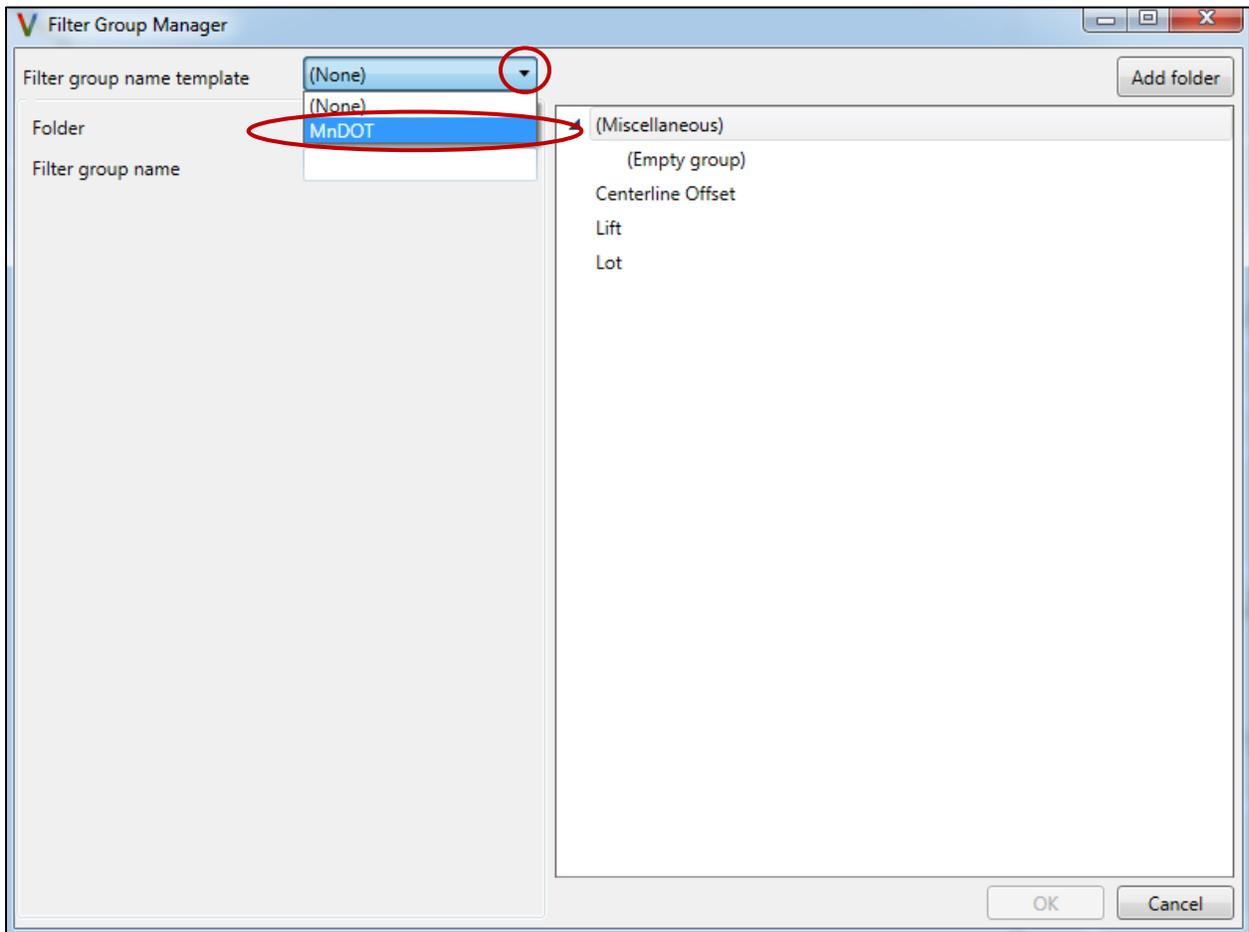
Select **Filters** from the menu toolbar.



Select **Create** from the menu toolbar and select **Create Filter Group**.

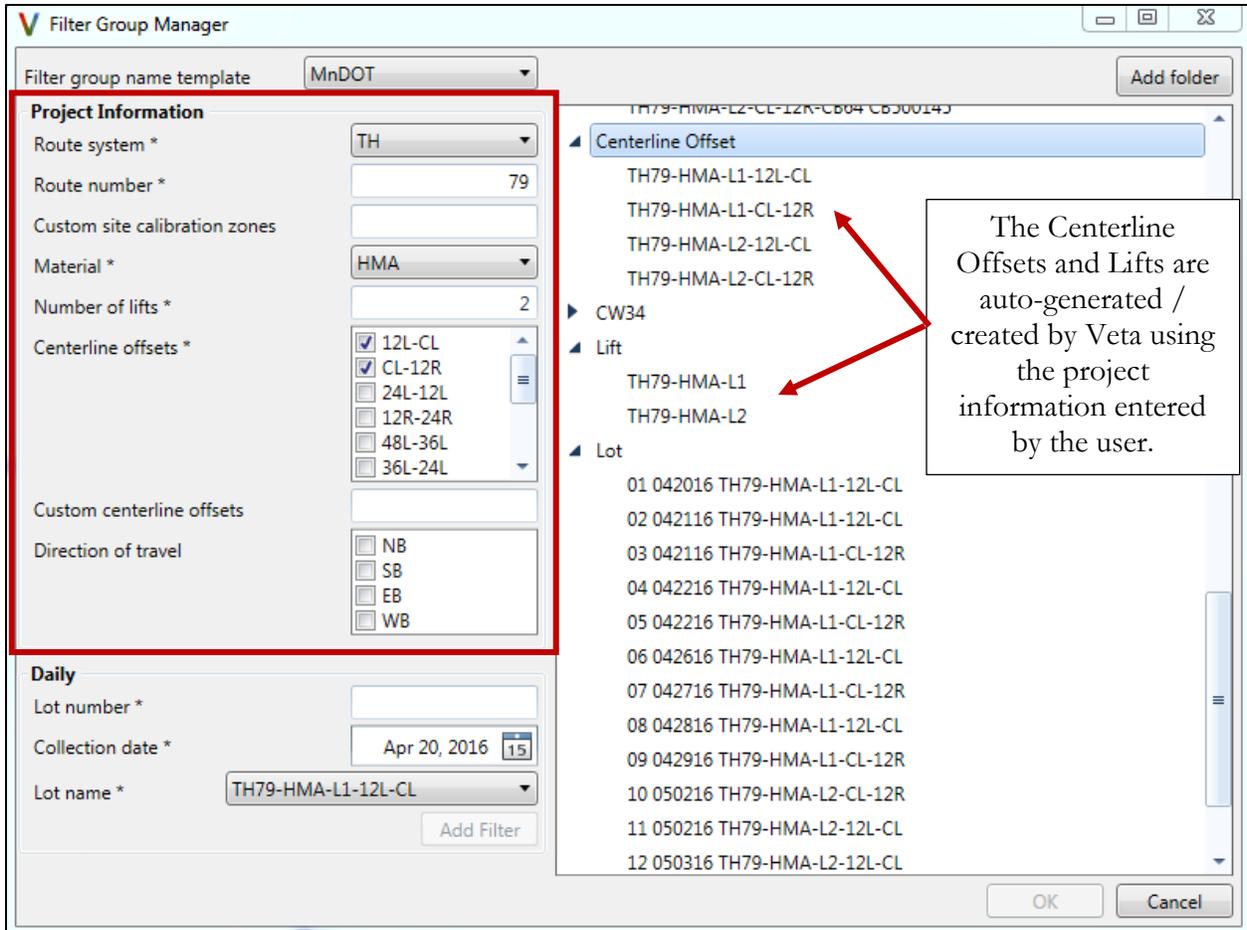


Select **MnDOT** from the **Filter Group name template** dropdown list.

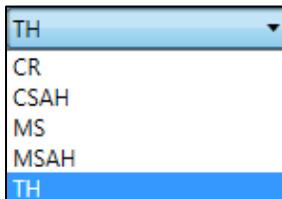


Project Information

Complete the required project information. Completion of the Project Information allows Veta to generate the needed Filter Group names.



Route System – Select the **type of system** from the **dropdown menu**.



Route Number – Type the route number into the text box (e.g., 79).



Custom Calibration Zones – This feature is used for cases where more than one site calibration zone is needed within the project limits. **Enter the name of the sites** into the **text box**. Ensure that these names are consistent with the lot naming convention used in the technology’s data acquisition

system (e.g., N, S, E, W). Use commas, without spaces, to add more than one site calibration zone.

Route number *	79
Custom site calibration zones	N
Material *	HMA

Material – Select the material type from the dropdown menu that the technology is being used.

Material *	HMA
Number of lifts *	
Centerline offsets *	

- CIR
- HMA**
- SFDR-I
- SFDR-P
- SMA
- UTBWC
- WMA
- 36L-24L

Number of Lifts – Enter the total number of lifts for where the technology is being used.

Material *	HMA
Number of lifts *	2
Centerline offsets *	<input checked="" type="checkbox"/> 12L-CL <input checked="" type="checkbox"/> CL-12R <input type="checkbox"/> 24L-12L

Centerline Offsets – Select all of the centerline offsets for where the technology is being used.

Centerline offsets *	<input checked="" type="checkbox"/> 12L-CL <input checked="" type="checkbox"/> CL-12R <input type="checkbox"/> 24L-12L <input type="checkbox"/> 12R-24R <input type="checkbox"/> 48L-36L <input type="checkbox"/> 36L-24L
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Custom Centerline Offsets – Use the Custom Centerline Offset text box to list offsets that are not included in the check box list. Use a comma, without spaces, to add more than one custom offset (e.g., 6R-18R,18R-30R).

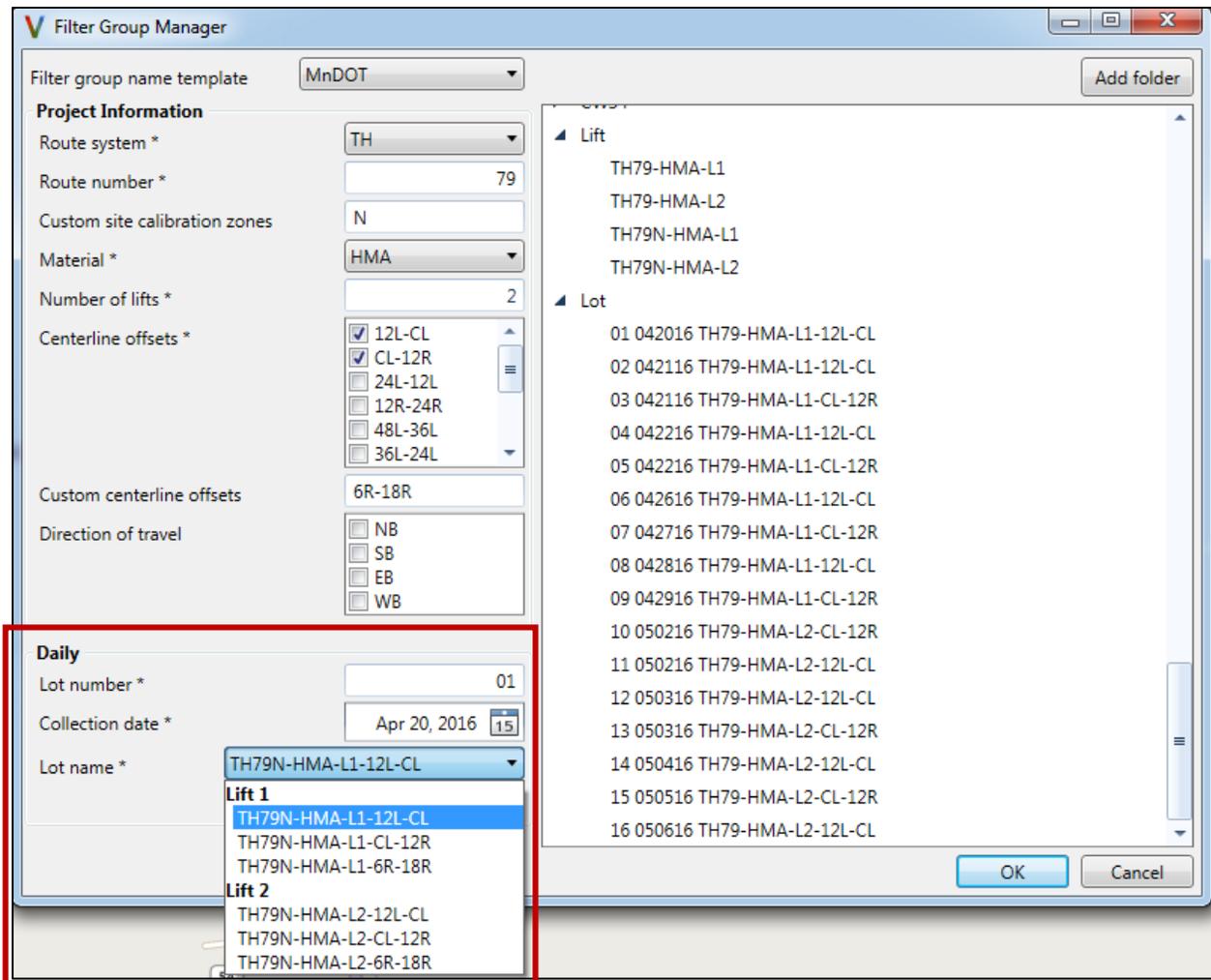
Custom centerline offsets	6R-18R
Direction of travel	<input checked="" type="checkbox"/> NB <input type="checkbox"/> SB <input type="checkbox"/> EB <input type="checkbox"/> WB

Direction of Travel – For **divided highways**, select the **Direction of Travel** for where the technology is used. This parameter is not needed on projects that are not undivided.

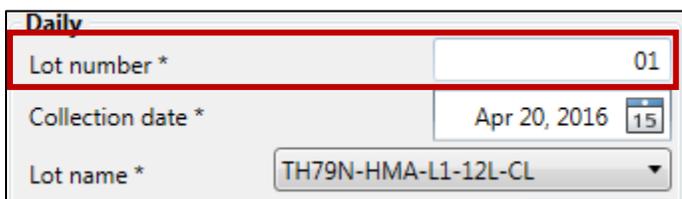
Direction of travel	<input type="checkbox"/> NB <input type="checkbox"/> SB <input type="checkbox"/> EB <input type="checkbox"/> WB
---------------------	--

Daily (Create Filter Group for Each Lot)

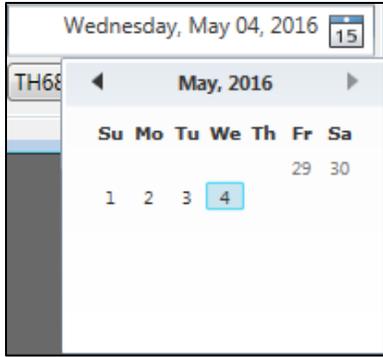
The Daily Pane allows the user to create the Filter Group names for each lot. Complete the following information for each lot.



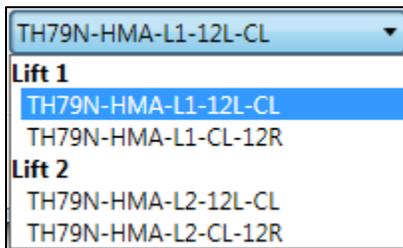
Lot Number – Type the lot number in the text box (e.g., 01, 02, etc.).



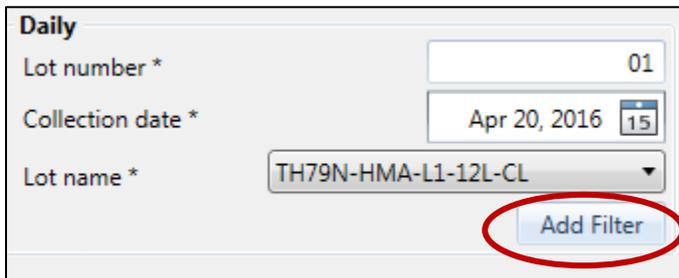
Collection Date – Select the date that the technology was used for the given lot using the provided calendar (e.g., paving date, compaction date).



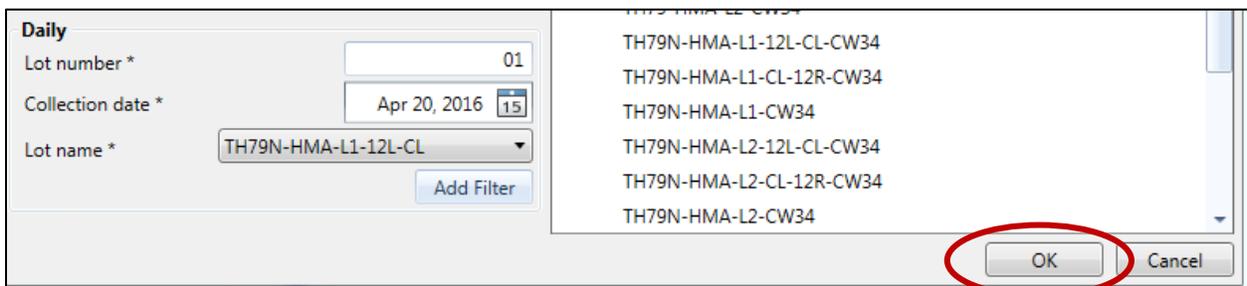
Lot Name – Select the **name of the lot** from the **dropdown menu**. Review the project information (in the upper pane) for missing information if the desired lot is not listed.



Add Filter – Select **Add Filter** to **add the given lot**. Continue this process to create Filter Group Names for additional lots.



OK – Select **OK** after creation of desired Filter Groups.



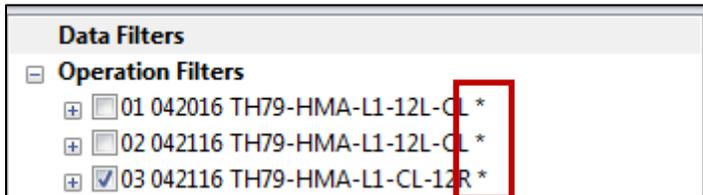
OPERATION FILTERS

In the background, Veta has created a database containing all of the data that has been imported into the project. Therefore, the user needs to use some criteria to separate (filter) the data for a given lot from the rest of the data. The Operation Filter allows the user to select different parameters to filter the data by (e.g., imported file name, machine ID, design name, time, location, etc.). Veta automatically creates the Operation Filter for each lot upon creation of the given Filter Group Name when using the MnDOT Filter Group Manager.

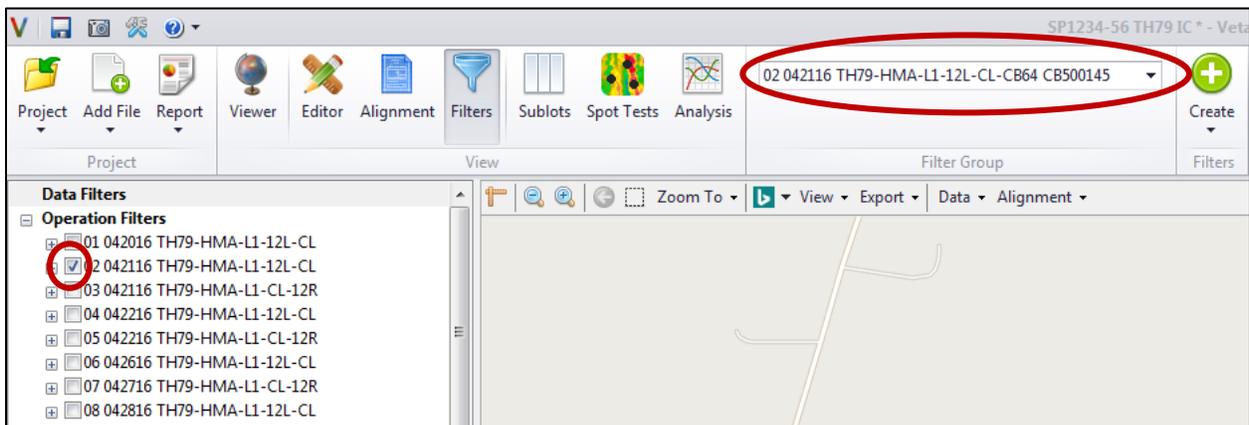
Review Operation Filters

Review the operation filter parameters for any needed changes.

An **asterisk** will show next to the newly created Operation Filter names that have not yet been expanded for review.



Verify that the Check box next to the operation filter name (in the left pane) is associated with the corresponding selected Filter Group Name.

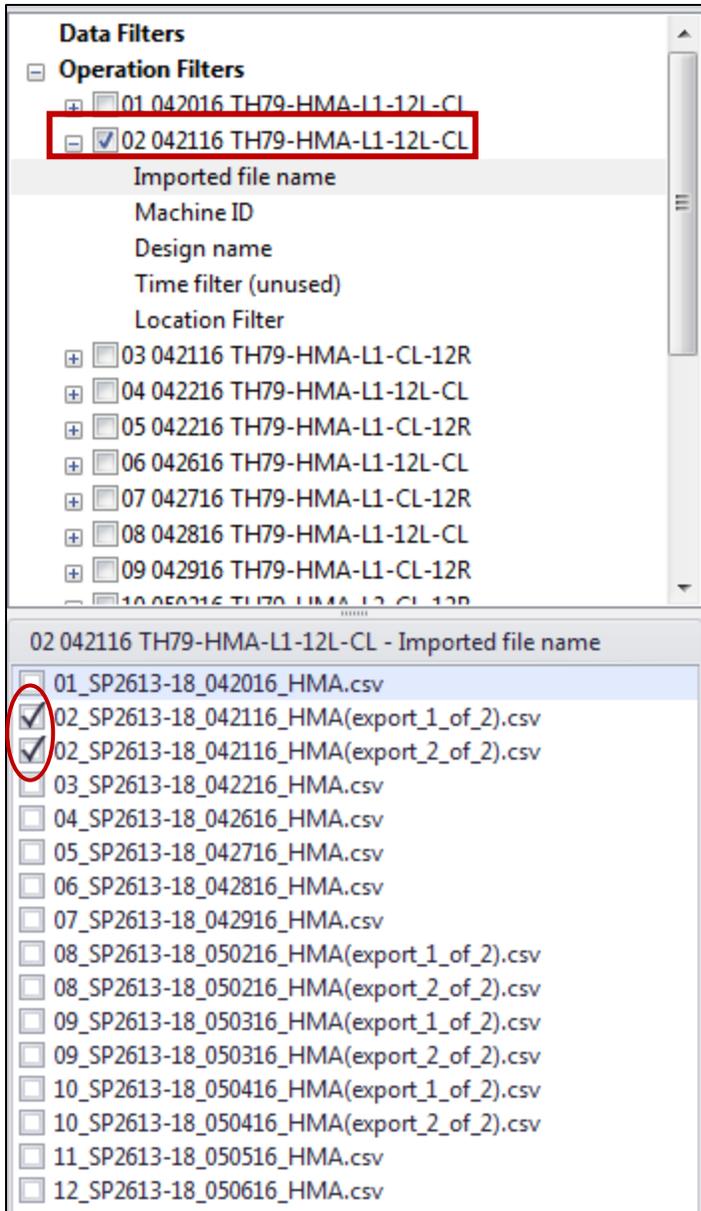


Imported File Name

The imported file name allows the user to filter by the files that are imported into the Veta project. In some instances, more than one file may contain data for a given lot.

Veta will attempt to automatically select file names with dates matching the date used in the filter group name for the given lot when creating Filter Groups using the MnDOT Filter Group Manager. Label exported compaction files with the MMDDYY date format in the file name.

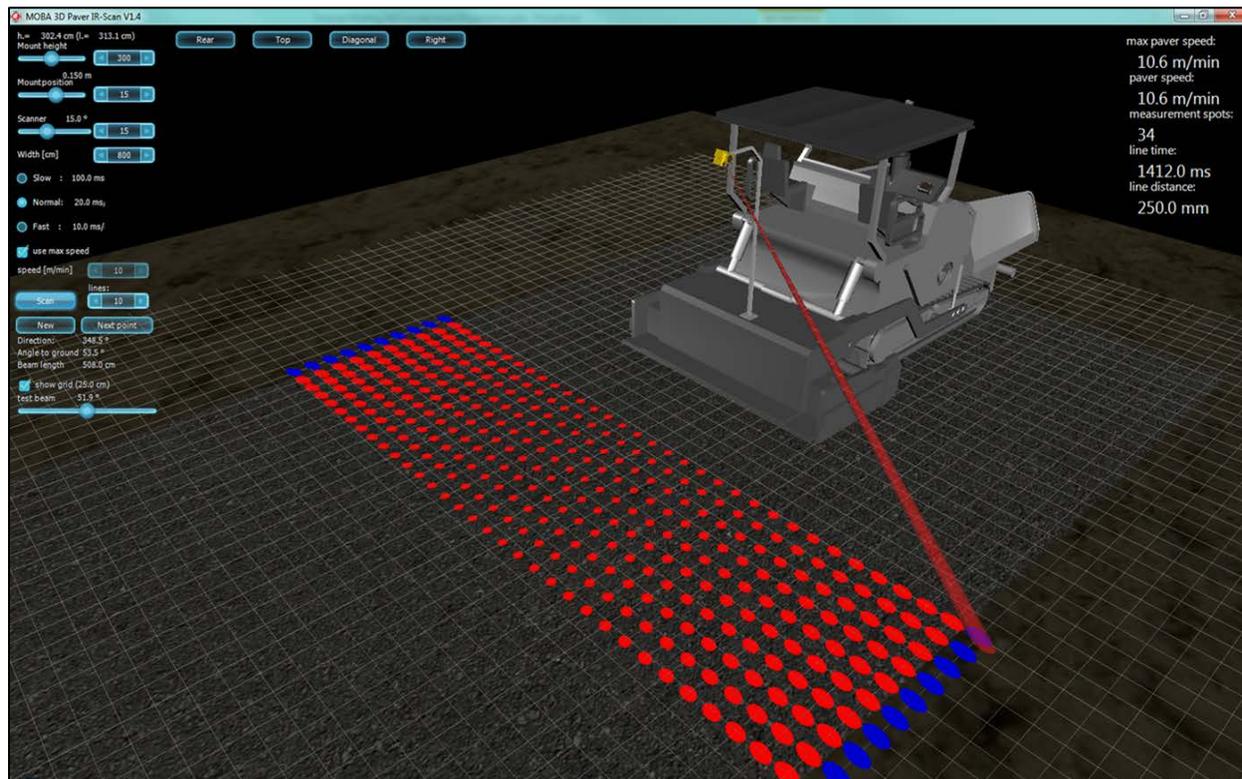
Select or deselect file names, as needed, for the given lot.



Sensor Location (PMTP Method Only)

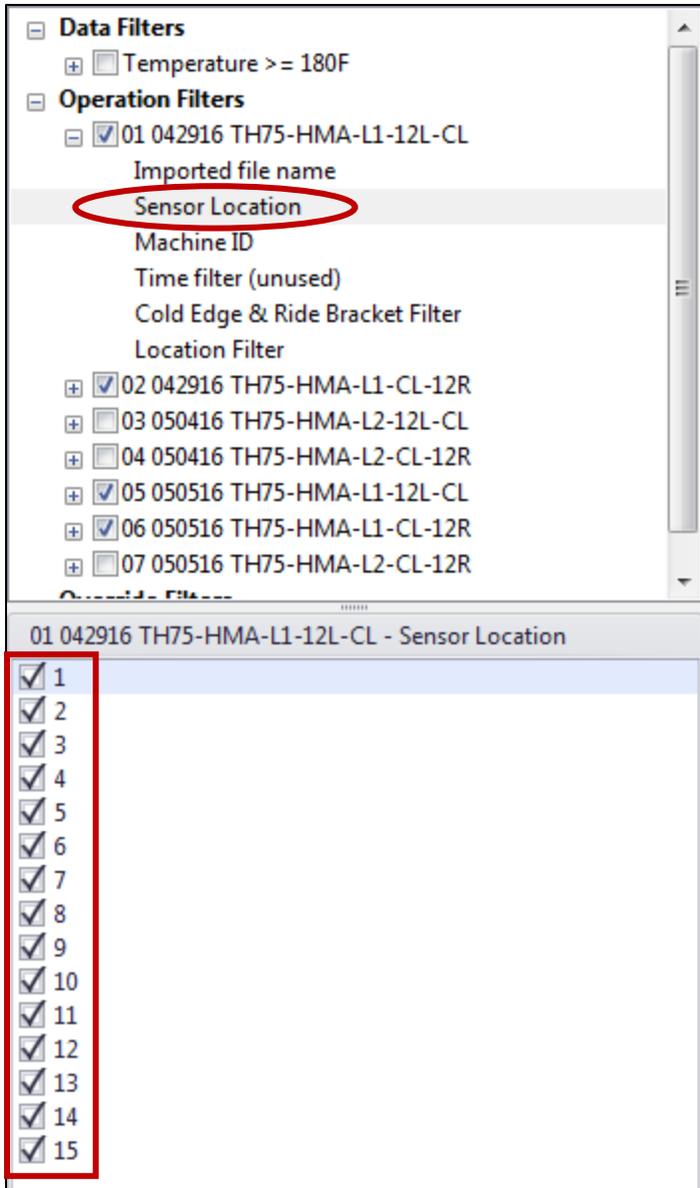
The sensor location lists the sensor locations in which the thermal profiling measurements were collected. For a scanning and photogrammetric systems, the measurements are gridded across the width of the paving area (see figure 5.1 below). Sensor locations are number from 1 to N, left to right, in the direction of paving (i.e., sensor 1 reflects the left edge of the paver).

Figure 5.1 – Example gridding of thermal profiling data (photo courtesy of Moba Corporation).



Select **Sensor Location** from the Operation filter in the upper left pane and **ensure that all sensors are selected (checked)** in the lower left pane. It is required that thermal segregation is evaluated using 100 percent of the recorded data for each subplot to ensure uniformity in analyses (see reference for requirements below).

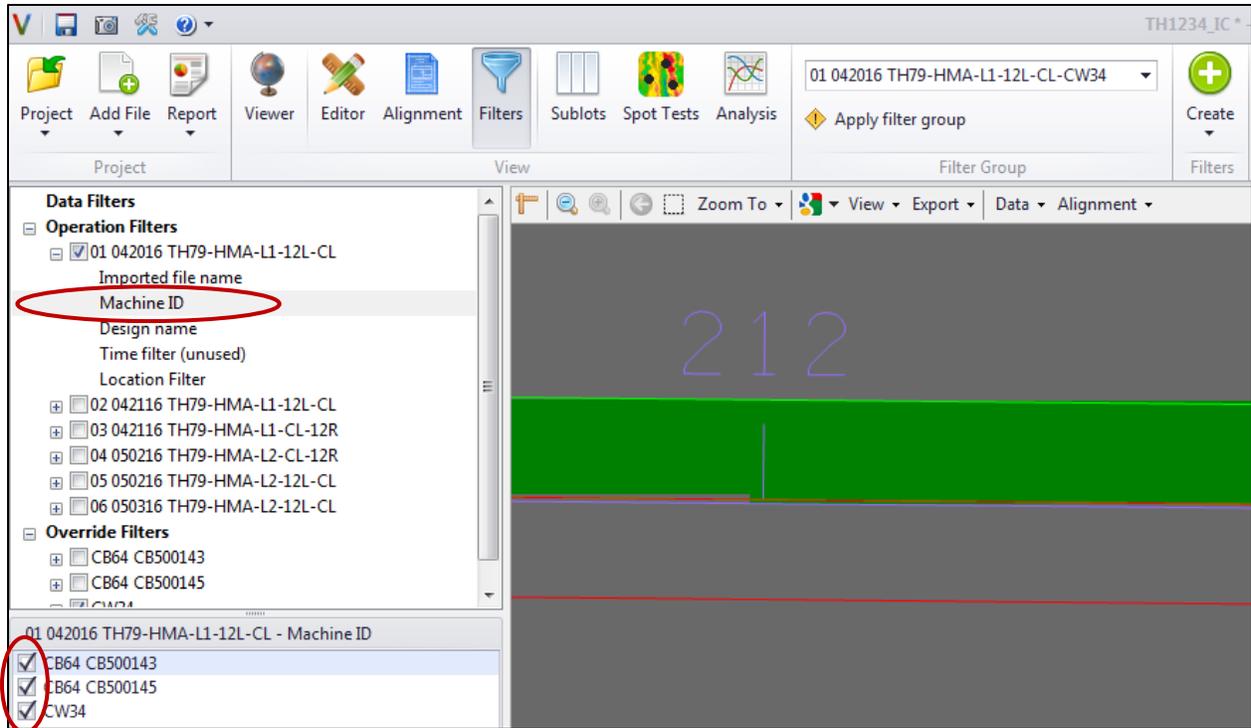
(2016) Quality Management – Paver Mounted Thermal Profiling Method (S-xx.3.J.1.a)



Machine ID

The Machine ID represents the identification used for each IC system (roller) or PMTP system.

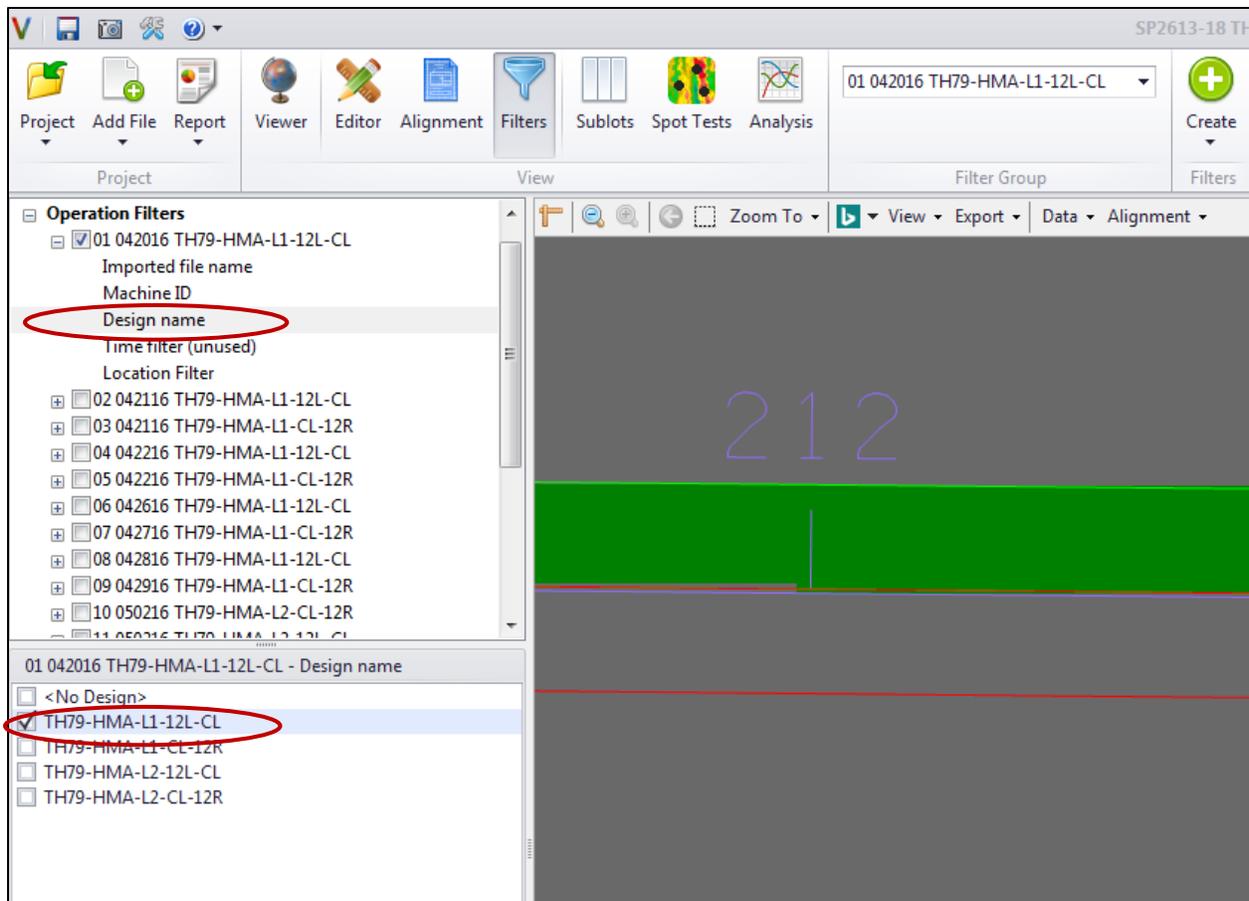
Select Machine ID from the operation filter in the **upper left pane** and ensure that the correct Machine ID(s) are **selected (checked)** in the **lower left pane**. **All IC systems (per lot) must be selected for compaction projects; only one PMPT system (per lot) is selected for thermal projects.** The example below is for a compaction project, and therefore, all Machine IDs are selected.



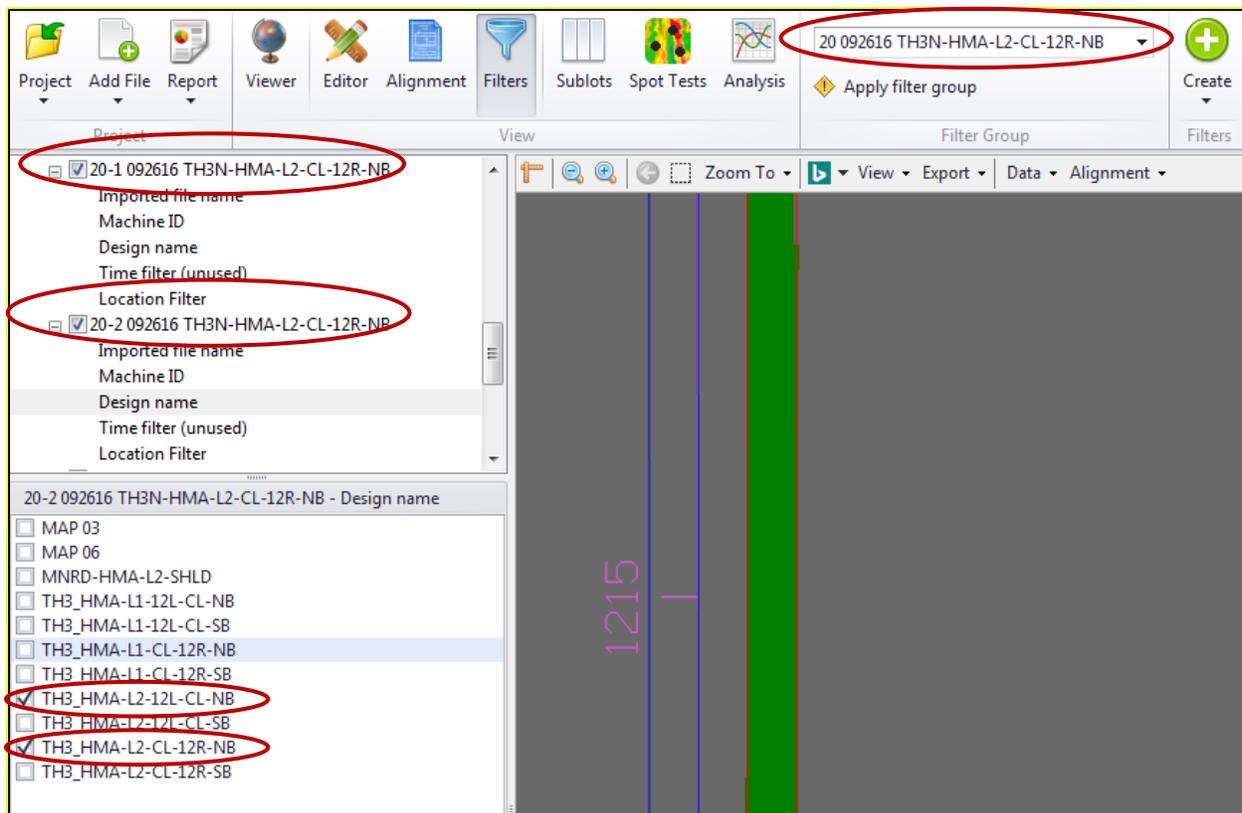
Design Name (IC Method Only)

The Design Name is used for select IC systems to define the lot where the rollers were compacting.

Select **Design Name** from the operation filter in the **upper left pane** and ensure that the correct design name(s) are **selected (checked)** in the **lower left pane** for systems using this parameter. Veta will automatically select the Design Name that is matching the lot designation included in the Filter Group Name when creating Filter Groups using the MnDOT Filter Group Manager.

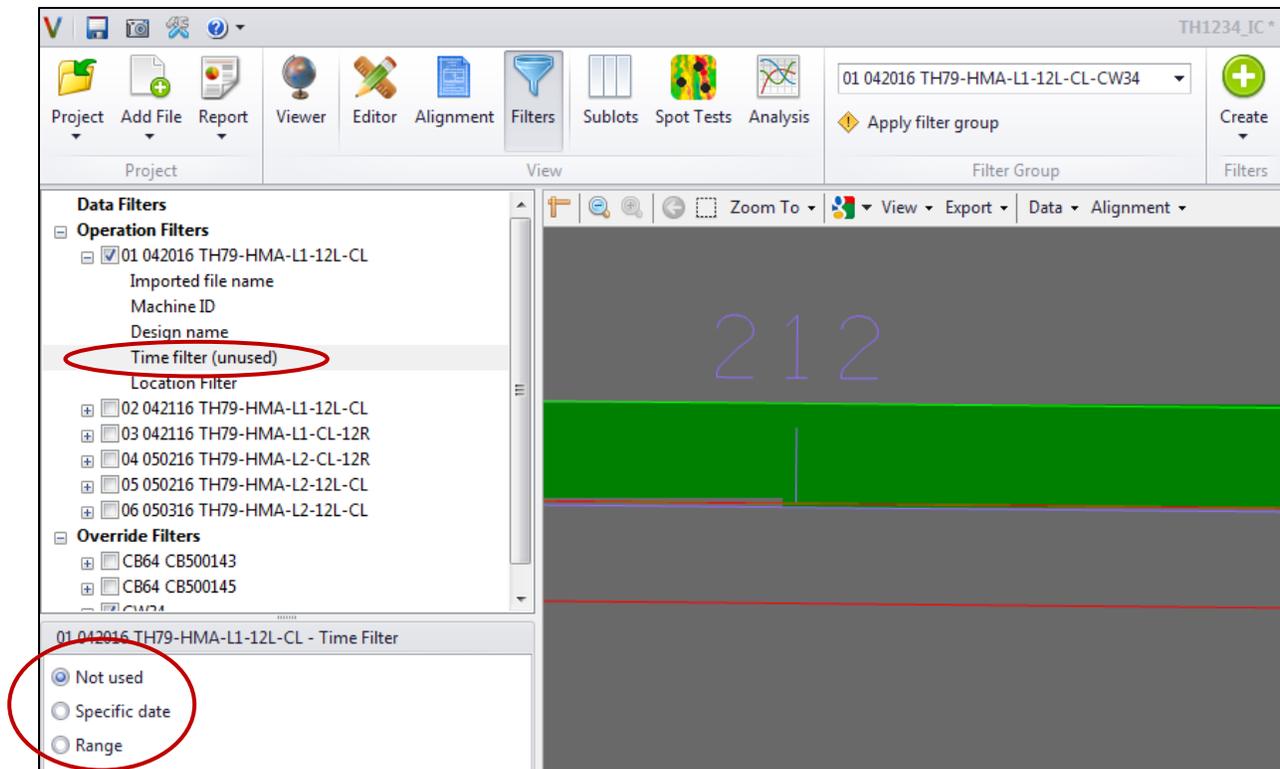


Troubleshooting – If data appears to be missing, verify that all of the rollers (IC systems) were using the correct / same Design Name. Multiple Design Names can be selected for instances where one or more rollers were using a different Design Name; however, there must not be an adjacent lot for the given day of paving. An additional Operation Filter must be made for instances where there are adjacent lots on the same day of paving. Each Operation Filter would use a different time filter and Design Name and would be selected for the given Filter Group. **Select Create** and **select Create Operation Filter** from the **dropdown menu** to create additional operation filters. Label the operations filters with the lot number followed by a hyphen and a numeric number in sequential order (e.g., 20-1, 20-2).



Time Filter

The time filter allows the user to filter by a specific date or a time/date range. **Select Time Filter** from the operation filter in the **upper left pane** and view the specific available **time filters** in the **lower left pane** for cases where the file is not used to sort by date.

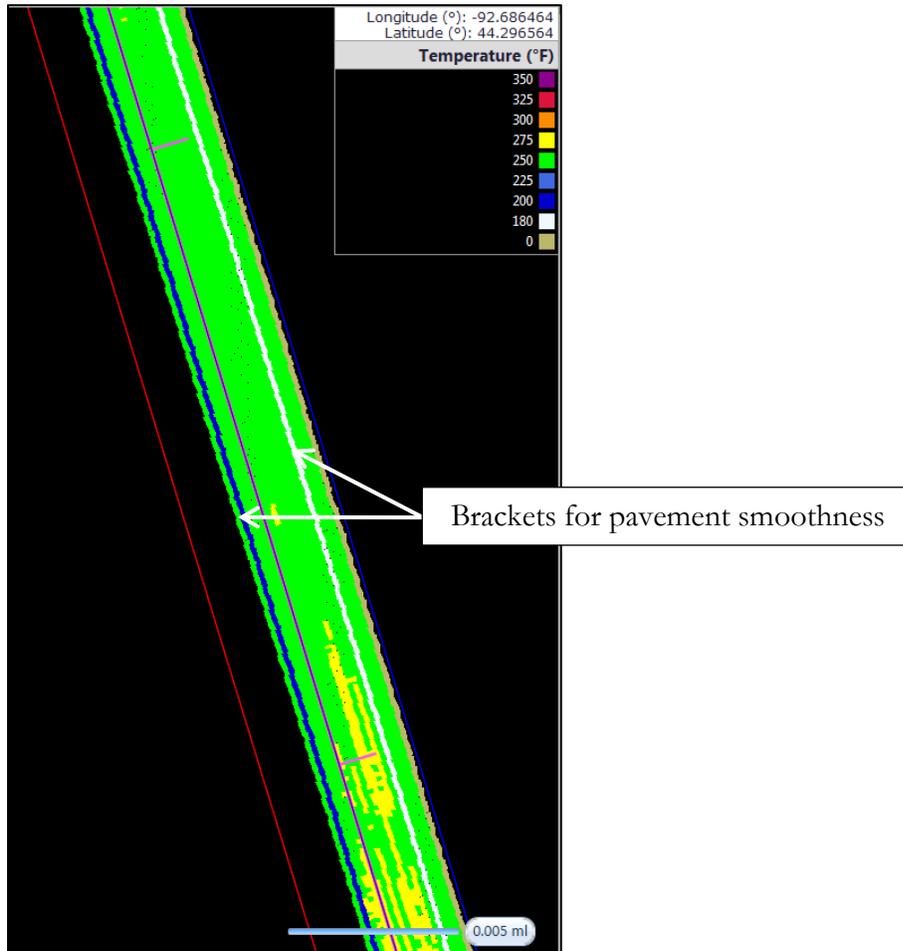


Cold Edge & Ride Bracket Filter (PMTP Method Only)

The Cold Edge & Ride Bracket Filter statistically removes the following surface temperature readings. Please note that it is important to remove these types of surface temperature readings as these measurements can significantly affect the thermal segregation analyses possibly causing improper thermal segregation classifications (i.e., categorizing a given subplot as moderate or severe when it otherwise would have been categorized as low severity).

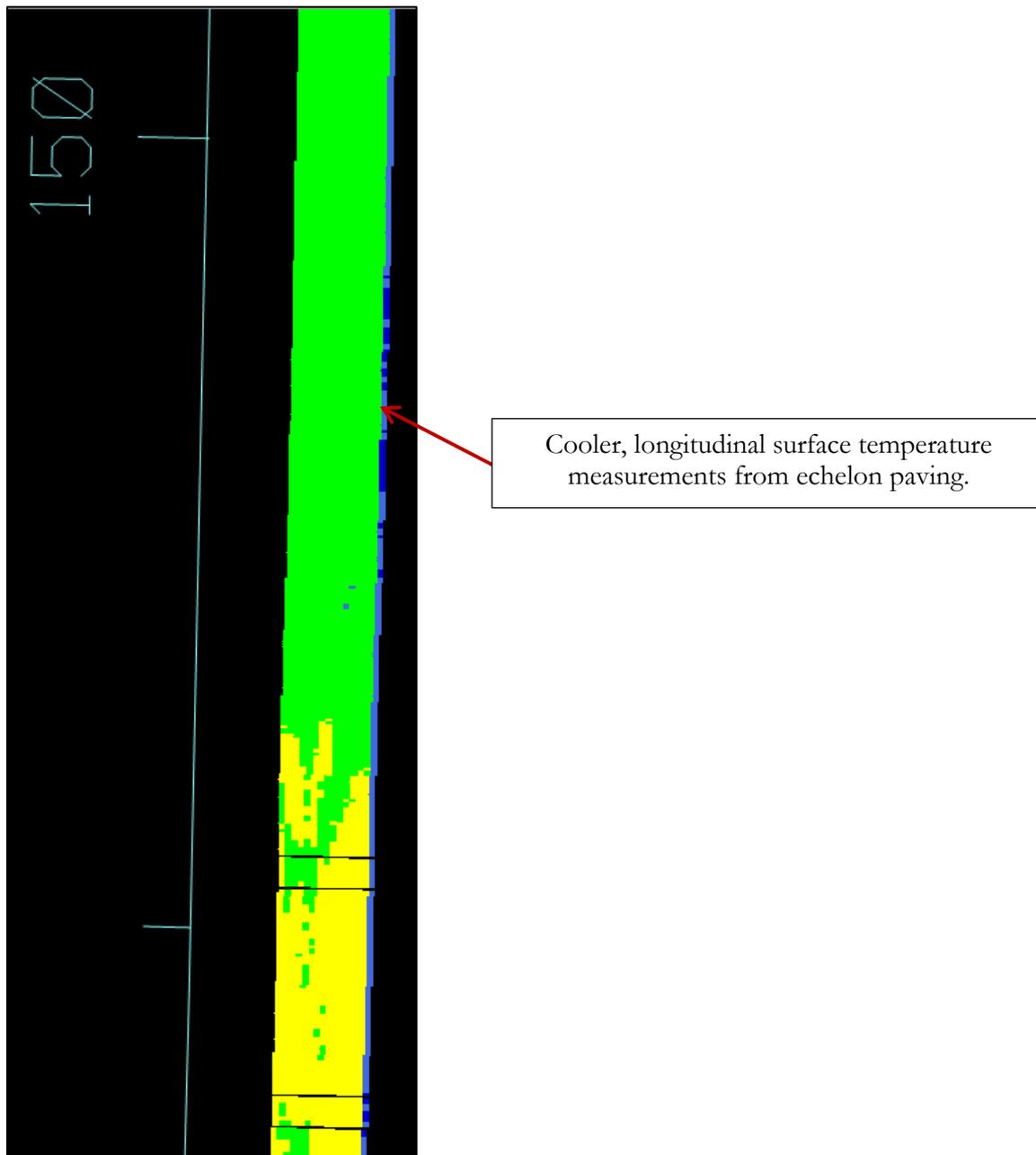
- Surface temperature measurements capturing brackets used for pavement smoothness that are located in the PMTP system measurement area. Figure 5.2 illustrates an example of cooler, longitudinal surface temperature readings that were caused by brackets used to assist with pavement smoothness (see Figure 5.2).

FIGURE 5.2 – Example of cooler surface temperature measurements caused by brackets used for pavement smoothness.

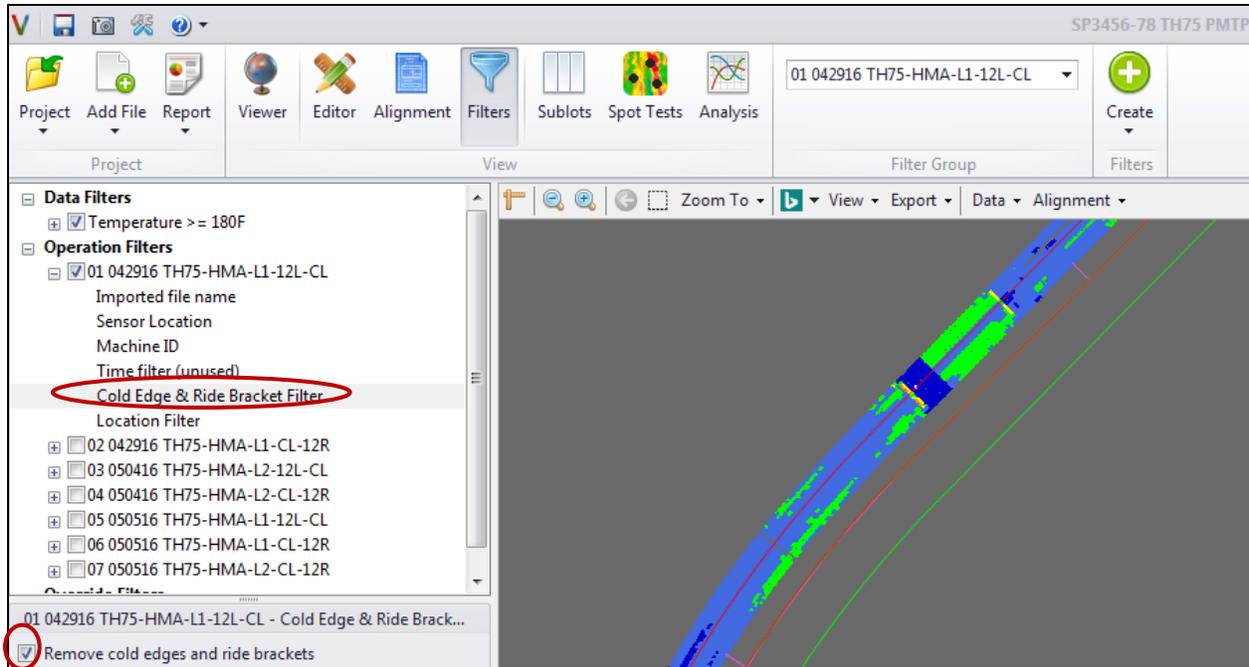


- Surface temperature measurements capturing an adjacent edge that is cooler than the mat currently being paved (e.g., echelon paving, shoulder, turn lanes, etc.). Figure 5.3 illustrates cooler surface temperature measurements collected on the pavement edge due to echelon paving (part of the last gridded surface temperature reading contained the cooler mat of the adjacent lane).

FIGURE 5.3 – Example of cooler surface temperature measurements along pavement edge due to echelon paving.



Select the **Cold Edge & Ride Bracket Filter** from the **upper left pane** and ensure that the **Remove cold edges and ride brackets** is selected in the **lower left pane** to statistically remove these types of surface temperature readings from future thermal segregation analyses. Veta automatically selects this filter when creating Filter Groups using the MnDOT Filter Group Manager.



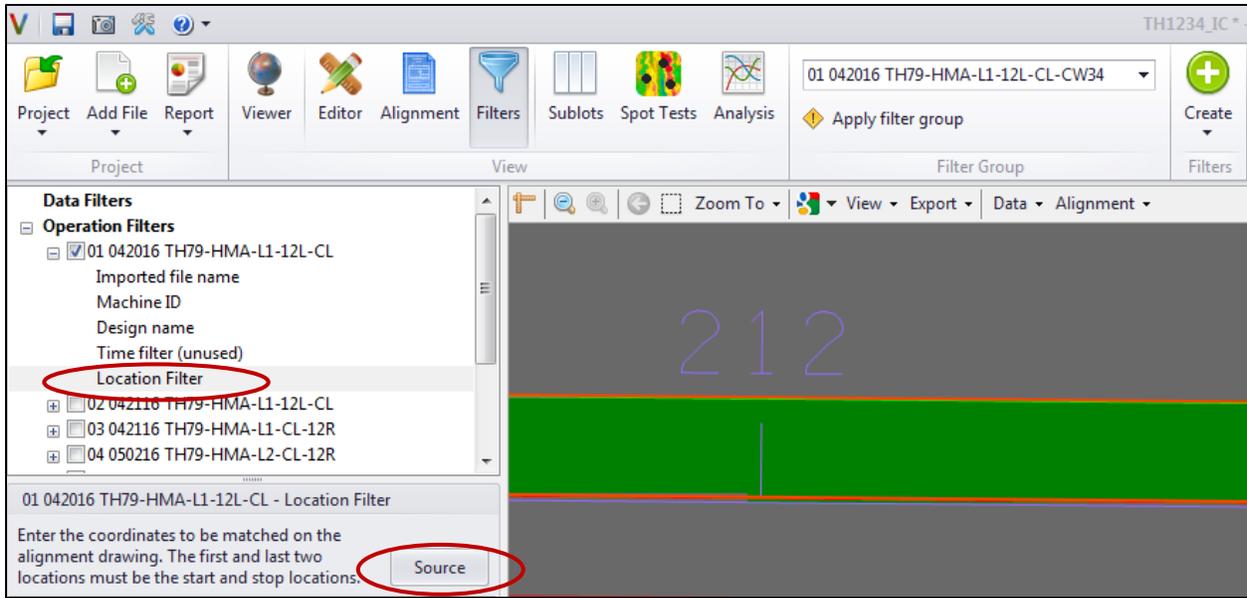
Location Filter

The location filter allows the user to select data based on a region defined by the user. There are three types of location filters: Custom, Copy from alignment drawing and Use a portion of an alignment drawing.

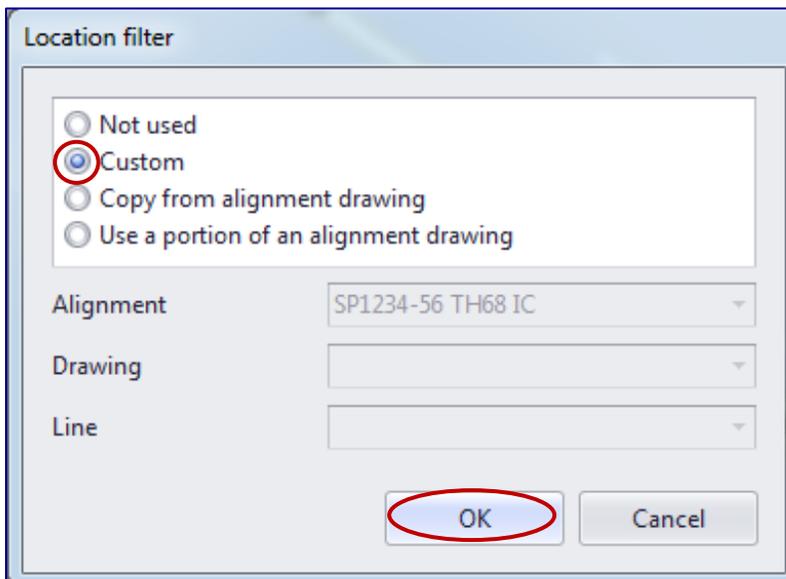
Custom Location Filter

The custom location filter allows the user to filter an area of data (trim the data) through custom creation of a polygon.

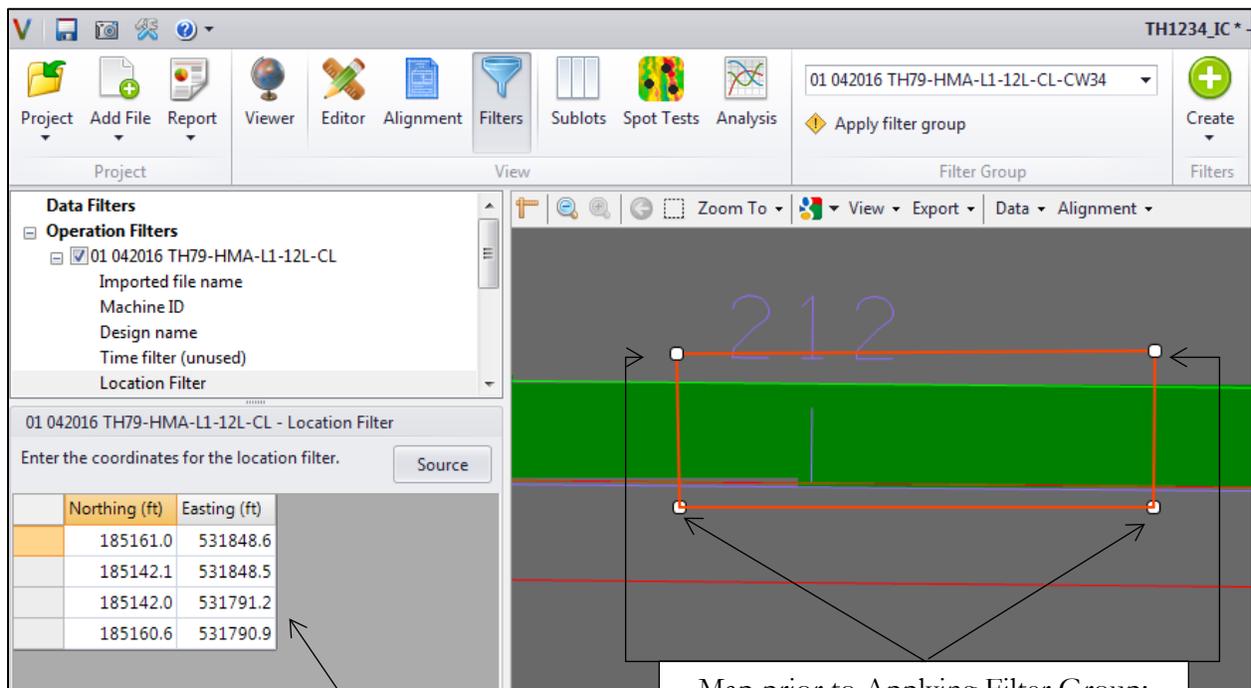
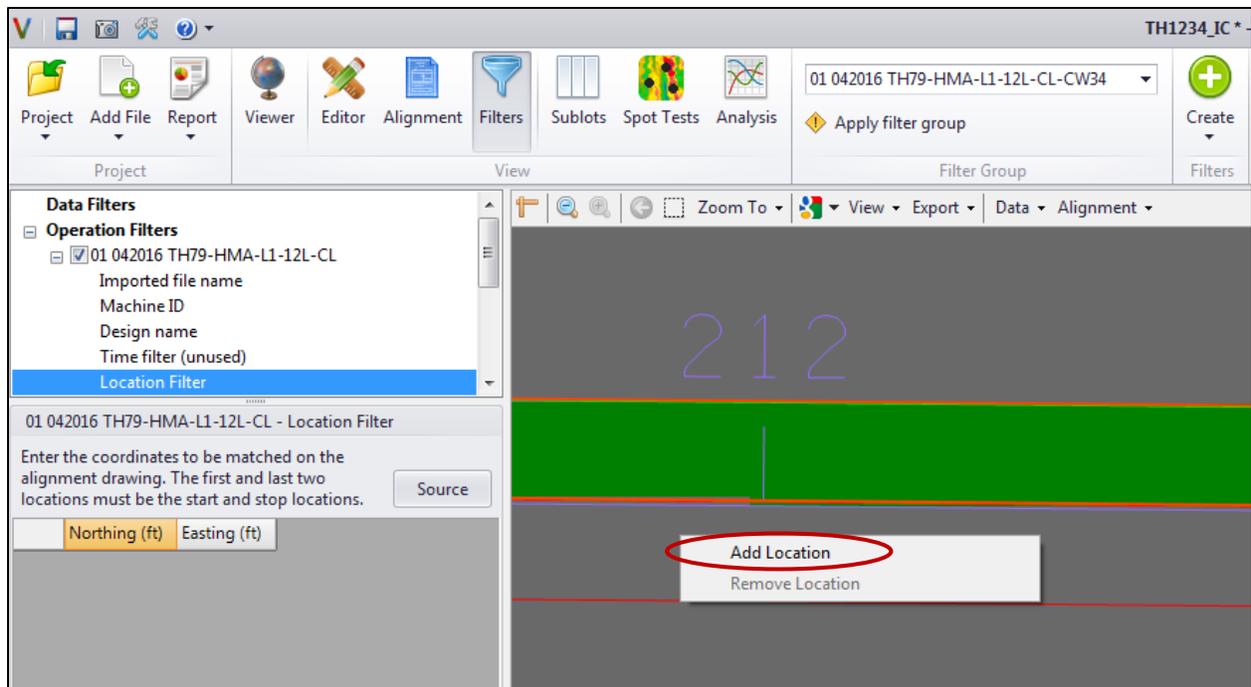
Select Location from the operation filter in the **upper left pane** and then **select Source** from the lower left pane.



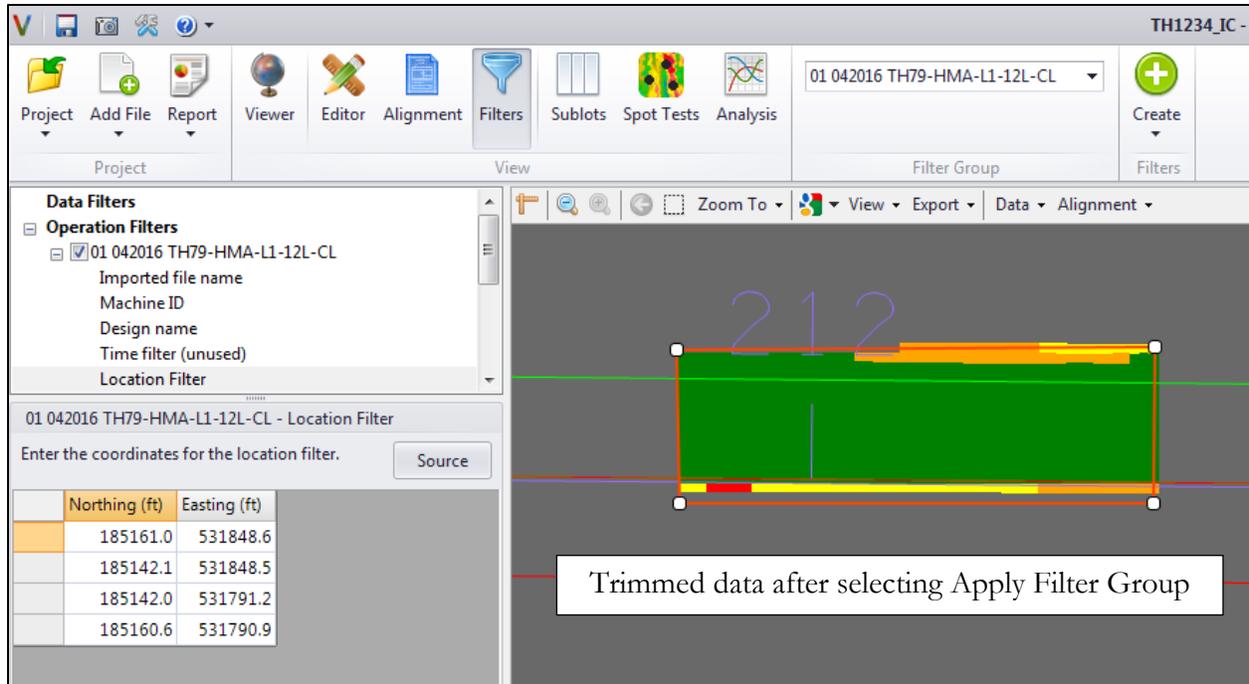
Select **Custom** from the resulting **dialogue box**. Select **OK**.



Select the **right mouse button** and **select add location** at desired locations to create customized filter area. **Select Apply Filter Group** from the menu toolbar to update map (i.e., remove data outside of selected region/custom location filter).



Map prior to Applying Filter Group:
Four (4) custom points added through
location filter.

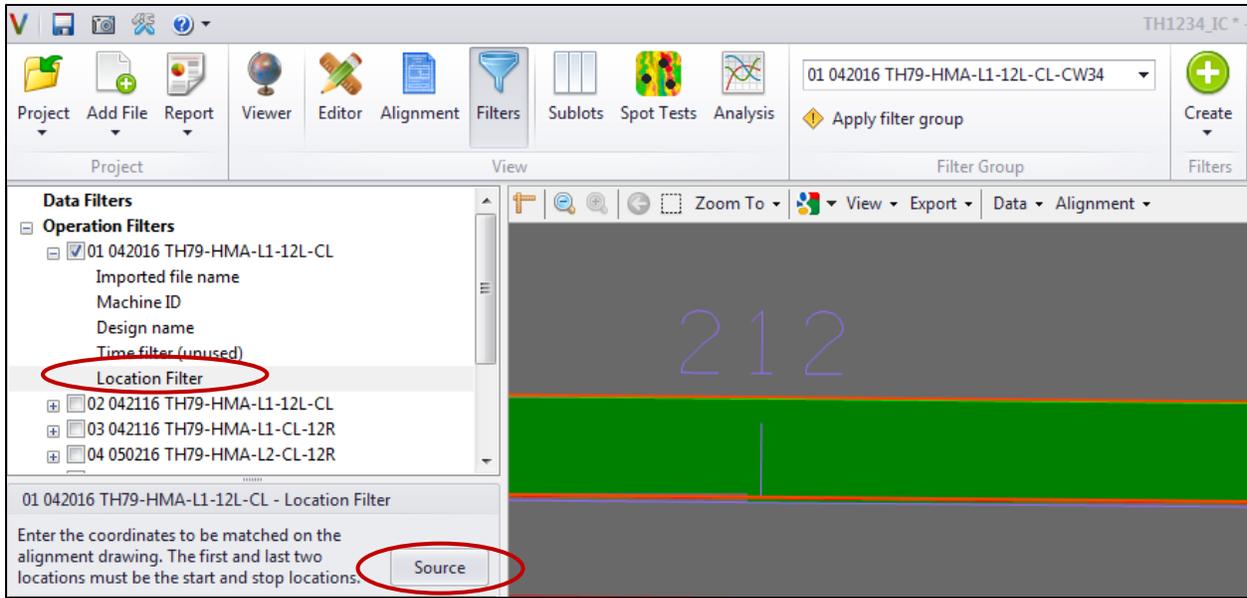


Points can be moved by placing the cursor over the given point and selecting and holding the left mouse button while dragging this point to a different location. Points can also be removed by placing the cursor over the point selecting the left mouse button and selecting **Remove Location**.

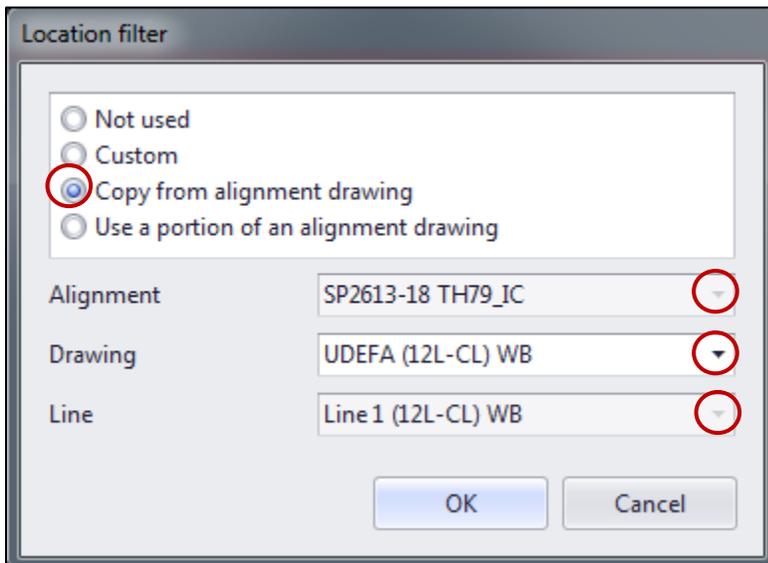
Copy from Alignment Drawing Location Filter

The copy from an alignment drawing location filter allows the user to filter an area of data (trim the data) through the use of a complex shape of an alignment file. (Complex shapes are alignment boundaries that are continuous and closed at each end.)

Select Location from the operation filter in the **upper left pane** and then **select Source** from the lower left pane.



Select **Copy from alignment drawing** from the resulting **dialogue box** and **select** the desired **alignment file, drawing** and **line** from the **dropdown menus**. **Select OK**. Please note that the dropdown menus are not available (grayed out) when there is only one option to select from as this value is auto populated in the selection box.



Select **Apply Filter Group** from the menu toolbar to update map (i.e., remove data outside of selected alignment drawing).

Data Filters

- Operation Filters
 - 01 042016 TH79-HMA-L1-12L-CL
 - Imported file name
 - Machine ID
 - Design name
 - Time filter (unused)
 - Location Filter

01 042016 TH79-HMA-L1-12L-CL - Location Filter

This filter is linked to an alignment drawing and cannot be changed. [Source](#)

	Northing (ft)	Easting (ft)
	185876.0	519261.1
	185876.4	519315.7
	185876.8	519370.3
	185876.9	519378.5
	185876.9	519386.7
	185876.9	519394.9
	185876.9	519403.2
	185876.9	519411.3
	185876.8	519419.6
	185876.7	519427.8
	185876.6	519436.0
	185876.5	519444.2

Map prior to Applying Location Filter:
Alignment boundaries used to trim data.

Coordinates of alignment drawing.

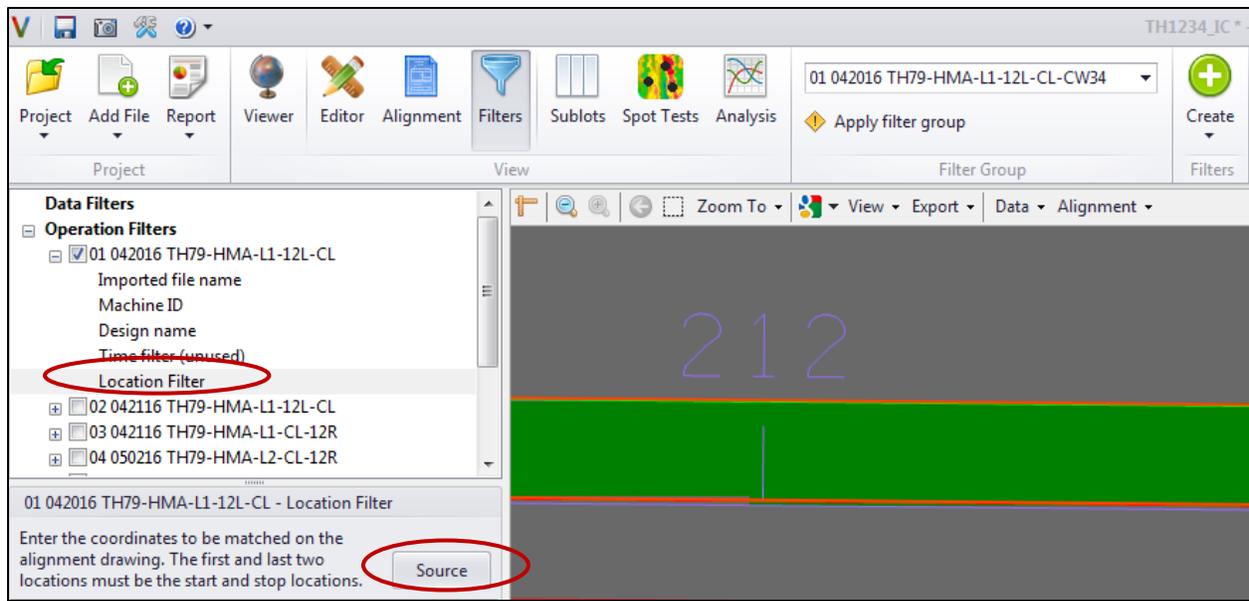
The screenshot shows a software interface with a top toolbar containing icons for Project, Add File, Report, Viewer, Editor, Alignment, Filters, Sublots, Spot Tests, and Analysis. A dropdown menu is open over the 'Filters' icon. Below the toolbar, the 'Data Filters' panel is visible, showing 'Operation Filters' with a checked item '01 042016 TH79-HMA-L1-12L-CL'. Below this, a 'Location Filter' section is expanded, showing a table of coordinates. A callout box points to the main data view, stating 'Trimmed data after selecting Apply Filter Group'.

	Northing (ft)	Easting (ft)
	185876.0	519261.1
	185876.4	519315.7
	185876.8	519370.3
	185876.9	519378.5
	185876.9	519386.7
	185876.9	519394.9
	185876.9	519403.2
	185876.9	519411.3
	185876.8	519419.6
	185876.7	519427.8
	185876.6	519436.0
	185876.5	519444.2

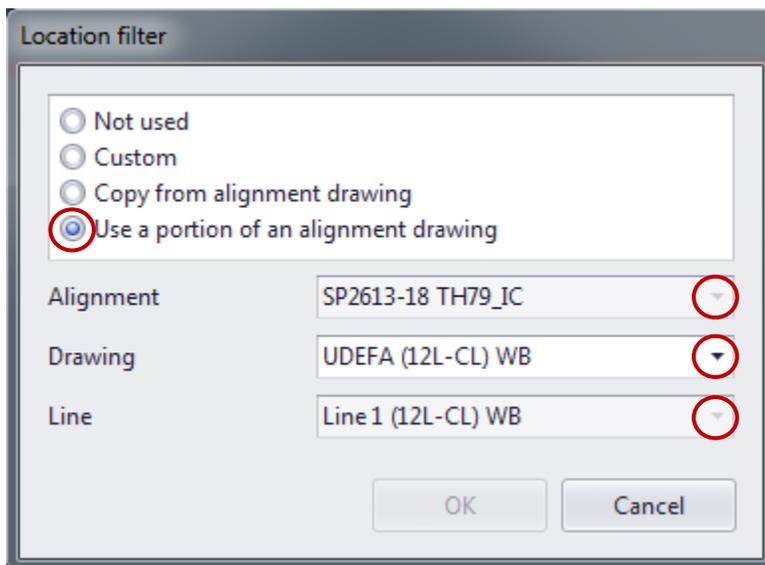
Use a Portion of an Alignment File Location Filter (Used for the IC Method)

The use a portion of an alignment file location filter allows the user to filter an area of data (trim the data) through the use of a *portion* of a complex shape of an alignment file. (Complex shapes are alignment boundaries that are continuous and closed at each end.)

Select Location from the operation filter in the **upper left pane** and then **select Source** from the lower left pane.



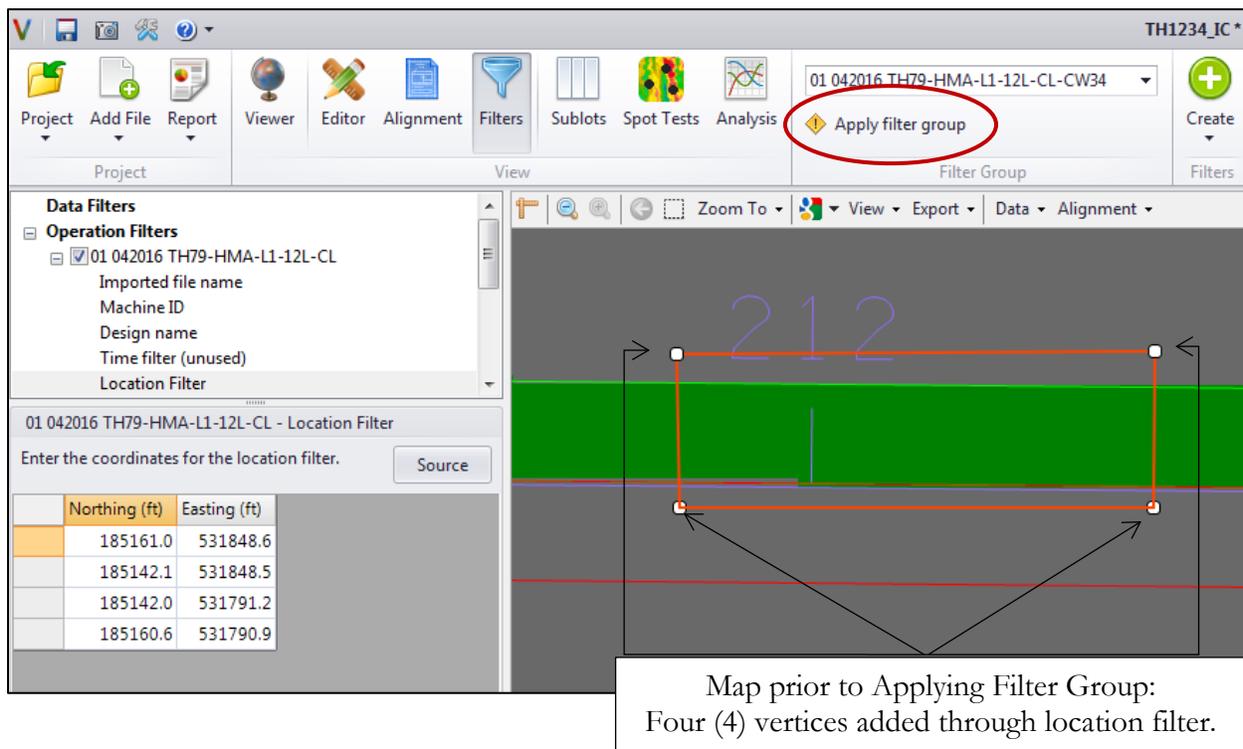
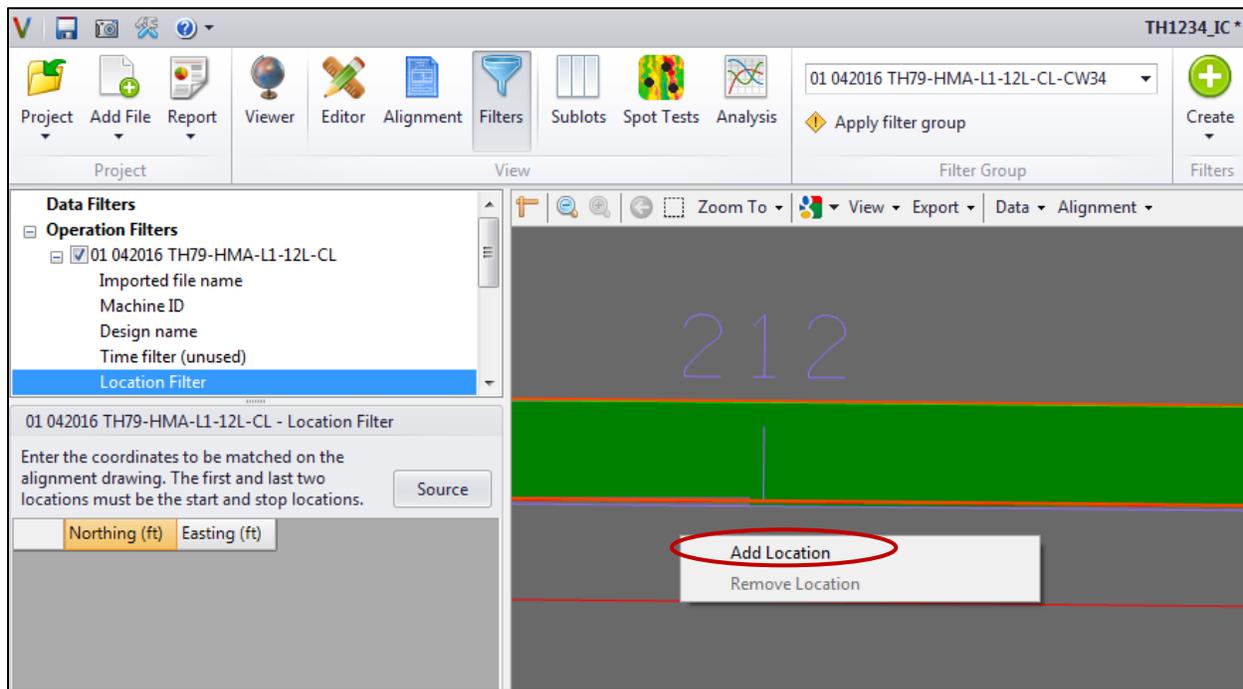
Select **Use a portion of an alignment drawing** from the resulting **dialogue box** and **select** the desired **alignment file, drawing and line** from the **dropdown menus**. **Select OK**. Please note that the dropdown menus are not available (grayed out) when there is only one option to select from as this value is auto populated in the selection box.

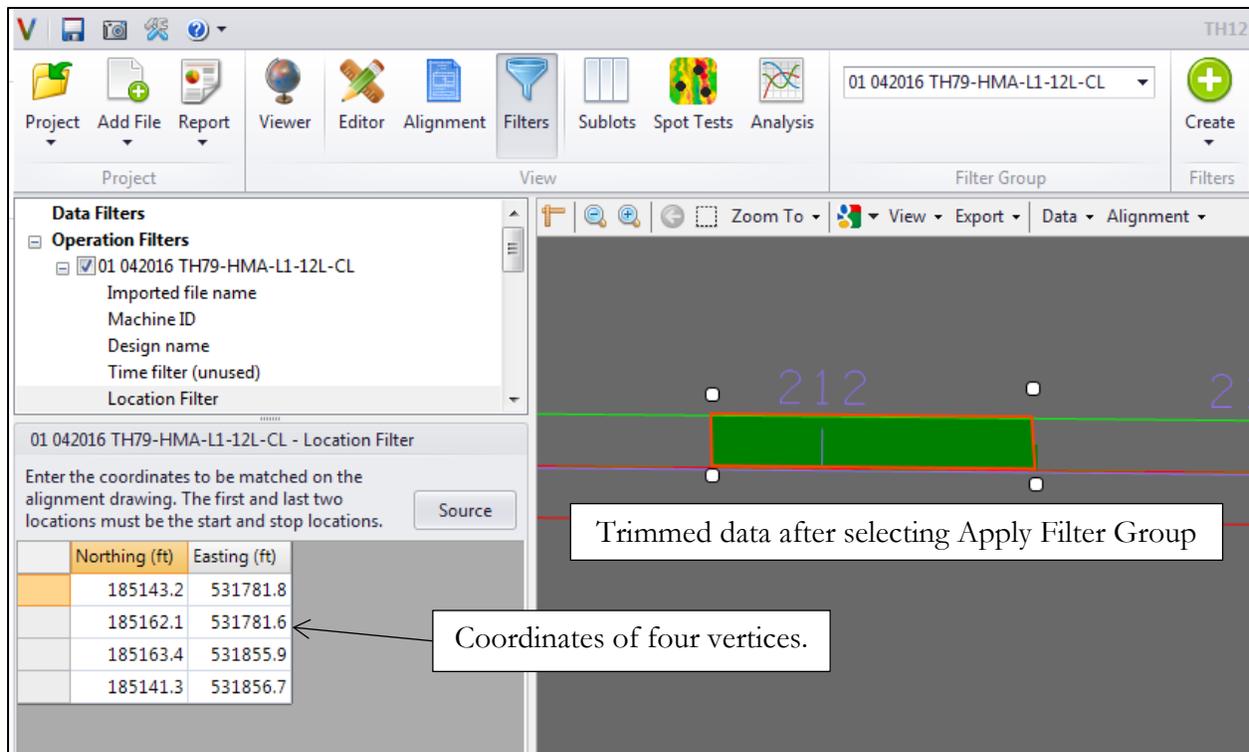


The user now enters four (4) coordinates to define the portion of the alignment drawing to use. This can be completed by one of two methods:

1. **Unknown coordinates:** Define the coordinates by creating points on the map. **Select the right mouse button** and **select add location** at the four vertices of the desired portion of the complex shape. **Select Apply Filter Group** from the menu toolbar to update map (i.e., remove data outside of the portion of alignment drawing). Please note that the user is not required to be exactly

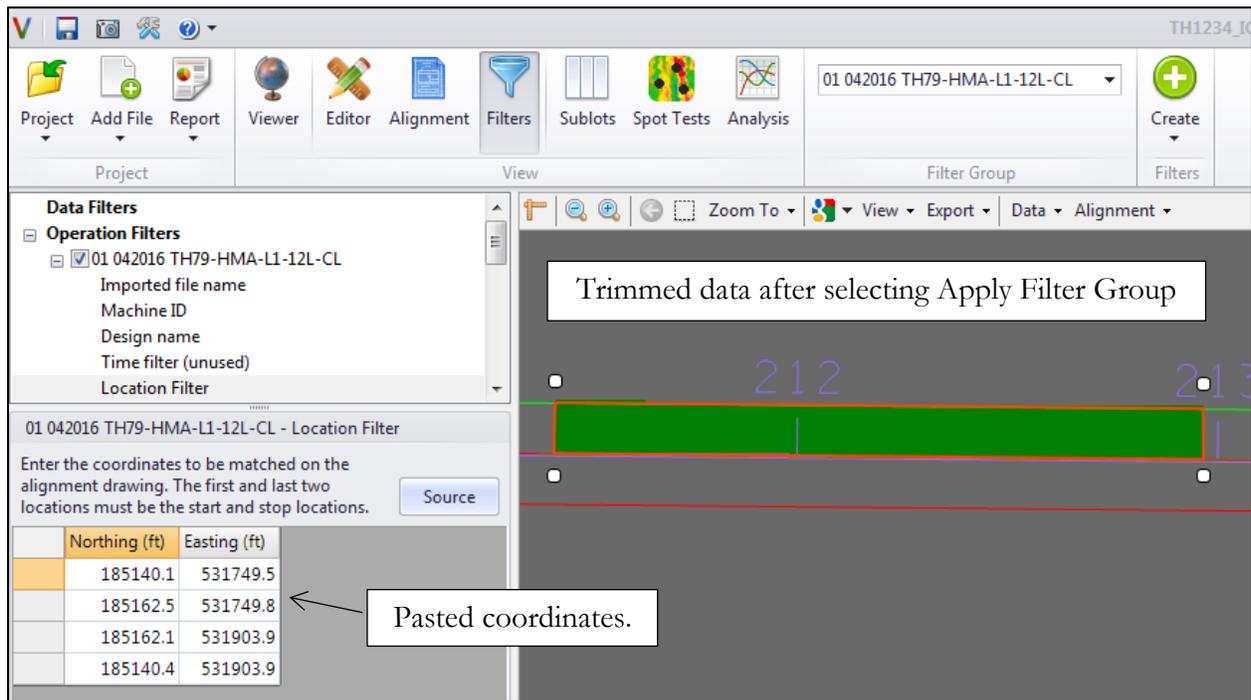
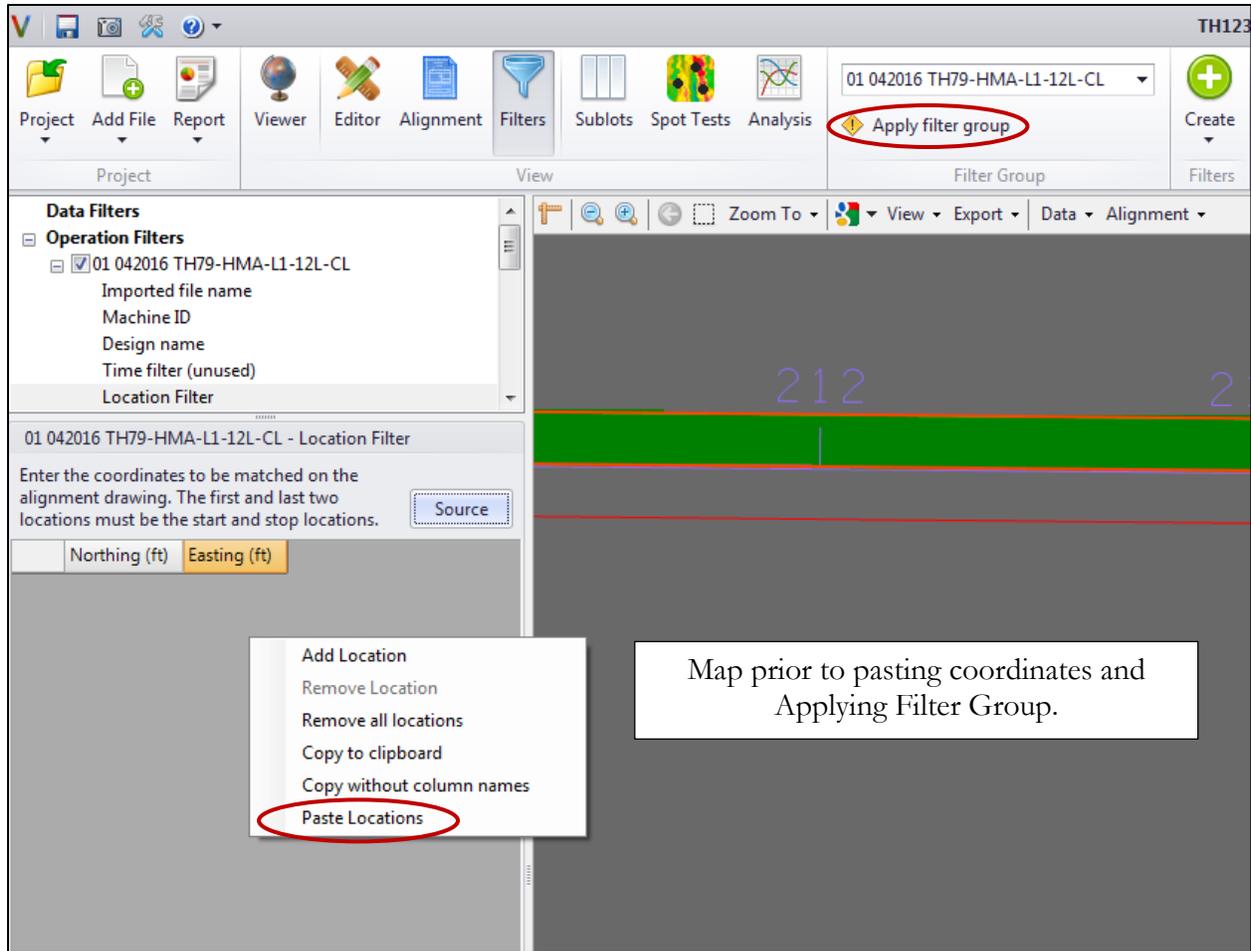
on the alignment drawing when adding the vertices point as Veta will find the closest point on the alignment drawing from each location added by the user.





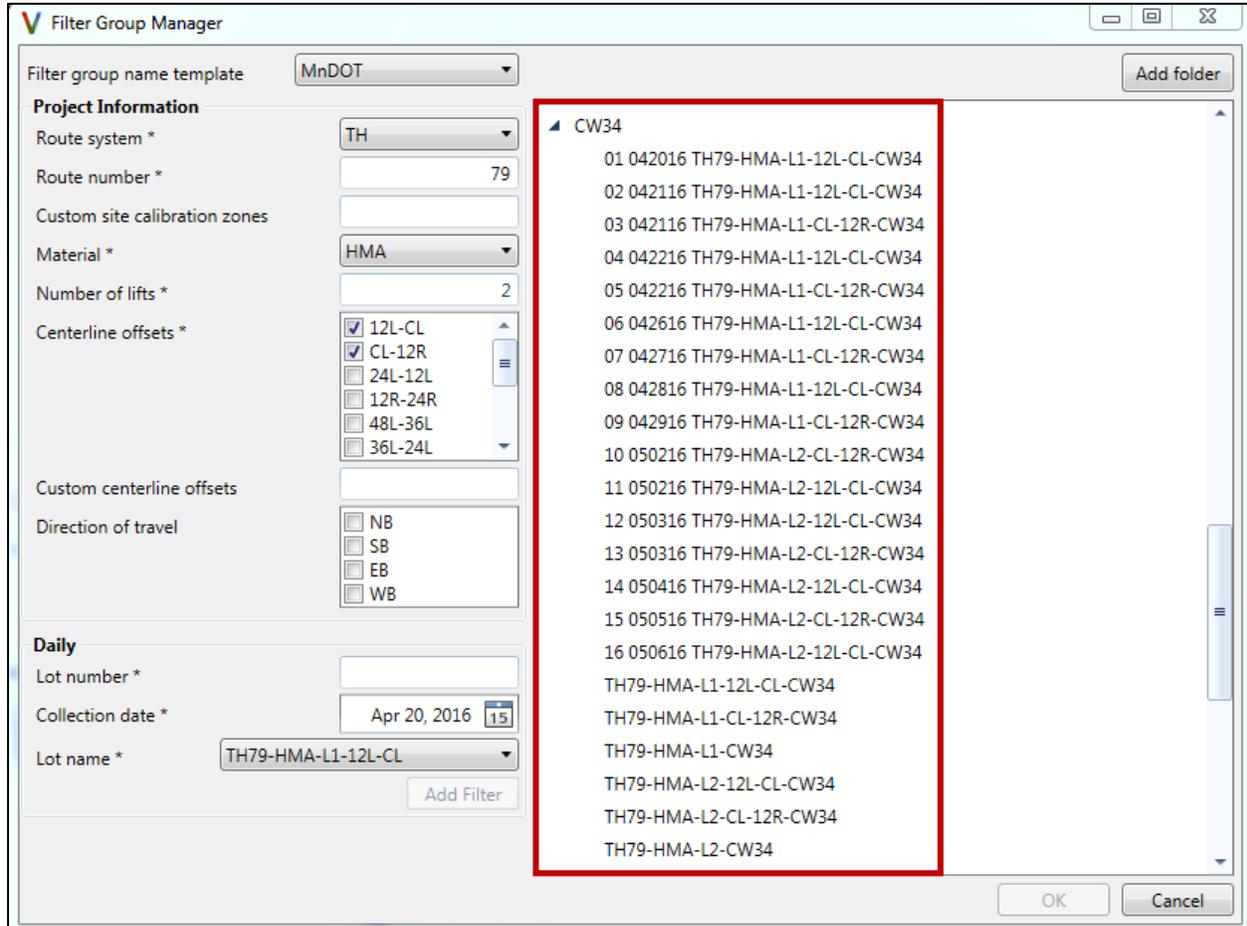
2. **Known Coordinates:** Define the coordinates by pasting in the known northing and eastings. Select and copy the vertices coordinates (including the northing and easting column headings). See form **IC-106** for lot coordinates for the IC Method.

Select lower left panel of northing and easting table with the right mouse button. Select Paste Locations. Select Apply Filter Group from the menu toolbar to update map (i.e., remove data outside of the portion of alignment drawing).

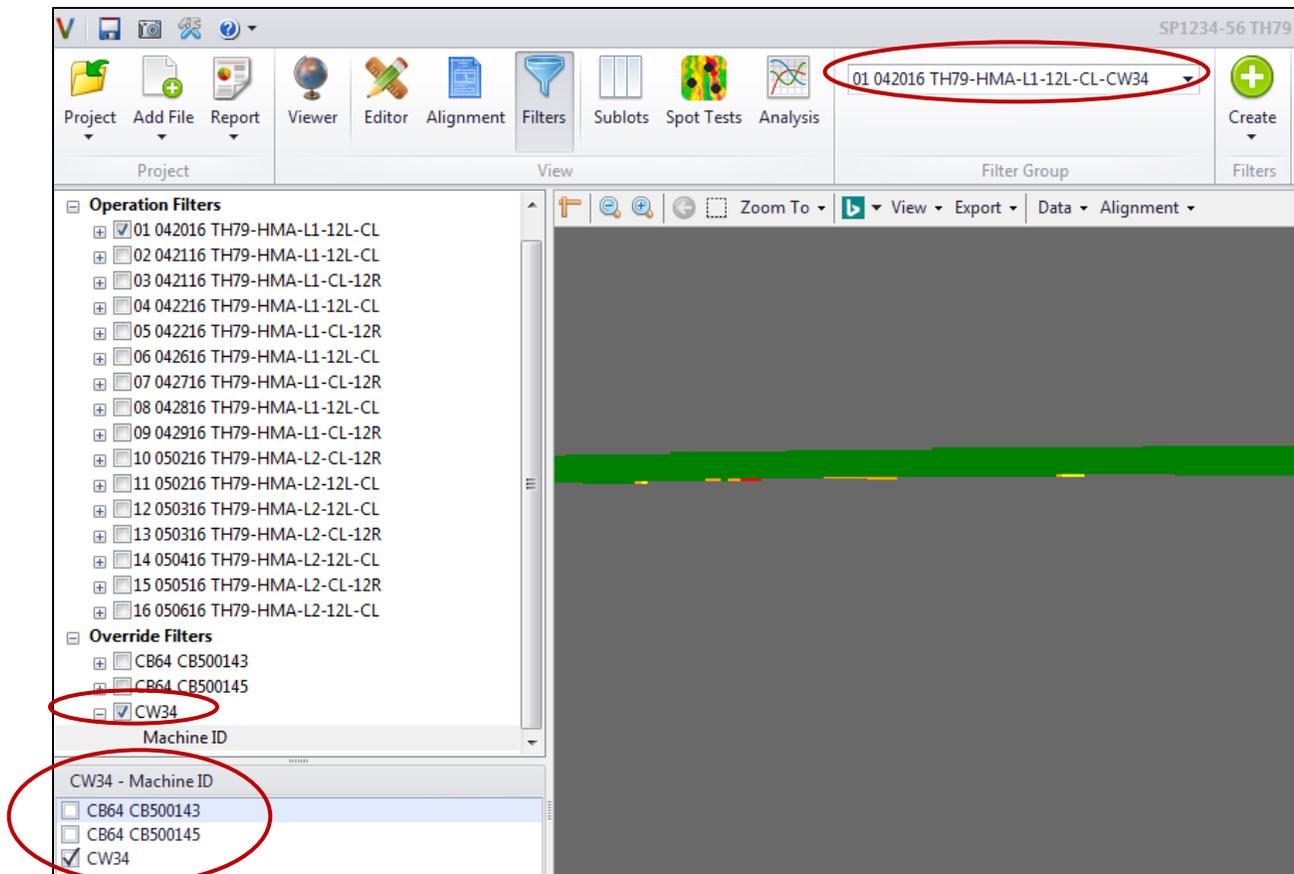


VERRIDE FILTERS

Override filters allow the user to filter the data per Machine ID (e.g., IC Roller, PMTP System). Veta automatically creates override filters for all Machines ID's with associated data when creating Filter Groups using the MnDOT Filter Group Manager.



The following is an example of an override filter for the IC system on the “CW34” roller.



DATA FILTER

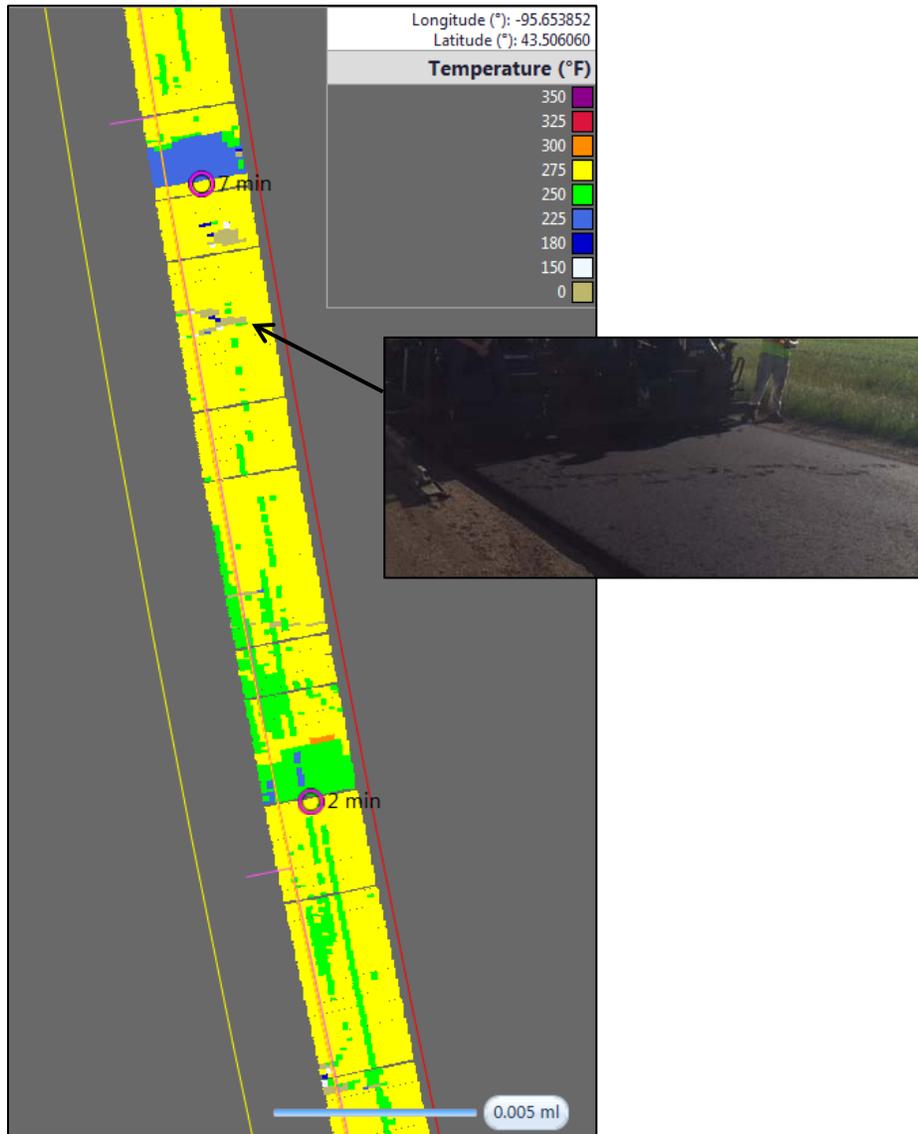
IC Method

The data filter is not currently used for the IC method, but can be used as needed for specialized analyses (e.g., reviewing measurements at given temperature ranges, compaction efforts when vibration is on vs. off, etc.) by **selecting Create** from the **menu toolbar** and then **selecting Create Data Filter**. The user must ensure that the **box is selected next** to the given **Data Filter** in order for it to be **associated** with the **given Filter Group**.

PMTP Method

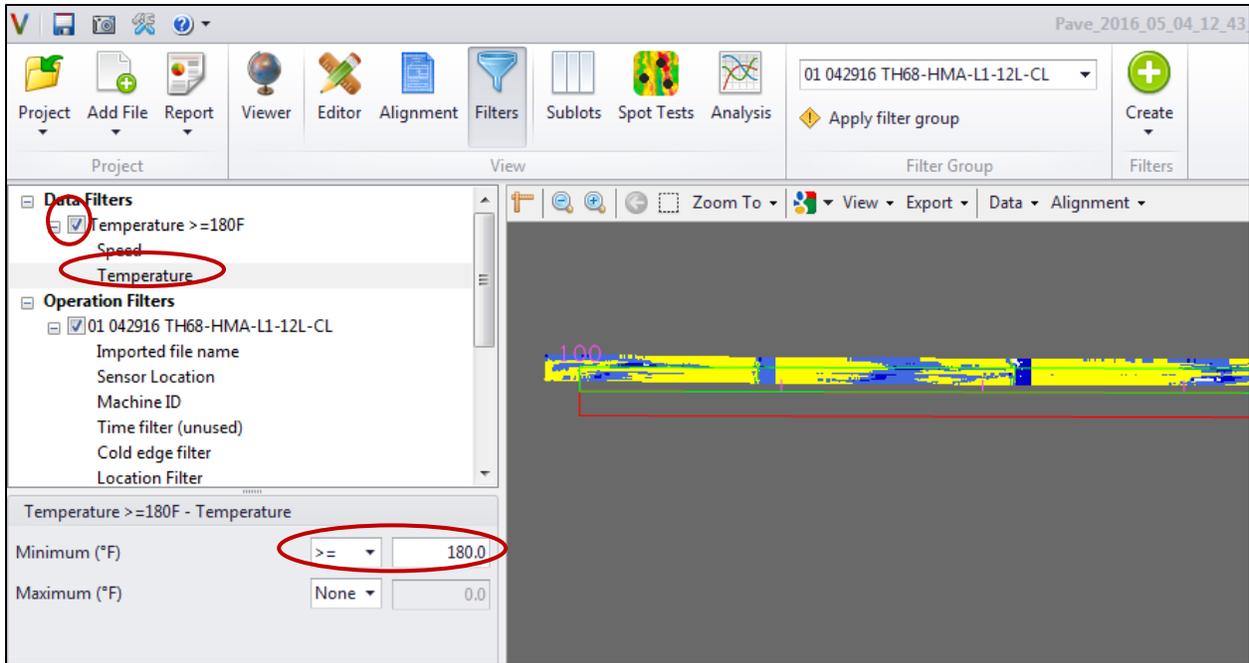
The data filter allows the user to filter the data by maximum and/or minimum speed and temperature. The temperature filter is the only data filter used for the thermal segregation analyses. Surface temperature readings less than 180°F (80°C) are removed from the thermal segregation analysis. These lower temperatures are removed to assist the cold edge filter with removal of brackets used for pavement smoothness and also to remove surface temperature readings capturing the body temperature of individuals checking the mat thickness / straight edge measurements in the PMTP system measurement area (see Figure 5.4). Brackets used for pavement smoothness are often measured at temperatures of 150-175°F, and therefore, 180°F is used to remove these measurements.

FIGURE 5.4 – Illustration of body temperature measurements captured by PMTP system.



Veta automatically creates and selects the temperature Data Filter when using the MnDOT Filter Group Manager for creation of Filter Groups.

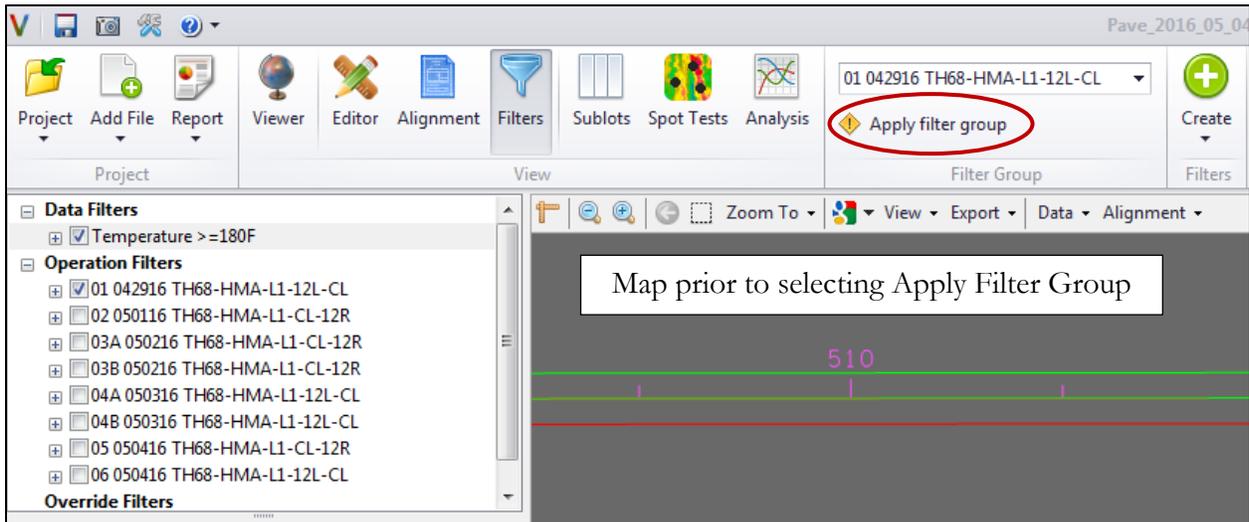
Ensure that the **temperature Data Filter** is **selected** to allow this data filter to be associated with all Filter Groups. Additionally, ensure that the minimum temperature is set ≥ 180 by **selecting Temperature** from the **Data Filter** in the **upper left pane** and then viewing the **minimum temperature** in the **lower left pane**.

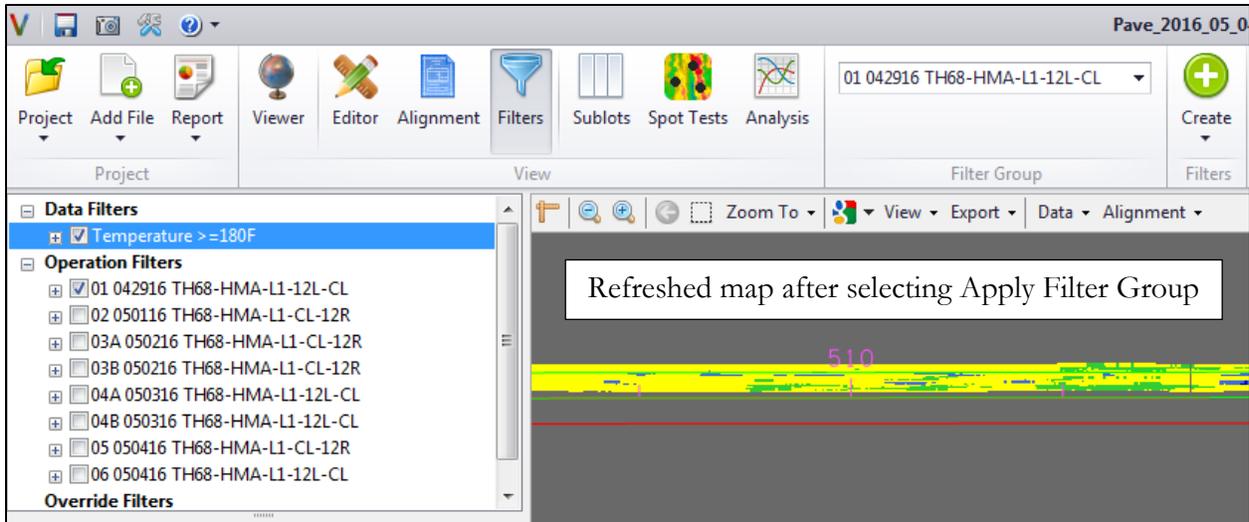


5.1.16 Apply Filter Group

The apply filter group feature in the menu toolbar allows the user to refresh the map with the currently selected filter group or with the modifications made to the data, operation and/or override filters.

Select **Apply filter group** from the **top menu** to refresh the map currently displayed with any filter modifications or for a new filter group selection.

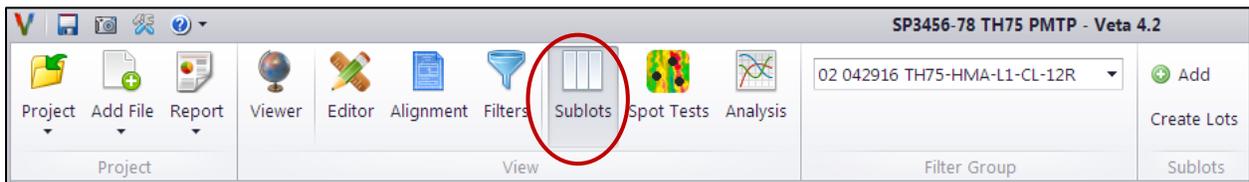




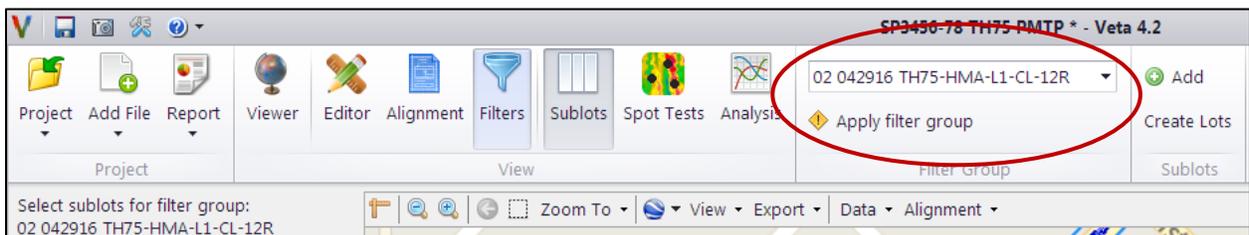
5.1.17 Establishment of Sublots for Each Lot (PMTP Method Only)

The PMTP method requires the creation of sublots. This can be done in Veta by using the Sublot feature.

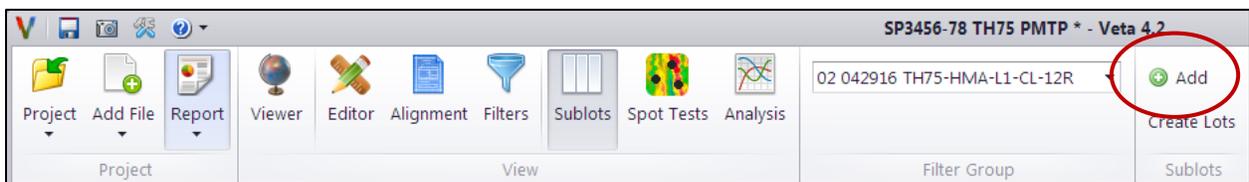
Select **Sublots** from the menu toolbar.



Select the **Filter Group** for the desired lot by selecting the dropdown. Select **Apply Filter Group**, if needed, to update the map.



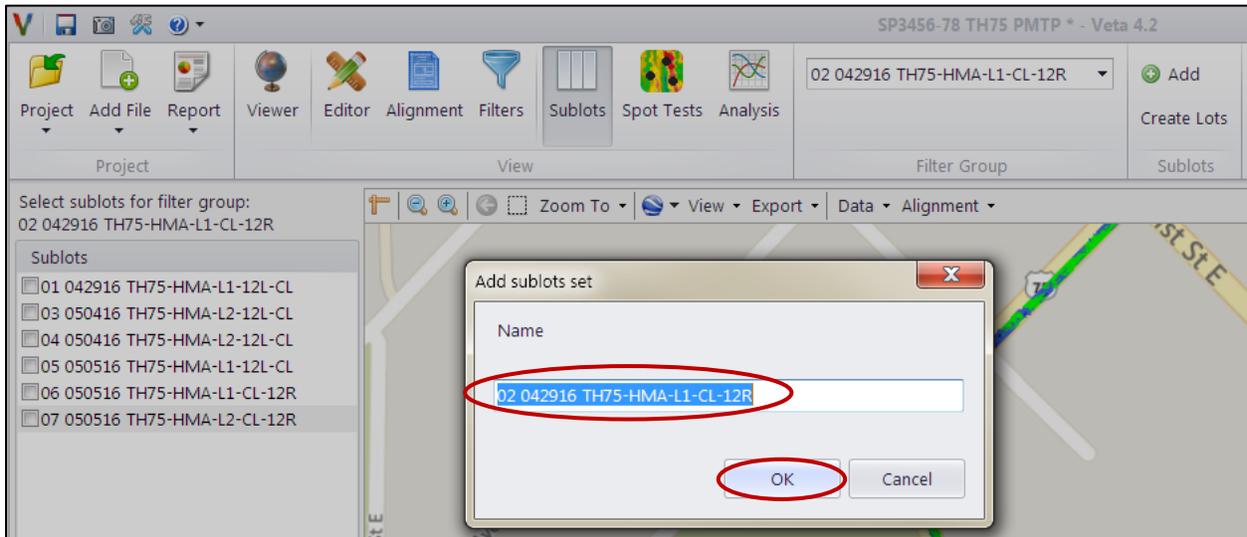
Select **Add** from the menu toolbar.



A pop-up box with an automatically generated subplot label using the required standardized naming convention will appear.

Select **OK** and Veta will associate the sublots with given Filter Group.

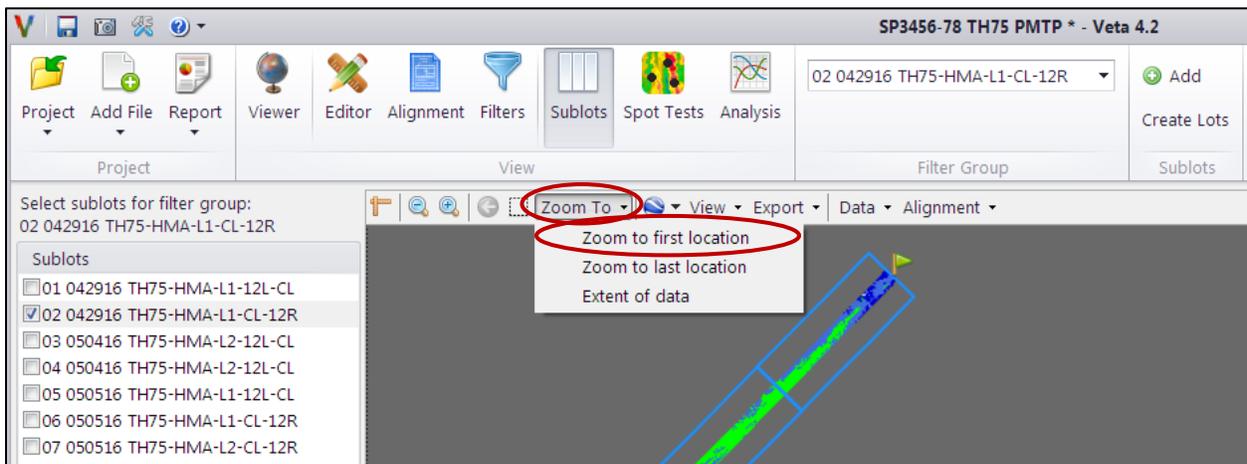
The user is required to set the start and stop location for generation of the sublots and to set the subplot length to 150-ft for instances where the MnDOT template was not used during creation of the given Filter Group.



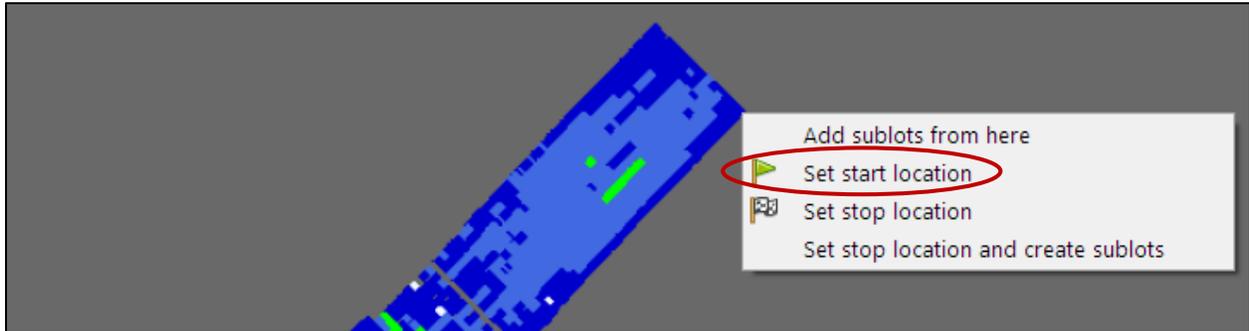
Ensure that the start and end locations were set correctly by completing the following steps.

Set Start Location

Select **Zoom To** from the command toolbar and then selecting **Zoom to first location** from the dropdown list to find the **beginning of paving**. Use the zoom feature to zoom into the image to the maximum zoom extents.

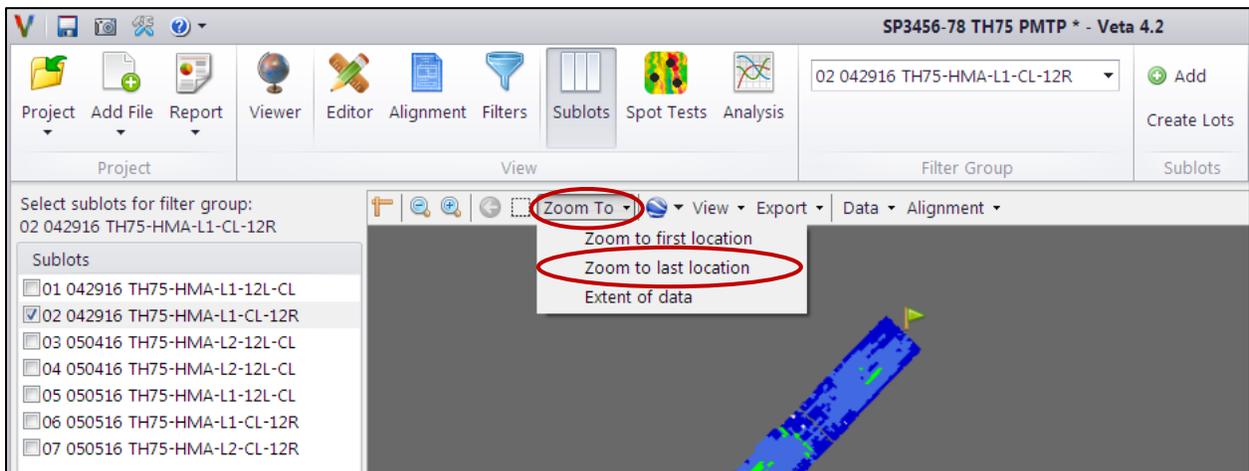


The user can modify the pin location by placing the mouse cursor immediately adjacent, to the mid-edge of the surface temperature readings. **Right click the mouse** and **select Set Start Location**.

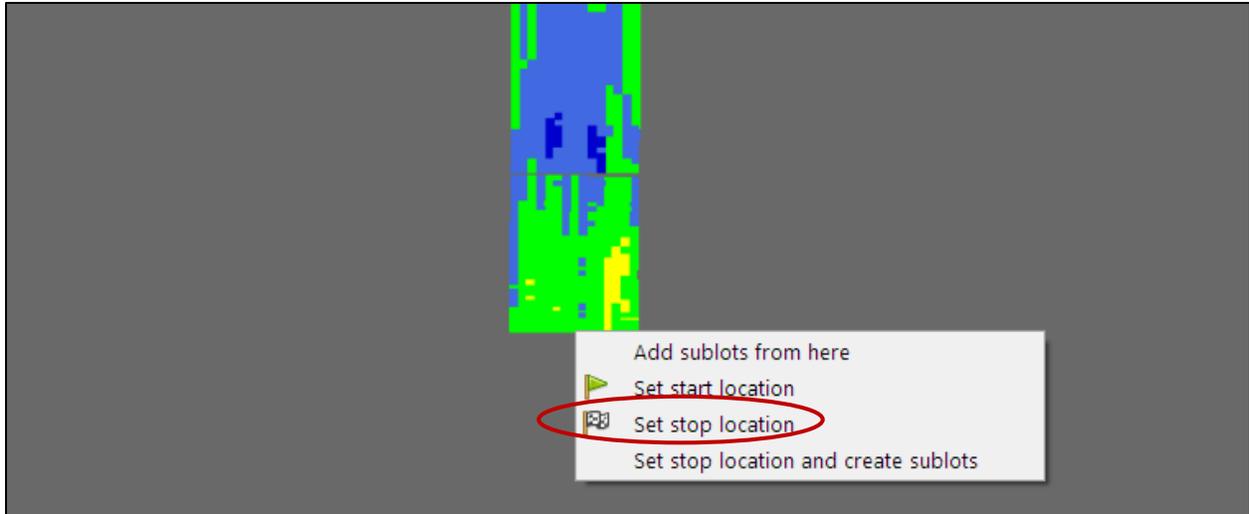


Set Stop Location

Select **Zoom To** from the command toolbar and then selecting **Zoom to last location** from the dropdown list to find the **end of paving**. Use the zoom feature to zoom into the image to the maximum zoom extents.



The user can modify the pin location by placing the mouse cursor immediately adjacent, to the mid-edge of the surface temperature readings. **Right click the mouse** and **select Set Stop Location**.



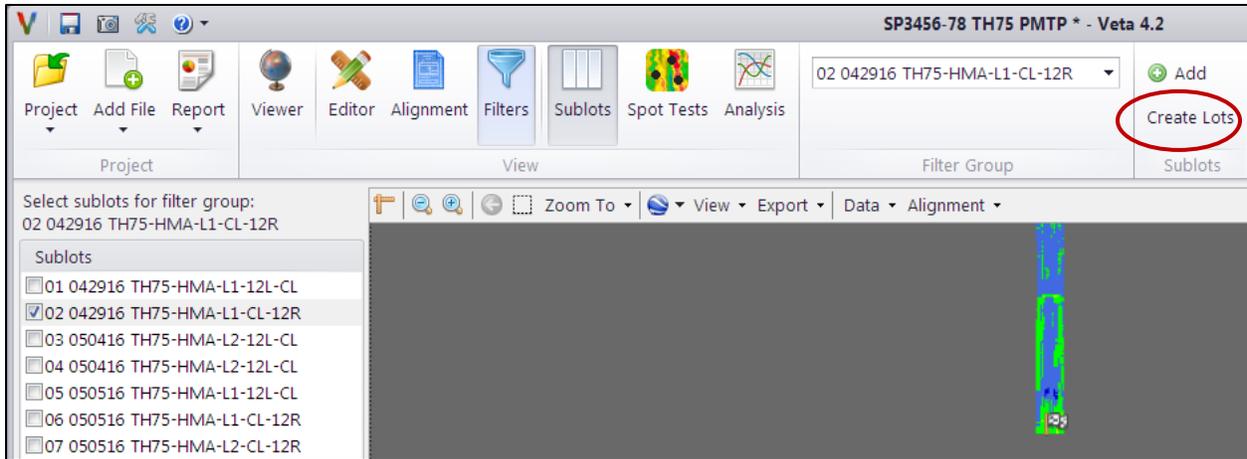
Sublot Length

Ensure that the longitudinal length of the sublots is set at **150 ft** by viewing the bottom, left pane. Do not adjust the northing and easting values. These were automatically entered through the previous steps when selecting the start and end of paving (i.e., start and stop locations).

Details	
Longitudinal Length (ft)	150
Start Northing (ft)	163109.0625
Start Easting (ft)	400188.09375
Stop Northing (ft)	164534.640625
Stop Easting (ft)	394895.21875

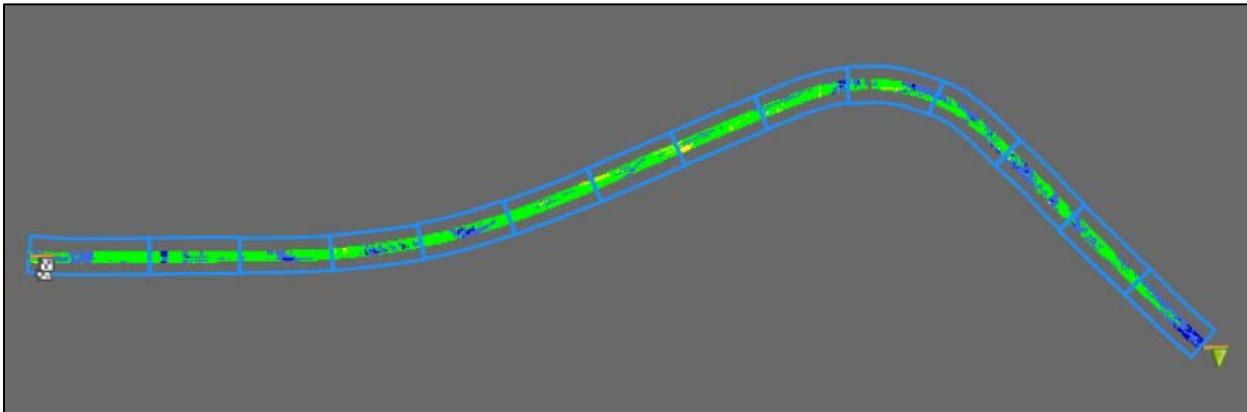
Create Lots

Select **Create Lots** from the top toolbar.



Review Created Sublots

Visually inspect the map to ensure that 150-ft sublots were created along the entire lot limits.



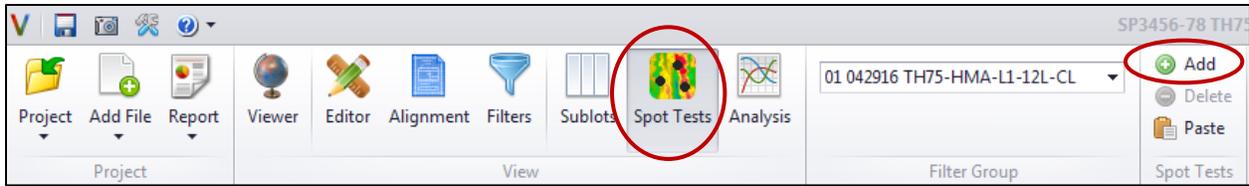
5.1.18 Spot Tests

The Spot Tests feature allows the user to overlay verification and/or quality assurance test results (e.g., density – cores, density – nuclear gauge, DCP, Sand Cone, etc.) on top of the IC or PMTP data. Coordinates of the verification/quality assurance spot test location are required to import the test values into Veta. **Ensure that the coordinate system associated with each spot test is the same coordinate system as that being used in the Veta project. Convert the coordinates as needed using MnCON (see section 5.2).**

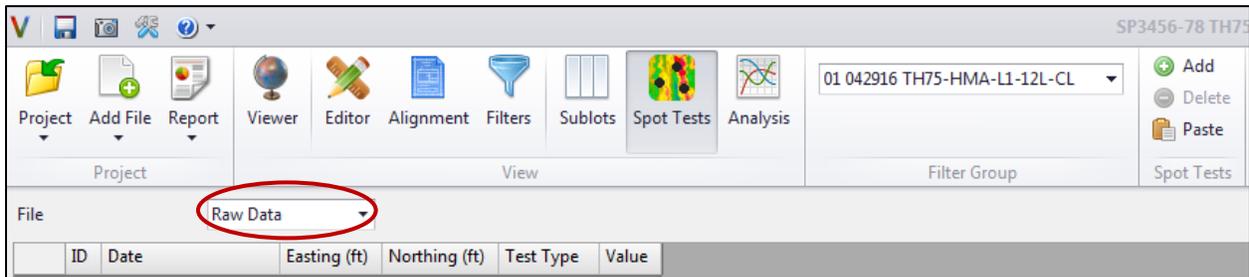
Veta does not currently have a spot test manager, and therefore, spot tests are added independently using the toolbars in Veta or by creating a data table in excel prior to batch importing.

Manual Entering of Spot Test Data

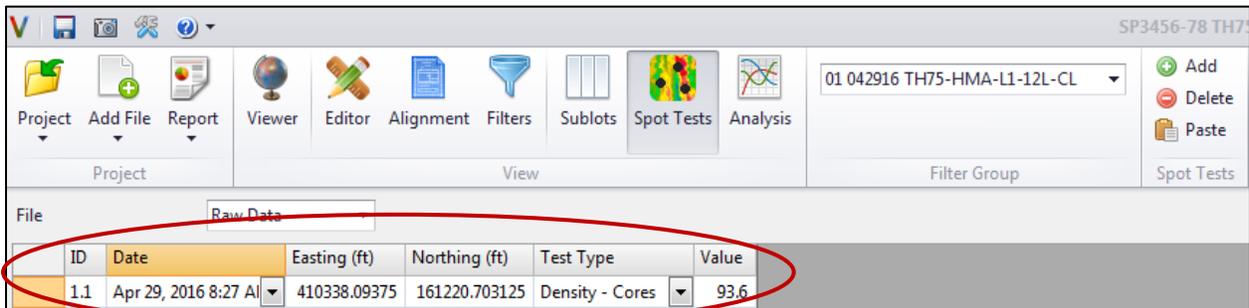
Select Spot Tests from the menu toolbar. **Select Add** from the Spot Test menu.



Select the file that the spot test data is associated (e.g., final coverage, pass count 1, pass count 2, raw data, etc.).



Enter the spot test ID, date, coordinate information, test type and value into each row of the table.



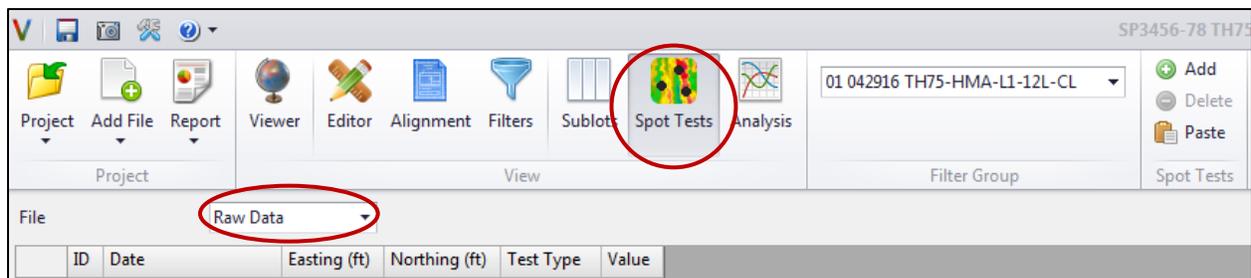
Batch Importing of Spot Test Data

Create spot test table in excel. Ensure that the table column headings in Excel identically match those used in Veta (e.g., ID, Date, Easting (ft), Northing (ft), Test Type, Value) and that the text for the Test Type identically matches the given test as listed in the dropdown in Veta (e.g., Density – Cores).

Sort	ID	Date	Northing (ft)	Easting (ft)	Test Type	Value	Sort	Lift
	1.2	011716	159316.688	401994.156	Density - Cores	92.7		L1
	2.1	011716	159389.688	401992.375	Density - Cores	92		L1
	2.2	011716	159460.578	401992.719	Density - Cores	91.6		L1
	3.1	011716	159574.547	401996.719	Density - Cores	93.8		L1
	3.2	011716	159678.859	401988.844	Density - Cores	92.4		L1
	4.2	011716	159887.516	401959.813	Density - Cores	92.5		L1
	4.1	011716	160372.828	401775.875	Density - Cores	89.7		L1
	5.2	011716	160474.484	401736.563	Density - Cores	94.6		L1
	5.1	011716	160712.875	401739.781	Density - Cores	93.5		L1
	6.2	011716	160819.516	401826.750	Density - Cores	93		L1
	6.1	011716	161015.984	402024.344	Density - Cores	93.6		L1
	7.2	011716	161124.609	402130.156	Density - Cores	91.3		L1
	7.1	011716	161191.125	402175.063	Density - Cores	91.1		L1
	8.1	011716	161324.547	402328.438	Density - Cores	90.8		L1
	8.2	011716	161640.813	402626.281	Density - Cores	94.2		L1
	9.1	011716	161771.516	402767.063	Density - Cores	95.2		L1
	9.2	011716	162218.484	403204.250	Density - Cores	95.1		L1
	10.2	011716	162327.703	403332.406	Density - Cores	91.8		L1
	10.1	011716	162462.703	403450.156	Density - Cores	95.2		L1
	11.2	011716	162470.219	403476.688	Density - Cores	93		L1
	11.1	011716	162722.063	403724.719	Density - Cores	93.4		L1
	12.2	011716	162810.688	403797.625	Density - Cores	93.3		L1
	12.1	011716	162975.266	403979.000	Density - Cores	94.3		L1
	13.2	011716	163061.813	404048.406	Density - Cores	95.9		L1
	13.1	011716	163232.625	404236.781	Density - Cores	95		L1
	14.2	011716	163327.500	404308.344	Density - Cores	92.2		L1
	14.1	011716	163469.266	404467.969	Density - Cores	93.6		L1
	15.1	011716	163571.734	404551.406	Density - Cores	95.7		L1

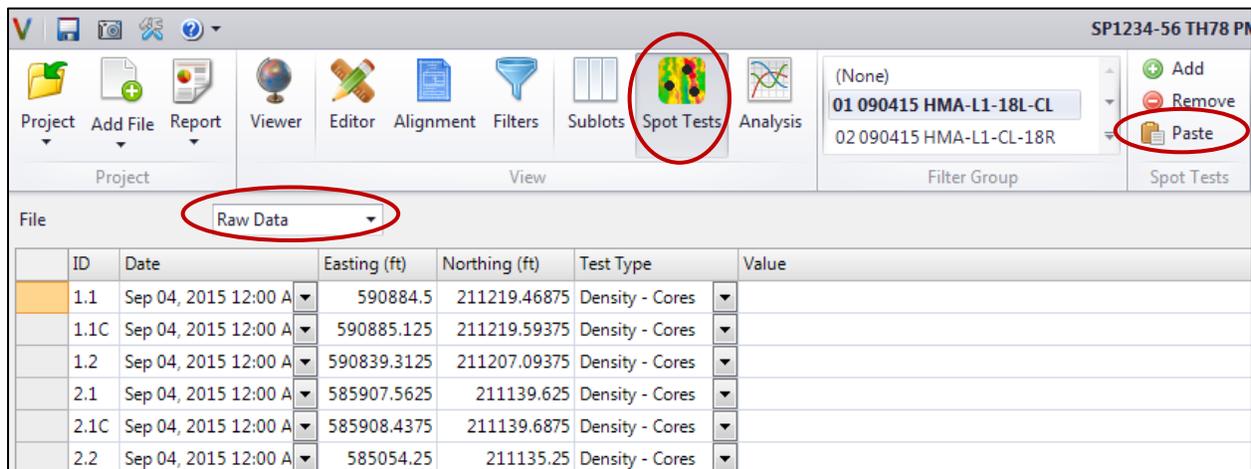
Select **Spot Tests** from the menu toolbar in Veta.

Select the **file** that the spot test data is associated (e.g., final coverage, pass count 1, pass count 2, raw data, etc.)

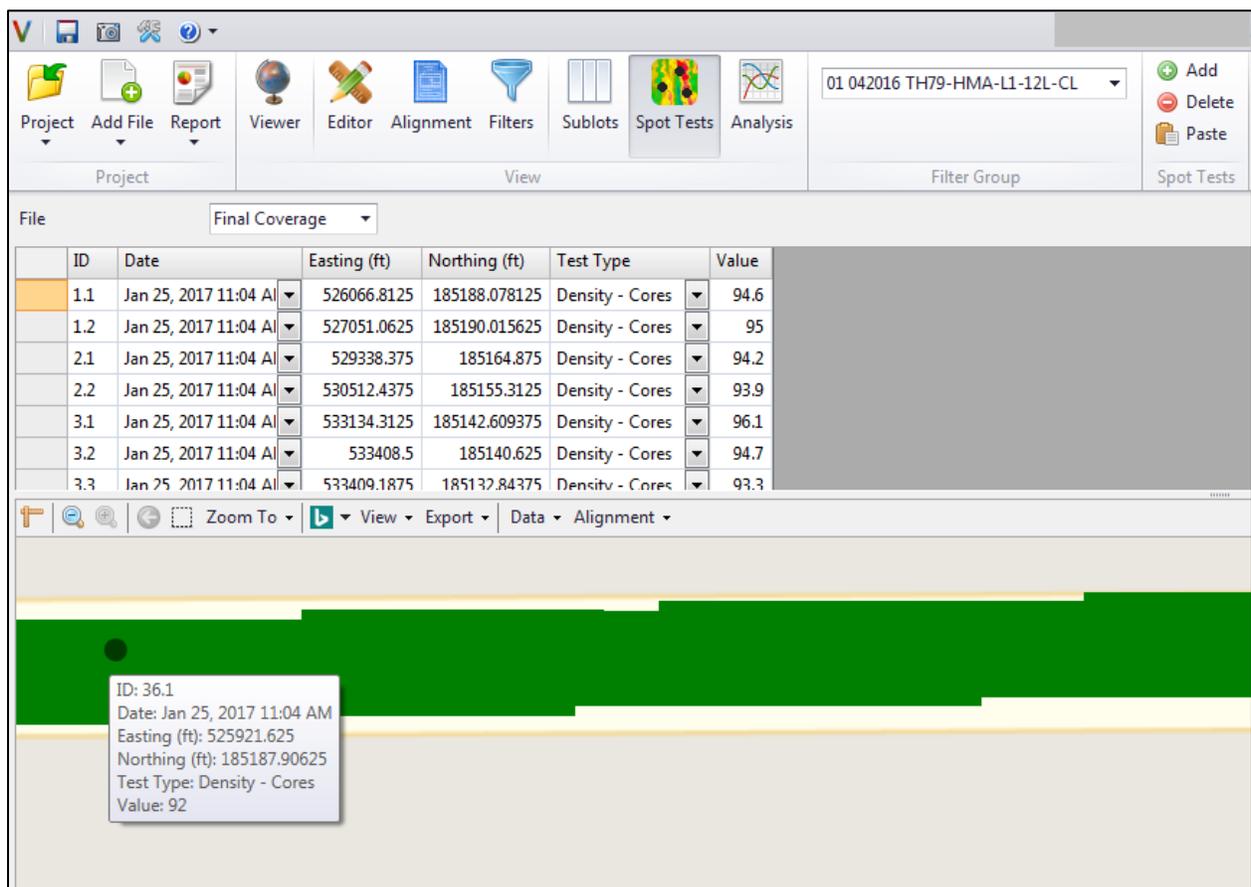


Copy spot test table (including headings) in excel by selecting the given cells (hold the left mouse button, and while holding the left mouse button, drag the mouse over the desired cells) and then selecting **CNTRL C**. See yellow shading in previous excel figure.

Select **Paste** in the spot test toolbar in Veta.



Examine the black dots on the map. Mouse over them to view the spot test information.



5.1.19 Analysis

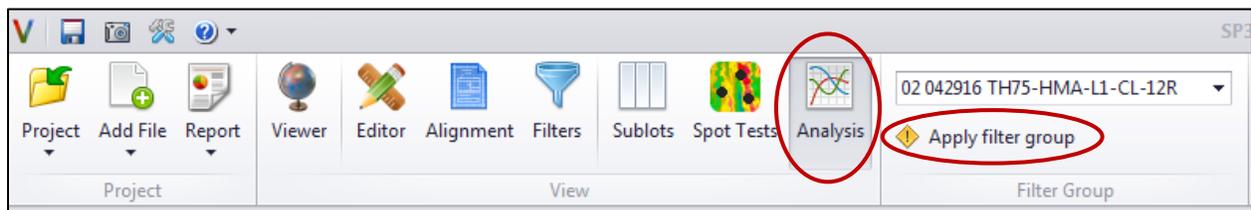
Analysis allows the user to analyze the IC or PMTP data and examine the results for each lot, lift, lane, and Machine ID.

Radius

The **Radius (ft)** feature is used when spot tests are added to the project. This feature allows the user to calculate the average value, of the given IC or PMTP measurement, over a circular region with a radius size as input by user. This average value is calculated at the location of each Spot Test measurement for use in correlation analyses.

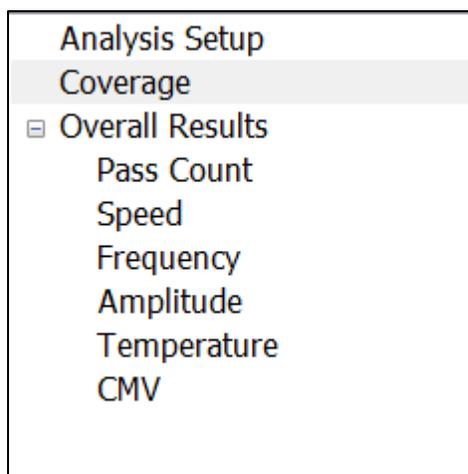
Analyses for the IC Method

Select **Analysis** from the menu toolbar and select the desired **Filter Group** and then select **Apply Filter Group**.



No additional setup or forms need to be completed in the analyses setup form. **Select Analyze. If Analyze button is grayed out ensure that the Apply Filter Group has been run.**

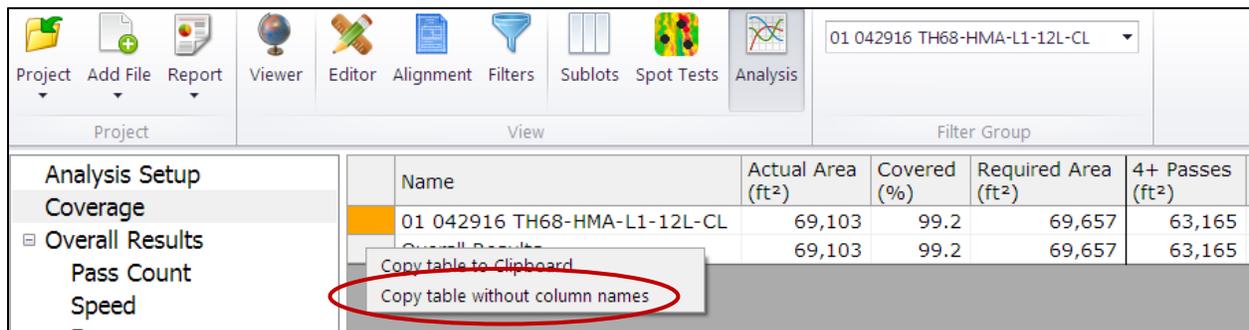
Observe the results by selecting the menu items on the left from top down.



Coverage (Form IC-108)

The roller coverage required in form IC-108, for each lot, is found in the Coverage results. Select Coverage from the left panel. Copy the results by hovering the mouse over the coverage table in the

upper right pane and **selecting the right mouse button**. Then **select copy table without column names**.



Paste the results into form IC-108 by selecting (with left mouse button) the desired cell in column C of excel and pasting the results (CNTRL V).

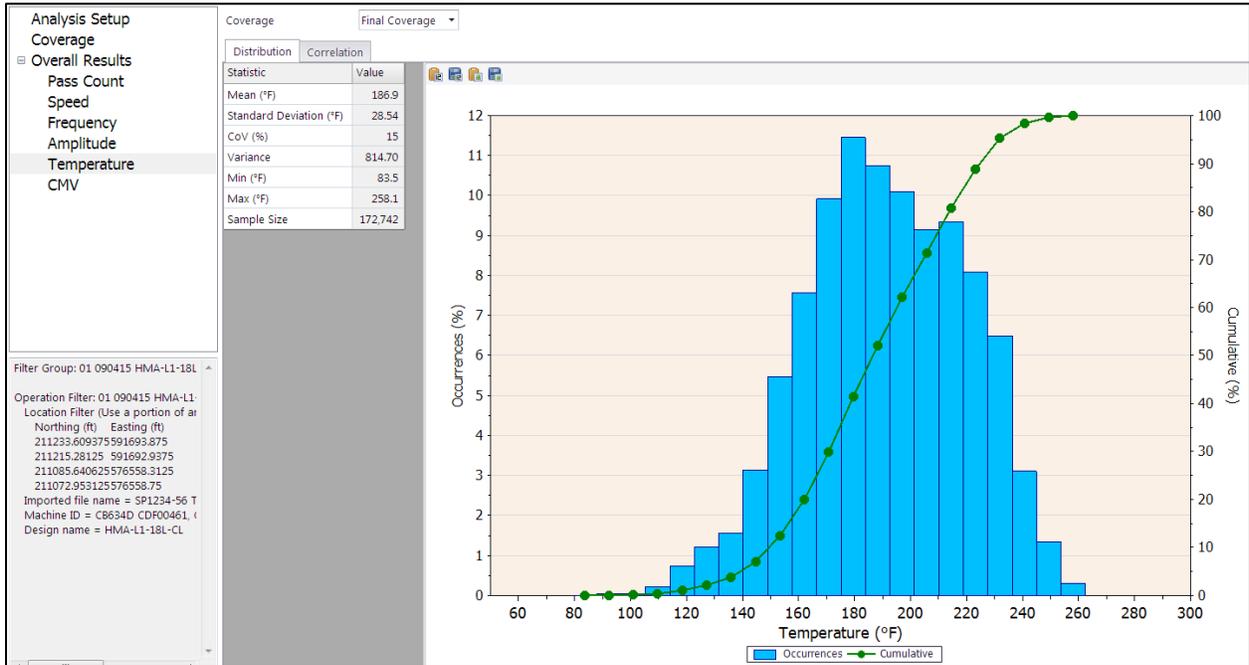
Veta adds an additional row of data for the overall results. Delete this data from the form.

County	No. of Rollers	Filter Group Name	Actual Area (ft ²)	Percent Covered (%)	Required Lot Area (ft ²) (A)	5+ pass (B)	4+ pass (C)	3+ pass (D)
		01 042916 TH68-HMA-L1-12L-CL	69102.65	99	69,657.3	63164.8	3166.8	16
		Overall Results	69102.65	99	69,657.3	63164.8	3166.8	16

Overall Results

The **Overall Results \ Distribution tab** provide a statistical summary of the entire data set associated with the Filter Group selected for the analysis. **Select the desired parameter** from the **left pane** to view the associated statistics. Univariate statistics (i.e., mean, standard deviation, coefficient of variation (CoV), Variance, minimum, maximum and sample size) are listed in the table to the left of the histogram. The histogram in the right pane reflects the cumulative distribution and the individual percent occurrences at given values.

The following is an example of the statistical analyses for temperature.



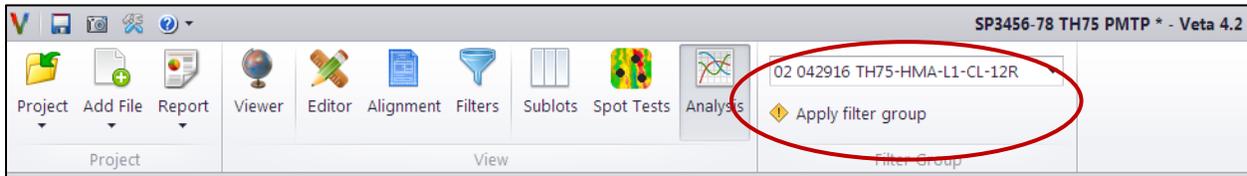
Correlation Results

The correlation results are presented in the **Overall Results \ Correlation tab** for the given parameter. Care must be taken when reviewing these results as the results are generated from a simple, linear regression. Multiple variables are often needed when looking at relationships.



Analyses for the PMTP Method

Select **Analysis** from the menu toolbar and select the desired **Filter Group** and then **select Apply Filter Group**.

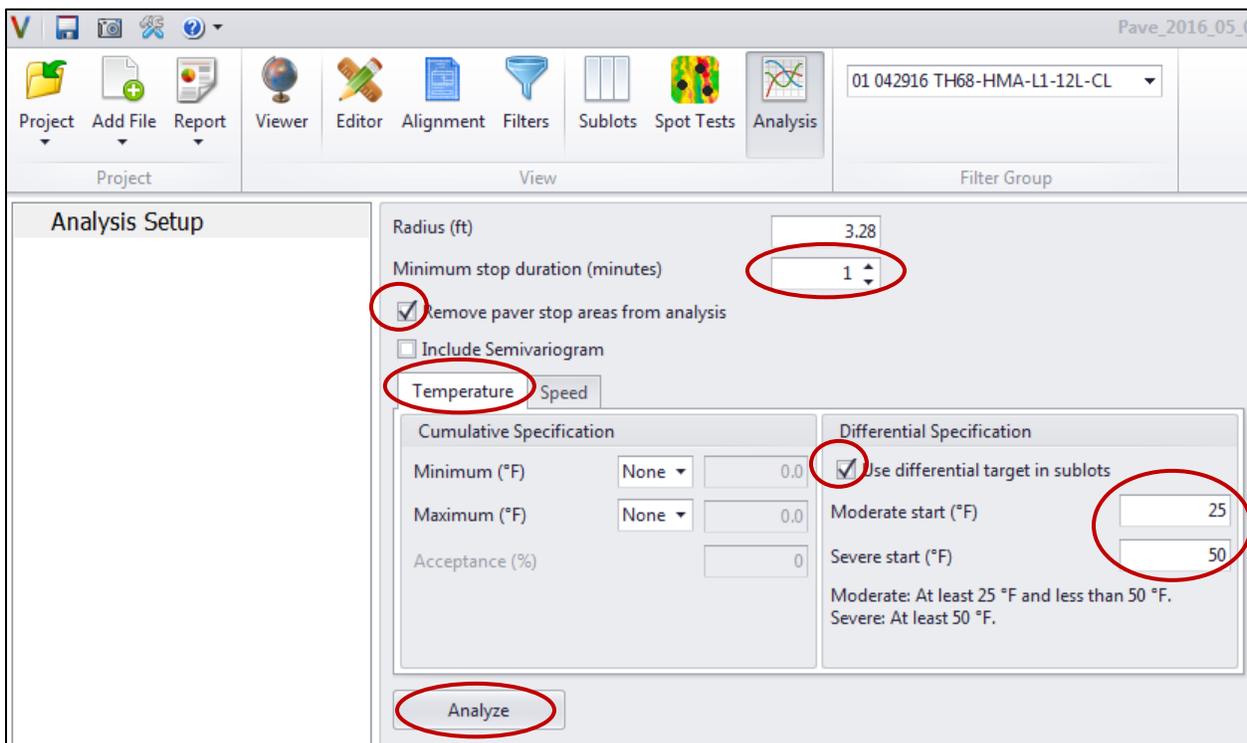


Additional setup of the analysis setup form is needed for the thermal segregation analysis. Setup the form as follows:

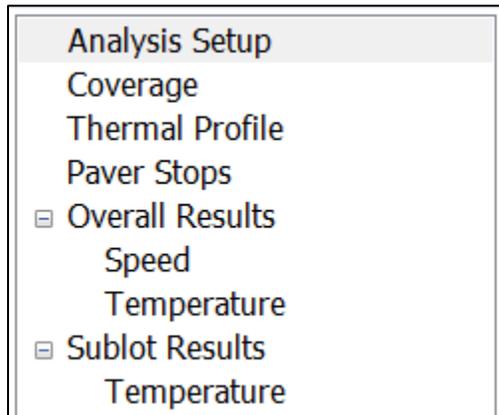
(2016) Quality Management – Paver Mounted Thermal Profile Method (S-xx.3.J.1)

1. Select the minimum stop duration (minutes) to **1 minute**.
2. **Select (check)** Remove paver stop areas from analysis.
3. **Select** the Temperature tab and complete the differential specification requirements as follows:
 - a. **Select (check)** the Use differential target in sublots.
 - b. Moderate Start (°F): **enter 25** in the text box.
 - c. Severe Start (°F): **enter 50** in the text box.

Select **Analyze**. If the **Analyze** button is grayed out ensure that the **Apply Filter Group** has been run.



Observe the results by selecting the menu items on the left from top down.



Thermal Segregation (Form PMTP-102)

The **thermal segregation information** required in form PMTP-102, for each lot, is found in the **Sublot Results \ Temperature \ Differential tab**.

Enter the filter group name and county into form PMTP-102. As indicated in the image below, the number of sublots in the low, moderate and severe categories can be found on the differential tab. Enter these values into **columns C-E** of form PMTP-102.

The **final subplot** length is often not equal to 150 linear-ft, and consequently, the monetary price adjustment is prorated for this final subplot. The length and severity level of the final subplot is listed in the detailed subplot table as indicated below. Enter this information into **columns G and H** of form PMTP-102. The user can either **scroll** to the bottom of the table or **select the drop down arrow** next to **Start Distance (ft)** to sort the sublots in descending order to view the final subplot length and thermal segregation category for cases where this information cannot be seen due to longer listings.

Analysis Setup
Coverage
Thermal Profile
Paver Stops
Overall Results
Speed
Temperature
Sublot Results
Temperature

Filter Group: 02 042916 TH75-HMA-L1-CL-12R

Data filter: Temperature >= 180F
Temperature >= 180.0 °F

Operation Filter: 02 042916 TH75-HMA-L1-CL-12R
Cold Edge & Ride Bracket Filter
Imported file name = Pave_2016_0

Distribution	Mean	Differential	Acceptance
Category	Count	Percent (%)	
Low	0	0	
Moderate	7	50	
Severe	7	50	

Start distance (ft)	Length (ft)	Category	Minimum (°F)	Maximum (°F)	Differential (°F)
0	150	Severe	211	268	57
150	150	Moderate	226	267	40
300	150	Moderate	220	269	49
450	150	Moderate	220	269	48
600	150	Severe	222	276	54
750	150	Severe	223	276	53
900	150	Moderate	230	279	49
1,050	150	Moderate	231	278	47
1,200	150	Moderate	232	277	45
1,350	150	Severe	207	273	66
1,500	150	Severe	214	274	60
1,650	150	Severe	216	271	54
1,800	150	Severe	224	281	57
1,950	196	Moderate	229	274	45

Number of sublots in the low, moderate and severe thermal segregation category.

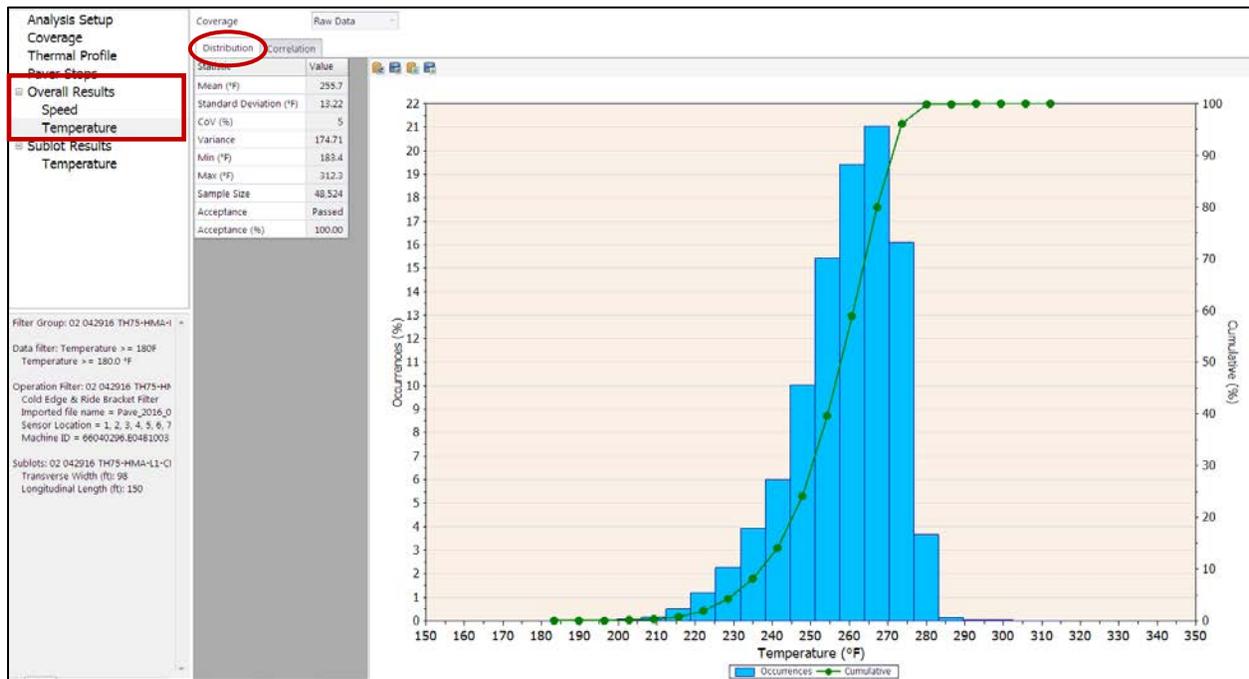
The length and thermal segregation of the last sublot.

Minnesota Department of Transportation (MnDOT)										
(2016) Quality Management - Paver Mounted Thermal Profile Method										
S.P. / S.A.P.:		SP3456-78		PMTP System (e.g., Moba Bar, Moba Scanner):						
Contractor:		Software Version of Veta:								
Project Engineer:		Add More Rows								
Prepared By:		Summarize Data								
Filter Group Name	County	Number of Sublots				LAST Sublot		No. of 150-ft Sublots		
		Thermal Segregation Category			Total	Length (ft)	Thermal Segregation Category	Thermal Profile Lot Length (ft)	Thermal Segregation Category	
		Low	Moderate	Severe					Low	Moderate
02 042916 TH75-HMA-L1-CL-12R	Yellow Medicine	0	7	7	14	196	Moderate	2,146	0	6

Overall Results

The **Overall Results \ Distribution tab** provide a statistical summary of the entire data set associated with the Filter Group selected for the analysis. **Select the desired parameter** from the **left pane** to view the associated statistics. Univariate statistics (i.e., mean, standard deviation, coefficient of variation (CoV), variance, minimum, maximum and standard deviation) are listed in the table to the left of the histogram. The histogram in the right pane reflects the cumulative distribution and the individual percent occurrences at given values.

The following is an example of the statistical analyses for temperature.



Correlation Results

The correlation results are presented in the **Overall Results \ Correlation tab** for the given parameter. Care must be taken when reviewing these results as the results are generated from a simple, linear regression. Multiple variables are often needed when looking at relationships.



5.2 MnCon

MnCon is a coordinate conversion program that performs conversions within or across the North American Datums of 1927 and 1983. It converts between any two of the 232 different map projections including: NAD27 and NAD83 latitude/longitude, NAD27 and NAD83 universal transverse Mercator zone 15 extended, the three Minnesota state plane zones in both NAD27 and NAD83, 68 NAD83 Minnesota county coordinate system zones (including one covering all of St Louis County) and 159 NAD27 project zones.

For use with Veta, this software can be used to convert the coordinates for spot tests that were collected in a coordinate system different from that used in the given Veta project.

5.2.1 Software Download

Open the following link to access the MnDOT Software applications and technical resources site.

<http://www.dot.state.mn.us/surveying/toolstech/index.html>

Accept the conditions and **select Office of Land Management Software** to be directed to the site where the MnCon software can be downloaded.

Minnesota Department of Transportation

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Land Management

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What we do

The Office of Land Management created and maintains an array of software and technical documents to assist surveying and mapping professionals with coordinate conversion, transformation and comparison and with other surveying calculations.

Software applications and technical resources

Disclaimer

Conditions for release of electronic data from the MnDOT Office Of Land Management

In order to access MnDOT OLM software, the user must accept the conditions expressed in [Disclaimer and Legal](#) in general and the "Disclaimer for OLM Software" statement below in particular.

The Minnesota Department of Transportation (Department) and the (Receiver) hereby agree that the release of software from this site shall be in accordance with and subject to the following conditions, restrictions, and provisions:

1. The Receiver releases the Department from all liability resulting from any inaccuracies in the computer software provided.
2. Acceptance of the computer software by the Receiver does not imply current or future support of this software by the Department for use by the Receiver, or that any future revisions of this software will be provided.

I accept these conditions.

Resources

- [Map Projection and Parameter Information](#)
 - This page provides an explanation of the Minnesota County Coordinate System the parameters necessary to perform conversions of coordinates between map projections used in the State of Minnesota.
 - [Office of Land Management Software](#)
 - Software includes:
 - Projection and Coordinate Conversion Software
 - MnCon ** New Version
 - MnConX **
 - Conad 83
 - Conad 27
 - MnDOT Survey Software
 - MnCogo
 - MnDataSheet **
 - MnGetDataSheets **
 - MnLevel

Scroll down the webpage to find the **MnCon** software. Select **DOWNLOAD** under the MnCon description.



Minnesota Department of
Transportation



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Land Management

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Survey tools and technology

[New software format notes](#)

MnDOT Office of Land Management Software

 MnCon	 MnConX	 MnCogo32	 MnDataSheet	 MnGetDataSheets	 MnLevel	 MnLTrans	
 MnMultShot	 MnTrans	 MnViewControl	 Stacor	 Conad 83	 Conad 27	 HP33s	 HP35s



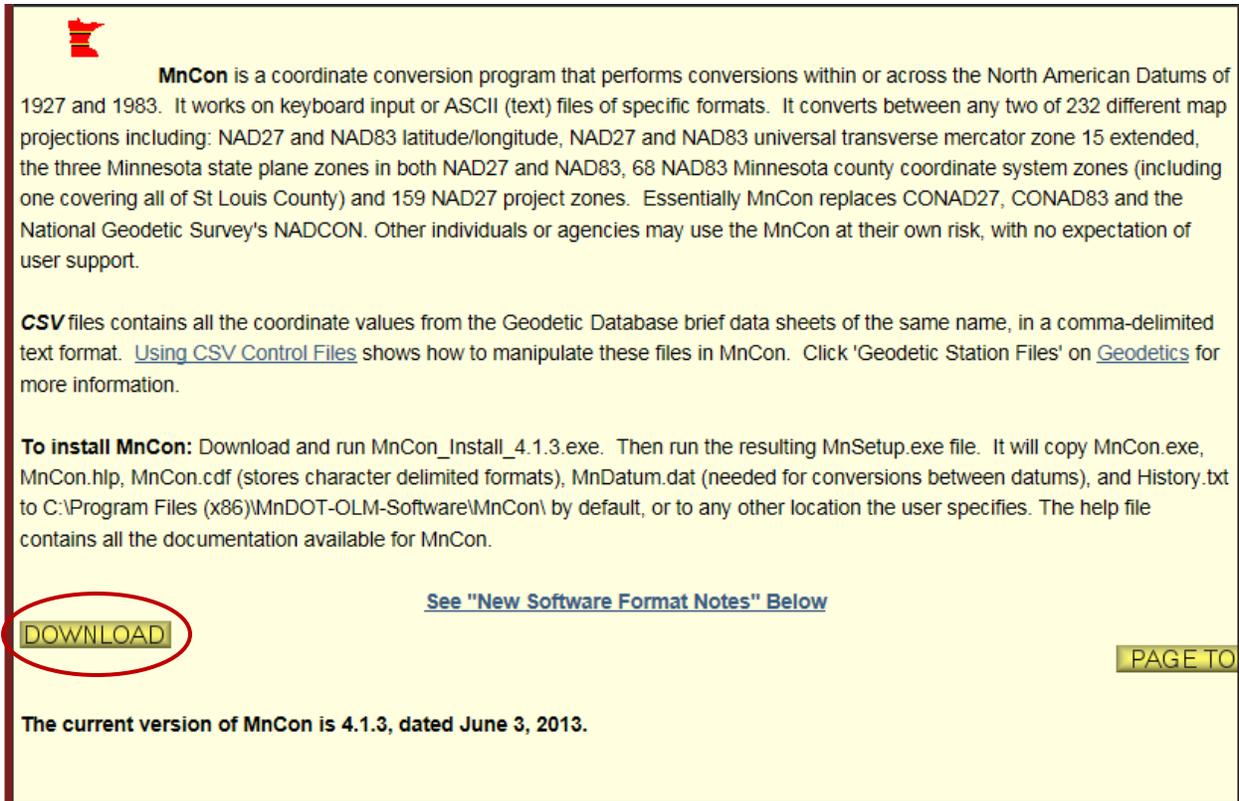
MnCon is a coordinate conversion program that performs conversions within or across the North American Datums of 1927 and 1983. It works on keyboard input or ASCII (text) files of specific formats. It converts between any two of 232 different map projections including: NAD27 and NAD83 latitude/longitude, NAD27 and NAD83 universal transverse mercator zone 15 extended, the three Minnesota state plane zones in both NAD27 and NAD83, 68 NAD83 Minnesota county coordinate system zones (including one covering all of St Louis County) and 159 NAD27 project zones. Essentially MnCon replaces CONAD27, CONAD83 and the National Geodetic Survey's NADCON. Other individuals or agencies may use the MnCon at their own risk, with no expectation of user support.

CSV files contains all the coordinate values from the Geodetic Database brief data sheets of the same name, in a comma-delimited text format. [Using CSV Control Files](#) shows how to manipulate these files in MnCon. Click 'Geodetic Station Files' on [Geodetics](#) for more information.

To install MnCon: Download and run MnCon_Install_4.1.3.exe. Then run the resulting MnSetup.exe file. It will copy MnCon.exe, MnCon.hlp, MnCon.cdf (stores character delimited formats), MnDatum.dat (needed for conversions between datums), and History.txt to C:\Program Files (x86)\MnDOT-OLM-Software\MnCon\ by default, or to any other location the user specifies. The help file contains all the documentation available for MnCon.

[See "New Software Format Notes" Below](#)

[DOWNLOAD](#)
[PAGE TO](#)



MnCon is a coordinate conversion program that performs conversions within or across the North American Datums of 1927 and 1983. It works on keyboard input or ASCII (text) files of specific formats. It converts between any two of 232 different map projections including: NAD27 and NAD83 latitude/longitude, NAD27 and NAD83 universal transverse mercator zone 15 extended, the three Minnesota state plane zones in both NAD27 and NAD83, 68 NAD83 Minnesota county coordinate system zones (including one covering all of St Louis County) and 159 NAD27 project zones. Essentially MnCon replaces CONAD27, CONAD83 and the National Geodetic Survey's NADCON. Other individuals or agencies may use the MnCon at their own risk, with no expectation of user support.

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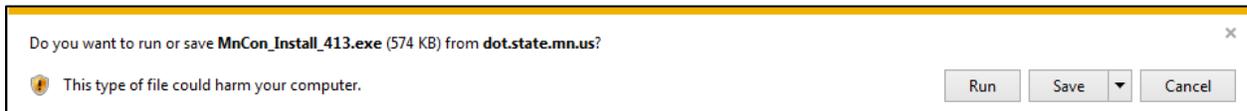
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[See "New Software Format Notes" Below](#)

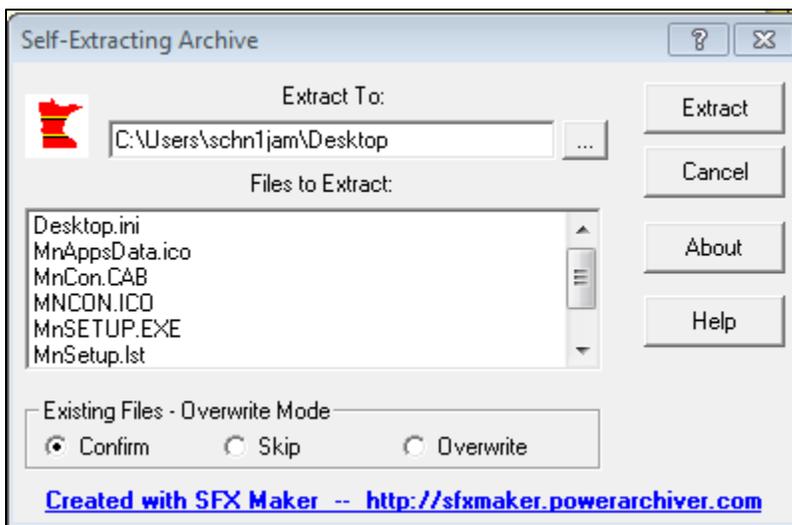
DOWNLOAD **PAGE TO**

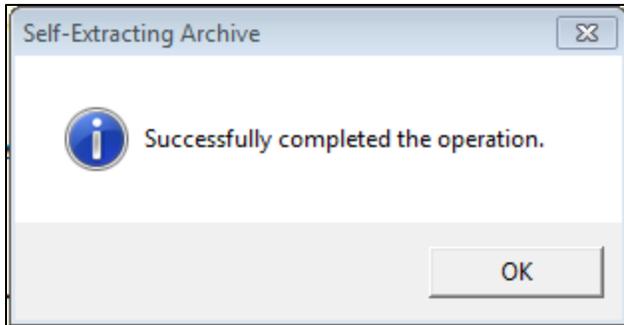
The current version of MnCon is 4.1.3, dated June 3, 2013.

Select either **Run** or **Save** MnCon_Install_413.exe.



Follow the prompts to extract and install the software.

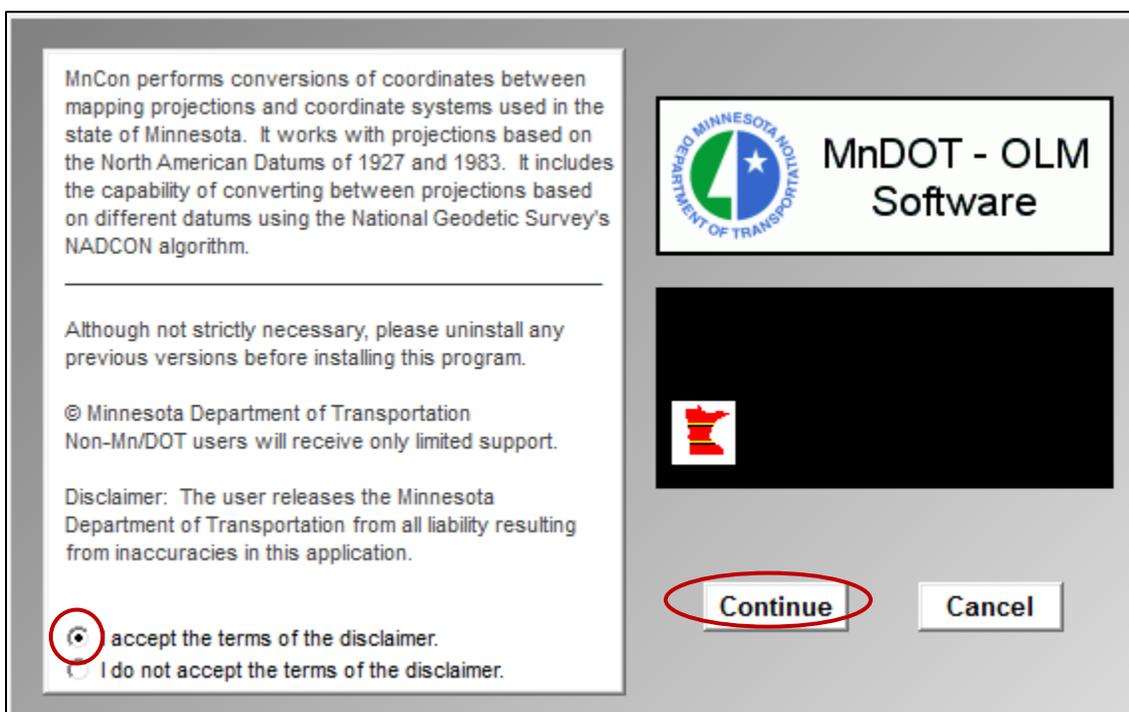




Navigate to the desktop (or folder) where the extracted files are located and find the MnSETUP.exe. **Double click** this file to open and execute.



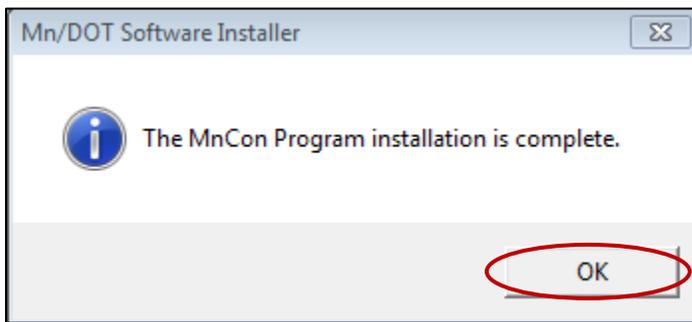
Review the terms of the disclaimer and **select** “I accept the terms of the disclaimer” if in agreeance. Next **select Continue**.



Use the default **Installation Path**. It is recommended that “**Install a Desktop Shortcut for MnCon**” is selected (checked). **Select Install**.



The following prompt will show upon completion of the installation. **Select OK.**

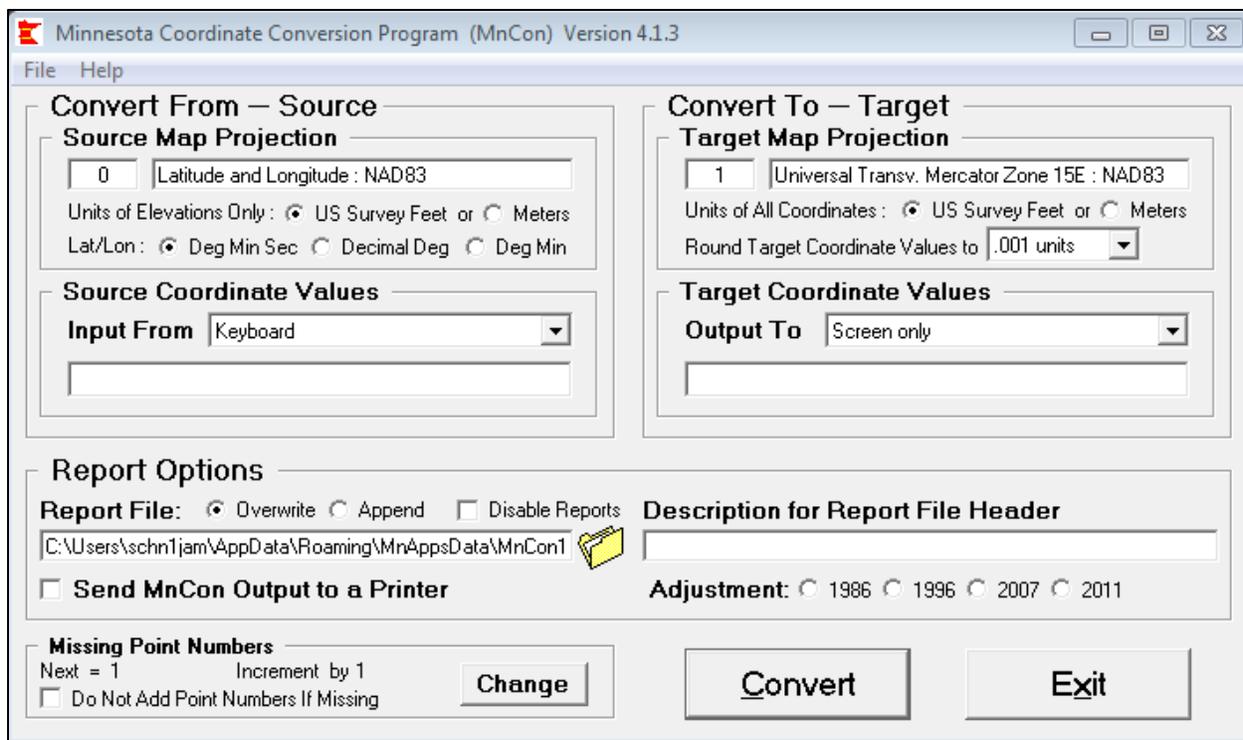


5.2.2 Open MnCon Software

Double click on the **desktop icon**, or **navigate** to the location chosen for the installation path, to **open** the **MnCon** software.



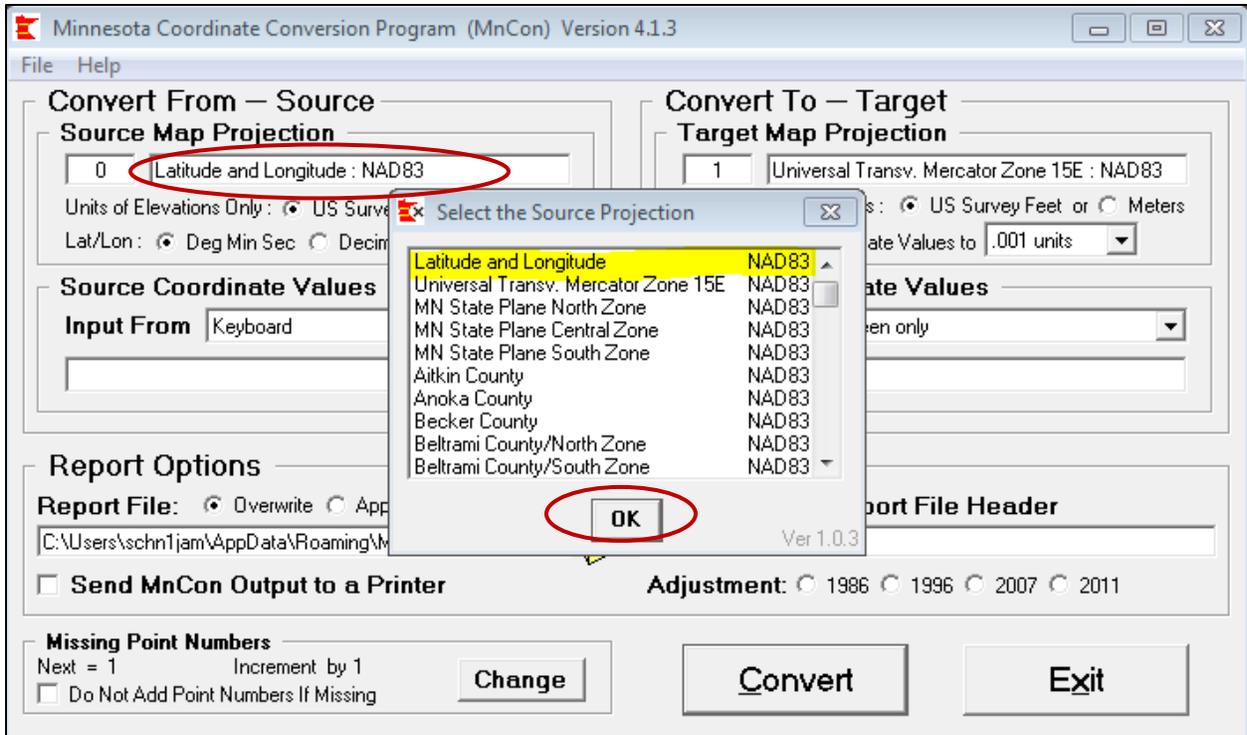
This will open the Minnesota Coordinate Conversion Program (see image below).



5.2.3 Convert From – Source

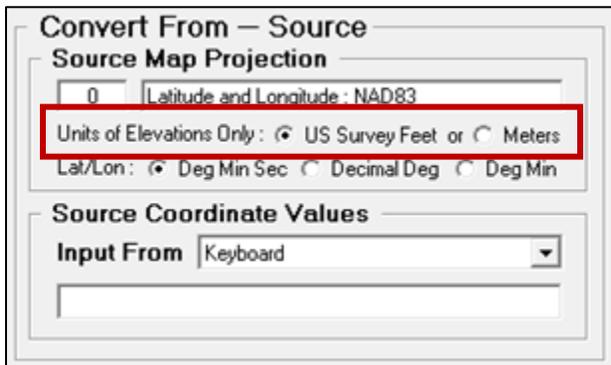
SOURCE MAP PROJECTION

Select the **projection box** in the left panel for **Convert From – Source** and then select the **projection** used for the spot test coordinates. **Select OK.**



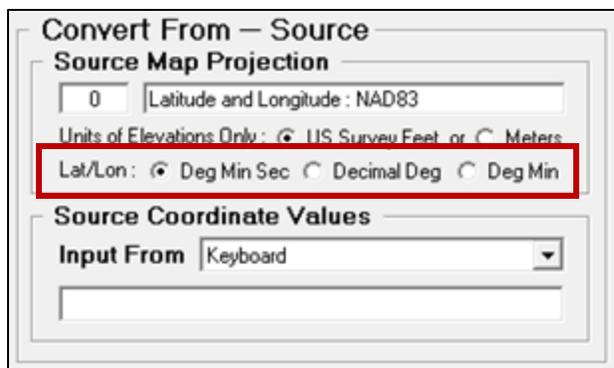
UNITS OF ELEVATIONS ONLY

Select the **Units of Elevations** (US Survey Feet or Meters).



LAT / LON

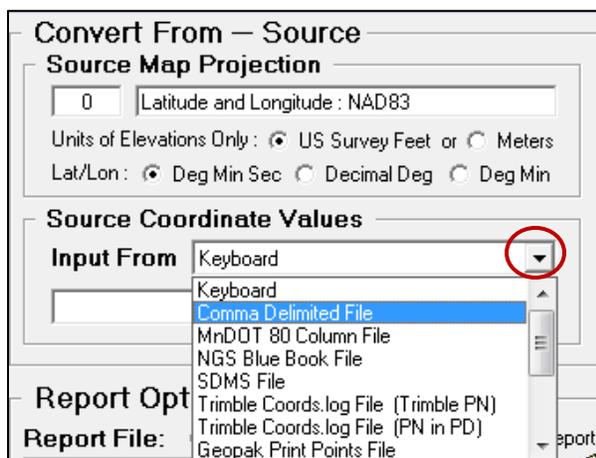
Select the **format** of the coordinates when collected in the Latitude / Longitude projection (Deg Min Sec, Decimal Deg, or Deg Min).



SOURCE COORDINATE VALUES

The source of the coordinate values reflects the format that the source coordinates will be input into MnCon.

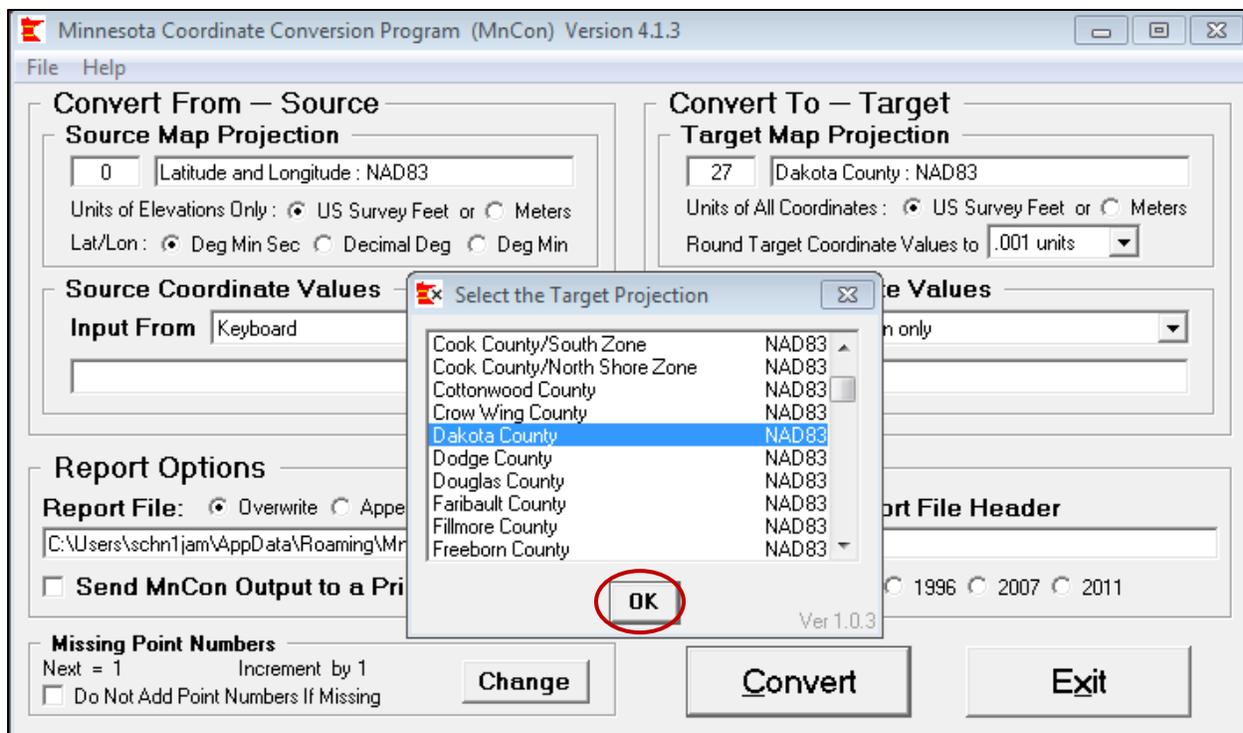
Select the **Input From dropdown** and select the **format** of the source coordinates. **Browse** to file location and select **open** to import file.



5.2.4 Convert To – Target

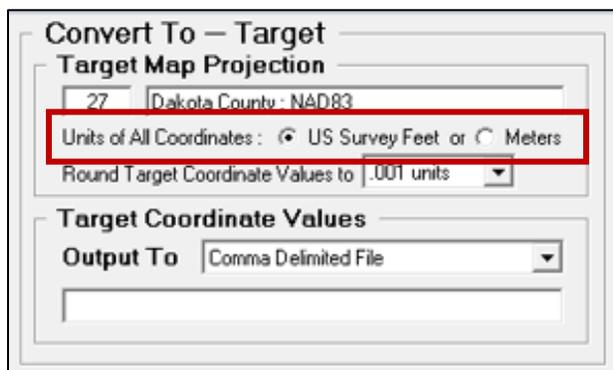
TARGET MAP PROJECTION

Select the **projection box** in the right panel for **Convert To – Target** and then select the **projection** used in the given Veta project (i.e., county coordinate projection). **Select OK.**



UNITS OF ALL COORDINATES

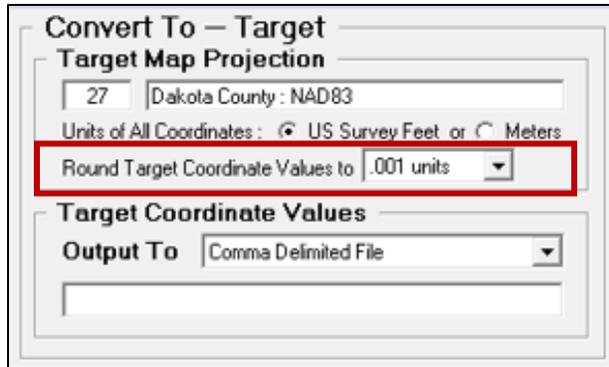
Select the **Units of All Coordinates** (US Survey Feet or Meters).



ROUND TARGET COORDINATE VALUES

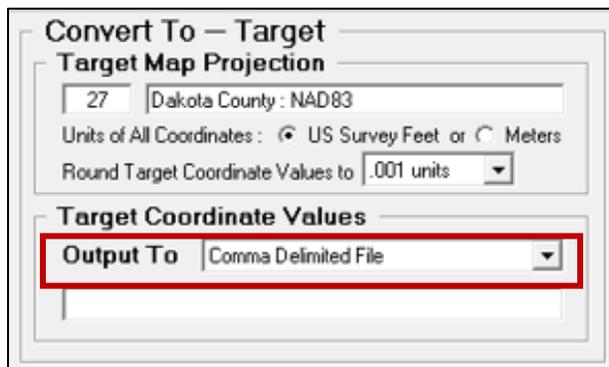
It is recommended that the coordinates are rounded to at least 0.001 units for conversion of spot test coordinates. Other applications, may require a higher accuracy.

Select the **Round Target Coordinate Values dropdown** and select the desired **rounding**.

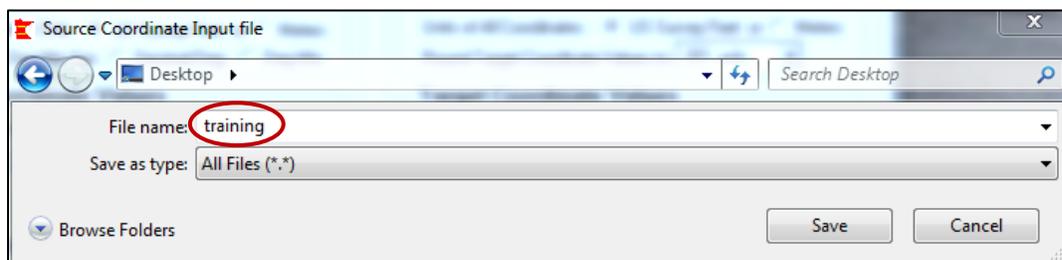


TARGET COORDINATE VALUES

Select the **Output To** dropdown and select the **desired format** of the exported file. It is recommended that **Comma Delimited File** is used for spot test coordinates.



Browse to desired file location to store output file. Enter name for the file to be stored as.



5.2.5 Report Options

REPORT FILE

Select **Overwrite** (unless the user wants to track the report files). The user can leave the Report file location as the default location, or browse to the desired file storage location.

Report Options

Report File: Overwrite Append Disable Reports

Description for Report File Header

C:\Users\schn1jam\AppData\Roaming\MnAppsData\MnCon0

Send MnCon Output to a Printer

Adjustment: 1986 1996 2007 2011

DESCRIPTION FOR REPORT FILE HEADER

It is recommended that the **original and final projection** of the coordinates is included in the description for the **Report File Header**.

Report Options

Report File: Overwrite Append Disable Reports

Description for Report File Header

C:\Users\schn1jam\AppData\Roaming\MnAppsData\MnCon0

Lat/Long - Dakota County

Send MnCon Output to a Printer

Adjustment: 1986 1996 2007 2011

ADJUSTMENT

Select the 1996 adjustment as MnDOT designs use this adjustment.

Report Options

Report File: Overwrite Append Disable Reports

Description for Report File Header

C:\Users\schn1jam\AppData\Roaming\MnAppsData\MnCon0

Lat/Long - Dakota County

Send MnCon Output to a Printer

Adjustment: 1986 1996 2007 2011

5.2.6 Convert

Select Convert.

Missing Point Numbers

Next = 1 Increment by 1

Do Not Add Point Numbers If Missing

USER-DEFINED DELIMITED FORMAT FOR OUTPUT FILE

A popup window will appear after selection of convert. **Select the Format Name dropdown and select the source projection** (e.g., MnCon Standard). This will then populate the Current Format Specification text box. **Select Accept and Continue** if this is the correct format of your imported file.

Repeat this same process for the **Output File**. Ensure that **county coordinates** are **selected** for the target projection.

Defined Formats

Format Name : MnCon Standard

Copy Add Remove Save

Current Format Specification

YCoord-Northing-Latitude , XCoord/Easting/Longitude , Name ,
Number , Elevation , GeoidHeight , EllipsoidHeight ,
AnythingElse ,

Prev Field Next Field Delete Field Add a Field to the Format

Lat-Long Output Format : DDMMSS.ss Delimiter : ,

Header Line

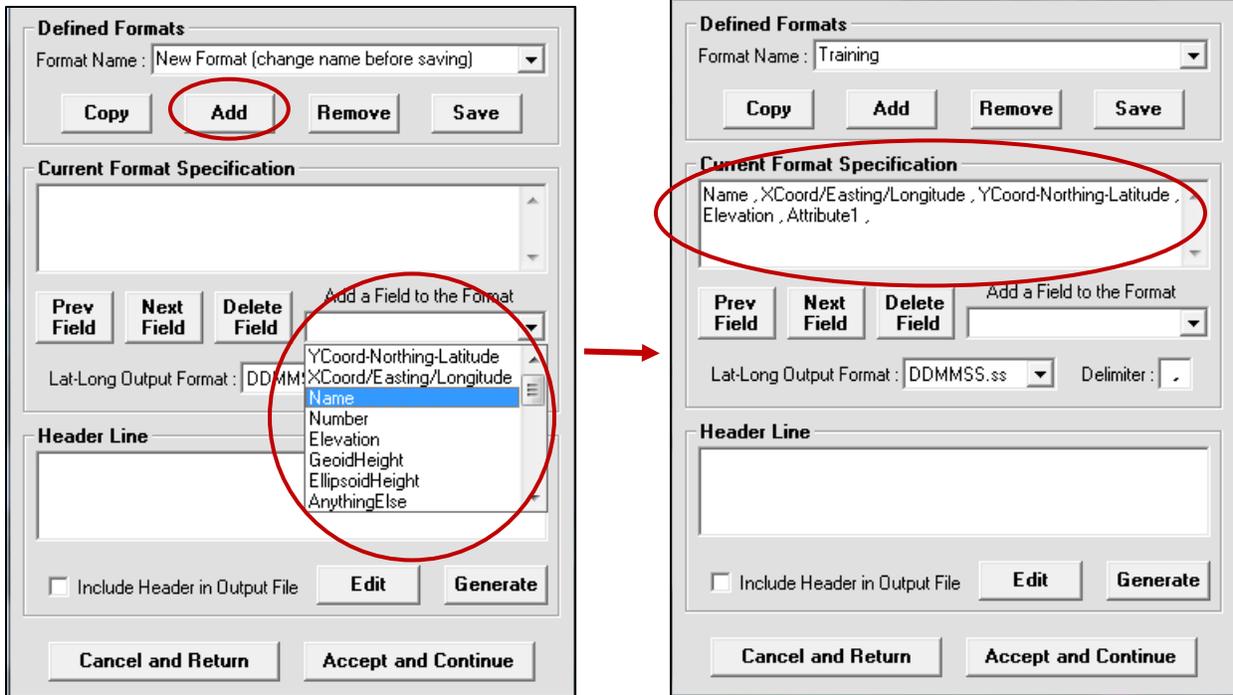
Y Coordinate , X Coordinate , Point Name , Point Number ,
Elevation , Geoid Height , Ellipsoid Height , Anything Else ,

Include Header in Output File Edit Generate

Cancel and Return Accept and Continue

ADD “NEW” USER DEFINED INPUT FILE FORMAT

Select **Add** to add a **new file format** when the **fields (or order of the fields)** in the default format do not match those of the import file. Ensure that the fields are added in the same order as listed in the import file.



COMPLETION OF COORDINATE CONVERSIONS

After completion of the user defined formats a viewer will open which displays the coordinate conversions. The file was also stored to the location selected in the report options.

MnCon Coordinate Conversion Output

Source Latitude and Longitude : NAD83(2011)			Target Dakota County : NAD83(2011)			
Point Name	Latitude	Longitude	Northing/Y (ft)	Easting/X (ft)	Theta Angle	Point Number
1080+0.00	45.01265595	-93.0412568	297265.915	571231.817	0 11 37.61	1
1079+99.50	45.01265595	-93.0412568	297265.915	571231.817	0 11 37.61	2
1079+99.00	45.01265487	-93.04125533	297265.523	571232.198	0 11 37.61	3
1079+98.50	45.01265402	-93.04125415	297265.214	571232.504	0 11 37.61	4
1079+98.00	45.01265309	-93.04125288	297264.876	571232.834	0 11 37.61	5
1079+97.50	45.01265217	-93.0412516	297264.542	571233.166	0 11 37.62	6
1079+97.00	45.01265166	-93.04125091	297264.356	571233.345	0 11 37.62	7
1079+96.50	45.01265024	-93.04124902	297263.840	571233.836	0 11 37.62	8
1079+96.00	45.01264957	-93.04124814	297263.597	571234.064	0 11 37.63	9
1079+95.50	45.01264881	-93.04124712	297263.320	571234.329	0 11 37.63	10

Return

5.3 TRIMBLE CONNECT

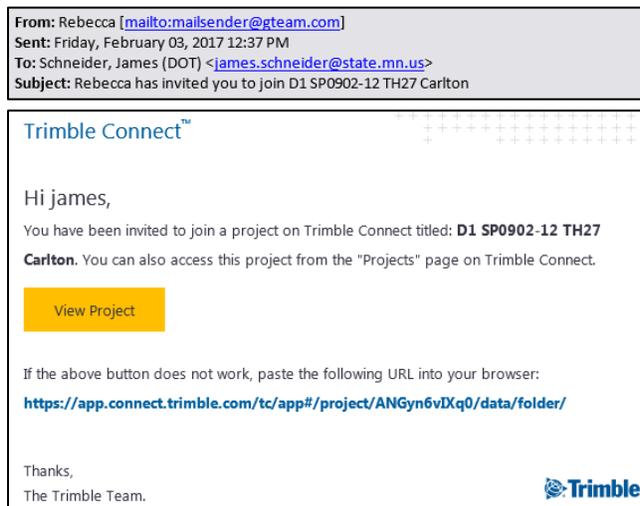
Trimble Connect is a tool used to improve project collaboration that can be accessed by Desktop, Mobile and/or Web to view, share and access project information. Trimble Connect is the file sharing platform that the Department is using during the 2017 Calendar Year for the sharing of files associated with the intelligent compaction (IC) and Paver Mounted Thermal Profiling Technology (PMTP) between the Engineer and Contractor. For more information related to Trimble Connect go to: <http://connect.trimble.com/>.

5.3.1 Trimble Connect User Account

The Department (the Advanced Materials and Technology Unit [AMT]) will **create** the given **project** in Trimble Connect and **create** the **Team** of individuals that can access this project. **To add users, the following information (in tabular format) must be provided to the AMT unit for both the Department and Contractor staff requiring access to Trimble Connect:**

Project Number(s) (e.g., SP)	Route Number(s) (e.g., TH 17)	First and Last Name of User	E-Mail of User
---------------------------------	----------------------------------	--------------------------------	----------------

An **automated e-mail** is sent to each user after being added as a Team member to the project. This e-mail message will provide a link to the project. The following image is an example of one of these automated e-mails.



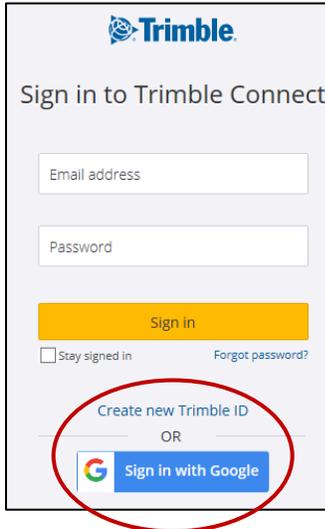
5.3.2 Create New Trimble ID

Creation of a user account is required for first time users.

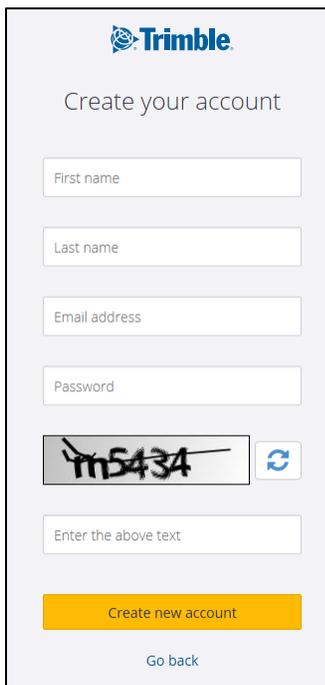
Go to the Trimble connect Website: <http://connect.trimble.com/> . Select **Sign In** from the **top right corner** of the website. Or, select **View Project** from the automated e-mail received when being added as a Team member for the given project.



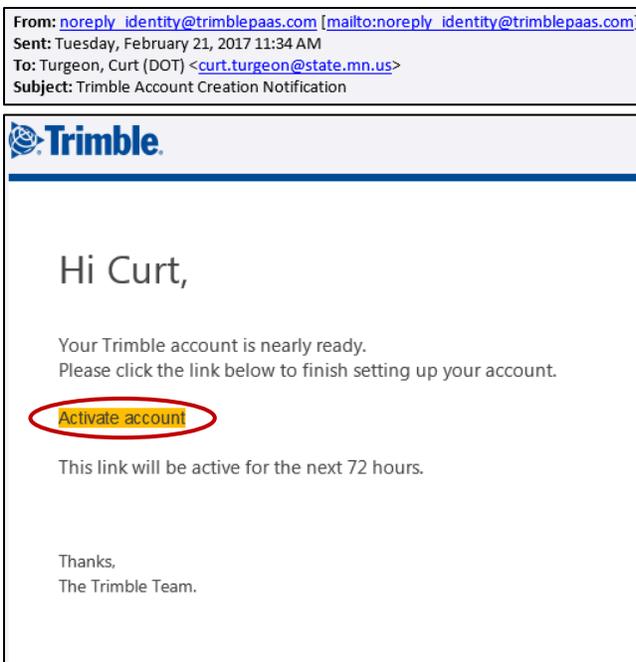
Select **Create New Trimble ID** or **Sign in with Google**.



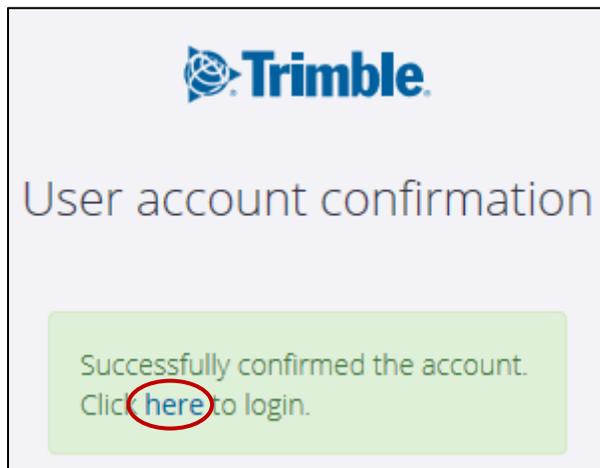
Complete the **required account information** and then select **Create New Account**.



An **automated e-mail** (Subject line will include: **Trimble Account Creation Notification**) is sent to the user for activation of this account. The following image is an example of one of these automated e-mails. **Select Activate Account**.



The user is **redirected** to the following **screen** after selection of Activate Account. **Select Here** to **login** to Trimble Connect.



5.3.3 Sign In (Login) to Trimble Connect

Go to the Trimble connect Website: <http://connect.trimble.com/> . Select **Sign In** from the **top right corner** of the website.



Enter the user **Email address** and **password** into the form and **select Sign In**.



5.3.4 Logout of Account

Select the **account icon** on the **top right menu** and then select **Sign Out** from the **dropdown menu** to logout of the Trimble Connect Account.



5.3.6 Profile (Edit Time Zone)

Ensure that the correct time zone (Central Time [US & Canada]) is set as the profile preferred time zone. Select the **account icon** on the **top right menu** and then select **Profile** from the **dropdown menu**.



Scroll down the profile information to the Timezone Preference section. Select the displayed time zone if an incorrect time zone is displayed.

Timezone Preference
(UTC-06:00) Central Time (US & Canada)

Timezone Preference
(UTC-06:00) Central Time (US & Canada)

Select the correct **time zone** using the provided **dropdown list**.

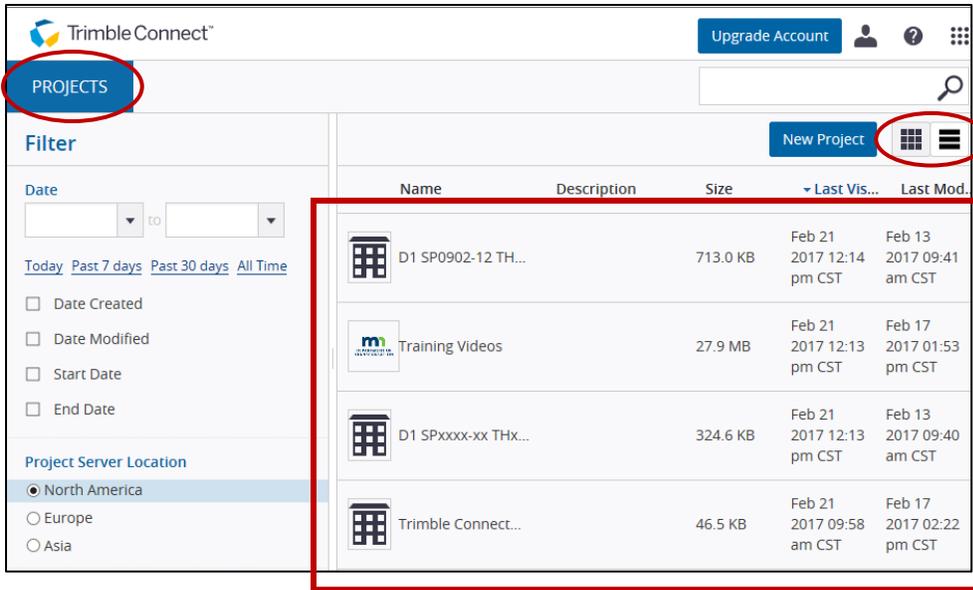
- (UTC-11:00) Samoa
- (UTC-10:00) Hawaii
- (UTC-09:00) Alaska
- (UTC-08:00) Baja California
- (UTC-08:00) Pacific Time (US & Canada)
- (UTC-07:00) Mountain Time (US & Canada)
- (UTC-06:00) Mexico City, Monterrey
- (UTC-06:00) Central Time (US & Canada)**
- (UTC-05:00) Eastern Time (US & Canada)
- (UTC-05:00) Indiana (East)
- (UTC-04:00) Aruba, Barbados
- (UTC-04:00) La Paz
- (UTC-04:00) San Tiago
- (UTC-04:00) Atlantic Time (Canada)
- (UTC-03:30) Newfoundland Time (Canada)
- (UTC-03:00) Buenos Aires, San Juan
- (UTC-03:00) Sao Paulo
- (UTC-01:00) Cape Verde
- (UTC+00:00) Greenwich Mean Time
- (UTC+00:00) Coordinated Universal Time
- (UTC+00:00) Dublin, Lisbon, London

Select the **check box** to **accept and save changes**, or select the **X** to **cancel changes**.

Timezone Preference
(UTC-06:00) Central Time (US & Canada)

5.3.5 Projects Menu

A listing of projects that the user has been added to as a team member are displayed on the projects screen.



PROJECT LISTING VIEWS

The command menu allows the user to view the project listing in either a tile or list format.

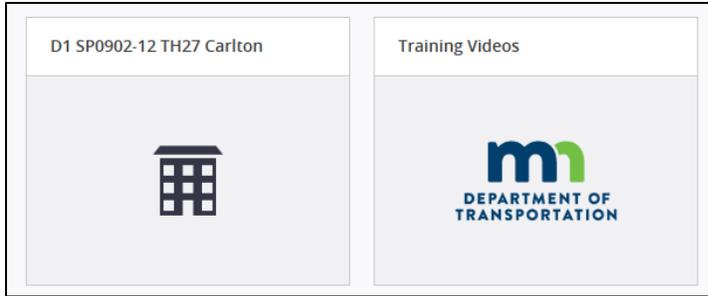
View of Project Listing in Tile Format



Name	Description	Size	Last Visited...	Last Modified
D1 SP0902-12 TH27 Car...		713.0 KB	Feb 21 2017 12:14 pm CST	Feb 13 2017 09:41 am CST
Training Videos		27.9 MB	Feb 21 2017 12:13 pm CST	Feb 17 2017 01:53 pm CST

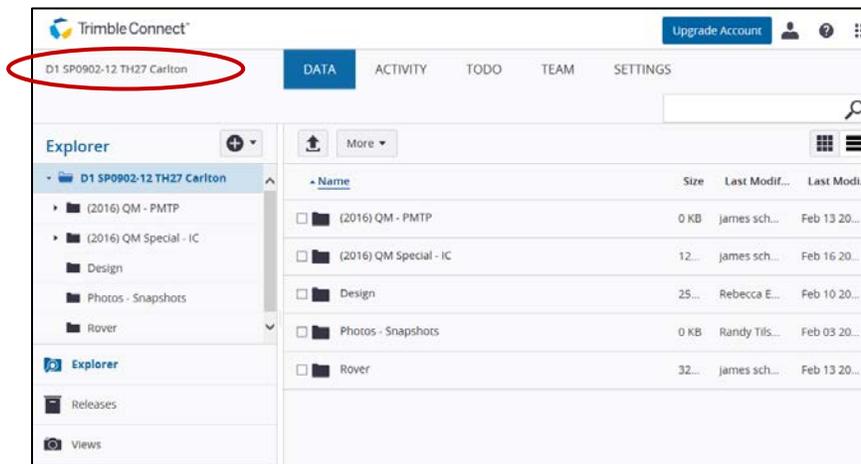
View of Project Listing in List Format





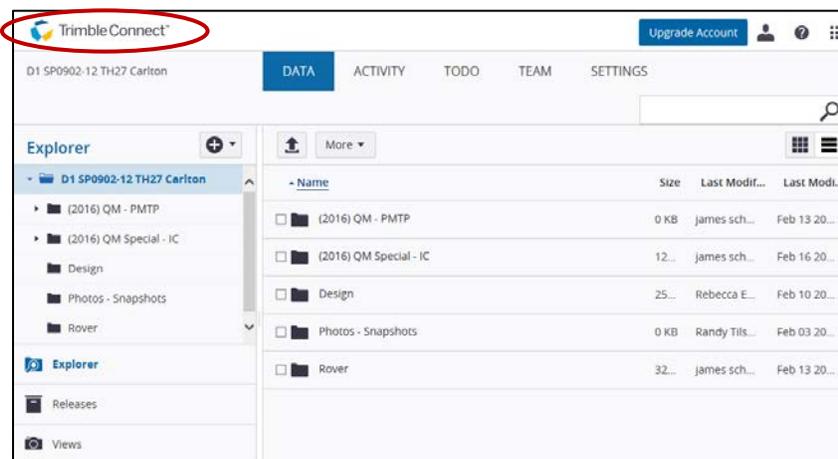
OPEN PROJECT

Select the **project** with the **left mouse button** to open it. The internet window will then redirect the user to the information contained within this project. The project currently being viewed is listed in the top left corner of the platform immediately below the Trimble Connect icon.



5.3.4 Exit Project

Select the **Trimble Connect icon** in the **top left corner** of the platform to **exit** out of the given project and to go back to the **project listing**.

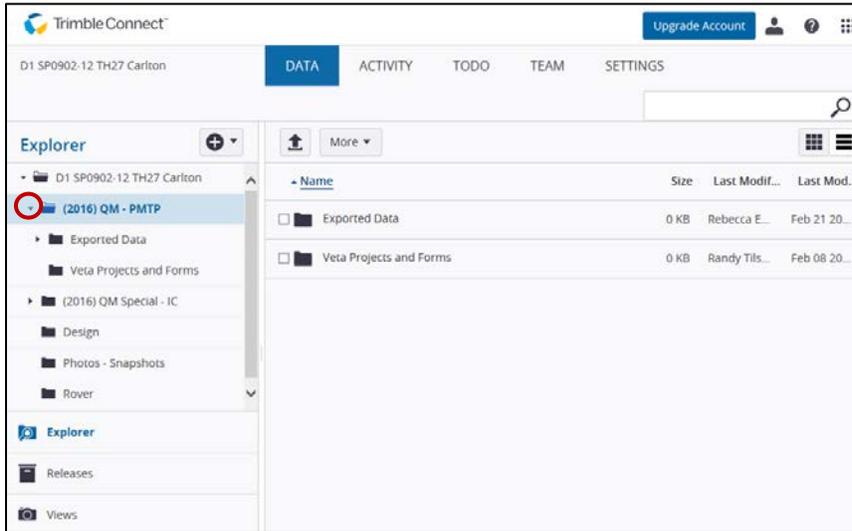


5.3.5 Data Menu

The data menu lists all of the project files with respect to the given folders and subfolders.

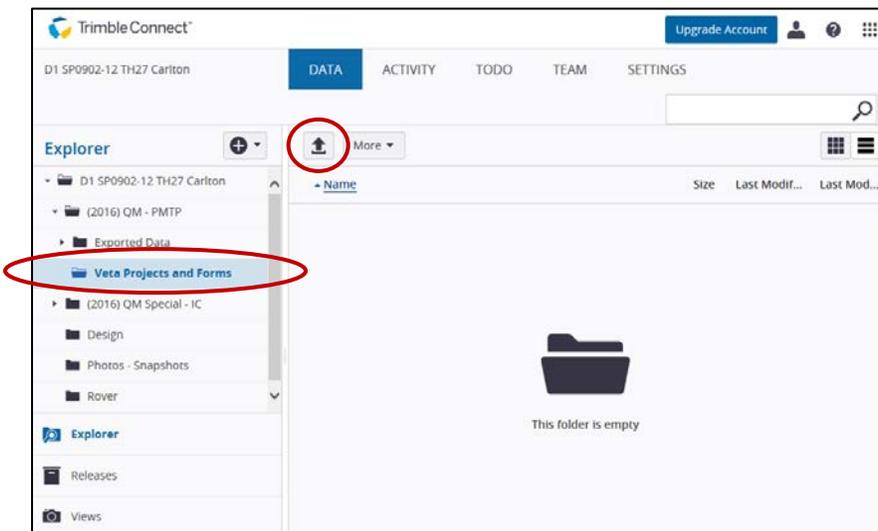
FOLDERS

Select the **triangle** to the left of the folder name to **expand** the given folder and view the corresponding subfolders. **Select** the desired **folder** in the **left or right pane** to open.

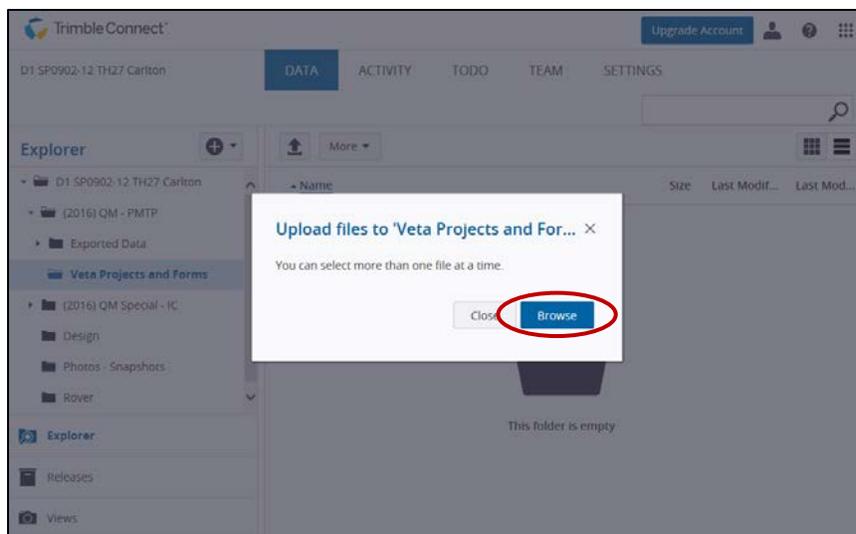


UPLOAD FILE(S)

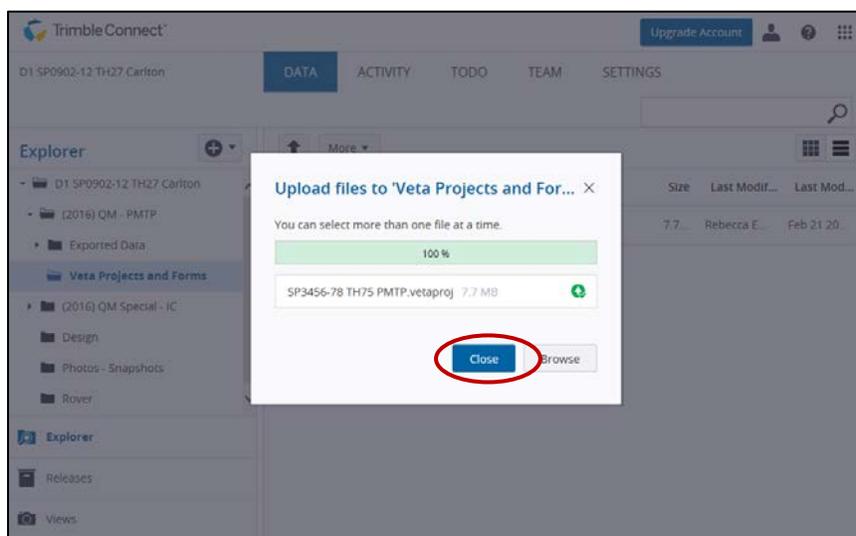
Select the desired **folder** to upload and store given files. **Select** the **Upload Files icon** to start the upload process.



Select **Browse** in the **popup window** to search for the file(s) to be uploaded to Trimble Connect. **Select** the **desired file(s)**.

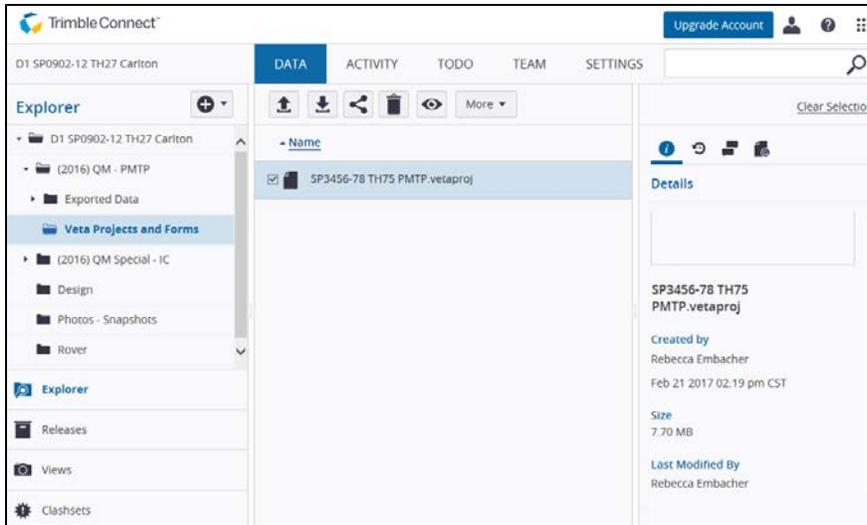


A **popup window** will appear providing a summary of the **upload status**. **Click close** if no further files need to be uploaded to this folder. Please note that files can be moved to other folders by selecting the file with the left mouse button and dragging it into the desired folder.

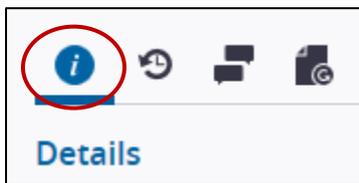


FILE PROPERTIES

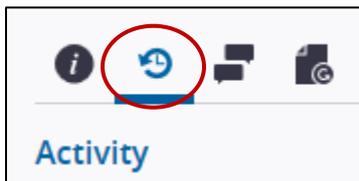
Select (check) the file to view given file property information.



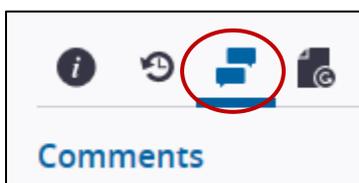
The menu bar in the right pane (after selection of a given file) allows the user to view the following properties:



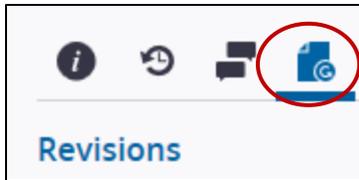
Details – File Name, Creator, File Date, File Size, Modification Information and the ability to add Tags for use with the search engine.



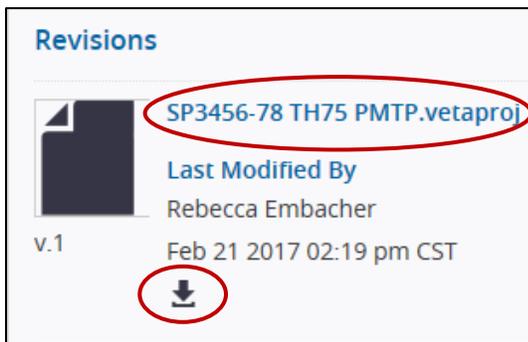
Activity – Provides a listing of the history of actions associated with the given file.



Comments – The user can add any needed comments to the available text box and then **select Add Comment** to save.



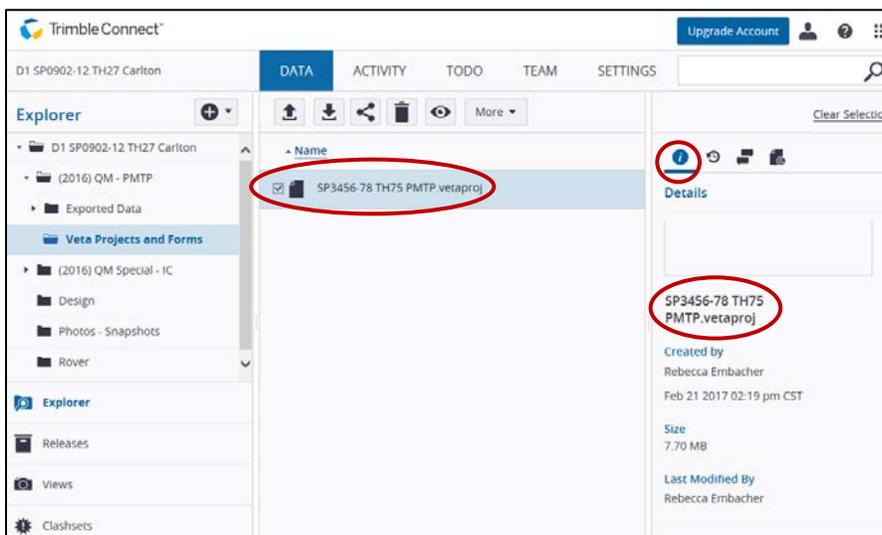
Revisions – All versions of the file are saved in Trimble Connect. The user can view and download the various versions at any time by either selecting the file or selecting the download icon.



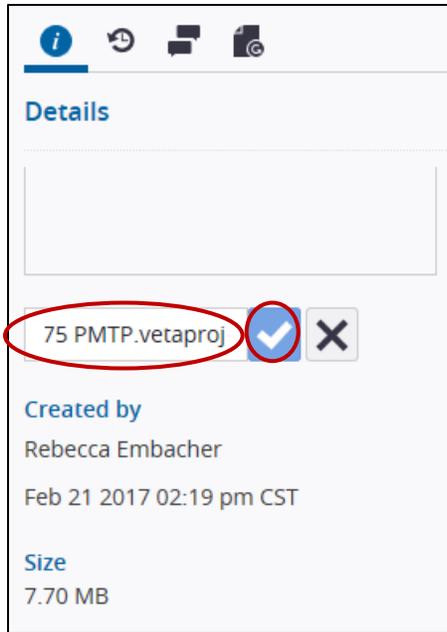
EDIT FILE NAME

File names can be modified after uploading the files.

Select the **file** to be modified. Select the **Details menu** in the **right pane** and then select the **file name** in the **details pane**.

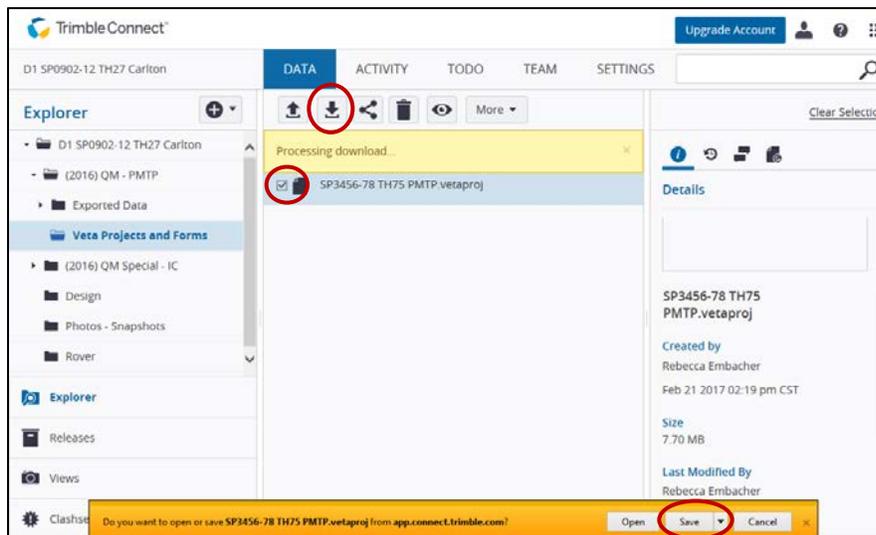


Place cursor in the **text box** (click the left mouse button while hovering over the text box) and **edit** the **file name** accordingly. Select the **check box** to save changes. Select the **X** to **cancel changes**.



DOWNLOAD FILE

Select the **file** to download. Select the **Download icon** to begin download process. A **message** will appear below the download icon to indicate the process has started.

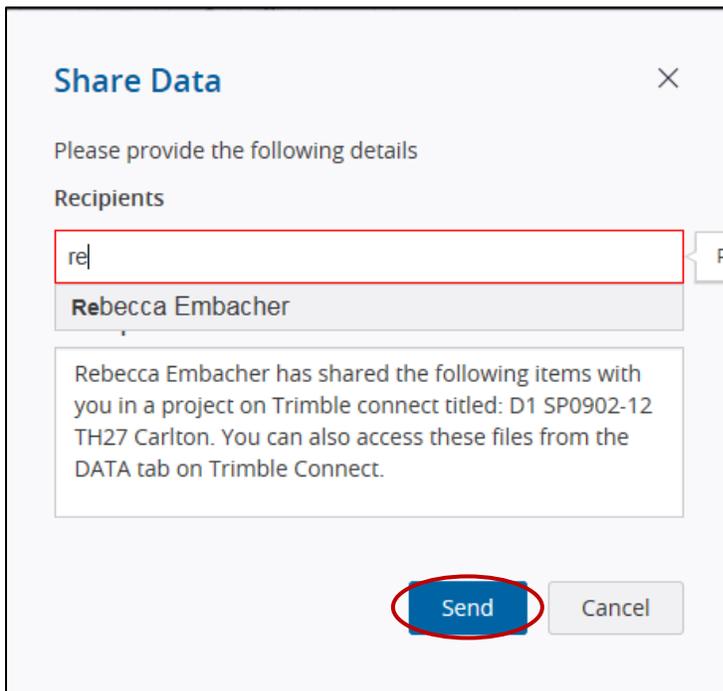
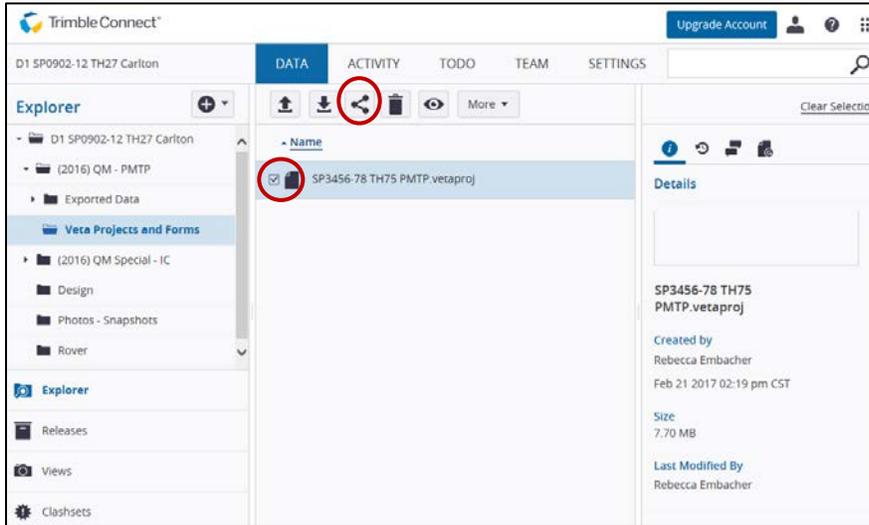


Select **save as** from the dropdown menu and **browse** to the desired file storage location and then select **save**.

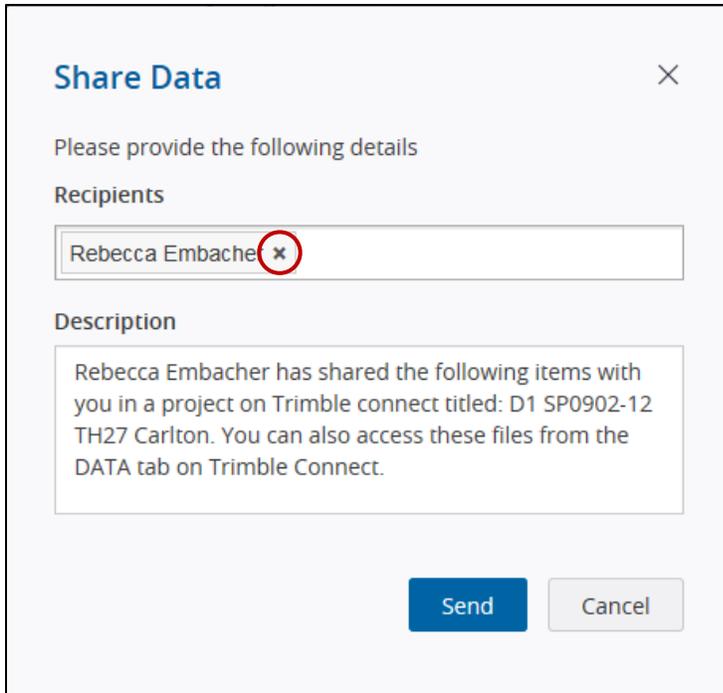


SHARE FILE

Share allows the user to notify other users that a new file was added to the Trimble Connect project. **Select the file** to share. **Select the Share icon** to share the file with another user. A popup window will appear. **Type** in the **name** of the desired recipients. The names should populate below as the user is typing. **Select the name auto-populated** in the list. **Add additional recipients** as needed. **Select Send.**

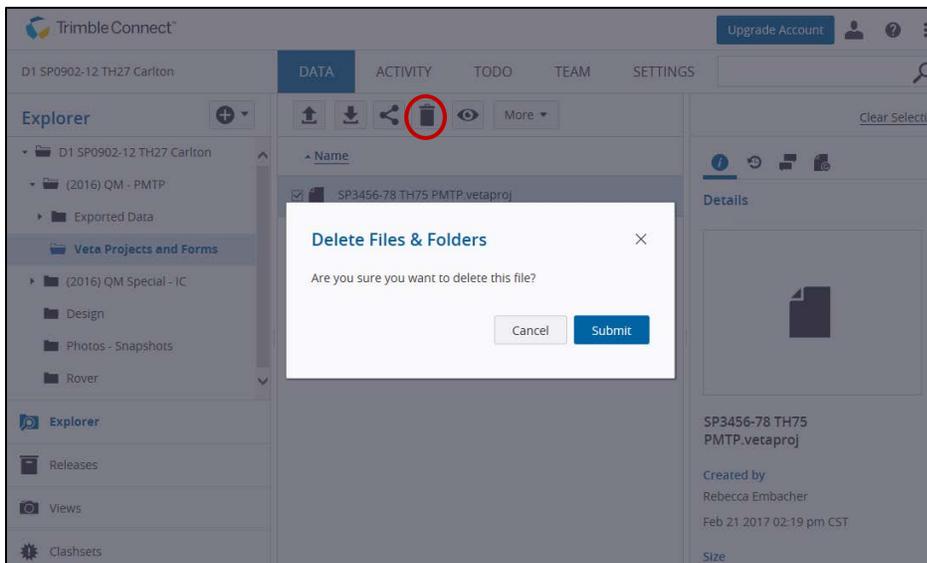


Delete a name from the **recipient list** by **selecting** the **X** next to the given name.



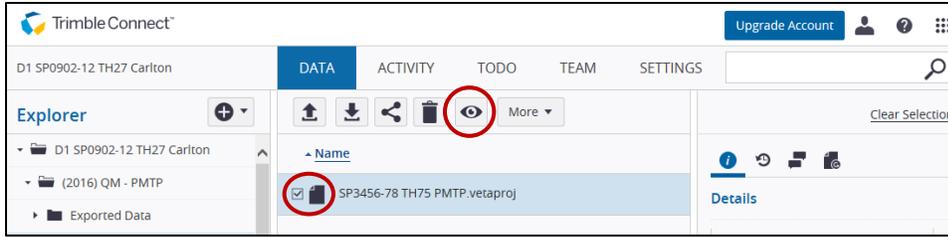
DELETE FILE

Select the **file** to delete. Select the **Delete icon**. A popup window will appear to confirm whether or not the file is deleted.



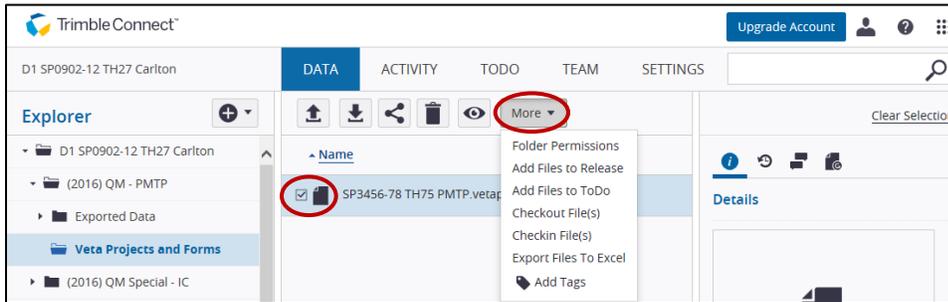
VIEW

The view icon will allow the user to view given file types within Trimble Connect. The Trimble team plans to add additional file formats into this viewer over time. Please note that Veta projects cannot be viewed directly in Trimble Connect.



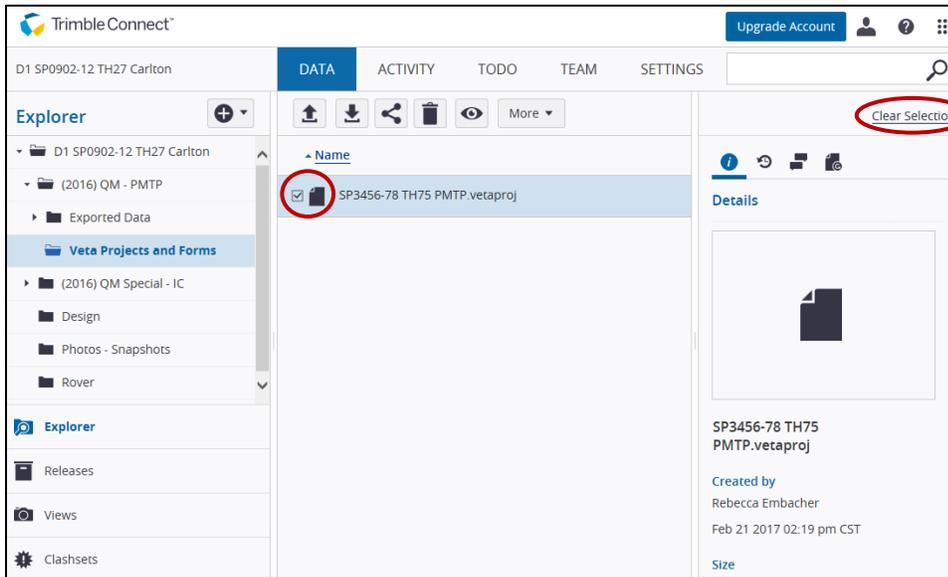
MORE

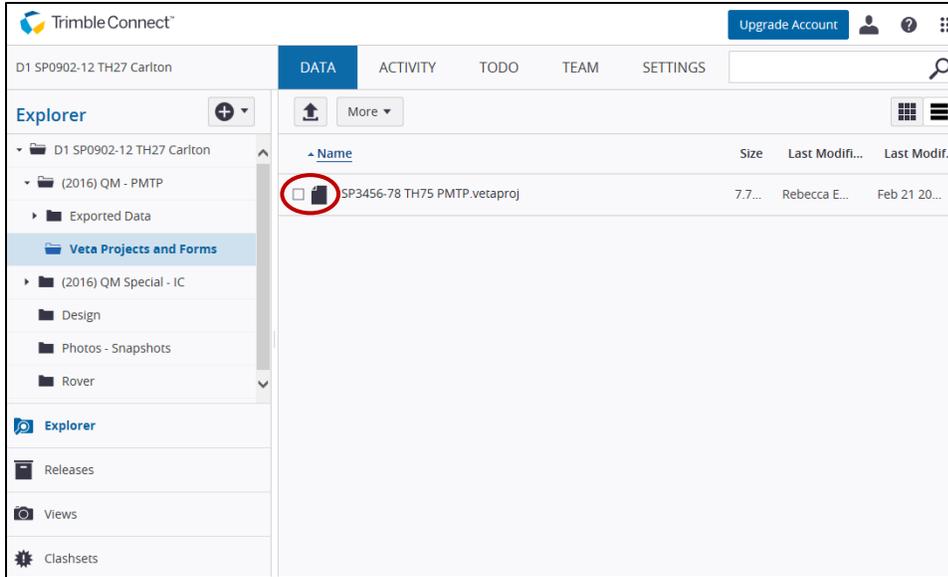
The More icon allows the user to complete additional actions, such as checking in and out files, etc.



CLEAR SELECTION

Select clear selection at any time to **deselect all file(s)** that have been selected.





5.4 TRIMBLE ROVER – FEATURE CODE LIBRARY

The intelligent compaction technology requires the Engineer to collect the four boundary coordinates for each lot as defined by the special provision. A feature code library has been created to assist with the required standardized naming convention used to establish lots. Additionally, this library contains attributes for the standardized naming of quality assurance / quality control test locations (e.g., core densities, nuclear gauge, etc.).

5.4.1 Download of Feature Code Library

The feature code library is available for download from the Advanced Materials and Technology website at: <http://www.dot.state.mn.us/materials/amt/forms.html>.

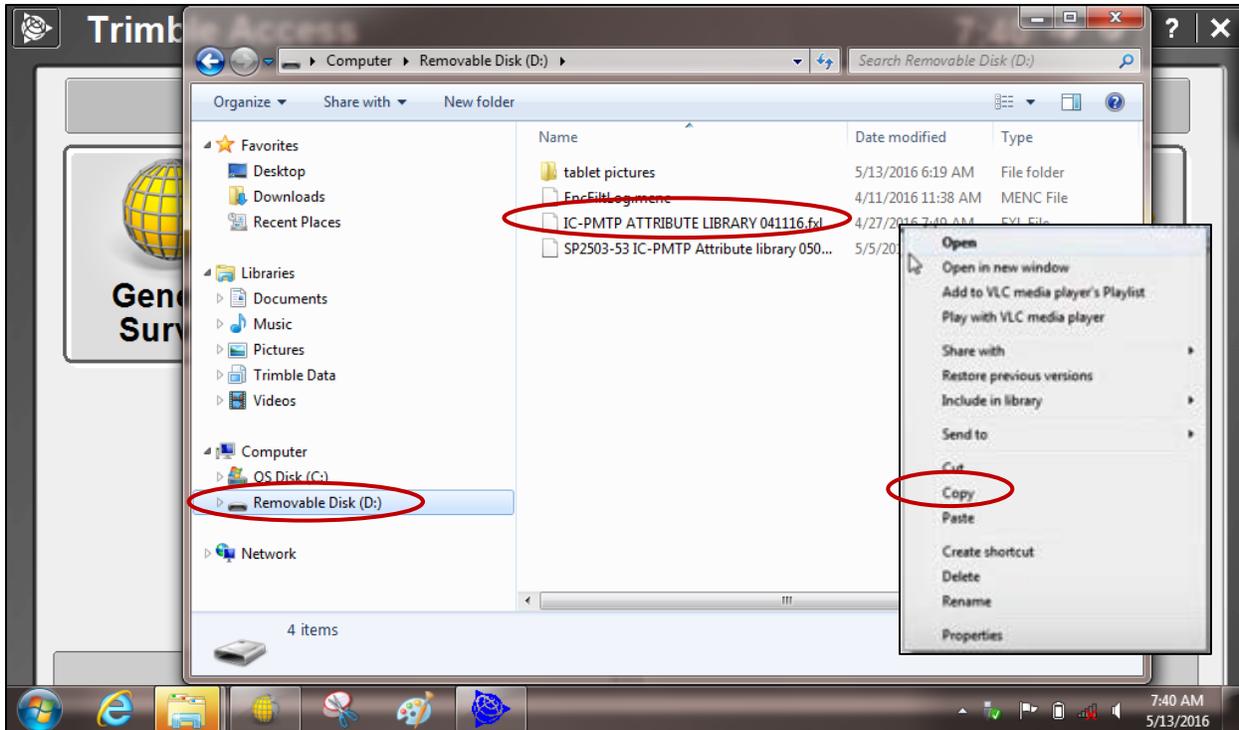
5.4.2 Installation of Feature Code Library (Tablet)

Copy the downloaded feature code library to a removable media device (i.e., USB thumb drive).

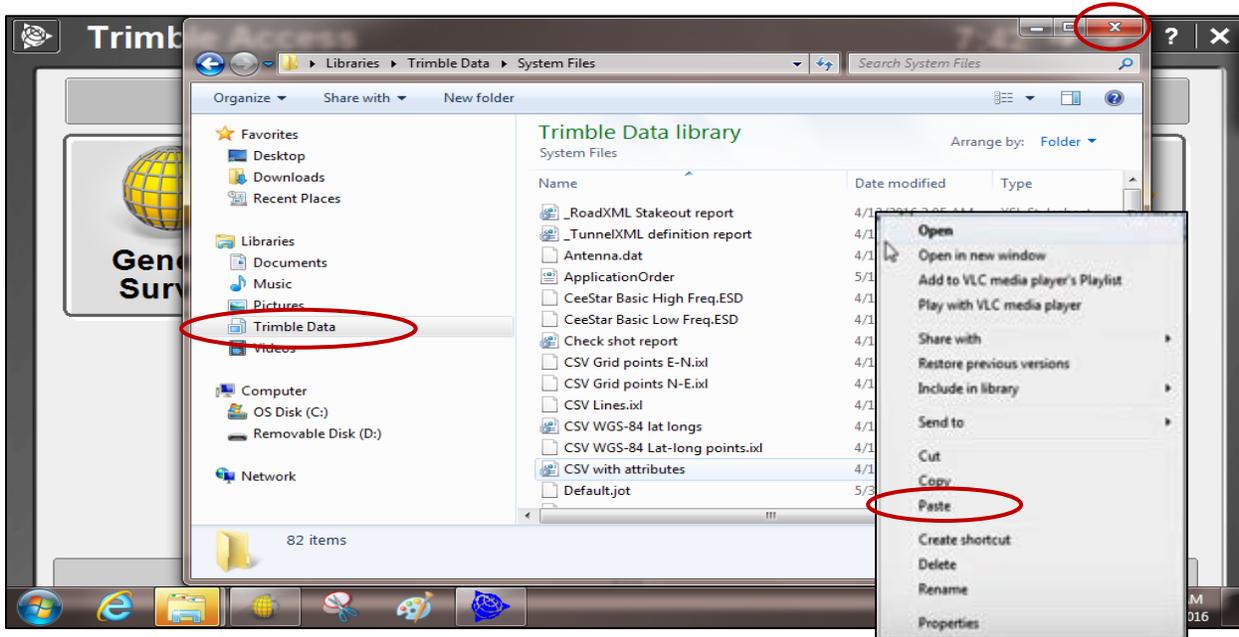
Open Trimble Access on the tablet and **select** the **Files icon**. A Windows Explorer Window will then open.



Navigate to the **Removable Disk** to locate the Feature Code Library File. **Tap and hold** on the **file** for a short period and select **copy** from the popup menu.



Navigate to **Trimble Data > System Files**. Tap and hold on the screen for a short period of time and select **paste** from the popup menu. Exit **Windows Explorer** by selecting the “x” in the top right corner after pasting the feature code library into the System Files folder.

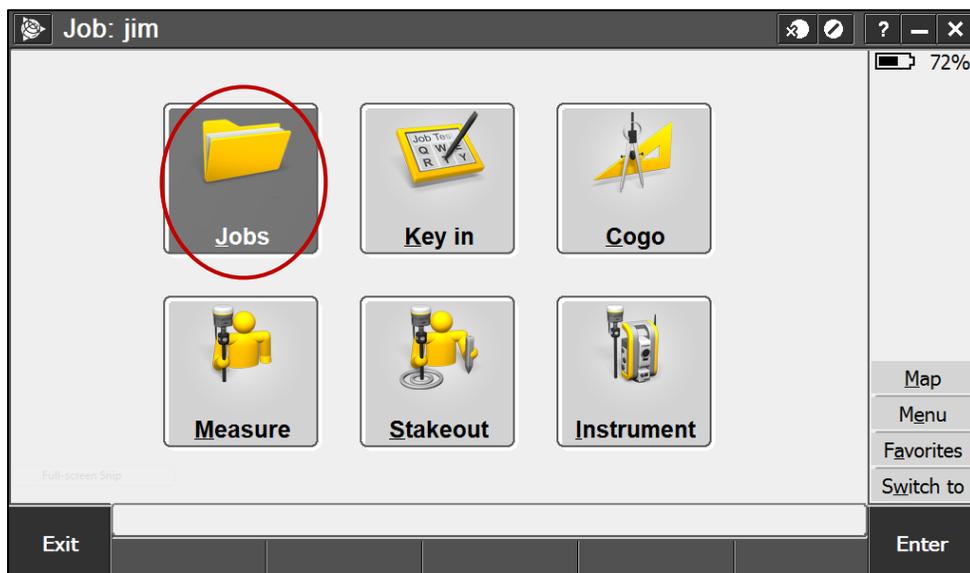


5.4.3 Setup Job Properties

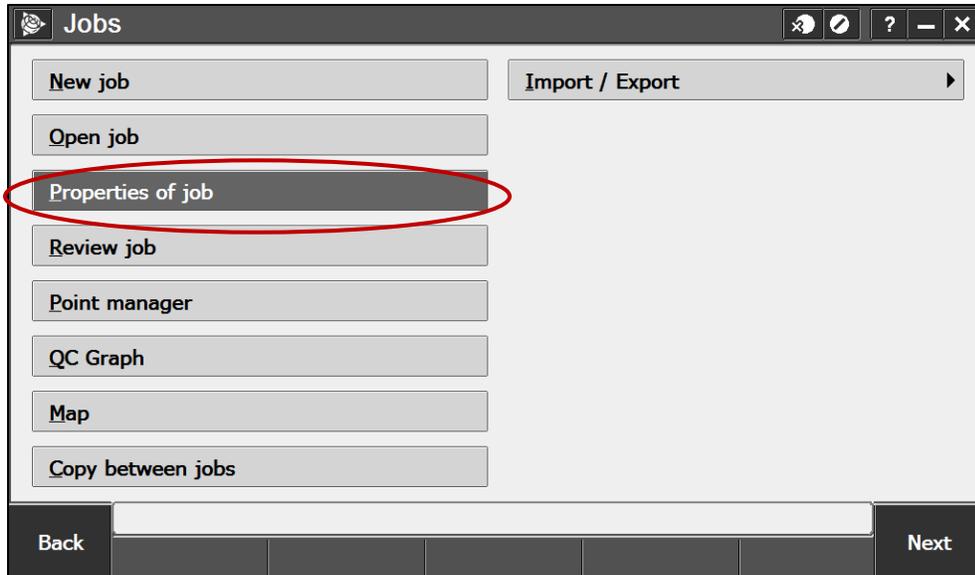
The user can modify the coordinate system used, units of measure and add the feature code library to a desired job through Trimble Access. **Open Trimble Access** on the tablet and **select the General Survey icon**.



Select the **Jobs icon** from the General Survey panel.

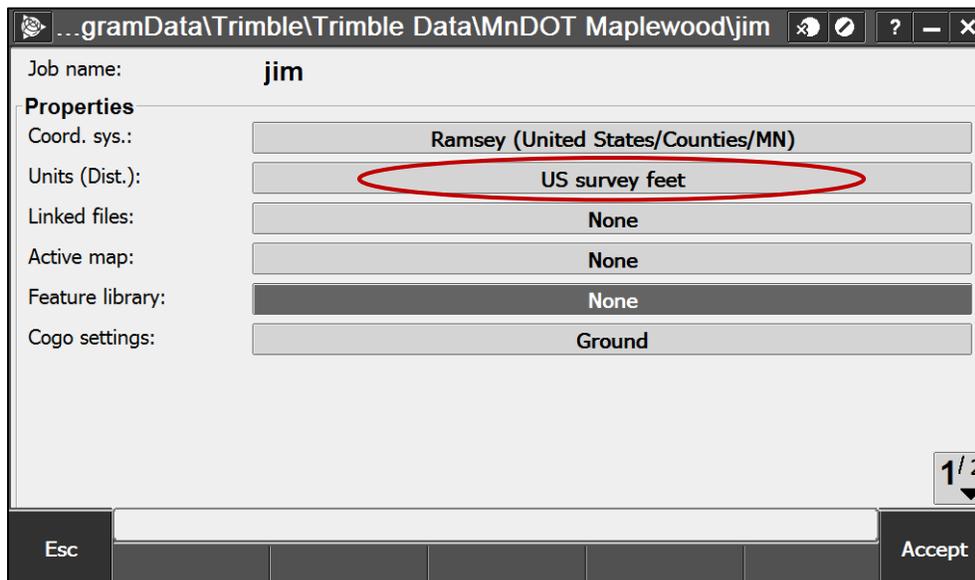


Select **Properties of Job** from the Jobs panel.

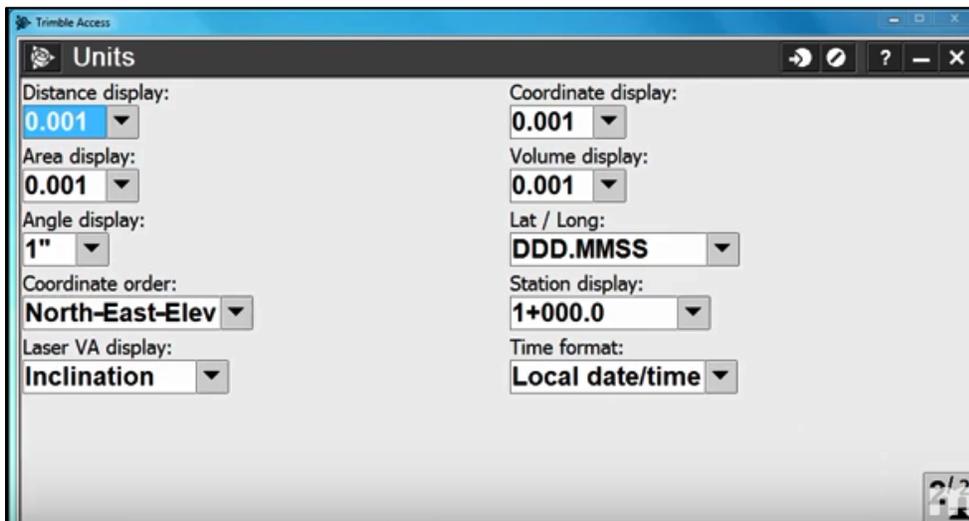
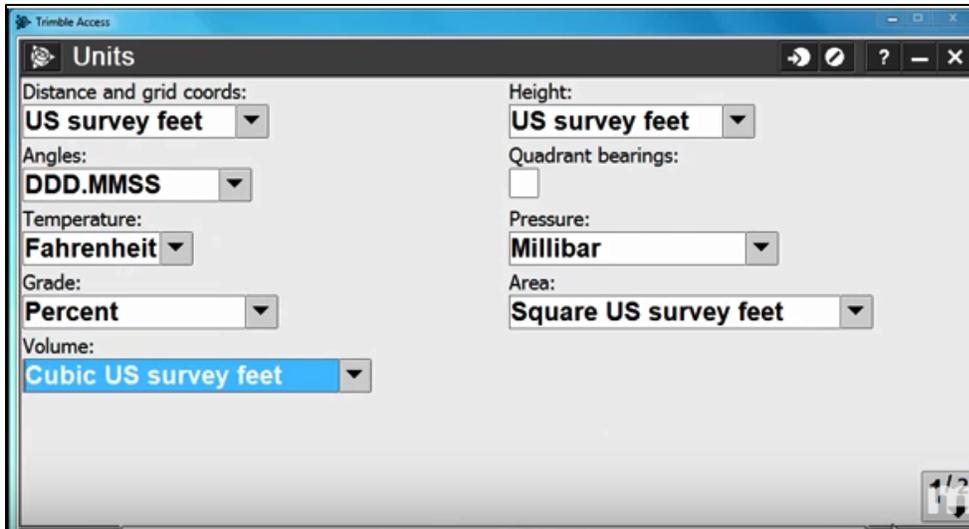


Units

Select **Units** from the Properties of Job panel.

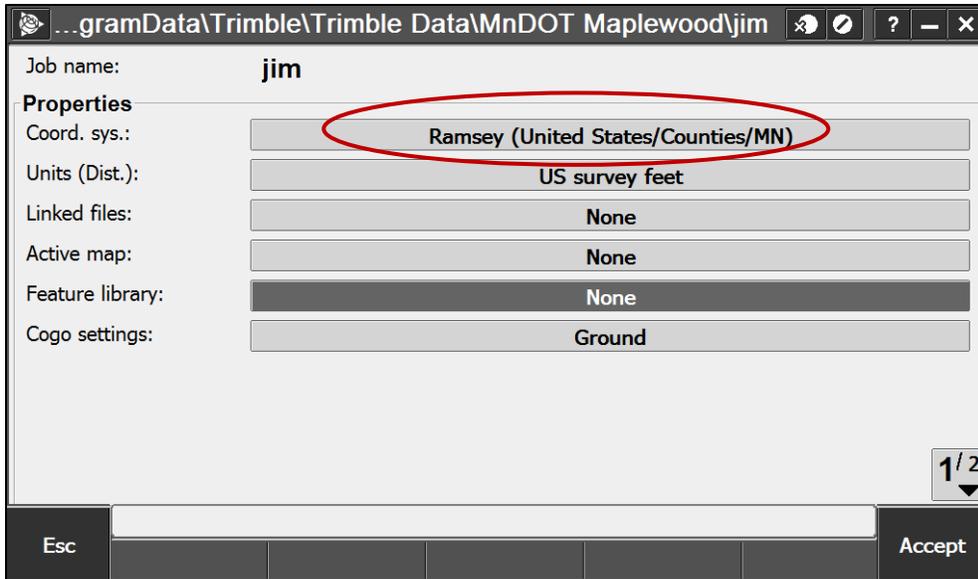


Update the units to English units using the dropdown menus. See images below for the final settings in Units panels 1 and 2.

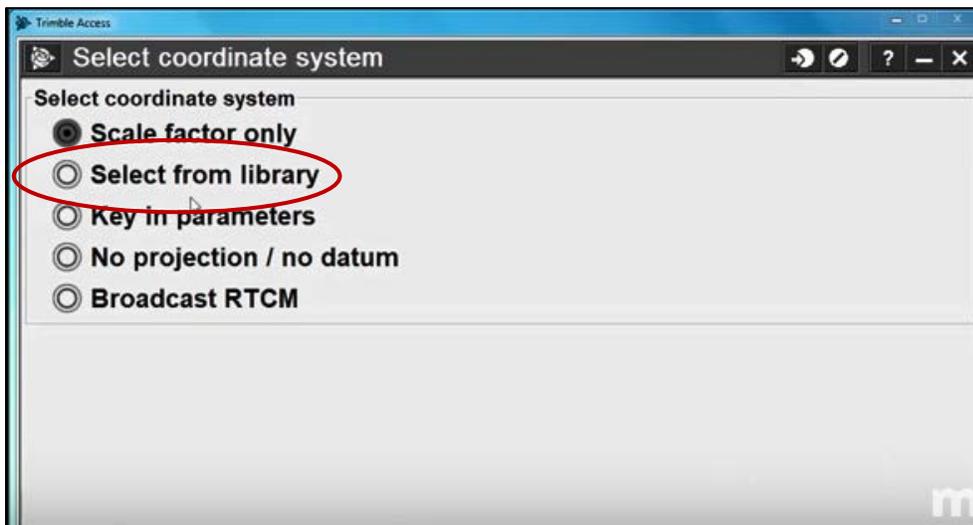


Coordinate System

Select **Coord. Sys.** from the Properties of Job panel.



Select “Select from Library” from the Coordinate System panel.

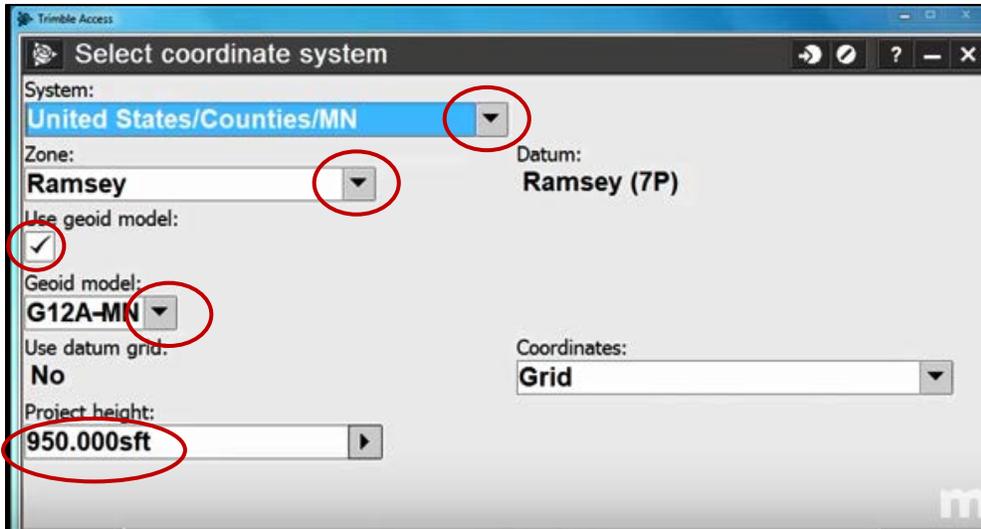


Select United States/Counties/MN from the System dropdown menu.

Select the desired County from the Zone dropdown menu.

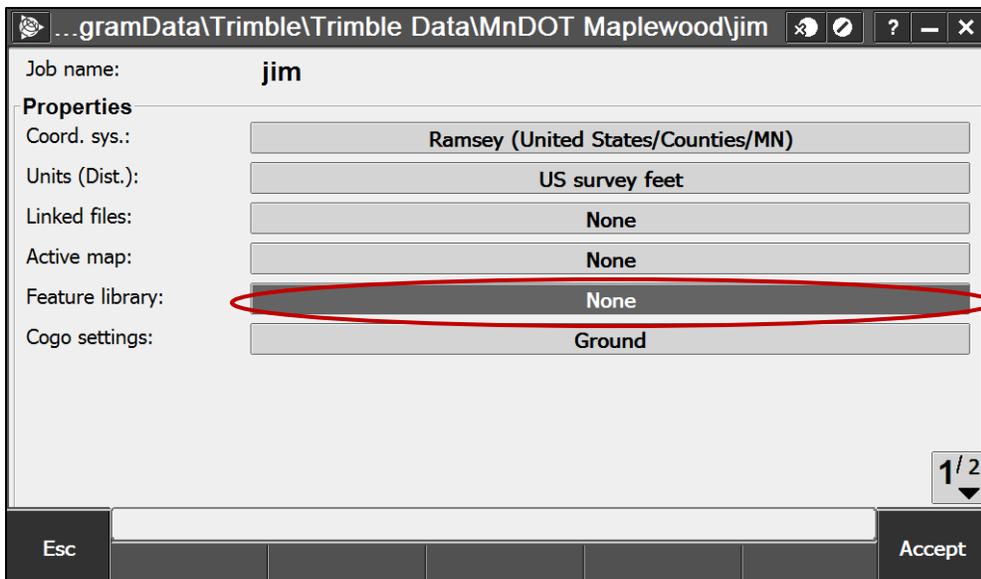
Check box for Use Geoid Model. Select the geoid model from the dropdown menu.

Enter the project height.

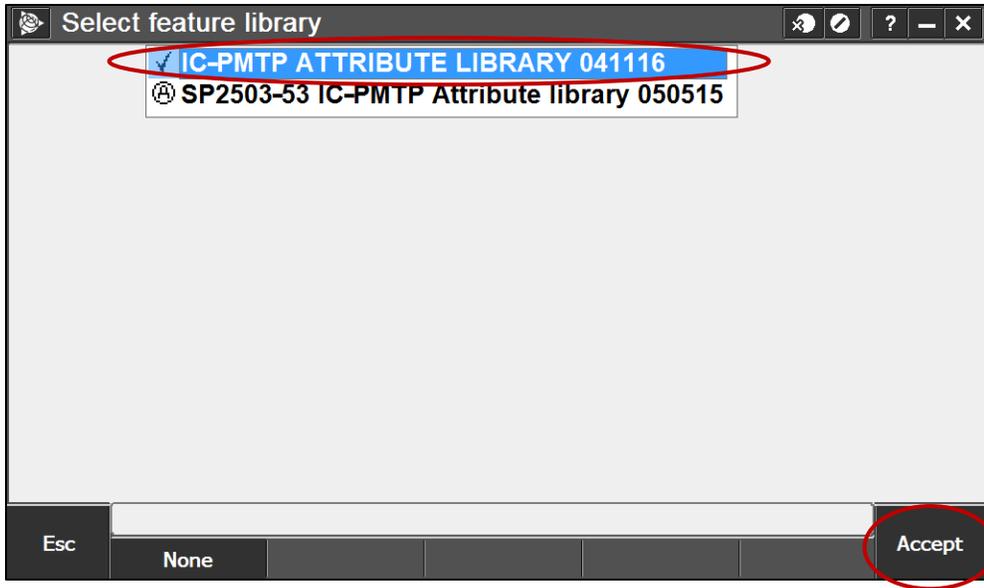


Attaching Feature Code Library to Job

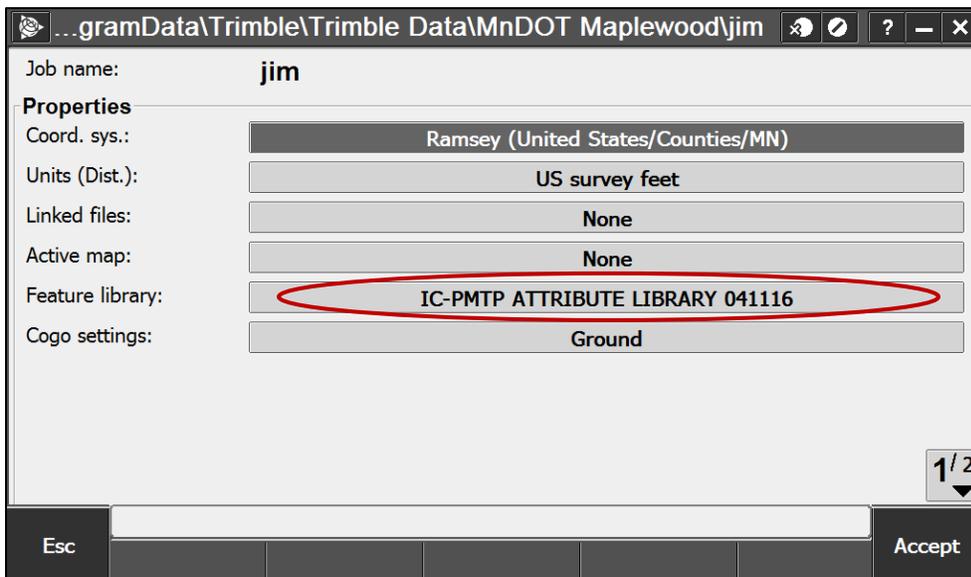
Select **Feature Library**, from the Properties of Job panel, to add desired library to this job.



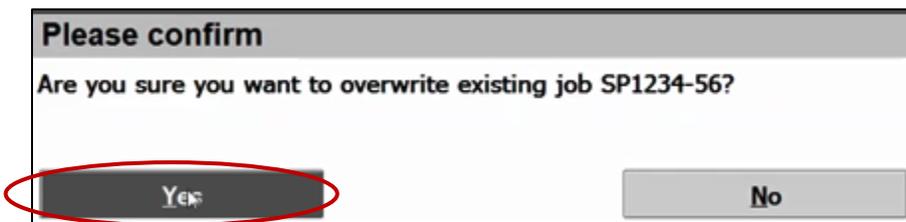
Select the **Feature Library** to be added to this job. **Select Accept.**



The recently added feature code library will now appear in the properties panel.



Select **Yes** to overwrite the existing job with these changes.

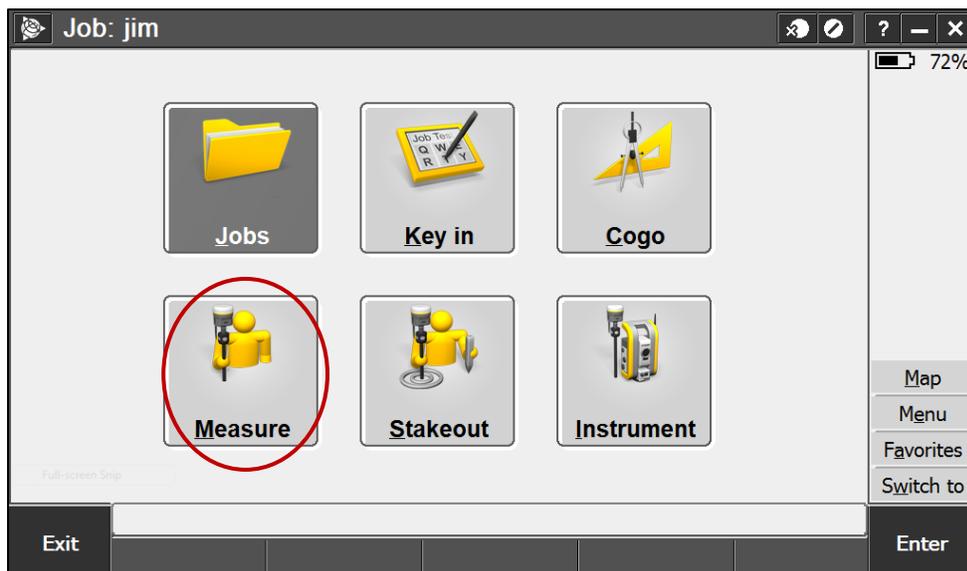


5.4.4 Storing Measurements Using Feature Code Library

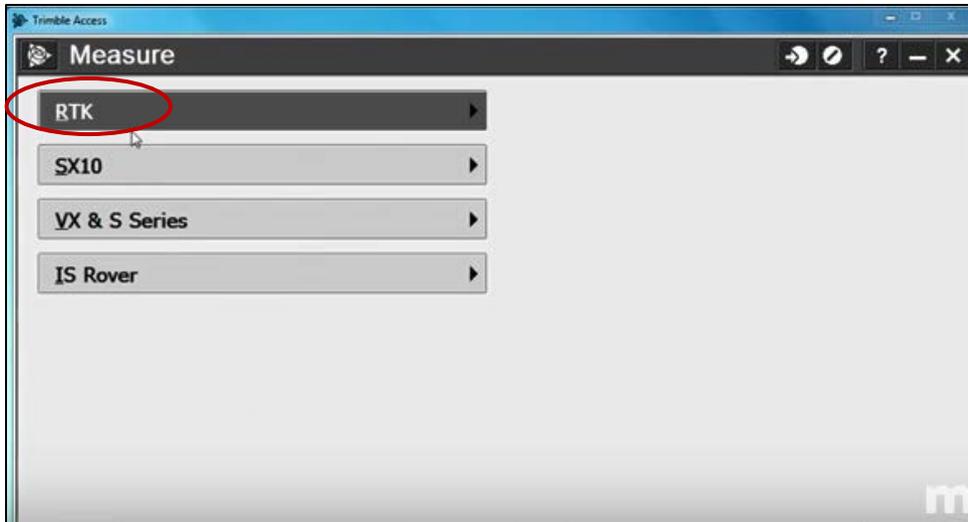
Open Trimble Access on the tablet and select the **General Survey** icon.



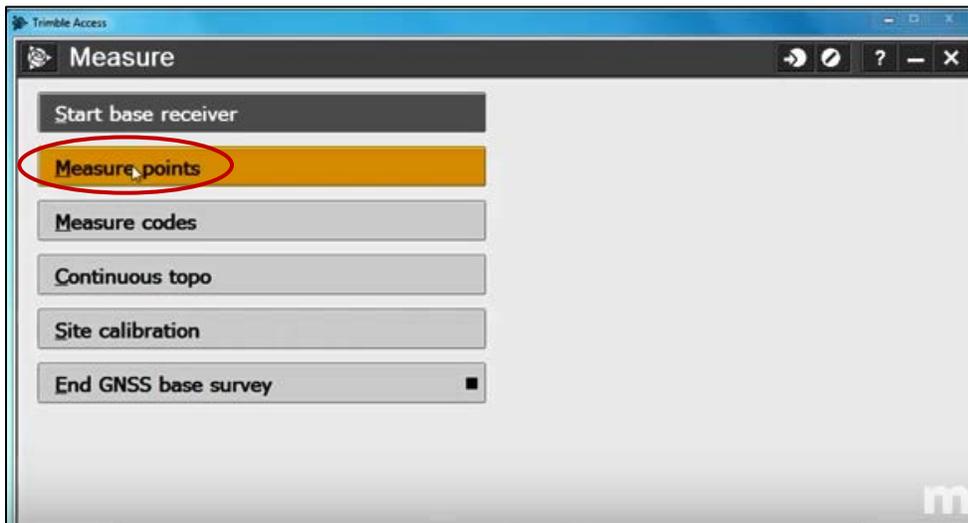
Select the **Measure** icon from the General Survey panel.



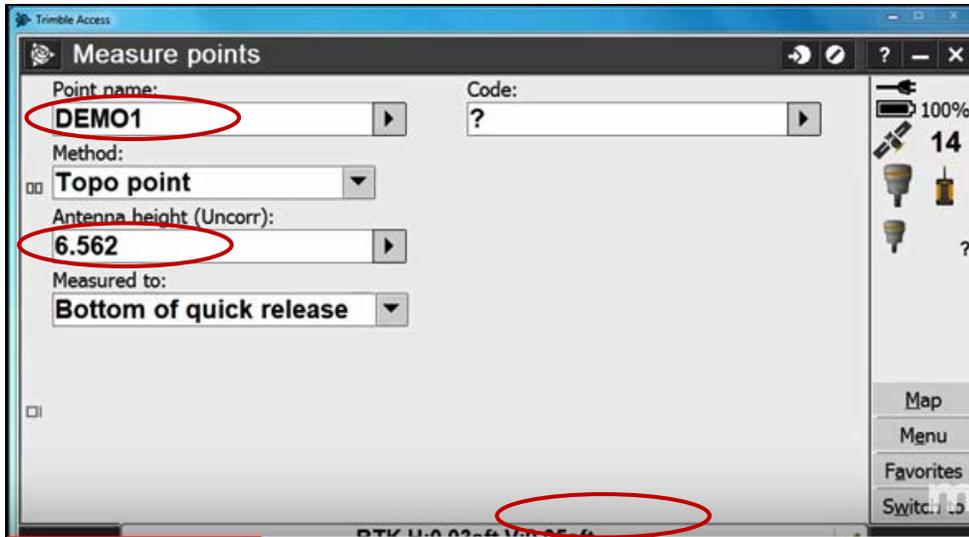
Select **RTK** from the Measure panel.



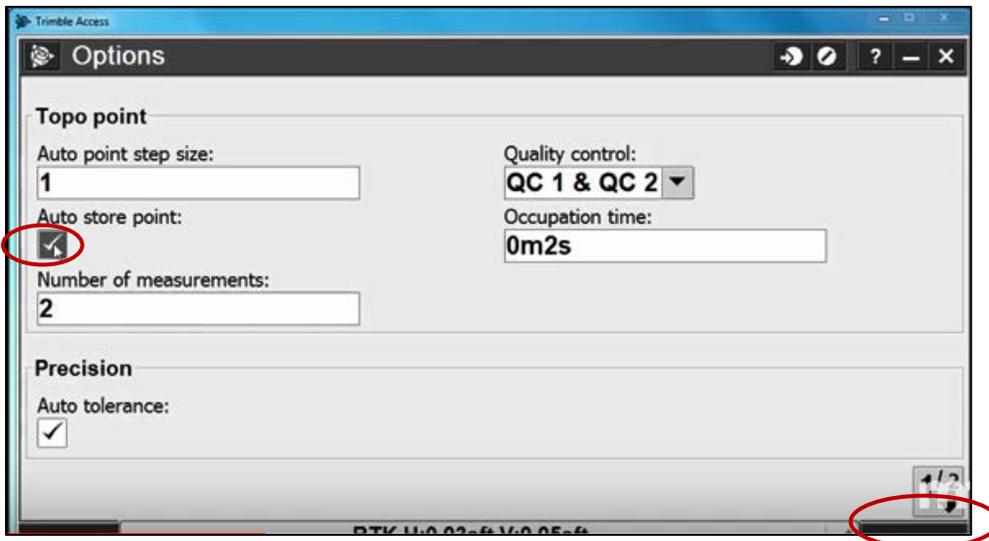
Select **Measure Points** from the RTK panel.



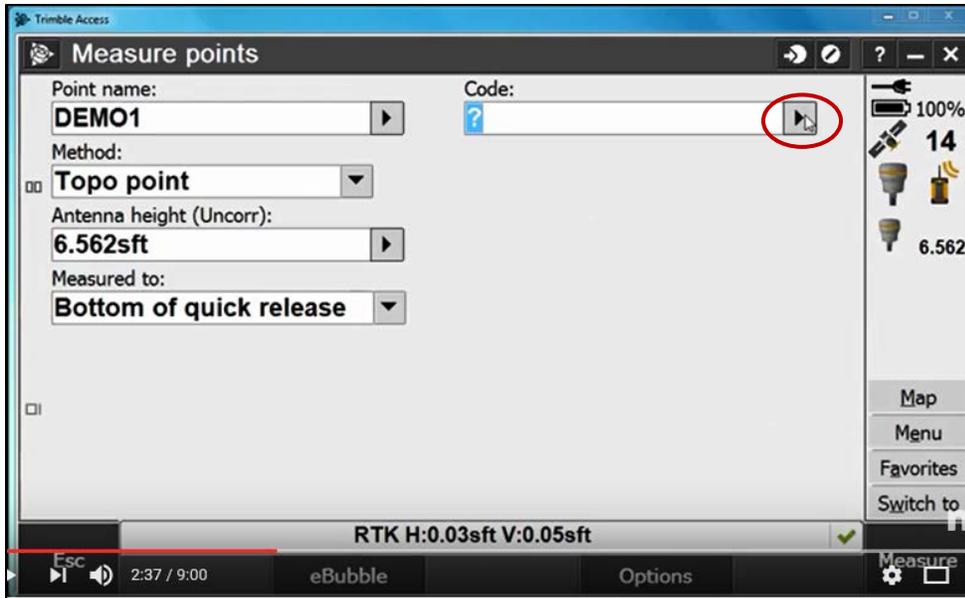
Enter the **Point Name** and **Antenna Height**. Select **Options** at the bottom of the panel.



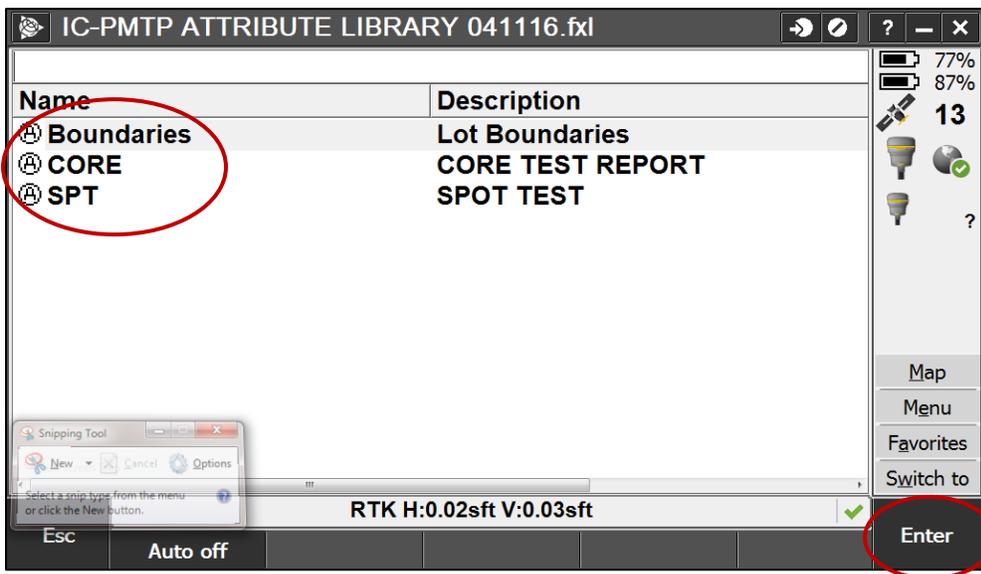
Check **Auto Store Point** on the **options panel**. Select **Accept**.



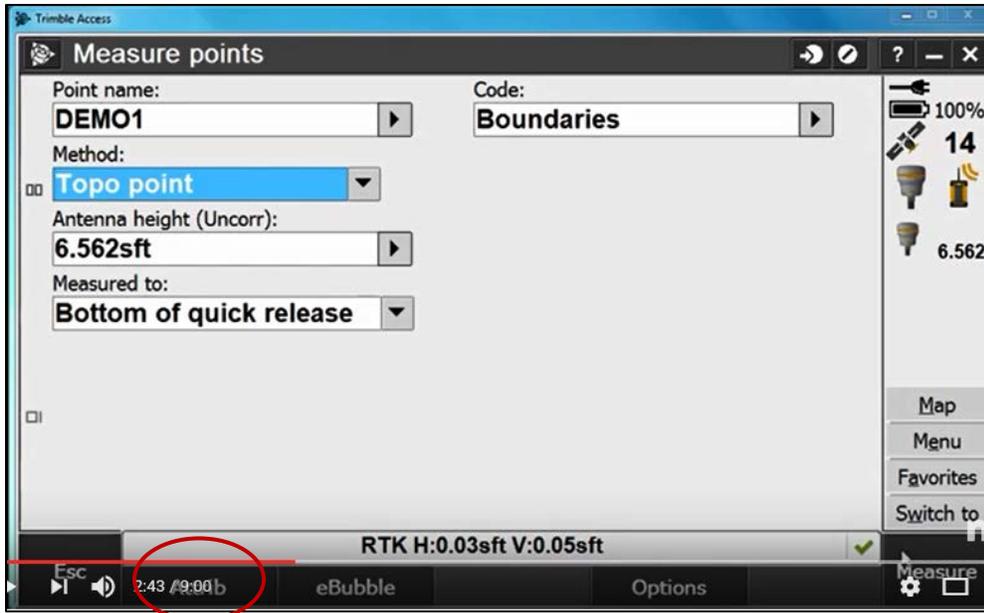
Select the dropdown menu for **Code** from the **Measurement Points** panel.



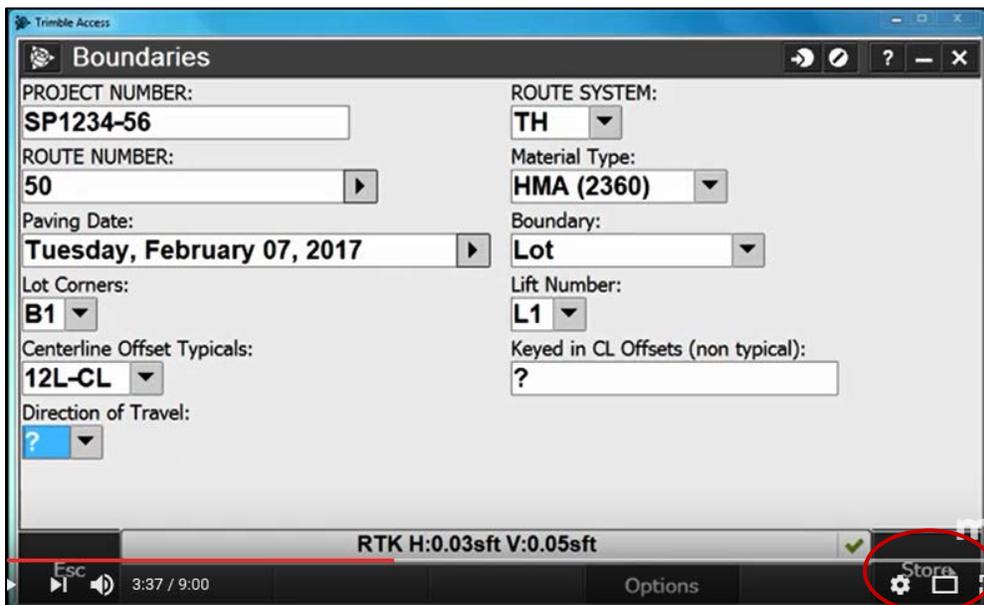
Select the desired Attributes library and then select Enter. See subsections below for descriptions of each attribute library.



Select **Attrib** from the bottom menu options.

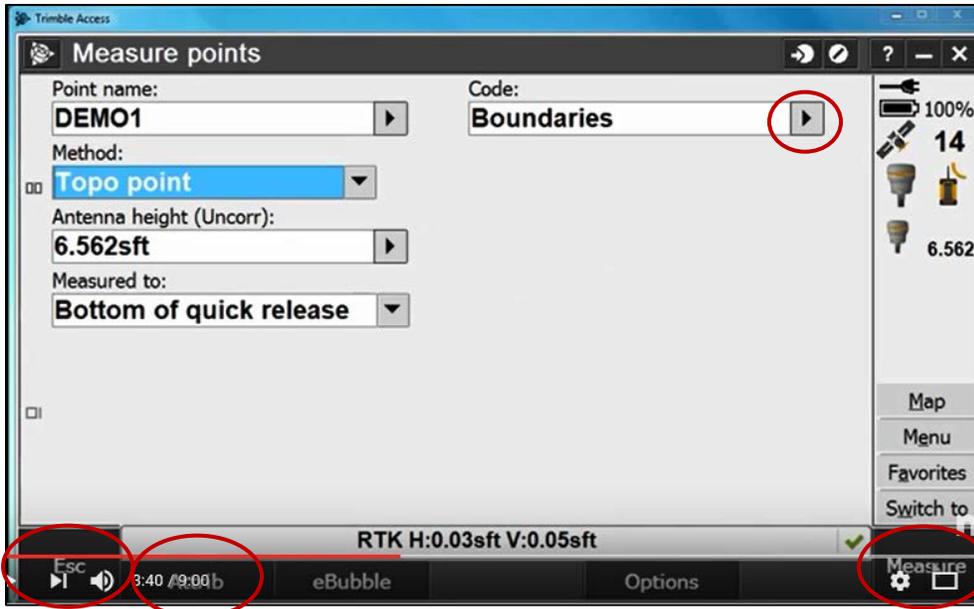


Complete the **attributes** library accordingly. **Select Store** to save the completed information.



Select Measure to capture the coordinates for the given location. **Repeat** this **process** for the collection of additional points using this library (1. Update Point Name; 2. **Select Attrib** to **enter** the information for the **next point**; 3. **Select Store** to save information; 4. **Select Measure** to capture coordinates). Reminder: **Select Code** to use a **different attributes library**.

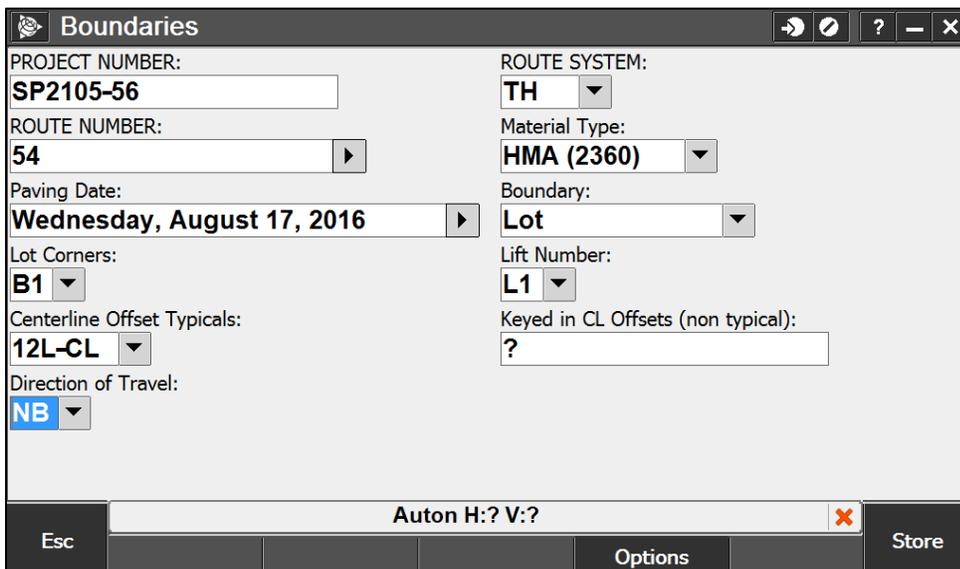
Select Esc to exit the Measurement Points panel.



BOUNDARIES ATTRIBUTE LIBRARY

This attributes library is used when collecting the four coordinates for a given lot boundary.

Additional details related to the boundary and lot corners attributes are discussed below. See (2016 Quality Management Special – Intelligent Compaction Method (Table 2016-7 [IC])) for additional details regarding the other attributes used in this library.



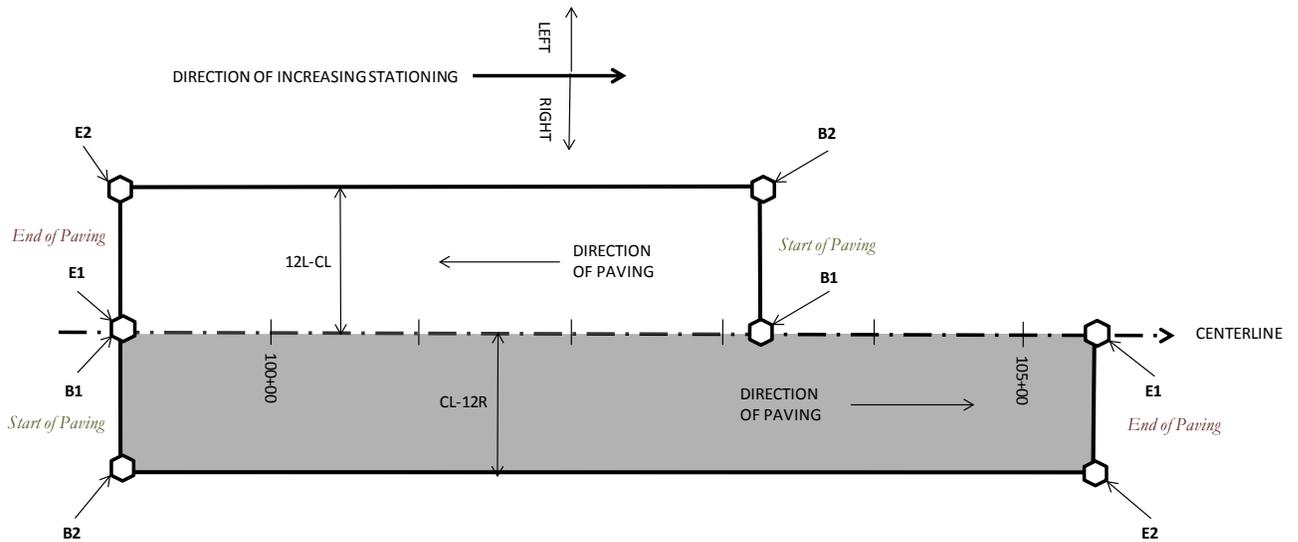
Boundary Attribute

The dropdown for the Boundary lists **Lot** and **Corrective Action**. **Select Lot** when capturing the 4 boundary coordinates for establishment of the lot. Collection of these coordinates are *required* with the IC method. **Select Boundary** when capturing the boundary coordinates of an area requiring

corrective action. Collection of these coordinates is *optional* with the IC method. This information is used for specification refinements.

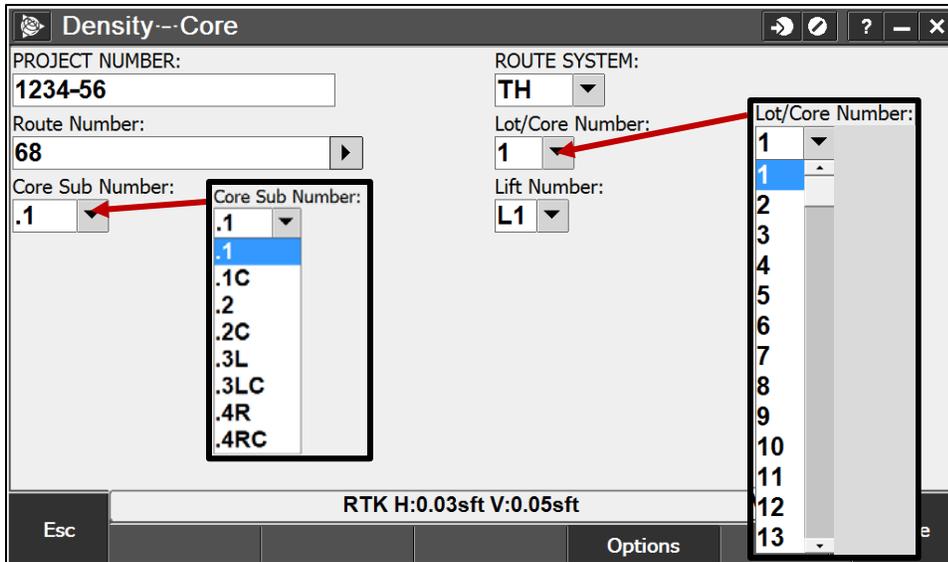
Lot Corners

The diagram below illustrates the locations of the lot corners (B1, B2, E1, E2). Please note, that the “B” designation needs to be at the start of paving and the “E” designation at the end of paving. The subsequent numbers of 1 or 2 can be interchanged as being either the left or right edge of the compaction area requiring the technology (e.g., B1 can be used for the edge of pavement and B2 as the centerline location).



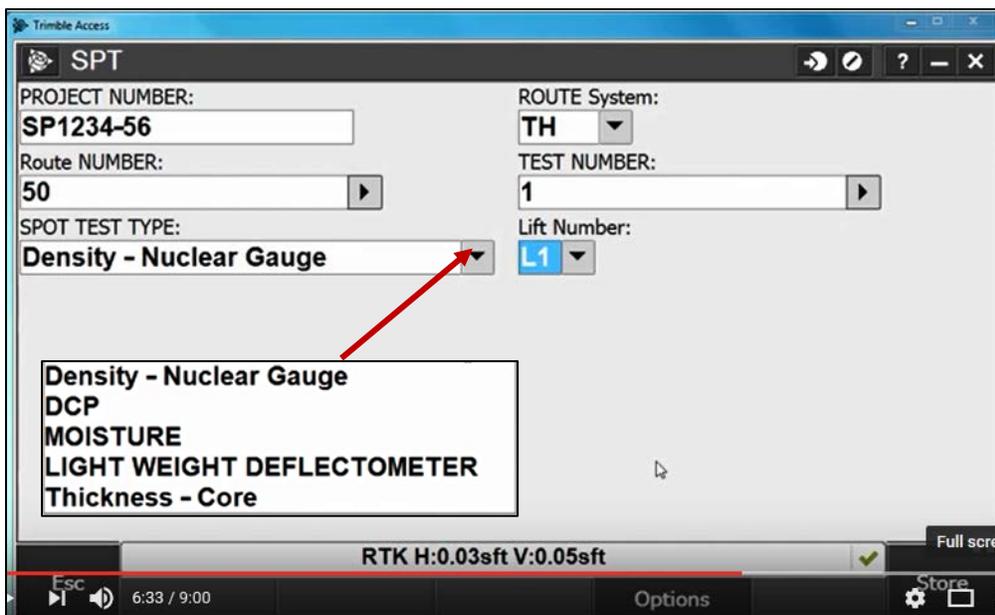
DENSITY – CORE ATTRIBUTE LIBRARY

This attributes library is used when measuring the location of cores used for density measurements. Ensure that the Lot/Core Number and Core Sub Number match the core number for the core taken from the given location (e.g., 1.1, 1.2C, etc.).



(SPOT TEST) SPT ATTRIBUTE LIBRARY

This attributes library is used when measuring the location of all other quality assurance / quality control test locations (i.e., test types other than core densities [e.g., nuclear gauge, light weight deflectometer, moisture, etc.]). Ensure that the Test Number matches that used for the spot test on the given testing form.

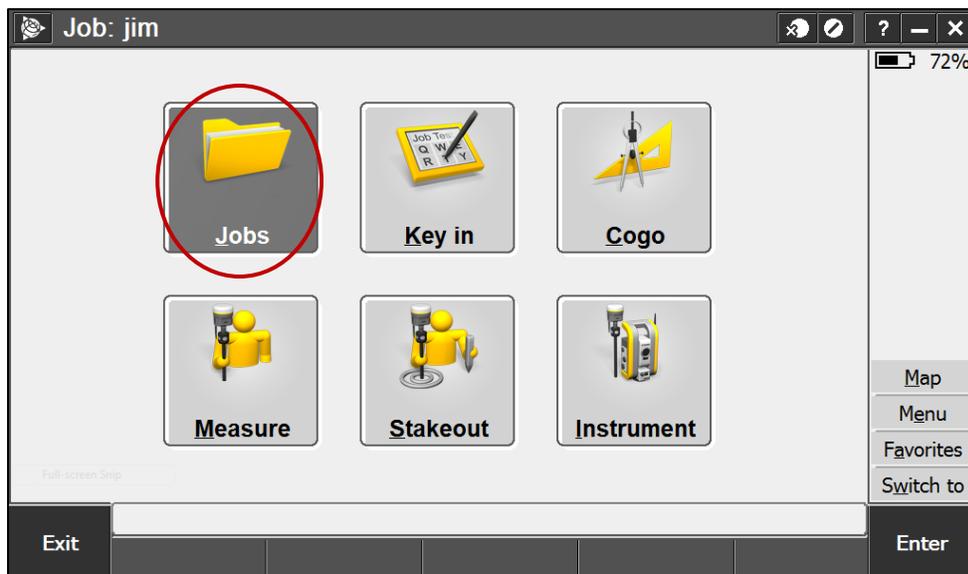


5.4.5 Exporting Coordinates

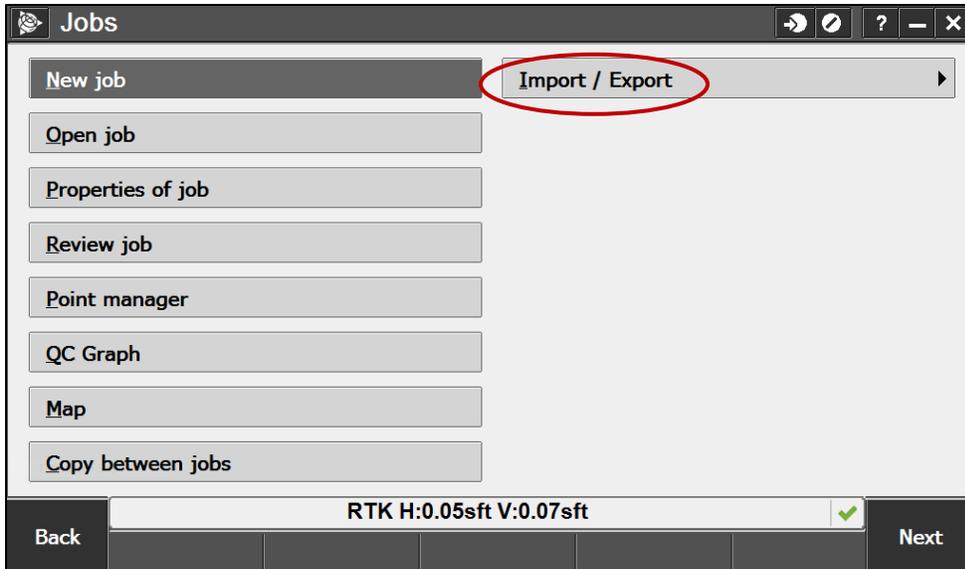
Open Trimble Access on the tablet and select the **General Survey** icon.



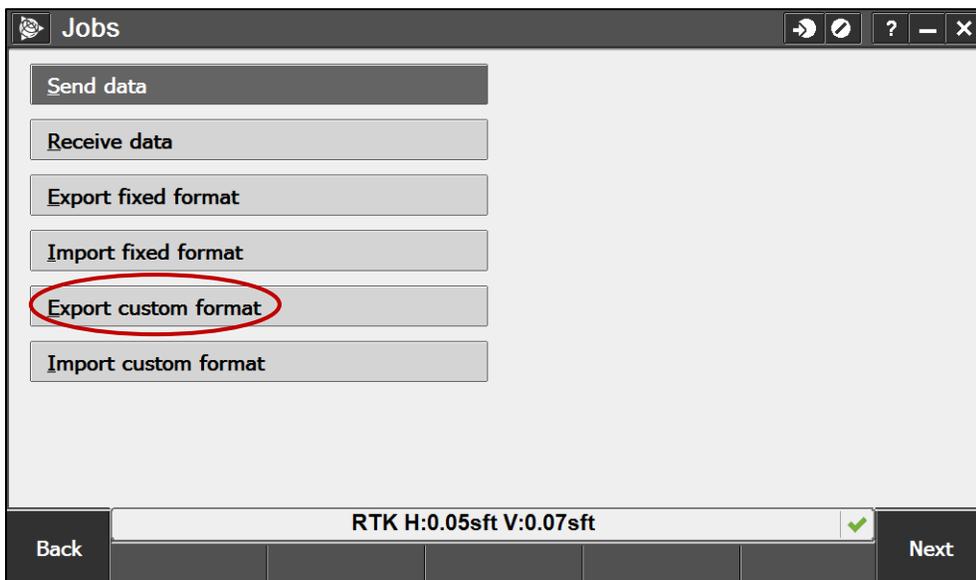
Select the **Job** icon from the General Survey panel.



Select **Import / Export** from the Job panel.

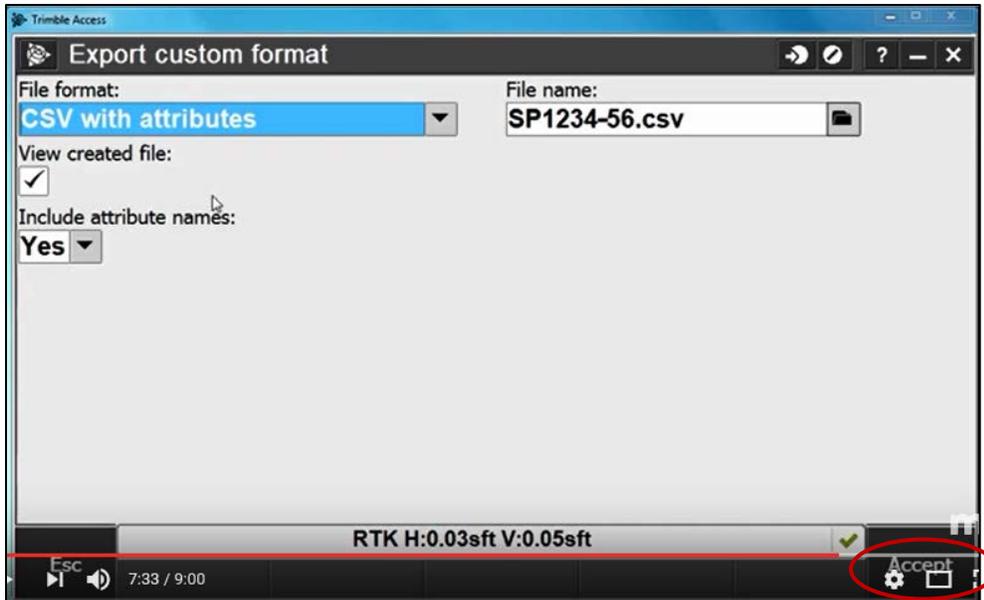


Select **Export Custom Format** from the Import/Export panel.

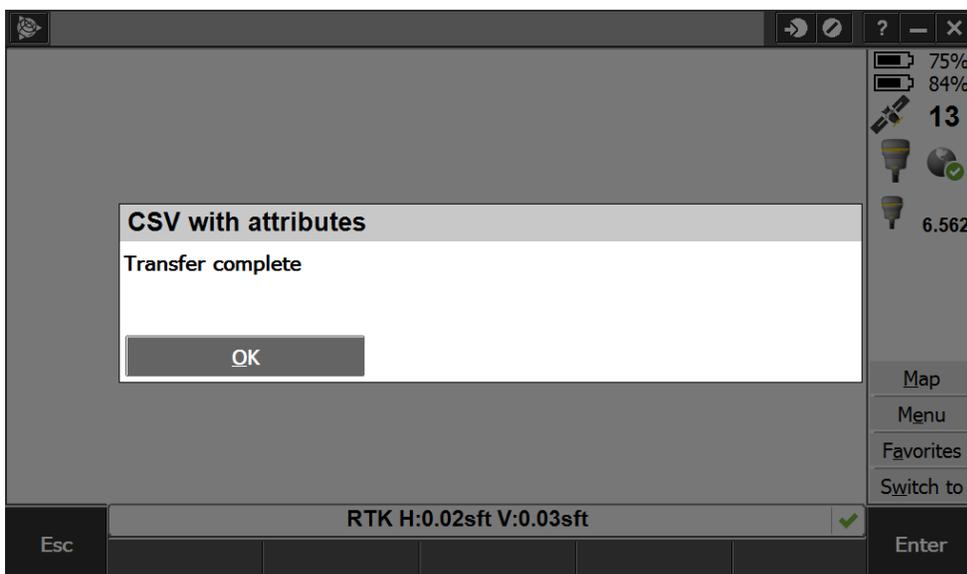


Select the following information in the Export Custom Format panel:

- (1) **CSV with Attributes**
- (2) **Browse to location** to store file and **enter File Name**. Include SP number, route number and export date (in MMDDYY format) in the file name (e.g., **SP1234-56 TH78 071217**).
- (3) **Uncheck View Created File** unless using Trimble Access 2016.
- (4) **Select Yes** from the **Include Attribute Names** dropdown menu. The attribute names are needed for the import feature in forms IC-105, IC-106 and IC-107 to work correctly.



A popup window will appear indicating the completion of the file transfer. **Select Exit** to leave Export panel.



Select Accept. Transfer file to a removable media device (i.e., USB thumb drive) and import coordinates into forms IC-105, IC-106 and/or IC-107. Please note that by default, the files are stored in the **Trimble Data>Username>Export folder** if a given directory was not browsed to and selected during creation of the export file.