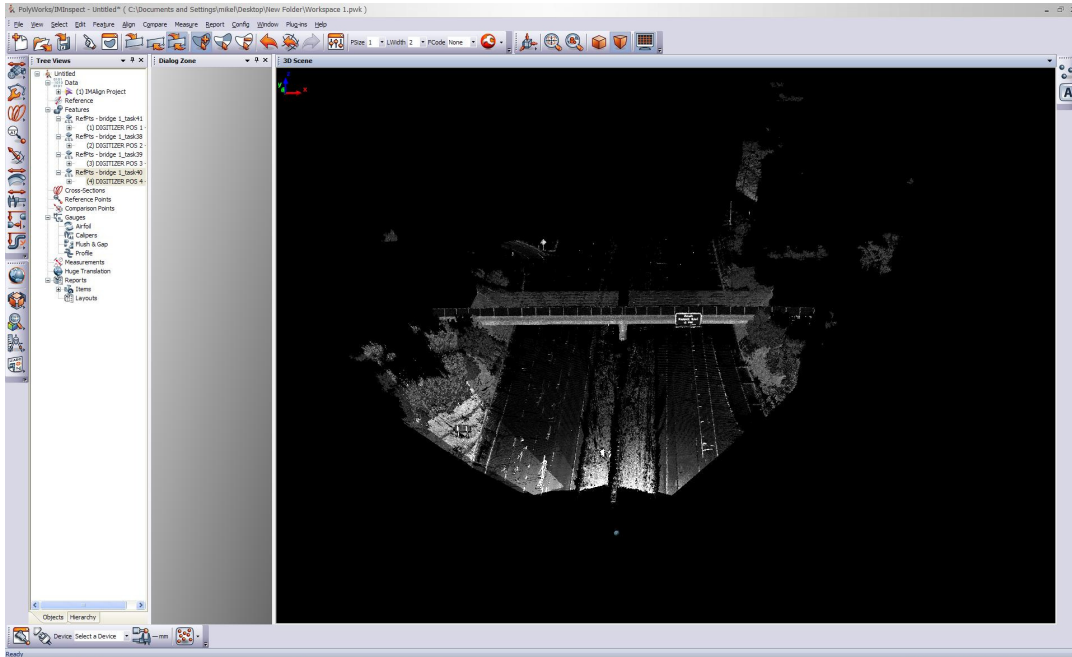


Geo-Referencing In IMINSPECT

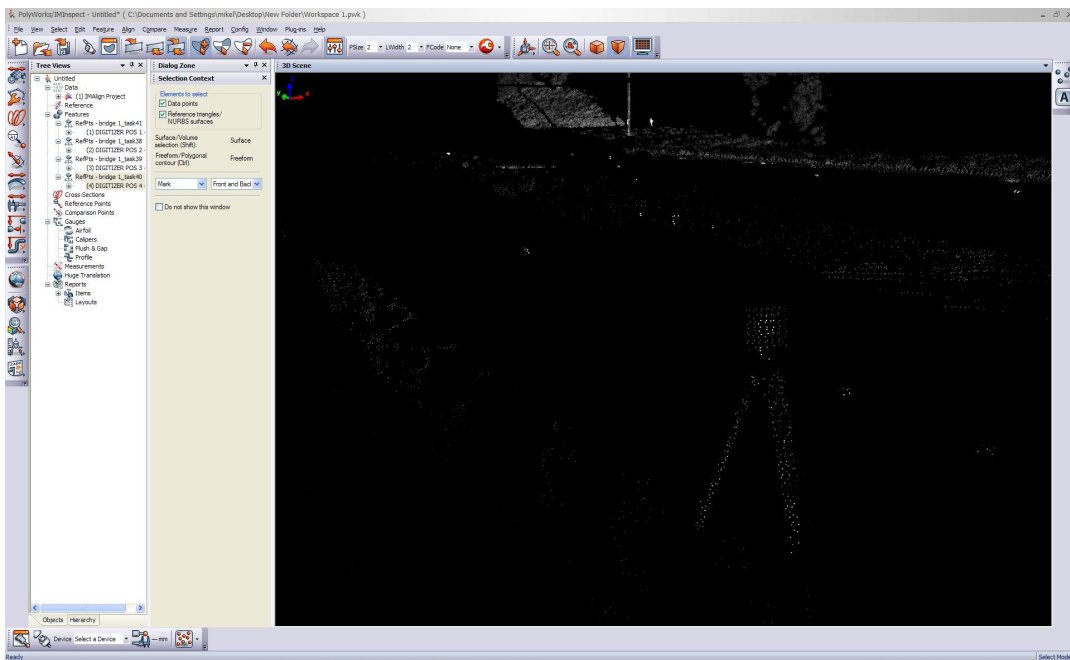
- Step 1 – Selecting a Target from the Point Cloud
- Step 2 – Setting the Hugh Translation
- Step 3 – Loading a Coordinate File
- Step 4 – Matching Coordinates to Selected Targets

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Imaging Division

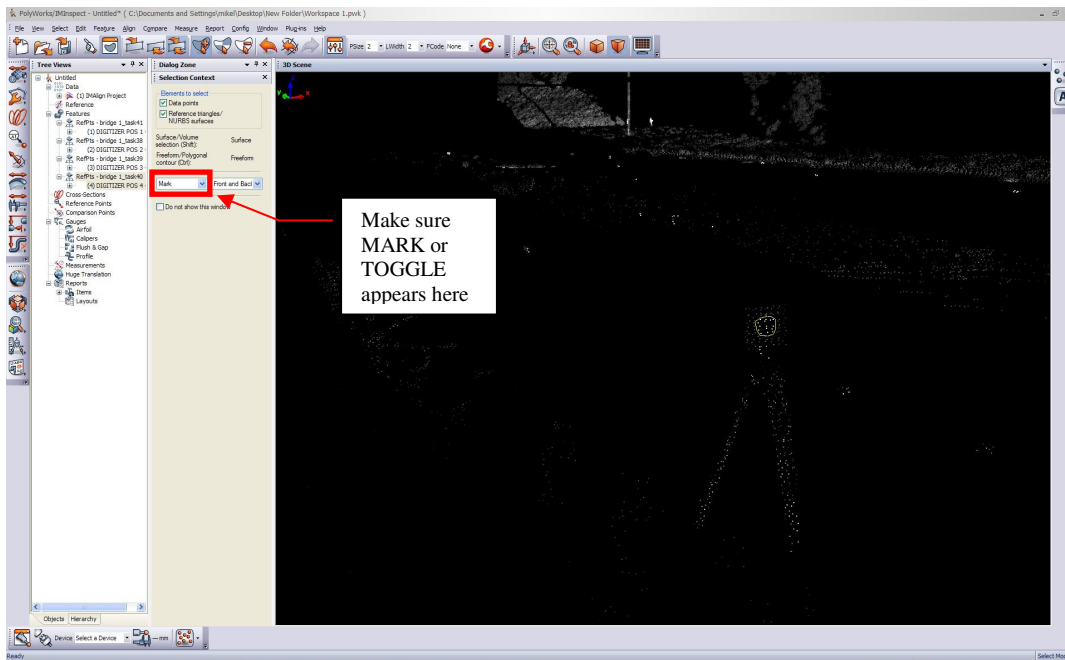
Step 1 – Selecting a Target from the Point Cloud



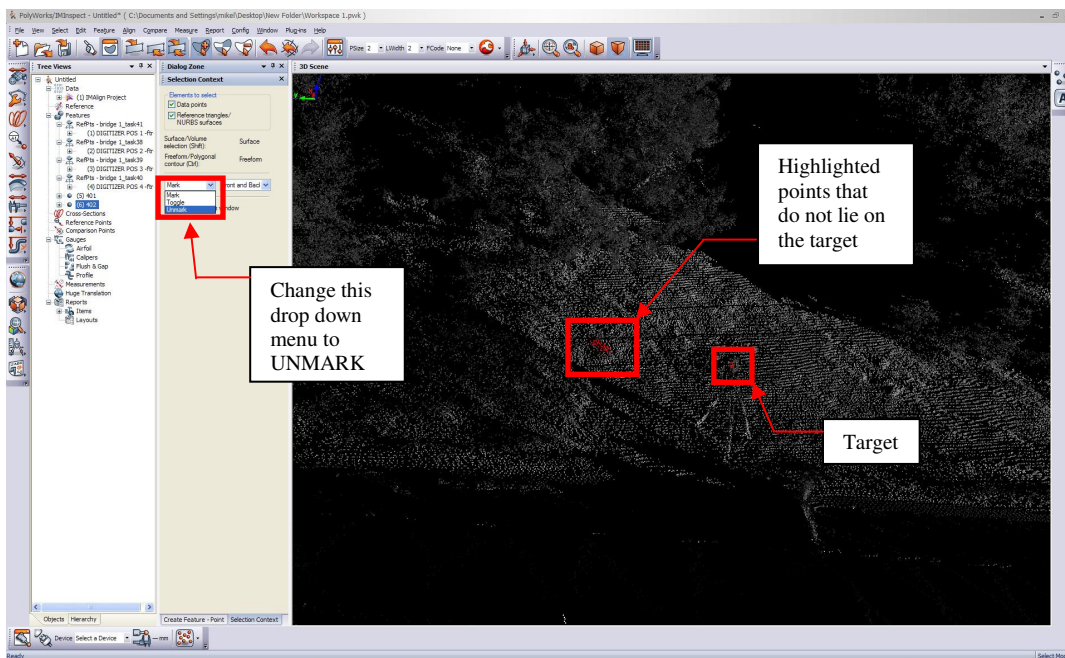
After loading your point cloud into IMINSPECT, you will need to locate the objects that you placed in the field as targets.



Once you have located a target, press the spacebar to bring up the element selection tool in Polyworks. This tool will cause the mouse point to change into a cross and a options window will appear in the dialog zone.

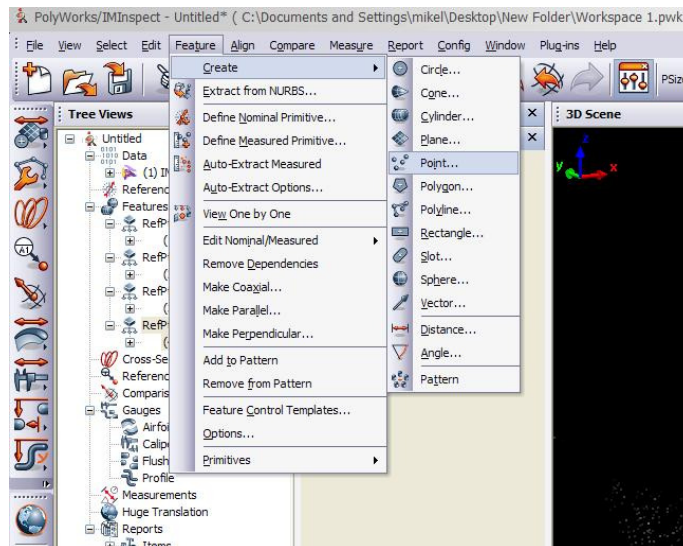


Holding down the SHIFT and CTRL keys and using the middle mouse button, draw a polygon around the elements of the point cloud that define your target. Right click to close your polygon. Please note the warning above. Make sure that the indicated dropdown menu says MARK or TOGGLE to ensure that the selected point will become highlighted.

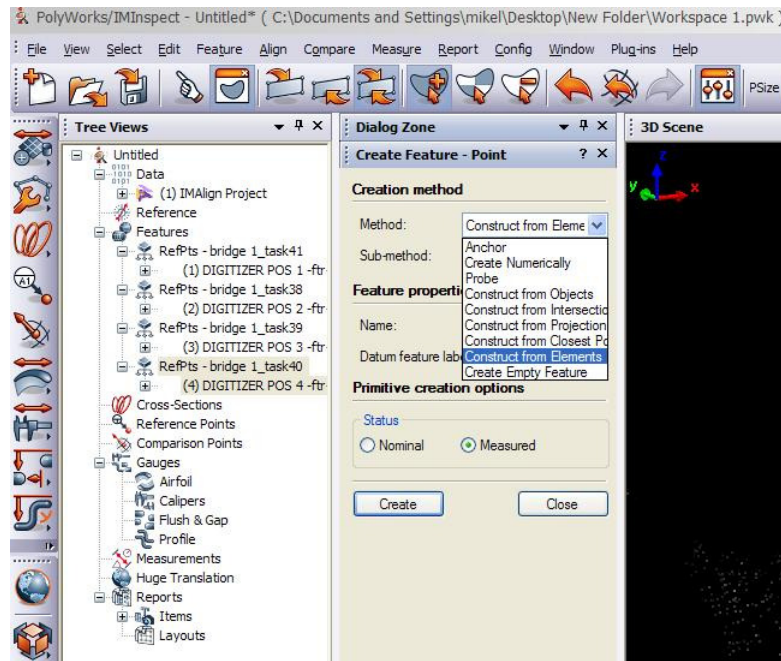


Press the space bar again to allow you to rotate the point cloud. Turn the target approximately 90 degrees and check to make sure that only points on your target have been highlighted. If extra points have been highlighted, press the space bar to bring up

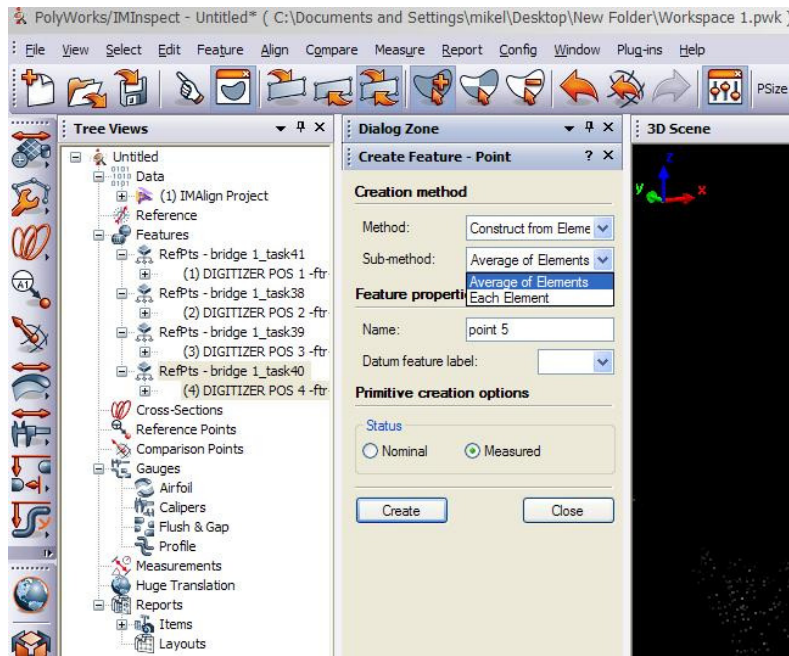
the selection context menu again, change the indicated drop down menu to UNMARK and select the unwanted points as before (hold down SHIFT and CTRL and use the MIDDLE mouse button). Right click to close your polygon. These points should no longer be highlighted.



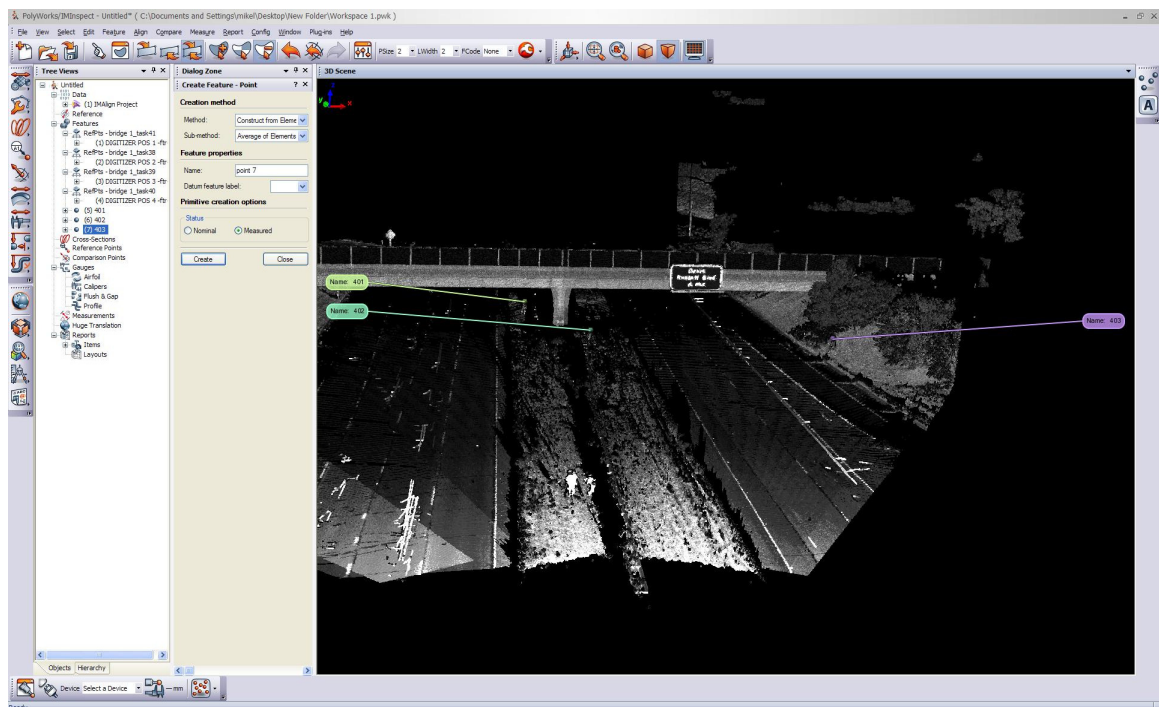
Once you have ensured that only the desired point cloud elements are highlighted select FEATURE -> CREATE -> POINT. This will cause the point creation tool to appear in the dialog zone.



Choose CONSTRUCT FROM ELEMENT from the Creation Method drop down menu. See Above.

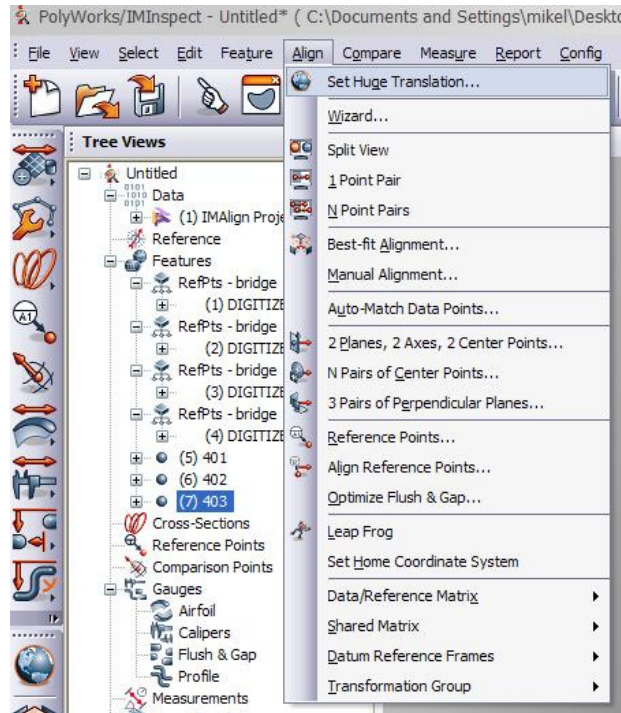


Choose AVERAGE OF ELEMENTS from the Sub-Method drop down menu as shown above. You can also change the name that Polyworks will give this new point. Click the CREATE button. A new point primitive will appear in the 3D Scene window and a new listing will appear under the Features section of the Tree Views window.

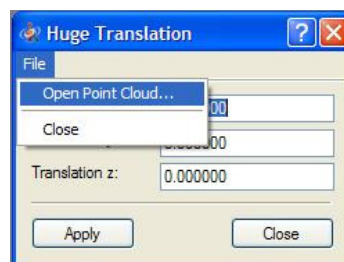
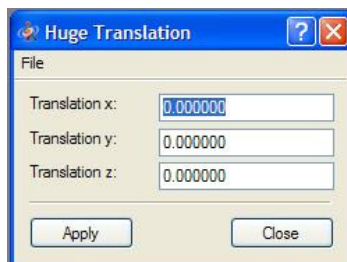


Repeat the above procedure for all of the other targets in the point cloud. You will require at least 3 points to geo-reference the point cloud.

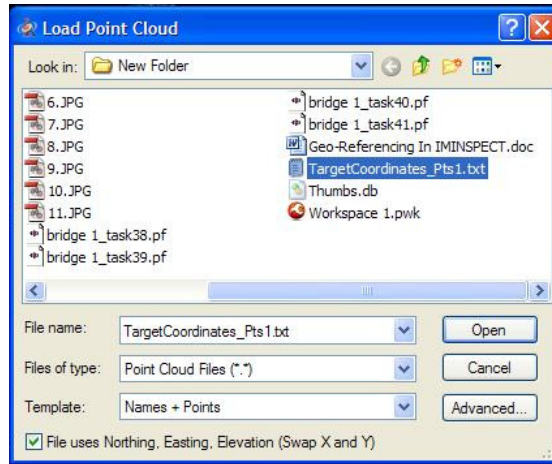
Step 2 – Setting the Huh Translation



Due to the fact that the geo-referenced coordinates are not going to be close to the point (0,0,0), it is required that we move the point cloud closer to the desired destination before we geo-reference. To do this select ALIGN -> SET HUGE TRANSLATION.



The above dialog box will appear. You can manually enter the coordinates of a point close to the geo-referenced coordinates for the targets. Alternatively, you may simply load the file containing the geo-referenced coordinates for the targets. This will cause the first coordinate in the file to be used for the translation. To do this, choose FILE -> OPEN POINT CLOUD in the Huge Translation dialog box.



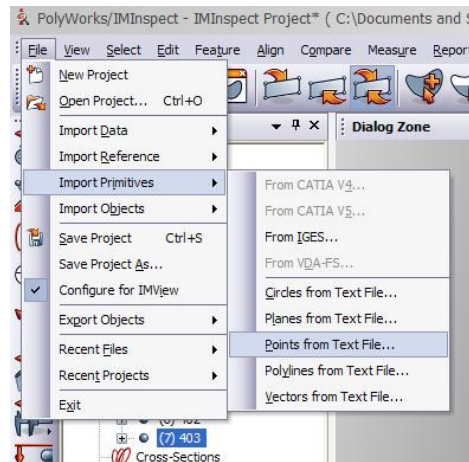
The above dialog box will now open. Choose the file containing the geo-referenced coordinates for the target points. Make sure that the Template is set to mirror the order of data in this file. As an example, the Template used in the image above is expecting the first column of data in the file to contain a name, the second, third, and fourth columns are expected to contain coordinate information. Also, the check box that says “File uses Northing, Easting, Elevation (Swap X and Y)” must be set. This check box will indicate the order of the data in the file. If unchecked, Polyworks expects the coordinate data to be in the order X, Y, Z. If checked, Polyworks expects the coordinate data to be in the order Y, X, Z. Please ensure your coordinate data conforms to the settings you use here, otherwise Polyworks will change the handedness of your coordinate system and point the Z- axis in the wrong direction for your point cloud.

Click Open. Now click Apply in the Hugh Translation dialog box. Your point cloud and point primitives will have now been translated.

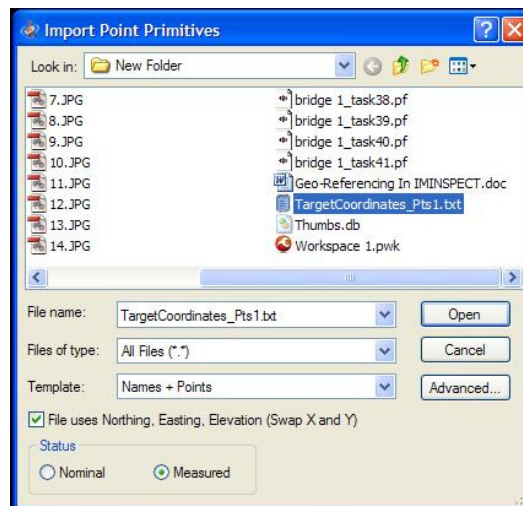
Step 3 – Loading a Coordinate File

401 596618.546 2020183.577 102.163
402 596597.136 2020189.618 102.357
403 596590.352 2020214.026 102.703

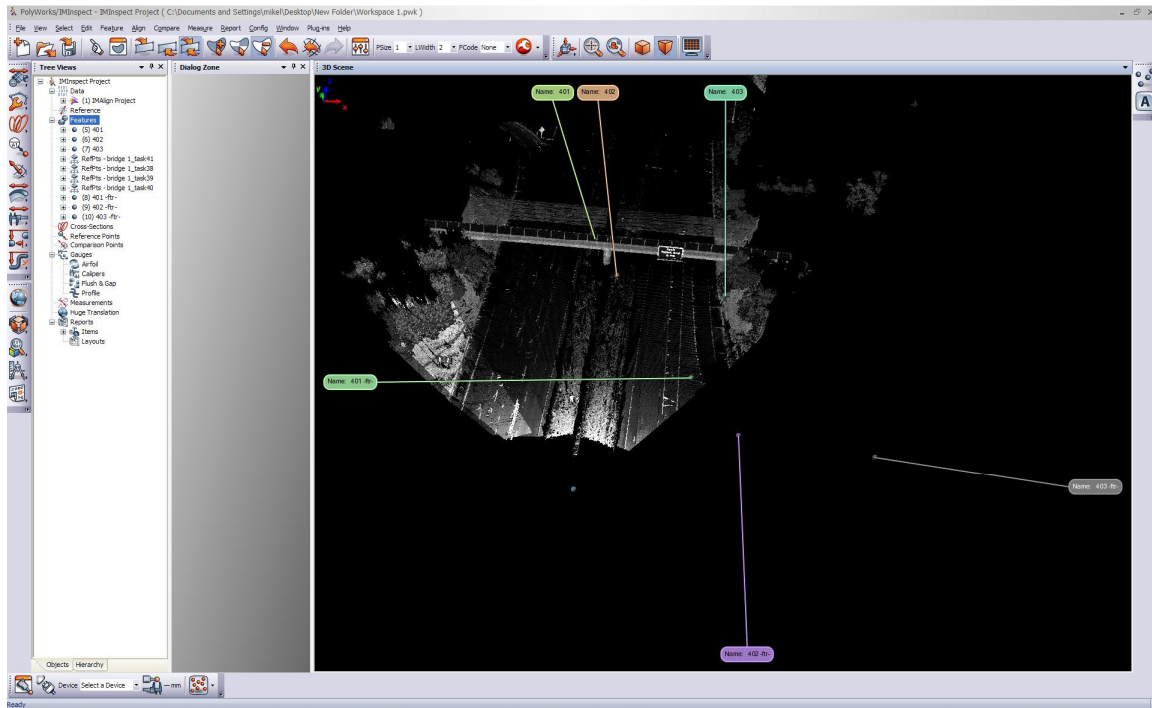
The geo-referenced coordinates should be located in an ASCII text file in a format similar to the one above. There should be no header or footer in the file, just point names and coordinates.



To import these coordinates into Polyworks select FILE -> IMPORT PRIMITIVES -> POINTS FROM TEXT FILE.

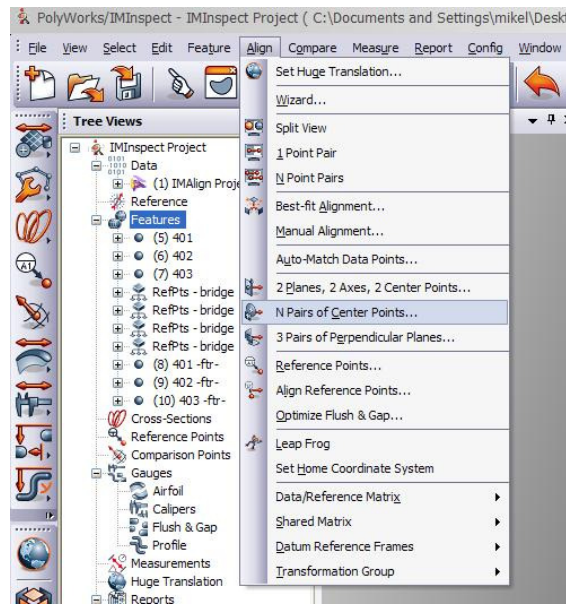


The above dialog box will appear. Browse to the file containing the geo-referenced coordinates, set your Template to Names + Points and in the case of the above example select the “File uses Northing, Easting, Elevation (Swap X and Y)” check box. Click Open.

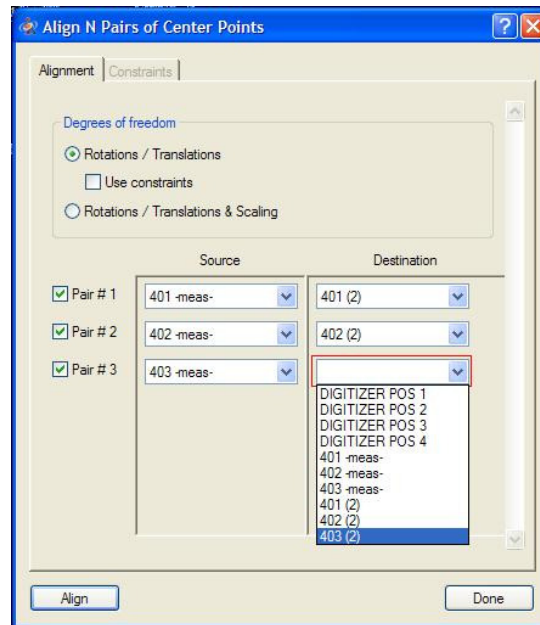


This will cause the three geo-referenced control points to appear as point primitives in the 3D Scene view and the Tree Views windows.

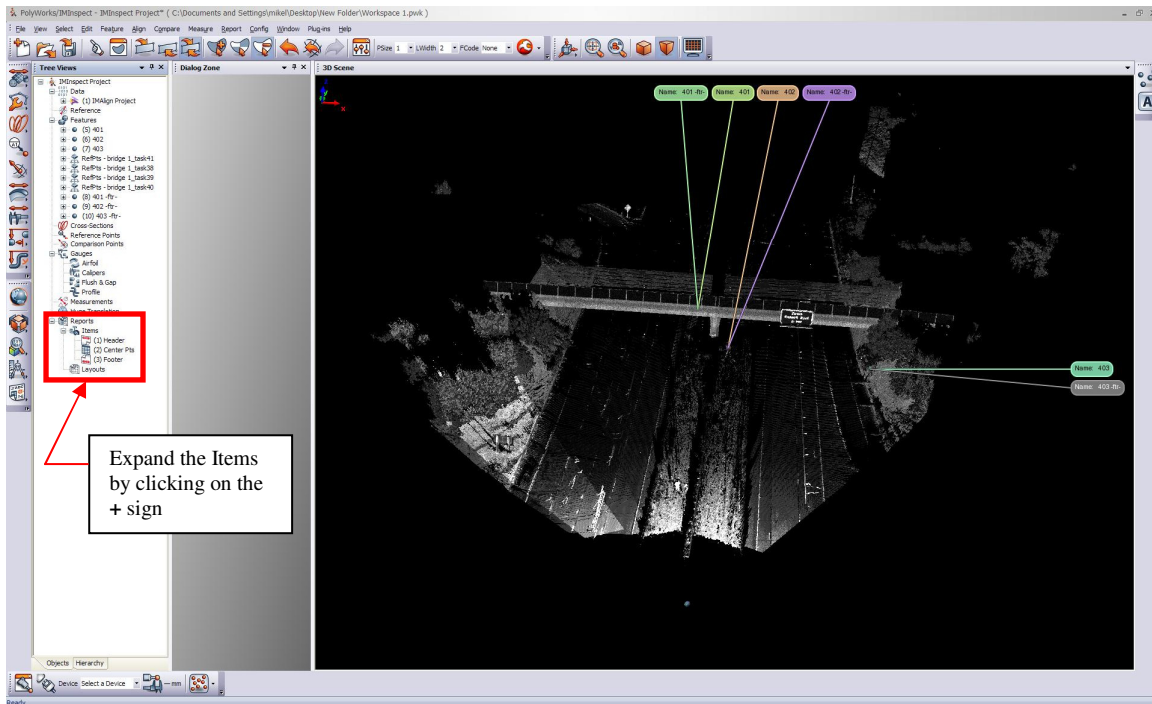
Step 4 – Matching Coordinates to Selected Targets



To move the point cloud to the geo-referenced point primitives we must select ALIGN -> N PAIRS OF CENTER POINTS from the main menu.



The above dialog box will appear. Ensure the Rotations / Translations option is selected (No Scaling). Match the user selected points to the loaded geo-referenced points using the drop down menus as shown above. Hint, this is where proper naming of the points comes in handy and makes your job easier. Once all your point pairs are selected (Minimum 3 required), click Align.



The point cloud has now been translated and rotated to align with the geo-referenced points previously loaded. To view how well the user defined points fit the geo-referenced points expand the REPORTS and then the ITEMS section of the Tree Views window. Double click on the Center Pts report that has been created by the N PAIRS OF CENTER POINTS routine.

Table Preview - Center Pts

Table Type	Align Center Points
Maximum Error	0.028366
Minimum Error	0.009483
Mean Error	0.019229
Standard Deviation	0.009456

Source Point (x)	Source Point (y)	Source Point (z)	Destination Point (x)	Destination Point (y)	Destination Point (z)	Distance between centers
2020183.591333	596618.532288	102.163257	2020183.577000	596618.546000	102.163000	0.019838
2020189.627263	596597.133975	102.357128	2020189.618000	596597.136000	102.357000	0.009483
2020214.002403	596590.367738	102.702615	2020214.026000	596590.352000	102.703000	0.028366

Close

The above dialog box will appear. It lists information about the alignment of the user selected points with the geo-referenced points. The Standard Deviation gives an estimate of the overall misalignment of the two sets of points. The Distance between center points gives you the actual measured distance between each set of point pairs. The units of the numbers in this file are the units of the points in the point cloud. This means that they will most likely be metres, unless the point cloud has been rescaled into another unit of measure.