

## Tools

# Analyze Relative Accuracy between flight lines with the Seamline Analysis tool

LP360, versions 2011.1 and above



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10-15-2012

Revision 1.0

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The recently published United States Geological Survey National Geospatial Program's LIDAR Base Specification Version 1.0<sup>1</sup> specifies that the "requirements for relative accuracy within overlap between adjacent swaths of data should be less than or equal to 10 cm RMSEz". In version 2011.1, LP360 introduced a new tool which allows for the ability to check the RMSEz value within overlapping regions of data. The goal of the seamline analysis tool was to provide a means for analyzing the relative accuracy between adjacent swaths of flight line data. The seamline analysis tool is available on the LP360 QA/QC toolbar.

### Analysis Input Requirements

The seamline analysis may be performed on either tiled or swath data provided that the point source ID for each point represents the source swath, i.e. flight line number. One must then delineate linear features, or seamlines, along which one desires to perform the seamline analysis. As one is trying to ascertain the relative accuracy within the overlap between adjacent swaths it is recommended to draw the seamlines such that they may then represent the gross error. Hence, the seamlines one would want to draw would be near the outer edges of the overlap area between two adjacent swaths (See figure 1). In delineating the areas in which to perform the analysis one must also keep in mind the ground cover, or lack thereof, in areas as it will dictate the settings to use with the tool to get comprehensive results. For example, if the ground class was not determined from individual swaths then one will have to compare multiple classes. In doing so, vegetation and other areas which are not comparable may be taken into account. To alleviate this issue one may delineate the linear features in a fashion to skip areas of heavy vegetation, water or other non-comparable areas of overlap.

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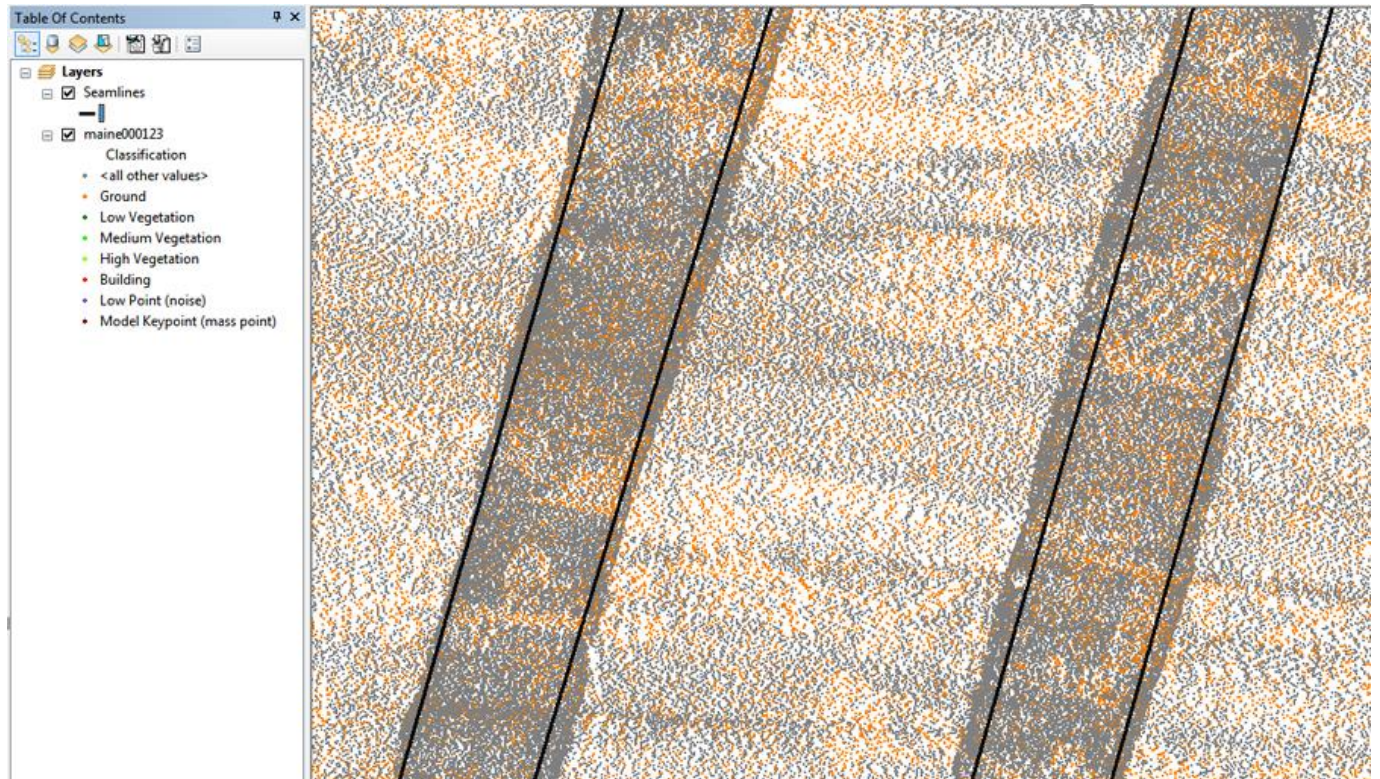


Figure 1 - Create Seamlines in Overlap Region

## Performing the Analysis

Having compiled the seamlines for the project area the Seamline Analysis tool, found on the LP360 QA/QC toolbar can then be used.



Figure 2 - Seamline Analysis Tool

The sample distance parameter represents how many sites will be tested along the linear feature, for example, every 50 map units. The search radius is the distance examined radially from the test area in which statistics will be gathered about the LIDAR points to determine the difference between the overlapping swaths and ultimately an RMSEz for each seamline. An option is provided to either omit no-data values, or to assign a no-data value, in areas where there is not enough data to calculate statistics. The filter option defines the set of points that will be used in the seamline analysis. For example, to analyze a dataset that had been classified on a swath basis one could use only ground points in the analysis to reduce the number of higher elevation values being pulled from vegetation, buildings and other features:

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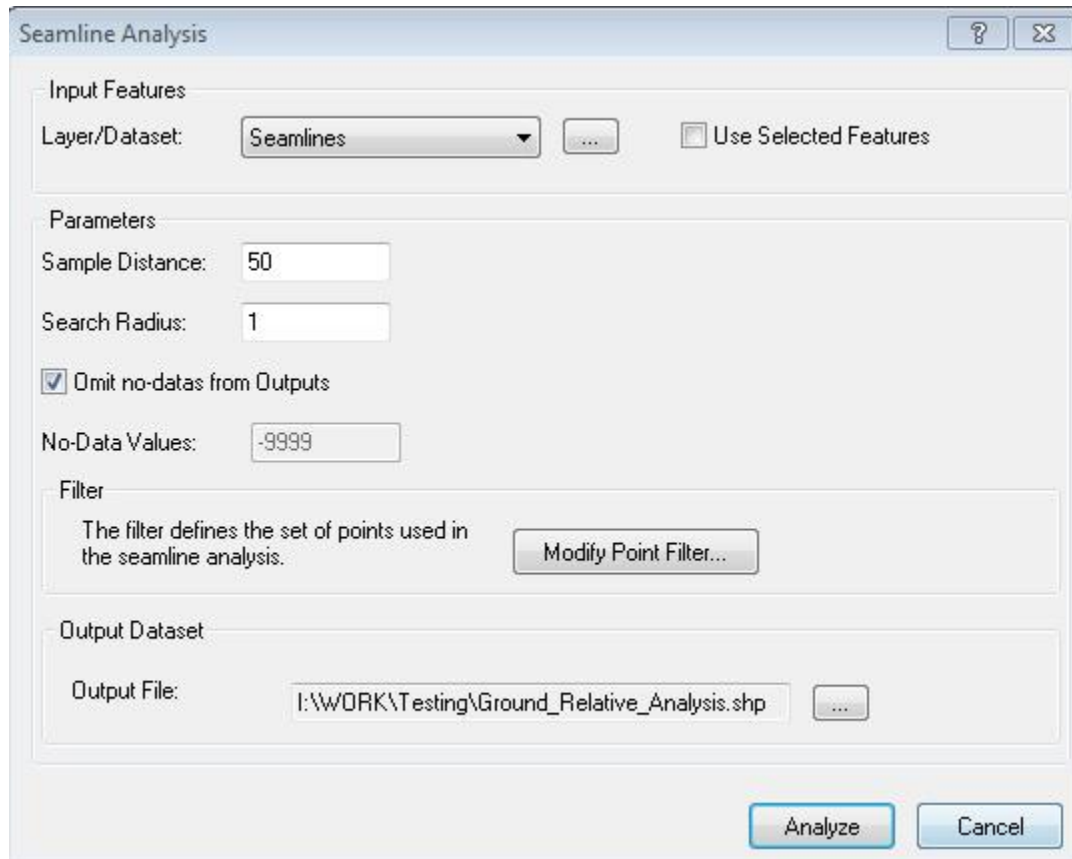


Figure 3 - Seamline Analysis Parameters

## Results of the Analysis

Two shapefiles result from running the seamline analysis. One shapefile is a geometric copy of the linear features that represent the seamlines; the second shapefile is a point shapefile representing the sample sites. In addition to the geometry each shapefile contains statistical information.

The linear shapefile provides the summary RMSEz from the vertical difference between each point source ID for all samples examined along the feature. In figure 4, the attribute table for FID zero shows the RMSEz value for the comparison between flight lines 79 and 81 along FID zero to be 0.1466 meters.



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FID	Shape	ID	IDSrc1	IDSrc2	RMSE1_2
0	Polyline ZM	0	79	81	0.1466
1	Polyline ZM	1	79	81	0.1361
2	Polyline ZM	2	79	78	0.0424
3	Polyline ZM	3	79	77	0.0545
4	Polyline ZM	4	77	78	0.0471
5	Polyline ZM	5	78	79	0.0302
6	Polyline ZM	6	79	78	0.0661
7	Polyline ZM	7	79	78	0.0687

Figure 4 - RMSE Seamlines

The point shapefiles provide the delta z, or difference in elevation values, between the stated point source ID's for each sample. In figure 5, the attribute table for FID one shows the dz value for the comparison between flight lines 79 and 81 at sample FID one to be -0.03 meters.

FID	Shape	ID	IDSrc1	IDSrc2	dZ2_1
0	Point ZM	0	79	81	-0.35
1	Point ZM	0	79	81	0.03
2	Point ZM	0	79	81	0
3	Point ZM	0	79	81	-0.06
4	Point ZM	0	79	81	-0.01
5	Point ZM	0	79	81	0.0433
6	Point ZM	1	79	81	0.19
7	Point ZM	1	79	81	-0.35
8	Point ZM	1	79	81	-0.075

Figure 5 - Elevation differences for test sites

The samples themselves should be reviewed for erroneous values and settings or seamlines adjusted accordingly. There are several ArcMap tools that may then be used to assist in the analysis and reporting of the seamline information. The Seamline Analysis tool is another valuable tool that should be added to

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any QA/QC plan and will assist users in determining the validity of a dataset to the USGS LIDAR Base Specification.

<sup>1</sup>Heidemann, Hans Karl, 2012, Lidar base specification version 1.0, U.S. Geological Survey Techniques and Methods, book 11, chap. B4, 63 p.

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