Testing Horizontal Accuracy:

Ensuring Your Data Will Serve Your Needs

To ensure our geospatial data is suitable for its intended use, Surdex performs thorough accuracy testing prior to delivery, certifying that all products meet the project's accuracy requirements. This is a critical step because if for any reason the data does not meet the appropriate accuracy requirements, any analysis performed with this data will not produce reliable results, which could cause serious problems down the line. Horizontal accuracy testing is therefore an essential step in any of our projects involving orthorectified imagery or planimetric mapping data. Some clients prefer to verify the product accuracy through an additional round of independent testing; the procedures described in this document can help guide you through that process.

What accuracy requirements should I use?

Ideally, you should determine the appropriate accuracy standards before issuing an RFP or signing a contract so that your geospatial data provider can design the data acquisition/production plan around these standards. The American Society for Photogrammetry and Remote Sensing (ASPRS) has a document titled *ASPRS Positional Accuracy Standards for Digital Geospatial Data.** These standards are widely accepted and used in the geospatial industry; Surdex uses these standards (unless clients specify otherwise), and we recommend our clients use them as well. This document can help you determine the appropriate accuracy standards based on the resolution and intended use of your data.

What is the process for horizontal accuracy testing?

For horizontal accuracy, the ASPRS standards provide guidelines for the number of quality control (QC) points based on the size of the project area and instructions for calculating and interpreting the accuracy statistics.

Testing horizontal accuracy involves three major steps:

1. Planning and selecting the field survey points
2. Performing a field survey of the QC points and
3. An in-office analysis comparing the horizontal location of the QC points in the dataset under review (e.g., imagery) to their location in the field survey.

The location of the survey points should in general be evenly distributed throughout the project area and represent good locations for measurement. Access and vegetation will play into this selection process and result in the movement of some points to more desirable locations. Field survey data should include the XY coordinate location of each QC point, as well as ground photos.

The check point survey needs to be of a higher accuracy than the geospatial product to ensure it truly tests the accuracy of the product; the ASPRS guidelines indicate that the check point survey should be at least three times more accurate than the required accuracy of the geospatial product. To assess the accuracy of a digital orthophotography product with a 1-foot root mean square error (RMSE) accuracy, the check point survey would have to be accurate to a 0.33-foot RMSE.

QC point measurements can be made in any software package that supports display of the geospatial product and allows independent point measurements. AutoCAD, MicroStation, Global Mapper, QGIS and ArcGIS can all be utilized to perform this task. Surdex uses ArcGIS to assess accuracy at the beginning and at the end of an imagery project. Field survey points (in shapefile format) are displayed on top of the imagery product, and we manually adjust the location of each point to match the respective

The same QC point over orthoimagery (left) and in the field survey (right)

* *ASPRS Positional Accuracy Standards for Digital Geospatial Data, https://www.asprs.org/news-resources/asprs-positional-accuracy-standards-for-digital-geospatial-data.*

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Example of a few entries in an accuracy report for an orthoimagery project (top) and final results (bottom)

Control Point ID	Survey Values in US Survey Feet		Control Point ID	Orthophoto Readings in US Survey Feet		Delta Easting	Delta Northing
	Easting	Northing		Easting	Northing		
QCDES119	714681.57	1081581.33	QCDES119	714681.25	1081581.51	0.33	-0.18
QCDES124	660104.45	1064944.81	QCDES124	660104.68	1064944.59	-0.23	0.22
FY2017ID104	704719.21	1052452.87	FY2017ID104	704718.97	1052453.02	0.24	-0.15
FY2017ID105	675194.12	1013682.54	FY2017ID105	675194.50	1013682.51	-0.38	0.03
AT-25	693891.17	1025436.86	AT-25	693891.46	1025436.98	-0.29	-0.12
AT-28	674162.82	1011120.87	AT-28	674163.25	1011120.97	-0.43	-0.10

field survey photo location. At this point the operator simply records the measured location of the QC point in the imagery product. All the required QC points are measured by this method, and a new shapefile is stored with the recorded point values.

You will see in this report that the accuracy of the digital orthophotography has been measured to 0.35 foot in Easting and 0.29 foot in Northing at the RMSE statistical level. In addition, the NSSDA Horizontal Error at the 95% confidence level is computed to be 0.79 feet. This is well below the 2.4-foot requirement. Therefore, we can see that the final digital orthophotography product meets the desired product specifications.

With this testing completed, the metadata of this product would include the following accuracy statement: "This data set was tested to meet ASPRS Positional Accuracy Standards for Digital Geospatial Data (2014) for a 1-foot RMSEx/RMSEy Horizontal Accuracy Class. Actual positional accuracy was found to be RMSEx = 0.35 foot and RMSEy = 0.29 foot which equates to Positional Accuracy = ± 0.79 feet at the 95% confidence level."

Number of check points	28	28
Mean Error (US S ft)	0.01	-0.06
Standard Deviation (US S ft)	0.36	0.29
Minimum Error (US S ft)	-0.78	-0.57
Maximum Error (US S ft)	0.86	0.41
RMSE (US S ft)	0.35	0.29
RMSEr (US S ft)	0.46	
NSSDA Horizontal Error 95% (US S ft)	0.79	

Where can I learn more or get help?

The ASPRS has a wealth of materials regarding geospatial product accuracy. If you have questions about testing accuracy to ensure your data is suitable for your work, we would be glad to help.

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