Minnesota Geospatial Advisory Council

# Positional Accuracy Measuring and Reporting Standard

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# About the GAC

The mission of the Minnesota Geospatial Advisory Council (GAC) is to act as a coordinating body for the Minnesota geospatial community. The GAC is authorized by legislation passed in 2009 and reauthorized in 2014 Minnesota Statutes (16E.30, subd. 8). It represents a cross-section of organizations that include city, county, regional, state, federal and tribal governments as well as education, business and nonprofit sectors.

As part of this mission, the GAC works with the Minnesota geospatial community to define and adopt standards needed by the community. GAC standards are developed and proposed by geospatial community subject matter experts. The GAC's Standards Committee administers a process to ensure community-wide public review and input for any proposed standards.

The GAC does not mandate or enforce standards. It offers the standards as a resource to the community. Organizations may choose to adopt the standards and require their use internally.

# Introduction

This standard provides a single, uniform statistical methodology for evaluating the positional accuracy of points on maps and in digital geospatial data and for reporting the results of that evaluation.

## Purpose of this Standard

This standard has been developed to provide detailed information about the positional accuracy of geospatial data to better define their appropriate use. Improved knowledge about data accuracy can also help minimize data redundancy and improve sharing of data resources.

## Applicability

This standard is important to all developers and users of geospatial data about Minnesota when those data will be used to analyze spatial relationships, support important decisions or produce maps. It is only applicable for geospatial data - data representing geographic location.

Use of the methodology defined in this standard is recommended when an organization needs an explicit measure of the positional accuracy of a geospatial dataset. The standard is particularly beneficial when those data are to be used for decision-support purposes or to express accuracy requirements in professional/technical contracts.

## Sources of this Standard

The standard requires the implementation of the National Standard for Spatial Data Accuracy (NSSDA). The NSSDA is a reporting standard, referred to as a data usability standard by the Federal Geographic Data Committee. Data usability standards describe how to express the applicability of a dataset for specific uses.

The NSSDA is one in a series of standards referred to as the Geospatial Positioning Accuracy Standards. This suite of five standards is intended to provide consistency in measuring and reporting the accuracy of point geospatial data collected for different activities (e.g., geodetic surveying, topographic mapping, bathymetric mapping, facilities management mapping, cadastral surveying). The NSSDA is Part 3 of that series and is the only part of the series dealt with in this Minnesota standard.

The National Standard for Spatial Data Accuracy (Federal Geographic Data Committee Standard 007.3-1998) can be obtained at: https://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy/part3/chapter3.

Find more information about the full set of Geospatial Positioning Accuracy Standards at: https://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy.

## Compliance Notes

To comply with this standard, report the results of accuracy testing using the methodology and format prescribed in the standard below. No minimum conformance level or accuracy threshold is mandated in this standard.

## Standard Requirements

The NSSDA is a Federal Geographic Data Committee standard (FGDC-STD-007.3) created in 1998 for the purpose of measuring and reporting the accuracy of maps and geospatial data which are produced by or for federal agencies. It uses root-mean-square-error (RMSE) to estimate positional accuracy. RMSE is the square root of the average of the set of squared differences between dataset coordinate values and coordinate values from an independent source of higher accuracy. Methods are presented in this standard for testing either horizontal data (latitude and longitude) or vertical data (elevation).

To comply with the NSSDA, a data steward conducts a statistical test using the following steps:

1. Determine if the test involves horizontal accuracy, vertical accuracy or both.
2. Select a set of test points from the data set being evaluated.
3. Select an independent dataset of higher accuracy that corresponds to the data being tested.
4. Collect measurements from identical points from each of those two sources.
5. Calculate a positional accuracy statistic using either the horizontal or vertical accuracy statistic worksheet.
6. Prepare an accuracy statement in a standardized report form.
7. Include that report in a comprehensive description of the data set (metadata).

Accuracy is reported in ground distance at the 95% confidence level. This means that 95% of the positions in the dataset will have an error that is equal to or smaller than the reported accuracy. Accuracy reports are presented in a standardized phrase to be included in the dataset's metadata report. For example, a typical accuracy statement for tested horizontal data would take the form:

**Tested ____ (meters/feet) horizontal accuracy at 95% confidence level**

The former Minnesota Governor's Council on Geographic Information developed an implementer's guide to the NSSDA titled the **Positional Accuracy Handbook; Using the NSSDA to measure and report geographic data quality** (1999; PDF; 33 pages).

The handbook describes how positional accuracy can be measured and reported for databases that contain geographic features like roads, rivers and property lines. Five practical examples illustrate the process using databases developed at Minnesota Departments of Transportation and Natural Resources, the city of Minneapolis, Washington County and Lawrence Mapping. All the mathematics needed to calculate vertical and horizontal accuracy statistics are made easier with Excel worksheets that can also be downloaded from the link above.