Toitu te whenua
Land Information New Zealand

Standard for the geospatial accuracy framework

LINZS25005

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Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

Term/abbreviation	Definition
accuracy	degree of conformity with a standard or accepted value. Accuracy relates to the quality of a result, and is distinct from precision, which relates to the quality of the operation by which the result is obtained.
class	a categorisation of a coordinate's local accuracy
coordinate	any one of a set of numbers used in specifying the location of a point on a line, in space, or on a given plane or other surface. For example, latitudes and longitudes are coordinates of a point on the Earth's surface.
datum	a particular type of reference system in which coordinates are defined in relation to a particular reference surface by means of distances or angles, or both
error	the difference between an observed or calculated value of a quantity and the ideal or true value of that quantity. Because, with few exceptions, the ideal or true value of a quantity cannot be known with exactness, the term "error" is applied to a difference between an observed or computed value of a quantity and some standard or accepted value used instead of the ideal or true value.
higher class	a class with a more restrictive accuracy threshold
LINZ	Land Information New Zealand
local accuracy	a value that represents the uncertainty of a coordinate relative to other coordinates nearby
network accuracy	a value that represents the uncertainty of a coordinate relative to a datum
tier	a categorisation of a coordinate's network accuracy

Foreword

Introduction

(a) Knowledge of the quality of spatial data is critical to its effective use. Accuracy is a measure of the difference between data and the reality that it represents.

(b) This standard provides an accuracy framework to use when applying other Land Information New Zealand (LINZ) standards.

Purpose of standard

The purpose of this standard is to specify an accuracy classification framework for coordinates and spatial relationships that can be used by other LINZ standards to ensure the consistent specification and reporting of the accuracy of different geospatial datasets.

Brief history of standard

This is a new standard.

1 Scope

This standard defines frameworks for specifying and classifying the accuracy of coordinates and the spatial relationships between them.

2 Intended use of standard

(a) Where use of this standard is required by other LINZ standards it must be complied with.

(b) Other users of spatial data may use this standard but may only claim conformance with the standard if they have used the parameters defined in it.

3 Network Accuracy

3.1 Quantifying network accuracy

The network accuracy of a coordinate must be quantified at the 95 % or 99.8 % confidence level.

3.2 Vertical network accuracy

The vertical network accuracy of a point must be calculated using:

$VE_{95} = 1.96\,\sigma_X$ at the 95 % confidence level, or

$VE_{99.8} = 3.09\,\sigma_X$ at the 99.8 % confidence level,

where:

σ_X is the standard deviation of a vertical coordinate in the X dimension.

3.3 Horizontal network accuracy

The horizontal network accuracy of a point must be calculated using:

$HE_{95} = \frac{2.45}{\sqrt{2}}\sqrt{\sigma_X^2 + \sigma_Y^2}$ at the 95 % confidence level, or

$HE_{99.8} = \frac{3.53}{\sqrt{2}}\sqrt{\sigma_X^2 + \sigma_Y^2}$ at the 99.8 % confidence level,

where:

σ_X, σ_Y are the standard deviations of a horizontal coordinate in the X and Y dimensions.

3.4 Three–dimensional network accuracy

The three-dimensional network accuracy of a point must be calculated using:

$$SE_{95} = \frac{2.80}{\sqrt{3}}\sqrt{\sigma_X^2 + \sigma_Y^2 + \sigma_Z^2}$$ at the 95 % confidence level, or

$$SE_{99.8} = \frac{3.85}{\sqrt{3}}\sqrt{\sigma_X^2 + \sigma_Y^2 + \sigma_Z^2}$$ at the 99.8 % confidence level,

where:

σ_X, σ_Y, σ_Z are the standard deviations of a three-dimensional coordinate in the X, Y and Z dimensions.

3.5 Tiers

(a) The network accuracy of a coordinate may be assigned to a tier.

(b) Each tier must be defined by an accuracy threshold.

(c) Each tier must be annotated by a unique identifier.

COMMENTARY

Assigning network accuracy to a tier

The network accuracy of a coordinate may be assigned to a tier as set out in the following example from *LINZS25006: Standard for tiers, classes, and orders of LINZ data*.

Tier	Accuracy (m)	Confidence level
A	0.05	95 %
B	0.10	95 %

4 Local accuracy

(a) The local accuracy of a coordinate must be assigned to a class.

(b) Each class must be annotated by a unique identifier.

(c) Each class must be defined by an accuracy threshold.

(d) The accuracy threshold between coordinates in a class must be specified using:

$$\sqrt{c^2 + (D\,p)^2}$$

where:

c is a constant term, expressed in metres,

p is a distance dependent term, expressed in metres per metre, and

D is the distance between the two coordinates being evaluated, expressed in metres.

(e) When assigning a coordinate to a class, local accuracy must be assessed against all other coordinates of the same or higher class within a specified radius.

(f) The local accuracy between coordinates must be assessed at the 95 % confidence level.

(g) A coordinate may only be assigned to a class if all local accuracy assessments are numerically smaller than the threshold for that class.

COMMENTARY

Assigning local accuracy to a class

(a) The representation of the local accuracy of a coordinate by a class is mandatory because the accuracy is defined in relation to other coordinates. Class parameters are used to limit the coordinates against which local accuracy will be assessed. Without these parameters, it is not possible to quantify the level of accuracy.

(b) The specified radius for assessing local accuracy will be defined by the standard requiring a coordinate to conform to a class.

(c) The local accuracy of a coordinate may be assigned to a class as set out in the following example from *LINZS25006: Standard for tiers, classes, and orders of LINZ data*.

Class	**Constant term (*c*)** (m)	**Distance dependent term (*p*)** (m/m)
IX	0.02	1×10^{-4}
X	0.03	1.5×10^{-4}