EIM Help – How to Determine Horizontal Coordinate Accuracy

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What is horizontal coordinate accuracy?

Horizontal coordinate accuracy is a best estimate of where coordinates actually lie on a horizontal plane. Accuracy depends on your collection method and field conditions.

How do I enter horizontal coordinate accuracy?

Horizontal Coordinate Accuracy goes in column AE of the EIM Location Template. Enter the numeric valid value corresponding to your estimated accuracy.

Horizontal Coordinate Accuracy Options	**Valid Value** (column AE)
± 0.1 ft or 0.03 m	1
± 1 ft (0.3 m)	2
± 3 ft (1 m)	3
± 10 ft (3 m)	4
± 20 ft (6 m)	5
± 40 ft (12 m)	6
± 100 ft (30 m)	7
± 180 ft (55 m)	8
± 250 ft (76 m)	9
± 500 ft (152 m)	10
± 1000 ft or greater (300 m)	11

Methods for collecting horizontal coordinates

Survey

Land surveying is usually the most accurate way to place horizontal coordinates. Surveying is most common on cleanup sites where we need high accuracy to map contaminant distribution. Survey horizontal accuracy is usually ± 0.1 ft (0.03 m), although sometimes it's less accurate. Check with your surveyor.

GIS

Online maps (geographic information system or GIS) are an easy way to get coordinates. Accuracy depends on the map base layer and aerial imagery resolution. You can use our EIM Lat/Long Tool to get coordinates from the EIM Map. It automatically gives you horizontal and vertical coordinate accuracy. Horizontal accuracy is usually ± 40 ft (12 m). Download our help document, Get Lat/Long Coordinates and Elevation from EIM Map, for instructions.

GNSS/GPS

Global Navigation Satellite System (GNSS) devices are a common way to collect coordinates in the field. Global Positioning System (GPS) is the U.S. system of 32 satellites. Other systems like GLONASS (Russian) and Galileo (European) are available globally.

Horizontal accuracy varies greatly based on:

- Antenna and receiver type and quality.
- Operator training and experience.
- Satellite positions and number of satellites available.
- Length of time spent collecting coordinates at a site.
- Real-time and post-processing error correction.
- Weather and atmospheric conditions.
- Environmental surroundings like trees, bridges, and buildings.
- Type of satellite signal. Code phase is less accurate. Most consumer devices are code phase. Carrier phase (envelope of the code) is more accurate. Survey-grade and some higher-end consumer devices use carrier phase.

Some GNSS devices give you Position Dilution of Precision (PDOP), an indicator of accuracy based on how well it corrects satellite signals. Generally, a PDOP under 4 is good accuracy and a PDOP of less than 2 is very accurate. A PDOP higher than 6 is not very accurate. If possible, wait for a lower PDOP before recording your coordinates.

Many GNSS devices have a satellite display screen that shows you the available satellites, satellite signal strength, and estimated accuracy.

You can reasonably determine the accuracy of your coordinates based on your GNSS device *and* the

factors listed above. The table below lists several types of GNSS devices with an estimated horizontal coordinate accuracy, listed most to least accurate.

GNSS Device Type	**GNSS Device Features**	**Example**	**Horizontal Accuracy Range** (ft and m)	**Horizontal Coordinate Accuracy Valid Values** (column AE)	**Horizontal Coordinate Collection Method Valid Values** (column AF)
Survey grade, static. $15,000 + price range.	• Carrier signal (L-band). • Usually tripod-mounted stationary receiver. • Long observation time. • Access to control/base station data. • Post-processing.		< 0.1 to 3 ft or < .03 to 1 m	1, 2, or 3	15 (Static GPS survey-grade unit)
Survey grade, real-time kinematic (RTK). $15,000 + price range.	• Carrier signal (L-band). • Tripod-mounted stationary receiver plus roving receiver. • Real-time positioning.		< 0.1 to 3 ft or < .03 to 1 m	1, 2, or 3	17 (GPS real time survey-grade)

GNSS Device Type	GNSS Device Features	Example	Horizontal Accuracy Range (ft and m)	Horizontal Coordinate Accuracy Valid Values (column AE)	Horizontal Coordinate Collection Method Valid Values (column AF)
Commercial and high-end consumer grade with DGPS. $1200 to $10,000 price range.	• Carrier (L-band) or code phase signal. • Handheld, tripod- or backpack-mounted. • Differential GPS error correction (OmniSTAR, StarFire, WAAS, H-Star, RTX, EVEREST multipath rejection, Atlas, WSRN. NovAtel, and others).		< 1 to 20 ft or < 0.3 to 6 m	2, 3, 4, or 5	29 (GPS high-end consumer unit, DGPS or WAAS enabled)
Consumer grade, mid and basic. $200 to $600 price range.	• Code phase signal. • Handheld. • Some software corrections.		20 to 180 ft or 6 to 55 m	5, 6, 7, or 8	16 (GPS consumer unit or unknown)
Smartphone or tablet.	• A GPS-enabled smartphone or tablet usually has a mapping app you can use to get coordinates.		20 to 180 ft or 6 to 55 m	5, 6, 7, or 8	16 (GPS consumer unit or unknown)

Document Revision History

Revision Date	Revision No.	Summary of Changes	Reviser(s)
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