

3. Hydrographic Position Control

3.1. Horizontal Position Accuracy

The NOS specification for hydrographic positioning is that the total error in position of soundings, dangers, and all other significant features, at the 95 percent confidence level, will not exceed 5 meters + 5 percent of the depth. This accuracy requirement is independent of survey scale.

For hydrographic surveys using single-beam echosounders, the accuracy of the vessel position can be considered the accuracy of the sounding obtained by that vessel, taking into account transducer offsets. However, for multibeam surveys, due to the oblique sounding pattern, the position of a sounding may be at some distance from the vessel position. The accuracy requirement for the vessel position will depend upon how accurately the sounding is positioned relative to the vessel. That, in turn, will depend upon the characteristics of the multibeam system, depth of water, the accuracy with which heave, roll, pitch, heading, and latency are accounted for and applied, and the reliability with which the speed of sound profile is known.

3.2. Differential Global Positioning System (DGPS)

DGPS is the primary positioning system currently used for hydrographic surveys. DGPS correctors can be obtained either through the U.S. Coast Guard (USCG) Maritime DGPS Service or other differential services provided they meet the accuracy requirement in Section 3.1.

3.2.1. DGPS Specifications

Unless specified otherwise in the Hydrographic Survey Letter Instructions or Statement of Work, the following specifications will be followed when DGPS is used as the primary positioning system:

- GPS receiver(s) aboard the vessel will be configured such that satellites below 8 degrees above the horizon will not be used in position computations.
- The age of pseudo-range correctors used in position computation will not exceed 20 seconds; however, any horizontal positioning interpolation must not exceed the accuracy requirement in Section 3.1.
- Horizontal Dilution of Precision (HDOP) will be monitored and recorded, and should not exceed 2.5 nominally. Satellite geometry alone is not a sufficient statistic for determining horizontal positioning accuracy. Other variables, including satellite pseudorange residuals, are used in conjunction with HDOP to estimate DGPS horizontal accuracy.
- A minimum of four satellites will be used to compute all positions.
- Horizontal and vertical offsets between the GPS antenna and transducer(s) will be observed and applied in no coarser than 0.1 m increments.

3.2.2. DGPS Site Confirmation

The hydrographer will conduct a 24-hour certification of all non-USCG differential reference stations prior to use for positioning control. The purpose of this certification is to ensure that no multipath or other site specific problems exist. Once the differential station is set up at the site and configured for survey operations, differential corrections will be broadcast and received at a remote site. This remote site may be within 2 meters of the differential reference station control point or over an existing control point (third order or better). The remote site will receive correctors, compute a final position at a rate of not less than once per second, and compare that position to the control point position. A position plot will be constructed comparing the known position and the differentially computed position. An analysis of the data must prove that the position accuracy requirement of Section 3.1 are met. Certification for any non-USCG differential station is valid for one year only. All related position accuracy plots will be included in the Vertical and Horizontal Control Report for each project.