

3 Hydrographic Position Control

3.1 Horizontal Position Accuracy

The NOS specification for hydrographic positioning is that the total error in position of soundings, 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. Refer to section 8.1 regarding horizontal reporting requirements.

3.2 Differential Global Positioning System

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 Project Instructions or Statement of Work, the following specifications are recommended 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 should not exceed 20 seconds; and 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 can be 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.

Any deviations from the above specifications shall be clearly documented in the Descriptive Report with an explanation and supporting data to show that the resulting positions meet the accuracy requirement in Section 3.1.

3.2.2 DGPS Site Confirmation

If any non-USCG differential reference stations are used, the hydrographer shall annually conduct a certification to ensure that no multipath or other site specific problems exist. Using a receiver established over a known point, create a plot to compare positions generated (at least one per second for 24 hours) to the known position and prove that the position accuracy requirement of Section 3.1 is met. Include plots in the Horizontal Control Report for each project (see section 8.1.4.2) .

3.2.3 Other GPS Techniques

Real Time Kinematic (RTK) and Post Processed Kinematic (PPK) may be used for positioning during hydrographic surveys. If RTK or PPK techniques are used, the hydrographer must ensure that all positions meet the accuracy requirements of Section 3.1.

Many vessels receive survey positions from a DGPS aided inertial navigation system (e.g. POS MV). A high quality inertial system may be able to maintain accurate positions for several minutes after loss of differential correctors. Also, age of correctors, satellite elevation variables, etc., may not be configurable. When using DGPS aided inertial navigation systems, the DGPS recommended configurations of Section 3.2.1 may not apply. However, whatever positioning system is used, the hydrographer must always ensure that positions meet the accuracy requirements of Section 3.1.

The hydrographer must describe the quality control checks used to ensure positional accuracy was met in the Data Acquisition and Processing Report (DAPR) and/or Descriptive Report (DR).