C. Vertical and Horizontal Control

All data for survey H12978 have been reduced to Mean Lower Low Water (MLLW) using documented VDatum techniques. The Ferdinand R. Hassler is equipped with Applanix POS/MV position and orientation systems on the port and starboard hulls. Both POS/MV systems have been integrated with Fugro's Marinestar service, which provides real-time GPS correctors via satellite. The correctors are derived using a Precise

Point Positioning (PPP) approach. The POS/MV data was post-processed in Applanix POSPac MMS to produce Smoothed Best Estimates of Trajectory (SBETs) and RMS uncertainty files using the method of Post Processed Precise Point Positioning (5P). See section 3.3.1 for vertical offset details.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	VDatum_shapefile_xyNAD83-MLLW_geoid12b

Table 13: ERS method and SEP file

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 17.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 Marinestar Solution - Vertical Offsets

After processing and applying Marinestar SBETS to port and starboard lines on H12978, vertical offsets were discovered in the data which on average were ~0.20m. The cause of the vertical offset is due to interruptions to the MarinestarGNSS correctors likely due to unavoidable dropouts of the L-band signal in the Primary GNSS antenna. When data were referenced to MLLW via traditional tides, the offsets do not appear. Though most of the data were within 2017 HSSD Specs for vertical uncertainty, six (6) crosslines experience large vertical offsets that exceed 2017 HSSD Specs and were therefore rejected and not delivered with the final products. For more information, please see the Project Correspondence.