C. HORIZONTAL AND VERTICAL CONTROL

Traditional zoning from water level stations was used for *OPR-E349-KR-09* with zoning and verified water level files provided by The Center for Operational Oceanographic Products and Services (CO-OPS). ***Concur.***

Prior to survey acquisition, a global positioning system (GPS) base station with a dual frequency (L1/L2) receiver was established to enable post-processing of survey vessel navigation and attitude data. The base station was located at the Smith residence on Tangier Island (TANGIER) and logged raw dual frequency (L1/L2) GPS observables at one second epochs. A base station position relative to the North American Datum of 1983 (NAD83) (CORS96) (Epoch 2002) was derived from the National Geodetic Survey (NGS) On-line Positioning User Service (OPUS) and based on a 24-hour data file, with one second-epoch logging prior to commencement of survey operations. ***Concur.***

DGPS navigation was logged during acquisition but ultimately overwritten with a post-processed Inertially-Aided Kinematic Ambiguity Resolution (IAKAR) navigation solution. The HIPS Load Attitude and Navigation tool was used to load position, heading and attitude data from a smoothed best estimate trajectory (SBET) file created from Applanix POSPac 5.2 MMS. Post-

processed uncertainty estimates for position, attitude and heading were applied using the HIPS Load Error Tool and used during the calculation of TPE. ***Concur.***

The TANGIER base station was not operating during survey acquisition on December 11 and December 15, 2009 (DN 345 and 348). As a result there was no base station data available to post-process the navigation solution in Single Base mode. Instead, data were post-processed using the Applanix POSPac MMS SmartBase option which creates a virtual reference station from a network of GPS base stations. The network was created from NGS Continuously Operating Reference Stations (CORS) VIMS, MDSI, HNPT, VAGP, DRV5, VAWI, DRV6, and LOY1. Post-processing with the SmartBase option generated an IAKAR navigation solution in SBET format and an associated error file. After the solution was created the POSPac NAVDIF routine was used to compare the SmartBase solution to real-time DGPS navigation as a check to the input base station coordinates and the quality of the final solution. SBET files created from SmartBase processing were loaded in Caris HIPS just like their Single Base counterparts. Table 6 lists the NAD83 coordinates of the base stations used in the GPS network. ***Concur.***

Table 6. CORS Base Stations Used During SmartBase Processing

CORS Base Stations	Coordinates NAD83(CORS) ARP (NGS Data Sheet)		
	Latitude	Longitude	Ellipsoid Height (m)
VIMS*	37/36/30.045 N	075/41/13.207 W	-27.739
MDSI	38/19/08.073 N	076/27/13.956 W	-16.774
HNPT	38/35/19.711 N	076/07/49.333 W	-26.645
VAGP	37/14/55.009 N	076/29/57.731 W	-19.809
DRV5	36/57/31.136 N	076/33/23.903 W	-21.358
VAWI	37/56/03.500 N	075/28/15.949 W	-22.315
DRV6	36/57/30.556 N	076/33/23.214 W	-21.425
LOY1	37/03/43.812 N	076/24/12.356 W	-22.722

* Primary station

A complete description of horizontal and vertical control for survey H12045 can be found in the *OPR-E349-KR-09 Horizontal and Vertical Control Report**, submitted under separate cover. A summary of horizontal and vertical control for this survey follows. ***Concur. *Included with survey deliverables.***

C1. Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary water level stations at Windmill Point, Virginia (863-6580) and Lewisetta, Virginia (863-5750) served as control for datum determination and provided water level correctors for the project. ***Concur with clarification. Final surfaces generated from ERS-VDatum data, in lieu of the data corrected via the above referenced water level station.***