

### C3. Discussion of Tide Zoning

Evaluation of tides was accomplished through comparison of zoned water levels from the primary station to the subordinate water level station, crossline comparisons, visually comparing adjacent lines during Caris subset editing, and analysis of the sun-illuminated CUBE grids for artifacts at zone boundaries. Several zoning scenarios using data from Windmill Point (863-6580) and the Rappahannock Front Range Light (863-2837) were evaluated to determine which gauge and zoning correctors most appropriately adjusted survey data within each of the six tide zones that cover the H11503 survey area. Tide zoning for Rappahannock Front Range Light (863-2837) was created by modifying the Preliminary CO-OPS zoning files tied to Windmill Point, Virginia (863-6580). Zone boundaries were not modified, but new time and range correctors were calculated. Time correctors were calculated by adjusting the average time corrector (ATC) for zone SCB67 which surrounds gauge 863-2837 from -54 minutes (zoned from 863-6580) to zero minutes. Similarly, the range corrector was adjusted from 1.47 to 1.00. From this average time correctors were calculated for each zone relative to 863-2837 by calculating the difference between the ATC relative to 863-6580 for the zone in question and -54 (the ATC for SCB65). Range correctors were calculated by dividing the range corrector for the zone in question by 1.47 (the range value for SCB65 relative to 863-6580).

After several iterations and evaluations of crossline statistics it was determined that the preliminary zoning values as provided for Windmill Point, Virginia (863-6580) and preliminary zoning transferred to the Rappahannock Front Range Light (863-2837) gave the best results. Further crossline analysis was performed to determine which gauge should be tied to each of the six tide zones. Rappahannock Light zoning gave the best crossline statistics for all but two of the tide zones (SCB 94 and SCB 88) which lie on the northeast side of the survey area adjacent to the Windmill Point gauge. A HIPS zone definition file (ZDF) was then created that used gauge 863-2837 as the primary gauge for all zones except for SCB 94 and SCB 88 which used 863-6580 as the primary station. Table 4 includes the zoning information for each zone used for the survey. *Concur.*

**Table 4.** Tide Zones

<b>Zone</b>	<b>Reference Station</b>	<b>Corrector(min.)</b>	<b>Ratio</b>
SCB77	8632837	18	0.67
SCB78	8632837	18	0.76
SCB87	8632837	36	0.76
SCB88	8636580	0	0.99
SCB94	8636580	18	0.99
SCB95	8632837	54	0.76

It is difficult to associate a precise vertical error due to tides. Errors observed are a composite from various sources such as measurement error, tides, heave, refraction, transducer draft, and settlement and squat. Though vertical errors are still visible in the data they are small and are

generally 10 cm or less and in some extreme cases approach 25 cm; below the 20-45 cm maximum allowable error for tides and water levels. The largest contributing factor to water level errors in the Chesapeake Bay is meteorological influences which can not be accounted for by zoning. *Concur.*