

## **TIDES AND WATER LEVELS**

NOAA tide station 8651370 Duck, NC was the source of final verified water level heights for the Mid-Atlantic Corridor, Coast of Virginia surveys (see supplemental correspondence email string with final date of 10 July 2009, located in Appendix V, and revised tide section for Project Instructions). Preliminary and verified water level data for this station were downloaded from the NOAA Center for Operational Oceanographic Products and Services Tides & Currents web site (<http://www.tidesandcurrents.noaa.gov/>). All water level data in meters were annotated with Coordinated Universal Time (UTC).

Final water level files for each tide zone were created from downloaded verified tide data using the **SABER Create Water Level Files** tool. Water level files contained water level heights that were algebraically subtracted from depths to correct the sounding for tides and water levels. These water level files were applied to the multibeam data using the **SABER Apply Tides** program within the **SABER** software.

When it was necessary to apply updated water level correctors such as verified tides to the GSF files, the program removed the previous water level corrector and applied the new corrector. Each time a routine was run on the GSF multibeam data file, a history record was appended to the end of the GSF file documenting the date and water level files applied. For quality assurance, the **SABER Check Tides** program was run on all GSF files to confirm that the appropriate water level corrector had been applied to the GSF file.

After confirmation that verified water levels were applied to all multibeam data, grids were created and analyzed using various color change intervals. The color intervals provided a means to check for significant, unnatural changes in depth across zone boundaries due to water level correction errors, unusual currents, storm surges, etc.

The primary means for analyzing the adequacy of zoning was observing zone boundary crossings in **MVE**. In addition, cross line analysis using the **SABER Analyze Crossings** software was used to identify possible depth discrepancies resulting from the applied water level corrector. Discrepancies were further analyzed to determine if they were the result of incorrect zoning parameters or weather (wind) conditions between the tide station and the survey area. The NOAA provided preliminary zone boundaries and zoning parameters are presented in Table C-19.

**Table C-19. Preliminary Tide Zone Parameters**

<b>Zone</b>	<b>Time Corrector (minutes)</b>	<b>Range Ratio</b>	<b>Reference Station</b>
SA45	0	1.05	8651370
SA46A	0	1.08	8651370
SA55A	0	1.11	8651370

## Final Tide Note

H12091, H12092, H12093, and H12094 surveys were entirely within preliminary water level zones for Duck, NC, 8651370 (SA45, SA46A, and SA55A). Correctors were computed at six minute intervals for each zone. Analysis of the multibeam data in **MVE** and in depth grids revealed minimal depth jumps across the junction of the zones. A spreadsheet analysis of the water level correctors for each zone and the differences observed at the boundaries of adjacent zones also confirmed the adequacy of zoning correctors based on Duck, NC (8651370). For the analysis, observed verified water levels from 19 September through 25 October 2009 and from 10 April through 31 August 2010 were entered separately into the spreadsheet. Differences were computed zone-to-zone and summarized in Table C-20 for the period 19 September 2009 through 25 October 2009 and Table C-21 for the period 10 April 2010 through 31 August 2010. As a result, the NOAA preliminary zone boundaries and zoning parameters for Duck, NC (8651370) were accepted as final and applied to all multibeam data for H12091, H12092, H12093, and H12094. The final analysis of the zone to zone comparisons for sheets yet to be delivered (H12092, H12093, and H12094) will be submitted with the Horizontal and Vertical Control Report and each sheets Descriptive Report.

**Table C-20. 2009 Differences in Water Level Correctors between Adjacent Zones Using Zoning Parameters for Station 8651370**

<b>Zone Boundary</b>	<b>SA46A – SA45</b>	<b>SA46A – SA55A</b>
Minimum Difference	-0.001	-0.001
Maximum Difference	0.058	0.058
Average Difference	0.023	0.023
Standard Deviation	0.012	0.012

**Table C-21. 2010 Differences in Water Level Correctors between Adjacent Zones Using Zoning Parameters for Station 8651370**

<b>Zone Boundary</b>	<b>SA46A – SA45</b>	<b>SA46A – SA55A</b>
Minimum Difference	-0.008	-0.007
Maximum Difference	0.050	0.050
Average Difference	0.019	0.019
Standard Deviation	0.011	0.011