

*The following is a report by CDR Shepard Smith, commanding officer of NOAA Ship Thomas Jefferson (TJ), about how the ship and crew provided hydrographic support in the lower Chesapeake Bay area following a November 2009 nor'easter.*

On Thursday, Nov. 12 and Friday, Nov. 13, Hampton Roads was hit by a strong nor'easter with sustained winds of 50 knots for days and four tidal cycles of high storm surge, up to eight feet in some areas. The Marine Operations Center-Atlantic was closed for two days, and even many essential employees were not able to get to the ship either day due to extensive flooding throughout Norfolk and the closure of many bridges and tunnels.

NOAA Ship *Thomas Jefferson*'s force stood onboard security watches throughout the storm, with the Officer on Duty, ENS Marina Kosenko, licensed engineer 3AE Vic Medina with OS Sonny Palmer and AB Tom Bascomb, fully qualified on all deck gear, on board throughout. The ship lost power several times and had to run on the emergency generator until power was restored. The shore power was partially damaged, but Mr. Medina was able to align the ship's power to run off it nonetheless, after consulting with the Chief Marine Engineer, who was ashore. In the midst of the storm, all hands were called to tend lines that needed to be adjusted as the water level reached record levels. On several occasions, the ship had to take in her bow because the angle was too steep. There was no damage to the ship.

On Friday afternoon, the U.S. Coast Guard (USCG) District 5 and Sector Hampton Roads each separately made requests of NOAA for survey support to help locate any debris or shoaling that might affect the safe passage of the dozens of ships waiting to enter or leave Hampton Roads and Baltimore. On Saturday at 0800, TJ put her launches over to survey in the protected waters of the Elizabeth River and Hampton Roads. We were able to report by Saturday afternoon that no navigationally significant hazards were found in the harbor.

Also on Saturday morning, we began recalling all of TJ's officers and crew in preparation to get the ship underway on Sunday. We were short one licensed engineer, one Able Seaman, one cook, and one unlicensed engineer. Naomi Sak, the MOC Crew Manager, was able to locate and arrange for travel for all of these vacancies in order for TJ to sail at 0800 on Sunday. Atlantic Hydrographic Branch (AHB) provided two physical scientists and one intern to round out our scientific complement.

At 1600 on Saturday, the TJ survey management team (Commanding Officer, Ops Officer LT Mark Blankenship, and Chief Survey Technician Daniel Wright) as well as National Ocean Service reps LCDR Rick Brennan from AHB and LT Sarah Mrozek the navigation manager, joined a conference call to discuss survey priorities with the USCG and the Army Corps of Engineers. At that meeting, the scope of work was reduced from 100 percent side scan sonar throughout the channel and Traffic Separation Scheme framework to bathymetry reconnaissance lines in all the channels.

With this reduced scope of work, the NOAA survey vessel *Bay Hydrographer II*'s planned deployment from Solomon's Island, Md., was cancelled. In addition, there were two specific areas of concern. Lynnhaven Inlet, where all the pilot boats for all Virginia and Maryland ports are stationed, was blocked

by a damaged dredge operation, and two of the pilot boats had been damaged by the loose gear. Without the pilot boats, the pilots cannot get to the ships, and the ships cannot run. Second, the area over the Chesapeake Channel tunnel of the Chesapeake Bay Bridge Tunnel (CBBT) had recently been armored with rock and the Army Corps and the pilots were interested in how the rock had weathered the storm and whether there was any significant erosion around the tunnel.

All our crew arrived by 0600 on Sunday, and we left the pier shortly after 0800. We began survey operations with the ship at 0900 in the Thimble Shoal Channel and dropped the launches at around 1030 at Lynnhaven Inlet. The launch was able to report by noon that the channel into Lynnhaven was clear, and the pilot boats went back into full operation. The survey over the CBBT tunnel showed that the new rock had stayed put and there was no new erosion around the tunnel. The channel reconnaissance surveys showed only limited areas of shoaling that may or may not be related to the storm.

The design of this reconnaissance survey was unique. Since we were looking for shifting sand coming into the channels, we ran multibeam lines along each toe of the channel (where the sloped edge meets the flat bottom), knowing that this is where we would see a problem first. Since NOAA and the Army Corps have done surveys in this area recently, we have some high resolution baseline surveys to use for comparison. Using the Tidal Constituent and Residual Interpolation tide grids we had on file from a previous survey, and the VSAT internet capability, we were able to process in near-real time in order to identify areas of shoaling that might need to be further developed.

We ran a total of around 200 linear nautical miles of survey lines over the course of the survey. Because we processed the data as we went, and were able to confidently know that we were done by the time we finished the last line. In addition, we were able to produce preliminary public products within hours of finishing the survey.

It was only an unusual set of circumstances that allowed TJ to respond to this event. We were here; for most of the year we are deployed some distance from home. Second, we were fully functional. We were fully operational; usually during the winter the ship is unable to field much of a survey capability due to maintenance on the ship and launches, crew leave and training, and technology refresh.

Overall, we were able to show that all of the major channels in Hampton Roads were clear with 24 hours of ship operations, and that the waterways were largely unaffected by the storm. We got underway 23 hours after the request was confirmed by the USCG and approved by the marine center, having pulled crew back from as far as Texas, South Carolina, and much of the mid-Atlantic, and despite the fact that many of our homes were damaged and families displaced by the storm. And lastly, we were able to produce actionable products for the navigation community within hours of completing the project.