

VERTICAL CONTROL

The tidal datum for this project is Mean Lower Low Water (MLLW). The operating tide station at Boston, MA(844-3970) served as control for datum determination.

Tidal zoning for this survey is consistent with the Letter Instructions. The zones used for this survey are as follows:

ZONE	CORRECTOR (min)	RATIO	REFERENCE
NA173	0	x0.96	844-3970
NA174	-6	x0.94	844-3970
NA175	-6	x0.92	844-3970

A Request for Approved Tides letter was sent to N/OPS1 on October 16, 2003 (Appendix IV)*. Observed tide files were e-mailed by TideBot daily during acquisition and applied to all sounding data using preliminary zoning. Final zoning was received and applied with observed water levels. The verified water level data was received and was compared to the observed data. No difference between these verified and observed water level data were notice. Verified water levels were not applied to these data.

Verified tides using final tide zoning were re-applied by AHB.

5.0. TIDES

5.1. Purpose: All tide requirements in these instructions are in direct support of hydrographic survey operations.

5.2 through 5.6. Refer to Standing Instructions.

5.7. Vertical Datums:

Refer to Standing Instructions.

5.7.1. The operating National Water Level Observation Network (NWLON) stations at Boston, MA (844-3970) and Portland, ME (841-8150) will serve as datum control for the survey area as well as control for datum determination at the subordinate stations. Therefore, it is critical that these stations remain in operation during all periods of hydrography.

5.7.1.1. **Water level data acquisition monitoring**

Refer to Standing Instructions.

5.7.1.2. **Water level station operation and maintenance**

Refer to Standing Instructions.

5.7.1.3. No leveling is required at Boston, MA (844-3970) and Portland, ME (841-8150) by NOAA Ship THOMAS JEFFERSON personnel.

5.8. Water Level Station Requirements: The operating water

level stations at Boston, MA (844-3970) and Portland, ME (841-8150) will also provide water level reducers for this project, reiterating the importance of their operation during all periods of hydrography. See Sections 5.7.1.1. and 5.7.1.2. concerning responsibilities.

5.8.1. Subordinate Water Level Stations:

Refer to Standing Instructions.

5.8.1.1. 30-Day Station(s): Install the following water level station. Operate the station for a minimum of 30 days, from 4 hours before to 4 hours after the period of hydrography and/or shoreline verification for the sheet(s) or area(s) specified in Section 5.8.4. of these instructions. However, if the period of hydrography is less than 30 days, this 30-day requirement is waived beyond the 4 hours after the period of hydrography.

<u>Station Number</u>	<u>Station Name</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>
844-4162 *	Boston Light, MA	42° 19.7'	70° 53.5'
842-3898 *	Fort Point, NH	43° 04.3'	70° 42.7'

* Water level stations are currently installed and will be operating during time of hydrography. Assistance obtaining closing levels will be required of NOAA Ship THOMAS JEFFERSON.

Section 5.8.1.2. is not applicable for this project.

5.8.2. GOES Satellite Enabled Subordinate Stations

Refer to Standing Instructions.

The following preliminary satellite antenna pointing angles are provided for the station in Sections 5.8.1.1. to facilitate GOES satellite transmission. Complete GOES information will be provided after the station location is finalized and reported to CO-OPS/RDD. If a suitable site for transmitting via satellite cannot be found within the required area, then a station should be established within the area and the data downloaded onto diskette and forwarded to CO-OPS/RDD. As a backup for all stations, data must be forwarded to CO-OPS/RDD on diskette.

<u>STATION</u>	<u>GOES EAST-EAST</u>	<u>GOES EAST-CENTRAL</u>
844-4162	ELEV. 41.0°	37.4°
	AZIMUTH(T) 186.1°	207.2°
842-3898	ELEV. 40.1°	36.6°
	AZIMUTH(T) 186.3°	207.1°

5.8.3. Recovering Historical bench marks:

Refer to Standing Instructions.

5.8.3.1. Obtain GPS Latitude and Longitude positioning for all historical bench marks recovered/installed at each required subordinate water level station. Refer to the document **Basic GPS Observation Guidelines for NOAA in-house Hydrographic Surveying** from CO-OPS for details. If GPS equipment is not available for this survey, GPS requirements from this section are waived.

5.8.4. Operate the water level station listed in Sections 5.8.1.1. of these instructions for the following hydrographic area(s) or zone(s).

<u>Station Number</u>	<u>Hydrographic Area(s) or Zone(s)</u>
844-4162	Zones: NA171, NA173, NA174, NA175, NA176, NA177, NA178, NA183, NA184, NA185, NA186, NA187, NA188, NA189, NA190, NA199, NA200, NA207, NA208
844-3898	Zones: NA155, NA156, NA169

5.9. Zoning: For hydrography in the area of Boston, Boston, MA (844-3970), and Portland, ME (841-8150) are the reference stations for predicted tides. Predictions may be retrieved in one month increments over the Internet from the CO-OPS Home Page at <http://www.co-ops.nos.noaa.gov/> and then clicking on "Predictions." Predictions are six-minute time series data relative to MLLW in metric units on Greenwich Mean Time. Apply the following time and height correctors to the predicted tides at Boston and Portland during the acquisition and preliminary processing phases of this project for correcting all sounding data.

<u>Zone Name</u>	<u>Time Corrector (mins)</u>	<u>Range Ratio</u>	<u>Predicted Reference</u>
NA155	-18	x0.93	841-8150
NA156	-6	x0.93	841-8150
NA169	0	x0.95	841-8150
NA171	-6	x0.95	844-3970
NA173	0	x0.96	844-3970
NA174	-6	x0.94	844-3970
NA175	-6	x0.92	844-3970
NA176	-12	x0.90	844-3970
NA177	-12	x0.87	844-3970
NA178	-30	x0.87	844-3970
NA183	-30	x0.85	844-3970
NA184	-12	x0.85	844-3970
NA185	-6	x0.85	844-3970
NA186	-6	x0.87	844-3970
NA187	-6	x0.90	844-3970
NA188	-6	x0.92	844-3970
NA189	-6	x0.94	844-3970
NA190	0	x0.96	844-3970

NA199	-6	x0.83	844-3970
NA200	-12	x0.83	844-3970
NA207	-12	x0.81	844-3970
NA208	-6	x0.81	844-3970

NOTE: The tide corrector values referenced to Boston, MA (844-3970), and Portland, ME (841-8150) are provided in the zoning file "A397TJ2003CORP" for this project and are in the fourth set of correctors designated as TS4. Longitude and latitude coordinates are in decimal degrees. Negative (-) longitude is a MapInfo representation of west longitude.

NOTE: For time corrections, a negative (-) time correction indicates that the time of tide in that zone is earlier than (before) the predicted tides at the reference station, whereas, a positive (+) time correction indicates that the time of tide in that zone is later than (after) the predicted tides at the reference station. For height corrections, the water level heights relative to MLLW at the reference station are multiplied by the range ratio to estimate the water level heights relative to MLLW in the applicable zone.

5.9.1. A zoning diagram, created in MapInfo, is provided in both digital and hard copy format to assist with the zoning provided in Section 5.9.

5.10. Tidal Records:

Refer to Standing Instructions on what data records, reports and requests to submit to CO-OPS and the address where these documents should be submitted to.