

## **Appendix B**

### **Requirements and Procedures for Referencing Coastal Navigation Projects to Mean Lower Low Water (MLLW) Datum**

#### **B-1. Purpose**

This appendix provides guidance, technical considerations, and general implementation procedures for referencing coastal navigation projects to a consistent Mean Lower Low Water (MLLW) datum based on tidal characteristics defined and published by the US Department of Commerce. This guidance was originally issued as an Engineer Technical Letter in 1993 to implement applicable portions of Section 224 of the Water Resources Development Act of 1992. It is still applicable to those Corps projects that have not been fully converted to the latest reference datum or tidal epoch.

#### **B-2. Applicability**

This technical guidance in this appendix applies to Commands having responsibilities for design of river and harbor navigation projects on the Atlantic, Gulf, and Pacific coasts, and where such projects are subject to tidal influence.

#### **B-3. References**

- a.* Rivers and Harbors Appropriation Act of 1915 (38 Stat. 1053; 33 U.S.C. 562).
- b.* Water Resources Development Act of 1992 (WRDA 92), Section 224, Channel Depths and Dimensions.
- c.* EM 1110-2-1003 (*Hydrographic Surveying*).
- d.* EM 1110-2-1414 (*Water Levels and Wave Heights for Coastal Engineering and Design*).
- e.* Tidal Datum Planes, Special Publication 135, US Department of Commerce.
- f.* Manual of Tide Observations, Publication 30-1, US Department of Commerce.
- g.* Tide and Current Glossary, US Department of Commerce.
- h.* Statement of Work for the Installation, Operation and Maintenance of Tide Stations, US Department of Commerce.
- i.* User's Guide for the Installation of Bench Marks and Leveling Requirements for Water Level Stations, US Department of Commerce.
- j.* The National Tidal Datum Convention of 1980, US Department of Commerce.

#### **B-4. Background**

*a.* Depths of USACE navigation projects in coastal areas subject to tidal influences are currently referred to a variety of vertical reference planes, or datums. Most project depths are referenced to a local or regional datum based on tidal phase criteria, such as Mean Low Water, Mean Lower Low Water, Mean Low Gulf, Gulf Coast Low Water Datum, etc. Some of these tidal reference planes were originally derived from US Department of Commerce, National Ocean Service (NOS) observations and definitions used for the various coasts. Others were specifically developed for a local project and may be without reference to an established vertical network (e.g., National Geodetic Vertical Datum of 1929) or a tidal reference. Depending on the year of project authorization, tidal epoch, procedures, and the agency that established or connected to the reference datum, the current adequacy of the vertical reference may be uncertain, or in some cases, unknown. In some instances, project tidal reference grades may not have been updated since original construction. In addition, long-term physical effects may have significantly impacted presumed relationships to the NOS MLLW datum.

*b.* The National Tidal Datum Convention of 1980 established one uniform, continuous tidal datum for all marine waters of the United States, its territories, and Puerto Rico. This convention thereby lowered the reference plane (and tidal definition) of both the Atlantic and Gulf coasts from a mean low water datum to a MLLW datum. In addition, the National Tidal Datum Epoch was updated to the 1960-1978 period and mean higher/high water datums used for legal shoreline delineation were redefined. The latest tidal epoch update is the 1983-2001 period.

*c.* Since 1989, nautical charts published by NOAA reference depths (or soundings) to the local MLLW reference datum, also termed a "chart datum." US Coast Guard (USCG) Notices to Mariners also refer depths or clearances over obstructions to MLLW. Depths and clearances reported on USACE project/channel condition surveys provided to NOAA, for incorporation into their published charts in plan or tabular format, must be on the same NOS MLLW reference as the local chart of the project site.

*d.* WRDA 92, Section 224, requires consistency between USACE project datums and NOAA marine charting datums. This act amended Section 5 of the Rivers and Harbors Appropriation Act of 1915 to define project depths of operational projects as being measured relative to a MLLW reference datum for all coastal regions. (Only the Pacific coast was previously referenced to MLLW). The amendment states that this reference datum shall be as defined by the Department of Commerce for nautical charts and tidal prediction tables for a given area. This provision requires USACE project reference grades be consistent with NOS MLLW (latest epoch).

#### **B-5. Impact of MLLW Definition on USACE Projects**

*a.* Corps navigation projects that are referenced to older datums (e.g., Mean Low Water along the Atlantic coast or various Gulf coast low water reference planes) must be converted to and correlated with the local MLLW tidal reference established by the NOS. Changes in project grades due to redefining the datum from mean low water to NOS MLLW will normally be small, and in many cases will be compensated for by offsetting secular sea level or epochal increases occurring over the years. Thus, impacts on dredging due to the redefinition of the datum reference are expected to be small and offsetting in most cases.

*b.* All Corps project reference datums, including those currently believed to be on MLLW, must be checked to insure that they are properly referred to the latest tidal epoch, and that variations in secular sea level, local reference gage or benchmark subsidence/uplift, and other long-term physical phenomena are properly accounted for. In addition, projects should be reviewed to insure that tidal phase and range characteristics are properly modeled and corrected during dredging, surveying, and other marine

construction activity, and that specified project clearances above grade properly compensate for any tidal range variances. Depending on the age and technical adequacy of the existing MLLW reference (relative to NOS MLLW), significant differences could be encountered. Such differences may dictate changes in channels currently maintained. Future NOS tidal epoch revisions after the current 1983-2001 period will also change the project reference planes.

c. Conversion of project datum reference to NOS MLLW may or may not involve field tidal observations. In many projects, existing NOS tidal records can be used to perform the conversion, and short-term simultaneous tidal comparisons will not be required. Tidal observations and/or comparisons will be necessary for projects in areas not monitored by NOS or in cases where no recent or reliable observations are available.

## **B-6. Implementation Actions**

A number of options are available to USACE commands in assessing individual projects for consistency and accuracy of reference datums, and performing the necessary tidal observations and/or computations required to adequately define NOS MLLW project reference grade. Datum establishment or verification may be done using USACE technical personnel, through an outside Architect-Engineer contract, by another Corps district or laboratory having special expertise in tidal work, or through reimbursable agreement with NOS. Regardless of who performs the tidal study, all work should be closely coordinated with both the USC&GS and NOS in the Department of Commerce.

a. *Technical specifications.* The general techniques for evaluating, establishing, and/or transferring a tidal reference plane are fully described in the USACE and Department of Commerce publications referenced in paragraph B-3. These references should be cited in technical specifications used for a tidal study contract or reimbursable agreement with another agency/command.

b. *Department of Commerce contacts.* Before and during the course of any tidal study, close coordination is required with the NOS.

c. *Sources.* If in-house forces are not used, the following outside sources may be utilized to perform a tidal study of a project, including any field tidal observations.

(1) Architect-Engineer (A-E) Contract. A number of private firms possess capabilities to perform this work. Either a fixed-scope contract or indefinite delivery contract form may be utilized. In some instances, this type of work may be within the scope of existing contracts. Contact NOS to obtain a typical technical specification which may be used in developing a scope of work. The references in paragraph B-3 of this appendix must be cited in the technical scope of work for the A-E contract.

(2) Reimbursable Support Agreement. Tidal studies and datum determinations may be obtained directly from the NOS, Department of Commerce, via a reimbursable support agreement. A cooperative agreement can be configured to include any number of projects within a district. Funds are provided to NOS by standard inter-agency transfer methods and may be broken down to individual projects. Contact the NOS to coordinate and schedule a study agreement.

d. *Scheduling of conversions.* Section 224 of WRDA 92 did not specify an implementation schedule for converting existing projects to NOS MLLW (or verifying the adequacy of an existing MLLW datum). It is recommended that a tidal datum study be initiated during a project's next major maintenance cycle.

*e. Funding.* No centralized account has been established to cover the cost of converting projects to NOS MLLW datum. Project Operations and Maintenance funds will be used to cover the cost of tidal studies and/or conversions on existing projects. For new construction, adequate funding should be programmed during the initial planning and study phases. Budget estimates for performing the work can be obtained from NOS.

*f. MLLW relationship to national vertical network.* USACE tidal benchmarks should be connected to the national vertical network maintained by the NOS--i.e., NAVD 88. Project condition surveys, maps, reports, studies, etc. shall clearly depict the local relationship between MLLW datum and the national vertical network.

*g. Changes in dredging.* It is not expected that the datum conversion will significantly impact dredging requirements. USACE commands should request HQUSACE guidance should a datum conversion cause a significant change in a channel's maintained depth.