

9.0 SURVEYS

9.1 Survey Standards Manual

All surveys shall conform to the latest published version of CEMVN-ED-SS-06-01 “USACE New Orleans District Guide for Minimum Survey Standards.” This standard is approved for public release and distribution is unlimited. It is available at:

<http://www.mvn.usace.army.mil/ed/edss/surveyingguidelines.asp>

9.1.1 Purpose

The document provides guidance on performing detailed engineering surveys of facilities and civil works projects. Technical specifications, procedural guidance, and quality control criteria are outlined for surveying services performed in a consistent manner for the New Orleans District in support of hurricane and flood protection, hydrologic studies, construction, and mapping projects.

9.1.2 Applicability

The document applies to all in-house and A-E contract surveying services having responsibility for the planning, engineering and design, operation, maintenance, construction, and related real estate and regulatory functions of civil works, and environmental restoration projects. It is intended for use by hired-labor personnel, construction contractors, and Architect-Engineer (A-E) contractors. It is also applicable to surveys performed or procured by local interest groups under various cooperative or cost-sharing agreements.

9.1.3 Use of Manual

The Survey Standards document is intended to be a reference guide for control surveying, site plan mapping, utility and infrastructure utility feature mapping. These activities may be performed by hired-labor forces, contracted forces, or combinations thereof.

9.2 Quality Assurance

Survey work shall comply with the following Quality Assurance steps at a minimum. A-Es should reference the MVN Survey Section web page for procedures on contacting MVN for benchmark information and submittal procedures relative to their project. The page is located at: <http://www.mvn.usace.army.mil/ed/edss/index.asp>

9.2.1 Survey Plan

All A-E contract surveying services shall require a Survey Plan to be submitted to Engineering Division Surveys Section for Independent Technical Review prior to the planned surveying activities. The Survey Plan shall be constructed in accordance with the guidelines established in the “USACE New Orleans District Guide for Minimum Survey Standards.” This requirement applies, whether the surveying activity is primary to the contract or task order or incidental to the contract or task order purpose. ITR does not impact mobilization or initiating surveying activities; the parties engaged in data collection remain responsible for appropriate surveying approach and methodologies and as such might be required to provide clarification, adjustments to the methods and data, and recollection.

9.2.2 Survey Report

All A-E contract surveying services shall require a Survey Report to be submitted to Engineering Division Surveys Section for Independent Technical Review within two weeks of completing the surveying activities and office processing. This requirement is independent of any other contractual deadlines. The Survey Report shall be constructed in accordance with the guidelines established in the “USACE New Orleans District Guide for Minimum Survey Standards.” This requirement applies, whether the surveying activity is primary to the contract or task order or incidental to the contract or task order purpose. ITR does not impact mobilization or initiating surveying activities; the parties engaged in data collection remain responsible for appropriate surveying approach and methodologies and as such might be required to provide clarification, adjustments to the data, and recollection.

9.2.3 Submittal Format

Both the plan and report shall follow this general outline.

1. Job Number:
2. Contract Number:
3. Lat/Lon:
4. Job Title:
5. General Approach:
6. Horizontal Positioning:
 - 6.1 Datum:
 - 6.2 Control:
 - 6.3 Equipment:
 - 6.4 Methodology:
7. Vertical Positioning:
 - 7.1 Datum:
 - 7.2 Epoch:
 - 7.3 Control:
 - 7.4 Equipment:
 - 7.5 Methodology:

9.3 Adherence to IPET Report Lessons Learned

All A-E contract surveying services shall conform to the following requirements as summarized from the IPET Report, Lessons Learned for Flood Control and Hurricane Protection Projects. All reference datums, surveying methods, benchmarks, and spatial data must be clearly defined and documented. Any questions shall be directed to Engineering Division, Survey Section.

9.3.1 Metadata Embedded Dataset Specification

The metadata embedded dataset specification can be found in Section H at :
http://www.mvn.usace.army.mil/ed/edss/USACE_MVN_Min_Survey_Standards.PDF

9.3.2 Dual Elevations on Flood Control and Hurricane Protection Structures

All planning, design, construction, and operation & maintenance inspection documents containing elevation data on flood control structures should show both geodetic and water surface referenced elevations or at a minimum, show the relationship between the geodetic and water surface or local tidal datum. The relative water surface reference datum (i.e., LMSL) is used as the baseline for hydraulic modeling and related levee height design computations. The terrestrial geodetic datum typically used by surveyors for construction stake out and subsequent periodic subsidence modeling must be corrected to be relative to the local water datum. The base gage with its correction to NAVD88 defining a water level datum must be clearly defined, along with applicable tidal or river stage epochs, and conversion parameters to relate water level datums to the local geodetic datum.

9.3.3 Geospatial Data Source Feature or Metadata Records

All planning, design, and construction documents containing survey information shall contain detailed source (i.e., metadata) information on geospatial coordinates or terrain models included in those documents. This would include the location and repository for the original source data, field book numbers, monument descriptions, etc. Geospatial metadata incorporated in documents shall have sufficient detail such that there is no uncertainty (currently or in the future) as to the location of the original data, its origin, and other temporal relationships.

9.3.4 Epoch Designations of Published Topographic Elevations

Reported elevations of surface topography, subsurface bathymetry, and/or constructed structures in high subsidence areas should contain feature (metadata) information on the source datum and applicable adjustment epoch date. This applies to both geodetic elevations (e.g., 12.34 ft NAVD88 (2004.65)) and water

level based elevations (e.g., (-) 5.25 ft LMSL (2000-2005) or 35.0 ft MLLW (1983-2001) or 12.3 ft LWRP (1974)). Hard copy or CADD data files should place this metadata information in the General Notes on the first sheet or digital file of a series, with appropriate references on subsequent sheets/files that depict topographic information and source files names and locations.

9.3.5 Definitions of NGVD29, NAVD88, Mean Sea Level, and Local Mean Sea Level

When referring to the mean water surface at or near a specific flood control project, LMSL should be used. A LMSL derived elevation should clearly identify the water level reference gage location and the time series (epoch) over which the mean surface elevation was computed. NOAA geodetic and tidal datasheets should be modified to clearly indicate orthometric heights/elevations differ from mean sea level elevations.

9.3.6 Coordination of Topographic Survey Data Collection, Processing, and Management

To minimize the confusion associated with several entities producing survey data, all surveys should be coordinated and archived by MVN Survey Section. This would standardize survey methods, survey control, deliverables, etc.

9.3.7 Vertical Control Monumentation Requirements and Stakeout Procedures on Flood Control Construction Projects

A minimum of three (3) permanent benchmarks (new or existing) shall be identified on design and construction drawings for all flood control projects. These marks should be established during the planning and design phase. The marks shall be situated in the middle and at each end of the project. They shall be established relative to existing NAVD88 control established by the NGS, using either conventional differential leveling and/or the latest NGS-approved differential GPS network observations, with appropriate corrections to the local hydraulic design surface. Prior to and during actual construction stake out, these primary reference marks should be verified externally and internally. Field records of these survey verifications shall be permanently archived.

9.3.8 LIDAR and Photogrammetric Mapping Calibration and Testing

Hurricane Protection Projects, requiring accurate, up-to-date topographic detail, should not attempt to utilize older mapping data of uncertain origin, resolution, and accuracy—especially if this data was not reliably quality assured (i.e., ground truthed). Contracts for aerial mapping services must contain quality assurance provisions for calibrating, ground truthing, and testing delivered mapping products. These methods should follow long-established testing methods outlined

in standards such as USACE EM 1110-1-1000 (Photogrammetric Mapping), FGDC, ASPRS, and FEMA.

9.4 Typical Scope of Services for Structural Design Projects

The following outline provides the generally required survey information for typical structural design projects. This list is neither definitive nor all-inclusive.

9.4.1 Vertical and Horizontal Control

Horizontal and vertical controls shall be established in accordance with MVN Survey Section Standards. Establish control points and baselines to use as horizontal reference. All horizontal control should be tied to a USACE baseline.

9.4.2 Boundary Surveys

Research adjoining property owners then locate and tie existing property into horizontal control.

Research and locate aboveground and underground utilities and tie them to the horizontal and vertical controls.

Locate required rights-of-way and construction easements.

9.4.3 Topographic Surveys

Identify above ground features such as roads, canals, fences, buildings, bridges, floodwalls, piers, etc. and tie features to vertical and horizontal control points.

If project includes construction in or adjacent to an existing facility, take measurements and spot elevations to verify existing “as-built” drawings and to identify any deviations in the existing structural, architectural or mechanical features. This may also require under water probing.

9.4.4 Cross-Sections and Profiles

9.4.4.1 Major Structure Site

Cross-sections are typically taken at 25 to 50 ft. intervals perpendicular to the baseline. Intervals will depend on site topography and may include or be continuous with hydrographic surveys.

At any intake and discharge areas where hydraulic modeling is to be required, cross-sections should be no further apart than 25 ft.

Extend cross-sections to provide full coverage of area to include important features such as C/L of pavement, edge of roads, waters edge, drainage ditches, top of bank, etc.

A centerline profile is typically required along the proposed project C/L (structure or roadway). The profile should be extended to include important features and may include or be continuous with hydrographic surveys

9.4.4.2 Levee and Floodwall Sites

Cross-sections are typically taken at 50 to 100 ft. intervals perpendicular to the baseline. Intervals depend on site topography and may include or be continuous with hydrographic surveys.

Extend cross-sections to provide full coverage of area to include important features such as C/L of pavement, edge of roads, waters edge, drainage ditches, top of bank, etc.