



## SECTION 5 SURVEYING

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### 5.1 PURPOSE

This section describes the survey requirements for design, construction, and acceptance of water and wastewater system improvement projects.

### 5.2 GENERAL STANDARDS

Unless otherwise specified, all surveying activities including the preparation of maps, plans, and other documents based on survey information shall be performed in accordance with the “Minimum Technical Standards for Land Surveying in the State of Alabama”. All data collected by the surveys shall be coordinated under the guidance and supervision of a Land Surveyor or Engineer registered in the State of Alabama.

### 5.3 HORIZONTAL AND VERTICAL CONTROL

#### 5.3.1 DATUMS

All projects submitted to the Board for consideration shall be referenced to Montgomery County Geographical Information Systems Horizontal and Vertical Datums. Horizontal datum shall be Alabama State Plane Coordinate System, East Zone, NAD 83. Vertical datum shall be NAVD 1988.

Acceptable source for horizontal and vertical datums shall be the established Montgomery County GIS monuments or “Blue Booked” National Geodetic Survey control points. Information pertaining to Montgomery County GIS monuments is provided in the Appendices of this manual (see “Montgomery County, Alabama, Control Point Information”).

#### 5.3.2 PROJECT CONTROL POINTS

##### 5.3.2.1 Project Control Point Location

Project horizontal and vertical control points shall be established in the vicinity of the project using generally accepted survey methods. These new points shall be set within the public right-of-way or easement limits, be located so as to avoid disturbance, and generally provide coverage of the entire project area.

### 5.3.2.2 *Project Control Marker*

Project horizontal and vertical control points shall consist of semi-permanent markers or objects recoverable by conventional survey metal detectors or by location reference points.

Points set in the ground in maintained areas shall be flush with the ground. Trees are not to be used for setting control points or references except where there is no practical alternative. No spikes, nails, etc., are to be driven into a tree except under the above described circumstances. Trees shall not be “blazed” under any circumstances, and only water-based paint may be used if it is necessary to mark a tree.

It shall be the responsibility of the project engineer or surveyor to maintain the required horizontal and vertical control points until final acceptance.

### 5.3.2.3 *Horizontal Control Points*

Project horizontal control may be established directly on system features (such as manholes, valves, etc.), by APS observation, or by the use of traditional survey control points and/or baselines. A minimum of two intervisible points shall be required to monument the horizontal datum.

### 5.3.2.4 *Vertical Control Points*

Project vertical control shall include a minimum of two points, one near each end of the project, or one point per 1000 feet  $\pm$  for larger projects.

## 5.4 HORIZONTAL AND VERTICAL ACCURACY

New project horizontal control points shall be established with positional accuracies of 1:5000. New project vertical control points shall be established with level run closures of  $\pm 0.005' \times (\text{distance in miles})^{1/2}$  or the equivalent.

Horizontal and vertical accuracies for alignment data (coordinates, bearings and distances, elevations, etc.) are the same as for control points. Horizontal locations of topographic and planimetric features shall be accurate to within  $\pm 0.5$  feet. Vertical locations of structures and map features shall be  $\pm 0.01$  ft for artificial features and  $\pm 0.10$  feet for natural features.

## 5.5 INFORMATION SHOWN ON THE PLANS

All horizontal, vertical, and other information critical to the design and construction of the improvements shall be shown on the plans. Such data and information shall include but not be limited to the following:

Notes identifying the horizontal and vertical datums and monuments on which they are based shall be shown on the plans and other applicable documents. References to other pertinent datums related to the project, such as previous survey, design, or construction datums, shall be identified by notes, including conversion factors relating to the datum.

Locations, descriptions, coordinates and/or elevations of new project control points and associated reference points.

Alignment data of the improvements including coordinates, bearings and distances, elevations, final stations, offsets, and curve data.

Offset distances to parallel features (such as roads, railroads, ditches, sidewalks, R/Ws, easement limits, etc.) within 30 feet of the improvement alignment.

## **5.6 ADDITIONAL DATA AND INFORMATION**

It may be necessary to obtain and provide additional data and information critical to the design and construction of the improvements. Such data and information may include but not be limited to that described in the following sections.

### **5.6.1 FIELD PROFILES**

Profile elevations along the improvement alignment shall be obtained at approximately 50 – 100 ft intervals with intermediate grade breaks sufficiently spaced to accurately depict the terrain. Profile drawings shall delineate all existing improvements, structures, roads, ditches, streams, etc., within 25 feet of the improvement alignment, with notes regarding size, type, and description of such feature.

### **5.6.2 CROSS-SECTIONS OR TOPOGRAPHY AND PLANIMETRY**

Cross-sections or topography and planimetry may be necessary at critical locations to evaluate alignment, slope, and excavation requirements. All cross-sections, topography, and planimetry critical to the improvement design shall be shown on the plans or other documents.

Topography generated from aerial photography shall be clearly identified as such, with notes regarding date of photography, original mapping scale and contour intervals, and datum references. The accuracy and completeness of this work is the sole responsibility of the Engineer or Land Surveyor even though obtained from other sources. Field checks and supplemental field topographic surveys may be required as necessary.

### **5.6.3 UTILITIES**

Information regarding all publicly and privately owned surface and subsurface utilities affecting the proposed improvements shall be shown on the plans. This information shall be obtained by field surveys and existing maps supplied by the utilities.

#### **5.6.4 HIGHWAYS AND RAILROADS**

When portions of the improvements are within railroad or road right-of-ways, topography and planimetry shall be provided as necessary for the design and construction of the improvements or as required by the affected reviewing agency.

#### **5.6.5 EXISTING RIGHTS-OF-WAY, EASEMENTS AND PROPERTY LINES**

Where the location of the improvements in relation to the existing features such as rights-of-ways, easements, and property lines is critical to the design or construction, sufficient information shall be shown to correctly establish the location of such features. Notes regarding the source of such information, and the name and addresses of the owners or owning agencies shall also be shown. Existing monumentation, pertinent improvements and evidences of prescriptive use within the project limits shall be shown.

#### **5.6.6 SANITARY SERVICE CONNECTION SURVEY**

Where existing housing is present along the route of a proposed sewer extension or replacement, a sanitary service connection survey shall be conducted. The survey shall determine the controlling elevations for design. The following information shall be shown.

Type of structure

Basement facilities (if present)

Size, type, and location of existing service lateral.

Elevation of the lowest possible living area floor.

Any additional information that may be required for design of the sewer line.

All elevations should be determined by actual field measurements; however, if a unit cannot be entered, an estimated lowest living area floor elevation shall be made from a known elevation from some other point on the unit. In this case, the elevation must be clearly marked as being estimated. Should an estimated elevation control have the potential to control the vertical elevation of the sewer, the Board's Engineer shall arrange provisions for entry and actual determination of service elevation.



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