

## **Borehole Location**

The Soil and Rock Logging, Classification and Presentation Manual requires that each borehole be located by Station and Offset from the reference line, and that the benchmark used to determine the borehole elevation be identified on the plan sheet. This section provides additional information and direction relating to these requirements.

The purpose of locating the borehole is to present its location relative to the planned work and to document the benchmark used to determine top of borehole elevation.

## **Benchmark**

Prior to drilling, the geoprofessional should locate and verify a nearby benchmark, which may be an actual USGS or Caltrans monument or a fixed object of known elevation, such as a centerline begin bridge or end bridge. Usable benchmarks may be shown on the project plans, topographic maps, or can be obtained from Caltrans Surveys or the US Geological Survey.

Verify whether the benchmark is located close enough to the planned boreholes to allow convenient determination of the borehole elevation. If not, the geoprofessional should consider setting a temporary benchmark close to the planned work so to allow quick and easy determination of the borehole elevation before, during, or after drilling operations. Such a temporary benchmark could be a paint mark made during an initial site visit or while marking the site for USA.

## **Location Methods**

Borings can be located using traditional tools, GPS devices, topographic mapping, and District surveys.

## **Traditional Tools**

The accuracy associated with traditional tools used by the Geoprofessional (measuring tapes and wheels, laser range finder, level, etc.) are acceptable for the log of test borings sheet, boring record, and geotechnical reporting.

To determine the station and offset, use convenient features shown on the plans. Foundation plans and layout plans typically present the alignment line, centerlines, and fixed objects such as drainage inlets, curbs, trees, structures and other features which may be used as a reference to locate a borehole. The station and offset of the feature can be scaled directly from the plan sheet. Alternatively, horizontal locations of reference points

can be determined by using the measuring tools within the MicroStation program if desired.

In situations where it is not possible to use an existing feature as a reference (e.g. a new alignment) contact the District Project Engineer or Surveys to inquire about existing benchmarks, or to request the local Caltrans surveyors set benchmarks, stake the centerline, or stake the begin bridge (BB) and end bridge (EB) locations.

Using the existing feature for horizontal control and benchmarks for vertical control the Geoprofessional determines the location and elevation of the boreholes. It is expected that the foundation drillers will assist with this process, as requested by the Geoprofessional, during or shortly after drilling.

If more than one leveling equipment setup is used to locate one or more boreholes, it is recommended that the loop be closed to assure accurate measurements were obtained.

## **GPS**

The accuracy of GPS tools varies widely. Use tools that can achieve accuracy that meets the reporting requirements. In general most GPS devices cannot achieve the needed accuracy for elevation.

## **Topographic Mapping**

Topographic mapping may be used to determine borehole elevations if the map accuracy meets the reporting requirement.

## **District Surveys**

Using District Surveys to determine borehole locations or elevations is recommended for those occasions when it is not possible, safe, or cost effective for the geoprofessional to do so in the field. Typical examples are:

- New alignment where prior staking is not available
- Site is located in an area of high relief where the location cannot be determined by physical means (tape measure, measuring wheel) or where the benchmark and borehole elevations are significantly different.
- Site is otherwise not conducive to direct measurement (e.g. in a wooded area)
- Site is heavily vegetated and the elevations cannot be determined without establishing a number of temporary benchmarks and turning points.
- Site is along a corridor in a metropolitan area with numerous boreholes.

## **Reporting**

Report station and offset to the nearest foot. For structures report elevation to the nearest 0.1 foot. For earthwork report elevation to the nearest foot unless special needs (e.g. slope inclinometer for landslide monitoring) or geology concerns (e.g. potential for encountering hard rock) require reporting the elevation to the nearest 0.1 foot.

The datum used for borehole location should be the same datum used by the Project Engineer.