

## NEW COORDINATE ADJUSTMENT FOR ALABAMA

The National Geodetic Survey (NGS) has recently completed the final adjustment of the Alabama High Accuracy Reference Network (HARN). Consisting of 25 existing horizontal control stations spaced at approximately 100 kilometer (62 mile) intervals (Diagram), the network was observed to A and B-Order accuracy standards (5 mm + 1:10,000,000 and 8 mm + 1:1,000,000) as defined by the Federal Geodetic Control Committee (FGCC).

Project implementation and coordination were directed by Mr. Bill Rindal, NGS Geodetic Advisor to Alabama, with the assistance of the Alabama Highway Department (ALHD). Field operations for the HARN were conducted between January and February 1992, by NGS surveyors using Trimble 4000SST dual frequency GPS receivers. Most observations far exceeded the 1:1,000,000 proportional accuracy required for the B-Order adjustment. A majority of lines exceed 1:10,000,000! A state-wide First-Order (1:100,000) network of 929 GPS stations established by ALHD between 1989 - 1992 was also included in this adjustment.

In addition to adjusting the GPS data to fiducial stations of the Very Long Baseline Interferometry (VLBI) and Cooperative International GPS Network (CIGNET) systems, all existing horizontal control in the State was readjusted to provide consistency between the HARN and the existing horizontal network, and to improve the internal consistency of the existing network. The readjustment extended into the bordering states to the extent required to maintain consistency of the National Geodetic Reference System (NGRS). The new coordinate values are referred to as North American Datum of 1983, Adjustment of 1992, and are designated NAD 83 (1992). This designation is necessary to distinguish between the original NAD 83 Adjustment of 1986, or NAD 83 (1986). Coordinate values should be properly labeled to eliminate confusion. Positional changes due to the network improvement vary across the State, but are generally less than 1 meter (3.2 feet).

Orthometric heights for the HARN were determined by occupying 5 published bench marks and performing spirit leveling connections to all other stations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Accuracy of ellipsoidal heights determined by the GPS observations are less than third order.

All GPS surveys performed prior to this readjustment, and not submitted to NGS ("Blue Booked") should be readjusted from original observations to maintain consistency with NGRS. Lower order coordinate information (e.g. cadastral survey, photogrammetry) can be transformed from NAD 83 (1986) to NAD 83 (1992) using a new version (2.10) of the NADCON software supplied by NGS, with special transformation grids for the

Alabama adjustment (ALHPGN.LAS and ALHPGN.LOS). The transformation grids have been tested by NGS and should provide transformation values accurate to an average of 0.05 meter  $\pm$  0.01 meter (0.16  $\pm$  0.03 feet) across the State. Updated coordinate information, and the NADCON software can be obtained from the NGS Information Center, (301) 713-3242.

Questions concerning the HARN and state-wide readjustment or coordinate transformations should be directed to Bill Rindal, (205) 242-6597 or Dave Doyle, (301) 713-3178.

# ALABAMA HARN

