

HIGH ACCURACY REFERENCE NETWORK FOR ARKANSAS

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The National Geodetic Survey (NGS) has recently completed the final adjustment of the Federal and Cooperative Base Networks (FBN/CBN) for Arkansas. Consisting of 101 stations, 32 new and 69 existing National Spatial Reference System (NSRS) control stations spaced at approximately 50 kilometer (31 mile) intervals, 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 Subcommittee. This network is often referred to as the High Accuracy Reference Network (HARN). Project implementation and coordination were directed by NGS, in cooperation with the Arkansas Geological Survey Land Survey Division, Arkansas Highway Transportation Department, Petit Jean Technical College, University of Arkansas at Little Rock, Arkansas Society of Professional Surveyors and the Little Rock Air Force Base. Field operations were conducted between March and April, 1997, using Ashtech Z-XII, Leica SR299 and SR399, Topcon Turbo SII and Trimble 4000SSE and 4000SSI, dual frequency Global Positioning System (GPS) receivers. Most observations far exceeded the 1:1,000,000 proportional accuracy required for the B-Order adjustment.

Fiducial stations used in the GPS adjustment included Continuously Operating Reference Stations (CORS) and existing FBN stations in Louisiana, Mississippi, Missouri, Oklahoma, Tennessee and Texas. To ensure the integrity of the NSRS, all existing horizontal control in Arkansas will be readjusted to provide consistency between the HARN and the existing horizontal network. The state-wide readjustment will extend into the bordering states to the extent necessary to maintain consistency of the NSRS. Until the completion of the state-wide readjustment, HARN stations will be designated as "SPECIAL STATUS" on NGS data sheets to indicate their positional differences with the existing lower order NSRS stations. Given the current back log of other HARN state-wide readjustments, the Arkansas readjustment could require as much as 2 years to complete. The new coordinate values are referred to as North American Datum of 1983 (NAD 83), Adjustment of 1997, and are designated NAD 83 (1997). This designation is necessary to distinguish between the original NAD 83 Adjustment of 1986, or NAD 83 (1986). Coordinate values, including State Plane Coordinates or Universal Transverse Mercator Grid should be properly labeled to eliminate confusion. Positional changes due to the network improvement vary across the State, but are generally less than 0.50 meter (1.6 feet).

Orthometric heights for the HARN were determined by occupying 27 bench marks and 15 stations with previously determined heights by GPS, referenced to the North American Vertical Datum of 1988 (NAVD 88). NAD 83 ellipsoidal heights were determined by holding the values published for 2 CORS and 33 existing A and B-Order quality stations in and around the State. Accuracy of ellipsoidal heights determined by these observations vary, and are sometimes less than third-order. Orthometric heights are generally considered to be equivalent to those obtained by conventional vertical angle observations (0.1 meter/0.3 feet).

All GPS surveys performed prior to the HARN, and not submitted to NGS ("Blue Booked") for inclusion in NSRS, should be readjusted from original observations to maintain consistency with NSRS. Lower order coordinate information (e.g. cadastral survey, photogrammetry, GIS data) can be transformed from NAD 83 (1986) to NAD 83 (1997) using version 2.10 of the NADCON software supplied by NGS, with special transformation grids for the Arkansas adjustment (ARHPGN.LAS and ARHPGN.LOS). The transformation grids will be developed by NGS following the state-wide readjustment, and should provide transformation values accurate to an average of 0.06 meter +/- 0.02 meter (0.20 +/- 0.06 feet) across the State. Updated coordinate information, and the NADCON software can be obtained from the NGS Information Services Section at (301) 713-3242 and the NGS Internet Home Page at <http://www.ngs.noaa.gov>. Requests for data should be referenced by the survey project identifier GPS1133. These data will also appear on the next edition of the NGS South Central CD-ROM scheduled for release in March, 1998.

Questions concerning the HARN and state-wide readjustment or coordinate transformations should be directed to Dave Doyle, NGS Observation and Analysis Division, telephone (301) 713-3178, or E-mail daved@ngs.noaa.gov, Kit Carson, Surveys Division Arkansas Highway Transportation Department, telephone (501) 569-2343 or E-mail dkce035@ahtd.state.ar.us, or Paul Walla, P.L.S., Arkansas HARN CBN Coordinator telephone (501) 756-2772. NGS is working with the Arkansas Society of Professional Surveyors to schedule a technical seminar in the near future to discuss the aspects of the HARN development and implementation.