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HIGH ACCURACY REFERENCE NETWORK FOR ILLINOIS

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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 Illinois. Consisting of 242 stations, 90 new and 152 existing National Spatial Reference System (NSRS) control stations spaced at approximately 30 kilometer (23 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 Illinois Department of Transportation (ILDOT). Additional support was also provided by Indiana University, and the Indiana, Iowa, and Wisconsin Departments of Transportation, and the Missouri Department of Natural Resources. Field operations were conducted between June and July 1997, using Trimble 4000SSE, 4000SSI, Ashtech Z-XII, Ashtech Z-XII3 and Leica SR399 dual frequency Global Positioning System (GPS) receivers. Most observations far exceeded the 1:1,000,000 proportional accuracy required for the B-Order adjustment.

In addition to adjusting the GPS data to fiducial stations of the Continuously Operating Reference Station (CORS) network, and existing FBN stations in Indiana, Iowa, Kentucky, Missouri and Wisconsin, all existing horizontal control in the State will be readjusted to provide consistency between the HARN and the existing horizontal network. The 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 Illinois 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 0.6 meter (2.0 feet). Positions and

published for all HARN stations.

Orthometric heights for the HARN were determined by occupying 113 bench marks and 21 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 4 Continuously Operating Reference Stations (CORS) and 55 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 Illinois adjustment (ILHPGN.LAS and ILHPGN.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>.

Questions concerning the HARN and state-wide readjustment or coordinate transformations should be directed to Ron Brewer, NGS Illinois Geodetic Advisor, telephone (217) 524-4890, E-mail rlklbl@aol.com, or Dave Doyle, NGS Observation and Analysis Division, telephone (301) 713-3178, or E-mail daved@ngs.noaa.gov.