

Workshop Report

Precise Digital Leveling Workshop

At New Mexico State University
Presented September 28 and 29, 2007 by:

**Texas Height Modernization Program – Corpus
Christi, Texas**
National Geodetic Survey – Silver Spring, Maryland

**Hosted by: – ACSM/NMPS Student Chapter at
NMSU**

The broad scope of Height Modernization includes integration of traditional differential leveling operations with precise GPS data and geoid modeling to establish/re-establish elevations on benchmarks in support of activities such as flood plain mapping, water resource management, development of civil infrastructure (roads, utilities, shopping centers, new subdivisions), and spatial data management at Spaceport America.

The student chapter of the American Congress on Surveying & Mapping and the New Mexico Professional Surveyors (ACSM/NMPS) hosted a Precise Digital Leveling Workshop on September 28 & 29, 2007, as a fund-raiser to support sending a team of NMSU students to the Annual ACSM Student Team Competition in Spokane, Washington, March, 2008. In addition to local participation, surveying professionals from Hobbs, El Paso, Albuquerque, and Alamogordo also attended the workshop. All were enthusiastic about the quality of instruction and pleased with the opportunities for hands-on data collection and processing.

The Texas Height Modernization Program was started in 2005 and is administered through the Texas Spatial Reference Center housed at the Conrad Blucher Institute of Surveying and Science in Corpus Christi, Texas. In the past, funding for Height Modernization has been obtained as a congressional earmark on a state by state basis. With the unfortunate breakdown of earmark funding in 2006, the National Geodetic Survey (NGS) is developing details for a National Height Modernization Program in which a broader effort will be administered on a "regional" basis. Tentatively, the Texas Spatial Reference Center will service the Height Modernization activities in the region including Texas, New Mexico, Kansas, and Oklahoma.

Although details for eventual funding for a National Height Modernization Program are still being developed, both the NGS and the Texas Height Modernization Program supported the Las Cruces Digital Leveling Workshop by sending two instructors from Corpus Christi, the NGS Geodetic Advisor from Arizona, and several sets of modern digital leveling equipment. The New Mexico DOT also supported the workshop by sending Mr. Garry Nielsen (Co-chair of the New Mexico Height Modernization Working Group) along with a set of modern digital leveling equipment. The Surveying Engineering Program at NMSU contributed use of a 4th set of digital leveling equipment, being part of the annual Leica equipment loan to NMSU arranged by Surveyors Service Company of Albuquerque. The workshop was conducted at NMSU, both outside on the Horseshoe and in EC-I, Room 210A, a computer lab in which each person participating was sitting at a computer and had

access to the internet as well as the power point material being presented. The combination of lecture, power point, internet access, lively discussion, field work and data processing was very popular with those attending. The workshop is viewed as an unqualified success.

As a matter of appreciating some of the technology and logistics involved in precise leveling, modern digital levels are built to read a bar-scale rod at a distance of 50 meters or more with a resolution of 0.01 mm (that is 10 microns). Each 3 meter long level rod has a bar-scale painted onto a continuous, precisely calibrated invar strip (invar is a special alloy having a very low coefficient of thermal expansion) and, in the interest of productivity, the rods are used in pairs. Understandably, such rods can not be checked as airline luggage. During an observing program from one bench mark to another, each level rod must rest on a very stable turning point. Readings from the leveling instrument can be accumulated in a wireless PDA carried by the observer and the temperature at each instrument set-up is part of the raw data. Yes, precise leveling is tedious, time consuming, and expensive. Therefore, GPS technology and geoid modeling are being incorporated into Height Modernization in an effort to establish bench mark elevations more economically. Reliable benchmark elevations are a valuable resource in every community and the surveying profession must rise to the challenge of preserving/re-establishing those elevations for current and future uses. Investment in the New Mexico Height Modernization Program will pay handsome dividends for years to come.



Pictured are: Scott Croshaw, graduated from the NMSU surveying program in 1995, and Coene Schamaun graduated from the NMSU Surveying Engineering program in 2007.