

# What is Height Modernization?

Height Modernization is a program in NOAA's National Geodetic Survey (NGS) that uses the Global Positioning System (GPS) and other new technologies to increase the accuracy of elevation measurements that comprise the vertical portion of the National Spatial Reference System (NSRS). This system provides the foundation for positioning and navigation activities in the United States. It is the reference base for latitude, longitude, height (elevation), and distance between points on the earth's surface and defines the nation's shoreline.



## Registration

[www.igic.org/events/glrhmc](http://www.igic.org/events/glrhmc)

March 23 GLRHMC Meeting

GLRHMC Members and Elected Officials : FREE

Nonmembers: \$30

March 24 GLRHMC Workshop: \$100

**West Lafayette, IN**

### March 23 GLRHMC Meeting

#### Doing More with Less: Funding Today's Survey Activities

7:00-8:00 am	Registration & Full Breakfast
8:00-8:15 am	Welcome & Introductions, Tom Mahon and Renee Shields, NGS
8:15-9:45 am	Height Modernization Past and Moving Forward, Renee Shields, NGS
9:45-10:00 am	Break
10:00-11:30 am	Real Time Network (RTN) Overview, Bill Henning, NGS
11:30-12:00 pm	Real Time Network (RTN) in Indiana, Boudewijn H.W. van Gelder, Purdue, Eric Banschbach, INDOT
12:00-1:00 pm	Lunch
1:00-2:00 pm	Funding and the Federal Grants Process, Renee Shields, NGS
2:00-2:15 pm	Break
2:15-3:45 pm	Panel Discussion Concerning Potential Alternative Funding Sources (Representatives from FEMA, USGS, State and Local Governments)
3:45-4:00 pm	Break
4:00-5:00 pm	GLRHMC Business Meeting

### March 24 GLRHMC Workshop

#### What Will the Future Control Network Look Like?

7:00-8:00 am	Registration & Full Breakfast
8:00-8:15 am	Welcome & Introductions, Tom Mahon, ISPLS, Renee Shields, NGS
8:15-9:30 am	Height Modernization Overview, Renee Shields, NGS
9:30-9:45 am	Break
9:45-11:15 am	Elevations and GPS, Boudewijn H.W. van Gelder, Purdue University
11:15-11:30 am	Break
11:30-12:15 am	The INDOT RTN Network, Eric Banschbach, INDOT
12:15-1:15 pm	Lunch
1:15-2:15 pm	Online Positioning Users Service Dat(B): Pros and Cons of submitting data to NGS, Chris Pearson, NGS
2:15-2:30 pm	Break
2:30-3:30 pm	Establishing Ellipsoidal and Orthometric Heights with GPS - Technical Memoranda 58 and 59: planning, executing, and submitting Height Modernization projects to NGS, Bill Henning, NGS
3:30-3:45 pm	Break
3:45-5:00 pm	Practical Issues with Field and Office Procedures Related to Control Networks, Bill Henning, NGS

# Great Lakes Region Height Modernization Consortium Meeting and Workshop



**March 23, 2010**  
**Doing More with Less:**  
**Funding Today's Survey Activities**

**March 24, 2010**  
**What Will the Future Control Network Look Like?**



**NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION**

## Workshop Presenters

Eric Banschbach is an Indiana licensed land surveyor with 19 years of experience in the profession. He is currently the Manager of INDOT's Office of Aerial Engineering which is responsible for construction, administration and management of the InCORS Network. InCORS is a network of DOT owned and operated continuously operating reference stations, which provides statewide coverage for static and real time GNSS positioning, based on a grid of stationary receivers. Eric is part of the Indiana Height Modernization Committee, in addition to representing Indiana on the GLRHM Consortium.

William Henning is a Registered Professional Land Surveyor with over 41 years of active experience in all phases of surveying technology. He has helped plan, construct, process, adjust and manage height modernization geodetic networks for countywide projects. He has been actively involved with outreach to the geospatial community, presenting over 60 talks and workshops on surveying and GNSS technology. Mr. Henning is a Past President of the American Association for Geodetic Surveying and is an ACSM/AAGS Fellow. He is currently employed by NOAA's National Geodetic Survey as a Senior Geodesist.

Chris Pearson works for the National Geodetic Survey where he is the geodetic advisor for Illinois, working with IDOT to maintain and improve geodetic control. He was instrumental in establishing Illinois's Height Modernization program. He gives numerous short courses and guest lectures in Illinois and surrounding states. He is also responsible for maintaining the model of crustal deformation that NGS uses to correct coordinates and survey data for tectonic motion in the western US. Chris has a PhD from the University of Otago in New Zealand and also has been a post doctoral researcher in Columbia University and the University of Otago working in crustal dynamics.

Renee Shields is a geodesist in the Geodetic Services Division of the National Geodetic Survey. She received a B.A. in Mathematics from the University of Massachusetts, Boston. Ms. Shields has been with NGS since 1980, and has been heavily involved in the geodetic adjustments for the North American Datum of 1983, and integration of new GPS projects into the National Spatial Reference System (NSRS). She has extensive experience in GPS and Geoid Height analysis, and has successfully used this experience to develop and conduct workshops around the country on incorporation of data into the NSRS. Renee is currently Project Manager for the Height Modernization Program, an effort that has 17 states as regular participants and additional activities in a number of other states.

Since 1995 Dr. Boudewijn H.W. van Gelder has served as the State of Indiana Geodetic Advisor. He is a professor of Land Surveying and Geomatics Engineering within the School of Civil Engineering at Purdue University, and has taught there since 1992. His Masters of Science in Geodetic Engineering is from the Delft University of Technology and his Ph.D. is from Ohio State University. Dr. van Gelder teaches or has taught courses in a vast variety of geomatics courses including physical, satellite and geometric geodesy. He is a member of ACSM, the Indiana Society of Professional Land Surveyors, AGU, and others. He is also a member of one of the committees on Geophysics of the Royal Netherlands' Academy of Arts and Sciences. From 2000 to 2002 he represented the Netherlands in the Education Committee of FIG.

# Great Lakes Region Height Modernization Consortium Meeting and Workshop

## Who will benefit from the Height Modernization Workshop?

Attendees will learn about past projects and approaches other states have used to implement Height Modernization; techniques on establishing accurate ellipsoidal and orthometric heights with the use of survey grade GPS; and progress on the INDOT RTN.

### Why are accurate elevations and the Height Modernization Program important?

For more than 125 years, NGS has set permanent survey marks throughout the United States. Each survey mark is referenced to an exact horizontal and vertical position, defined by latitude, longitude (horizontal), and height (vertical) coordinates. NGS connects these marks together in the NSRS. In the past, NGS employed traditional line-of-sight survey measurements to determine the position of these permanent marks. The process was labor-intensive, time-consuming, and expensive. With the advent of GPS in the 1980s, however, these methods drastically changed (hence the term "modernization"). Developed by the U.S. military, GPS is a constellation of 24

satellites transmitting signals to receivers all over the world. By using GPS, NOAA can determine accurate elevations quickly, inexpensively, and in places where traditional methods are impractical.

### What are the benefits of Height Modernization to the nation?

Reliable elevation data is essential both for scientific inquiry and for safety and convenience. It allows people to measure, for example, how fast a piece of land is sinking (a process called subsidence). It improves aircraft navigational aids to make approach-and-landing procedures safer. Because it precisely pinpoints the rise and fall of land surfaces, it increases the efficiency of water delivery and drainage systems, and helps reduce urban and agricu-

ltural runoff and water pollution. It allows more precise modeling of storm-surge and pollution trajectories during extreme weather events.

### How will it benefit the geospatial community?

The objectives of the Height Modernization program is to increase the availability of reliable vertical control and to incorporate ground measurements and airborne gravitational reading to create a high definition geoid model. Once these objectives are achieved, geospatial projects will greatly benefit from the cost benefit of readily available control monumentation and more accurate heights derived by both real time and post processed GPS positioning techniques. The ISPLS / IGIC Height Modernization joint committee is excited about how these impacts can push geospatial professionals to the forefront of this effort and help both state and local government realized the economic benefits to the State of Indiana.

