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Surveyor's Corner: Next Generation

Putting the Future of Surveying In the Next Generation's Hands

For more than 20 years, the National Society of Professional Surveyors (NSPS) has organized a student competition in conjunction with its spring business meetings in Washington, D.C. Now organized by the Young Surveyors Network (YSN) of the NSPS, the competition hosts higher-education land surveying student teams from across the U.S. and Puerto Rico and challenges them to put the surveying skills they are learning in school to practical use.

Over time, the competition has evolved to incorporate new technologies while also challenging students in fundamental surveying principles. This year's competition spanned two days and consisted of conventional field exercises and a survey monument scavenger hunt. The event saw a record

number of 24 teams participate, including one high school team.



Students performing field exercises at the National Mall.

Practicing Field Fundamentals

One day of field activities took place on the National Mall near the Washington Monument. Students competed in three exercises: a three-wire leveling loop that was judged on closure and balancing of foresight/backsight, a four-sided traverse using a compass and Gunther's chain, and a triangulation exercise where students set up a T2 theodolite over known geodetic control marks, backsighted the Washington Monument (with known coordinates), and determined the coordinates of the Jefferson Pier. Teams were given one hour to complete each exercise using the non-electronic equipment, including their computations (calculators were allowed).

Geodetic control is hidden all over the National Mall. The Washington Monument itself is a geodetic control mark, and NGS has occupied it with GPS in 1999 and again in 2013, when scaffolding was put in place for repair work following the 2011 earthquake nearby in Virginia. During this year's student competition, NGS had the specially made antenna mount for the top of the monument on display.

Yesterday Meets Today

With the help of geographic information system (GIS) technology, the students set out in the city for another day of field competition to see how many of the 104 historic survey monuments and NGS control points provided they could find. Not wanting students to be farther than a 20-minute walk from a metro station and being mindful of sensitive areas, competition organizers used the analytical capabilities in today's GIS's to select points appropriate for the students to find. (An NSPS YSN representative accompanied each team for safety and guidance).

Wanting to make sure the hunt was sufficiently challenging, monuments of varying degrees of difficulty to find and recover were included and assigned point values accordingly. This required the students to be strategic in their approach—find as many low-point value monuments as they could quickly or spend more time going after the higher value ones? Take the metro, walk, run, scooter…or bike? So many decisions. In a timed competition, (six hours), one wrong decision can be detrimental to the final score.



Students learning about the surveying of the Washington Monument from NGS's Galen Scott.

ArcGIS Field Maps was instrumental in providing students with a navigation and data collection platform. They were required to find the monument, collect a point, and take a picture. Once submitted, the point value was automatically assigned and extra credit added if they posted the photo to social media.

ArcGIS Dashboards enabled organizers to monitor the student teams in real-time and see the scores aggregate automatically. For an event that only lasts two days but is packed with activity, the amount of efficiency gained by using GIS cannot be understated.

Washington D.C.: Rich in Surveying History

For most participants, the competition provides a once-in-a lifetime opportunity to not only put surveying skills they are learning in school into practice, but also learn about and experience the rich surveying history in our nation's capital.



Washington, D.C., was set aside as a 10-mile by 10-mile Federal District, with land ceded from Maryland and Virginia.

Land that Virginia had contributed was retroceded in 1846. The boundary stones around the perimeter of the District were the first survey marks set by the federal government, with the earliest one being the South stone that is still in place at Jones Point Park in Alexandria, Virginia. Andrew Ellicott and Benjamin Banneker surveyed and set the boundary marks around the District in 1791 and 1792. Given its history and all the hidden marks throughout the city, Washington, D.C., is a surveyor's paradise.

Surveying experts from the National Geodetic Survey (NGS) were on hand at the National Mall during the event and shared some history about the Washington Monument. Students learned that on the ground around the base of the monument are four marks, one at each corner, that were used to monitor the stability of the monument as it was being built. These marks are named "Casey" in the NGS database as tribute to Lt. Col. Thomas Casey, who supervised the construction of the Monument.

Levels were regularly run from the Mini-Monument (Mark A) to each corner, making a strong local leveling tie that was brought into the National network once leveling to the rest of the country was brought through in 1884. During the student competition, the manhole cover that normally hides Mark A was removed, and for two days this 14-foot-tall model of the Washington Monument was viewable. While exposed, an OPUS Share observation was taken and it was scanned with terrestrial lidar.



Antenna mount specially made by the NGS for occupying the top of the Washington Monument with GPS.

In addition to the "Casey" marks and mini monument that were described, there are two tiny caps that are barely noticeable on the monument. These hide leveling control that was put in during the 1980s. NGS has a tool that was specially made that takes the cap off and then there is a separate precision-made adaptor that fits in. That is

then used as a benchmark. This same style of monument is built into the Lincoln Memorial and the Jefferson Memorial.

The Future of Surveying is Bright

Recognizing that land surveying is faced with the same workforce challenges that are impacting many other professions, it was uplifting to witness not only the energy, enthusiasm, and hard work put in by the students, but also by young surveying practitioners in the YSN. The dedication of the land surveying educators and support of local and regional surveying professional societies also cannot be understated. They are the foundation beneath our next generation of surveyors and geospatial professionals.



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Article by Linda Foster

Linda Foster oversees Esri's worldwide strategic vision for land records, cadastre, surveying, and land administration, and is vice president of the

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