

The Tarheel SURVEYOR

FALL 2020 | No. 20.2



NCRR

OVER A DECADE OF
CENTERLINES,
SAFETY, AND SHARING
WITH SURVEYORS

AERIAL ANALYTICS

Data for Asset Management & Evaluation



Aerial Analytics LLC
Cary, NC
www.aerial-analytics.com

Concord Engineering & Surveying, Inc.
Concord, NC
www.cesicgs.com

GPI Geospatial, Inc.
Charlotte, NC
www.gpinet.com



Allen Precision Equipment, Inc.
Atlanta, GA
www.allenprecision.com

Davis-Martin-Powell & Associates Inc.
High Point, NC
www.dmp-inc.com

Guisewhite Professional Land Surveying, PC
Charlotte, NC | www.gplsurvey.com



Allied Associates P. A.
LAND SURVEYORS ♦ S.U.E.



Allied Associates, P.A.
Winston-Salem, NC
www.alliedapa.com

DRMP, Inc.
Cary & Charlotte, NC
www.drmp.com

Hayes Instrument Company, Inc.
Shelbyville, TN
www.hayesinstrument.com



AP Surveying PLLC
Shelby, NC
www.apsurveyingpllc.com

Duncan-Parnell, Inc.
Morrisville, NC
www.duncan-parnell.com

Insurance Management Consultants Inc.
Davidson, NC
www.imcipls.com



Avioimage Mapping Services, Inc.
Charlotte, NC
www.avioimage.com

Earl Dudley, LLC
Charlotte, NC
www.earldudley.com

Johnson Lumber Products
Ivanhoe, NC
email: stakes@intrstar.net



Benchmark Tool & Supply, Inc.
Raleigh, NC
www.benchmarksupply.com

eGPS Solutions
Norcross, GA
www.egps.net

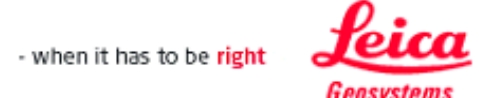
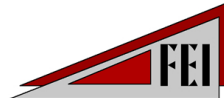
Land Design Insurance Group
Timonium, MD
www.landdesigninsurance.com



Berntsen International, Inc.
Madison, WI
www.berntsen.com

Encompass Services, PLLC
Asheville, NC
www.encompassservices.com

Lawrence Associates PA
Monroe, NC
www.lawrencesurveying.com



Cape Fear Engineering
Wilmington, NC
www.capefearengineering.com/

Fleming Engineering, Inc.
Greensboro, NC
www.flemingengineering.com

Leica Geosystems, Inc.
Peachtree, GA
www.leica-geosystems.com/en-us



CH Engineering, Inc.
Raleigh, NC
www.ch-engr.com

Floodproofing.com
Pitman, NJ
www.floodproofing.com

Maser Consulting
Charlotte, NC
www.maserconsulting.com

The Tarheel SURVEYOR Fall 2020

IN THIS ISSUE...

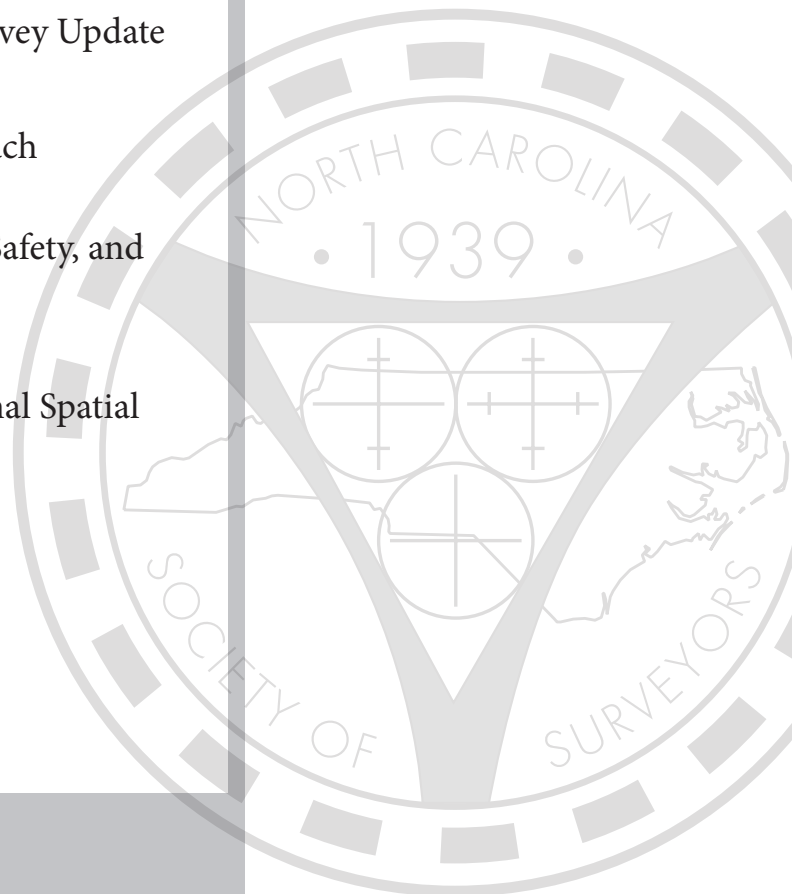
- 2 | Who We Are
Chapter Meetings
- 3 | NCSS Local Chapters
- 4 | Director's Notes
- 7 | Letter from the President
Schedule at a Glance
- 8 | Education Foundation
New Licensees
- 10 | We Are Growing
- 11 | North Carolina (NC) Geodetic Survey Update
- 12 | Why We Do It
- 14 | Field-to-Finish: A Personal Approach
- 16 | FEATURE ARTICLE:
Over a Decade of Centerlines, Safety, and
Sharing with Surveyors
- 20 | Go With the (Surface) Flow
- 24 | NGS's Modernization of the National Spatial
Reference System
- 26 | Problem Corner
- 27 | Member Profile: Jason C. Hedley

ABOUT NCSS:

- Founded January 31, 1939
- Second oldest professional surveying organization in the United States
- Only professional surveying organization in NC
- Affiliated with the National Society of Professional Surveyors and, therefore, all Professional Members are also accounted as members of NSPS as of July 1, 2013

OUR MISSION:

"A society of professional surveyors and their associates dedicated to enhancing professionalism, improving legislative awareness and promoting the profession of surveying."



WHO WE ARE

**NCSS PRESIDENT**

James I. Jeffreys III
james.jeffreys.3@gmail.com

NCSS PRESIDENT-ELECT

Peter J. Brennan, Jr.
peter.brennan@wilmingtonnc.gov

NCSS VICE PRESIDENT

Jerry W. Nave
jwnave@ncat.edu

NCSS PAST PRESIDENT

Tim Bowes
tbowes@vhhb.com

NCSS SECRETARY/TREASURER

Dale L. McGowan
dmcgowan@ch-engr.com

NSPS NC DIRECTOR

Randy S. Rambeau, Sr.
rrambeau@mckimcreed.com

ALBEMARLE CHAPTER PRESIDENT

Lucy Cardwell
sablecardwell@hotmail.com

CAPE FEAR CHAPTER PRESIDENT

Michael J. Adams
capefearchapter.ncss@gmail.com

NCSS EXECUTIVE DIRECTOR

Christy C. Davis
cdavis@ncsurveyors.com

CENTRAL CHAPTER PRESIDENT

Jerry C. Callicutt
jcc@rtmc.net

COASTAL CHAPTER PRESIDENT

John A. Odom
jodom.pls@embarqmail.com

EASTERN CHAPTER PRESIDENT

Stuart Barwick
bstu33@hotmail.com

FOOTHILLS CHAPTER PRESIDENT

J. Douglas Suttles
doug@suttlessurvey.com

GUILFORD CHAPTER PRESIDENT

John Willis
jwillis@geo-professionals.com

JOHNSTON COUNTY CHAPTER PRESIDENT

W. Royce Lambert, Jr.
mopbucket627@gmail.com

MECKLENBURG CHAPTER PRESIDENT

Timothy S. Guisewhite
tim@gplsurvey.com

NANTAHALA CHAPTER PRESIDENT

R. Joel Johnson
rjohnson31@hotmail.com

NCSS OFFICE MANAGER

Michelle A. Kenny
mkenny@ncsurveyors.com

NE PIEDMONT CHAPTER PRESIDENT

Nathan R. Hymiller, Jr.
pls3010@aol.com

NORTHWEST CHAPTER PRESIDENT

Neil Shepherd
neil@ridge.blue

PIEDMONT CHAPTER PRESIDENT

David K. Alley
dalley@allied-engsurv.com

SOUTHEASTERN CHAPTER PRESIDENT

Benjamin C. Brown
benjyb@bellsouth.net

SW PIEDMONT CHAPTER PRESIDENT

Gabriel D. Brown
gabriel.brown@duke-energy.com

TRIANGLE CHAPTER PRESIDENT

Troy C. Clayton, Sr.
tcclayton@daa.com

WESTERN CHAPTER PRESIDENT

Cameron Baker
cbaker@als88.com

YADKIN VALLEY CHAPTER PRESIDENT

David L. Haywood, Jr.
davidhaywood@cesicgs.com

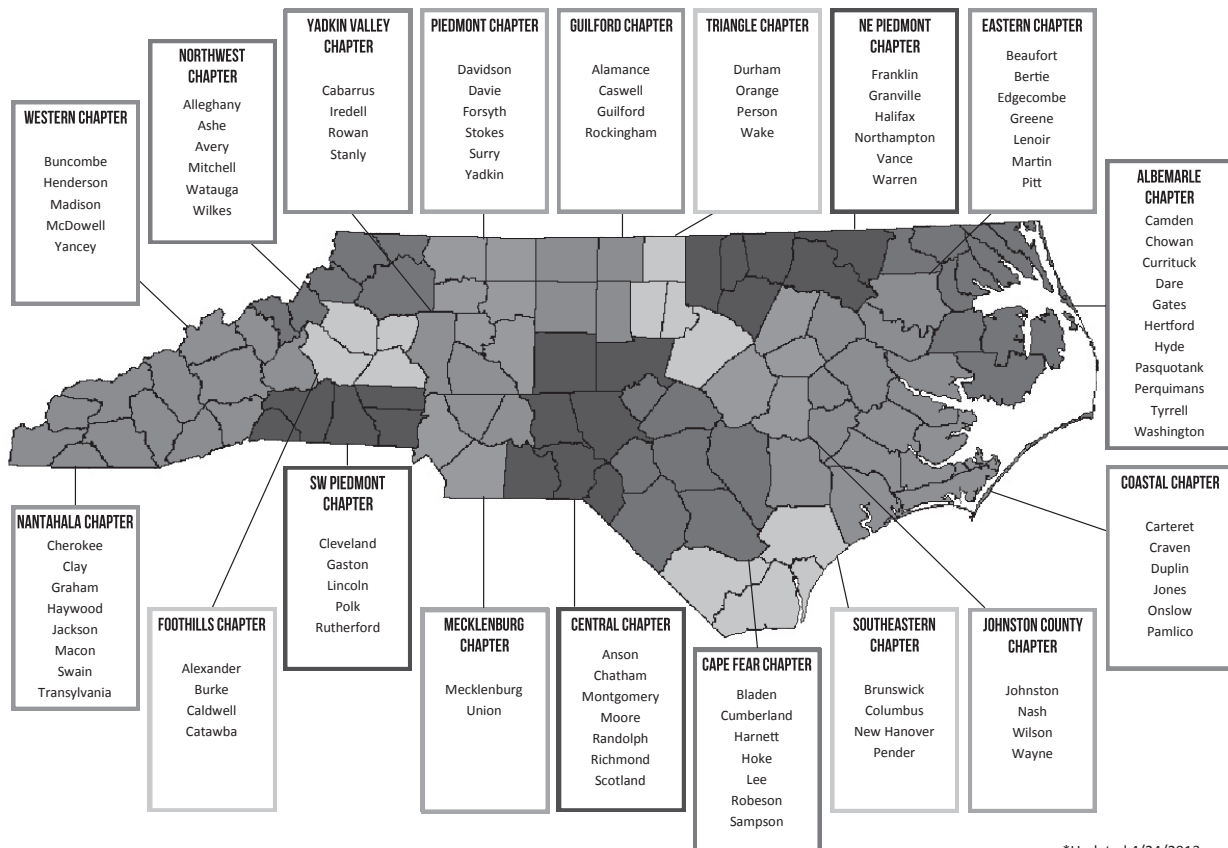
MARKETING & MEMBERSHIP DEVELOPMENT

Sherri L. Barron
sbarron@ncsurveyors.com

CHAPTER MEETINGS

CHAPTER	DATE & TIME	LOCATION
Albemarle	4th Tuesday 6:30 pm	Various Locations, NE Counties
Cape Fear	Last Tuesday 6:30 pm	Various Locations, Fayetteville
Central	Last Tuesday 6:00 pm	Blake's B-Que, Candor
Coastal	Last Monday 6:30 pm	Sagebrush Steakhouse, Morehead City
Eastern	2nd Monday 6:30 pm	Parker's BBQ, Greenville
Foothills	2nd Tuesday, 7:00 pm	Timberwoods, Morganton
Guilford	3rd Tuesday 6:00 pm	Cooper's Ale House, Greensboro
Johnston County	2nd Tuesday 6:00 pm *no meeting Jul-Aug	Holt Lake BBQ, Smithfield
Mecklenburg	1st Tuesday 6:00 pm *no meeting Jul-Aug	Dilworth Grille, Charlotte
Nantahala	3rd Tuesday 6:30 pm *no meeting Jun-Aug	Various Locations, Sylva
NE Piedmont	4th Tuesday 7:00 pm	Johnny Bulls, Louisburg
Northwest	3rd Tuesday 6:00 pm	Various Locations, Boone & Wilkesboro
Piedmont	4th Tuesday 6:00 pm	Hickory Tavern, Winston-Salem
Southeastern	Last Wednesday 7:00 pm	Carolina BBQ, Wilmington
SW Piedmont	2nd Thursday 6:30 pm	Olive Tree, Rutherfordton
Triangle	3rd Tuesday 6:30 pm	Peddler Steakhouse, Raleigh
Western	2nd Tuesday 6:00 pm	AB-Tech Campus, Asheville
Yadkin Valley	2nd Wednesday 6:30 pm	Pancho Villa's, Salisbury

NCSS Local Chapters



*Updated 4/24/2013



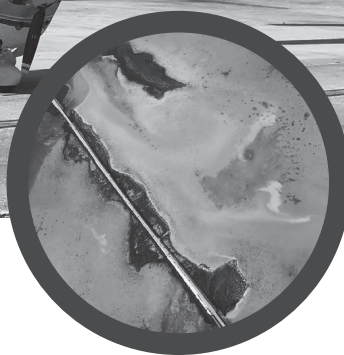
Innovative Geospatial Solutions Utilizing Advanced Technologies

GPI



AERIAL LIDAR

Exceptional point cloud density using our RIEGL VQ-1560 II LiDAR Sensor



IMAGERY

Vexcel UltraCAM Eagle sensor captures extraordinary aerial imagery data



MOBILE LIDAR

Topographic mapping/asset management with RIEGL VMX-450 mobile LiDAR sensor

CHARLOTTE

Paul Badr, CP, PLS, PPS, SP
pbadr@gpinet.com
704.251.8402

GPI GEOSPATIAL, INC.

www.gpinet.com/geospatial



WILMINGTON

Scott Williams, PLS, PPS
scottwilliams@gpinet.com
910.294.8170

DIRECTOR'S NOTES



I find myself in the middle of the profession's nationwide diversity discussion primarily because of the SCORE initiative NCSS began working on in 2017, long before the country erupted over the death of George Floyd. The

political climate, paired with the focus on recruiting women and minorities into the surveying profession, has caused me to think more deeply about what opens or closes minds and hearts to varying viewpoints.

Throughout the summer, I have tried to follow the advice given by American Literature's favorite father, Atticus Finch, in *To Kill A Mockingbird*. "You never really understand a person until you consider things from his point of view . . . until you climb into his skin and walk around in it." I cannot walk around in the skin of those who have suffered injustices because of their race, but I can thoughtfully listen to various points of view. Here are my thoughts for the profession after a summer of reflection.

1. Messaging is critical.
2. Uniformity rather than diversity may not be intentional.
3. Like painting a house, change happens one brushstroke at a time.

Messaging is critical.

Like many of you over the past several months, I have seen good messages hijacked and used for evil intent. It has reminded me just how important the messaging of diversity is. The failure of some messaging begs the question from us, "Why would we like to see the surveying profession more diverse?" The simple answer is - because it can be. We are missing skill sets, ingenuity, and experiences of valuable groups of people. Is it because of unopened doorways? Perhaps certain socio-economic groups simply lack information. Closely evaluating our personal beliefs and motives is the first step towards making our profession more diverse. Following this analysis, we must be ready to set aside preconceived expectations that may not be accurate or helpful. Open doorways by an acknowledgment that all humans are valuable with gifts and talents to offer. We are fortunate that surveying needs a wide variety of skills. Yes, you must be good at math to pass the exams, but there is room for proficient researchers, historians, adventurers, arborists, drafters, and even remote pilots. Mentoring a young technician in an

area of weakness will eventually increase diversity. Other pathways that may be closed to minorities are financial. A small contribution to the Education Foundation or the purchase of the specialized surveying license plates opens doorways for students that may not otherwise be able to afford the education needed to become licensed.

What if the problem arises from a lack of information? We must put ourselves in the paths of those we hope to recruit. Are you speaking about the value of surveying to the young ladies in your extended family when you ask, "What do you want to do when you grow up?" Becoming a career ambassador through NCSS gives you opportunities to tell many diverse students about surveying. Ask local organizations such as Scouts, FFA, 4H, ROTC, The Boys & Girls Club if you can speak with their group about how surveying fits into everyday life. Start small and watch the message spread. One personal goal of mine is to have clear recommendations for classes students should take to prepare. If I'm speaking to a dual enrollee or a high school sophomore who gets excited about our presentation, I want to be confident as I suggest classes for them to take to pave their way.

Whatever you do, keep the message positive. This experience-driven generation wants to join groups and professions that make a difference and have unique experiences while working. And, may I add, stepping on yellow jackets' nests every summer is not the type of experience ANYONE looks for! However, seeing wildlife, experiencing nature, and locating the region's rich history can be very exciting.

Uniformity rather than diversity may not be intentional.

One of the most detrimental arguments within the nationwide discussion of diversity and justice occurs when either party assumes the opposing points of view's thoughts and intentions. Most surveyors were led into the profession by family members or mentors. Our membership looks the way it does because, like all professions, we recruit those around us. A lack of diversity is often unintentional. It is a byproduct of our surroundings. Too often, we presume the worst motivations of people. The real effort towards diversity comes into focus as we work to put ourselves into circles that do not come naturally. NCSS has over 1100 members. If we each committed to making an effort to tell one person outside of our typical circle of friends and family about the value of surveying, including



Women in surveying circa 1940.

the enormous need for surveyors, and provide needed resources if they are interested, we could make a significant difference in the future.

Like painting a house, change happens one brushstroke at a time.

My husband and I, with one other person, painted our house this summer – with brushes! On the second weekend, I asked myself why we did not rent a sprayer? However, by Sunday afternoon, we completed the entire front, and it looked like a new house. One career ambassador event, one specialized license plate, one lunch with someone, one more prompting of that field crew member can make a real difference in the profession long term. If you focus those efforts on reaching a minority or female, diversity will eventually follow. You may be weary, assuming your efforts ineffective, but Sunday afternoon is right around the corner.

I am encouraged and excited about the work ahead of NCSS. We often hear that surveying is an older, dying profession. I would rather think that we are a seasoned and wise profession. That wisdom will lead us to make significant decisions for our future. As the iconic Atticus Finch also said in *To Kill a Mockingbird*, "It's not time to worry yet..."

Christy C. Davis

Christy C. Davis
NCSS Executive Director

"Leaders In Advanced Photogrammetry and Surveying Solutions"

Spatial Data Consultants, Inc.
1008 Hutton Lane, Suite 109
High Point, NC 27262

www.spatialdc.com
info@spatialdc.com
(336) 841-1247 Phone
(888) 772-8425 Toll Free



Microdrones mdMAPPER1000

Microdrones mdLIDAR3000 Riegl MiniVUX-1 UAV LiDAR



SPATIAL DATA
CONSULTANTS INC.

Full Service Professional Geospatial and Surveying Consultants

THE POTENTIAL OF ONE

Helping you move your business forward has always been at the heart of Leica Geosystems' work. Now more than ever, we understand the importance of keeping your crews safe and driving productivity while scaling your business.

Our latest solutions empower a single surveyor to do far more than what anyone ever thought possible.

<http://hxgn.biz/PotentialOfOneNC>



HEXAGON

Leica
Geosystems

LETTER FROM THE PRESIDENT



These have been unprecedented times for our profession. Many of us have changed how and where we work and communicate with our clients and peers. I hope that most of you have been able to find opportunities to make the best of the current situation. The concept of working remotely can be a benefit to both the employee and the employer. Employees save the time and expense of a commute and the employer does not need to maintain the additional office space for those employees. Now is the time to think outside the box and find different ways of doing things.

Your Society keeps working for you during the pandemic. We keep watching legislation that could affect our profession and act accordingly. We need your help to do this effectively. If you have an issue that you are interested in, join one of the Society committees working on it. Attend your local chapter meetings in whatever form they are being held. NCSS is your Society and we need your participation to be successful.

One of the benefits we have gained from the pandemic is an incentive for Registers of Deeds, who had not previously accepted electronic plats, to reconsider their electronic recording position. In the last few months, Mecklenburg, Union, and Polk Counties have accepted plats for electronic recording. Check with your local Register of Deeds and ask if they accept plats for electronic recording. If not, ask why, and let them know you would make use of it if offered.

Many of you have expressed your appreciation for the letter sent to Governor Cooper, which resulted in surveyors being added to the list of exemptions in the Governor's "Stay at Home" Executive Order 121. Even though I signed the letter gladly, it was the product of collaboration within our Society leadership. Leading this Society is a group effort, and we have an outstanding group. Even so, we still need your participation to have the best outcomes for our profession.

I am proud to be representing this profession on your behalf. Thank you all for your contributions to the profession.

James I. Jeffreys, PE, PLS
NCSS President 2020-2021



Schedule at a GLANCE

OCTOBER 23, 2020

SW Piedmont Partnership

8:00am-4:30pm

7.5 PDHs

Shelby, NC

NOVEMBER 6, 2020

Northwest Chapter

Partnership

8:00am-4:30pm

7.5 PDHs

Banner Elk, NC

NOVEMBER 14, 2020

Saturday Surveyor Seminar

8:00am-4:30pm

7.5 PDHs

Wake Forest, NC

DECEMBER 4, 2020

SW Piedmont Partnership

8:00am-4:30pm

7.5 PDHs

Shelby, NC

DECEMBER 11, 2020

Final Surveyor Workshop

8:00 am-5:00 pm

8 PDHs

Greensboro, NC

Education Foundation

by Gary Thompson, PLS
Education Foundation President



We completed a review of 2020's first cycle scholarship applications and awarded \$7500

in scholarships to students enrolled in two-year and four-year programs in North Carolina. We also provided the NC A&T Geomatics Program \$5,000 to support students in the geomatics program. The Education Foundation is now reviewing scholarship applications for the second cycle of 2020. We had a successful raffle at the 2020 NCSS Annual Conference. The Board of Directors used revenue from the 2020 Education Foundation Raffle as a funding source for the scholarships awarded in 2020.

NCSS Education Foundation Activities in 2020

- Develop additional sources of funding
- Develop an online scholarship application (completed)
 - https://ncsurveyors.com/files/PDFs/Scholarship_Application_Fillable_Rev4.2.20.pdf
- Provide support to NC's two- and four-year geomatics programs
- Update foundation web page (in progress)

The NCSS Education Foundation Needs Your Help to Promote the Surveying Profession

We would like to increase the number of North Carolina high schools participating in the 2021 Trig-Star program. The Education Foundation wants to challenge each NCSS Chapter to sponsor the Trig-Star program at a minimum of one high school within their chapter area. Find Trig-Star program information at <https://trig-star.com/>.

North Carolina Surveyors Specialty License Plate

If you have not purchased a North Carolina Surveyors specialty license plate, please consider purchasing a plate that promotes our profession and provides financial contributions to the Education Foundation.

This tag would look great on your vehicle!



Two Ways to Order Your Specialty Plate

- Order your tag using the form found at <https://www.ncdot.gov/dmv/downloads/Documents/MVR-27LS.pdf>
- Or order when renewing online: <https://www.ncdot.gov/dmv/title-registration/license-plates/Pages/specialty-plates.aspx>

WELCOME NEW LICENSEES

Justin E. Silva	Gardiner H. Smith
Russell W. Claus	Timothy A. Brown
August A. Thick II	Theodore C. Benbow
Dustin G. Spillman	Jack H. Fields
Kenneth W. Smith, Jr.	

NSPS Memorandum of Understanding

In 2012, NCSS agreed to partner with the National Society of Professional Surveyors (NSPS) to foster membership on both the state and national levels. As a result, your membership with NCSS now includes dual membership with NSPS.

Read the MOU on our website at: www.ncsurveyors.com/about_ncss/governing_documents/nsps

You Don't Need to be a Millionaire to Leave a Legacy

Estate Planning is not something reserved only for the rich. The word 'estate' may bring to mind an image of riches with a mansion and landscaped grounds. In legal terms, it simply means "property or possessions". I think it's safe to assume that everyone seeing these words has property or possessions and for you to depart this life without a formal declaration of what happens to your possessions creates a huge potential for your loved ones to become embroiled in a destructive conflict. Without a will, your property or possessions will be distributed according to state guidelines which may not match your final wishes. A will should be created with the proper documents, and accordingly, we strongly encourage you to engage a professional for assistance or there are several books available to guide you through the process. In short, almost everyone needs a will.

The NCSS Education Foundation, Inc. is a non-profit, all-volunteer group which raises funding for the education of future surveyors. We urge all of the NCSS members, fellow surveyors and others to create a will to represent their own personal wishes. The Foundation can offer you an opportunity to leave a legacy (a gift of property or personal possessions) to assist the future of surveying through the education of newcomers to the profession. The following sentence included in your will is one way to ensure that you can leave that legacy to reflect your passion for the surveying profession: I give (specific or identified property, possessions, percentage or residue) to the NCSS Education Foundation, Inc. (a tax-exempt organization located in Wake Forest, NC) for the purpose of supporting its education-stewardship programs.



4600-E Lebanon Road
Charlotte, NC 28227-7304
Phone: 704-573-7080
Fax: 704-573-7081
avioimage.com

Avioimage Mapping Services, Inc.

North Carolina & South Carolina Professional Land Surveyors

SERVICES

- Digital Imagery
- Ground Control Surveys
- Photogrammetric Mapping
- UAS Drone LiDAR
- Digital Orthophotography
- Geographic Information
- Volumetric Calculations
- Low Altitude LiDAR
- Hydrographic Surveys
- Remote Sensing

PRINCIPALS

Robert F. Akers, Jr., PLS
bob@avioimage.com

Francisco Mahecha, PLS
fmahecha@avioimage.com

We Are Growing

by Peggy Fersner, PE

So, let's talk about the enrollment in the Geomatics Program in this unique year of 2020. We had reasons to not be hopeful in the spring, although we weren't sure what to expect, because Jerry Nave, our intrepid recruiter, was not able to visit the community colleges when he usually makes the circuit. The community colleges have been our primary feed into the program. And truthfully, another Zoom chat was not in the cards. However, we also have seen in the past that when the economy and jobs take a downward turn our enrollment increases.

Much to our surprise and relief, our enrollment increased to the highest level in 15 years. We had 39 applications with nine (9) being traditional campus students and the remaining online. We were obviously forced to switch to predominantly online classes for the fall, with a few exceptions. From those 39 applicants, we enrolled 31 new students in the program giving us a current enrollment total of 69 students for this academic year. Of the 31 new students, eight (8) are women which represents 26% of the incoming class. It appears that some of the misconceptions about the surveying field for women may finally be changing. Not to be boastful but, our other two programs in the department, Construction Management (CM) and Environmental Health and Safety (EHS), enrolled nine and twelve new students, respectively. Yes, we are still gloating.

Now, here is where it gets a little interesting. Remember I said that a significant portion of our enrollment comes from the community colleges' Geomatics and Civil Technology Programs. That means we don't see too many new students in our Surveying I class because that is a community college requirement. Of those 31 students enrolled, 19 of them are taking Surveying I. We were shocked. Fourteen of them came to campus last weekend for their first group of labs. The others had PLS's administering the labs. Of those 19 students, 6 are women. So almost a third of our new Surveying I students are women and coming to the program from

other areas. On a sidenote, three of our new students are from out of state representing Georgia, Michigan and New Hampshire.



2020 NC A&T Geomatics Students

The lab students all had a great time and they really enjoyed being on campus and meeting their peers in the program. We will be digging a little deeper as to the reasons behind this shift with some surveys this semester, but we now have a solid pipeline from Cape Fear Community College's Marine Science Program and we are attracting forestry majors in the western part of the state, as well.

Other initiatives being pursued to increase enrollment are through the North Carolina Society of Surveyors in conjunction with our Geodetic Advisory Committee. These groups help build a relationship with the Chancellor's office to advocate for an online tuition reduction for neighboring states – specifically Virginia and South Carolina. Currently, it is on the list of priorities to present to the Provost and then the Chancellor before approval by A&T's Board of Trustees at their November meeting. Please keep positive thoughts going in that direction. Our vision for the program has always been to serve the overall society of professional surveyors. What better way can there be than by reducing the financial barriers for potential out-of-state future surveyors.



Peggy Fersner is the Geomatics Coordinator at NC A&T State University in Greensboro. She has been on staff since 1993, teaching surveying, GIS, and hydrology courses. She has earned both her BS and MS in Civil Engineering.

North Carolina Emergency Management

North Carolina Geodetic Survey Update

by Gary Thompson, PLS, Chief of the North Carolina Geodetic Survey and Deputy Risk Management Chief

North Carolina Continuously Operating Reference Station (CORS) and North Carolina Real Time Network (NCRTN) update is as follows:

Galileo and BeiDou satellite were data added to the NCRTN solution on June 1, 2020. For additional information go to <https://geodeticsurvey.nc.gov/> (Geodetic News, June 2, 2020)

Equipment upgrades will be performed at the following CORS by January 2021.

CORS Location	CORS Acronym
Jackson	NCJA
Jordan Lake	NCJL
Carthage	NCCA
Lumberton	NCLU
Rockingham	NCRO

A new solar powered CORS has been added to the North Carolina (NC) CORS/NCRTN network and the new CORS has been accepted by the National Geodetic Survey as a National CORS.

CORS Location	CORS Acronym
Rodanthe	NCRT

For real time information about the status of the NCRTN, go to this link: <http://rtn.nc.gov/Map/SensorMap.aspx>

Transformation Tools

Transformation tools that are available from the National Geodetic Survey and NOAA are as follows:

- National Geodetic Survey (NGS) Coordinate Conversion and Transformation Tool (NCAT) is at <https://www.ngs.noaa.gov/NCAT/>
- Vertical Datum Transformation tool to vertically perform transformations for tidal, orthometric, and ellipsoidal vertical datums at <https://vdatum.noaa.gov/vdatumweb/>

County/State Boundary Information

The county/state boundary status table is found at https://geodeticsurvey.nc.gov/docs/status_county_lines.pdf

Adopt a Gauge (AaG) Program

The Adopt a Gauge program allows a county/local government or non-profit organization to adopt the gauges in their community and serve as eyes on the ground for those gauges. Adopt a Gauge partners regularly check the status of their assigned gauge sites, reporting problems (debris buildup, damage, theft) or simply reporting that the gauge is in good condition. While we have online monitoring tools, having eyes in the field can aid in initially assessing any issues with a gauge.

For more information about the AaG program go to this link. <https://www.ncdps.gov/our-organization/emergency-management/risk-management/adopt-gauge>



Gary has held a professional license as a Professional Land Surveyor (PLS) in NC since 1980. He has served as president of both NCSS & NSPS. He most recently served as treasurer of NCEES, chair of the North Carolina Boundary Commission, and an emeritus member of NCBEES.



Taylor Wiseman & Taylor

ENGINEERS | SURVEYORS | SCIENTISTS

2043 Energy Drive
Apex, NC 27502
(919) 297-0085

9771-A Southern Pine Blvd.
Charlotte, NC 28273
(704) 527-2535

www.taylorwiseman.com

Why We Do It

by Frank Mundy, PLS, Vice President and Geomatics Practice Leader, Stewart



The uncertainty during the early stages of the pandemic completely changed how many work, learn and live day to day. In a moment of reflection, I found myself asking, “Why do we do it?” Why do we work through the heat of the summer and the brutal winter months? Why are we out in the world, albeit socially distanced, during a global pandemic? Why do we work within inches of moving traffic? Why do we deal with angry landowners? Why do we spend additional time away from families and loved ones?

As quick as the question came flying in, the answer to that question followed immediately behind. As our firm’s founder and CEO Willy Stewart, fondly states, “We’re not just working on a project for a new building. That new building may be a new hospital that will help heal the sick. That new building may be a school that will help teach our kids. That new building may be a home that will help a group of individuals become a family.” To deem our work essential amongst building, design and engineering is an understatement.

The necessity of land surveying dates beyond the needs of today, quite literally shaping our nation’s framework. Today, with the help of technology, surveying has evolved beyond what may have been thought possible even just a decade ago. Accelerated innovation throughout the current COVID-19 pandemic has enabled drones to deliver medicines to an individual’s front door. Our industry’s improved data collection methods continue to play an integral role in many economic segments,

including infrastructure, healthcare, transportation, and education.

As I continued to reflect, I decided to look no further than a sampling of the timesheets of our Geomatics Team for one week. It was a truly amazing and inspiring research project to say the least. In just this short period alone, we helped:

- Repair failing stormwater facilities to keep a neighborhood from flooding in the future
- Rehabilitate aging sewer infrastructure within a large-scale urban environment
- Provide public sanitary sewer infrastructure to entire sections of several underserved communities
- Study the flood implications and required repairs to a city-wide stormwater system effecting one of our nation’s largest military bases
- Design a new school that will allow children to learn within their community
- Provide drinking water to a rural area that did not have access to public water before
- Preserve a cemetery that had been ravaged by the effects of a hurricane

The demanding reconnaissance of a project area isn’t just for a new building – it’s the conception of a hospital that will heal the sick.

The long drive to a rural location for full field day isn’t just another workday – it’s the start of a project bringing public drinking water to a community in need.

In one week alone, we played a vital role in helping a wide variety of people in our communities. Whether we’re preserving an old location, protecting a site or pioneering a project, our work is the foundation of developments enhancing the quality of life. Each day is different. Each day is tough. Each day is inspiring and a constant reminder of “why we do it.”



Frank is the Columbia, South Carolina market leader and a member of Stewart’s Executive Leadership Team. As the Practice Leader, he is responsible for managing Stewart’s Geomatics services including survey, subsurface utility engineering (SUE), and geospatial services.



**Duncan
+ Parnell**
Successful Projects Start Here

YOUR TRUSTED FIELD-TO-FINISH SOLUTIONS PROVIDER

Offering the latest in Trimble instruments, software,
accessories, supplies, rentals, training and maintenance

 **Trimble**
Authorized Distribution Partner

1208 Copeland Oaks Dr., Morrisville, NC 27560 | 800-353-7392 | duncan-parnell.com

Field-to-Finish

A Personal Approach

by Jim Gellenthin, PLS

In this article, I want to share a fundamental approach that we can all take to become better supervisors, better mentors, better professionals, and better people. In our Land Surveying community, the phrase “Field-to-Finish” refers to a process that takes properly-coded field data and automatically converts that data into drafted linework and symbology within CADD, creating a “near final” mapping quality product. The keys to the successful application of the Field-to-Finish approach are found in a strong and diligent field effort, which is supported by a well-organized and consistent office process. Though we usually consider this process in terms of data management, the same principles can be applied to the development of our staff. The desired outcome is to bring them closer to their “near final” personal and professional goals. Remember, as the supervisor of an employee who aspires to grow in our profession, each step of this development process must focus on the final goal. A good supervisor is a good mentor who will provide all the tools that their staff needs to be successful.

In the beginning of this field-to-finish process, the supervisor and the employee should take time to discuss the employee’s goals and ambitions -- particularly their professional goals. A successful supervisor can help the employee, their mentee, identify those personal and professional goals and then assist them in charting a path to attain those goals. The development of feature codes, layers, line styles, and symbols are required to produce a professional final survey drawing when using Field-to-Finish. In the same manner, the development of life and professional skills, traits, qualities, and experiences are required to produce the confident, competent, and honest professional that the mentee wants to become. The employer should encourage their mentee to

consider goals in all areas of their life, both personal and professional, and invite them to establish goals which will help them to be well-rounded in life. The goals should be centered on family, education, talents, hobbies, and community, as well as their vocational goals.

Next, the mentor and mentee should develop a written personal development plan together that will help the mentee achieve those goals. Goals that are not written down are often just wishes. The development plan should include specific tasks and time frames that will help to accomplish the objectives. The tasks

“Good supervisors can take you to incredible heights. They help you learn to fly, providing the wind beneath you, and providing a net for when you fall.”—unknown author.

should be measurable and achievable and, of course, lead to at least one of the final goals. The mentor can provide valuable assistance in developing sub-tasks, or micro-goals, that the mentee can achieve as they move along their

charted growth path. The mentor should establish professional goals with their mentee. By working together, both of you can chart a growth path that will help the mentee reach their objectives. The mentor can help the mentee establish intermediate milestones to achieve. Encourage the mentee to be specific about the technical, educational, and personal things they can work on to become a better surveyor.

I can remember my first “real” years in the field of surveying. I grew up in a small family land surveying business in Southern New Jersey. My three brothers and I (I was the youngest) grew up in the survey world and were proud to be part of dad’s company. I can remember working with my dad and brothers at a very young age, when I was so excited to be carrying (or dragging) the five-gallon bucket of stakes that probably weighed more than I did! After high school and a two-year church mission, I came back to work in the family business in earnest. I spent a couple more years in the field as

an instrumentman to each of my two older party chief brothers, who taught me the fundamentals of solid field work. I still draw on some of those experiences as I work with and mentor some of the field staff working in my company today.

My dad and brothers were great mentors to me. At a memorable point in my career, my older brother Jeff, who is six years my senior and was a newly licensed professional land surveyor at the time, took me under his wing. Jeff recognized that, like him, I wanted to get serious about surveying and that I had the aptitude to grow beyond the limited duties of a field crew member. I spent many evenings with him after the field work was done, learning the new AutoCAD with the DCA CADD program together. As we discovered new commands, Jeff would explain how that same function was done traditionally (board drafting and hand computations), which really helped me to understand the principle behind the click of the “puck.” He showed me how to balance level runs, close traverses, interpret field notes, conduct research and decipher deeds, prepare plats, and many other skills I needed to become a great survey tech. Jeff also shared with me the business side of things as I helped him prepare proposals, write survey reports, and work through billing and payroll. During that time, I discovered my affinity for EXCEL, which I embrace to this day in my current practice. My brother helped me to set goals for myself—both personal and professional—and took the time to help me achieve them on my path to licensure and leadership.

A final point is that accountability is a very important aspect of a personal development plan. Accountability can be the difference between setting goals and achieving goals. To provide the opportunity for your employee (or mentee) to be accountable for their goals, you should establish a method and frequency of continued interaction to follow-up on those tasks that they are working on and the commitments that has been made. These follow-up discussions and interactions can be great opportunities for you to share your knowledge, wisdom, and advice as you encourage them along their path.

My recommendation is that each employee meet with their supervisor in a review and goal-setting session at least annually. Less formal, intermediate follow-up discussions could be scheduled monthly or quarterly. The employee should be able to recognize YOUR commitment

to THEIR future. Regularly dedicating your time to them will send that very message. When you meet together, be sure to share in their successes, redirect them if they get off course, and encourage them to remember exactly what they have set out to accomplish. Keep them focused on those primary objectives. That kind of support pretty much defines mentorship!

As you work together through this personal development plan and have the chance to mentor your staff, which is far beyond just supervising their daily activities, you will begin to see their growth. You will see how this rod-person or instrument operator is developing into the next generation of surveyors that we so desperately need in our profession. Over time, you will see them go from Field-to-Finish. There is no greater feeling in our profession than to share your personal legacy with someone you have mentored by giving a little of yourself, your time, your knowledge, and your experience. Although it may not always be easy, I can promise you it will be worth the effort!



Jim Gellenthin, PLS, of Smithfield, NC is Chief of Surveys for KCI Technologies, Inc. He has managed KCI's local survey practice in Raleigh for 25 years and is also licensed in TN and FL. Jim and his wife Paula have 6 children and enjoy 10 grandchildren. Jim enjoys spending time with family, playing the piano, and working with youth.



Jeff Todd
President

jeff@imcipls.com
Mobile: 704-500-6887
Direct: 704-997-2719

Over a Decade of Centerlines, Safety, and Sharing with Surveyors

by Kristian Forslin, PLS, GIS



It began with some challenging articles in Charlotte-area newspapers about encroachments on the North Carolina Railroad (NCRR) corridor, but the result was a relationship and a program that has helped many surveyors and others in the real estate profession. The articles highlighted the need for better information about the location and width of the NCRR corridor for adjacent property owners. Representatives from the NC Society of Surveyors (NCSS) saw an opportunity to work with the Company to educate and inform surveyors and other real estate professionals. It was a welcome conversation.

In 2005, NCRR was already underway with a GIS program to help manage the 200-foot-wide corridor that runs through sixteen counties from Charlotte to Morehead City. Shortly thereafter, NCRR took NCSS representatives on a tour of the railroad to illustrate the Company's challenges in managing the corridor. While the tour initiated the relationship these two organizations have today, it could only show the physical aspects and not the property boundary or nuances of the historical centerline. NCSS provided valuable advice, contacts, and opportunities to guide NCRR in the launch of what would become a marathon

project: properly documenting the location and width of the corridor and educating those who need to know about it. This is where the real work began.

Good Advice Put to Use

NCRR identified three goals as it pertained to the corridor: document, educate and protect. These goals were centered around the corridor itself, but they also overlapped in purpose. NCRR received advice from NCSS representatives and, in turn, was plugged into the larger surveying and mapping community 'brain-trust' to examine best practices from NCDOT, NC Geodetic Survey, NC Geographic Information Coordinating Council, NC Department of Revenue, and private contractors. Using this advice, a program was designed to not only seek out the best way to document the corridor through survey/mapping projects, but also the best opportunities to educate surveyors and, by extension, other real estate professionals. The documentation and education aspects of this program would accomplish both protection of the corridor and ensuring the safety of surveyors and others accessing the corridor for their work.

The corridor monumentation project may be the most familiar component of the program and may also be the most visible documentation of the program with 788 published geodetic monuments placed on the NCRR corridor boundary from the coast to Charlotte. The Company also conducted the historical centerline survey, which verified and recorded the basis for NCRR's 200-foot-wide corridor boundary. Additionally, NCRR has embarked on a survey modernization project that records surveys for properties that vary from the typical 200-foot width. These survey projects serve as a basis for NCRR's GIS program and ability to visualize and monitor the corridor. They also offer a significant benefit to the surveying community.

Getting It Out There

Railroads have always 'just been there' and it was apparent this would be the main issue the survey

information would resolve. It can be argued that over many decades, a lack of information or incorrect assumptions about corridor location/width based on other railroads may have led to many of the property discrepancies near the NCRR corridor making it into the public record.

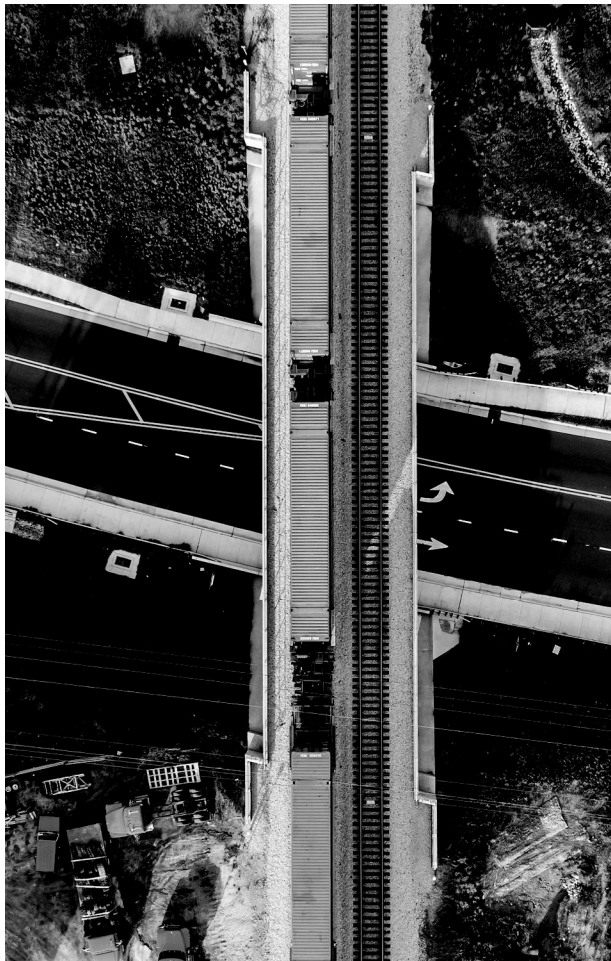
NCRR recorded as much information as possible, including publishing the monuments in the National Geodetic Survey database, and recording historical centerline surveys and modern boundary surveys. However, these things are not entirely discoverable even if recorded. Many of these recorded plats do not convey ownership being that they are centerline surveys (control surveys per N.C.G.S 47-30) and the boundary surveys are of an existing parcel that typically does not subdivide, combine and is not linked to a transaction, or otherwise change anything; therefore it is not always referenced in deeds or grantee/grantor indexes. Recording alone was not enough and the Company felt strongly that more should be done. This is where the education and outreach component and the relationship with NCSS paid off.

The Company leveraged local government partnerships

already in place to raise awareness that new information provided by NCRR would more accurately reflect the corridor in their respective online GIS, and properly map railroad parcels. NCRR also reached out to the source: surveyors. NCRR's commitment to surveyor outreach over the past 10 years has made a significant impact. Participation in NCSS conferences, education seminars, the Otis A. Jones Institute, and NCSS chapter meetings has elevated awareness of NCRR's program. Through the relationships NCSS helped the Company build and the education opportunities afforded to NCRR, a data sharing program was developed to distribute the information to surveyors, engineers, and designers in an easy to use, single source format. Where available, this information includes CAD data for the historical centerline, historic deeds, maps, standard language for notes/references, etc. that serves as a standard, or basis, for any project adjacent to the NCRR corridor. While this has an obvious benefit to the Company's ability to protect the corridor, it also presents significant advantages to surveyors both in personal safety and professional protection.

Protect Our Friends

It is no secret that boundary surveys can be considered



**Partnering with the
Surveyor Community to
preserve and protect a
vital rail asset that's been
moving North Carolina's
economy for 170 years.**

**Contact us if you are working adjacent to the
NCRR corridor for assistance on doing your
work safely, efficiently and accurately.**

ncrr.com/corridor-access/surveyors



**NORTH CAROLINA
RAILROAD
C O M P A N Y**

a starting point for any project. You must know what the extent, or boundaries, of your project are prior to developing grading, drainage, building or other plans. Get it wrong and anything that comes afterward could be out of place, not line up, or encroach onto someone else's property. NCRR's goal is preventing encroachment and ensuring the neighboring project can proceed without impacting the corridor, but there is significant benefit to surveyors as well.



The survey component of NCRR's corridor protection program made it clear that protection came in a few different forms: protecting the corridor, helping to ensure surveyors avoid errors or omissions, and the issue of personal/physical safety when working on or near the corridor. The data sharing program makes the NCRR data readily available to surveyors, so they have access to reliable data backed up by a surveyor's report. This provides both a standard for the NCRR corridor that all surveyors can work from and a firm basis from which to start projects adjoining the NCRR rail corridor. Access to this data may eliminate the need to physically access the corridor in some cases and removes the burden of acquiring a right of entry permit, paying for a railroad flagman, or needlessly trespassing in an active railroad corridor.

While physical safety is always important, access to the data provides another form of protection for surveyors – protection from errors and omissions. As mentioned earlier in the article, surveys adjoining NCRR property can often overlook the proper historic centerline location, reference an incorrect corridor width, not acknowledge NCRR deeds and potential overlap, or

simply not label the rail corridor as owned by NCRR. Many errors and omissions may be honest mistakes, but few clients will see it that way when paying for a product from a professionally licensed individual or company. Historic railroad information is not always easy to come by, but the Company has worked to change that on the NCRR corridor.

What Has it All Accomplished?

Awareness and protection of the NCRR corridor has increased, though the actual return on investment is difficult to quantify. What can be quantified is the Company's efforts to make these improvements. To date, NCRR has recorded 39 historic centerline surveys, published 788 geodetic monuments on the corridor boundary with NGS, and recorded 20 boundary surveys of corridor properties. NCRR has presented at trade shows and conferences, NCSS chapter meetings, and professional education seminars. In total, NCRR has participated in at least 49 events to help assist surveyors and other real estate professionals and has authored or contributed to articles in numerous professional publications. NCRR has also worked with 13 of the 16 counties our corridor travels through to incorporate some level of NCRR's ownership into the tax parcel layer of their GIS for easier discovery.

Recording information and deploying a steady communication strategy culminated in NCRR sharing data with surveyors on more than 200 different projects adjoining the NCRR corridor. In addition, that open line of communication between the Company and surveyors has also helped hundreds more surveyors with advice on projects not on the NCRR corridor. Encroachments and boundary discrepancies can get resolved in time, but it can often take a long time. NCRR understands this and will continue to increase awareness and provide information through a strong foundation of relationships with NCSS membership and surveyors at large.



Kristian Forslin is the GIS Coordinator for the NC Railroad Co. and has 20 years of experience in the geospatial industry as a project manager and GIS consultant. He has served on a number of boards and committees in the geospatial community, including Carolina URISA for over 10 years. He has also authored numerous articles on surveying, railroad, geospatial, and damage prevention matters.

That CAD Girl

Continuing Education Virtual Workshop with CAD & Carlson software

Presentations on AutoCAD, IntelliCAD, Carlson Survey, Civil, Hydrology,
GIS and field hardware & software

Registration opens October 1, 2020
www.thatcadgirl.com/workshops

Hands-on Classroom Training in Raleigh NC • \$250 per day Very limited seating

- Nov 12** - Getting Started with Carlson Software Basics
- Nov 13** - Basics of Surface Modeling in Carlson Software
- Nov 19** - Intro to Site Project Grading with Carlson Software
- Nov 20** - Intro to Subdivision and Lot Grading with Carlson Software
- Dec 1** - Intro to Pipe & Structure Design with Carlson Hydrology
- Dec 2** - Intro to Pond Design with Carlson Hydrology

Registration to any hands-on class includes:

- certificates of attendance for 8 hours professional development
- coffee, water & snacks, box lunch
- door prizes and giveaways
- registration to 3 days of Virtual Workshops scheduled for December 2020

3 days of Virtual Workshops • Dec 15, 16, 17 • \$99 per person

Over 3 days we will be presenting approximately 20 hours of virtual online training sessions that include product demonstrations, question & answer sessions with sales, support and development staff and end-user case studies.

Registration includes:

- your option to attend any or all sessions over 3 days
- certificates of attendance for professional development credit
- access to recordings of sessions for verification of content
- door prizes and giveaways

Day of Show Specials
on Carlson Software, Carlson Upgrades
and Maintenance Renewals

50% off

Virtual Workshop registration
with purchase of
software

That CAD Girl Webinars

www.thatcadgirl.com/webinars

Purchase of new or upgrade licenses of Carlson Software include a year's access to That CAD Girl webinars.

Confirmation of webinars attendance will be provided and may be eligible for professional development credit.

Upcoming Webinars:

- Intro to Carlson Software – Settings, Setup, Configuration & Points
- Survey Project from Start to Finish
- Subdivision Roads & Lot Grading
- Advanced Carlson Hydrology
- What's So Special About... Carlson's Annotate Menu
- Tips & Tricks with Carlson Civil
- Getting Started in Carlson Takeoff (and Takeoff Suite)
- Customizing, Migrating and Sharing Settings in Carlson Software
- Drawing Cleanup for Model Building and Construction Staking

Recent recordings

www.thatcadgirl.com/videos

- Autodesk Licensing Changes - Plan for the Future
- Overview of Carlson Civil Suite 2020
- Overview of IntelliCAD: Where it WAS. Where it IS. And Where it WILL BE.



www.thatcadgirl.com



jennifer@thatcadgirl.com



(919) 417-8351



Go With the (Surface) Flow

by Kristopher M. Kline, PLS

While river flooding is a staple for headlines on national news networks, a more common—but less spectacular—problem can set adjacent property owners against each other. Waters flowing across the land that have yet to enter a recognizable channel still can be destructive and become a source of court disputes.

Court precedent, state statutes and various forms of regulatory authority often combine in surprising ways to determine how surface water may be controlled or re-directed. These factors can vary significantly between jurisdictions, resulting in a plethora of variations nationwide.

Today, most American courts apply some variation of one of three well-established doctrines when dealing with water that flows over land before reaching a recognizable channel. The ‘Common Law Rule’ (also called the ‘Common Enemy Doctrine’) and the ‘Civil Law Rule’ formed the original basis for relevant case law in virtually all U.S. jurisdictions. From their original—and unforgiving—forms, these two doctrines later were modified by many state courts, as occurred in North Carolina. The ‘Reasonable Use Doctrine’ is of more recent origin, and will be discussed later in this article.

The Common Law Rule in the United States may be traced to two rulings: the Massachusetts case *Gannon v. Hargadon*: 92 Mass. 106 (1865), and *Town of Union v. Durkes*: 38 N.J.L. 21 (1875) from New Jersey. These early decisions highlighted the paramount right of an owner to make major changes to drainage patterns on his land regardless of the misfortunes that might result for those unfortunates situated down-slope. In other words, water was the common enemy of all landowners—hence the ‘Common Enemy’ appellation. Despite the ‘bright line’ drawn in these early decisions, this uncompromising attitude has been largely superseded by modern corollaries to the basic doctrine.

The Common Enemy doctrine is primarily an invention of the American courts, while the Civil Law Rule is found in the legal systems (past and present) of various

European nations, including the Code Napoleon. In its original form, the Civil Law Rule balances rights of the owners of adjacent parcels and limits the changes to drainage that are acceptable on either lot.

In recent years, the ‘Reasonable Use Doctrine’ has become more significant, in large part due to increased problems associated with widespread grading and the related alterations of natural terrain in major metropolitan areas. This doctrine is more flexible and provides greater latitude for the courts to consider equities associated with the situation under dispute.

An Easement or a Servitude?

While some rulings have characterized the rights associated with surface flow as ‘natural easements,’ the broader consensus holds that rights related to surface flow are incidental rights that arise due to the physical relationship between two tracts of land. In this respect, these rights are analogous to the right of riparian/littoral property owners to build a dock extending to the line of navigation. North Carolina rulings are not consistent among themselves on this issue, reflecting a certain indifference regarding the nature of the underlying right.

The majority argument is central to the recent adoption of the Reasonable Use Doctrine by many states. Applying legal principles associated with easements to these disputes requires a rigid approach in keeping with the court mandate to protect real property interests, both public and private. The Reasonable Use Doctrine is more flexible, and therefore more congruent with modern regulatory schemes. This doctrine is also more consistent with local, state and federal regulations for storm-water management.

North Carolina

The North Carolina court included a detailed discussion of the various doctrines applied to surface flow in *Midgett v. Highway Commission*, 260 N.C. 241 (1963). This early benchmark ruling considered property damage caused by the construction of a highway that diverted storm water over the lands of Midgett. It also includes an excellent summary of the various

doctrines and their acceptability to the North Carolina court: *“North Carolina has not recognized and does not apply the ‘common enemy doctrine’ with reference to surface waters. ... We follow the ‘Civil-Law Rule,’ which recognizes a natural servitude of natural drainage as between adjoining lands, so that the lower owner must accept the surface water which, naturally drains onto his land but, on the other hand, the upper owner cannot change the natural drainage so as to increase the natural burden, ...*

The common-enemy doctrine is sometimes called the ‘old common law rule.’ ... In its strict application, it is that surface waters are a common enemy and, as an incident to the right of a landowner to use his property as he pleases, he has an unqualified right by operations on his own land to fend off surface waters as he sees fit without regard to the consequences to other landowners, who have the duty and right to protect themselves as best they can. This rule in its original rigor was applied in many states during the pioneer period of settlement when the country was largely undeveloped and sparsely settled.

The Civil Law Rule was the prevailing standard in North Carolina for many years, as described in *Davis v. Cahoon*: 168 S.E.2d 70 (1969): *“Diametrically opposed to this rule is the civil law rule which is the rule prevailing in this jurisdiction...” “The surface of the earth is naturally uneven, with inequality of elevation. The upper and lower holdings are taken with a knowledge of these natural conditions, and the privilege or easement of the upper tenant to carry off the surface water in its natural course, under reasonable limitations, and the subserviency of the lower tenant to this easement are the natural incidents to the ownership of the soil. The lower surface is doomed by nature to bear this servitude to the superior and must receive the water that falls on and flows from the latter. The servient tenant can not complain of this... The upper owner can not divert and throw water on his neighbor, nor the latter back water on the other with impunity.”*

A New Standard for North Carolina

One problem with either of the original doctrines is that their rigid structure was a poor fit with flood zone regulations and modern storm-water management principles. To deal with the increasing density of subdivision and neighborhood development, courts added corollary after corollary until the original doctrines were hardly recognizable. Confusion was widespread in many courts and a ‘reasonable use’ variant became more common, until it was recognized

as a separate doctrine in its own right.

Following a continuing national trend—and recognizing some of the problems associated with application of rigid rules to a myriad of situations—North Carolina abandoned the Civil Law Rule. The benchmark decision *Pendergrast v. Aiken*: 293 N.C. 201 (1977) provides an in-depth review of the early doctrines and their tortured modifications by various courts. It also provides justification for the adoption of a new standard: *“The rising prominence of the reasonable use rule is seemingly attributable to the increasing industrialization and urbanization of the nation. Where people are forced by social and demographic pressures to live in close proximity with each other and with commercial and industrial development, there will be, of necessity, increased conflict over the proper utilization of land...”*

As other states had already discovered, North Carolina courts were frequently forced to create variants for unanticipated situations, resulting in decreased certainty in a doctrine that was premised on a rigid standard. The court concluded: *“Accordingly, we now*

JOIN THE ESP TEAM TODAY!

- Fort Mill, SC
- Charleston, SC
- Cornelius, NC
- Concord, NC
- Greensboro, NC
- Raleigh, NC
- Wilmington, NC
- Nashville, TN
- Pittsburgh, PA
- Bradenton, FL

Survey Specialties:

- | | |
|--------------------------------|------------------------|
| Mobile LiDAR Scanning | Aerial Mapping |
| 3D Laser Scanning | H&H Surveys |
| Conventional & GPS Surveys | Hydrographic Surveying |
| Subsurface Utility Engineering | UAS Services |



Visit our careers page for job openings:
www.espassociates.com/careers



formally adopt the rule of reasonable use with respect to surface water drainage. That rule is expressed as follows: Each possessor is legally privileged to make a reasonable use of his land, even though the flow of surface water is altered thereby and causes some harm to others, but liability is incurred when his harmful interference with the flow of surface waters is unreasonable and causes substantial damage."

The court justifies its adoption of the new standard as an act of clarification rather than the creation of a new system. This argument is defensible because the court had already been applying a reasonable use modification to the Civil Law Rule.

The North Carolina courts have followed this new standard in at least two subsequent decisions. The Reasonable Use Doctrine allows the court to rule against a landowner who alters surface flow patterns

in ways that are considered unreasonable, negligent, or dangerous.

This brief history serves to emphasize the pitfalls that may be associated with water flow patterns depicted on a survey. It is also apparent that, as professionals charged with locating features on the surface of the earth, the collection of relevant data for surface water disputes will often fall to the surveyor. With increased public scrutiny of many aspects of water use and control, land use professionals cannot afford to float blindly through this sea of confusion.



Kristopher Kline is an educator, consultant, land surveyor and author living in Alexander, North Carolina. Kris has published four books relating to legal aspects of boundary retracement and operates 'Surveyors Educational Seminars.' Follow his new blog posts at www.2Point.net or at www.surveyorsed.com



Kelly Acord | NC Sales & Support Rep | kacord@egps.net
c: 678.787.1596 | o: 770.695.3361 | www.egps.net

YOUR ONE-STOP SHOP FOR ALL SURVEYING NEEDS!

RTK Network | Equipment, Supplies, Accessories | Tech Support
Certified Repairs | Rentals | Data Plans | UAV, LiDAR Sales & Training



Authorized Reseller of
LiDARUSA
Pageant Technologies Inc.



Authorized Reseller of
GEOMAX

Gold Status GeoMax-Authorized
Total Station, Robotics and GPS Service Center.

We're committed to providing

Affordable Insurance Packages

to NORTH CAROLINA SURVEYING FIRMS

Plus, receive up to

15% PREMIUM CREDIT

Just for being a member of NCCS

(applies to Professional Liability only)

- Professional Liability (E&O)
- General Liability
- Commercial Property
- Equipment Floater (Inland Marine)
- Business Income with Extra Expense
- Workers Compensation
- Commercial Automobile
- Commercial Umbrella
- Life Insurance
- Personal Homeowners, Automobile, Watercraft & Umbrella

We specialize in building comprehensive insurance packages for you, the surveyor.



YOUNTS INSURANCE



LAND DESIGN
INSURANCE GROUP

Younts Insurance Agency, Inc. is a Preferred Agency of Land Design Insurance Group.



Call for a FREE
quote today.

Phone 888.672.5325

Fax 877.608.0976

Beth@YountsInsurance.com

www.YountsInsurance.com

NGS's Modernization of the National Spatial Reference System

by David B. Zilkoski

The National Geodetic Survey (NGS) held a webinar on August 27, 2020 announcing that there will be a delayed release of the modernized National Spatial Reference System (NSRS) (https://www.ngs.noaa.gov/web/science_edu/webinar_series/delayed-release-nsrs.shtml). NGS stated they are performing a thorough review of all tasks and will provide regular updates on their progress. What this means is that the modernized NSRS will not be completed by 2022. Even if it's delayed a couple of years, it's never too early to obtain an understanding of the new, modernized NSRS.

This article is a brief introduction to what working in NGS's modernized NSRS in 2022 will mean to North Carolina surveyors. It will briefly address the following questions:

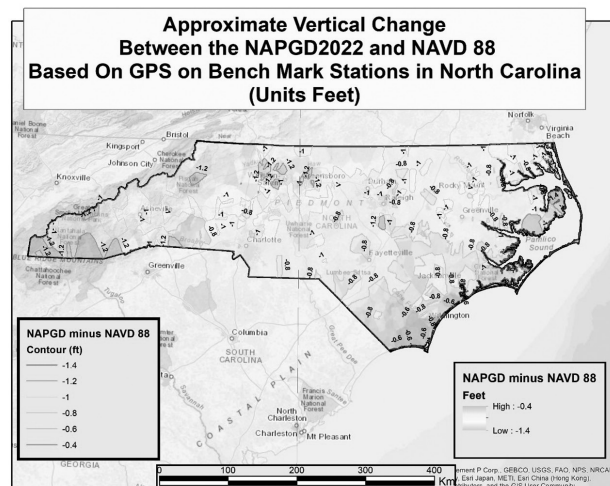
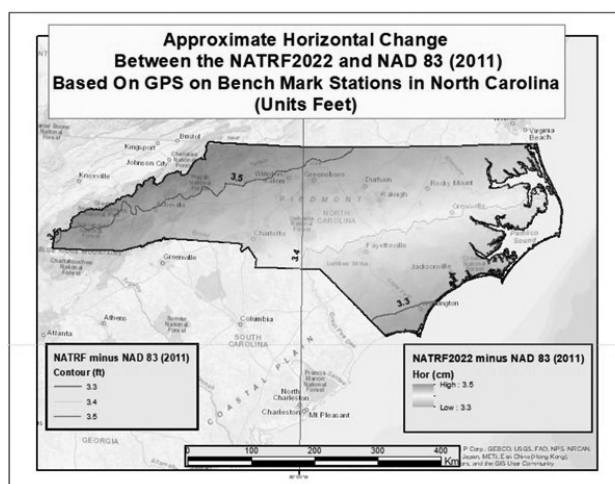
- Why is NGS modernizing the NSRS?
- What are the expected changes from the old to the new NSRS?
- What does NGS mean by time-dependent coordinates?
- What about the vertical datum?

Why is NGS modernizing the National Spatial Reference System?

The current national geodetic datums, that is the North American Datum of 1983 [NAD 83 (2011)] and North American Vertical Datum of 1988 (NAVD 88), have shortcomings that are best addressed through defining new reference frames. Specially, NAD 83 (2011) is non-geocentric by about 2.2 meters (7.22 feet), and it's different from the latest International Terrestrial Reference Frame (ITRF) system [1 to 1.5 meters (3.28 to 4.92 feet) in North America and ~2.5 to 4 meters (~8.20 to 13.12 feet) in Pacific]. The NAVD 88 has a bias of about 50 cm (1.64 feet) and a tilt of about a meter (3.28 feet) from the east coast to the west coast of the United States. NGS has a website that depicts the changes at the national level (<https://www.ngs.noaa.gov/datums/newdatums/WhatToExpect.shtml>).

What are the expected changes in NC from the old to the new NSRS?

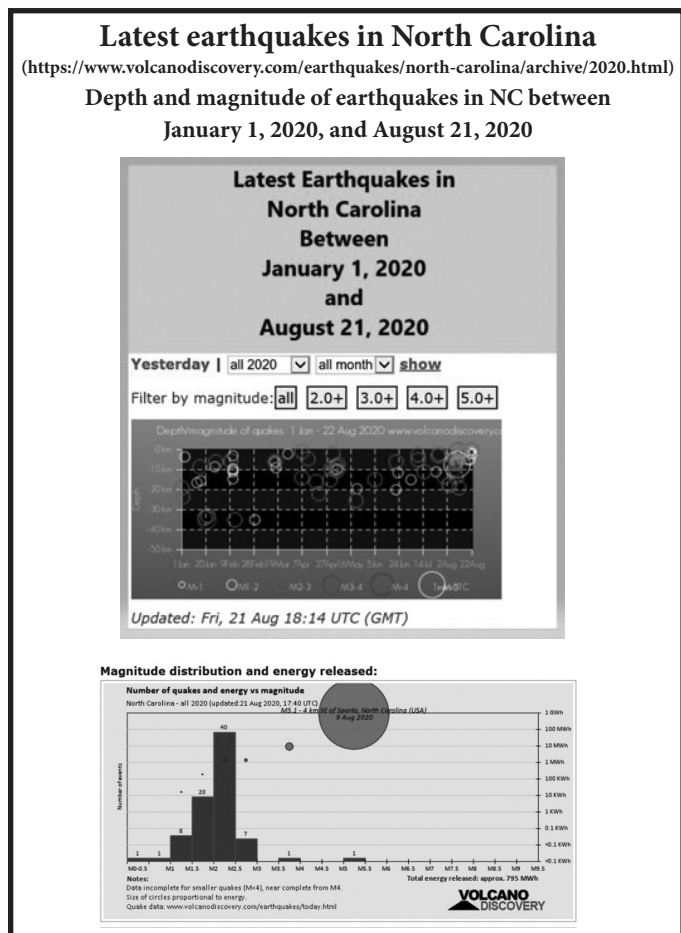
So, what does this mean to North Carolina surveyors? In North Carolina, based on the GPS on Bench Marks used in Geoid18, the horizontal change [NAD83 (2011) to North American Terrestrial Reference Frame 2022 (NATRF2022)] will typically range from about 3.3 feet (101 cm) to 3.5 feet (107 cm), and the vertical change [NAVD 88 to North American-Pacific Geopotential Datum 2022 (NAPGD2022)] will typically range from about -1.4 feet (-43 cm) to -0.4 feet (-12 cm). The two plots below provide a generalized view of the approximate differences for North Carolina.



In the last three decades, surveyors have been through many changes in reference datums; that is, NAD 27 to NAD 83 (1986), NAD 83 (2007), and then NAD 83 (2011), and NGVD 29 to NAVD 88. So, what's the big deal? As indicated above, the changes will be fairly large. [As a side note, the difference between NAPGD2022 and NGVD 29 in North Carolina will be at the -50 cm level (-1.64 feet).] The NC State Plane Coordinate System of 1983 (SPCS83) coordinates will also change a large amount in the NC State Plane Coordinate System of 2022 (SPCS2022). These differences can be easily dealt with but there's more. The coordinates will have a time-dependent component to them. This includes the station's latitude, longitude, ellipsoid height, gravity value, and geoid height. So, why do these coordinates have a time-dependent component?

What does NGS mean by time-dependent coordinates?

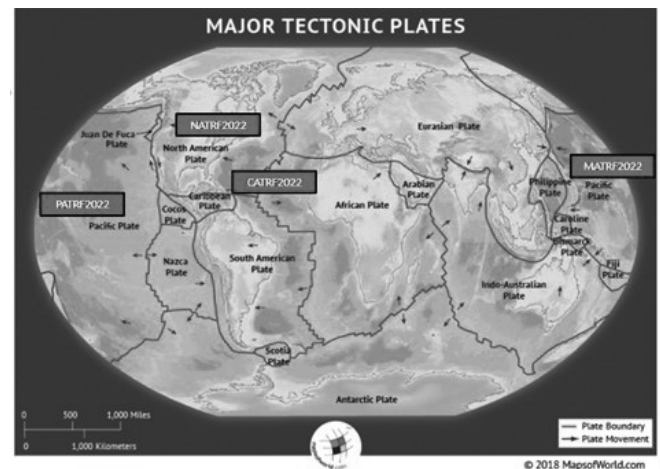
The coordinate values change because the Earth's surface is moving. As a matter of fact, on August 9, 2020, there was a 5.1 magnitude earthquake located in Sparta, NC. The figure below titled "Latest Earthquakes in North Carolina," depicts the number and magnitude of earthquakes in NC from January 1, 2020, to August 21, 2020.



NGS understands that coordinate values change because the Earth's surface is moving and is attempting to manage the changing coordinates by providing a time-dependent component. Survey marks are located on separate tectonic plates which are continuously moving. This is known as "Plate Movement" and NGS will provide a model that describes the plate rotation relevant to the new NSRS; the NGS model is denoted as Euler Pole Parameters (EPP) in their documentation.

NGS will be defining four geometric terrestrial reference frames that are based on the tectonic plates:

- North American Terrestrial Reference Frame of 2022 (NATRF2022)
- Pacific Terrestrial Reference Frame of 2022 (PATRF2022)
- Mariana Terrestrial Reference Frame of 2022 (MATRF2022)
- Caribbean Terrestrial Reference Frame of 2022 (CATRF2022)



NATRF2022 will be the reference frame that most North Carolina surveyors will be using to perform their work.

What about the vertical datum?

New orthometric heights will be determined by the North American-Pacific Geopotential Datum (NAPGD2022). NAPGD2022 is a geopotential datum that will provide geoid undulations, acceleration of gravity, geopotential number, and deflection of the vertical at a mark. When using NGS web tools, users will establish a NAPGD2022 orthometric height by using GNSS technology that uses the NOAA CORS Network (NCN) to estimate an ellipsoid height in one of the four geometric terrestrial reference frames and then by applying a geoid height, will compute a GNSS-derived orthometric height.

In other words, a GNSS-derived ellipsoid height (e.g.,

NATRF2022) combined with the geoid model (e.g., GEOID2022) will become the primary means for deriving orthometric heights on marks in the new, modernized NSRS. Of course, NGS recommends that surveyors ensure that their survey provides redundant observations because depending on only one GNSS observation to obtain a height that the public depends on is against basic survey principles. It was mentioned that the geometric terrestrial frame will have a time-dependent component and so will the geopotential datum. This means that the geoid model used to compute the NAPGD2022 orthometric height will also have a time-dependent component.

$$H_{\text{NAPGD2022}}(t) = h_{\text{TRF2022}}(t) - N_{\text{GEOID2022}}(t)$$

*NATRF2022, PATRF2022, CATRF2022, MATRF2022
 $t = \text{date of observation}$

One would think that because North Carolina is located entirely on the North American Plate that there wouldn't be any movement between marks. This is not the case. The entire Earth's crust is moving everywhere. As previously stated, NC recently experienced a 5.1 magnitude earthquake. The relative movement between closely-spaced marks is small but there is still some movement. NGS refers to this relative movement as "Intra-Frame Movement" in their documentation and will provide an "Intra-Frame Velocity Model (IFVM)" to account for the movement. NGS denotes the concept as "Shift and Drift." The shift is accounted for by the EPP model and the drift is accounted for by the IFVM.

So, does this mean that North Carolina surveyors will see their coordinates changing daily? Only if they

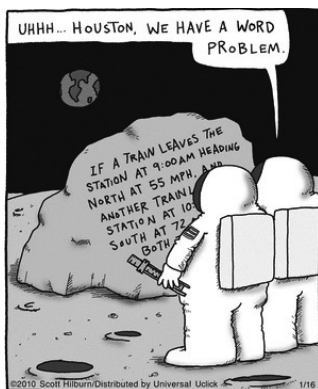
request that option. According to NOAA TM NOS NGS 67 (https://geodesy.noaa.gov/PUBS_LIB/NOAA_TR_NOS_NGS_0067.pdf), NGS will be building flexibility into OPUS so users can estimate coordinates in a specific reference frame (e.g., NATRF2022) at a NGS-supported five-year Reference Epoch (e.g., 2020.00) which is similar to how NGS publishes coordinates today in NAD 83 (2011), epoch 2010.00.

How NGS computes these models is something that may be addressed in future articles, but what's important to know is that NGS will provide models to account for the time-dependent component of the coordinates in the new NSRS. They will provide routines that will automatically convert coordinates obtained on a specific date to a published reference epoch date such as 2020.00.

Future articles will address other aspects of the new, modernized NSRS and what it will mean to North Carolina surveyors. For example, after 2022, why do you need to perform GNSS observations when you're performing a leveling project? What will the North Carolina State Plane Coordinate System of 2022 (SPCS2022) look like?



David B. Zilkoski served as Director, National Geodetic Survey, from 2005 - 2009 and was the Project Manager of the New Adjustment of the North American Vertical Datum of 1988. He currently works as a geodetic consultant on NGS' modernization of the National Spatial Reference System. He is Chair of North Carolina Geodetic Survey Advisory Committee and a member of the North Carolina 2022 Reference Frame Working Group.



Looking for the solution?

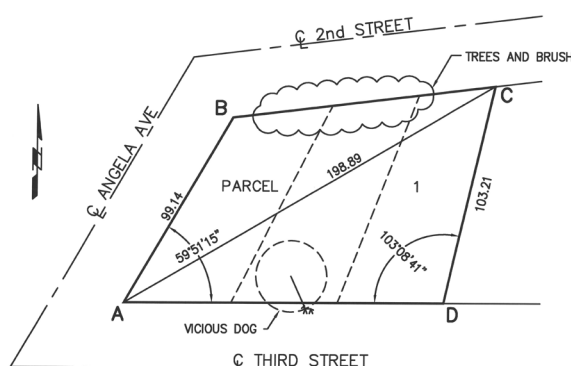
It's on our website at www.ncsurveyors.com or scan this QR Code.



PROBLEM CORNER

PROBLEM:

Leo owns a piece of land, shown in the sketch as parcel 1. He wishes to divide the property into three parcels of equal area and give one to each of his three sons. To be completely fair to each son, Leo also wants each parcel to have an equal amount of frontage along third street. Leo has hired surveyor Susan to help divide parcel. Due to obstacles in her way, she was unable to get all angles and distances of the parcel. She obtained the angles and distances as shown and now needs to complete her calculations.



FIND:

Distance AD = _____

Distance BC = _____

Angle ABC = _____

Distance BD = _____

Area ABCD = _____

MEMBER PROFILE

Jason C. Hedley



Children

Two Sons: Jelani and Terrell

Favorite Movie

The Godfather

Favorite Food

Sweet Potatoes

Childhood Ambition:

To build bridges and highways

What was your most recent purchase?

A new phone. It was long overdue.

What was your first job?

A paper route

Employment:

Project Manager at Stewart

What is your favorite surveying equipment?

I became a fan of the Trimble SX 10 when I saw the level of functionality.

In 2019, the North Carolina Society of Surveyors (NCSS) was chosen to partner with the National Council of Examiners for Engineers and Surveyors (NCEES) to begin work on the SCORE Initiative. SCORE is

a regional pilot project recruiting talent and increasing diversity within the profession. This edition of the Tarheel Surveyor celebrates Jason Hedley, whose achievements, and experiences as one of the few African American surveyors in North Carolina are worthy of attention. The following interview is very thought-provoking as I discussed with him NCSS's recent efforts and his experience as a professional licensed surveyor.

Give us a little background on your education and career.

I obtained a Bachelor of Science degree in Civil Engineering from Howard University in Washington, D.C. The first twelve years of my career involved working with traffic systems. During the recession of 2008, I moved to North Carolina, where I decided to pursue my four-year geomatics degree from North Carolina A&T State University (NC A&T).

Upon graduation, I began work for the North Carolina Department of Transportation (NCDOT) as an Assistant Locating Engineer for the Location and Surveys Unit in Division 4, in Wilson, NC. Eventually offered the position of Locating Engineer in Division 5 in Raleigh, I found myself in one of the busiest offices statewide. Logistical challenges and constant coordination between consultants, personnel, and staff elevated my experience and skills. I am very proud of the work I accomplished during my tenure there.

Following my ten-year tenure with NCDOT, I moved into the private sector. While I was able to continue to work on NCDOT-related projects, I was also able to see firsthand other survey needs beyond those of

NCDOT. I gained experience with boundary, ALTA and topographic surveys while learning to meet the needs and requirements of private development. Earlier this year, I had the opportunity to further my career with Stewart where I have gained more varied experience managing statewide projects for clients of all types.

Have you had opportunities to serve the profession in other capacities?

Yes, I am fortunate for the opportunities to serve as a PLS on two outside boards. I was invited to serve on the Advisory Board of the Geomatics Program of my alma mater, NC A&T. Stewart has also furthered that opportunity by allowing me to spearhead the company's desire to develop and endow a scholarship and internship program for geomatics students attending NC A&T. This support has helped me fulfill a personal desire to give back to the university which has helped me build my career.

I was also honored in 2018 to be appointed by Governor Roy Cooper to serve on the Geographic Information Coordinating Council (GICC), whose mission is "to develop policies regarding the utilization of geographic information, geographic information systems (GIS), and related technologies. The GICC advises the Governor, General Assembly, and the State Chief Information Officer on needed directions, responsibilities, opportunities, and funding related to GIS and geospatial data."

Are you particularly proud of any one project?

I have a couple of projects currently under construction that will make me very proud once completed. The current widening of I-440 will

alleviate a traffic bottleneck that has been frustrating travelers on Raleigh's Beltline for years. The other is completing the next section of NC 540, which will continue developing the toll road around Raleigh from NC 55 near Holly Springs to I-40 near Clayton. There was a significant amount of pressure to have the surveys for both projects completed quickly. I am looking forward to one day being able to ride on both roads when finished.

With this much professional success, do you see barriers in your career because of your race?

I had heard references to a "good old boy network" but you do not see that until you run right into it. I ran into that a few times. That was surprising to me because quite frankly, I was not expecting it. Even while working to expand professional diversity, I have seen situations that lacked diversity, equality, and inclusivity. However, I feel like I have crossed that threshold now and am on the other side, having earned my colleagues' respect.

How are you treated as a colleague of those in your sphere of influence?

One of my concerns personally and professionally has been a lack of diversity in the surveying community. Unfortunately, I have only seen one other African American licensed professional land surveyor. I know the talent exists within the African American community and other communities of color. As I have attended NCSS events, such as the Annual Conference and Trade Show, there has been awkwardness

at times. I have heard comments or seen actions by others attempting to discredit or not consider my findings as valid. I have seen those same findings presented by another

African Americans and other people of color will represent the geomatics community. I know the talent exists.

What steps can surveyors take to include more talented individuals of color into the profession?

We must get in front of more diverse audiences. I attended a career event at my son's school when he was a sophomore. The students still believed that we took pictures on the side of the road. Meeting with schools, Boys and Girls Clubs, or other diverse audiences would lead us in the right direction. I also think we need to be speaking to first-year engineering students who may not make it through the entire program, but still have an affinity for math and science. I genuinely wish I could do more.



Jason with his sons, Jelani and Terrell

surveyor lauded as a reasonable consideration or a "great catch." There have also been times on project sites and meetings when clients or fellow professionals have not been willing to address me. It is uncomfortable when a colleague must remind others that I am the person with whom they need to speak.

Do you sense that the above examples are becoming less or changing?

Unfortunately, I do not believe these instances will change substantially until the numbers of diverse surveyors increase. Seeing more African Americans in the professional ranks will help us become the norm rather than feeling like a unicorn. I look forward to the day when significant numbers of

PUT YOUR BEST PLAT FORWARD

2020 Plat Competition

Enter for your chance to bring home \$100 for the best overall plat & gain recognition among your peers!



Scan QR Code for Details



McADAMS

McAdams Company
Durham, NC
www.mcadamsco.com



senseFly Inc.
Raleigh, NC
www.sensefly.com



TGS Engineers
Morganton, Shelby, & Garner, NC
www.tgsengineers.com



McKim & Creed
Raleigh, NC
www.mckimcreed.com



SEPI, Inc.
Charlotte, NC
www.sepinc.com



That CAD Girl
Clayton, NC
www.thatcadgirl.com



Meridian 3D, Inc.
Greensboro, NC
www.meridian-3d.com



SLS-NC, Inc.
Glenville, WV
www.slsww.com



THE WOOTEN COMPANY
The Wooten Company
Raleigh, NC
www.thewootencompany.com



Merrick & Company
Charlotte, NC
www.merrick.com



So-Deep | SAM NC, Inc.
Raleigh, NC
www.sodeep.com



Timmons Group
Raleigh, NC
www.timmons.com



NC Railroad
Raleigh, NC
www.ncrr.com



Spatial Data Consultants Inc.
High Point, NC
www.spatialdc.com



Transit & Level, Inc.
Cary, NC
www.transitandlevel.com



NV5 Engineers & Consultants
Raleigh & Charlotte, NC
www.nv5.com



STEWART
Stewart, Inc.
Raleigh, Durham, Charlotte, NC
www.stewartinc.com



Tuck Mapping Solutions, Inc.
Big Stone Gap, VA
www.tuckmapping.com



Regional Land Surveyors, Inc.
Greensboro, NC
www.regionallandsurveyors.com



SURDEX Corporation
Chesterfield, MO
www.surdex.net



VHB
Raleigh, NC
www.vhb.com



Schneider
Schneider Geomatics
Charlotte, NC
www.schneidercorp.com



SURV-KAP, LLC
Tucson, AZ
www.surv-kap.com



WithersRavenel
Cary, NC
www.withersravenel.com



Scott Church Land Surveying, PLLC
North Wilkesboro, NC
www.scottchurchsurveying.com



Taylor Wiseman & Taylor
Apex & Charlotte, NC
www.taylorwiseman.com



Younts Insurance Agency, Inc.
Lexington, NC
www.yountsinsurance.com



North Carolina Society of Surveyors
331 S. White Street
PO Box 2101
Wake Forest, NC 27588
919.556.9848

PRESORTED
STANDARD
US POSTAGE
PAID
PONTIAC, IL
PERMIT #592

FOCUSSED ON SUCCESS

NCSS 2021 CONFERENCE & TRADE SHOW
FEBRUARY 17 - 20, 2021 | THE PINEHURST RESORT