

The Tarheel SURVEYOR

FALL 2021 No. 21.2

EXPERIENCE

EDUCATION

EXAM

THE CRITICAL
CROSSROADS
P. 16

MORE THAN MEETS
THE EYE
P. 14



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The Tarheel SURVEYOR Fall 2021

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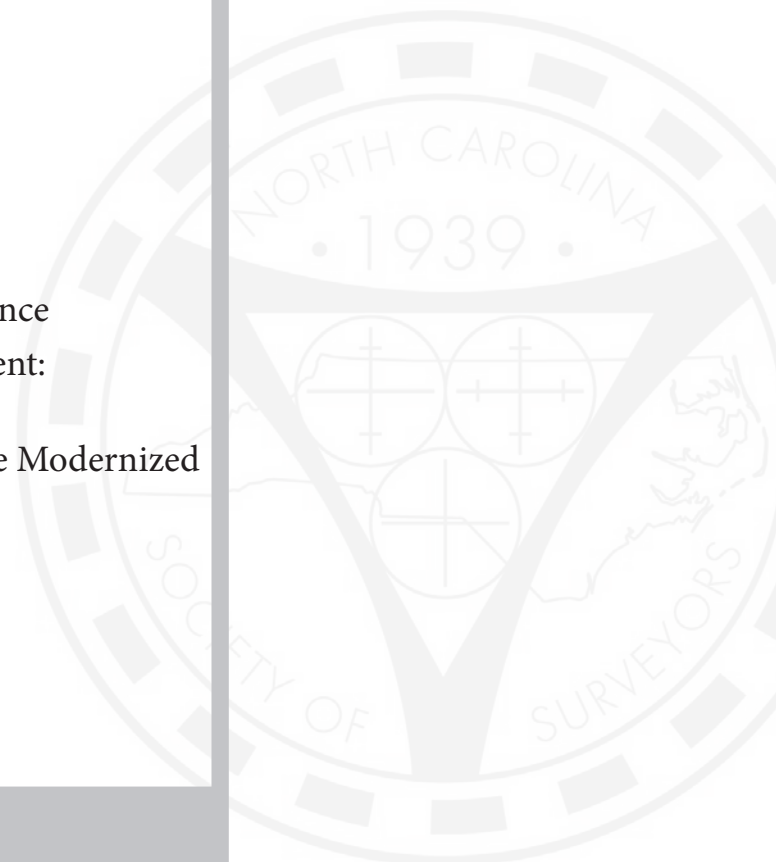
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ABOUT NCSS:

- 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



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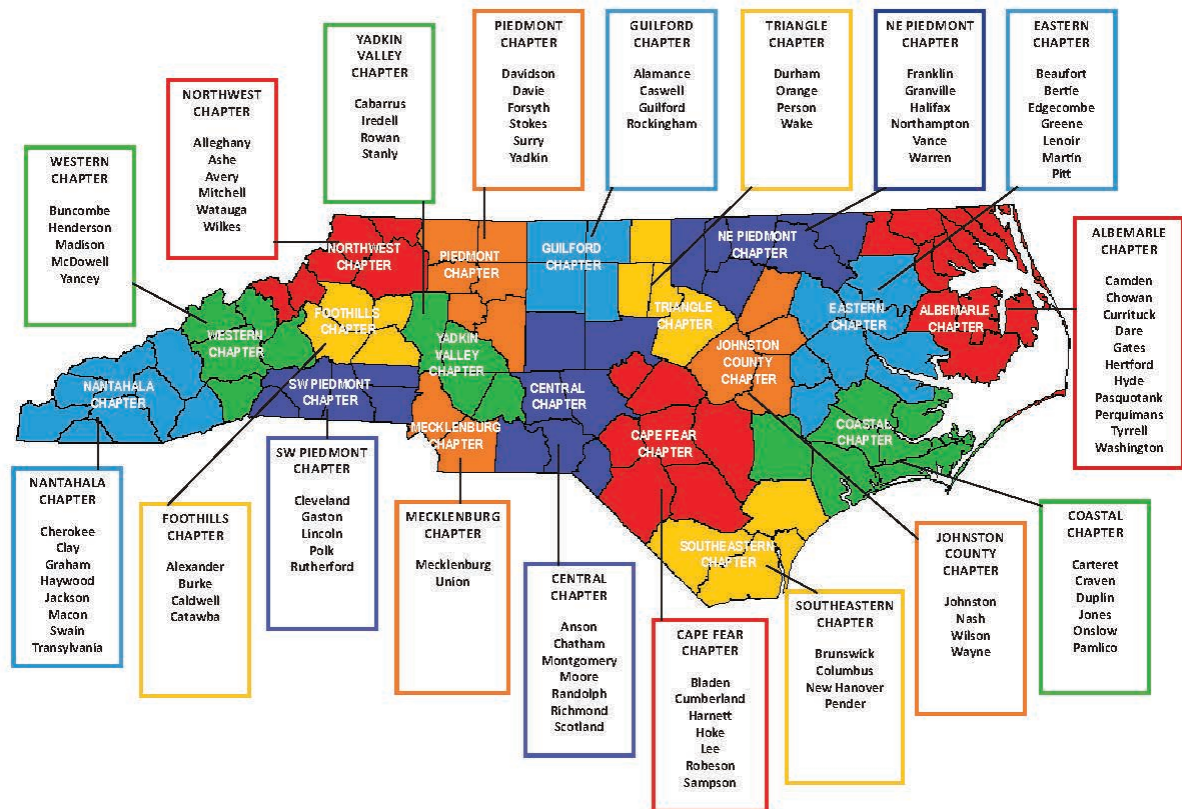
Sherri L. Barron
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CHAPTER MEETINGS

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	Various Locations, 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	Foothills Brewpub, Winston-Salem
Southeastern	Last Wednesday 7:00 pm	Carolina BBQ, Wilmington
SW Piedmont	2nd Thursday 6:30 pm	Olive Tree, Rutherfordton
Triangle	3rd Wednesday 6:30 pm	Casa Carbone, Raleigh
Western	2nd Tuesday 6:00 pm	AB-Tech Campus, Asheville
Yadkin Valley	2nd Wednesday 6:30 pm	Pancho Villa's, Salisbury

Please contact chapter president to confirm meeting details before attending.

NCSS Local Chapters

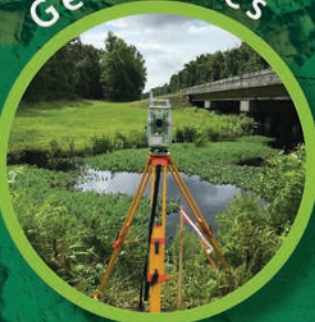


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DIRECTOR'S NOTES



Same Goal, Different Approach

We can rarely all agree on anything these days, but I think we can all agree on the shortage of personnel in the surveying profession. Whether one sees the greatest need to be technical employees or licensees, there is a shortage that makes surveying vulnerable to legislative initiatives begun by others. In this edition, we hope to convey an overall depiction of the licensure process. The variety of perspectives is vital to those for whom it matters most; the ones who serve the public and follow in each other's footsteps.

In February, Senator Tom McInnis reached out to the North Carolina Society of Surveyors (NCSS), concerned that it takes too long to become a surveyor. He told me that he called the surveyor who usually does his work but found him months away before getting to his project. Senator McInnis said he called other surveyors and was shocked at the estimates he received. The reason given to Senator McInnis for the time delay was there were not enough surveyors because it takes too long to become one.

After several meetings with Senator McInnis, lobbyists, NCSS leadership, the NC Board of Examiners for Engineers and Surveyors (NCBELS), and statistical help from the National Council of Examiners for Engineers and Surveyors (NCEES), Senate Bill 219 unanimously passed the Senate. NCSS is currently working with Representative Arp's office to amend the bill in a way that we feel addresses all concerns.

The current bill changes the experience requirements for licensure for two groups, high school and associate degree graduates.

Currently, general statute 89C calls for a high school graduate to have 16 years of experience, which the Senate found shocking. However, an engineer requires twenty years of experience if he pursues the longest route after high school to become licensed. Associate degree graduates currently need eight years of experience to become fully licensed. The changes will require a high school graduate to have only seven years of experience and an associate degree graduate to have four. NCSS is not entirely pleased with the results, so we are currently awaiting amendments in the House. The national average is 10.5 years required after high school.

The current requirements legislated in 2003 explored statistics and found that a high school graduate averaged 16 years of experience before passing the exams. Therefore, the education committee decided to set the experience requirements at 16 years, hoping to direct candidates toward surveying coursework, speeding up the process. It was never a point of protectionism within the profession. The idea was to nudge everyone towards education to become a qualified, knowledgeable surveyor as quickly as possible. As an aside, we recalculated the current statistics for a high school graduate, and the average is 18.5 years before they are licensed.

Although many excellent surveyors became licensed with a high school degree, three factors have changed dramatically.

1. The tests became national and much more academically based.
2. The field crews became smaller with the advance of technology, and therefore, the younger generation of surveyors haven't had the same mentoring opportunities as their predecessors.
3. Technology makes the "why"



Schedule at a GLANCE

NOVEMBER 5, 2021

CFS Update

12:30pm-4:30pm

4 PDHs

Wake Forest, NC

NOVEMBER 12, 2021

NCSS MAPS Bodie Island

Base Line Cleanup

8:00am

Wake Forest, NC

NOVEMBER 17, 2021

CST Exams

8:30am - 4:00pm

Cape Hatteras National Park
Nags Head, NC

DECEMBER 3, 2021

SW Piedmont Partnership

Dave Brubaker

8:00am-4:30pm

7.5 PDHs

Shelby, NC

DECEMBER 3, 2021

Piedmont Partnership

Kristopher M. Kline

8:00am-4:30pm

7.5 PDHs

Winston Salem, NC

behind the “how” taught less often. The knowledge of the process then becomes equipment expertise rather than understanding the principles. You may hear more experienced surveyors refer to the younger generation as “button-pushers.”

Ultimately, we risk discouragement if a post-high school graduate unprepared for the exams takes the test once, twice, or even three times without success. Many candidates would say at that point, “This is too hard. I’ll do something else.” The best way to avoid failure and discouragement is to prepare them for the exam. Education and ample field training, reduce their risk of violation after they are licensed professionals. We can all see the need for more qualified surveyors, but we have different approaches to accomplish the goal.



Christy C. Davis
NCSS Executive Director

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



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LETTER FROM THE PRESIDENT



Zen and the Art of Negotiation

We often think of negotiations as a high-stakes game. As with many things in life, negative experiences and our natural aversion to risk can cause a desire to avoid intense negotiations. Recalling times when you purchased a car or fought off a timeshare salesperson reaffirms a belief that negotiations are best avoided unless completely necessary. The reality is we are engaged in numerous successful negotiations every day. Most of the time, we are unaware that we are even doing it.

In a fairly typical scenario, you call your spouse from work and offer to cook dinner on the grill, if they would swing by the grocery store and pick up a few things. This is the classic win-win negotiation. You don't have to make the extra stop on the way home, allowing extra time to finish that proposal, and they get a delicious home-cooked meal without having to prepare it.

Many of us believe that a good negotiator, like William Shatner, the Priceline Negotiator, always gets everything they want in the deal. They make their case, make the other person give in entirely, and get to go home with all the winnings. Awesome deal, right? Except that it's not.

Imagine a scenario where you want a new set of golf clubs. I mean, that new set could easily knock three or four strokes off your game. It said so right in the brochure, and the sales guy confirmed it. The only thing between you and a scratch game is \$1400. So, as you pull away from the pro-shop, you begin to work on your pitch.

You'll explain to your spouse that you've been playing with that old set for a full two years. Golf years are like dog years; that set is ancient. Plus, ninety percent of business is conducted on the golf course. Imagine how impressed your clients will be! If the spousal negotiations get tough, you can always pull out the sympathy card. "Well, you know how hard I've been working, and it sure would be nice to have something to show for it.

When you get home, you're ready. Your confidence is high, and your arguments are perfected. What could go wrong? You wait for the perfect time to propose the purchase and release a flurry of facts and anecdotes to support your idea. "My buddy Joe at work has a set like this. He says it knocked so many shots off, he finishes his game faster now, he's actually catching up on his to-do list around the house." Somehow it all seemed more convincing during rehearsals.

You look across the table and notice the look. The look that says, "Are you serious?" You've seen it before, but this time...this time there's depth to it you weren't prepared for. You check the usuals. Nope, not a birthday or an anniversary. What are you missing? You just need a minute to think, but that look. Who could think while under that steely glare?

Finally, your spouse says, "I was hoping you could leave early tomorrow and go with me to the laundromat. The washer is still broken, and it's super sketchy there. I don't like going alone." There it is. That thing you forgot. The only tactic left is the tantrum. Hey, it works for the kids, so why not. You raise your voice and blurt out, "I work my butt off all week. Sometimes nights and weekends, and I can't even have this one thing. It's not fair, and it's not

right. Everyone else gets their new phones, their Xboxes and new cars (low blow there). It's my turn. I don't care if I have to rob a bank to do it."

In response, you hear, "If it means that much to you, fine, get your golf clubs. I can do the laundry at Mom's for a while." Congratulations, victory is yours! Except this negotiation wasn't a win-win, this was a 'get what you want at any cost.' This can lead to resentment and bitter feelings. You probably won't get a great night's sleep either. Your marriage will probably survive it, but in business, there is usually less forgiveness. A one-sided result could provide a quick windfall but a long-term loss of business from that client.

There are dozens of negotiation scenarios that play out in the office every day. Most are simple. "Hey boss, can I take off next Friday?" They reply, "Sure, just get that stakeout set-up for the crew beforehand." A give and take win-win. Others are much more complex. When dealing with politicians or regulators, the negotiations can become unbalanced.

Some situations we've come to expect. It's hard to negotiate whether a stream is waters of the U.S. with the Corps of Engineers. The standards are rigid. Local planning boards and commissions may provide a little more flexibility. I've been successful in some things, such as having stub roads removed from a requirement when the environmental impact was too great. I'm certain many of you have had similar successes. The key is to approach it as a negotiation, not as a confrontation.

A proposal can and should also be viewed as a negotiation. Make sure to have a comprehensive list of what you need such as a minimally profitable fee, extended timeline or compensation for lodging. Then list the things that you can compromise. Perhaps you can accelerate the timeline for a better fee. Negotiating could increase your overtime expenses but increase profitability and still meet their needs, a win-win. Sometimes offering some value-added services, such as custom formatting of the deliverables, or extra onsite meetings to reassure the client can help seal the deal.

There are times when you can get drawn into a negotiation that you're not prepared for or weren't seeking. This year NCSS found itself in one of those situations. The North Carolina Senate created a bill to reduce the requirements for survey licensure. The reduction, with amendments, would make North Carolina the quickest state in the nation to qualify for licensure. Many surveyors were concerned that we would become a magnet for inexperienced surveyors, and that it would undermine all the hard work we have accomplished advancing the four-year degree program at North Carolina A&T State University. The North Carolina Society of Surveyors Board of Directors held votes that authorized both the Executive Committee and Executive Director to negotiate on the Society's behalf.

Many of us at NCSS have conducted meetings, prepared reports, and performed research on topics related to the appropriate amount of education and experience for professional surveyor candidates. Weeks of coordination ensured that our position protected both the public and the profession and would be acceptable to most Society members. Please consider that during many of these negotiations, we were not on an equal footing and had very little leverage. When the final bill is approved (if it makes it out of committee in the House), it will be the best 'deal' we could strike, although it may not be perfect.

Being a good negotiator is a valuable skill regardless of your career advancement. Some of the scenarios described here show how true that is. It can be very beneficial to study up (there's an almost endless amount of material available online) and to put some techniques to practice. If you do that you will increase your business acumen and I will receive the satisfaction that this letter helped in some small way. A true win-win!



Peter J. Brennan Jr., PLS
NCSS President 2021-2022

Education Foundation

by J. David Lee, PLS

Education Foundation President



Education, what does this word mean? According to Webster's dictionary, education means the action or process of educating or being educated. Of course, we all

know education starts both at home and in a learning institution. We understand how the school part works; you take classes, get books, have teachers, and learn. The at-home portion could be as a child you found a bee's nest, poked at it, and the bees stung you! Now you are educated on what not to do. This type of education is not the preferred way. By combining the positive classroom education with the practical field experience, knowledge is expanded and stored.

The way we survey and collect data today is much different than 20 years ago. Technology has improved and changed the way we work. Because of this, we must continue to educate ourselves to interpolate the data we are receiving both in the field and the office. Programs and equipment have helped to make our jobs easier and faster. The Greek philosopher Heraclitus of Ephesus once said, "The only thing constant is change," and no truer words could be spoken when it comes to our profession.

The only way to stay on top of the change is education!

Our Mission at the Education Foundation is to provide scholarships for the education of geomatics students in North Carolina at both two-year and four-year institutions. Our goal is to one day grow our endowment fund to a level that will support full scholarships to multiple students across the state. As stated above, formal education is the first step to help avoid the sting of the unknown!

Purchasing a specialized license plate is an additional way you can support the NCSS Education Foundation and geomatics students in North Carolina.

Two Ways to Order Your Specialty Plate

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- Or order when renewing online: <https://www.ncdot.gov/dmv/title-registration/license-plates/Pages/specialty-plates.aspx>



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Buckley Blew

Christopher Brown

Dylan Buckley

Christopher Carroll

Byung Chan Choi

Christopher Clark

Anthony Edwards

David Essick

Joshua Exline

Daniel Fogleman

Byron Freeman

Christopher Glosson

Yvonne Harding

James Henson

Michael Kitchin

Ryan Lockhart

Roberto Rodriguez

Michael Schmidt

Kerry Simon

Paul Smith

Jeffrey Stickley

Daniel Trembly

The Trifecta

Education, Experience and Examination

by Peggy Fersner, PE



It's a trifecta – education, experience, and examination. It cannot be one out of three or even two out of three. I don't care how this is perceived, but surveying,

aka Geomatics, needs all three of these milestones just as the engineering and medical professions require. Why? Because it is a profession. That's at least what (I'm donning my honorary surveyor hat) we hold ourselves up to be. But this profession must have all three areas just as medicine and engineering do. I don't know about you, but if I need a heart valve replaced, I want my surgeon to not only have the necessary technical skills to do this, but I also want them to have a broad knowledge base to deal with unexpected issues that may arise. In academia, we call this critical thinking.

So, which comes first – the chicken or the egg? Education or experience? Traditionally, it is education followed by experience. The Fundamentals of Surveying (FS) exam is set up for this progression – more on that later. However, the majority of Geomatics students in our program are in their experience stage while pursuing the educational side. I can tell you that these individuals make the best type of student. They ask questions because of this exposure. So, the education completes the “oh – that's why we do this or get this result” moments. In their adjustment computations courses, where examining accuracy is commonplace, least squares adjustments have replaced the compass rule. How many of you know the theory and the mechanics behind this process? How much confidence do you have in those values? What allows you to assess that the solution obtained through software is valid? With this broad background, they now have a foundation for critical thinking and assessing their data and deliverables. Both education and experience need to go hand in hand, with both being held to the same level. These are the types of employees employers need to value and retain for the positive promotion of the profession.

The third area with the examination process guarantees at least minimal knowledge and competency that tag teams with protecting the public. But another driving influence has been the National Council of Examiners for Engineers and Surveyors (NCEES). Over the last ten years, NCEES has shifted the FS exam from a practical-based exam to an educational-based exam. If you have not recently looked at the knowledge-based topics for the FS, please acquaint yourself with them. The exam means to assure a minimum competency to enter the profession as an intern. There are seven broad areas with specific topics under each. Without a broad geomatics education, I can assure you that a high school degree will not be sufficient with just the experience component. While providing excellent field crew personnel and CAD technicians, the two-year degree leaves major holes in the academic preparation. Now, I will hedge and say that there are individuals who are great at educating themselves and who will be successful studying for the exam. I do not want to take anything away from them for that achievement, but the depth in the topics is still not there.

So, where does that leave the profession? It seems that the surveying profession is often targeted by self-interested politicians trying to demote it to a trade. I hope that most of you agree that this is not where you want the practice of surveying to go. Experience alone is just not enough these days. In response and in an effort to compromise with proposed legislation (see S219), the society is putting forth an apprenticeship program that is modeled after similar programs in California and Virginia. If adopted, this would allow a qualified and determined individual to work and pursue set educational requirements established by our licensing board. But again – it has the experience set concurrently with education that is always a good thing. This may create another path forward for some, and hopefully, grow the numbers of those seeking professional licensure.



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.

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NSPS North Carolina Report

by Randy Rambeau, PLS



The Fall NSPS meeting was held in Oak Brook, Illinois, on September 23-25. I attended the meeting—along with Christy Davis, who serves on the NSPS Executive Committee—as one of two state executive directors.

Committee meetings began on Thursday (23rd) at 8:00 am, and I attended the ALTA/NSPS meeting chaired by Gary Kent. The current ALTA/NSPS standards became effective in February of this year and Gary has received numerous suggestions for revisions/additions. He anticipates a new version of the standards by 2023 and welcomes suggestions from surveyors who perform ALTA/NSPS surveys.

Next, I attended the Education Committee meeting, which Steve Gould chaired. Much of the discussion in this meeting centered around the Student Competition for the NSPS Spring Meeting in March 2022. Next year's competition will consist of a monument hunt on the first day and, on the second day, a three-wire level loop and traverse using older equipment. Rich Vannozzi of the University of Maine discussed its success with its online BS degree in Geomatics, which currently has 150 students from 39 states and five countries.

In the afternoon, I attended the meeting of the Southern Coalition Directors represented by North and South Carolina, Kentucky, Tennessee, Alabama, and Texas. We discussed various issues within our states and several items we anticipated would be brought up at the Board of Directors meeting on Saturday.

Christy and I attended the sponsored event, a cruise on the Chicago River, on Thursday evening. It was an enjoyable two-hour riverboat cruise with excellent food, remarkable sights of many very tall buildings with distinctive architecture, and a very knowledgeable tour guide.

On Friday morning, fellow CST Board member Norm Ellerbrock and I hosted a CST question and answer session with seven attendees. The discussion generated several new ideas for the CST Board. We also had the opportunity to explain the CST application and testing process to the attendees not familiar with the CST program. I then sat in on the State Executives Forum, which Christy chaired. As always, Christy did an awesome job in chairing the meeting and covering an important agenda with several state executives in person and a good number more joining virtually.

In the evening, Christy and I attended the NSPS 40th Anniversary Reception with great food and the opportunity to network with numerous other directors whom I had not seen since the beginning of the pandemic. Curt Sumner gave some parting remarks, as this was his last meeting as NSPS Executive Director. Curt has been the “face” of this organization for over three decades and is well known and respected across the country and on Capitol Hill.



The Board of Directors meeting began at 8:30 am on Saturday and ended at 4:00 pm. President Mark Sargent noted that even though his term as president was extended for a second year (2021), this was his first in-person meeting. His report included several items, such as:

- The search committee for a replacement for the executive director has received applications. It will conduct interviews with the goal of having a new executive director in place by the end of the year.

- The Young Surveyors Group is very active and growing across the country.
- NSPS News and Views has gotten over 40,000 downloads, which is significant growth over the past couple of years.

President Sargent then presented a motion to establish the Executive Director Emeritus position to allow Curt to continue to serve NSPS on a part-time, as-needed basis for the next year. The motion was unanimously approved.

In her report, Vice President Amanda Allred challenged every state to establish a Young Surveyors group and encouraged every state society president to attend the NSPS meetings. She also reminded everyone of the upcoming joint URISA and NSPS Survey and GIS Summit virtual event on November 03, 2021.

Robert Miller, NSPS treasurer, reported that NSPS had a profit of \$150,000 in 2020, partially due to reduced expenses caused by the pandemic. The financial outlook for 2021 looks very good as well. He also reported that Christina Lee, our new accounting manager who came on board several months ago, is doing an excellent job.

The NSPS budget for 2022, comparable to this year's budget, was presented and approved.

NSPS Lobbyist John (JB) Byrd spoke on his work on our behalf in Congress. There was good participation at the virtual Lobby Day on April 1, 2021. Even more participation is needed for the 2022 Lobby Day. He is optimistic that the hard infrastructure bill will pass soon with robust dollars for the Coastal Bill, 3DEP program, and flood mapping. He is continuing the fight against Ligado to get the FCC ruling reversed. Much more information on Capitol Hill activities is available on the NSPS website.

PAC Chairman Jon Warren reported that the golf tournament on September 22 netted \$5,100. (NCSS contributed toward tournament expenses, not the PAC). He would like to see all states represented in the PAC Jefferson Club, which requires a \$500 annual contribution to the PAC.

Foundation Committee Vice Chair Rick Howard reported that currently, the committee has \$1.4 million

Continued on page 29.

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More Than Meets the Eye

by William (Billy) Bowen, P.E.

I recently joined the National Council of Examiners for Engineering and Surveying (NCEES) in April 2021 as an exam development engineer (EDE). NCEES develops, administers, and scores the exams required for professional licensure for engineers and surveyors. Individual state boards actually license applicants, and requirements can vary from state to state. As the NCEES EDE assigned to support the Principles and Practice of Surveying (PS) examination,

What is the PS Exam?

The Principles and Practice of Surveying (PS) exam is designed to test individuals' level of competency and ability to practice surveying. This exam differs from the FS exam in that it is designed to focus on tasks and experience instead of just theoretical knowledge. This exam is typically taken after four years of professional experience.

CURRENT PASS RATES							
		North Carolina		Nationally			
Examination	Year	Number of Examinees	First-time Examinee Pass Rate	Number of Examinees	First-time Examinee Pass Rate	Number of Repeat Examinees	Repeat Examinee Pass Rate
Fundamentals of Surveying (FS)							
	2018	29	41%	810	47%	435	28%
	2019	43	33%	879	44%	539	27%
	2020	26	62%	716	60%	410	43%
Principles and Practice of Surveying (PS)							
	2018	25	64%	479	73%	221	41%
	2019	19	53%	500	70%	223	42%
	2020	30	80%	415	72%	145	53%

I am humbled by the amount of work put forth by the NCEES staff and the subject matter expert (SME) volunteers from all over the country.

I am often asked what it takes to pass an exam. It is not easy for me to answer that question for any examinee. I remember in school, I was always good in math but not so much in English. We all have strengths and weaknesses, items that come naturally to us and items that we must work on. However, one common area of focus for anyone seeking professional licensure is to learn about the process and the examination first, before taking it.

What is the FS Exam?

The Fundamentals of Surveying (FS) exam is designed for recent graduates and students close to completing an undergraduate surveying degree from an ABET-accredited program. It is based on knowledge obtained through classroom instruction. This exam is typically the first step in the process to becoming a licensed surveyor.

How are the Exam Specifications Developed?

The FS exam and PS exam are developed with input from practicing surveyors across the country via a questionnaire that we call a knowledge content review for the FS and a professional activities and knowledge study (PAKS) for the PS. SMEs, with the help of a psychometric consultant, develop the questionnaires and send them to surveyors in different regions, with differing years of experience and with different backgrounds. (A psychometrician is trained and skilled in the administration and interpretation of objective psychological tests.) In both the FS content review and the PS PAKS, diverse committee volunteers use the questionnaire responses from the study to identify knowledge areas that are relevant to the practice of surveying and are the basis for the exam specifications. The exam specification lists the knowledge areas that have been deemed appropriate for knowledge or licensure purposes. This process is performed every six to eight years unless changes to the profession require it sooner.

How are the FS and PS Exams Developed?

The FS and PS examinations, respectively, test the knowledge and skills required to enter a surveying internship or to practice surveying in a manner that will safeguard the health, safety, and welfare of the public. SMEs from across the nation volunteer their time and experience to develop exam items that allow examinees to demonstrate minimal competence in their field. Once exam items are assembled, a standard of minimum competence is determined using psychometrically proven statistical methods. This is the score required to pass, or the cut score. This score is reviewed and approved by an oversight committee called the Committee on Examinations for Professional Surveyors. This cut score can change for each exam administration period, so we do not release this number publicly to be fair to all examinees as they prepare to take the examinations.

How are the Exams Given?

The FS exam has been administered year-round through computer-based testing (CBT) at Pearson VUE test centers across the country since 2014, and the PS exam since 2016. The CBT exam that is presented to the examinees is a linear-on-the-fly exam. Exam items are selected at random from the bank to produce an exam that offers the same statistical difficulty to all examinees. Both the FS and PS examinations have larger examinee populations and use the item response theory psychometric model. This theory takes into account the difficulty of each question on the exam. This means that one examinee doesn't get all hard questions and another examinee get all easy questions. (All exam items in the bank are pretested as unscored items on previous exams.)

The FS exam contains 110 questions, and an appointment is 6 hours long. The FS Reference Handbook is supplied and is the only reference material allowed to be used during the exam.

The PS exam contains 100 questions, and an appointment is 7 hours long. The PS Reference Handbook is supplied and is the only reference material allowed to be used during the exam. Any codes or standards that are required to answer the questions will also be provided.

The CBT format also allows for the use of alternate item type (AIT) questions. AITs include the following question styles:

- Multiple correct – allow examinees to select multiple answers
- Point and click – require examinees to click on

part of a graphic to answer

- Drag and drop – require examinees to click on and drag items to match, sort, rank, or label
- Fill in the blank – provide a space for examinees to enter a response to the question

These AITs provide opportunities to assess an examinee's technical or applied knowledge that would not be available through the traditional multiple-choice questions. No partial credit is offered for these types of questions.

How are the Exams Weighted/Graded?

There are no penalties for wrong answers. Exam results are based on the total number of correct answers and are converted to a scaled score that is adjusted based on exam difficulty. This score is compared to the minimum ability level for that exam as determined during the cut score process. All exams are graded to the same standard, first-time and repeat test-takers. There is no pre-determined passing percentage, and examinees are not graded against each other.

Examinees are notified of results, typically, within 7 to 10 days after taking the exam. A passing score will only receive notice of passing, while a failing score will receive a diagnostic sheet to assist the examinee during his or her studies to retake the exam.

Current Pass Rates

Not all professions have this level of organization or requirements to satisfy before being able to work. But the work that professional surveyors do is essential to safeguarding the health, safety, and welfare of the public. This directly relates to the NCEES mission of the advancement of licensure. Licensure is a process, but one worth completing. For those that are pursuing licensure or are already licensed, I commend you.

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William (Billy) Bowen, P.E., holds an industrial engineering degree from North Carolina State University and an MBA from Limestone University. He is a veteran of the U.S. Navy. He currently lives in Greenville, South Carolina, but grew up and graduated from high school in Western North Carolina.

The Critical Crossroads

by Frank Mundy, PLS



The Prime Minister of India, Narendra Modi, once stated, “Learning from experience and learning from education, both are important. Your education and values decide how you learn from your experiences.” This quote resonates when applied to the ongoing debate regarding education and experience requirements in the surveying/geomatics profession. While there appears to be no magic answer to this complex question, it is important to consider several factors as we move forward with this discussion.

First and foremost, we, as a community of surveyors, must answer a simple question: “Are the services we offer a trade or a profession?” For comparison purposes, we need to look no further than Merriam-Webster’s Dictionary. Per this trusted source, a “trade” is “an occupation (or craft) requiring manual or mechanical skill.” Meanwhile, a “profession” is “a calling requiring specialized knowledge and often long and intensive academic preparation.” Expanding upon these definitions, a “tradesman or craftsman” is described as a worker in a skilled trade. At the same time, a “professional” is a person who is “engaged in one of the learned professions.” With these definitions in hand, let’s compare licensure nomenclature between three other occupations.

In a review of North Carolina General Statute (NCGS) Chapter 87-21, an individual can apply for licensure as a plumber with a minimum of two years of experience in the workforce. Plumbers can obtain advanced levels of licensure with additional specialized on-the-job training. Once the required experience is obtained, an examination follows. When a candidate achieves - the

minimum required experience and successfully passes the examination, the candidate is called a “Licensed Plumber”. While technical and trade schools exist to train these candidates more fully and to provide continuing education to licensees, it is important to note that a clear and concise pathway to licensure within this trade is solely through experience.

Secondly, let’s look at the requirements for licensure for soil scientists as regulated by the North Carolina Board for Licensing of Soil Scientists. Candidates within this industry may only seek licensure if they “hold at least a bachelor of science degree from an accredited college or university with a minimum of 30 semester hours in agricultural, biological, physical or earth sciences” in addition to “three years of professional work experience as a soil scientist under the supervision of a licensed soil scientist” (NCGS 89F-10). Only at the conclusion of the formal academic and “professional work experience” may a candidate take the licensure examination.

Finally, let’s consider the licensing requirements for a Medical Doctor (MD). According to the application requirements on the North Carolina Medical Board’s website, an applicant must have both undergraduate, graduate, and medical school degrees, as well as completed many hours of on-the-job experience through residency programs acquired through and concurrently with the advanced degree process. Finally, substantial examination occurs before a license confers.

In North Carolina, there are three pathways to surveying licensure:

- Experience only,
- Two-year technical degree with experience, or
- Four-year degree with experience

At Stewart, we have more than forty employees working in the surveying and geomatics field, including eleven licensed as “Professional Land Surveyor (PLS)” or “Survey Intern (SI)” by the State of North Carolina and/or other surrounding states. Five of these professionals are graduates of four-year academic programs with degrees in surveying/geomatics. In contrast, two additional professionals are graduates of four-year academic

programs with degrees in allied professions. Four more are graduates of two-year degree programs with degrees in surveying. Finally, and just as importantly, one professional earned licensure based solely on experience. All licensed members of our team can and do “get the job done” for our clients. More importantly, they actively work to protect the public every day by striving to fulfill the commitment we all made when we accepted the responsibility of professional licensure.

Recently I discussed the issue of surveying licensure with our firm’s CEO, Willy Stewart, PE. Willy is a past board member of the NC Board of Examiners for Engineers and Surveyors (NCBEES). Additionally, he serves as an appointee to the board of WakeMed Health and Hospitals, one of the leading medical networks in the Triangle, NC region. Our conversation included a thought-provoking exchange about how medical care has changed over the past few decades.

We all remember going to the doctor when we were kids. Our parents would drive us to the doctor’s office, where we would wait for what seemed like hours to finally see the doctor in person, regardless of whether we needed a simple prescription for penicillin or had broken an arm and needed it set. Conversely, last week, I had a virtual appointment with a nurse practitioner for a routine check-up. She was able to take care of what I needed, and I didn’t have to go to the office or see an actual MD. On the other hand, had my issue been more severe, I probably would have been more comfortable visiting in-person with an MD.

The point acknowledges that different types of tasks can be performed with great success by trained technical staff under the supervision and guidance of a licensed professional. There is a need and a requirement to have individuals involved in our industry from all backgrounds, levels, and skillsets. We all know how difficult it is to find great technicians, whether it be for the field, office, or a combination thereof. It is imperative that we continue to recruit to these roles of expanding responsibility. As technology continues to change the way we provide services and conduct our business, these positions continue to be of utmost importance. The community colleges are and will continue to be critical in this process.

But there are limitations – just as working in a hospital for twenty years does not automatically qualify someone to perform heart surgery, there may be elements of the

geomatics profession that should not be left to experience alone. For example, the level of complexity varies greatly between a typical mortgage survey in a residential subdivision compared to “blue-booking” new high order control monuments for the geodetic survey.

It is not the intent of this article to say which licensure pathway is better than others. I would challenge you, regardless of your personal pathway to examine the following items:

- Do the day in, day out job requirements of a “professional land surveyor” align more with a “trade” or a “profession”?
- Does the work completed by a “professional land surveyor” require “specialized knowledge” or “manual skill”?
- The nomenclature reflects that the surveyor is licensed as a “professional land surveyor” not a “licensed surveyor”.

I believe our profession is at a critical crossroads. We can either become a trade or take the necessary steps to adjust and cement our role as a professional. We have a pathway for licensure that we must protect. We also must provide a career pathway within the industry for those that do not obtain professional licensure. The Certified Survey Technician (CST) program provided by the National Society of Professional Surveyors (NSPS) is a great tool. I don’t necessarily believe the day will come when CSTs are providing services directly to the public. However, I never thought I could drive down the street and get a vaccine delivered to me by a medical technician in a parking lot “down by the Wal-Mart” either.



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.



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The Value of Higher Education: A Young Surveyor's Frame of Reference

by Adam Canoy, PLS



The importance of having a formal education in order to become a licensed land surveyor cannot be overstated. In the past, the majority of land measurement knowledge was passed down by experience in the field while working with others in a master-apprentice relationship. Although this method is a great way to pass along knowledge of the land surveying profession, it has significant limitations.

Similar to architecture and engineering, the work that surveyors do directly impacts the welfare of the general public. Not only can land surveying affect monetary assets, but also the work done in this profession can actually affect public health and safety. Inaccurate measurements in the surveying field can lead to catastrophic failures that can be both costly and dangerous. For these reasons, having work done by a licensed professional surveyor is very important. The professional license ensures the client that the surveyor has the knowledge base to perform competently the work requested. In my experience, the quickest and most effective way to obtain the knowledge necessary to be a professional surveyor is through formal education. Though work experience is necessary, a combination of education and work experience makes the best surveyors. The more education the surveyor has, the broader his or her understanding is of all aspects of surveying. The surveyors who have more education also tend to build a level of competency more quickly than those with only

work experience.

Many surveyors who have only a high school diploma or an associate degree become accomplished professional land surveyors. However, those surveyors without a formal education had to do more “leg work” on their own to solidify an understanding of adjustments and proper checks and balances of field data in order to ensure accurate results. Although most work-experienced surveyors will eventually learn the applicable field techniques to help prevent errors in the field, many of them will not learn the proper procedures to check the data by using adjustment techniques until much later in their career. This knowledge of data adjustments is one of many aspects that set a 4-year degree holder apart from those with less formal education. A true understanding of how to adjust and check data properly is required instruction in any accredited geomatics program. Classes specifically geared toward this information enable the student to understand how adjustments are made and why they work.

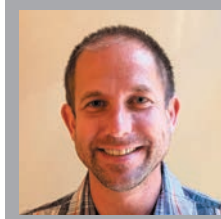
Without these formal educational classes, passing the National Surveying exams can be much more difficult. The exams are becoming more geared toward information learned through higher education. For example, a strong knowledge of adjustments and computations is required to perform well on the exams. Data collectors and computers certainly do a lot of the work for us, but having a strong knowledge of what the data collectors and computers do is necessary to excel in this field. (For example, how many surveyors who have always had a data collector know the equation $[(n-2)*180]$ off the top of their head?)

Prior to my education in geomatics, I did not know the proper way to research properties. Though I was fortunate enough to have a great surveyor, Chad Howard, to train and mentor me, in hindsight, I didn't have enough instruction in deed research. Nor did I fully comprehend the need for complete record research. However, through my formal education, I learned the importance of having

very good deed and record research. I discovered that deed and record research was better learned through formal education than through workforce experience. The reasons why formal education provided a more favorable learning experience than routine field work were that (1.) I had adequate time to learn and (2.) I had qualified professors to teach me correct research procedures. For example, as deed and record research is one of the most important aspects of a boundary survey, Chad and other licensed surveyors I worked with could not afford to completely rely on my research efforts. At some point the licensed surveyor had to complete the research - not because they didn't think I could not conduct the research, but as the licensed professional, they had to be certain the research was exact. With the college education I gained in record research, I am now able to perform a meticulous examination of property records. I learned to recognize, to understand, and, most importantly, to approach solutions to problems in the best way. I firmly believe that my formal education put me ten years ahead of my peers who relied only on work experience.

I think that any surveyor who has graduated from the geomatics program at NC A&T would agree that formal education was the biggest reason they passed the National Surveying Exams. If the land surveying community is going to help alleviate the shortage of

surveying professionals, the quickest way to do that is by encouraging young surveyors to gain a better understanding of geomatics through formal education. As licensed surveyors, we should be encouraging young people to pursue a formal education. Work experience can provide a wealth of knowledge and is certainly necessary for the complete development of a professional land surveyor. However, work experience alone is a far longer and less effective path to reach the ultimate goal of becoming a licensed professional in our field.



Adam Canoy is a full-time Professional Surveyor and President of Canoy Surveying PLLC based out of Stem, NC. He is a proud graduate of North Carolina A&T University with a BS in Geomatics (2019), and a BS in Mathematics from Lees-McRae University (2008).

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Where and How Wide is the Easement: A North Carolina Perspective

by Kristopher M. Kline, PLS



With each passing year, easement disputes become more prevalent, and surveyors are more likely to become embroiled in them. Chapter 89-C-3(7)(a)(1) places easement retracement

solidly within the practice of Land Surveying: “*Locating, relocating, establishing, laying out, or retracing any property line, easement, or boundary of any tract of land.*” While some entanglements may result from a conscious decision on the part of the surveyor, these complications often arise unexpectedly in the midst of an otherwise innocuous survey project.

Disputes that arise with monotonous regularity concern the width and location of the right created. Where easements are based on recent recorded plats or a detailed legal description, the answer may seem obvious. Even in these cases however, litigants may call into question dimensions and location that seem incontrovertible at first glance.

In cases of older record easements where original documentation is poorly drafted or vague, the analysis becomes more complex and subject to debate. Documents may specify dimensions that are at odds with the apparent use and location on the ground. In these cases, evidence of present and past land use may be of critical importance.

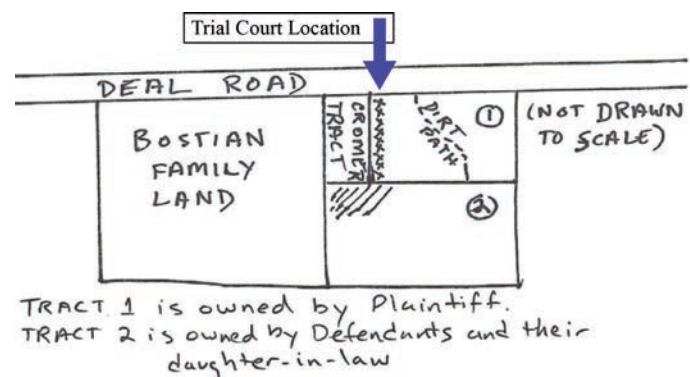
Surveyors involved in easement disputes may find themselves pressured to accept theories that are at variance with established principles of retracement, or that conflict with applicable state common law and statutory principles. Court cases often showcase parties who claim rights with no real understanding of the principles that they invoke. Even the courts may misapply the law and reach incorrect conclusions, as seen in the following example.

Gribble v. Bostain: 2021-NCCOA-423: No. COA 20-412 (August 17, 2021)

This dispute concerns both the width and location of an easement created by deed. The 1991 deed description includes the following language: “*Together with a right-of-way thirty (30) feet in width running from Deal Road to this property, the exact location of said right-of-way to be agreed upon between the parties or their successors and assigns.*” Dominant and servient tracts are identified clearly, but no other information is given regarding the location of the easement.

Authors’ Note: the approximate relationship between the various tracts is shown on the sketch below.

For 15 years following the execution of the easement agreement, there was no express written agreement between the parties regarding the location of the right, but Bostain continued to use an existing narrow dirt path with the apparent acquiescence of Smith, who owned Lot 1 at the time. No other portion of Lot 1 was used by Bostain for access. In 2005, Smith died and Gribble inherited Lot 1. Gribble immediately moved to physically block the dirt path.



This sketch was included as a display aid in Gribble v. Bostain

The trial court concluded that a 30-foot easement existed for the benefit of Lot 2 over Lot 1, but declared—erroneously—that the easement was along

the west edge of Lot 1 as indicated on the sketch as a series of 'x' marks. This location was not proposed by either party and may have been influenced by economic considerations regarding the land value of Lot 1. On appeal, the court reversed the lower court decision



with regards to the location of the easement. Rejecting equity considerations, Judge Dillon observes: *“By locating the easement along the edge of Plaintiff’s tract—a location no one advocated for and for which no evidence was offered—it appears that the trial court sought to achieve a compromise by recognizing an easement in favor of Defendants, but in a way that would cause Plaintiff minimal economic harm. However, we must follow the law; and the law requires that the facts, as found by the trial court, must lead to the conclusion that the dirt path is the easement.”*

Citing the prior decision **Borders v. Yarbrough**, 237 N.C. 540 (1953) the judge applies the Doctrine of Practical Location to fix the limits of the right: *“It is a settled rule that where there is no express agreement with respect to the location of a way granted but not located, the practical location and use of a reasonable way by the grantee, acquiesced in by the grantor or owner of the servient estate, sufficiently locates the way, which will be deemed to be that which was intended by the grant.”*

The acquiescence of the dominant landowner permanently fixes the location of the easement, even where the original servient owner passes away and another party takes ownership of the servient tract. In these situations, the physical use fixes the location of the easement as if the description was written in the original document. Quoting **Allen v. Duvall**: 316 S.E.2d 267 (1984), Judge Dillon observes: *“The use of roads in question by [the owners of the dominant estate], acquiesced in by [the] predecessors in title of the servient estate, sufficiently locates the roads on the ground,*

which is deemed to be that which was intended by the reservation of the easements.”

In an interesting twist, this decision also considers the issue of overburden of the easement. Because it was granted only for the benefit of Lot 2, it was not intended to serve the larger parcel to the west (Labeled “Bostain Family Land” on the sketch).

33 Feet Means ... 33 Feet.

An early North Carolina decision considered the legitimacy of a stated width in a deed where a lesser burden might have sufficed. In **Patton v. Western Carolina Educational Co.**, 101 N.C. 408 (1881), the court considered a private street right-of-way that was described in part: *“And further, that the street now opened up through to the college land, thirty-three feet wide, shall be kept open.”* Despite the unambiguous statement of the intent of the parties, the servient owner installed gates and fences along the road that interfered with the easement rights.

Judge Davis concluded: *“It is shown that there has been no abandonment or nonuser of the street, and there is no claim of title to the soil by length of possession or otherwise...”*

The plaintiffs have shown title to the easement reserved, and we think the obstructions admitted to have been made were invasions of their right. A street with gates or fences across it is not what was reserved, but a full and unobstructed “33 feet for a street.”

One corollary that the judge alludes to in the previous quotation is that partial abandonment of an easement will not be presumed simply because the dominant user is not utilizing every available bit of land surface.



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The preceding analysis is consistent with a benchmark Maryland decision. In **Miller v. Kirkpatrick, 833 A.2d 536 (2003)**, the court observed: “There, as here, the defendant had chosen to deny the plaintiffs the use of a portion of the express easement. We said that a grant of a right to use a piece of property includes “the last inch as well as the first inch,” and therefore it is clear that the fence or obstruction placed upon it by defendant is an invasion of the plaintiff’s legal rights, for which an action may be maintained.”

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the “right of repair” consistent with the intent of the easement. For utility easements, pipes or overhead lines must be maintained and sometimes replaced in order to effectuate the purpose of the easement and to protect the public. For road or driveway easements, the driving surface, as well as associated bridges, culverts and ditches generally may be maintained.

The right to repair is highlighted in a dispute over a drainage easement as described in the North Carolina decision **Hair v. Downing, 96 N.C. 172 (1887)**. An easement 8 feet in width was created by express grant, but a dispute later arose after a subsequent purchase of the servient tract by a third party. The original ditch was narrow, but was improved at a later date to a width of 4 feet. In order to maintain the flow of water, trees and brush had to be cleared periodically, necessitating travel along the banks of the ditch by the dominant user.

The headnotes of this case include this statement: “Where a party has the right to use a ditch to drain his land, he has the right to keep it open and clear from obstructions.”

This established common law principle is supported by early English precedent, as seen in the 1669 decision **Pomfret v. Mycroft**, which states: “...when the use of a thing is granted, everything is granted by which the grantee may have and enjoy such use, as if a man gives me a license to lay pipes of lead in his land to convey water to my cistern, I may afterwards enter and dig the land to mend the pipes, though the soil belongs to another and not to me...”

These examples highlight the need for detailed location of features within and near easement corridors. This statement applies equally in areas where evidence indicates the possibility of an easement, even if no record document indicates the existence of a right.



Kristopher M. Kline is a surveyor, author, instructor and consultant living near Asheville, North Carolina. President of 2Point, Inc., he can be reached at kristopherkline1@gmail.com. More information on Kline’s continuing education courses and books can be found at www.2Point.net. Kline also presents seminars each year in Tennessee and North Carolina, d.b.a. Surveyors Educational Seminars. Information on classes presented by Kline and by Donald A. Wilson may be found at www.surveyorsed.com.

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The Five Types of Coordinates in the Modernized NSRS

by David B. Zilkoski

This article will briefly define the different types of coordinates that the National Geodetic Survey (NGS) will be distributing in the new, modernized National Spatial Reference System (NSRS) as defined in NGS's revised February 2021 publication of NOAA Technical report NOS NGS 67, Blueprint for the Modernized NSRS, Part 3, Working in the Modernized NSRS (https://www.ngs.noaa.gov/PUBS_LIB/NOAA_TR_NOS_NGS_0067.pdf).

As stated in my previous Tarheel Surveyor articles, there are many changes that are going to happen once the new, modernized NSRS is adopted. One of these new changes will be how NGS computes, stores, and disseminates coordinates. It should be noted that this is based on the latest information published by NGS. As NGS revises terms and concepts, they will provide updates to their publications.

First, there will be five different types of coordinates distributed by NGS after the new, modernized NSRS is promulgated. The five types of coordinates include (1) **Reported Coordinates**, (2) **OPUS Coordinates**, (3) **Reference Epoch Coordinates (RECs)**, (4) **Survey Epoch Coordinates (SECs)**, and (5) **Active Coordinates (ACs)**. I used the term distributed as opposed to published because some of these coordinates **will NOT be considered Tied to the NSRS**. I will explain that later.

The goal of this article is to define the five types of coordinates with a focus on the **Reference Epoch Coordinates (RECs)** which will be the coordinates that most North Carolina surveyors will be using.

1. Reported Coordinates. These are coordinates directly reported to NGS without supporting data such as coordinates reported from a smartphone or from a RTN without vector data. NGS **CANNOT** evaluate the coordinates so these coordinates will

NOT be considered **Part of the NSRS**. NGS does this today but the user may not realize the accuracy of the coordinates. For example, coordinates that have been scaled off a map or were transformed from one datum to another (such as through the use of NADCON or VERTCON) are published on NGS datasheets but should not be used in high-accuracy computations or applications.

2. OPUS Coordinates. It's fairly obvious that these are coordinates computed by NGS's OPUS routine (<https://www.ngs.noaa.gov/OPUS/about.jsp>). These are coordinates that have NOT been evaluated by anyone at NGS. When a user selects the constraints that OPUS recommends (specifically coordinates, weights, and other metadata pulled directly from the NSRS Database), then OPUS coordinates will have an additional label of **Tied to the NSRS**. However, labeled as **Tied to the NSRS** is NOT the same as **Part of the NSRS**. Only coordinates **computed by NGS** and stored in the NSRS database are labeled as **Part of the NSRS**.

3. Reference Epoch Coordinates (RECs). These are coordinates that most surveyors are used to finding on NGS's datasheets, such as a published NAD 83 (2011) Epoch 2010.00 latitude, longitude, ellipsoid height computed by NGS in an adjustment project to estimate the coordinates in NGS's official datum. See the box titled "Excerpt from NGS Datasheet UNN16 (AH9928)." In North Carolina, according to NGS's

PROGRAM = datasheet95, VERSION = 8.12.5.13			
Starting Datasheet Retrieval...			
1	National Geodetic Survey, Retrieval Date = AUGUST 29, 2021		

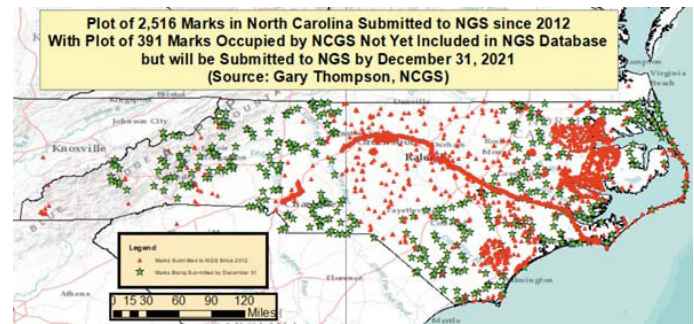
AH9928			
AH9928	DESIGNATION -	UNN 16	
AH9928	PID -	AH9928	
AH9928	STATE/COUNTY -	NC/UNION	
AH9928	COUNTRY -	US	
AH9928	USGS QUAD -	WAXHAW (2019)	
AH9928			
AH9928	*CURRENT SURVEY CONTROL		
AH9928			
AH9928*	NAD 83(2011) POSITION-	34 55 29.07167(N) 080 43 48.09539(W)	ADJUSTED
AH9928*	NAD 83(2011) ELLIP HT-	156.812 (meters)	(06/27/12) ADJUSTED
AH9928*	NAD 83(2011) EPOCH -	2010.00	
AH9928*	NAVD 88 ORTHO HEIGHT -	187.181 (meters)	614.11 (feet) ADJUSTED
AH9928			

datsheets, as of July 18, 2021, there are 10,639 marks with the data tag of NAD 83 (2011) EPOCH 2010.00.

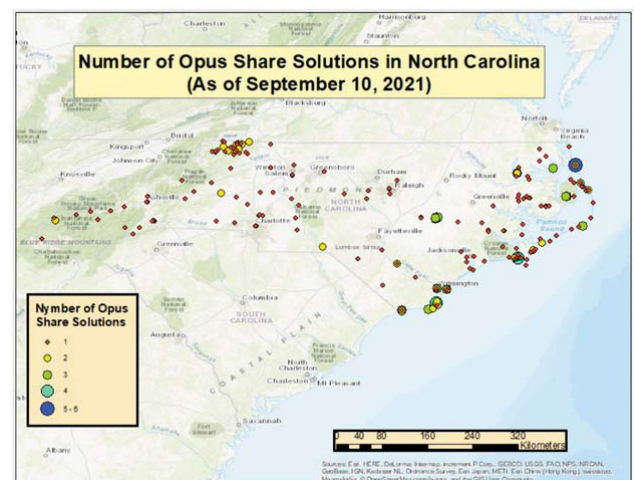
The difference in the new, modernized NSRS is that NGS is planning to create RECs every five or ten years, according to NGS's current plan. These coordinates will be considered **Part of the NSRS**. As in the past national adjustments, most coordinates come from observations that did not take place at the reference epoch. These coordinates will require an intra-frame velocity model (IFVM) to generate the RECs at the specific reference epoch. The IFVM process will be addressed in a future article. What data will go into the first iteration of the REC adjustment project, denoted as 2020.00, has not yet been defined. For the 2020.00 project, that cutoff date for incorporating data is December 31, 2021. However, NGS has not determined the cutoff for the **earliest** data to be included in the determination of the 2020.00 RECs. NGS will be conducting experiments to determine the appropriate cutoff date. What does this mean to surveyors in NC who are currently using one of the 10,639 marks with published NAD 83 (2011) EPOCH 2010.00 data tag? It should be noted that NGS has issued a Federal Register Notice (FRN) on this topic in 2020 [<https://www.federalregister.gov/documents/2020/07/24/2020-16084/consideration-of-potential-age-limiting-observations-to-be-used-to-compute-202000-reference-epoch>]. The FRN encouraged the NSRS user community to submit what data they have, with a special focus on new observations since 2010. As of August 27, 2021, there are approximately 2,516 marks in North Carolina that have been submitted to NGS for incorporation into NAD83 (2011) since 2012 (based on data received from Gary Thompson, Chief of NC Geodetic Survey).

There's still time to submit data to NGS before the cutoff date of December 31, 2021. The North Carolina Geodetic Survey under the direction of Gary Thompson has been very active in occupying marks in GNSS projects in support of transitioning to the new reference frames. Mr. Thompson provided a list of additional marks that will be submitted to NGS before the December 31, 2021, deadline. The figure below depicts the locations of the marks submitted by NCGS since 2012 and marks that will be submitted to NGS

by the deadline.



As previously stated, NGS has not determined the cutoff for the earliest data, but the announcement implies they are considering around ten years. A recent July 2021 NGS GPS on Bench Marks Update email announcement stated the following: “Less than 6 months remain until the December 31, 2021, cutoff to submit GPS data that NGS can guarantee will be analyzed to compute the initial set of 2020.0 Reference Epoch Coordinates (RECs) to be released with the Modernized NSRS.” This means that NGS will compute RECs for OPUS Shared results that meet the GPS on BenchMarks criteria. The box titled “Plot Depicting OPUS Share in North Carolina (09/10/2021)” provides the location of the OPUS Share solutions in NC. As indicated in the plot, there are only a few OPUS Share marks with two or more occupations. What this means to NC surveyors is that, at this moment, there may only be about 3,000 marks with “Part of the NSRS” published Reference Epoch Coordinates (RECs).



Plot Depicting OPUS Share in North Carolina (09/10/2021)

The last two types of coordinates (Survey Epoch Coordinates and Active Coordinates) probably won't

be used by most NC surveyors but it's important to understand that they will be distributed by NGS.

4. Survey Epoch Coordinates (SECs). These are coordinates that are computed by NGS and are defined at **one survey epoch**. This survey epoch will not be the same as the RECs unless the data were collected on the exact date of the survey epoch, such as January 1, 2020.00. Users will submit their data and its metadata to NGS, and NGS will then check, adjust and **define the coordinates at one survey epoch**. These coordinates will be **Part of the NSRS**. NGS is computing coordinates in this manner to provide the best estimate of the coordinates at any mark at some specific moment in time. This is very important in areas influenced by crustal movement.

5. Active Coordinates (ACs). These coordinates are different from SECs because they are not associated with a specific epoch. Active coordinates are determined by **functions in time**. They will only be generated by NGS at stations with active control, such as a continuous GNSS stations, e.g., NOAA CORSS. They are considered **Part of the NSRS**. It should be

noted that they will not exist on passive control. Most surveyors will only be concerned with Reference Epoch Coordinates but it is important to understand what is considered **Part of the NSRS** and what is only considered **Tied to the NSRS**. A client may request that the results of the survey work be "Part of the NSRS," which would require at least performing a survey to obtain Reference Epoch Coordinates (RECs). Also, it is important for surveyors to understand these differences so they don't confuse RECs for SECs or ACs. Future articles will address other aspects of the new, modernized NSRS such as the intra-frame velocity model (IFVM) and Euler pole parameters (EPPs).



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.

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Barbed Wire in Surveying

by Ken Mills, PLS



In the early 1980's I attended a seminar taught by Walter Robillard in Raleigh, NC. The main topic of the seminar was field search for boundary evidence. He touched on barbed wire in the woods and what evidence was left behind.

I've been surveying in the mountains of western North Carolina since 1976 and have encountered many different types of barbed wire. During different surveys, I saw some of the things Mr. Robillard talked about during the seminar.

When the wire is stapled to the side of a tree, the tree will continue to grow, and after a while, it appears to look like the wire goes straight through the middle of the tree. If you follow a boundary line with pieces of the fence on the ground or in trees, look for a hollow stump. Inside the stump, you may see some of the wire. You may also see wood around the wire looking like drippings from a burning candle. This wood is scar tissue from the tree. It is much denser than the regular wood of the tree, and it takes much longer to rot away.

I was on a problem survey to locate a boundary line alongside an old wagon road. I saw a hollow stump that had about $\frac{1}{2}$ to $\frac{1}{4}$ inch of wire on the outside of the stump. When I looked in the stump, I saw some of the

scar tissue around the wire. If you are following a wire fence and the deed calls for a tree as the corner marker and you don't see a tree or a stump, look around on the ground for a piece of the tree's scar tissue. It is evidence for the location of the called for tree.

If you are searching for an old boundary and cross a slight rise, you may have found a balk line. This is an old fence line where livestock walked on the lower side and no animals were on the higher side. This is the ideal place to search the ground for old, barbed wire. I would think this would occur more often in the Piedmont area of North Carolina with the abundance of pastures and fields.

There is a book titled *Barbs, Prongs, Points, Prickers and Stickers* by Robert T. Clifton, a complete and illustrated catalog of antique barbed wire, which I have used quite a lot. The book lists all types of barbed wire and when the design was patented. The patent date is crucial because it gives you an idea of when the fence was put up. In the mountains, the oldest barbed wire I found was patented on November 24, 1874. It is a common variation of the "Glidden's Barb."

Just because the wire was patented in November of 1874 does not mean the wire was erected the same year. Once the wire was patented, it had to be manufactured and then distributed. Most of the manufacturers were in the northern states, and the wire had to be shipped to North Carolina. The wire probably was shipped by rail or wagon along the main rail lines and main wagon roads to a distribution center. From there, the wire was sent out to stores in the areas. A salesman would carry samples from town to town for the merchants to show samples to their customers.

In the eastern part of North Carolina, this process could take from five to ten years from the patent date. I learned the time for the new barbed wire to reach the mountain area where I work took anywhere from

15 to 20 years.

The railroad did not reach Asheville until 1880. Until that time there were wagon roads that followed the main transportation routes, but no roads from these routes to the farms back in the mountain hollows.

From this time frame you can get an indication when the old wire you found in a tree was first nailed up. This will give you a good idea if your client's predecessors in title were the ones who put up the fence.

Often, I would read in a deed description, "a line followed a fence." This is where finding evidence of a wire fence is very important. On many surveys I would follow the evidence of a fence, such as old posts on the ground, with the wire under the leaf fall and then run out of posts only to find the wire went from tree to tree up a rocky ridge.

I also tried to discover who put up the barbed wire fence on the posts. The staples used are there to hold the wire on the posts. The posts are there to act as the resistance against cattle trying to get to the greener grass on the other side. The side of the post where the wire is attached determines the landowner who put up the fence.

Not all barbed wire fencing was put on or along the boundary line. The landowner may have wanted to avoid a solid rock outcrop, a dense growth of trees, a meandering water course, or other obstacles. When I put up fencing around my property, I moved the fence 4 feet from the line because of a row of hawthorn trees 200 feet long that I didn't want to tangle with. On the other side of my property, I moved the fence 20 feet to avoid a dense growth of multi-flora roses. Moving the fence saved time and I avoided a lot of hard work and was able to fence in two pastures quicker.

On another survey, the landowner's surveyor subdivided a portion of the owner's land. The southern line of the subdivision was not against the owner's boundary by around 120 feet at the east end and the owner's corner at the west end. Before the subdivision was created, a sanitary sewer line and easement started at the owner's southeast corner and followed an old

logging road in a northwest direction. Later, another surveyor did a location survey of a new house on a lot in the subdivision and showed the house to be on top of the sewer easement. A lawsuit started and I was called in to check the surveyor's work.

After plotting all the deed descriptions of the property to the north and south of the line and the subdivision from the southeast corner, west for four lots, I headed to the site to begin my field search. The southeast corner of the subdivision was listed as the top of a quartz rock, half the size of a small room. The original deed description described a pipe in an old stump surrounded by a ring of stones.

I began at the quartz rock and headed west along the subdivision's southern line. About 400 feet along, I noticed a short piece of wire sticking out of a tree to the south of the line I was following. I went to the tree and looked west and east to see more trees with pieces of wire. I decide to follow the wire to the east where the original deeds called for a pipe in an old stump surrounded by a ring of stones on the east side of an old road.

I found the original corner markers beside the old road. Once I located everything, including the house, and calculated the boundaries and the sewer easement I found only a four-inch corner of the house to be in the sewer easement. The lawsuit was dropped.

Old barbed wire fence can be excellent evidence for your survey.



Ken Mills became a PLS in 1975. He has been an active member of NCSS, serving three terms as the Western Chapter President. He served as the NCSS President in 1998. Mills co-authored Following in their Footsteps with Otis A. Jones. He has also written for American Surveyor Magazine.



Otis A. Jones EDUCATIONAL INSTITUTE

The Otis A. Jones Educational Institute October 6-8 at the McKimmon Center in Raleigh, NC saw record-breaking attendance and celebrated four PLS graduates: Mike Adams, Stuart Barwick, James Huggins and John Story.



Continued from page 13.

in funds and last year awarded educational scholarships worth over \$32,000 to 16 students. One-third of the profit for the final point markers is donated to the foundation by Berntsen International. I know that several NCSS Chapters utilize the final point markers.

The Trig-Star Committee is working on the online version for the Trig-Star testing and asked the directors to help expand the program in their states. Christy reported that the SCORE marketing questionnaires have been completed and the goals for this initiative should be announced in the spring. Christy is serving her second and last year on the NSPS Executive Committee and I heard many compliments about how valuable she has been and the great job she has done chairing the State Executives Forum. Christy has been

and continues to be a wonderful voice and excellent representative for North Carolina surveyors!

This was my last meeting as your North Carolina Director, so I would like to offer my heartfelt gratitude for allowing me to serve you. I have very much appreciated the opportunity to get to know and become friends with so many great professional surveyors across the country. Thank you!



Randy Rambeau recently retired from his role as the Geomatics Office Manager at McKim & Creed, Inc. in Raleigh, a position he held since 1991. He graduated from NCSU and became a PLS in 1978, when he joined NCSS. He was voted by his peers as Surveyor of the Year for 2013. Randy will complete his final term as the NSPS NC Director in February.

MEMBER PROFILES



In line with this edition's theme, NCSS requested information from the North Carolina Board of Examiners for Engineers and Surveyors (NCBEES) regarding the most recent licensees who achieved this great accomplishment by taking the high school education pathway.

NCSS thought it would be interesting to evaluate the pros and cons of this pathway to licensure by asking specific people rather than simply looking at statistics.

In 2020 eight individuals awarded a Professional Land Surveyor license, took the high school pathway to licensure. All eight were solicited to respond to a questionnaire, but only three of them responded.

Of those three, Byron Freeman, PLS with Platinum Geomatics, LLC, sent the following statement: *"I'm not sure that I'm the best candidate for your questionnaire. I obtained my LSIT in 2005 and my first license in Georgia in 2009. In 2016, I added Tennessee and was licensed in North Carolina by comity. I took a non-traditional path, but I'm 21 years in [sic] at this point, so my advice might not be relevant to the current standards."*



Our two other responses were from Christopher Glosson with McAdams in Charlotte and Scott Osterhoudt with ESP in Charlotte.

Christopher graduated high school in 2002 and took the Fundamentals of Surveying Exam (FS) in 2020. He passed on the first attempt, but it is interesting to note that he enrolled in the geomatics program at NC A&T University while preparing. He said, *"the core geomatics classes I took in my first two years pretty much prepared me for my exams."*

During that preparation, Christopher saw the benefit of education and now intends to finish his Bachelor of Science in Geomatics, making it possible to become licensed in states where a four-year degree is required.



Scott graduated high school in 1993 and took the FS Exam in 2019, where he failed the first attempt but passed the second. He was fully licensed in early 2021. His difficulty may be explained by the fact that the highest-level math he took in school was algebra. He said he had to relearn algebra and teach himself geometry and trigonometry on his own time. He used Kahn Academy and other YouTube channels as his instructors. Finally, he would sequester himself at his father's home for three or four days of intensive study before each exam. He also noted that it allowed him to bounce questions off his father, who first piqued his interest in math and

drafting at a very early age. Scott drew his first invention on mylar when he was only eight years old! He said he still has the design, which was a chair with an attached lamp for reading. Scott, too, hopes to pursue his four-year degree so that he can be licensed in other states.

When asked if mentorship played an essential role in their licensure, Christopher responded that he had several mentors that helped him along the way with field procedures and applying fundamental boundary law. He said Ken Frost, David Skiba, and Mike Sawhill were very instrumental in his career development.

Scott also had important mentors during his early career. His roommate and best friend Lorenz Quinn initiated his interest in 1999. From there, several party chiefs, office techs, CAD managers, and owners over the years took him under their wings. John Attaway, Cranston Engineering; Phil Ghiotto, Ghiotto and Associates; Ken Carlson, Jacobs Engineering and Jim Safrit, ESP Associates were the most influential in Scott's career. He reflected that "each one showed me that they were committed to helping me with my path to licensure in different ways, and each one is truly appreciated."

The final questions on our survey sought to know whether they would pursue the same route to licensure if they had to do it all again.

Christopher emphatically said, no! He would have studied to take the FS earlier. He believes that many licensed surveyors make becoming licensed seem like an insurmountable accomplishment, when in fact, it is completely achievable. When asked if he would recommend the same pathway for his son or daughter, he said he would urge them to enroll in a four-year program to start their process sooner. "The amount of time it took me to get my license was my doing, but I now regret not doing it sooner." He feels that eight years of experience is sufficient if the candidate is receiving a broad range of experience.

When asked the same questions, Scott replied, "While I do feel I earned great knowledge and experience, there is no way I'd take the same approach. I'd get my degree without needing 16 years of experience." He would, however, encourage his children into the profession. It is a dying breed, and job security would never be a concern.



PROBLEM CORNER

PROBLEM:

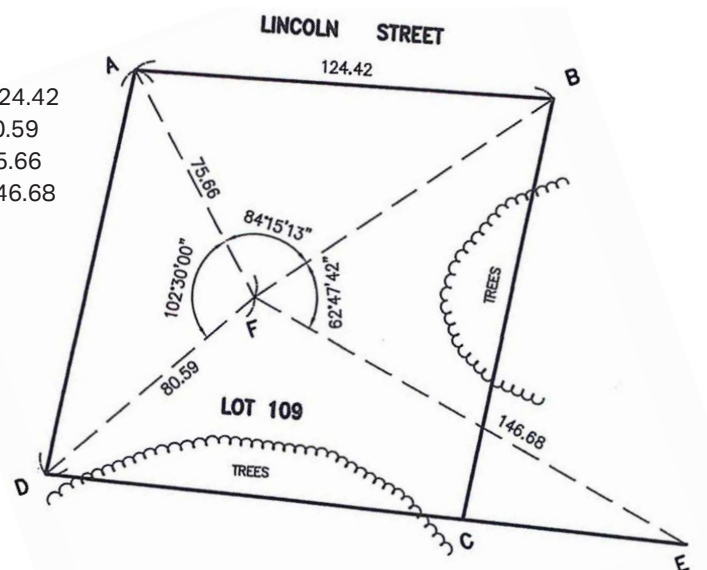
The owner of lot 109, wants to obtain a building permit of lot 109 and hires a surveyor to complete a boundary survey. The surveyor finds existing monuments at points A, B, and D, and needs to reestablish point C. Trees obstruct the view along lot lines as shown, so the surveyor sets a control point at point F from which all four lot corner locations can be seen. The surveyor also finds a monument at point E and notes that point C would be on a straight-line connecting points D and E. It is also noted that line AD is parallel to line BC.

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Area: Nearest Whole Unit

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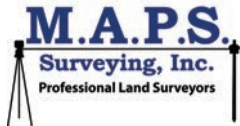
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