The Florida Surveyor

October 2022
Volume XXX, Issue 9

IN THIS ISSUE

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The GTL-1200 combines the power of a robotic total station with a best-in-class laser scanner to perform digital layout and capture high-res 3D scans in a single setup. Simplify the scanning process and dramatically reduce the need for post-processing by capturing scan data on survey control. The workflow seamlessly integrates with ClearEdge3D software for advanced construction QA workflows and as-builts.

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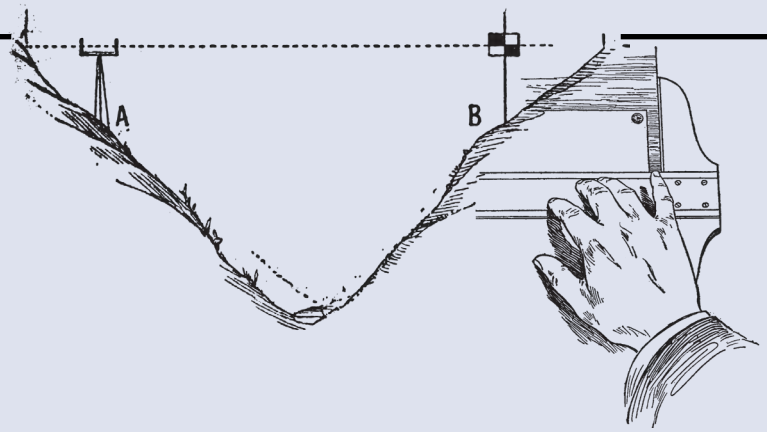

The Florida Surveyor is the official publication of the Florida Surveying and Mapping Society, also known as FSMS. It is published monthly for the purpose of communicating with the professional surveying community and related professions who are members of FSMS. Our award winning publication informs members eleven months out of the year about national, state, and district events and accomplishments, as well as articles relevant to the surveying profession. In addition, continuing educational courses are also available.

PRESIDENT'S Message

Wow, what a difference a month makes.

Hurricane Ian, Florida's deadliest hurricane since 1935, has torn through the heart of Florida, laying waste to far too many and far too much. As some folks know, FSMS maintains a Disaster Relief Fund that was first established after Hurricane Andrew, and we have received a few requests from the area (Lee County) for folks in dire need of financial assistance. This Fund is not bottomless, but I am sure we can find a way to bolster it if need be. If you are in need, or if you know of someone in need, please contact the FSMS office.

I had more for this month's President's Message, like upcoming PSM license renewals, but this month is too solemn to reflect on that, or anything else besides getting help, in whatever form, to those who were affected, in whatever manner, by Hurricane Ian.

I will resume my naturally long-winded diatribe next month. Until then, be safe.

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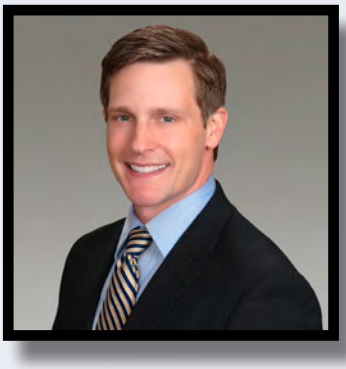

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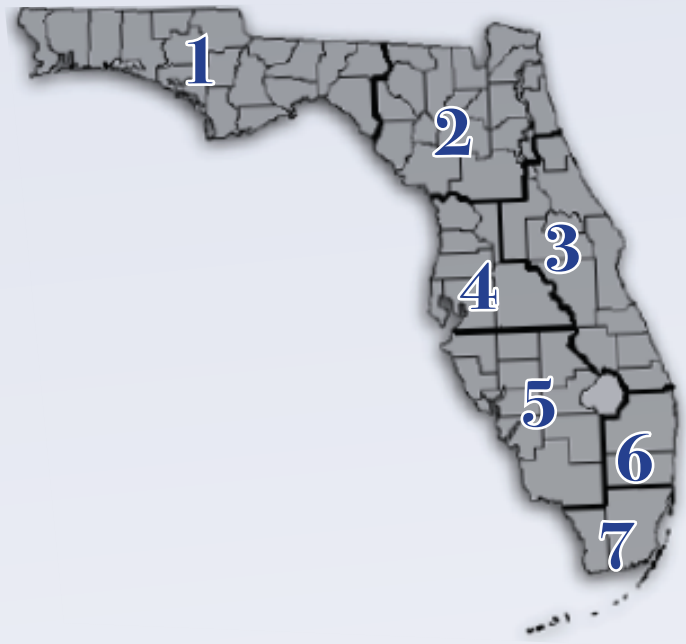

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For Those Needing Assistance or Would Like to Give a Donation to Those Impacted by Hurricane Ian, FSMS has an Established Disaster Relief Fund.

*The FSMS Disaster Relief Fund is solely funded by member donations and distributed to those in need after a disaster occurs.

APPLY FOR DISASTER RELIEF

Click Here for Disaster Relief Application
(Fill out & email to director@fsms.org)

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*Funds can go towards covering deductibles, storm supplies, minor damages and losses, gas, replenished food, etc.

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Florida Surveying and Mapping Society

County Surveyor

Board of County Commissioners
St. Johns County, Florida

ABOUT ST. JOHNS COUNTY

On July 21, 1821, Andrew Jackson established St. Johns and Escambia Counties in West and East Florida, with St. Johns County encompassing all areas east of the Suwanee River. For 200 years, St. Johns County has been a place where families establish roots and where residents and visitors alike can share history.

Today, St. Johns County is the 10th fastest-growing county in the United States. The most recent population figure is 265,512, representing an estimated 104,233 households. The County has a relatively wealthy, well-educated demographic profile with a median household income of more than $82,000 and the second- lowest unemployment rate in the state. Families benefit from its top-ranked public school system and low crime rate.

Bordered by the scenic Atlantic Ocean and St. Johns River, St. Johns County embraces its historic heritage and uniquely diverse communities, which have piqued people's interest for centuries, such as the City of St. Augustine, the nation's oldest city, St. Augustine Beach, Ponte Vedra, and Hastings, the Potato Capital of Florida.

Contributing to St. Johns County's popularity is a low overall cost of living. In addition to not having a state personal income tax, the County does not charge a local gas tax or utility franchise tax, and has a .5% local option sales tax to support schools. County real estate taxes are also the lowest in Northeast Florida with a millage of 13.3141 for residents in unincorporated areas of the County.

Exceptional quality of life, beautiful public parks, and natural waterways are just some of the amenities luring residents and businesses. Area enthusiasts enjoy numerous outdoor recreational activities such as golf, tennis, boating, fishing, and musical entertainment at the nationally recognized St. Augustine Amphitheatre. Shopping, dining, arts and, culture are also on the list of things to experience.

County Surveyor POSITION IN BRIEF

The Surveying and Mapping Division, a division of Land Management Systems Department, provides project and geodetic surveying services to various County programs and departments. This position is responsible for overseeing the projects and signing and sealing all surveys, maps, and reports. Project surveying may include boundary, topographical, right-of-way, as-built, and construction surveys.

The County Surveyor interacts with internal staff and external clients to provide professional guidance on surveying matters, interpreting and advising Florida Statutes, Florida Administrative Code, the County Land Development Code, and surveying standards and practices. The County Surveyor is called upon to provide expert opinions and testimony and reviews proposed plats for compliance with Chapter 177, Florida Statute and certifying such review on the face of the plats.

The Surveying and Mapping Division consists of the County Surveyor, a Survey Manager, a Sr. CAD Technician and two field crews.

EDUCATION AND EXPERIENCE

County Surveyor candidates should possess the following education, experience, and preferred traits, knowledge, skills, abilities:

- Knowledge and level of competency commonly associated with the completion of a baccalaureate degree in a course of study related to the occupational field.
- Must possess current registration as a Professional Surveyor by the Florida State Board of Professional Surveyors and Mappers.
- Experience sufficient to thoroughly understand the diverse objectives and functions of the subunits in the division/department in order to direct and coordinate work within the division/department, usually interpreted to require five to seven years of related experience.

COMPENSATION AND BENEFITS

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The St. Johns County Board of County Commissioners, Florida, is an Equal Opportunity Employer. All employment actions are taken without regard to race, color, religion, sex, sexual orientation, gender identity or expression, age, handicap, disability, marital status, national origin, veteran status, or genetic information.

COLLIER-LEE CHAPTER

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THE FLORIDA SURVEYING AND MAPPING SOCIETY HAS SERVED THE STATE OF FLORIDA FOR OVER 60 YEARS DEDICATING ITS EFFORT TO MAKING A DIFFERENCE WITHIN THE COMMUNITY EACH LOCAL CHAPTER RESIDES IN.

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OUR MISSION IS TO EXPAND OUR COMMUNITY OUTREACH TO HELP PROVIDE SCHOOL SUPPLIES FOR CHILDERN IN NEED AND CONTINUE PROVIDING CHRISTMAS GIFTS AND HOLIDAY DINNERS TO FAMILIES WITHIN LEE AND COLLIER COUNTY

COLLIER-LEE CHAPTER

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2ND ANNUAL CLAY TOURNAMENT

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Originally Published on Geo Week News, August 12, 2022

The Geospatial Industry's Key Place in the Metaverse

by Matt Collins

GIS data will play a big role in both the development and usage of the eventual metaverse

When starting to learn about any new topic, especially something as large in scope as the theoretical "metaverse," the obvious place to start is simply with the definition. That proves to be a bit of a problem in this case, though, because the most common answer you'll find is that no one really has a definition. There are disagreements from people involved in metaverse development in all phases on things from what the metaverse will look for, how many there will be, or even if it's already here. Most commonly, the broad explanation is that the metaverse is the next phase of the internet, a 3D representation of it, following the personal computer era of the late 1980s, 1990s, and 2000s, moving on to the mobile internet era of the 2010s to today.

At a metaverse panel earlier this year at the Geo Week Conference, Brey Tucker of Autodesk likened the idea of marrying physical mail to email. So, the metaverse is the next stage, and similar to a person in the 1970s trying to predict what the internet would be like, there are a wide range of specific predictions for the metaverse, some of which will turn out to be correct, others not so much.

That being said, there are a couple of key truths that form an important basis for what's coming next. One is that 3D technology is going to be the backbone of whatever it is the metaverse turns into. Additionally, there is going to be a lot of data involved, and coming from a variety of sources, and even a variety of types of sources. And third, the geospatial industry is going to play a huge role in the development and functionality of these virtual worlds. The good news is, the industry is getting involved right from the start as key players in the development. As Nadine Alameh, CEO of the Open Geospatial Consortium, put it in her appearance on the *Building the Open Metaverse Podcast*, geospatial is the representation of everything happening in time and space. Those same principles exist in virtual time and space as well, making GIS data and geospatial professionals key for any discussion around the metaverse.

Location, Location, Location

Although exact definitions around the metaverse are still very much up in the air, one of the things most everyone involved agrees with is that users will be placed in virtual rules – sometimes in VR, but not always – which means that spatial data will be key. Consider the idea of commerce in the metaverse, with virtual shops that can be visited by digital avatars who are physically in different places. A lot of this will be based on real-world locations too, with at least part of it consisting of exact copies of our planet. For that to be accurate, experts in mapping the real world are going to need to be involved in mapping the digital version to ensure everything works as intended.

It's not just the development of this metaverse where geospatial professionals are going to be key, though. For one thing, that development never really ends, as anything that mirrors the real world is going to be constantly updating just as our physical environment is. And even in virtual environments not entirely based on real world ones, many of the same spatial principals will still be in play, and geospatial professionals will have an upper hand in being able to interpret and take advantage of the data available. For example, virtual real estate is likely to be a very important part of the metaverse, especially in commercial contexts. Just like in our physical world, location is going to be extremely important for companies to maximize their return on virtual real estate investments, and many will certainly be willing to pay up front for the best location possible. As Jeran Miller, a realtor with a GIS background, points out, software using GIS data can create a map of even a virtual area and factor in key information like "foot traffic, parcel values, and proximity to related businesses," in order to find the ideal location for a potential customer. Miller also mentions in his blog the eventual need for virtual geography researchers.

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Digital Twins are the backbone

Given that at least one vision of the metaverse involves either an exact or at least near-exact replica of our real world, it makes sense that the concept of digital twins is going to be heavily involved in this development as well. Digital twins was at one point considered simply a buzzword in the AEC industry, but the concept is quickly being recognized as a significant value–add for those that take advantage. As a reminder, and as we talked about recently with Dr. Qassim Abdullah, digital twins are not simply a 3D model of a physical building or other asset, but rather a living, breathing model utilizing things like Internet of Things (IoT) sensors to provide real-time updates to the environment of the physical twin.

The use cases of these digital twins are going to be important for both public and private entities. On the private side, it is really a lot of the things that we already see in this space, just on a potentially larger sale. Building owners and facility managers can both spot in real-time potential issues with things like piping systems earlier than they would without the digital twin thanks to the IoT sensors, and they can also run simulations for future events using the information gleaned from sensors in concert with artificial intelligence and machine learning.

That same principle can also be used on a larger scale by governments at all levels. Using the geospatial data discussed above to create digital twins of streets, cities, states, nations, and even just the Earth at larger eventually, public entities can

theoretically simulate things like climate events, which are expected to become more commonplace, both figuring out potential consequences and simulating potential ways to minimize the damage from such events. Alameh brought this up in a conversation with us around the geospatial industry's role in the metaverse, providing the example of simulating a flood before it happens.

"If we can just see it in the metaverse, if we can see floods — not fake, not Hollywood, based on real scientific models and data, and historical data and predictions and you know, all this stuff that the experts do — then the decision makers can see it. You stand, you see where the water is coming. You see how many bridges are affected and how much they cost."

Openness is Key

As discussed earlier, there is still a lot unknown around the idea of a metaverse, and nobody is really clear on what exactly it will look like, one thing that most everyone agrees with is that there will be a massive amount of data needed for creation and continued development of this virtual space (or spaces), geospatial and otherwise. And building from that, it's also clear that no one company or person is going to be able to harness, never mind possess, all of this data themselves. It is going to need to be a collective effort with a lot of different entities and industries being able to share information and data seamlessly. That will require open standards that are followed by different industries to maximize collaboration of tools and software. This led to the creation of The Metaverse Standards Forum, which is not a standards developer but a forum for many different organizations to work together to create standards themselves. The OGC is one of the founding members of the organization.

Alameh points out some of the early signs that this may work with the examples of geospatial companies partnering with gaming companies, combining the GIS data with high-quality 3D representation that comes from games. We see that with Cesium and Epic Games – which also helped lead to the aforementioned *Building the Open Metaverse Podcast* with hosts Cesium CEO Patrick Cozzi and VP and General Manager of the Unreal Engine at Epic Games Marc Petit – and more recently Esri announced a new integration for their data to be visualized using the Unreal Engine as well as Unity's gaming engine. Alameh, speaking of the geospatial industry, indicates that they have "half the metaverse right here," referring to their crucial spatial data. Merging that other half with other relevant industries seamlessly and openly is going to be the other key if the metaverse is going to be as impactful as it has the potential to be.

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- This is the deadline for License Renewal.
- Licensed Surveyors are Required to have Completed at least 24 Continuing Education Credit Hours.

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6 General CEC - $99/course (members)

$120/course (non-members)

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- Ethics for the Design Professional - *Course #8621*
- Land Tenure & Cadastral Systems - *Course #8260*
- Map Projections & Plane Coordinate Systems - *Course #8261*
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- Public Land Survey System - *Course #7147*
- Remote Sensing Applications to Surveying & Mapping - *Course #7148*
- Practical Geometry for Surveyors - *Course #7141*

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3 CEC	$58 Per Course	x	_____	=	$ _____
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6 CEC	$125 Per Course	x	_____	=	$ _____
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	TOTAL		_____		$ _____

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3 CEC	$78 Per Course	x	_____	=	$ _____
MAILED					
6 CEC	$145 Per Course	x	_____	=	$ _____
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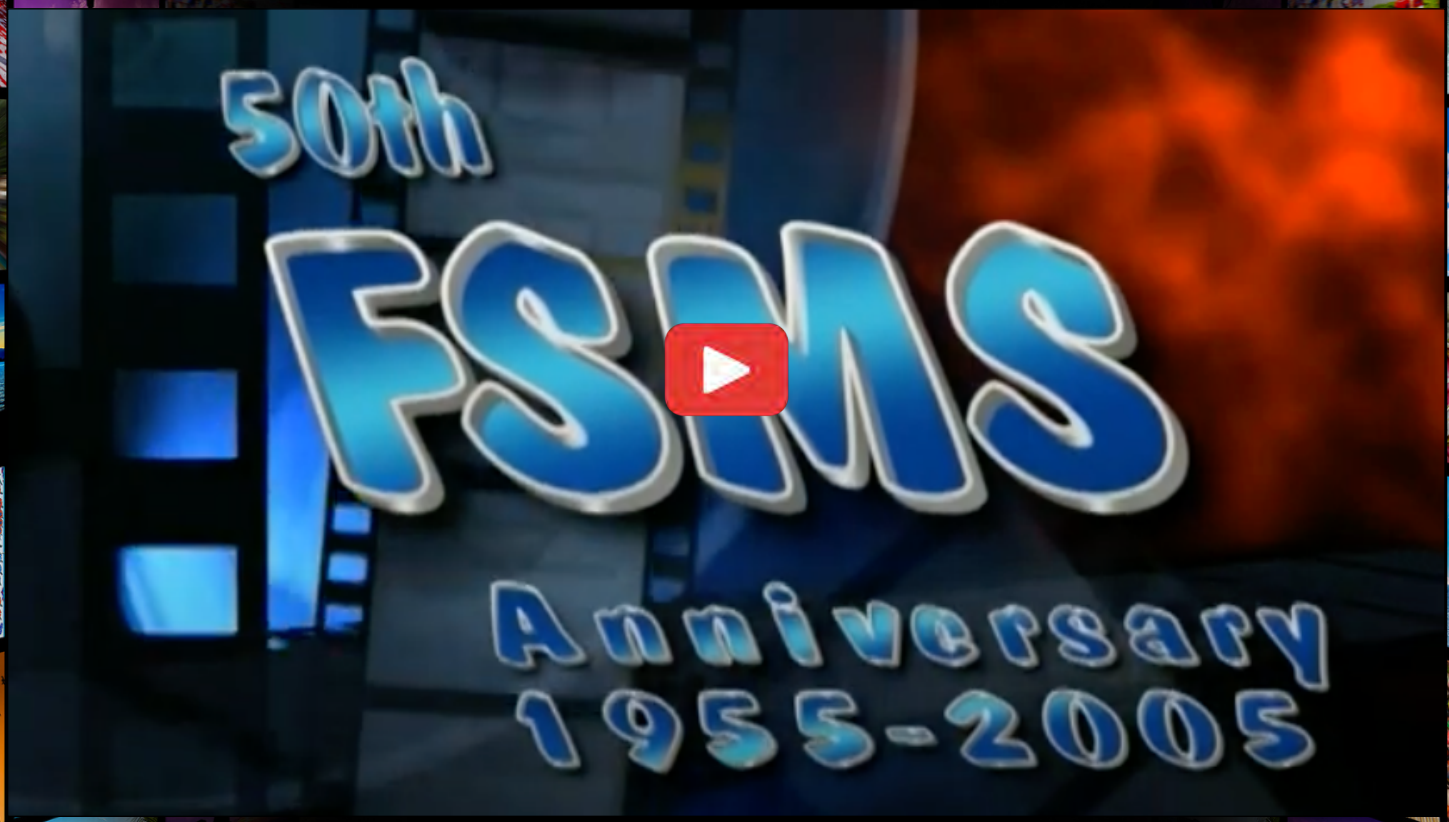
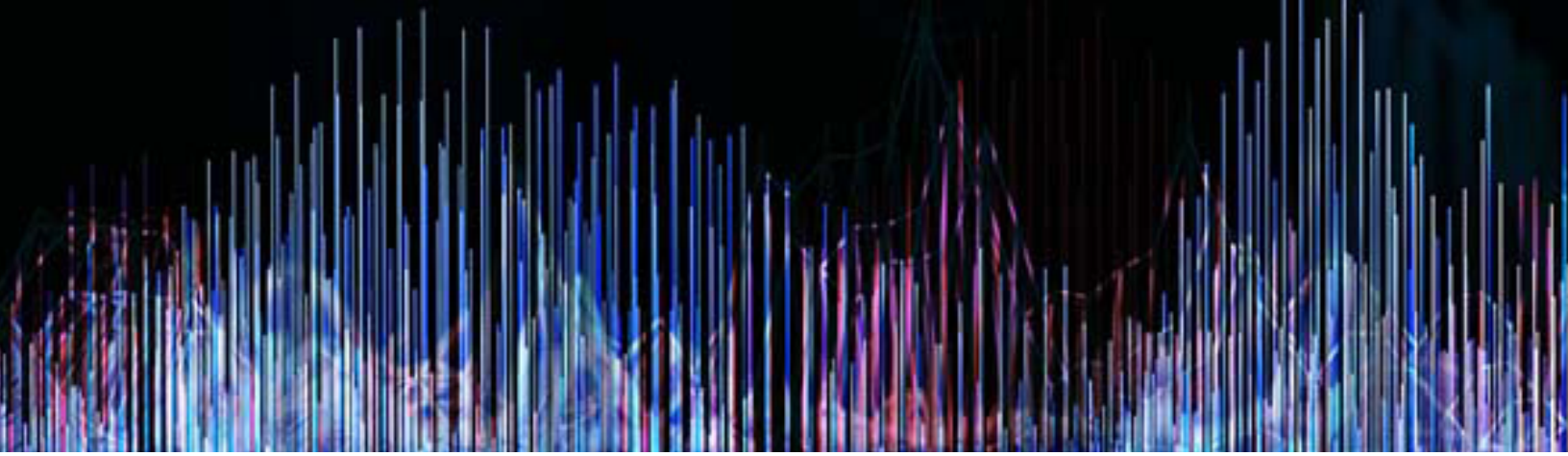




Potential Effects of Operating a Terrestrial Radio Network Near GPS Frequency Bands Assessed by New Report

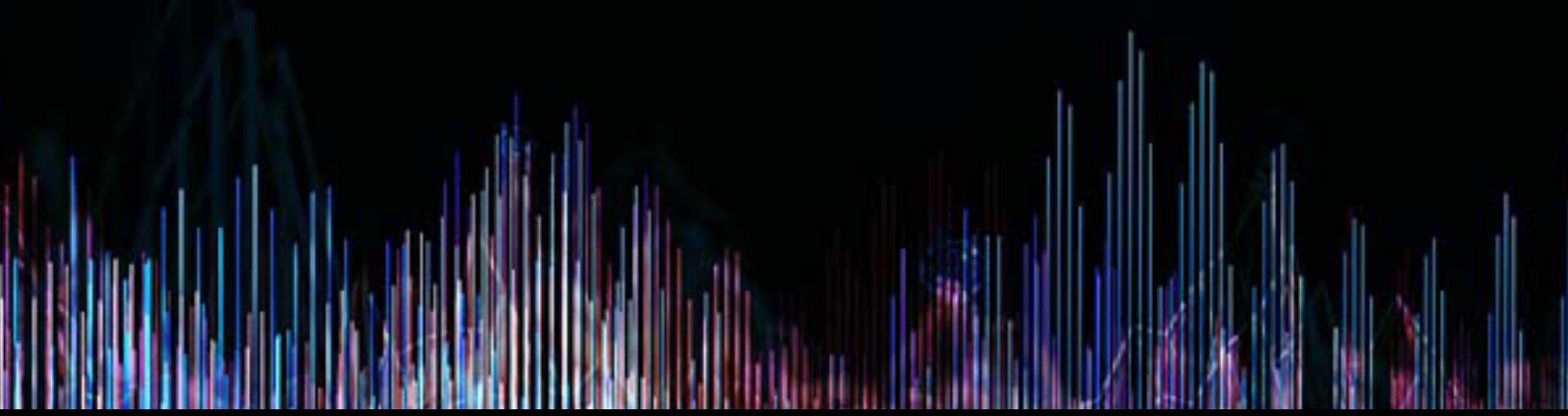
News Release | September 9, 2022

WASHINGTON — A new congressionally mandated report from the National Academies of Sciences, Engineering, and Medicine assesses the likelihood of harmful interference from Ligado Networks' authorized use of the radio frequency spectrum near bands used by GPS and other satellite services.

The report says use of radio frequency bands — as authorized by the Federal Communications Commission in its 2020 order — by Ligado Networks, a private satellite communications company, will not cause most commercially produced general navigation, timing, cellular, or certified aviation GPS receivers to experience harmful interference. However, some high-precision receivers, used for applications such as farming, geodesy, and surveying and sold before about 2012, can be vulnerable to significant harmful interference. In addition, certain mobile satellite services provided by Iridium Communications Inc. and used by the U.S. Department of Defense and others will experience harmful interference under certain conditions.

The committee that wrote the report reached these conclusions from its review of signal transmission and reception physics and engineering pertaining to devices working in the spectrum region in question, as well as from publicly available interference tests evaluating various operating scenarios and representative devices.

The radio frequency spectrum is a natural resource that underpins all wireless activity, from mobile phones to GPS and satellite communications. The spectrum is divided into frequency bands, each allocated for specific services and managed in the United States by two agencies — the Federal Communications Commission and the National Telecommunications and Information Administration. While strict adherence to transmission and reception only within authorized frequency bands would provide protection against harmful interference, in practice transmitters do not have sharp



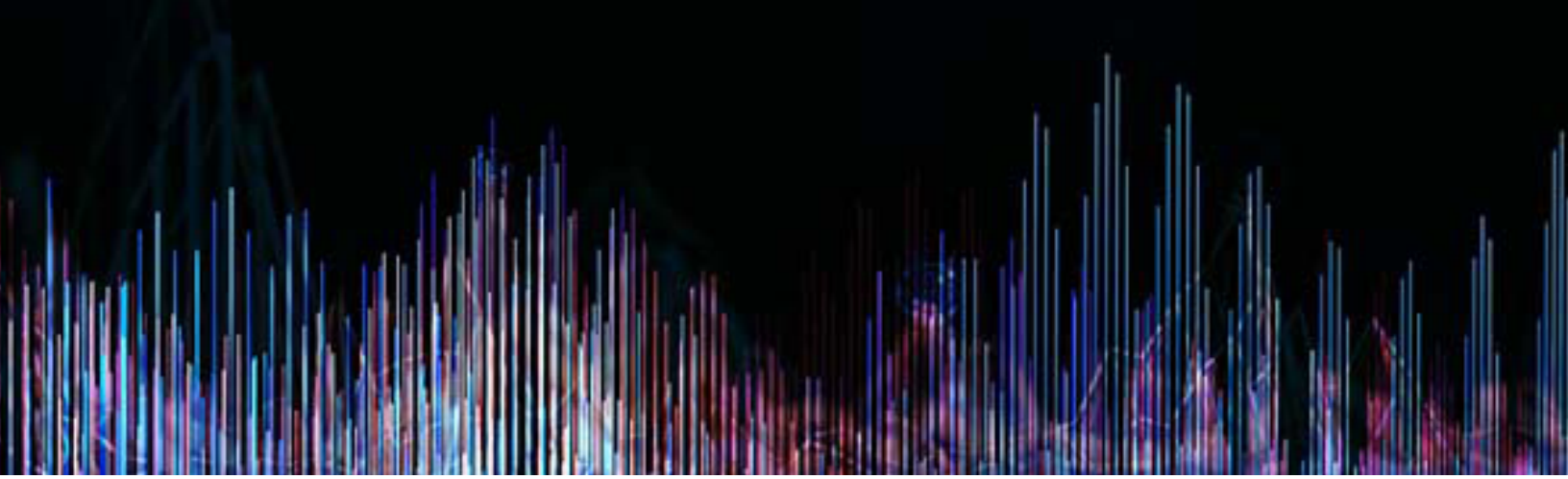
cutoffs and may emit signals beyond their authorized frequencies, and receivers may pick up frequencies beyond their authorized range. Both of these factors can potentially contribute to interference that degrades performance or causes loss of operation.

Due to the commercial, economic, and national security interests involved, and questions over whether signals from Ligado transmitters could create adverse effects including the disruption of critical services, Congress, through the DOD, requested a study from the National Academies. The committee's statement of task did not include consideration of whether the FCC reached a correct outcome in authorizing the Ligado system.

Manufacturers are technologically capable of building new GPS receivers that are robust enough to withstand interference from Ligado Networks' signals, the report says. The installation of new antennas and electronics, as well as the extension of exclusion zones in which Ligado would not be permitted to operate, offer other potential avenues for mitigating harmful interference. In some cases, though, these mitigation procedures may not be practicable at relevant time scales or reasonable costs due to test certifications and other efforts required.

Additionally, the report finds that neither of the two prevailing approaches for evaluating harmful interference concerns in the radio spectrum effectively mitigates the risk of harmful interference. While assessments of positional accuracy degradation and signal-to-noise ratio reduction both have a role to play, there are multiple ways in which interference can degrade receiver operations that are not considered by these two approaches. These approaches also require cumbersome device-by-device testing, and lack analytical, repeatable, and straightforward criteria, thus impeding progress in making more efficient and effective use of the spectrum.

The report says that a more collaborative approach to resolving spectrum issues, joint study and testing by the FCC and NTIA of proposed changes to spectrum use, more definitive receiver performance standards, and the establishment of specific timespans where adherence to those standards will ensure successful operation are



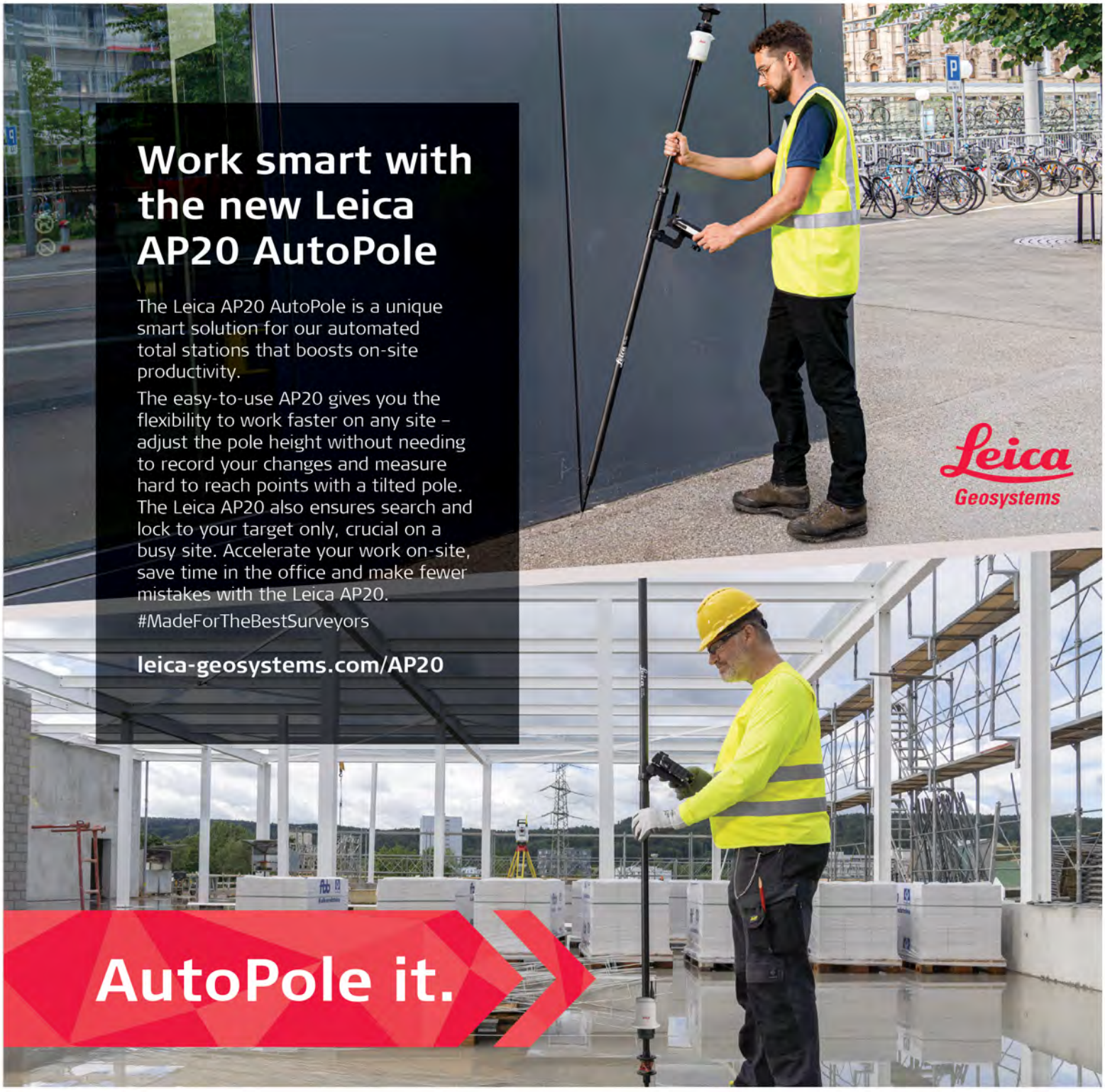
all important tools for the future of the sector.

“Our technological capabilities in this space are constantly evolving, so spectrum real estate should be seen as a living asset that evolves alongside new technologies,” said J. Michael McQuade, strategic adviser to the president at Carnegie Mellon University and chair of the committee. “But to ensure stability, approaches must also allow for a degree of confidence that a deployed system will not be compromised, for a time, by harmful interference from new entrants.”

The committee evaluated “harmful interference” as related to relevant physics and engineering questions, using the term in a general sense to imply degraded receiver operations. It did not assess whether “Harmful Interference” as defined by U.S. or international regulations, which include language pertaining to assessments of the consequences of the interference, might occur.

A classified annex to the report provides further information on the test results and analysis as they relate to DOD systems and missions.

The study — undertaken by the Committee to Review FCC Order 20-48 Authorizing Operation of a Terrestrial Radio Network Near the GPS Frequency Bands — was sponsored by the U.S. Department of Defense. The National Academies of Sciences, Engineering, and Medicine are private, nonprofit institutions that provide independent, objective analysis and advice to the nation to solve complex problems and inform public policy decisions related to science, technology, and medicine. They operate under an 1863 congressional charter to the National Academy of Sciences, signed by President Lincoln.



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FROM THE ARCHIVES

Tennessee Valley Surveying 1745 to 1780

By E.D. HEPPERT, JR. (Originally published December 1975 in *Surveying and Mapping*.)

Surveyors Before Daniel Boone

The Kentucky Road from Great Island (at present Kingsport) into the "Kentucky District" of Virginia in 1779 was built by Daniel Boone well after the survey work of the early land speculators. By 1750 one group had surveyed and recorded plats for some 80 different sites, which later became most of the major towns and cities on the New, Clinch, and Holston Rivers, extending from Blacksburg, Virginia, to Kingsport, Tennessee.

"Claiming a first" is always risky, but present records of Augusta County at Staunton, Virginia, show that by 1750 land claim surveys were made and recorded as far west as the present city of Kingsport. This was 19 years before "the first permanent settlement in Tennessee," accredited to settlers coming up the Watauga Valley from the Yadkin River area in North Carolina. The first settlers were arriving on the promises of choice land by the speculators. Later, many came to secure grants for Military service. But this is getting into subject matter to be covered later, so let us go back and start with the surveying equipment and regulations of that period.

Early Surveying Texts

There were few texts in print at that time, one of them being *Geodaesia*, written by John Love, which was first printed in 1688. Love had been a surveyor in North Carolina and Jamaica before returning to England, where he wrote and published his book. Eleven editions were published in England and, finally, two more editions were printed in the colonies. Other than the unfamiliar printing symbols and terms, one would find nothing too different in this book from elementary surveying and surveying texts of today. Even then the author recommended that a surveyor should check each closure "by comparing the sum of the eastings with the westings, and the sum of the northings with the sum of the southings." Another text of the period was *A Treatise on Land Surveying*, written by Robert Gibson in 1739. In 1785 it was reprinted in the colonies—the first surveying text to be printed here.

By the time surveying had gotten into the present Tennessee Valley area, the unit of measure was the pole of 16½-ft. length. During earlier times a rod, a rood, or a perch were commonly used, but all were usually of the same length. In some cases, though, a perch was also a term of square measure. An early rule long since forgotten in modern surveying, was that an acre is defined as 160 sq. rods or poles, rather than in terms of square feet. A page from *Geodaesia* shows a table of "Long Measures" as used in 1688, which

favored the use of the term “perch” rather than “pole.”

Surveying Equipment

Although the surveying texts of that day described the use of other instruments, it is most unlikely that anything other than a compass mounted on a Jacob's Staff was used for early frontier surveying. The ingenuity of the colonial craftsmen was not to be outdone by the demand for equipment. Colonial newspaper advertisements placed by instrument and clock makers showed that surveying equipment was being made for sale here by the mid-1700s. Fine compasses made of brass were produced in Maryland as well as New England; some surveying compasses were even made of wood. Each unit had a wooden carrying box, and the sighting vanes were either removable or could be folded for storage. The better and more expensive units had tables of sines and cosines engraved on the metal face to assist in figuring latitudes and departures in the field. Some compasses had special tables of corrections for magnetic variations. A wooden unit 10¼ in. long with sight vanes 5½ in. high was made in 1762 by Joseph Frye to survey land in the present State of Maine.

The theodolite was used on special work, where it was necessary to check the latitude and longitude, as its use was noted in the reports of the commissioners for the Fairfax Line Survey of 1746. This survey was made to locate “the head Spring of North Branch of the Potomack.” Young George Washington was supposedly a helper on this survey, although he would have been only 14 years old at the time.

Surveying chains and pins varied with the skill of the builder and often were carried in a cylindrical metal box. Chains were normally of 4-pole length; however, this was not universal as some work specifically called for the use of a 2-pole chain. Generally this was specified to minimize errors caused by the practice of surface chaining, rather than horizontal chaining. In later times when the practice of measuring distances in feet became more regular, chains of 40-, 50-, and 60-ft. lengths came into limited use. By definition the 66-ft. chains were divided into 100 links, each 66–100 ft. long; however, later chains measuring in feet contained links 12 in. long, and one 60-ft. chain had twenty 36-in. links. The chains usually had swivels at the quarter points to help keep them from kinking. Frequently brass tags were attached marking the major units of the chain. Although not an approved practice, records show that some surveys were made with a knotted rope.

Practices and Regulations

The point where regulations leave off and practices begin in surveying work today is a broad area, and it must have been the same in this earlier period.

This article will cover both subjects and they will not be separated, except for specific references made on these points. At the time when the State of Tennessee was organized, the current Land Laws of the State of North Carolina were incorporated into the Tennessee Code, which makes a good reference point for surveying work beginning around 1800. However, first, the surveying work of Virginia's surveyors before 1800 will be dealt with.

Surveying in Virginia was not permitted unless the surveyor was licensed, and this was granted upon examination by the Masters of the College of William and Mary. Only one official surveyor was permitted for each county, and it was also required that he be a resident of that county. Most county surveyors had several assistant surveyors, particularly in the large newer counties, some of which extended 100 miles or more westward. Regulations were also enacted covering the duties of chain carriers (or bearers), one of which required that they be sober.

At this particular time, surveying was permitted only during the wintertime, October through March, but no reason for this was given. The lack of tree foliage in the winter and the need for spring work on the farms are obvious reasons, and it is also known that Indians of that time usually did not make war in the winter. All surveys had to be recorded in the county court records, and the plat had to be drawn within a specified number of years. There was a recording fee paid to the college which was used for the examination of the surveyors working in that county.

Some of the regulations made from time to time were to suit special occasions not always mentioned. One early North Carolina law required that all tracts be laid off from roads or rivers by right angles to them. Frequently, the maximum size of the survey tract was also given or required to be of exact acreage, even though located in virgin territories.

Work of Frontier Survey Parties and Commissions

Most surveys included here were in areas uninhabited by colonial settlers; however, it was not until after the beginning of the French and Indian War that the Virginia and Carolina frontier activities were hindered by the Indians.

As best as can be determined, all surveys mentioned here were made with a compass and any corrections, if made, were not recorded, except on some of the commission work. Lines were usually recorded as compass bearings, but some of the surveyors used a compass inscribed with the compass points and occasionally intermixed the compass points with bearings. On the land company parcel

surveys, distances were recorded in poles frequently in full tens, suggesting possible rounding. On cross-country lines, distances were recorded in miles and fractional miles, and some with poles on the end. There is no indication that anything other than "surface chaining" was done, without distance correction for slope. Very few notes have been found on the size of survey parties; nevertheless, a few field books on parcel surveys lead one to the conclusion that the surveyor kept his own notebook and was assisted only by chain carriers, as they were usually called. On state boundary surveys it was a different story. For these surveys, there were not only two or more surveyors for each side, but also commissioners representing each governor.

Several books and almost 200 years covered the settlement of the disputed boundary line from the Atlantic to the Mississippi. Only the highlights of this particular period will be included here. The first section, some 245 miles, was run in 1728, the western end being at Peters Creek on the headwaters of the Dan River. The extension from that point made in 1749 by two commissioner/surveyors, one each from Virginia and North Carolina, carried the line westward "90 miles and 280 poles," ending on the waters of the Holston shown at that time as "Steep Rock Creek, 336 miles from the ocean." This was still in the mountains, probably on Beaver Dam Creek at a point some 3 miles southwest of Damascus, Virginia, 10 miles east of the Holston and 20 miles east of Bristol.

At this time, all of the land north of the Holston River as far west as the Great Island (at Kingsport)—although at some points it is as much as 20 miles south of the present state line—was considered as part of Virginia. Land company surveyors from Virginia made numerous parcel surveys for land speculators and settlers in the present Bristol and Kingsport areas during the 1749 to 1753 period. Following a time of Indian wars, the Virginia land company surveyors returned in 1767 but were being pressed for a boundary line by the North Carolina settlers coming across from the Watauga River areas.

A new Commission authorized in 1778 was directed to check the original work "by astronomical observations," make necessary corrections and carry the line due west to the Tennessee River. They were to "endeavor to procure the most accurate instruments—borrowed from individuals or any seminary of learning." In September 1779 the commission met at the starting point and made necessary determinations of latitude and longitude. Here enters one of the strange questions in the settlement of the line. The Fry & Jefferson Map, published in 175l, shows "Steep Rock Creek" to be located in the mountains and a branch of the present Holston River, probably the present

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DID YOU KNOW?

The Parthenon, located in Athens, Greece was pretty much intact for several centuries after it was constructed.

The ruins we see today were not caused by the elements of nature or traditional passage of time, but by an explosion of gunpowder in 1687.

Source

Beaver Dam Creek. However, the next running of the line was an Indian boundary survey by Col. Donelson in 1771, who went back east of the mountains and started "at the Steep Rock on the waters of the Great Canaway River"—the headwaters of the present New and Kanawha Rivers.

The 1779 commissioners apparently were unable to settle on suitable remaining line markers and also started at the eastern side of the mountains. They then noted that they "were in superficial measure of 329 miles west" of the ocean and "that there should be an abatement of 12 miles for mountainous and uneven ground," with a corrected total of "317 miles west of Currituck Inlet" on the ocean. They also "measured off the one mile and 201½ poles in a due south course" before beginning westward again. After proceeding some 40 miles, the North Carolina men insisted that the line was too far south and they would not continue. After making observations and debating the problems, the Virginians continued that line while the North Carolina group ran another line parallel and 2 miles to the north as far west as Cumberland Gap, the Gap falling approximately halfway between the two lines. Here the North Carolina men terminated their line, while the Virginia surveyors went on arriving at the Tennessee River in March 1780. The original party had several commissioners, surveyors, pilots, and hunters as well as a company of militia from each state.

A map and only brief information are all that the author has found on the 1749 survey, but several articles as well as court records are available on the 1779-80 extension. The Virginia–Tennessee line was run several times in the next century and was settled only by a 1903 decision of the U.S. Supreme Court.

Indian Boundary Surveys

Tennessee and Southwest Virginia areas are crossed by many Indian boundary lines as the settlers pushed westward or were forced back eastward by successful Indian movements, each new boundary line resulting from long treaty negotiations. Some of the lines were established by actual surveys in the field.

In a meeting at Lochabor, South Carolina, during October 1770, a treaty was negotiated with the Cherokees, in which they sold part of the Upper East Tennessee and Southwest Virginia areas. By a treaty made a year earlier, the boundary was to have run from Fort Chiswell (east of Wytheville) direct to the mouth of the great Canaway (Kanawha) on the Ohio River. At Lochabor, the final agreement provided for the new line to begin at "the end of the North Carolina boundary (Steep Rock Creek) running in a west course to a point 6 miles east of Long

Island in Holstons river, thence in a — course to the confluence of the great Canaway & Ohio rivers." This line, called the Ministerial Line, was to be run by Col. John Donelson; however, through some "field changes" with the Cherokee chiefs, either by collusion or possible error, the line from the Holston (above Kingsport) went northwesterly all the way to the Ohio rather than somewhat easterly to the agreed point. Part of the lines run by Col. Donelson from his May 1771 report and map follow:

"—due West direction—crossing the lron mountain to several marked trees on the south fork of Holstons River near several small Islands in the same. Thence down the stream thereof as it meanders 30 miles to a point 6 miles above the Long Island. [The Col. Donelson map shows the point to be just east of Fall Creek.] Th. N5°W 4¼ miles to a Red Oak marked on the top of a Ridge on Col. Byrds Road. Th. N36½ W7¼ miles crossing the N° fork of Holstons River to a point of Rocks on the top of Clinch Mountain. Th. N45°W 20½ miles & 32 poles crossing Clinch River ..."

Land Company Surveyors

Virginia land companies were the result of a decision of the Council to attempt to get settlers on the western lands in order to establish claims ahead of the French. Large land grants were offered to groups of prominent citizens who could have the land to sell if sold to a settler living on the land. Thus, the need for frontier surveyors who served as subdividers, developers, and promoters, usually known as the Agent of the Company. Although others were authorized, only two land companies were working in the present Southwest Virginia and Upper Tennessee areas. Each had royal grants to survey, claim, and sell tracts on a first-come basis. Col. John Buchan was surveying from 1746 to 1750 on a 100,000-acre grant to the Wood River Company, while Dr. Thomas Walker was surveying in 1753 and again in 1767 on an 800,000-acre grant to the Loyal Company. More than a hundred tracts were surveyed, recorded, and occupied on the waters of the Clinch and Holston Rivers. The first occupancies known were made from 1750 to 1755, but these people were driven out by Indians, and it was not until about 1767 that they were able to return.

Col. Buchanan usually made two trips a year, one beginning in January or February, and a second late in the year, with most of his surveys from 50 to 100 miles from the nearest colonial settler. Little is known about Buchanan's equipment or field records; however, all of his surveys are available in original form in Augusta County record books. A tabular summary of his work on one of these trips is shown (*see* Table 1). The upper lines are information from courthouse records, while the second lines (italics) are comments by the author on each survey.

SURVEY TRIP—Spring of 1750

Table 1

Colonel John Buchanan for Wood River Company

Data	*Date*	*Location*		*Size*	
Survey	21 March	North Branch Indian River	Buffilo Cow Bottom	220 Acres	
edh	*Wednesday*	*N. Fork Holston; East of Saltville, Va.*		*0.8 × 0.7 mi.*	*5 courses*
Survey	23 March	North Branch Indian River	Papa Bottom	300 Acres	
edh	*Friday*	*N.F. Holston–East of Saltville, Va.*	*Pau Pau Bottom*	*1.9 × 0.5 mi.*	*7 courses*
Survey	24 March	Branch Midle Forke Indian River	Cedar Creek	2,800 Acres	
edh	*Saturday*	*M.F. Holston–Meadowview, Va.*	*Cedar Creek*	*2.9 × 2.9 mi.*	*12 courses*
Survey	26 March	Joyning Cedar Creek Survey	Holstons Creek	2,193 Acres	
edh	*Monday*	*M.F. Holston–Emory and Glade Springs*	*Hall Creek*	*5.1 × 1.5 mi.*	*17 courses*
Survey	29 March	Branch of Indian River	Castles Creek	6,780 Acres	
edh	*Thursday*	*M.F. Holston–Abingdon, Va.*	*Wolf Creek*	*4.4 × 4.9 mi.*	*19 courses*
Survey	2 Apr.	Branch of Indian River	Ranfrows Creek	950 Acres	
edh	*Monday*	*S.F. Holston–N.E. of Bristol, Va.*	*Spring Creek*	*2.6 × 1.7 mi.*	*10 courses*
Survey	2 Apr.	Branch of Indian River	Shallow Creek	676 Acres	
edh	*Monday*	*S.F. Holston–N.E. of Bristol, Va.*	*Beaver Creek*	*2.3 × 1.1 mi.*	*8 courses*
Survey	6 Apr.	Branch of Indian River	West Creek	3,000 Acres	
edh	*Friday*	*S.F. Holston–East of Kingsport, Tn.*	*Reedy Creek*	*8.5 × 1.0 mi.*	*25 courses*
edh	*17 days*			16,919 Acres—Total	

After a close review of the table, one wonders about the speed of modern surveyors. On this trip, eight tracts which was a total of 17,000 acres, were surveyed in only 15 working days. To accomplish this, the survey party traveled more than 70 miles from the first site to the last, probably moving the campsites as the party progressed. Col. Buchanan was a Scotch-Irish Presbyterian and, like some of the other surveyors of his time, did not work or explore on Sundays, even though the party was away from home. One might question the accuracy and permanence of his work, but, here too, his record speaks for itself. All of the sites shown were later patented (occupied and deeds granted) and can be identified in the field today. Almost all of the sites have fencing or lines of trees several miles long. The outline map (Fig. 1) shows one of his earlier surveys which later was to become a main portion of Bristol. Some of the field books and sale entry books of these two surveyors and the Land Companies are still in existence and are available for study on microfilm, in addition to the plats found in courthouse survey record books.

The Watauga Purchase

The first surveying on the North Carolina side of the area, located by the author, was that which followed the Watauga Purchase from the Cherokee Nation in 1775. Broadly speaking, the limits of the area were the Holston on the north, the mountains on the south and east, and the west point being the earlier boundary limit "on the Holston 6 English miles above the Long Island (Kingsport)." This area later became the main part of the new State of Franklin. Surveys began in April 1775, with William B. Smith and James Smith as the surveyors. The first tracts show the line distances to be recorded in chains (of 66-ft. length) read to the nearest one-half chain. Included were tracts for John Sevier and several for William Bean, who is known as the first permanent settler in Tennessee. Records of these are available in the Land Office, Tennessee Library and Archives.

The New Nation 1776–1796

These were troubled years over lands later to become Tennessee, both on the political and the surveying frontier. The wars were over, making settlement and ownership of western lands the concerns of the entire nation, and, in particular, the people living on the land. Probably the biggest incentive to settlers was the practice of awarding land to the officers and soldiers of the various wars, with some of the individual grants running into thousands of acres. The need for surveyors was recognized by all parties concerned. Much of the Tennessee political unrest was caused by disputed land titles where both Virginia and North Carolina settlers were claiming the same lands. Some of the events during this period of time illustrate the problems.

In 1773 Botetourt County appointed road surveyors along Beaver, Steele, and Muddy Creeks west of the present Bristol, while in 1776 Fincastle County appointed road surveyors for the section between the present Blountville and Kingsport. These early Virginia counties were seated east of Wytheville, over 100 miles from the location of the settlers. In 1779, North Carolina divided its western lands known as Washington County separating off a new county mostly of Virginians, to be known as Sullivan County. In 1782, it recognized as legal four Virginia land patents in the Bristol and Kingsport area, these patents had been granted almost 30 years earlier. In 1783 North Carolina established an area around the present day Nashville as a Military Land Grant Reservation, and at the same time reserved "Cherokee Lands" below the Holston and Tennessee Rivers. In 1788, it set aside land known as Indian Hunting Grounds which prohibited surveys and entries of colonial settlers in the entire Carter Valley area west of present Kingsport. Self-government, land titles, Indian displacement, and

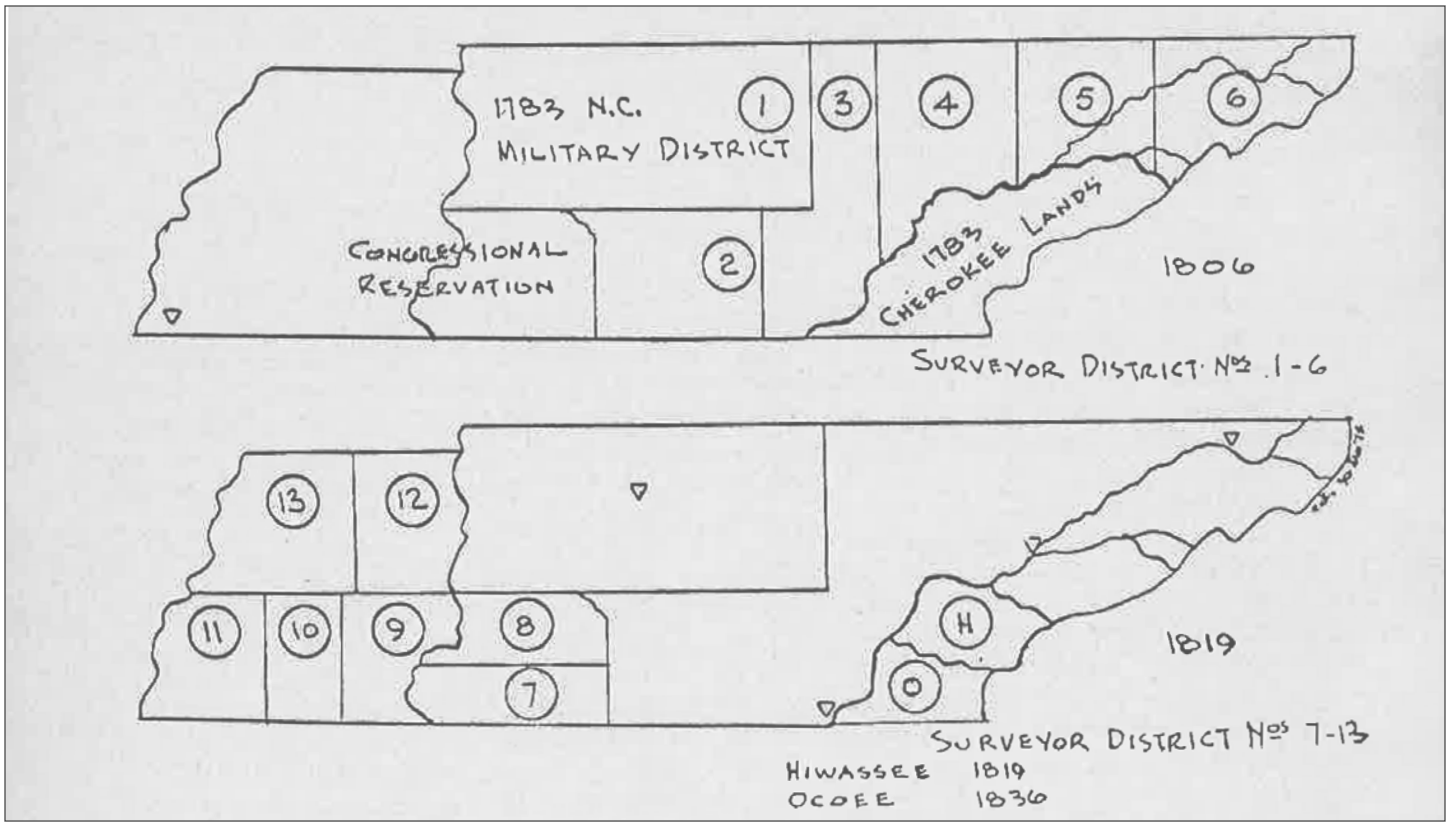

Figure 1. Tennessee Surveyors Districts.

western movement were problems facing the founders of the State of Tennessee.

Land Cession by the States

The awarding of land to the veterans of the wars was leading to many disputed claims in the western lands. Even in areas where there was no conflict between the states, the conflicts between claims made on paper and claims made on the ground were numerous.

Toward an organized procedure for setting up land titles and also for the award of public lands, Congress recommended that all states cede Western lands to the new nation. In 1784 and 1789 North Carolina submitted its Act of Cession of the Tennessee Territory, and in 1790 it was accepted by the Federal Government. It was part of "The Territory South of the Ohio and East of the Mississippi," the name applied to this entire group of western lands. During this period of time, the colonists were without military support and land titles, and some local groups organized their own government, one of which was the State of Franklin in East Tennessee.

Rectangular Survey System

Such a system was first used in parts of New England and was proposed for use in the western lands of the new nation. By an act of Congress in 1796,

a Surveyor General was appointed to oversee the work in the Ohio Territory and to establish the system for all western lands. The Federal System was not used in the eastern states, but all of the new states were surveyed under this system, with the exception of Texas, Kentucky, and Tennessee which were surveyed in part by individual state systems.

Tennessee Surveyor District Nos. 1 to 6

In 1806 the legislature established a rectangular system for the State of Tennessee, and provided for a division of the eastern part of the state into the land districts to be known as Surveyor Districts (see Fig. 2). This included all of East and Middle Tennessee except for an Indian Territory previously reserved for the Cherokees. The First District was to be the land previously set aside by the State of North Carolina as an area for Military Grants. The law required that the sections be 6 miles square and established with the meridians. The surveyors were required to survey the section lines and mark the corners. They were to draw a map to the scale of 400 poles (1¼ miles) to the inch, and the maps were to show "the quality of lands and on each line distinguishing the same by colors."

An original copy of the map for District 6 (circa 1807–1808) shows that there was no following of the Federal System. The Tennessee-Virginia line was used as the baseline, and the map was drawn

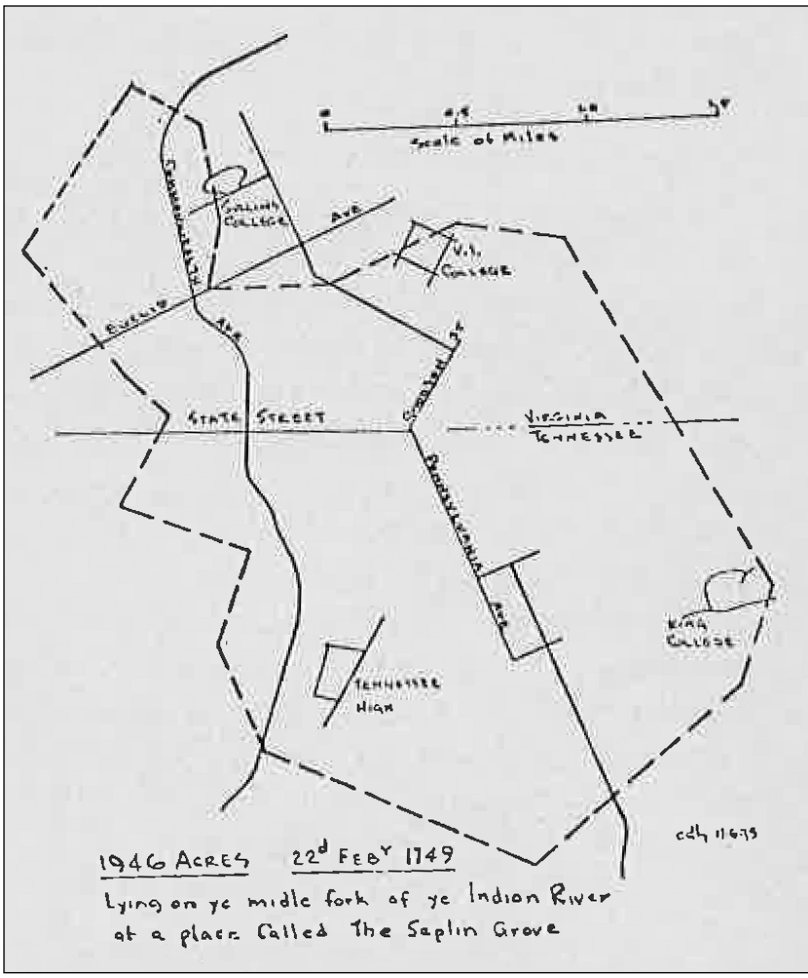

Figure 2. One of Col. Buchanan's Surveys superimposed on the principal features of Bristol, Tennessee-Virginia.

with the south side up. Sections were numbered consecutively for the entire district, rather than in ranges. How far the surveyor went in actually doing the field work and in marking the corners is not apparent, but this District Surveyor was familiar enough with the contiguous boundaries of the Indian Territory to keep east of the Big Pigeon River and to show sections in the area south of the "Frenche Broad River."

The map, which is 49½ x 77 inches

in size, includes all principal rivers, creeks, as well as roads, and shows the settlements of Elizabethton, Jonesborough, Blountville, Long Island, Rogersville, and Greenville. The map legend contains the following notation: "The Greene Serpentine Lines Represent the Watercourses; the Red Dotted Lines Represent the Roads; the Black or Blue on the Sectional Lines Represent the First Rate Land; The Greene Represents the Second Rate Land; the Red Represents the Third Rate Land."

Tennessee Surveyor District Nos. 7 to 13

Legislation of 1819 provided "that that part of the state usually denominated the congressional reservation shall be divided into seven districts, in each of which one principal surveyor shall be appointed by joint ballot of both houses of legislature." Section lines here were to be 5 miles square instead of 6 miles square. The maps were to be drawn to a scale of 160 poles (½ miles) to one inch; however, all maps examined by the author were drawn to the scale of 400 poles to the inch. The Tennessee State Library and Archives has on file copies of maps for Surveyor District Nos. 1, 3, 6, 7, 8, 9, 10, 11, and 13, all of which were drawn between 1807 and 1819.

Also in 1819, a surveyor's district known as Hiwassee District was established. Sections were 6 miles square laid out on the meridian lines with "standard 1 to 36 Federal Numbering." The Ocoee District was opened in 1836, again with 6 miles of square sections and standard federal numbering. In this area, however, the baseline ran with the mountains in the direction south 20° west.

The extent of the field drawing and records of the Tennessee Rectangular Survey System is not known to the author; nevertheless, it is known that baselines and numbering systems were established throughout much of the state. The 1855 and 1862 Kentucky-Tennessee maps show full grids as well as all of the adjoining areas of Georgia, Alabama, Mississippi, Arkansas, Missouri, Illinois, Indiana, and Ohio. A Kentucky-Tennessee map of 1883 shows the grid in both states to be limited to the areas west of the Tennessee River.

Concluding Remarks

As this article on East Tennessee Surveying concludes, the story is not finished, of course. The study has been limited to the period of 1740–1780, covering the land area of some 150 miles east of Kingsport. Surprisingly, surveyor field books, land entry books, trip journals, computations, and land office records still exist for much of this period. Investigations show that many items accepted as historical facts are actually erroneous assumptions, now easily disproved by documentary evidence. Surveying field books apparently are a source not yet tapped by historians. ■

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