SC DEPARTMENT of ENVIRONMENTAL SERVICES

Improving Permitting Efficiency with GPS/GIS:

South Carolina's Selection and Deployment of a Statewide Solution

October 27, 2026



Disclaimer

- The materials presented represent my opinions and do not reflect the opinions of NOWRA

Introduction

My name is Brad Poston. I began with SCDES in 2024 as a Program Manager for our Coastal Region. I worked previously as a Wetland's Scientist and High School Biology Teacher.

- As you will soon find out, I am not a public speaker



Purpose

The purpose of this presentation is to communicate how our Department recognized GPS technology could make our permitting procedure more efficient and to demonstrate the process we used to identify the unit and software we feel best suits our needs.





Agenda

- History of GPS technology
- A brief overview of how GPS technology works
- Identifying our need for technology
- Identifying the GPS unit and software
- Collaboration with SC Labor, Licensing, and Regulation to ensure use of GPS units do not require Surveyor's license
- Exploring further opportunities with GPS

History of GPS

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History of GPS Technology

- GPS began in the 1970s as a U.S. Department of Defense project.
  - The goal was to help the military know exactly where people and equipment were anywhere in the world.
- In the 1980s and 1990s, the satellite system expanded, and by the mid-1990s it became fully operational.
  - That's when the government allowed civilians—surveyors, engineers, farmers, and eventually everyone with a smartphone—to use GPS signals.

History of GPS Technology

- GPS works because dozens of satellites orbit Earth and constantly send out signals with their exact time and location.
    - A GPS receiver uses those signals to calculate your position on the ground.
- Over time, the system has improved with better satellites and stronger signals.
    - Today's GPS is much more accurate and is supported by other satellite systems from around the world, making it extremely reliable for professional surveying.

How GPS Works

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How GPS works

- GPS receivers track multiple satellite signals simultaneously to compute precise 3D positions on earth.
  - Satellites constantly send out signals that include the exact time the signal transmits.
  - The receiver picks up the signal from several satellites and measures how long the signal took to reach it.

How GPS works

- Since the signal travels at a known speed, the receiver can calculate exactly how far the satellite is from the receiver.
- With a known distance from at least four satellites the receive can figure out its exact location including; latitude, longitude, and elevation.

How GPS works

- The calculation is not always perfect:
  - Errors can be caused by the atmosphere and satellite clock drift.
  - Some receivers have the capability to use differential GPS or real-time kinematic corrections from reference stations that provide real time adjustments.

How GPS works

- Many GPS units combine with other constellations for faster fixes and higher reliability.

Identifying the Need

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Identifying the Need

- QI study done by Lisa Brownlee of Leader's Imago, LLC in 2024.
- Recognized how we perform site evaluations can be improved for accuracy.
- Observed that there is inconsistence in the quality of site layout drawings.
- Ultimately Created GPS Workgroup



QI Study

- Processed 3,660 permits from June-November 2023
- Average time of processing 21 weeks
  - Goal of agency is 15 days
- Identified finding and using technology to speed up initial site evaluation



Site Evaluations

- Different evaluators use various tools to measure distance.
  - Tape measures, 25’, 100’, 200’, etc.
  - Wheels
  - Pacing
  - Laser Range Finders
- Use their outstretched arms pointing to property corners to identify property lines.
- Sight judge a 90° angle with property lines



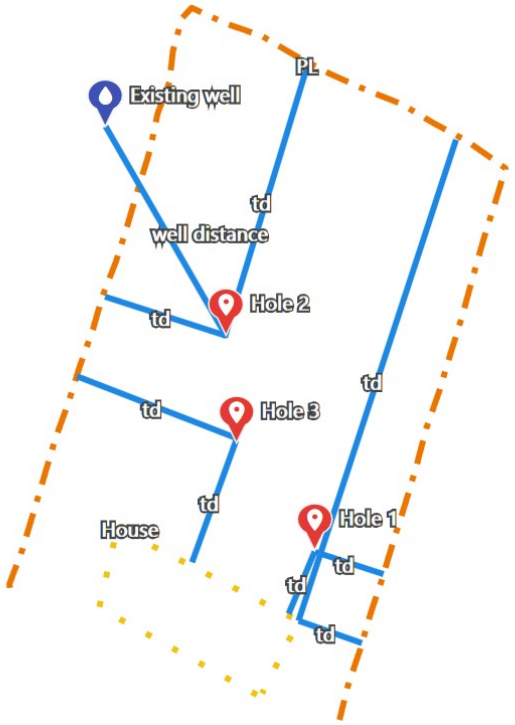
Quality of Permit Drawing

- Permits vary in legibility, scale, and detail.
    - Hand drawn
        - Some freehand drawings, others use rulers, protractors, etc.
    - Solid lines are used for all features, i.e., property lines, fences, roads, etc.

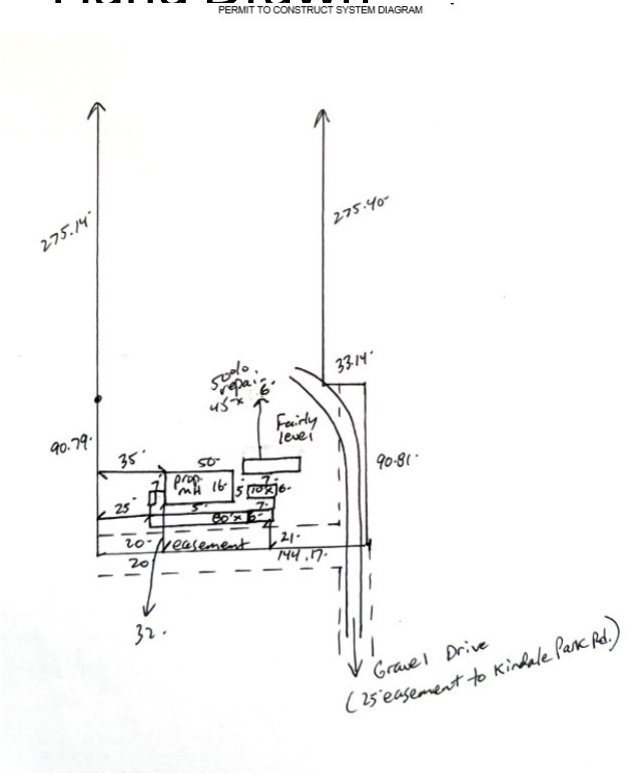


Site Drawing Comparison

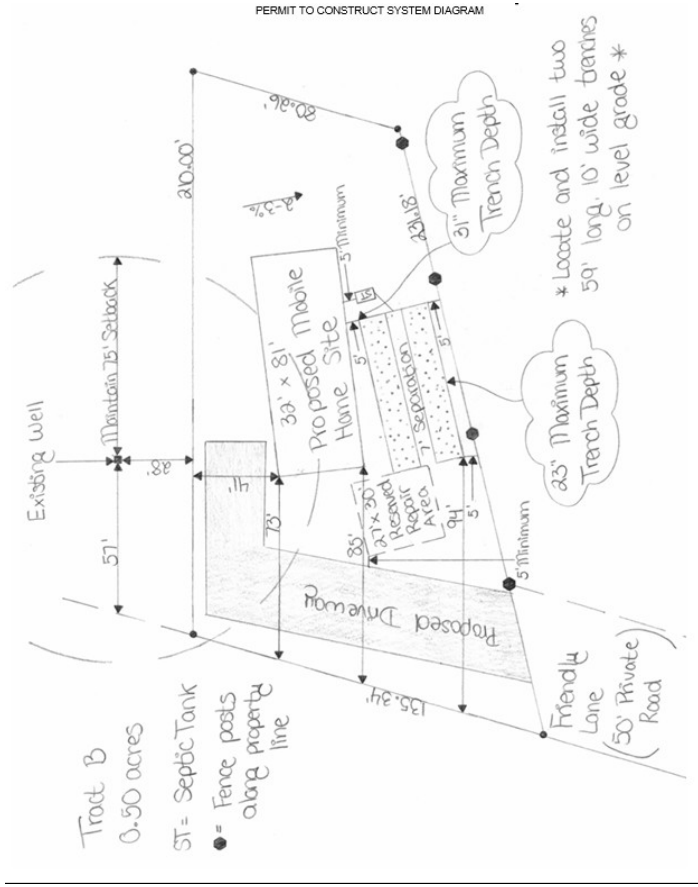
Uinta

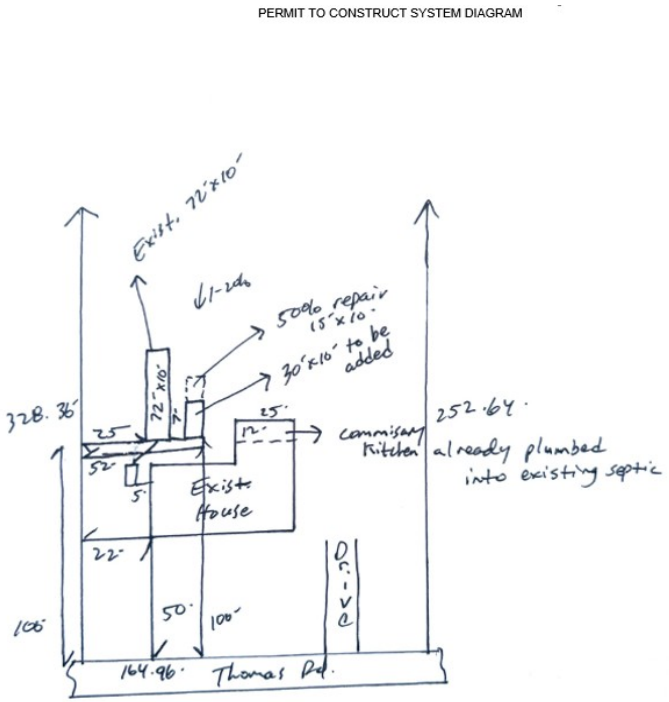


Hand Drawn



Hand Drawn Permits





Identifying the Solution

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Workgroup Members

- Brad Poston
- Kevin Holland
- Jason Goff
- Jacob Guiton
- Emily Newman
- John Hutchinson
- Austin Short
- Jeff Lowder
- Marcus Harris
- Michael Hayes
- Robin Mack

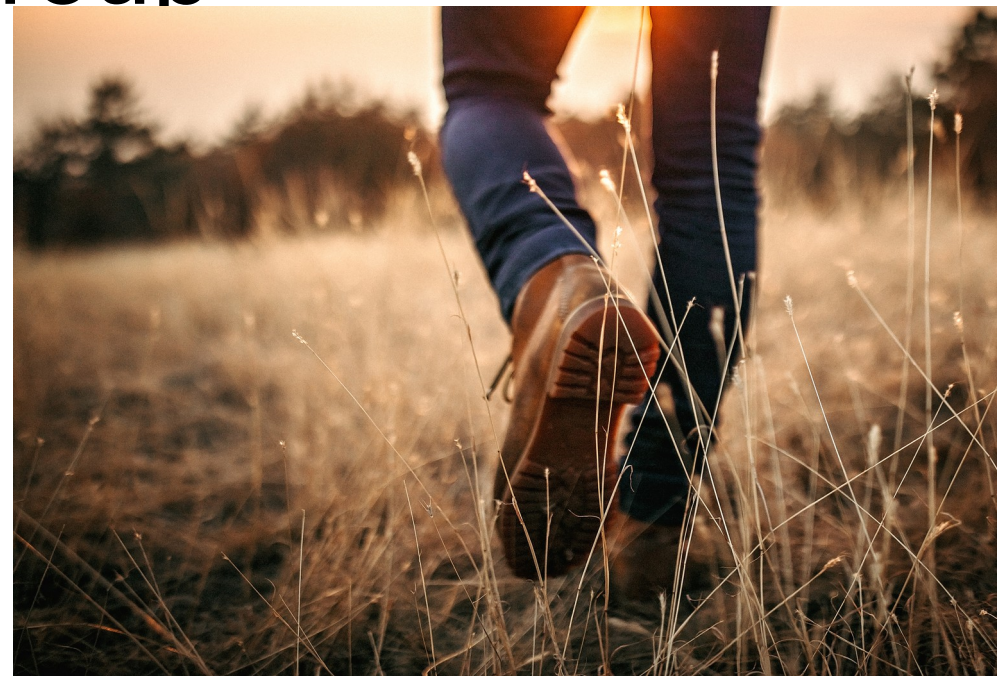
GPS Workgroup

- Met virtually
  - Discussed whether there was a need using information passed on to us from management, i.e., QI study, variability of site drawings, etc.
  - If so, what were the goals with the technology
  - What technology would be best suited

GPS Workgroup

- Ultimately decided there was a need for some kind of technology
  - Reached out to a Leica rep, Landmark Solutions, and a Moasure Rep
  - Used information from prior presentations on TopCon and Trimble.
- Created Goals

GPS Workgroup



- Created Goals
  - Accuracy
    - Sub meter
  - Efficiency on site
    - Less time walking
    - Having points stored rather than noting by hand
  - More professional, consistent site drawing
    - Digital vs. hand drawn

GPS Workgroup

- Presentations from Vendors
  - Leica, Topcon and Trimble
    - Enormous capabilities
    - $$$$





GPS Workgroup

- Landmark
  - Juniper Geode w/ Uinta software
  - Simple to use
  - $$
- Moasure
  - Easy way to measure distances
  - $



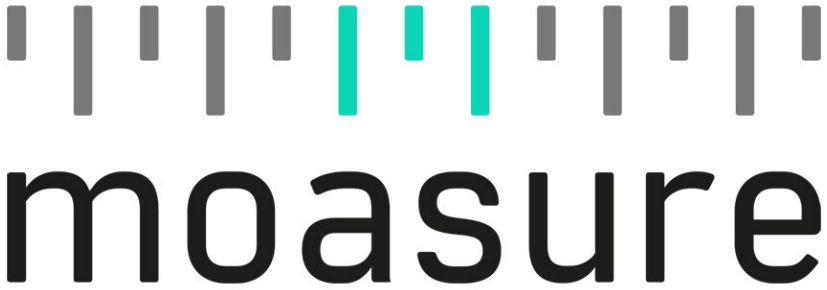
GPS Workgroup

- Determined units to test
  - Did not test
    - Leica, Topcon, and Trimble
      - Numerous features and capabilities
        - High complexity and steep learning curve
      - $$$$



GPS Workgroup

- Tested
  - Juniper Geode + Uinta software, Moasure
    - Apparent ease of use
    - $$,$



Field Testing Units

Field staff went out to various sites on different terrain with different cover and used Geode or Moasure.

- Used information gathered to draw site design

Geode

- Uses GPS to measure lengths and store points, lines, and areas.
- Uinta software allows for measuring and editing in field and office

Moasure

- Uses motion to measure distances
- Software allows for some editing in office



Juniper Geode Results



- Accuracy
  - Sub 3’
- Efficiency
  - Ease of use
  - Record marked points in field, i.e. house, property corners, well, etc.
  - Measure and edit in field and office
  - Con- cannot use on lots with heavy cover

Juniper Geode Results



- Professional Product
  - Digitally drawn, straight lines, can use dashes, dots, etc. for different features
  - Can export as pdf into our permitting system to create permit
  - Can overlay system drawing onto satellite imagery.

Moasure



- Accuracy
  - 99.7%
    - Accuracy is based on length of line
- Efficiency
  - Measures lines and areas

Moasure



- Somewhat difficult to measure entire site
  - Times out when paused
  - You must stop to tap unit to ground every 10’ or so.
- Professional Product
  - Created site plan in layers
  - Difficult to export site plan, no pdf export

Platform Chosen

- Juniper Geode with Uinta software from Landmark Solutions
  - Ease of use
    - Can set up templates to use for sites so many common features are already labeled.
  - Accuracy
  - Price
  - Professional final product
- Landmark included training
- Same workgroup to develop SOP and operating manual

SC Labor, Licensing and Regulation Collab

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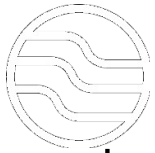
SCLLR Collaboration

- We announced to our local SCOWA we would be implementing GPS units into our evaluations.
- Someone in the audience notified our leadership that we may need to contact SCLLR to be sure our activities with the GPS unit did not require a Professional Surveyor's license.



SCLLR Collaboration

- We met with their attorney to explain our purpose of using the units
  - Do not intend to expand our authority or perform new functions
    - Same function with tape measure, range finder or GPS receiver
  - Do not intend to establish boundary lines, replace missing corners, determine ownership, etc.
    - We rely entirely on boundaries and features identified by the applicant and accept them as existing facts for permitting purposes

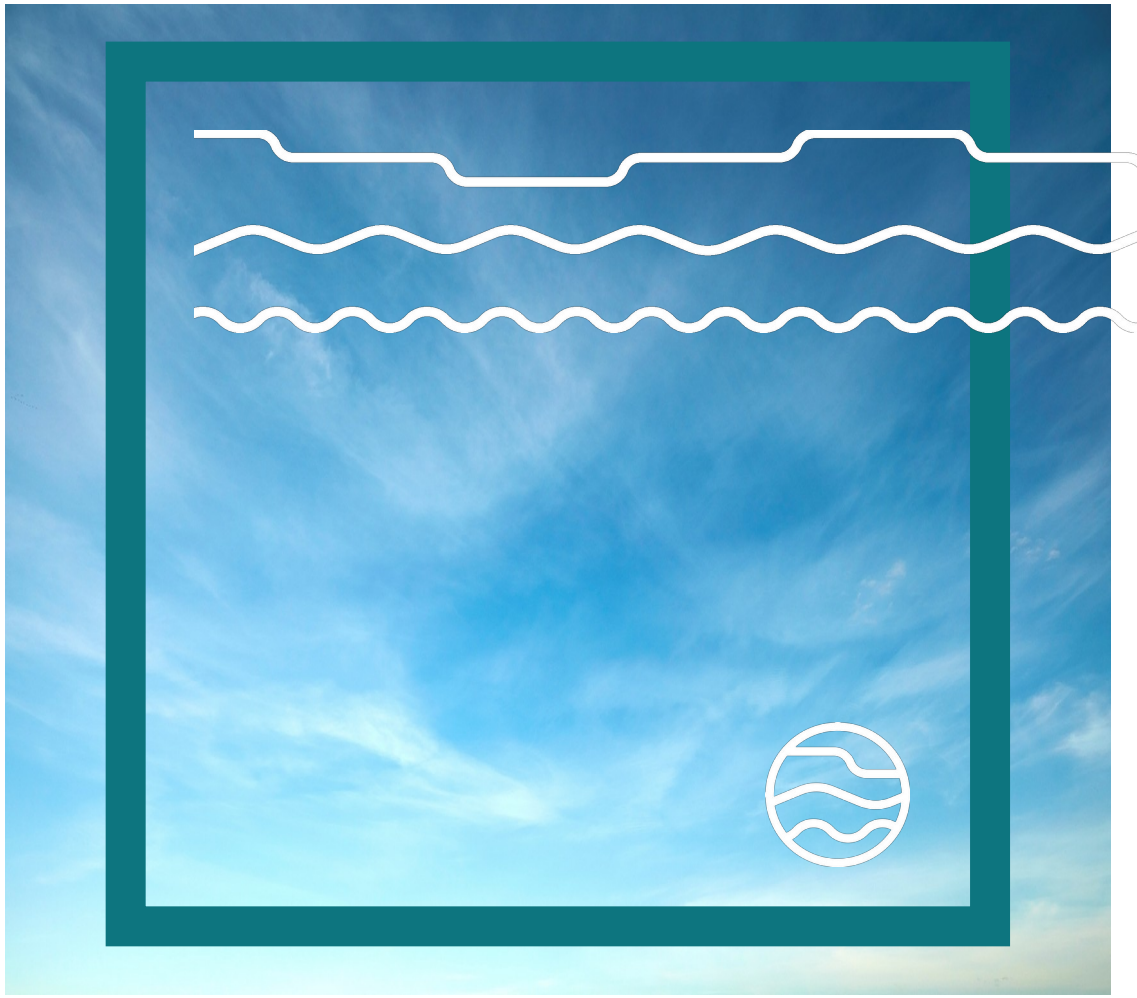


Exploring Further Opportunities

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Where can we go from here?

- Possible multi-frequency w/ RTK to gather elevation
    - Juniper's Geode GNS#H is a low-cost multi-frequency RTK receiver.
        - Centimeter grade accuracy
        - elevations of sites to determine slope and elevation of installed systems.



Where can we go from here?

- Potentially use GPS coordinates to tie down systems
  - Save time in the field
  - Also help with difficulty in determining features to tie down to on large sites
- Use the units with ESRI to integrate our captured data directly into our permitting software.



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