

Field note Fundamentals: How to Prepare Them & What to Include

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Field notes: love them or hate them? Paper or electronic? Clear-cut process or wild west?

Professional land surveyors recognize that field notes are a critical part of the surveying process.

In a nutshell, field notes serve to record all pertinent information, measurements, calculations, sketches, and observations made by the surveyor during the course of their duty. These notes become the permanent record of the survey.

The bigger the project or business, the more critical field notes arguably become. And because the individual preparing the field notes may not be the same person who reviews them in the future, their legibility and meaning must be clear.



Three professionals share their field note expertise

On a recent episode of [The Geoholics](#) podcast, hosts Kent Groh and Ryan Kelly interviewed three experienced surveyors on exactly how they take field notes and what they include.

The three surveyors in attendance were:

Philip Adams, PLS: President and CEO of Adams Surveying Company in Dallas, Texas, Adams specializes in large construction projects. Adams founded his firm 12 years ago and has been in the surveying business for 40 years.

Ryan Swingley, PLS: Geospatial Manager for ESP Associates, Swingley is based in Indianapolis and specializes in LIDAR and UAV. He has been surveying for 24 years.

Phil Fedor, RLS: A surveyor for Bowman Consulting, Fedor is a project manager based in Tempe, Arizona. A long-time field veteran, he will celebrate 30 years of surveying in July 2021.

Why are field notes important?

Imagine you work for a big surveying company with ten crews. Your company takes on a big construction staking project, and five separate crews have a role on the site.

In this scenario, the importance of being able to follow the surveyor who came before you takes on both a short-term and a long-term significance.

"Following in the footsteps of the surveyor before you - that's what we all been doing. And it's one of the fundamentals. And on the construction side of it is a microcosm of that," said Phil Fedor.



Essentials like where control is and how it was established, and what the line of sight was are critical paper trail. If the surveyor or party chief responsible for the original field notes moves out of town, the new chief needs to pick up the project quickly.

"The new guy coming in has to be able to move in smoothly and seamlessly and take care of his contractor who's jumping up and down and barking at them because things aren't getting laid out, so they can get this stuff built and meet their timeline. Those field notes help make that a seamless transition," he said.



While field notes are an essential piece of the puzzle at every level, they are of particular importance to the crew chief.

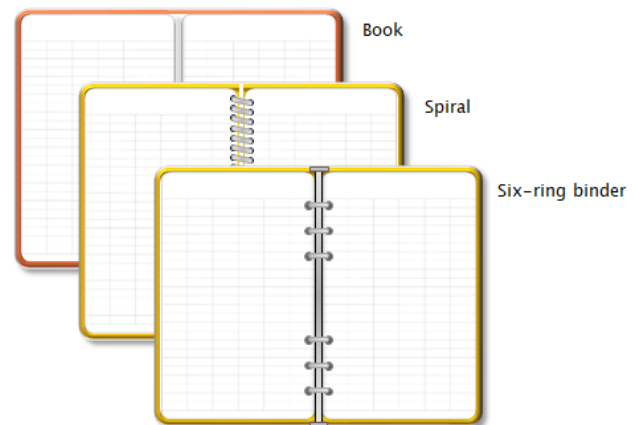
If you want to jump into an ongoing project and quickly understand where a project stands, you need access to good field notes.

"The crew chief is the eyes and ears of any office personnel. And in today's day and age, not many of our techs and PLS's go out to the field on a regular basis. So obviously, we're relying on that party chief to be those eyes and ears and relay any important pertinent information to the team back to the office," said Ryan Swingley.

Essential fieldnote components

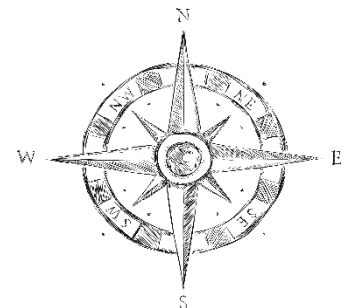
There are many essential elements of field notes in addition to establishing control. Important components that Adams, Swingley, and Fedor mentioned include the following:

- Date
- Team members present
- Weather conditions
- Equipment used
- File naming conventions
- Control used
- Location of first control point
- Rod heights
- Base height and location
- Level information (benchmark location, type, method)
- North arrow
- Relevant drawings
- Relevant variables impacting the site or crew



"One of my pet peeves was having a North arrow on every single page that has a sketch. I can't tell you how many times people start drawing things and whenever someone else looks at it, North looks like the other way," said Philip Adams.

He explained that it's also important to give a correct sense of proportions. He recommended that teams complete a practice exercise to ensure they have a method for getting it right.



"It's very difficult when the drawings are substantially out of proportion. You have a building five feet from a property line, but it looks a hundred and comparison to everything else. So the best way to teach these guys how to do it is to have one guy on a crew go out and draw it. And the other guy has to come into the office and draft it. And they started understanding what they need," he said.

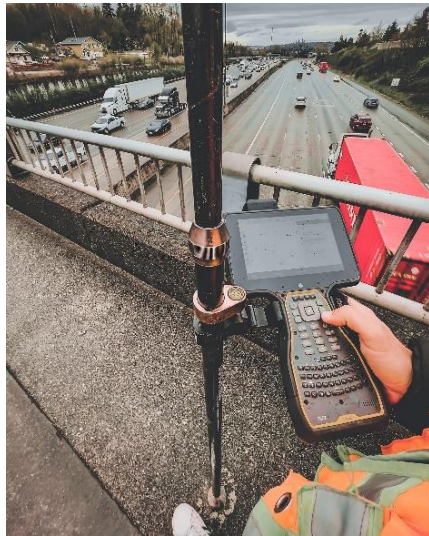
Electronic versus handwritten field notes

The question of the hour seems to be: how do you actually go about recording your field notes? Is it all paper? All electronic? Something in between?

Valid arguments were made on both sides of the aisle, with the consensus being that a hybrid model works best.



The case for electronic notes



Ryan Swingley was team electronic notes, citing the fact that you can easily save all notes to an electronic file, timestamp sensitive documents and photos, and save everything safely in the cloud.

"I don't want to say there's little place for paper notes today, but I'm definitely very pro electronic notes because electronic notes don't lie, right?" Ryan said.

With the electronic data from his GPS Rover, he knows every second every shot was taken in history, which is powerful information to have at your fingertips.

"I really liked the data integrity of electronic notes. And what I would say is when it comes to a boundary perspective and a topographic perspective to me, I mean, you can add a written note to any code or any shot. You can add attribution. You can take photos and attach them to points these days. So from that perspective, I find that there's little use of paper notes," he added.

Ryan also made the point that paper notes are fragile. On one job site when he was in college, it started to rain, and the field book got kicked out of the truck and swept down the gutter, never to be seen again. And while he admits that you can lose a data collector just as easily, there are ways to safeguard and backup electronic data - but not a paper field book.

The case for handwritten notes

Philip Adams agreed that today's technology is astounding - but sometimes, you need some good old-fashioned backup checks and balances.

"Just to challenge that new technology, we use heavy photogrammetry and LIDAR. We're constantly checking ground observation, ground-truthing, to compare it. In a conventional survey, we still run an actual close level on every GPS point that we do. They are just safeguards," he said.

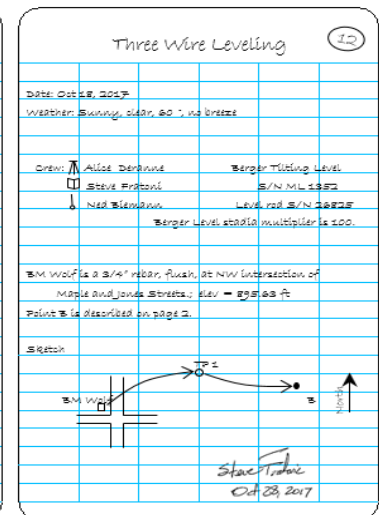
And while some people may think it's strange, his team still uses levels on every job.

"Being heavy construction, GPS just flat out by itself is not adequate for hardscape construction when you're on a network. You can do all the checks you want, but it has a floating variable of about two tenths so that you just can't mean out in construction. So we do things robotically, but we have to run a level on every single job because you have to know what your precision is going to be to know which tool to use. And we never lose an argument when we run a level."

Philip also said that you can't lose sight of the history of the profession and need to cultivate a deep understanding of how things work and why things are done the way they are.

① Three Wire Leveling

Point	BS (+)	Stadia	IS (-)	Stadia	Elev
BM Wolf					100.000
I	4.755	0.80	2.81		+4.753
M	4.755	0.80	2.80	0.81	
B	4.25	0.45	2.80	0.80	104.753
Avg	4.753	0.83	2.803	1.01	- 2.103
TP 1		89.0	101		102.850
I	3.35		3.80		+3.337
M	3.34	0.81	3.21	0.83	
B	8.72	0.82	8.81	0.80	111.987
Avg	3.337	1.23	3.207	1.19	- 3.207
B		123	119		104.780
Σ BM	14.020		3.810		
Page Check					
Start	100.000				
Σ (BS)	14.020				
Σ (IS)	-3.810				
End	104.780				✓



"When the equipment has a failure or question, you need to be able to go back to the old way," he said. "I think we'll let go of some of the use of it, but we can't let go of the history."

He gave the example of seeing an airplane flying through the sky. It's impossible not to look at the plane and know the general history of how it got into the sky in the first place.

"We'll still have to go back to the root, the core. So everything that we're doing, we have to go back to the core root of the development, whether it's the survey or the equipment that we use to get the survey," he said.

The benefits of a hybrid notes system

Just because Philip Adams takes an old-school approach does not mean he doesn't value technology. At the end of the day, he sees a clear need for both legacy systems and new technology to work hand in hand.

About seven years ago, Adams' company bought a drone to start their photogrammetry department. Soon, they were taking drone photos for every single boundary. For every image, they then create a compilation mosaic in order to underlay additional survey information such as sidewalks.

"Every photograph associated with that mosaic is stored in a database that has the date and time. So we have that type of record as well, but we still have a handwritten field book that says this drone flight occurred on this date, and this time this was the drone we use," he said. "The photo or photogrammetry has replaced a lot of hand notes because a picture's worth a thousand words."



In this way, handwritten notes and photos work together.

"There's a lot of data that is stored in the data collectors. It's processed; it's raw data. But I look at that as like paragraphs in a book. And I look at the handwritten notes as the footnotes describing when and where something occurred because you have to trace it back somehow," He explained.

Phil Fedor agreed. He explained that when it comes to boundary surveying in the construction world, he likes to see handwritten notes that cover key project elements like the state of the control and monuments.

"There certainly has to be a compromise for lack of a better term. But yeah, I mean, you certainly don't want to throw away the old way, and you know, throw the baby out with the bathwater, cut your nose off to spite your face, all those cliches. They both have to work hand in hand," Fedor said.

As with many aspects of surveying, you have to trust the insights of competent, boots-on-the-ground team members as they record important information on the fly and have appropriate technological aids in place.

Field notes as legal evidence

Perhaps the most significant consideration when it comes to field notes is that the notes aren't just a good handoff between professionals - they are also a key piece of evidence within the courtroom setting.

This is one of the biggest reasons why Philip Adams argues for a combination of handwritten and electronic field notes: in the legal world, he has observed firsthand that handwritten evidence often wins.

"I spent a lot of time in court or trying to avoid being in court because I was an expert witness," he explained.



"The field notes are the genesis of your survey. Everything is rooted in those field notes. You can have a flawless survey, but if your field notes don't support it, the court's going to reject your findings. So it's absolutely imperative to have those field notes as perfect as possible."

Naturally, the first hurdle is that you need to have field notes, period.

"If I don't have the field notes, or if the other side doesn't have field notes, whoever doesn't have good field and usually loses. You can sit there and talk all you want about your survey, but unless you can prove it, it's difficult," he said.

As far as whether electronic field notes will cut it or not, sometimes it just comes down to the judge assigned to the case and which field note format they view as being superior. But more often than not, he's seen surveyors who have some form of handwritten evidence win out.

"If you're in the field and you're taking handwritten notes, those are more valid than the collected data that's processed later. So there's an order of dignity of call, so to speak, in the chain of title of how these notes were created. So you want to get those handwritten notes, even if it's not specific to the details, but what day it was, who did it, and generally what were you trying to accomplish," he said.

If you have text messages and photographs that are meticulously dated and timed, those can certainly be on par with handwritten field notes.

In the end, it all comes down to the aura of thoroughness and trustworthiness that you can present based on your cumulative field note data. Because we live in a very litigious society, you want to make sure you CYA: cover your ass.

Field notes role in the construction world



If there's a surveying sector where field notes retain extra importance, it's in the construction realm.

Phil Fedor drove home the point that party chiefs are the critical link to transmit information from the field to the office - and more often than not, that means taking good field notes.

"You're the eyes and ears of the field for the office, and you've gotta be able to convey that story to us. And so that way we can take care of our contractors or our clients, whatever the case may be. So we rely heavily on you guys to be able to draw that picture for us, whether it be in words and numbers or actual drawings," said Phil.

Philip Adams agreed. In the world of land development, where boundary surveys are plentiful, it's hard to move totally away from handwritten notes pertaining to corners and offsets to roads.

Rather than focusing on how the field notes get taken down, Adams is currently focused on accuracy.

"I think one of the things we're trying to do and in our own way is not necessarily getting rid of notes, but trying to avoid transposition errors, human errors, just user errors. We're actually investigating inverted scanning technology so that when we pop a lid on a manhole, we can just scan the manhole instead of having the traditional way of writing it down," he said.

All too often, manhole measurements are transcribed incorrectly, or one-person crew data results in confusion since there is no partner to double-check the notes and calculations.

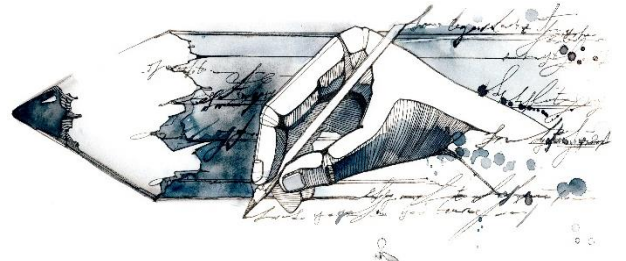
Ultimately when a contractor is standing in front of you telling you that you screwed up, you want to be able to correct them with confidence rather than slink off with your tail between your legs.

Surveying is an art

Surveying is more than flying drones and beeping machinery.

It's both an art and a science - and field notes are an integral part of that.

Field notes don't just supply evidence for a theoretical courtroom. They tell a story. Looking back at surveyors' field notes from decades past is to witness something both informative and beautiful.



Surveyors can and should take pride in every stamped survey that is sent to a client and every field book that carries that story forward into the future.

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