Standards Oversight Council (SOC)

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01 Verification of Land Features in Silurian Bedrock/Karst Areas Standard Team MEETING NOTES

Thursday, June 27, 2019 ▲ 9:30am – 3:00pm ▲

UW Division of Extension - 625 E. County Road Y, Meeting Room B, Oshkosh, WI

9:30 Welcome, Introduction, Notes Approval (Kate, Team)

Goal: Welcome, review objective for meeting today, and review and, if needed, adjust 5/23/19 draft meeting notes as necessary and approve.

Present: Kate Brunner, Rachel Rushmann, Joe Baeten, Travis Engels, Amy Haak, David Hart, Maureen Muldoon, Nathen Nysse, Tony Reali, Francisco Arriaga, Matt Komiskey, Jason Nemecek, Jamie Patton, and Matt Woodrow.
Absent: None
Invited Guests: Art Fromm; Tyler Lund, Veris (remotely); and Brian Luck, Extension (remotely)
Public Guests: None

No edits to 5/23 notes were raised. Kate will post final online in a week so please email her any lingering comments this week. For those who were absent at last meeting, please be sure to review notes to stay caught up with team progress.

Action Items from last meeting:

- Matt W – list of items to include in each submittal
- Joe – restoration - summary of DNR requirements or guidance for boring and test pit abandonment/restoration
- DATCP will take the information from these and insert into draft standard for later review and consensus by the team

Rachel emailed a summary of NR151 Targeted Performance Standard implications for DATCP.

- This was in response to earlier questions posed by the team related to acreage impacted—this summary includes a table showing cropland acreage by depth.
- Figure in that NR151 summary was outdated. Joe emailed updated DNR map, showing areas with Silurian bedrock at depth less than 20 ft. This was map composited from multiple sources, not county scale map.

Geophysical Survey Options (Art Fromm)

Goal: Question and answer discussion for input on geophysical methods – recommendations for each targeted depth, accuracy, qualifications. Some key points of the presentation and discussion are below.

Art has many years experience operating and interpreting a variety of geophysical equipment. His website bedrockmapping.com has detail on his interpretations and advice for field verification component of the NR 151 targeted performance standards.

Art poses questions for team consideration: What is definition of top of bedrock? What is the horizontal and vertical accuracy that will be needed?

There are a variety of geophysical technologies—like Geonics has EM-38 which is good up to 5', EM-31S good 2-10', EM-31 good up to 20', EM-34 good for deeper soil/rock interface. He also recommends Ohmmapper and GPR.

Art recommends a multi-phase approach:

First, wide transects.
Then, 2nd phase to focus on areas where the data is changing a lot or to define critical boundaries. The area for the 2nd phase would be about 25% of initial field size.
Collecting geophysical data would be about $1500-$2000 per 100-acre field for 2 phases and would take about 2 days. Data analysis would be minimum 1 week for draft data.
3rd phase would then be ground truthing.

Accuracy:

- Team/user will need to consider what is cost-effective. Geophysical methods tend to get more accurate with increased cost.
- Geophysical methods tend to have greater error with increased depth. Ground truthing is recommended for all depths.
- Vertical resolution depends on soil variations but likely 10% of the total depth. Geonics rep says +- 6 inches, which is true for less than 5-foot depth but it's less accurate with greater depths.
- Variation in conductivity needs to be interpreted into a depth to bedrock—this is why qualifications and experience are important.

Qualifications:

- Running the equipment is relatively easy but more advanced skill and experience is required to interpret the output. Team discusses that the qualifications could be split for data collection and interpretation.
- Data interpretation doesn't necessarily have to be a licensed professional but that could be a place to start—perhaps 5 years experience in geophysics as well.
- Background in "Earth Sciences" – broader, more inclusive term than geology or soils science, for example.

Ground truthing is recommended though this isn't Art's area of expertise. He recommends the team could talk to Al Shapiro of Vulcan materials about confirmation methods like probing and excavation.

General issues also raised (not just geophysics)

- What would timing allowance be for farmer while verification is underway? This standard is for farmer to dispute the mapped depth to bedrock. There are certain windows of time where a field is available and accessible to perform field verification, then time for analysis and approval. It could be a 1-year process to perform verification and have it confirmed complete; during that time the mapped depth to bedrock would be applied for NR151 implementation.
- Cost sharing is not yet developed for this verification but if there's cost sharing, that could add time.

Geophysical Survey Options from Veris (Tyler Lund)

Goal: Question and answer discussion for input on Veris technologies – recommendations for each targeted depth, accuracy, qualifications. Some key points of the presentation and discussion are below.

Veris products max-out at 36" depth so 2' and 3' boundary would be appropriate but 5' and 20' are beyond Veris capacity. Veris equipment can get to 5' depth on some models with use of additional "wings" to widen area.

Veris products are pulled behind a vehicle with probes that hit the soil. The instrument records real time (typ. a reading every second) in the line of the driving pattern. Spacing of points depends on speed of vehicle.

Accuracy:

- Veris measures voltage changes is soil resistivity and it's very accurate at this specifically.
- For depth to bedrock, accuracy would be based on validation (field truthing) and frequency of spacing. Veris recommends spacing every 40-60' with a reading every second for spatially dense data set.
- Shallow and deep conductivity are recorded to triangulate depths. Differences in soil texture are interpreted as background. Bedrock would be identified.
- Differentiation of consolidated bedrock vs weathered bedrock would be nuanced based on conductivity; this is why ground truthing is important.

Qualifications:

- Collecting the data is easy with no special knowledge, just a couple hours between Veris and operator
- Choosing the locations and interpreting data require some skill.

Veris software allows real-time data viewing via Windows (like a tablet in the cab of the vehicle). The software reports out errors like:

- no conductivity (probe out of soil)
- too dry

- erratic readings (e.g., wire loose or probe bouncing)

Cost:

- Cost of operation varies $5-$15/acre depending on field, operator skill, and data requirements. Typ. field $10/acre.
- There is additional cost to interpret data and convert resistivity results to top of rock.

In Team discussion on accuracy and field truthing, **Travis, Nate and Francisco** offer to work together on a field in Kewaunee Co. to compare in-field depth to bedrock data for a single field. This comparison would include hand probe, Veris and EM (EM-38 and/or other avail via Francisco). The field needs to be cleared first but they will coordinate when the time comes.

Review Intrusive Method Comparison & Geophysical Survey Options (Rachel, Dave)

Goal: Review and finalize the intrusive method comparison summary and detailed comparison and start discussion on geophysical comparison table.

Team reviews the updated summary comparison tables (handout and show on-screen) of intrusive methods side-by-side. These are based on the breakout group work from last meeting and team discussions. The high-level summary table would likely be the first table in the standard to start with a big picture overview of the options.

In addition to edits made directly to table, some key points of discussion:

- Team should be cautious about non-quantified terms like “relatively accurate”.
- Team should be cautious about safety issues for some of these methods. Standards typically don’t reiterate things like OSHA or environmental protection requirements, but there is a boilerplate, generic statement about following all applicable rules and regulations.
- Physical ability is subjective; this may impact data quality for hand probing.
- Experience level would impact quality of data. Team may include a Consideration that greater experience with a method/technology would be expected to provide greater accuracy. Exact language will be determined later.
- Frequency (aka density) of sampling will require additional discussion. Some areas of discussion thus far:
    - Maps that are being disputed are typically not based on dense sampling, like 1 sample per 40 acres. We’d need more dense sampling to refine the existing data. We’d start with some general grid (like 1 sample per acre), then have increased sampling to determine boundary (2’, 3’ or 5’) with greater accuracy. What is acceptable accuracy?
    - Density should change by depth. The 2’ boundary is most critical depth, though all the boundaries have utility depending on the farmer’s need (e.g. CAFOs and 3’ or 5’ boundary). Perhaps 1 sample per acre (which would be 1 sample every 208’) where bedrock is expected to be 5’ or shallower, but 1 sample every 2

acres for deeper rock. What is acceptable density for various depth intervals we are considering?
    - How does sample density decrease further when one method is combined with another (like Veris plus hand probing)? **Francisco** knows of some existing soil sampling protocols that have varying sample density based on combinations of multiple methods; he will pull some examples and send them to the team for consideration as template for our language.
    - The density should take into account cost. Though cost sharing may be available at a later date, it is not yet known and this could get expensive. CAFOs wouldn't be eligible for cost sharing.
    - Standard should specify whether sample point is central or on grid line.
- This standard will just be about the in-field verification. ATCP 50 will include who to submit it to, and what happens to the data.

Kate will email revised working tables of intrusive methods (basic summary and the details from the 5/23 breakout groups) and geophysical methods (initial draft started by Dante Fratta and Dave Hart). The **Full Team** will review the tables and provide comments to Rachel and Kate by July 11.

GPS Accuracy and Cost (Brian Luck)

Goal: Gain understanding of the degrees of GPS accuracy and associated cost, use of GPS in both gathering sample locations and in returning to the location during manure spreading.

Brian provided some websites to help with terminology and understanding of the different GPS accuracies.
http://precision.agwired.com/2009/10/30/gps-accuracy-how-accurate-is-accurate/
https://www.gps.gov/systems/gps/performance/accuracy/
https://www.gps.gov/systems/augmentations/

Team asked about the GPS cost and device accuracy, both for initial point location and for farmer/hauler use for future spreading. Some key points:

- Only RTK/Wiscors can be accurate within a foot. These are pay services around $800 to $1000 per year, plus cost of equipment. This are on some farming equipment now, but that level of precision not needed on all farm equipment.
- Traditional hand-held Garmin-type unit are +- 16" with drift up to 5' in either direction. Potential error on GPS is additive, so if you have +-6' accuracy, the initial data point Is+-6" but when you go back to locate the point a second time (to repeat data, or to spread), THAT'S only +-12' accuracy.
- GPS drifts over time so points would be less accurate if there are years between initial verification and spreading.
- Manure spreaders can use WAAS, since that doesn't usually need to be exact (more about relatively even spreading and not precision application).
- Manure spreaders have around 20'-30' wide spread, and they will pass so the spray will overlap.

Geophysical Survey Options Review and Discussion (Dave, Rachel)

Goal: Review geophysical summary spreadsheets as well as criteria and considerations for geophysical survey methods. Identify additional knowledge gaps and develop plan to address.

There is not adequate time remaining to fully discuss this topic. We briefly show on-screen and provide a handout of the revised summary comparison tables with geophysical methods side by side.

Dave, Dante Fratta, and Rachel met twice since the last meeting to come up with this table with comparable information for each geophysical method. **Kate** will email revised working tables of geophysical methods to the group, and the **Full Team** will review the tables and provide comments to Rachel and Kate by July 11.

At next meeting we can discuss where further clarification is needed and get consensus on geophysical criteria to go into standard.

Next Meeting Topics and Plan of Action (Kate, Team)

Goal: Identify and understand the topics, concerns, and goals for next meeting. Review Action Items and agenda items for next meeting.

Show timeline on-screen – these were our original milestone goals and we'd like to adhere to them if possible. Rachel is starting to assemble language into the technical standard style, based on discussions thus far.

1. What remains to be discussed?
    a. Sampling density – consensus on basic density by depth, plus variations with combination of methods (ground truthing)
    b. Accuracy of vertical measurements
    c. Definitions – bedrock defined in NR141 so we may use that. **Joe** will send the team the DNR definition of bedrock for discussion.
    d. Qualifications – define qualification for data collection and interpretation and whether farmer-collected data is acceptable
    e. Relationship of Precision, Risk, and Cost – where can standard land in compromise
    f. Closed depressions – additional criteria
    g. Submittals – what documentation will be required? Matt W created list as assignment from last meeting, based on DNR and NRCS samples. Team will review in subsequent meeting.
2. In remaining time, we'd like to continue to make use of take-home assignments. The assignments and action items from this meeting:
    a. **Joe** - Send the team the DNR definition of bedrock and abandonment details.

b. **Kate** - Email revised working tables of both the intrusive methods (basic summary and the details from the 5/23 breakout groups) and geophysical methods (initial draft started by Dante Fratta and Dave Hart).
c. **Full Team** - Review the summaries of intrusive methods and geophysical methods. Provide comments to Rachel and Kate by July 11.
d. **Travis, Nate and Francisco** - Work together to compare in-field depth to bedrock data for a single field using hand probe, Veris and EM (EM-38 and/or other avail?). This will be done after field in Kewaunee Co cleared (not before next meeting in July).
e. **Francisco** - Provide examples of text which use varying sample density based on combinations of multiple methods.
f. **Tony** - Contact Bruce Riesterer from Manitowoc Co. LCD to discuss county usage of Lidar for closed depressions and depth to bedrock. Start coordination with Bruce to make a presentation at our next meeting on 7/18. **Kate** will then finalize logistics with Bruce.
g. **Kate** - Finalize the meeting notes from 5/23 and start drafting notes for 6/27.
h. **Kate** - Forward team GPS resources provided by Brian Luck.

3:00 *End* See you all back in Oshkosh on July 18. If you can't make it, please let Kate and Rachel know so we know not to wait for you.