BCRET/OSU ERI TIMELINE

September 18, 2014
Signed MOA between Oklahoma State University (OSU) and University of Arkansas Cooperative Extension Service (UACES) -Agreement effective October 1, 2014, and expire June 30, 2015
research services related to Electrical Resistivity Imaging of Mantled Karst in the Buffalo River Basin, Arkansas.
In accordance with Exhibit A, UACES agrees to pay OSU a lump sum of $27,550 upon receipt and acceptance of the final report and receipt of a detailed invoice from OSU.

December 2, 2014
Judge Marshal Issued Order
Excerpt: The Buffalo River watershed is characterized by karst geology-underground limestone which has been eroded over time. Whether there's karst under C & H is unknown.

Mid-December 2014
Todd Halihan conducted ERI

December 17, 2014
Sharpley to BCRET/Mark Cochran/Mary Hightower: Todd Halihan conducted his ERI studies on two of our application fields....Todd plans to have the data and information analyzed in the New Year and was gracious enough to come over and present what he found, discuss their implications, and include in that assessment any other relevant information we may have collected. Given the complexity of his work, Todd felt a face to face meeting was the most productive way for us to learn what was found. Thus, could you please let me know of date you are available in February to meet here in Fayetteville with Todd for one day to go through the findings.

December 23, 2014
Todd Halihan reports to BCRET that preliminary look at the data indicate that data quality is very high for both electrical and GPS data. Look forward to our meeting in February.... will also be collecting some additional geophysical data after the meeting.

February 5, 2015
Meeting between OSU and BCRET-discussed preliminary results. Halihan explained complex process.
Sharpley to Halihan, Fields and Sokolovsky: I think with the additional work, we will have made real progress in more clearly defining what is below the surface of our monitored areas.

March 15, 2015
Sharpley to Jason re permission to finish ERI work on Field 12: Tim and the group from Oklahoma State are completing the underground assessment as you know.

April 1, 2015
OSU Phase II ERI Update to BCRET
Jon Fields to Sharpley: It has now been now two and half weeks since the field work and I wanted to touch base with you all to give updates and coordinate the remaining pieces for this work to move forward.

We collected three samples per point along each line. I believe we have about 33 total points (99 total samples) among the three lines sampled.

We have been thinking about the presentation of this report and would like your insight. We know this is a very sensitive topic and the decision is up to you about when and where you decide to open up to the public about the results of our work, but we have found a conference in your neck of the woods that might be a great venue to

debut the results. It is the 60th Annual Midwest Groundwater Conference held October 14-15th in Bentonville, AR.

April 13, 2015
Sharpley to Jon Fields: I have not had any responses back raising any concerns and I think it is within your scientific progress to report your data as you see fit. However, given the sensitivity of the situation, we would like to continue to be kept up to date with progress reports, prior to them being released. The main concern I have is that if there are any potential red flags arising from your ERIA work, we need to know first and we need to let the farmer know as well before any release.

May 30, 2015
BCRET Report: "A final report detailing findings of the Electrical Resistivity Imaging (ERI) analysis conducted on application fields was not available at the time this Quarterly Report was due. The ERI report will be released as soon as it is available to us."

June 30, 2015
OSU sends ERI Quarterly Report

July 10, 2015
Meeting between OSU and BCRET-Presentation of ERI.
Sharpley to Tim Kresse and Phil Hays: If and when released, we **MUST** include all the information we have, which would include well drilling reports, chemical monitoring from the trenches, and ERI analysis in order to make a meaningful conclusions {sic}.

Sharpley to Todd Halihan and Jon Fields: Firstly, thank you for conducting the work and compiling this report. We all agree it will advance our understanding of what the substrata is below the application fields and how this would help us better manage surface applications to minimize the potential for any off-site transport.

Attached are the edits I made and those received from the group on your report. I know they might seem extensive but there offered constructively for this specific project report release. Overall we need to limit data interpretation at this point in time in this report. Others can do that with the information provided if they see fit to.

I think naming the fields by their Plan designation number (i.e., Fields 5a and 12) is preferred to whether they received or did not receive slurry, although that can be noted, would be more definitive. I have also created a couple of figures that might be included for clarification. This includes a legend explaining the general breakdowns in electrical resistivity measurements to matrix material, which would supplement descriptions in the text. Likewise, I think adding the planar views on both fields overlaying the aerial photo of the fields would be instructional.

As you know, we have an audience with widely differencing knowledge of this whole area and we need to target both. Thus, some of our comments reflect either a need for clarification or deletion because of a lack of detail or too speculative**.**

I realize these changes may take some time, so I am looking at the possibility of submitting our next quarterly report on time, which is July 15th and noting that the ERI would be released subsequently. To this end, I suggest the timeline of getting your revision back to us within the next two weeks and then we go from there.

Please let me know if that timeline does not work for you or if you have any questions or concerns about our review.

Halihan to Sharpley: Thanks for the review. We were trying to write this to get you the pieces to add into your quarterly report, but it sounds like you just want this as a standalone product. We will modify this accordingly as necessary to be independent. We will add a title page and OSU logo to indicate it came from our end. We will look at detail through the edits and may contact you next week if we have questions.

August 3, 2015
Sharpley to Halihan: wonder how you are coming along with revising the Big Creek ERI analysis report.

August 4, 2015
Jon Fields sends Sharpley ERI 2nd Quarterly report.
Fields to Sharpley: We are currently running the samples for isotopic analysis and we hope to have them completed by tomorrow after and will soon compare the results and continue work onto the Final Report.

August 10, 2015
Sharpley to Halihan: We will get together and send you the information we have on (1) the elevations of the pond (top and bottom) and elevations of the trench, (2) descriptions of the soil in the trench, especially the nature of the thickness of the clays, (3) chemistry of the waters collected in the trench, and (4) the variable flows (high flows following rain events) that denote the lateral movement of perched groundwater following infiltration of precipitation following rain events. This should help put the information you have on the ERI analysis around the ponds into a more complete picture.

August 17, 2015
Sharpley to Jon Fields follow-up request for soil sampling test results-We were out last week at a Faculty Retreat and putting out hog farm fires.

September 17, 2015
OSU email to UACES re MOA: Dr. Todd Halihan here at OSU would like to spend $1,985.92 per the attached request to aid him in the design and conduct ERI imaging experiments and ERI data collecting on this project. Since Dr. Halihan had funds left over from the Labor portion of the budget he would like to spend those leftover funds toward this purchase for the project.

September 30, 2015
Mike Daniels approves Final Report on behalf of UACES.

October 12, 2015
Sharpley: I only received a couple of yeh's' to meeting while you were here next week to go over your findings for the second and final field report of your work in Mt. Judea. Thus, I would like to suggest having another Adobe Connect meeting like you did last time. I feel this would enable more people to be involved, who I would like/need to be involved.

Todd Halihan: Not sure this one would need to be discussed much as conclusions are similar to 2nd Quarter Report. I was wanting to discuss results from soil sampling. However, we still don't have: 1) Dates for application for 1 and 12; 2) Fluid properties (EC at a minimum) for the lagoons and French drain. Without these, hard to put the data into context. Let me know if you would still like a separate meeting for the just the ERI conclusions that we are finalizing for the 3 alluvial sites.

October 14, 2015
Halihan to Sharpley: Let us know if you see any major difficulties with Jon's presentation for Thurs.

Sharpley to Daniels, et al: Attached is Jon's presentation at the upcoming Groundwater meeting at Chrystal Bridges tomorrow. I didn't see any "major difficulties." But I am not privy to the dialogue that will go with it.

October 16, 2015
Tim Kresse to Sharpley, et al: I saw the presentation. There were no difficulties at all and it was a good presentation. I did chat with Todd and Jon some about the pond results, and Phil joined in on the second half of that conversation. We can chat about that sometime. In short, it would be nice to put a well on the west side in the vicinity of where Todd believed he saw a major fracture and movement of waste. This could be critical to resolving the interpretation of the resistivity data**.** Todd would be willing to assist on getting the drilling done for free. I just don't know the amount of grief or worry this would cause, in lieu of all the activity at the farm, but again I believe it is a critical component. Todd is fairly confident of his interpretation.

Karl VanDevender to Kresse: Would the new potable water well serve? I understand that is located west of ponds between barns.

Tim Kresse to Karl Vanvender, et al: Not really. I would imagine (or hope) that the zone we are concerned with would be cased off from the potable water. Cuttings would have helped some. When was the well installed?

Karl Vandevender to Sharpley, et al: Not sure. Where and how deep does the well need to be?
All do we need to schedule a phone/web conference to discuss?

October 22, 2015
Sharpley: I am sorry but have not been able to get the manure application schedule for this year. We were told that this information will be released at the end of the year. And our sphere of influence is not strong enough to change that at this time.

Halihan: Understood. Jon and I talked with Phil and Tim last week in Bentonville. They wanted the soil data as part of the report, so we are going to add an Appendix with the soil data and include the analysis in the report. That means it would be good to have a discussion on that data with the group. We are going to send over the data appendices first so that you can have time to review those formats and we will follow with the report when the soil analysis is completed. Currently we will have 6 appendices of data for the report.

Sharpley: Is there a time that works better for you, before I send out a Doodle invitation to the group?

Halihan: Still need to do a bit of analysis....How is Monday Nov. 23?