Affidavit of Larry T. West, Ph.D.

COMES NOW the affiant, and states and declares all as follows under oath or affirmation:

1. My name is Larry T. West.

2. In support of the original motion for post-conviction relief in *Randeep Singh Mann v. United States*, No. 4:14-CV-00614 (U.S. Dist. Ct. E.D. Ark. October 20, 2014), I submitted a declaration executed Oct. 15, 2014, labeled "PCR/Habeas Exhibit 1", a true and correct copy of which appears on pages 62-80 of Doc. No. 395 in the Court's public electronic record in *United States v. Mann*, No. 4:09-CR-00099-BSM. To the present affidavit I attach a true and correct copy of the same declaration as it appears in the Court's electronic record in the post-conviction relief action as "West Affidavit Exhibit A". That declaration is incorporated into this affidavit.

3. In support of the traverse in the foregoing post-conviction relief action, I submitted an affidavit. That affidavit appears in the Court's public electronic record in *United States v. Randeep Singh Mann*, No. 4:09-CR-99-BSM as Doc. No. 491-1 (PCR/Habeas Exhibit 102, including Figures 1-7). A true and correct copy of that affidavit as it is on file in the same post-conviction relief action is attached to this affidavit, incorporated in it, and marked as "West Affidavit Exhibit B".

4. The foregoing exhibit, "West Affidavit Exhibit A", includes a curriculum vitae and a summary of my professional qualifications on pages 1-2 of the declaration. Additions to that curriculum vitae are summarized on page 1 of "West Affidavit Exhibit B". With the following additions, my professional qualifications are essentially unchanged. In the past eight months, I have

- written – with my coauthors – three chapters for Soil Science reference books;
- taught a class at the University of Arkansas;
- been employed as an instructor at the University of Arkansas; and
- accepted a part time position as a contractor to the National Soil Survey Center of the Natural Resources Conservation Service of the U.S. Department of Agriculture to prepare and edit scientific publications.

5. If I were to appear as a live witness at any trial during the week of August 22, 2016, in *United States v. One Intercord Corp. Model USAS-12 12 Gauge Shotgun, Serial Number A0002089SA*, No. 4:14-CV-134-BSM, or *One Assortment of 93 NFA-Regulated Weapons, No. 4:14-CV-423-BSM*, or both of these actions, my testimony would be in conformity with the declaration (West Affidavit Exhibit A) and affidavit (West Affidavit Exhibit B) that I have submitted as exhibits to the present affidavit.

Further, the affiant saith naught.

I swear or affirm that the foregoing is true and correct.

LARRY T. WEST

STATE OF ARKANSAS

COUNTY OF Washington

Personally appeared Larry T. West before me, a Notary Public, by me known and known by me to be Larry T. West, this 17th day of August 2016, and executed the foregoing affidavit on his oath or affirmation.

My commission expires
5 June 2024.

NOTARY PUBLIC

STEVEN RAY DICKS
MY COMMISSION # 12398957
EXPIRES: June 5, 2024
Washington County

DECLARATION

COMES NOW the declarant, Larry T. West, PH.D., and as authorized by 28 U.S.C. § 1746, states and declares under penalty of perjury all as follows:

1. My name is Larry T. West.

2. I reside in Washington County, Arkansas.

3. I am of legal age and of sound mind and body.

4. In 1973 I graduated from the University of Arkansas with a Bachelor of Science in Agriculture, majoring in Agronomy (Soil Science).

5. In 1978 I earned a Master of Science degree in Soil Science from the University of Arkansas.

6. In 1986 I earned a Ph.D. in Soil Science from Texas A&M University.

7. My practice as a Soil Scientist has included the following positions:

   a. 1978 to 1980 — Soil Scientist, USDA Soil Conservation Service in Gatesville, Texas

   b. 1981-1986 — Research Associate, Soil and Crop Sciences Department, Texas A&M University, College Station, Texas

   c. 1986-1987 — Soil Scientist and Adjunct Assistant Professor, USDA-ARS and Agronomy Department, Purdue University, West Lafayette, Indiana

   d. 1993-2008 — Professor (previously Assistant and Associate Professor), Department of Crop & Soil Sciences, University of Georgia, Athens, Georgia

   e. 2008-2013 — National Leader for Soil Survey Research and Laboratory, USDA-NRCS, National Soil Survey Center, Lincoln, Nebraska

   f. 2013-present — Soil Scientist, Soil Systems LLC, Fayetteville, Arkansas

A more comprehensive listing of my record of experience and public service appears in pages 1-2 and 13-15 of the accompanying West Declaration Exhibit A.

8. During the past ten years, I have published 32 journal articles, three chapters in books, 29 scientific conference abstracts, and ten other research reports. My publications,

including those earlier than the past ten years, are cited on pages 2-10 of the accompanying West Declaration Exhibit A.

9. In 1990 I received the Superior Service Award from the USDA. In 1995 I received a Paper Award from the American Society of Agricultural Engineers. Other recognitions are listed on page 12 of the accompanying West Declaration Exhibit A.

10. I have not offered expert testimony in last four years.

11. In 2014, I was approached to serve as a consulting expert in a post-conviction relief or habeas corpus action to be filed in federal district court on behalf of Dr. Randeep Singh Mann. In this capacity I am being compensated for my professional time in studying the soil and soil-related evidence in this case at my standard consulting rate of $100 per hour.

12. I have been provided the following materials specifically relating to Dr. Mann's case:

a. Jason Smith still photographs taken on March 3, 2009, in a clearing off a cul-de-sac at the end of Galaxy Lane, in London, Arkansas, subsequently admitted as Government Exhibits 98-A through 98-I at Dr. Mann's criminal trial

b. ATF still photographs taken on March 4, 2009, in a clearing off a cul-de-sac at the end of Galaxy Lane, in London, Arkansas

c. Video clips dated February 17, 2010, on the menu and created March 22, 2010, according to the directory on the disk containing them, depicting the same clearing as well as other , sites on Milky Way Lane and Galaxy Lane, in London, Arkansas, subsequently admitted as Government Exhibit 101-C at Dr. Mann's criminal trial

d. Photographs of the creation of holes at the same clearing in March 2014 that would have in fact accommodated an ammunition canister that Mark Rinke testified that he found in a clearing off a cul-de-sac at the end of Galaxy Lane, in London, Arkansas, on March 3, 2009; the placement of ammunition canisters of the same or similar size to the one introduced at Dr. Mann's criminal trial as Government Exhibit 99-A; placement of the canisters in these holes; and removal of the canisters, together with declarations explaining the process and certifying the accuracy of the pictures

e. Photographs of the weathering of holes of a size consistent with placement of Government Exhibit 99-A consistently with Mr. Rinke's testimony, and

showing this weathering and the accumulation of biological data in and around the holes at various points in time, from two days to six days to 91 days after the initial dig, together with affidavits and declarations explaining the process and certifying the accuracy of the pictures

f. Weather data from weathersource.com for both National Weather Service stations in the Russellville, Arkansas, area for January-March 2009 and from the Dardanelle weather station for January 1 through March 9, 2014, and precipitation records for 2009-2014 from March 15 through April 16;

13. The hole in Government Exhibits 98-C, 98-H & 98-I photographed in 2009 contains a much larger quantity of leaves than the holes of known dimensions created in the same month in 2014. Even after the 2014 holes had been exposed to the elements for three months, they contained fewer new leaves—as opposed to the leaves that were left in them as part of the creation of holes that would accommodate the ammunition canister which was said to have been in the hole in Government Exhibits 98-C, 98-H, and 98-I.

14. The leaves in the hole in the latter three exhibits are similar or identical to the ones surrounding the hole. They appear to have fallen into the hole well before the pictures were taken. From this I conclude that the hole was open before the leaves fell.

15. Soil that is removed from a hole in the course of creating it is called "spoil".

16. There appears to be soil surrounding Government Exhibits 98-C, 98-H, and 98-I that came out of the hole when it was created. It is relatively smooth. In the main it is not cloddy. It appears to have been walked on or rained on for some time.

17. By contrast, the spoil from either of the holes of known depth and volume is greater in quantity than the material around the hole in Government Exhibits 98-C, 98-H, and 98-I which I assume to be spoil. Either the latter hole is smaller, or the assumed spoil has been spread around.

18. The material close to the holes in Government Exhibits 98-C, 98-H, and 98-I that I assume to be the spoil from the hole is tan to brown in color. The only noticeable red soil in

the foregoing exhibits is on the far right periphery of Government Exhibit 98-I. This is a distance from the hole identified as the one where the object had been retrieved the same day. I cannot say from the exhibit that the reddish material was spoil from the hole at the center of the exhibit.

19. By contrast, the spoil from the holes of known depth and volume is red clay soil.

20. At least at the location where the pictures were taken, red soil starts at a depth of three or four, or possibly five, inches.

21. For the foregoing reasons, it is my opinion, to a reasonable degree of scientific certainty, that the hole pictured in Government Exhibits 98-A, 98-B, 98-C, 98-H & 98-I, and in Government Exhibit 101-C (part two), was not a freshly dug hole.

22. I was not contacted about Dr. Mann's case until 2014. If I had been consulted in 2009 or 2010, and presented with the same or substantially the same data, the opinions I would have expressed would have been the same as I have expressed in this document.

23. In 2009-10 I was employed by the USDA, and would have required to obtain permission to give evidence then. Whether or not this federal agency chose to allow me to give the evidence, the evidence would have been the same as it is in this document. Based on the facts reflected in the data of the hole pictured in the 2009 exhibits, and the applicable principles of soil science, it is my opinion that any person with the same or similar education and experience would have given the same opinion if agents of the federal government had not allowed me to give it.

Further, the declarant saith naught.

I declare under penalty of perjury that the foregoing is true and correct.

Executed: October 15, 2014

LARRY T. WEST
PH.D. in Soil Science
Soil Systems LLC
Fayetteville, Arkansas

Larry T. West

Soil Systems LLC
3640 Monte Vallo Mnr
Fayetteville, AR 72764
479-225-8201
larrywestar@gmail.com

Educational Background:

B.S.A., Agronomy (Soil Science), University of Arkansas, 1973
M.S., Soil Science, University of Arkansas, 1978
Ph.D., Soil Science, Texas A&M University, 1986

Professional Employment:

2013-present	Soil Scientist, Soil Systems LLC; Fayetteville, AR
2008-2013	National Leader for Soil Survey Research and Laboratory, USDA-NRCS, National Soil Survey Center, Lincoln, NE
1998-2008	Professor, Department of Crop & Soil Sciences, University of Georgia, Athens, GA
1993-1998	Associate Professor, Department of Crop & Soil Sciences, University of Georgia, Athens, GA
1988-1993	Assistant Professor, Department of Crop & Soil Sciences, University of Georgia, Athens, GA
1986-1987	Soil Scientist and Adjunct Assistant Professor, USDA-ARS and Agronomy Department, Purdue University, West Lafayette, IN
1981-1986	Research Associate, Soil and Crop Sciences Department, Texas A&M University, College Station, TX
1980-1981	Graduate Teaching Assistant, Soil and Crop Sciences Department, Texas A&M University, College Station, TX
1978-1980	Soil Scientist, USDA-Soil Conservation Service, Gatesville, TX
1973-1978	Research Assistant, Department of Agronomy, University of Arkansas, Fayetteville, AR

Research Interests:

Landscape distribution of soils and soil properties; effects of soil horizons and properties on landscape redistribution of water; soil suitability and function for wastewater management systems.

West Declaration Exhibit A

Teaching responsibilities (1988-2007, University of Georgia):

Pedology	CRSS 4540/6540 (yearly)
Soil Mineralogy	CRSS 8540 (alternant years)
Contaminants in Soils (team taught)	CRSS 4510 (yearly, 1993-97)
Soil and Site Assessment (team taught)	CRSS 4520 (yearly, 2002-2006)

Publications:

Chapters in Books

1. Rabenhorst, M.C., L.T. West, and L.P. Wilding. 1991. Genesis of calcic and petrocalcic horizons in soils over carbonate rocks. p. 61-74 In W.D. Nettleton (ed.) Occurrence, characteristics, and genesis of carbonate, gypsum, and silica accumulation in soils. Spec. Publ. No. 26, Soil Science Society of America, Madison, WI.

2. West, L.T., S.C. Chiang, and L.D. Norton. 1992. The morphology of surface crusts. p. 73-92 In M.E. Sumner and B.A. Stewart (eds.) Soil crusting: Chemical and physical processes. Lewis Publishing Co. Chelsea, MI.

3. West, L. T. and D.D. Bosch. 1997. Scaling and extrapolation of soil degradation assessments. p. 359-376 IN R. Lal, W.H. Blum, and C. Valentin (eds.) Methods for assessment of soil degradation. Advances in Soil Science. CRC Press, Inc. Boca Raton, FL.

4. West, L.T., F.H. Beinroth, M.E. Sumner, and B.T. Kang. 1997. Ultisols: Characteristics and impacts on society. Advances in Agronomy 63:179-236.

5. West, L.T., J.N. Shaw, E.R. Blood, and L.K. Kirkman. 1998. Correlation of water tables to redoximorphic features in the Dougherty Plain, southwest Georgia. p. 247-258 IN M.C. Rabenhorst, J.C. Bell, and P.A. McDaniel (eds.) Quantifying soil hydromorphology. Soil Sci. Soc. Am. Spec. Publ. no. 54, SSSA, Madison, WI.

6. West, L.T. and F.H. Beinroth. 1999. Ultisols. p. E-358-E-372 IN M.E. Sumner (ed.) Handbook of Soil Science. CRC Press, Boca Raton, FL.

7. Hamiliton-Wood, D.A., L.T. West, and P.A. Schroeder. 2002. Weathering Sequences of Contrasting Mafic and Felsic Parent Materials in the Georgia Piedmont, US. Proc. 17th World Cong. Soil Sci., Aug. 14-21, 2002., Bangkok, Thailand. p. 871-1 - 875-9.

8. Shaw, J.N. and L.T. West. 2002. Sesquioxides (Fe, Mn, Al, and Si). p. 1192-1196 *IN* R. Lal (ed.) Encyclopedia of Soil Science. Marcel-Dekker, Inc., New York.

9. West, L.T. 2002. Entisols. p. 391-394 *IN* R. Lal (ed.) Encyclopedia of Soil Science. Marcel-Dekker, Inc., New York.

10. West, L.T. 2004. Soils and site: Landscape and soil classification for forest management. p. 1216-1223 IN J. Burley, J. Evans, and J. Youngquist (eds.) Encyclopedia of Forest Science. Elsevier, Amsterdam.

11. West, L.T., J.N. Shaw, and F.H. Beinroth. 2011. Ultisols. IN Yuncong Li and M.E. Sumner (ed.) Handbook of Soil Science. CRC Press, Boca Raton, FL.

12. Bliss, Norman B., Sharon W. Waltman, Larry T. West, Anne Neale, and Megan Mehaffey. 2014. Distribution of soil organic carbon in the conterminous United States. P. 85-93 IN A.E. Hartemink and K. McSweeney (eds.), Soil Carbon. Progress in Soil Science, Springer International Pub., Switzerland DOI 10.1007/978-3-319-04084-4_9.

Journal Articles (past 10 years; 100 total)

1. Chen, F., D.E. Kissel, L.T. West, D. Rickman, J.C. Luvall, and W. Adkins. 2005. Mapping surface soil organic carbon for crop fields with remote sensing. J. Soil & Water Cons. 60:51-57.

2. Faucette, L.B., C.F. Jordan, L.M. Risse, M. Cabrera, D.C. Coleman, and L.T. West. 2005. Evaluation of stormwater from compost and conventional erosion control practices in construction activities. J. Soil Water Cons. 60:288-297.

3. Jackson, C.R., J.K. Martin, D.S. Leigh, and L.T. West. 2005. A Southeastern Piedmont Watershed Sediment Budget; Evidence for a Multi-Millenial Agricultural Legacy. J. Soil Water Cons. 60:298-310.

4. Radcliffe, D. E., L.T. West, and J. Singer. 2005. Gravel effect on wastewater infiltration from septic system trenches. Soil Sci. Soc. Am. J. 2005 69: 1217-1224.

5. Chen, F., D.E. Kissel, L.T. West, W. Adkins, D. Rickman, and J.C. Luvall. 2006. Feature selection and similarity analysis of crop fields for mapping organic carbon concentration in soil. Computers and Electronics in Agric. 54:8-21.

6. Finch, S.D., L.T. West, D.E. Radcliffe, and E.V. Hufstetler. 2007. Thickness and Hydraulic Properties of Drainfield Trench Biomats formed in Georgia Soils. IN On-site wastewater treatment XI. Proc. 11th National Symposium on Individual and Small Community Sewage Systems. October 21-25, 2007, Providence, RI, ASABE, St. Joesph, MI.

7. Franklin, D.H., L.T. West, D.E. Radcliffe, and P.F. Hendrix. 2007. Characteristics and genesis of preferential flow paths in a Piedmont Ultisol. Soil Sci. Soc. Am. J. 71:752-758.

8. Franklin, D.H., M.L. Cabrera, L.T. West, V.H. Calvert, and J.A. Rema. 2007. Aerating Grasslands: Effects on runoff and phosphorus losses from applied broiler litter. J. Environ. Qual. 36:208-215.

9. White, W.J., L.A. Morris, A.P. Pinho, C.R. Jackson, and L.T. West. 2007. Sediment Retention by Forested Filter Strips in the Piedmont. J. Soil and Water Cons. 62:453-463.

10. Butler, D.M., D.H. Franklin, M.L. Cabrera, A.S. Tasistro, K. Xia, and L.T. West. 2008. Evaluating aeration techniques for decreasing phosphorus export from grasslands receiving manure. J. Eviron. Q. 37:1279-1287.

11. Chen, F., D.E. Kissel, L.T. West, W. Adkins, W, D. Rickman, and J.C. Luvall. 2008. Mapping soil organic carbon concentration for multiple fields with image similarity analysis. Soil Sci. Soc. Am. J. 72:186-193.

12. Elrashidi, M.A., C.A. Seybold, D.A. Wysocki, S.D. Peaslee, R. Ferguson, and L.T. West. 2008. Phosphorus in runoff from two watersheds in Lost River basin, West Virginia. Soil Sci. 183:792-806.

13. Fimmen, R.L., D.D. Richter, D. Vasudevan, M.A. Williams, and L.T. West. 2008. Rhizogenic Fe-C redox cycling: a hypothetical biogeochemical mechanism that drives crustal weathering in upland soils. Biogeochem. 87:127-141.

14. Finch, S.D., D.E. Radcliffe, and L.T. West. 2008. Modeling trench sidewall and bottom flow in on-site wastewater systems. J. Hydro. Eng. 13:693-701.

15. West, L.T., M.A. Abreu, and J.P. Bishop. 2008. Saturated Hydraulic Conductivity of Soils in the Southern Piedmont of Georgia, USA: Field Evaluation and Relation to Horizon and Landscape Properties. Catena 73:174-179.

16. Elrashidi, M.A., L.T. West, C.A. Seybold, D.A. Wysocki, E.C. Benham, R. Ferguson, S.D. Peaslee. 2009. Nonpoint source of nitrogen contamination from land management practices in Lost River Basin, West Virginia. Soil Sci. 174: 180-192.

17. Radcliffe, D.E., and L.T. West. 2009a. Design Hydraulic Loading Rates for Onsite Wastewater Systems. Vadose Zone J 8:64-74.

18. Radcliffe, D.E. and L.T. West. 2009b. Spreadsheet for converting saturated hydraulic conductivity to long term acceptance rate for on-site wastewater systems. Soil Survey Horizons 50:45-52.

19. Elrashidi, M.A., L.T. West, C.A. Seybold, E.C. Benham, P.A. Schoeneberger, R. Ferguson. 2010. Effects of Gypsum Addition on Solubility of Nutrients in Soil Amended With Peat. Soil Sci. 175:162-172.

20. Zhu, X., L.M. Risse, S.C. McCutcheon, E.W. Tollner, T.C. Rasmussen, and L.T. West. 2010. Laboratory Investigation of Rill Erosion on Compost Blankets under Concentrated Flow Conditions. Trans. ASABE 53:1077-1086.

21. Franklin, D.H., D. M. Butler, M. L. Cabrera, V. H. Calvert, L. T. West and J. A. Rema. 2011. Influence of Aeration Implements, Phosphorus Fertilizers, and Soil Taxa on Phosphorus Losses from Grasslands. J. Environ. Q. 40: 312-319.

22. Richter., D.deB., A.R. Bacon, M.L. Mobley, C.J. Richardson, S.S. Andrews, L. West, S. Wills, et al. 2011. Human-soil relations are changing rapidly: Proposals from SSSA's cross-divisional soil change working group. Soil Sci. Soc. Am. J. 75:2079-2084.

23. Bosch, D.D. C.C. Truman, T.L. Potter, L.T. West, T.C. Strickland, and R.K. Hubbard. 2012. Tillage and slope position impact on field-scale hydrologic processes in the South Atlantic Coastal Plain. Agric. Water Man. 111:40-52.

24. Elrashidi, M.A., L.T. West, and N. Persaud. 2012. Phosphorus Loss and Forms in Runoff from Watersheds in the Great Plains. Soil Sci. 177:638-649.

25. Elrashidi, M.A., L.T. West, and C. Smith. 2012. Phosphorus Availability and Release Characteristics for Irrigated Cropland in Afghanistan. Soil Sci. 177:251-262.

26. Herrick, J.E., K.C. Urama, J. Karl, J. Boos, M-V.V. Johnson, K.D. Shepherd, J. Hempel, B.T. Bestelmeyer, J. Davies, J.L. Guerra1, C. Kosnik1, D.W. Kimiti, A. Losinyen, K. Muller, L. Norfleet, N. Ozor, T. Reinsch, J. Sarukhan K., and L.T. West. 2013. The global Land-Potential Knowledge System (LandPKS): supporting evidence-based, site specific land use and management through cloud computing, mobile apps and crowdsourcing. J. Soil and Water Cons. 68:5A-12A. doi:10.2489/jswc.68.1.5A.

27. Wills, Skye, Cathy Seybold, Joe Chiaretti, Cleiton Sequeira, and Larry West. 2013. Quantifying tacit knowledge about soil organic carbon stocks using soil taxa and official soil series descriptions. Soil Sci. Am. J. doi:10.2136/sssaj2012.0168

28. DeGloria, S.D., J.R. Irons, and L.T. West. 2014. Remote sensing of soils for environmental assessment and management (Special Issue Forward). Photogrammetric Eng. & Remote Sensing 80:309-310.

29. DeGloria, S.D., D.E. Beaudette, J.R. Irons, A. Libohova, P.E. O'Neil, P.R. Owens, P.J. Schoeneberger, L.T. West, and D.A. Wysocki. 2014. Emergent imaging and geospatial technologies for soil investigations. Photogrammetric Eng. & Remote Sensing 80:289-294.

30. Hartley, P.E., D. R. Presley, M.D. Ransom, G.M. Hattiarachchi, and L.T.West. 2014. Vertisols and vertic properties of soils of the Cherokee Prairies of Kansas. Soil Sci. Soc. Am. J. 78:556-566 doi:10.2136/sssaj2013.06.0217

31. Libohova, Z., J. Doolittle, R. Sims, T. Villars, and L.T. West. 2014. Mapping the subaqueous soils of Lake Champlain's Missisquoi Bay using ground-penetrating radar, digital soil mapping, and field measurements. Photogrammetric Eng. & Remote Sensing 80:323-332.

32. Sequeira, Cleiton H., Skye A. Wills, Cathy A. Seybold, and Larry T. West. 2014. Predicting soil bulk density for incomplete databases. Geoderma 213:64–73.

Bulletins and Reports

1. Hallmark, C. T., L. T. West, L. P. Wilding, and L. R. Drees. 1986. Characterization data for selected Texas soils. MP-1583; Tex. Agric. Exp. Stn., College Station.

2. Goebel, C.P., B.J. Palik, L.K. Kirkman, and L.T. West. 1997. Landscape ecosystem types of Ichauway. Tech. Rep. 97-1, J.W. Jones Ecological Research Center at Ichauway, Newton, GA.

3. Ainslie, W.B., R.D. Smith, B.A. Pruitt, T.H. Roberts, E.J. Sparks, L.T. West, G.L. Godshalk, and M.V. Miller. 1999. A regional guidebook for assessing the functions of low gradient, riverine wetlands in western Kentucky. U.S. Army Corps of Engineers, Vicksburg, MS.

4. West, L.T. and L.A. McKinley. 2000. Site evaluation. Bull. 1152-2. Georgia Coop. Ext. Ser., Athens, GA.

5. Gaskin, Julia, Brian Kiepper and Larry West. 2007. Understanding Wastewater Treatment Systems. UGA Cooperative Extension. Available online at http://pubs.caes.uga.edu/caespubs/pubcd/EB-100/EB-100.htm.

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1. Abreu, M.E, and L.T. West. 2005. Evaluation of saturated hydraulic conductivity for soils in the Southern Piedmont in Georgia. ASA, CSSA, SSSA Annual Meeting Abstracts 97.

2. Shroeder, P.A., and L.T. West. 2005. Weathering profiles developed on granitic and mafic terrains in the area of Elberton, Georgia. Georgia Geologic Society Guidebook. 25:20-37.

3. West, L.T., D.E. Radcliffe, T. Rasmussen, W. P. Miller, R. Jackson, and L.A. Morris. 2005. Soil science education in Georgia: Expanding the clientele. ASA, CSSA, SSSA Annual Meeting Abstracts 97.

4. Abreu, M.E, L.T. West, D.E. Radcliffe, and M.L. Cabrera. 2006. Impact of soil structure on saturated hydraulic conductivity in the Piedmont of Georgia, USA. World Congress of Soil Science, Philadelphia, PA.

5. Bishop, J., M.E. Abreu, and L.T. West. 2006. Evaluation of hydraulic conductivity Piedmont landscapes. Southern Regional Soil Survey Conference, Oklahoma City, OK.

6. Chen, F., David Kissel, Larry West, Rex Clark, and Wayne Adkins. 2006. Field-Scale Mapping of Soil Organic Carbon with Soil-Landscape Modelling. ASA, CSSA, SSSA Annual Meeting Abstracts 98.Pearson, M., T.G. Reinsch, R. Ferguson, and L. West. 2008. Particle size analysis of gypseous soils. ASA, CSSA, SSSA Annual Meeting Abstracts 99.

7. Worsham, L., D. Markewitz, N. Nibbelink, and L. West. 2008. A comparison of three landscape sampling methods to estimate soil carbon. ASA, CSSA, SSSA Annual Meeting Abstracts 99.

8. Beck, J.F., J. Thompson, M. Harman, P. Schoeneberger, L. West, and S. Wills. 2009. Confidence Intervals for Estimated Saturated Hydraulic Conductivity Measured Using Compact Constant Head Permeameters. ASA, CSSA, SSSA Annual Meeting Abstracts 100.

9. Elrashidi, M. L. West, and S. Peaslee. 2009. Effect of Manure Application On Nitrogen Contamination for Watersheds in West Virginia. ASA, CSSA, SSSA Annual Meeting Abstracts 100.

10. Hammer, R.D., L. West, M.G. Johnson' and C.A. Stiles. 2009. The Roles of Soil Science in Global Climate Change Mitigation and Evaluation of Ecosystem Services. ASA, CSSA, SSSA Annual Meeting Abstracts 100.

11. Hartley, P, M D. Ransom, D. Presley and L.T. West. 2009. Genesis, Mineralogy, and Micromorphology of Vertic Soils in Southeastern Kansas. ASA, CSSA, SSSA Annual Meeting Abstracts 100.

12. Johnson, M.G., R. D. Hammer, D.W. Ebert, M. Fillmore, J.S. Noller, and L.T. West. 2009. A Terrain-Attribute Based Approach to Assessing Soil Carbon Sequestration in the Oregon Coast Range Mountains. ASA, CSSA, SSSA Annual Meeting Abstracts 100.

13. Stiles, C.A. Stiles, R. D. Hammer, R. Ferguson, L. West, P. Jones, K. Newman[1], M.G. Johnson, J.Shaw, J. Arriaga, A. Falen, P. McDaniel, A.T. O'Geen, J.M. Galbraith, and R.J. Miles. 2009. Development and Cooperator Testing of An Active Carbon Field Kit.ASA, CSSA, SSSA Annual Meeting Abstracts 100.

14. Benham, E., R. Ferguson, M.J. Pearson, and L. West. 2010. A Comparison of Geographically Broad Models for Prediction of Soil Carbonate, Total Carbon, and Gypsum Using VNIR. ASA, CSSA, SSSA Annual Meeting Abstracts 101.

15. Ferguson, R., E. Benham, M.J. Pearson, and L. West. 2010. A Comparison of Three Light Sources for VNIR Analysis of Soil Samples. ASA, CSSA, SSSA Annual Meeting Abstracts 101.

16. Stiles, C., L. West, and A. Tugel. 2010. Evaluating Soil Change Using Standardized Dynamic Soil Properties Comparison Projects. ASA, CSSA, SSSA Annual Meeting Abstracts 101.

17. Franklin, D.H., M. Cabrera, D. Butler, J. Gaskin, L. West, and L.M. Risse. 2011. Integrating Management Into the Georgia P-Index. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

18. Libohova, Z. R. Ferguson, R. Nesser, N. Odgers, J. Thompson, and L. West. 2011. Soil Reaction Conversions Between ISO and US Soil Survey Methods for GlobalSoilmap.Net Specifications. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

19. Sequeira, C. E. Benham, R. Ferguson, D. Harms, K. Scheffe, Z. Libohova, S. Monteith, C. Seybold, L. West, and S. Wills. 2011. U.S. Soil Carbon Assessment with VNIR Diffuse Reflectance Spectroscopy. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

20. Stiles, C. R. Ferguson, P. Jones, and L. West. 2011. Assessing the Accuracy of Permanganate Reactive Carbon Fraction Analysis In High Carbon Content Soils.

21. Waltman, S.W., A.C. Neale, N. Bliss, and L. West. 2011. Soils – A Critical Layer for Estimating Ecosystem Services. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

22. West, L., and C. Rasmussen. 2011. A Pedologist Looks At Sixty. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

23. West, L., S. Waltman, S. Wills, T. Reirsch. E. Benham, R. Ferguson, and C.W. Smith. 2011. U.S. Soil Carbon Stocks Derived From SSURGO and Pedon Data. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

24. Wills, S. L. West, and C. Sequeira. 2011. Sample Design for National Carbon Stock Assessment. ASA, CSSA, SSSA Annual Meeting Abstracts 102.

25. Sequeira, C. S. Wills, C. Seybold, and L. West. 2012. Predicting Soil Bulk Density for Incomplete Databases. ASA, CSSA, SSSA Annual Meeting Abstracts 103.

26. West, L. M. Wilson, and D. Wysocki. 2012. The National Cooperative Soil Survey and Soil Systems Research. ASA, CSSA, SSSA Annual Meeting Abstracts 103.

27. Wills, S., C. Sequeira, L. West, K. Scheffe, E. Benham, R. Ferguson, G. Teachman, and D. Harms. 2012. Initial Summary of Soil Carbon Stocks From the Rapid Assessment of Carbon Project. ASA, CSSA, SSSA Annual Meeting Abstracts 103.

28. Xiong, X., S. Grunwald, D.B. Myers, L. West, W. Harris, N. Comerford. 2012. Characterizing Multi-Scale Variation of Soil Organic Carbon in the United States. ASA, CSSA, SSSA Annual Meeting Abstracts 103.

29. Williams, C., J. Chiaretti, L. West, and D. Harms. 2013. Evaluation of the EPIC Model to Predict Soil Moisture and Temperature Regimes. ASA, CSSA, SSSA Annual Meeting Abstracts 104.

Book Reviews

1. West, L.T. 1999. Soil Genesis and Classification - Fourth Edition. J. S.W. Buol, F.D. Hole, R.J. McCracken, and R.J. Southard. J. Environ. Qual. 28:355.

Other Research Reports (past 10 years, 23 total)

1. Abreu, M.E, and L.T. West. 2005. Evaluation of permeability estimates for soils in the Southern Piedmont in Georgia. *IN* K.J. Hatcher (ed.) Proc. 2005 Georgia Water Resources Conference, April 25-27, 2005, Athens, GA. University of Georgia, Athens, Georgia.

2. da Costa. L.M., Guedes, I.M.R., L.A. Morris, L.T.West, and A.P.de Oliveira. 2005. Biogeoghemistry of silica phytoliths in agriculture. p. 23-25 *IN* Proc. III Silicon in Agriculture Conference, Uberlandia, Brazil.

3. Finch, S.D., L.T. West, and E.V. Hufstetler. 2005. Biomat effects on wastewater infiltration from onsite system dispersal trenches. *IN* K.J. Hatcher (ed.) Proc. 2005 Georgia Water Resources Conference, April 25-27, 2005, Athens, GA. University of Georgia, Athens, Georgia.

4. Finch, S.D., L.T. West, D.E. Radcliffe, and E.V. Hufstetler. 2005. Hydraulic Properties of drainfield trench biomats formed in Georgia Soils. Proc. National Onsite Wastewater Recyling Association, October 9-13, Cleveland, OH. National Onsite Wastewater Recyling Association, Edgewater, MD.

5. West, L.T., and D.E. Radcliffe. 2005. The STATSGO database: Simulation modelers as users. Proc. National Cooperative Soil Survey Conference. May 22-25, Corpus Christi, TX. USDA-NRCS, Washington, D.C.

6. Borden, D., K.A. Payne, and L.T. West. 2006. Management Measures for On-Site Disposal Systems (OSDS). Marine Extension Service, University of Georgia, Athens.

7. Finch, S.D., and L.T. West. 2006. Biomat effects on wastewater infiltration from onsite system dispersal trenches. *IN* D. Lindbo (ed.) Proc. 22nd Annual On-site Wastewater Treatment Conference: Advances in Systems, Standardization, and Technology, April 24-26, 2006. NC State University, Raleigh.

8. Radcliffe, D.E., B. Bumback, S. Udvardy, P.G. Hartel, L.T. West, T. Rasmussen. 2006. Scientific basis for bacterial TMDLs in Georgia. University of Georgia and the Georgia Conservancy, Atlanta.

9. West, L.T., S.W. Waltman, S. Wills, T.G. Reinsch, E.C. Benham, C.S. Smith, and R. Ferguson. 2010. Soil carbon stocks in the U.S.: Current data and future inventories. Proc. of Int. Workshop on Evaluation and Sustainable Management of Soil Carbon Sequestration in Asian Countries. Bogor, Indonesia Sept. 28-29, 2010.

10. Herrick, J.E., K.C. Urama, J. Karl, J. Boos, M.V.V. Johnson, K.D. Shepherd, J. Hempel, B.T. Bestelmeyer, J. Davies, J.L. Guerra1, C. Kosnik1, D.W. Kimiti, A. Losinyen, K. Muller, L. Norfleet, N. Ozor, T. Reinsch, J. Sarukhan K., and L.T. West. 2013. A Land-Potential Knowledge System (LandPKS) Based on Local and Scientific Knowledge of Land Productivity and Resilience. 2nd UNCCD Scientific Conference, Feb. 2-13.

Grants Received – (2002-2007 at University of Georgia)

Contributions to Soil Judging			
	1989-2007	Contributions from various groups to support the UGA Soil Judging Team.	$35,000
National Small Flows Clearinghouse			
	2001-2007	On-site demonstration project – Hall County, GA (co-principal investigator, Dr. West's portion - $30,000	$120,000
USDA-CREES			
	2001-2004	Single Landuse Watersheds for Accurate TMDLs (co-principal investigator, Dr. West's portion - $60,000	$560,000
	2006-2007	Development of a field-scale protocol to measure the long term hydraulic acceptance rate of mature wastewater drainfield systems with varying interface architecture. UGA portion, $3,300.	$15,000
Georgia Department of Human Resources			
	2002-2005	Soil Properties Influencing Performance of On-Site Wastewater Management Systems in Georgia (sole principal investigator)	$114,620
	2005-2007	Onsite Wastewater Management Training	$120,000
	2007-2010	Evaluation of gravel-filled drainfield trench hydraulics and treatment efficiency	$118,605
Georgia Department of Natural Resources			
	2003-2006	Management measures for on-site disposal programs. Georgia DNR Coastal Management Program. West portion - $10,000.	$63,112
USDA-NRCS			
	2003-2006	Evaluation of Permeability Estimates for Soils in the Southern Piedmont in Georgia. (sole PI)	$64,000

	2005-2006	Quantification of Seasonal Saturation and Saturated Hydraulic Conductivity for Selected Soils in MLRA 128 in Georgia.	$9,900
	2006-2009	Order 1 soil survey, landscape attributes, management-dependent soil properties, and simulation modeling to predict seasonal saturation of plinthic soils in the Southeastern Coastal Plain	$75,000
Water Environment Research Foundation			
	2007-2010	Development of quantitative tools to determine the expected performance of unit processes in wastewater soil treatment units. UGA portion - $189,614.	$2,000,000

Recognitions and Outstanding Achievements

1990 Superior Service Award (group), USDA
1990 Outstanding Teacher Award, UGA Agronomy Club
1995 Paper Award, American Society of Agricultural Engineers
1995 Outstanding Teacher Award, UGA Agronomy Club
1995-96 Selected to participate in ESCOP/ACOP Leadership Development Program.
2011 Friend of Water Office Award. U.S. EPA.
2013 Fellow, Soil Science Society of America

Supervision of Student Research

While at the University of Georgia, Dr. West served as major advisor on nine graduate student research projects. He served on the graduate committee of 60 students.

Editorship and Editorial Board Activities

Editor, Soils of the USA, Springer Publishing, 2013-
Editorial Board, Geoderma, 2013-
Guest Editor, Remote Sensing of Soils for Environmental Assessment and Management, Photogrammetric Engineering & Remote Sensing Special Issue, 2012-2014.
Pedology Section Editor, Handbook of Soil Science, 2008-2011
Co-Editor, Minerals and Landscapes, Geoderma Special Issue, 2008-2010
Associate Editor, Soil Survey Horizons 1993-1998
Associate Editor, Soil Science Society of America Journal 1999-2005

Public Service

From 1988-2008, Dr. West served as the representative of the Georgia Agricultural Experiment Station to the National Cooperative Soil Survey (NCSS). In this capacity, Dr. West provided laboratory characterization of soils from around the state to insure proper classification and interpretation, participated in quality control reviews of active soil surveys with NRCS personnel, and provided technical information concerning properties and interpretations of soils in Georgia as requested. Dr. West also cooperated with NRCS and Forest Service Soil Scientists in Georgia and from the National Soil Survey Center on special studies of soils in Georgia.

Workshops and Short Courses

1. 1995. Field investigations of forest soils for management - Piedmont and Coastal Plain (2 day workshop; West - one of three instructors). Georgia Center for Continuing Education (40 forest managers).

2. 1996. Wetland Delineation Shortcourse. (4 day workshop; West - one of four instructors). Georgia Center of Continuing Education (30 students).

3. 1996. Field investigations of forest soils for management - Piedmont and Blue Ridge Mountains (2 day workshop; West - one of three instructors). Georgia Center for Continuing Education (20 forest managers).

4. 1998. Piedmont Soil Scientist Training Workshop (4 day workshop; West - one of five instructors). USDA-Natural Resources Conservation Service and Department of Crop and Soil Sciences, University of Georgia (65 soil scientists).

5. 2004. Basic and Advanced Hydric Soils (4 day workshop; West was one of three instructors). Georgia Center for Continuing Education (30 participants).

6. 2005. Basic and Advanced Hydric Soils (4 day workshop; West was one of three instructors). Georgia Center for Continuing Education (28 participants).

7. 2006. Basic and Advanced Hydric Soils (4 day workshop; West was one of three instructors). Georgia Center for Continuing Education (29 participants).

8. 2007. Basic and Advanced Hydric Soils (4 day workshop; West was one of three instructors). Georgia Center for Continuing Education (22 participants).

9. 2007. Soils and onsite systems for engineers. Georgia Center for Continuing Education (28 participants).

Between 2000 and 2007, Dr. West organized and was principal instructor in a 5-day lecture and field short course on soils, hydrology, and onsite systems for Georgia Department of Human Resources Environmentalists who regulate onsite system installations in the State. This short course was taught 22 times to over 500 DHR environmentalists.

Dr. West is regularly called upon to present lectures in continuing education sessions for certified crop advisors, soil scientists, engineers, and geologists. He also regularly presents educational sessions on use and maintenance of onsite systems to homeowners and local officials.

Service to Professional Organizations

Professional Society Offices and Committee Assignments

Organizing Committee for VIII International Working Meeting on Soil Micromorphology (S-884), Soil Science Society of America, 1986-1988.
Soil Geomorphology Committee (S-880), Soil Science Society of America, 1990-1993.
Kubiena Award Committee, International Soil Science Society, 1992.
Chairman, Nominating Committee for Sub-commission B, International Soil Science Society, 1992.
Soil Judging Committee, Soil Science Society of America, 1994-1998, Chair 1998.
Soil Micromorphology Committee, Soil Science Society of America, 1994-1998.
Feasibility Committee for U.S. Hosting International Soil Science Congress, Soil Science Society of America, 1995-1997
Chair-elect, Soil Science Society of America, Division S-5, 2001
Chair, Soil Science Society of America, Division S-5, 2002
Soil Geomorphology Committee, 2006-2008; Chair 2008.

Professional and Honorary Society Memberships

Soil Science Society of America
Chair, Division S-5, 2002
International Union of Soil Science
Alpha Zeta
Gamma Sigma Delta
Society of Sigma Xi (Associate Member)
AGHON - Honorary Member

Affidavit of Larry T. West, Ph.D.

COMES NOW the affiant, and states and declares all as follows under oath or affirmation:

1. My name is Larry T. West.

2. I submitted a declaration executed Oct. 15, 2014, labeled "PCR/Habeas Exhibit 1" to the initial motion in *Mann v. United States*, No. 4:14-CV-00614 (U.S. Dist. Ct. E.D. Ark. October 20, 2014), a true and correct copy of which appears on pages 62-80 of Doc. No. 395 in *United States v. Mann*, No. 4:09-CR-00099-BSM.

3. In the foregoing exhibit, I include "West Declaration Exhibit A", a curriculum vitae, and also summarize my professional qualifications on pages 1-2 of the declaration itself. With the following additions, these are essentially unchanged. In the past twelve months, I have

- published—with my coauthors—two additional peer-reviewed articles;
- served as lead editor for a book titled "Soils of the USA" due to be published in 2016;
- made one additional presentation at a professional conference;
- delivered three guest lectures in University of Arkansas professors' courses;
- served on the committee for a Master's student; and
- been elected President of the Arkansas Association of Professional Soil Classifiers.

4. As explained in paragraph 12, since my initial study of the materials in this case identified on pages 2-3 of PCR/Habeas Exhibit 1, I received soil samples collected in this case as documented in Paulman and Steuber Declarations and other materials submitted as PCR/Habeas Exhibits 22-25 (Doc. No. 421).

5. I have reviewed the portion of the response to show cause by counsel for the respondent in No. 4:14-CV-00614 (Doc. No.483 in No. 4:09-CR-00099-BSM) that addresses

the evidence I gave in the original declaration. In the original declaration of October 15, 2014, I reviewed images of the hole (Government Exhibits 98-A, 98-B, 98-C, 98-H & 98-I, and Government Exhibit 101-C (part two)), from which the ammunition canister was stated to have been removed and applied my knowledge of soil science and the behavior of soils in their natural setting to evaluate the relative age the hole in question. My conclusion was that the hole was not freshly dug.

6. On page 36 of their response, the respondent's counsel argue that "there is no way, based upon the information and evidence available to the parties (images of the hole), - whether presented at trial or not – any expert – whether for Mann or for the United States – could reliably or accurately determine the depth or age of the hole where the grenades were buried. It is just not possible. ... These pictures were clearly not taken with an eye towards determining the depth or age of the hole ...".

7. At face value, these statements are partially correct. It is impossible to accurately determine the age of the hole (depth is a different matter) without being present when the hole was dug. There are characteristics of soils in a hole and piled or spread around the hole, however, that can be used to interpret if the hole has been dug since the last appreciable rainfall or has been open long enough for one or more rainfall events to have altered the physical appearance and characteristics of soil removed from the hole. My ability to recognize such changes was initially developed during my graduate school education and was greatly enhanced during my professional career that includes 20 years as a professor at the University of Georgia and 8 years as a soil scientist with the United States Department of Agriculture during which I observed, studied, and performed research on soils in their natural setting at locations across the United States and in several other countries. Change in

soils, especially those that have been disturbed by tillage or other means, when the soils are wet by rainfall and subsequently dry is a natural process and is generally referred to as consolidation. The processes and changes associated with consolidation are particularly important for evaluation the potential of soils to erode. I have done research on consolidation associated with wetting by rainfall for multiple soils (see West Declaration Exhibit A) and can identify certain visual characteristics of consolidated soils.

8. Regardless of the purpose of taking the pictures of the hole that the Government produced in hearings, discovery, and trial, they contain information about the visually observable characteristics of the soil in and around the hole that enables a person with education and experience in soil science, especially as related to consolidation processes, to judge if the hole is freshly dug or has been open long enough to have been rained on one or more times.

9. The soil that has been mapped in the area where the hole was located is Linker fine sandy loam[1]. This soil typically has about 5 inches of brown topsoil with 15 to 40% sand and 10 to 20% clay that overlies yellowish red subsoil that has a similar sand content as the topsoil but has an increase in clay to 25 to 35%. The Linker soil is acidic and typically has pH less than 6.0.

10. To evaluate appearance of freshly dug and re-excavated holes, in March 2014 two ammunition canisters similar or identical to the one that trial witnesses Mark Rinke and Ryan Kimbell testified they removed from a hole in the woods off the cul-de-sac at the end of Galaxy Lane in London, Arkansas, were buried at or very near the site of the hole about which

[1] Soil Survey Staff. 2015. Web Soil Survey. USDA-Natural Resources Conservation Service, Available online at http://websoilsurvey.nrcs.usda.gov/.

they testified. See Paulman and Steuber Declarations, Doc. Nos. 421-02 and -03.

11. In this declaration, the two holes dug at or very near location will be referred to as Known Hole 1 and Known Hole 2. The hole from which trial witnesses Mark Rinke and Ryan Kimbell testified they removed the ammunition canister will be referred to as the Questioned Hole.

12. During excavation of Known Hole 1 and Known Hole 2, soil samples were collected from both holes at depths of 1 and 8 inches (see Paulman and Steuber Declarations). These samples were transferred to me in September 2015, and I had chemical and particle size properties measured on the samples at the University of Arkansas Agricultural Diagnostic Laboratory in Fayetteville, AR. All four samples were acid (pH range of 4.1 to 4.5), which is typical for Linker and similar soils in the area around Russellville. Samples taken at 1 inch depth from Known Hole 1 and Known Hole 2 had 25 and 27% sand and 16 and 14% clay, respectively. Samples from 8 inches had 18 and 20% sand and 30 and 32% clay, respectively. These data are within the concept of the Linker soil, and because of the proximity of the Known Holes to the Questioned Hole support the mapping of the soil at the Questioned Hole as Linker with brown topsoil and yellowish red subsoil.

13. In the image of the Questioned Hole in Fig. 1 (page 10 of this affidavit), yellowish red subsoil is visible on the sidewall of the hole opposite the bottle in the image foreground. Brown topsoil is also visible in the image above the yellowish red subsoil. A similar sequence of horizons can be seen in Fig. 2 (page 11), an image of Known Hole 1 excavated to show what the actual burial of an ammunition canister would look like. Depth to the boundary between these two soil layers cannot be determined from these images, but the depth appears to be similar in the two. Identification of yellowish red subsoil in the hole strongly suggests that

this subsoil material should have been removed during excavation of the Questioned Hole and deposited in the spoil adjacent to the hole as was observed for Known Holes 1 and 2 (Figs. 3 and 6; pages 12 and 15). Well-aggregated yellowish red soil is clearly visible in the soil covering Known Hole 2 (Fig. 3; page 12) and in the soil adjacent to Known Hole 1 after excavation of the buried ammunition canister (Fig. 6; page 15).

14. It is reasonable to expect that a mixture of topsoil and subsoil would be visible in the area adjacent to the Questioned Hole if an ammunition canister covered by soil taken from the hole had been covered by soil from the hole and more digging or other soil removal were done in order to remove the ammunition canister. Such a mixture of brown topsoil and yellowish red subsoil particles and aggregates can be seen in images of Known Holes 1 and 2 contained in Figs. 3 (page 12) and 6 (page 15). In contrast, Figs. 1 (page 10), 4 (page 13), and 5 (page 14) show no yellowish red subsoil material in the area immediately surrounding the Questioned Hole from which Rinke and Kimbell reported and testified that they retrieved the ammunition canister.

15. Figures 4 (page 13) and 5 (page 14) show a small pile of yellowish red soil a short distance from the Questioned Hole that is visible in images of the broader area around the hole. The soil aggregates in this pile are indistinct and appear to be "molded" together, most likely due to being wet by rainfall. At the Dardanelle weather station, which is 6.5 miles from the location of the hole, the most recent appreciable rainfall prior to the reported discovery of the ammunition canister from the Questioned Hole was 0.94 inches on February 10 and 11, 2009. Small rains of 0.12 and 0.11 inches were recorded at this station on February 21 and 27, 2009, respectively. Based on my education, training, and research experience, I find it improbable that the small rains on February 21 and 27 were sufficient to result in the

aggregate breakdown visible in images of the pile of yellowish red soil. The rains of February 10 and 11 were sufficient to result in aggregate breakdown, however, which suggests the pile of yellowish red soil had been in place prior to the rains on February 10 and 11. The reason this small pile of yellowish red soil is separated from the Questioned Hole cannot be determined from information the Government has thus far made available to Dr. Mann's counsel and the courts.

16. Reasons for the lack of yellowish red subsoil adjacent to the Questioned Hole is unknown but is not consistent with expectations for soil that recently had been placed there in the course of storing or retrieving an ammunition canister. Abundant yellowish red soil is visible around the Known Hole 1 in Fig. 6 (page 15). This soil was deposited when the ammunition canister buried two days prior was dug up and removed from the hole.

17. Images such as Fig. 4 (page 13) indicate the ammunition canister was placed on soil immediately adjacent to the Questioned Hole. In images of the area around the Questioned Hole such as Fig. 5 (page 14) taken after Rinke and Kimbell said the canister had been moved, the soil that was under the ammunition canister is brown, not aggregated or cloddy, and generally appears to be smooth with the exception of a few soil aggregates scattered across the underlying smooth soil. The lack of soil aggregates in this area could be due to their having been crushed by the weight of the ammunition canister and/or foot traffic. Aggregates from soils with properties of those in this area will disintegrate when they become wet from rainfall and may develop a smooth surface when rained on.

18. There was one small pile of aggregated soil adjacent to the Questioned Hole that is visible in Fig. 1 (page 10). The soil comprising this pile is light colored and appears to be relatively dry (the color of soil becomes lighter as it dries). Soil that has recently been dug

and piled at the surface would be expected to be relatively moist similar in appearance to the soil exposed in the sidewalls of the hole (Fig. 1; page 10). The dry condition of the aggregated soil suggests it has been laying on the surface for more than the short time the trial testimony indicated elapsed before Jason Smith took his pictures of the scene or the one day that elapsed before the ATF took its pictures.

19. The remainder of the soil on the surface immediately adjacent to the Questioned Hole lacks aggregation and, for the most part, is covered by leaves. Lack of aggregation suggests that rain or foot traffic has broken down aggregates that were present when the soil was placed at the surface, even on the side of the hole opposite to where the ammunition canister was placed (Fig. 5; page 14). Appearance of leaves on the surface suggest that the area adjacent to the Questioned Hole had not been subject to the same amount of foot traffic as the area around where the ammunition canister was placed. As discussed in paragraph 15, Dardanelle weather station data indicate that no rain had fallen in the area since February 27, 2009, and that only 0.23 inches of rain had fallen since February 11, 2009, when 0.94 inches of rain fell over a two-day period. It is unlikely that two small rain events on February 20 and 27 would cause all aggregates around the hole to break down. Thus, with the exception of the small pile of aggregated soil, the soil surrounding the hole appears to have been rained on and would have been in place for at least 21 days. The leaf cover on the soils adjacent to the hole also supports the soil having been in place for a considerable period, at least more than one or two days.

20. Figure 7 (page 16) shows that the bottom of the Questioned Hole is covered with intact tree leaves. Figures 1 (page 10), 4 (page 13), and 5 (page 14) show that most of the soil surface in the broad area surrounding the Questioned Hole is covered with leaves. In theory,

the leaves could have been kicked into the hole subsequent to removal of the ammunition canister. But Figures 1 (page 10) and 7 (page 16) show that these leaves are mostly intact and not broken. Comparison of these leaves to the broken leaves on the soil in the area in and around where the canister sat, as in Fig. 5 (page 14) suggests they had not been subject to the amount of disturbance needed to "kick" the leaves into the hole.

21. Figure 7 (page 16) shows that there is no visible soil mixed in with the leaves in the hole as I would expect if leaves lying on the soil surface had been "kicked" into the hole. Additionally, none of the images of the site, such as Figs. 1 (page 10), 4 (page 13), and 5 (page 14), shows an area in the vicinity of the hole where the leaf cover or soil surface is disturbed as would be expected if the leaves in the hole had been kicked into it.

22. In theory, a strong wind might have blown the leaves into the hole; but the average daily wind speed recorded at the Russellville Airport Weather Station (9.3 miles from the site) was 5.5 and 3.9 miles per hour for March 3 and 4, 2009, respectively. In my experience and judgment based on my education and research, it is unlikely that light winds such as these could have blown the leaves into the hole. The maximum average daily wind speed between February 1 and March 2 reported by the Russellville Airport Weather Station was 9.9 miles per hour on February 28. This suggests that if wind was the reason for the leaves in the hole, it had to have been open for several weeks preceding March 3, 2009.

23. An alternate explanation for the leaves in the hole is that they fell into the hole during the annual leaf drop in the autumn of 2008. This explanation would require that the hole had been open as far back in time as the autumn of 2008.

24. Interpretations of soil and land surface characteristics visible on images taken of the site suggest that the hole at the site had been open for at least two weeks before March 3,

2009 and possibly for a much longer period. Until rain or compaction causes their breakdown, the soil will be aggregated. Soil removed from Known Holes dug in the area had the type of aggregation that would be expected, and the aggregates remained intact until destroyed by rain weeks after excavation. The soil that Rinke's and Kimbell's testimony indicates they would have removed and deposited immediately adjacent to the Questioned Hole lacked aggregation. The lack of aggregation is partially due to compaction from the weight of the ammunition canister and from foot traffic. Only limited aggregation was visible, however, in areas that had a leaf cover and that were away from obvious foot traffic. Yellowish red soil would be expected to be visible in the area immediately adjacent to the hole since visual observations of images suggested the Questioned Hole extended into the yellowish red subsoil characteristic for the soil mapped in the area. The only yellowish red soil observed on images from the site was in a small pile at a distance from the hole, and this soil was poorly aggregated suggesting it had been exposed to rain. Only light rain unlikely to destroy aggregates was recorded in the area for the 20 days prior to the date on which Rinke and Kimbell reported and testified that they had discovered and excavated the ammunition canister. Intact leaves were visible in the Questioned Hole. No soil was mixed with the leaves, and there was no visible evidence of soil surface disturbance near the site that would suggest the leaves had been kicked or raked into the hole. Wind speeds the day of and day after discovery and excavation of the ammunition canister were low, suggesting the hole was open during a period of higher wind speeds prior to March 3, 2009, or that the leaves were deposited in the hole during leaf fall in the autumn of 2008.

25. The assessments, evaluations, findings, opinions, and conclusions in this affidavit are given to a reasonable degree of scientific certainty.

Figures

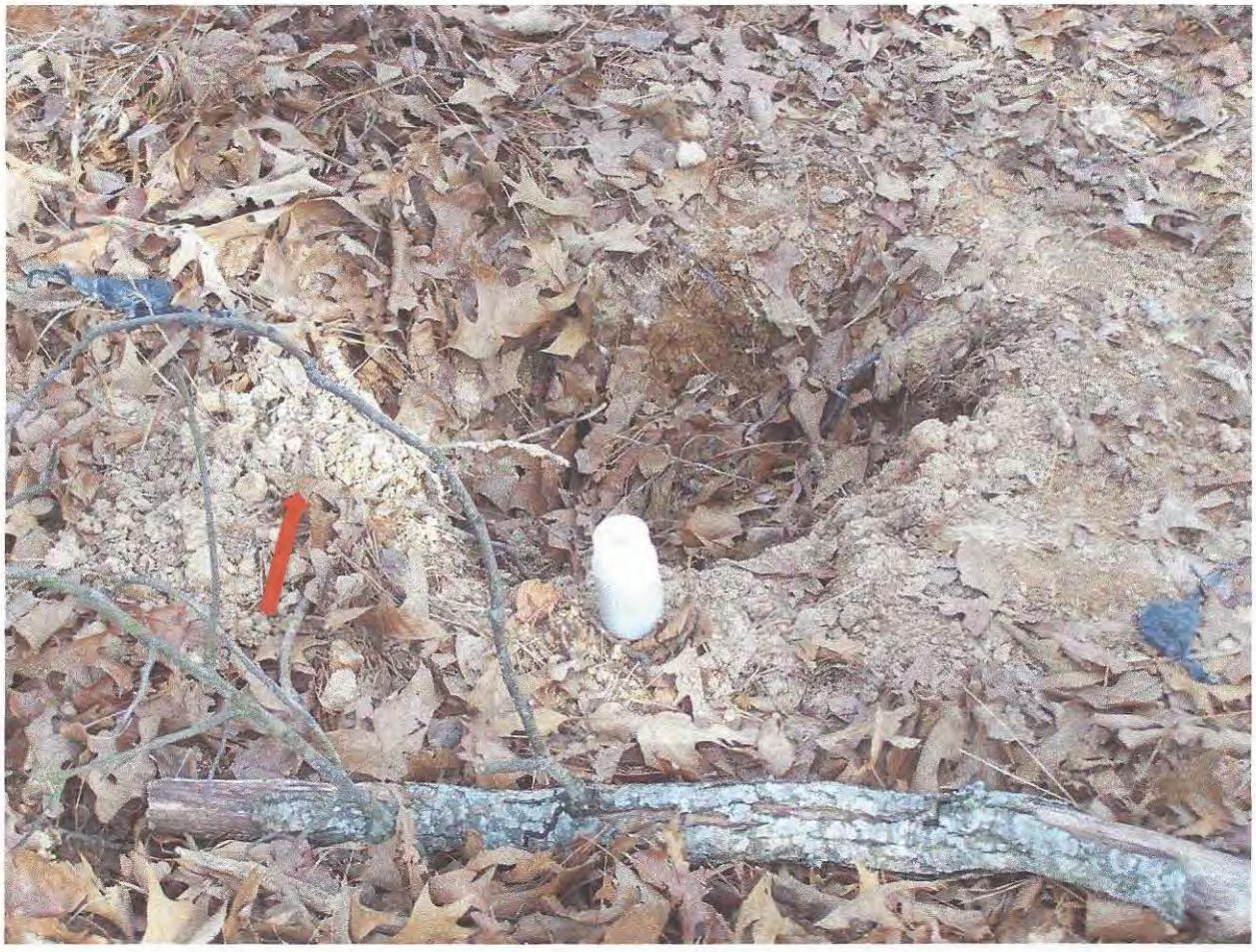

Figure 1. Image of Questioned Hole from Respondent Exhibit 3. Red arrow indicates area of brown soil with weak aggregation. Note lack of aggregates in remainder of soil adjacent to hole. Also note leaves in bottom of hole and amount of leaves on soil surface surrounding the hole.

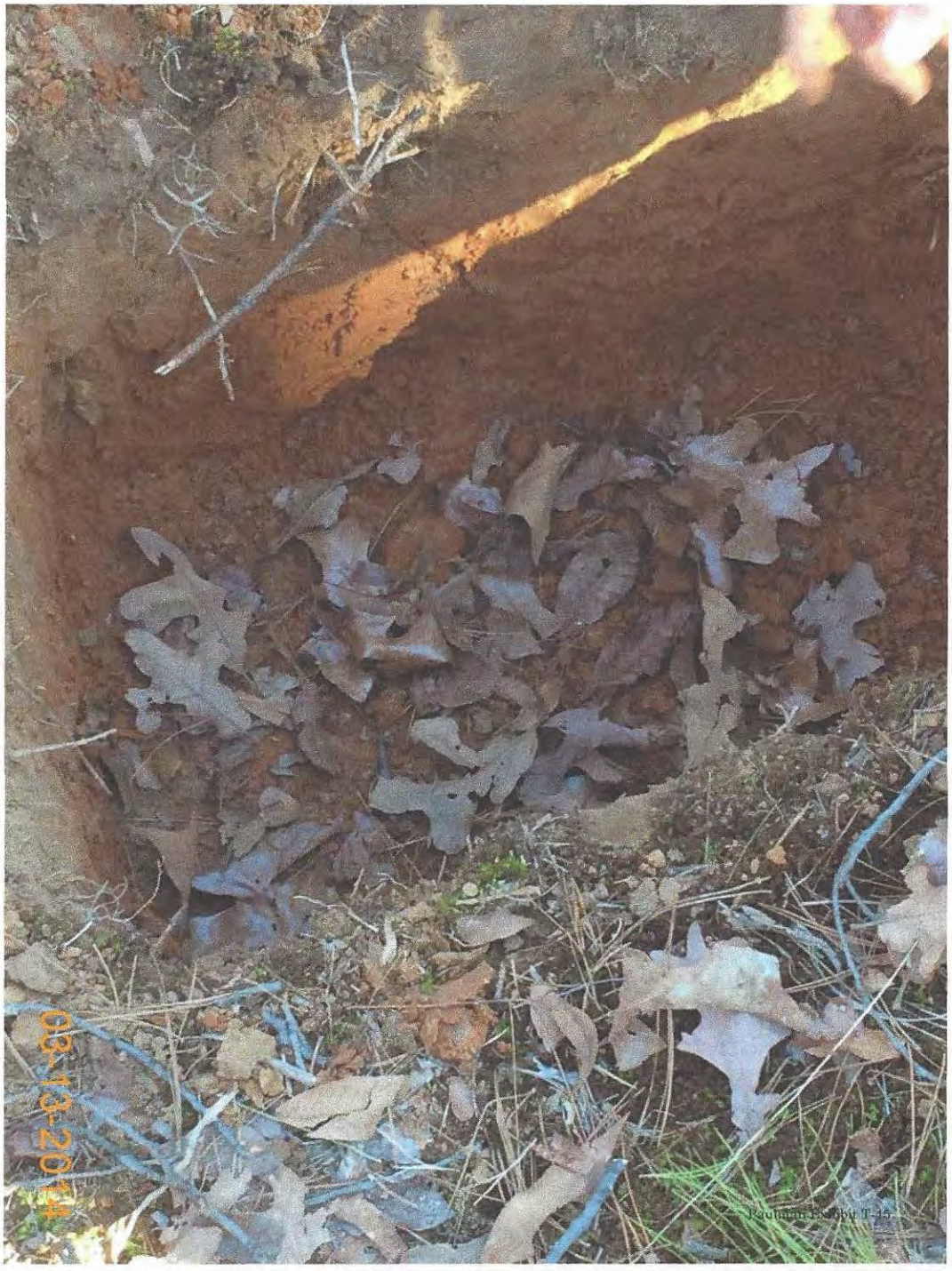

Figure 2. Image of Known Hole 1 (Paulman declaration exhibit T-45) showing brown topsoil overlying brownish red subsoil.

Figure 3. Image of soil covering Known Hole 2 after burial of ammunition canister (Paulman declaration exhibit T-69). Note aggregation of the disturbed soil.

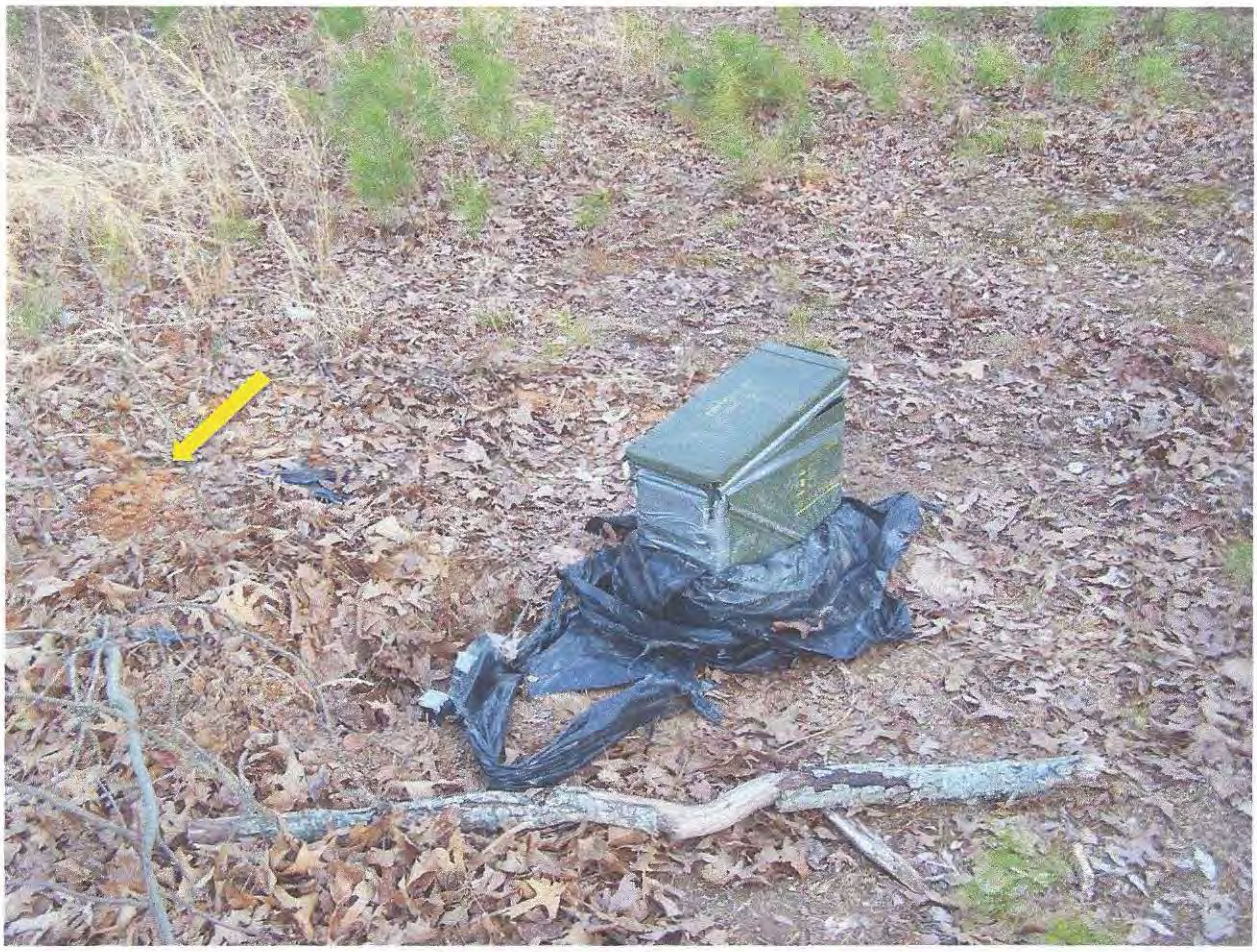

Figure 4. Image of ammunition canister and Questioned Hole from Respondent Exhibit 2. Note small pile of yellowish red soil marked with yellow arrow. Also note intact leaves on the soil surface on all sides of the hole.

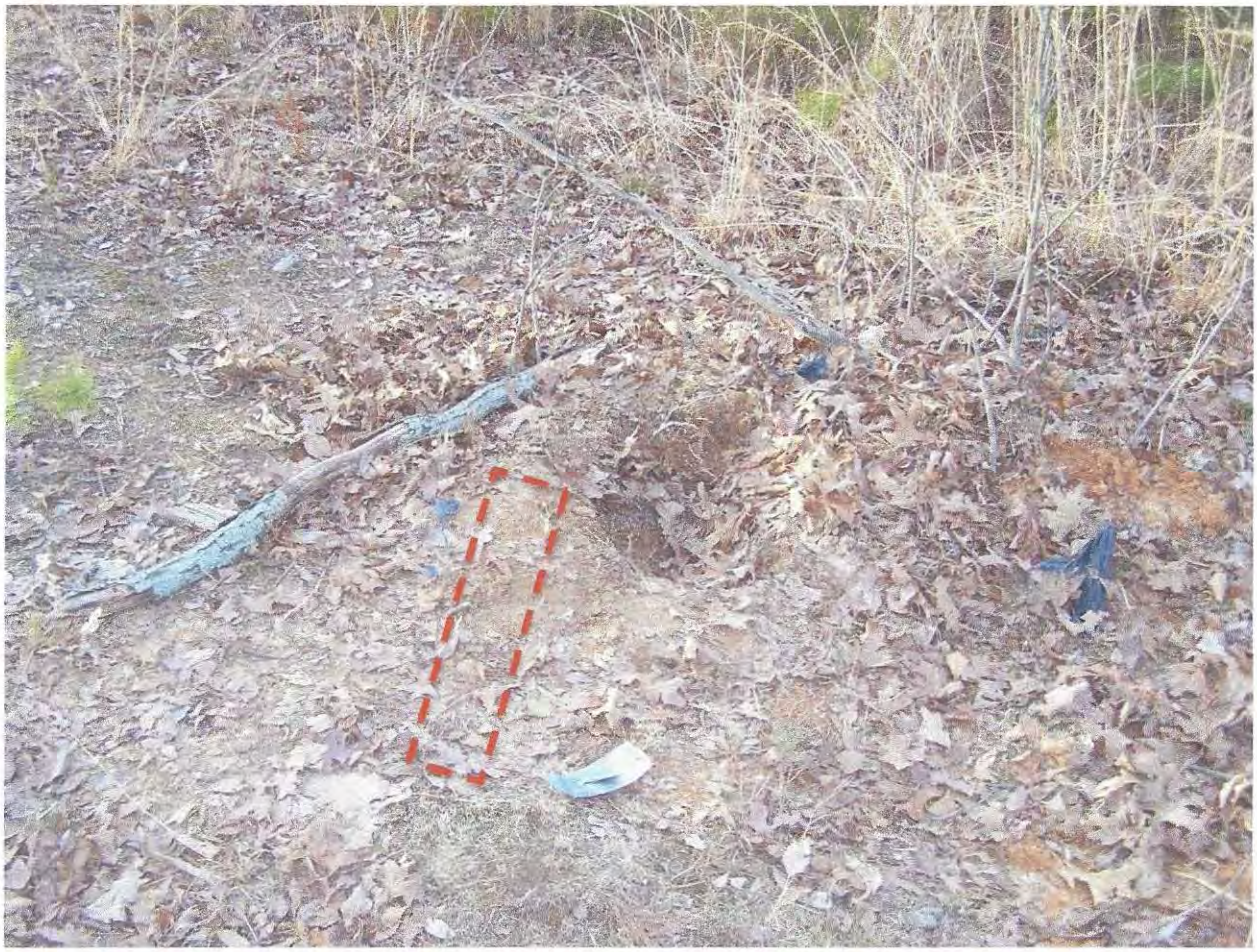

Figure 5. Image of the Questioned Hole from Respondent Exhibit 2. Note lack of aggregation of the soil. Soil on surface at location where ammunition canister sat (dashed outline in red; approximation; not to scale) lacks aggregation potentially because of crushing by weight of canister and foot traffic. Little soil aggregation can be seen in soil in the area adjacent to the hole away from area where ammunition canister sat.

Figure 6. Image of Known Hole 1 after excavation of buried ammunition canister (Paulman declaration exhibit T-45; showing the deeper of the two Known Holes) showing aggregation in soil.

Figure 7. Image of Questioned from Respondent Exhibit 3. Note intact leaves in bottom of hole that appear to be continuous up the side of the hole to the soil surface.

26. In summary, it is my opinion, to a reasonable degree of scientific certainty, that (a) the pictures taken by federal agents or their witnesses in March 2009 are adequate to assess the characteristics of the soil and leaves for the purpose of evaluating the relative age of the Questioned Hole within the discipline of soil science; (b) the documentation of the creation of the Known Holes 1 and 2 in March 2014 at substantially the same location as the Questioned Hole make them appropriate bases of comparison within the discipline of soil science; (c) lack of aggregation of soil in soil removed from the Questioned Hole indicates that the aggregates had been disrupted by rain which fell before the date the soil was reported to have been excavated from the hole; (e) the condition of the leaves in the Questioned Hole and on the surrounding soil surface are inconsistent with leaves having been kicked into the hole by Rinke, Kimbell, and agents responding to them; (f) if wind blew the leaves into the Questioned Hole, it was likely before February 1, 2009; (g) no soil was mixed in with the leaves in the hole; and (h) for all the reasons in this affidavit, the Questioned Hole had been open for at least two weeks before March 3, 2009, and possibly for a much longer period back through autumn 2008.

Further, the affiant saith naught.

I swear or affirm that the foregoing is true and correct.

LARRY T. WEST

STATE OF ARKANSAS

COUNTY OF Washington

Personally appeared Larry T. West before me, a Notary Public, by me known and known by me to be Larry T. West, this 5th day of November 2015, and executed the foregoing affidavit on his oath or affirmation.

My commission expires
Aug 26th 2020.

NOTARY PUBLIC

J. WILEY HOLT
MY COMMISSION # 12378228
EXPIRES: August 26, 2020
Washington County