Appendix A.

Curriculum Vitae

Dwayne R. Edwards, Ph.D., P.E.
Biosystems and Agricultural Engineering Department
University of Kentucky

SUMMARY

Research

Publications

Peer-Reviewed Articles:	82 (80 in print/press, 2 in review)
Book Chapters:	1
Peer-Reviewed Proceedings:	3
Other Reviewed:	9
Conference Proceedings:	26
Professional Meeting Papers:	35
Major Completion Reports:	17
Other Publications:	8
Funded Proposals:	$2.06M ($1.42M external, $0.64M internal)

Service

Academic: 14 formal service memberships, including Director of Graduate Studies.
Professional: 17 formal service memberships, including journal editorship.
Community: 8 service activities, including non-profit Board of Directors.

Teaching

Courses Taught

BAE 343 (Fluid Mechanics):	10 Semesters
BAE 437 (Land and Water Resources):	8 semesters
BAE 536 (Fluvial Hydraulics):	22 semesters
BAE 662 (Stochastic Hydrology):	13 semesters
BAE 775 (Professional Practices):	11 semesters

Graduate Student Advising:

Ph.D.	4 (two expected in 2017)
M.S.	10
Committees:	24

Leadership

Service in U.S. Army Reserve, retired in 2014 at rank of Brigadier General
More than 30 years in command/principal staff assignments
Primary responsibility for organizations of up to 3,000 with budgets > $30M
Formal training and experience in strategic planning and executive leadership.

Dwayne R. Edwards, Ph.D., P.E.
Biosystems and Agricultural Engineering Department
University of Kentucky

EDUCATION

2005:	M.S. Strategic Studies, U.S. Army War College
1988:	Ph.D. Agricultural Engineering, Oklahoma State University
1986:	M.S. Agricultural Engineering, University of Arkansas
1984:	B.S. Agricultural Engineering, University of Arkansas

PROFESSIONAL EXPERIENCE

2000 - Present:	Professor, Biosystems and Agricultural Engineering Department, University of Kentucky, Lexington
1994 - 2000:	Associate Professor, Biosystems and Agricultural Engineering Department, University of Kentucky, Lexington.
1993 - 1994:	Associate Professor, Biological and Agricultural Engineering Department, University of Arkansas, Fayetteville.
1988 - 1993:	Assistant Professor, Biological and Agricultural Engineering Department, University of Arkansas, Fayetteville.

PROFESSIONAL SPECIALTY

Water resources and environmental research to identify sustainable solutions for agricultural producers. Published research topics include hydrologic and water quality assessments as related to confined animal production, forage and row crop production, climate variables, organic/inorganic amendments and others. Responsible for all program components, including identification of topics, resource procurement, dissemination of findings and professional training for undergraduate and graduate students. Further responsible for formal undergraduate and graduate instruction on bioenvironmental engineering and analysis of hydrologic data as well as standards of research and communication in the larger professional context.

AWARDS

American Society of Agronomy Excellence in Extension Award, 2016
ASABE New Holland Young Researcher Award, 2000
Honorable Mention, ASABE Paper Competition, 1999
Environmental Excellence Award, U.S. Environmental Protection Agency, 1993,1995

Outstanding Researcher, Bio & Agri Engr Dept, University of Arkansas, 1991, 1992
Honorable Mention, ASABE Paper Competition, 1988

RESEARCH ACTIVITIES

PROGRAM OVERVIEW

My current major research efforts involve (a) evaluating the hydrologic impacts of climate change on major Kentucky water resources, (b) field assessments of surface water quality benefits of chemical treatments to organic soil amendments for high-productivity soils in Kentucky, (c) refinement of methods to estimate urban runoff and peak flow rates to ensure adequate flood mitigation and water quality protection and (d) improved mathematical descriptions of the physics of runoff and water quality processes. These lines of effort represent an evolution of previous research involving field- and watershed-scale investigations of best management practices for organic soil amendment application; reconnaissance studies involving nutrients, microorganisms, sediments, pesticides and endocrine disruptors; and use of field data to improve hydrologic/water quality simulation models.

PEER-REVIEWED JOURNAL ARTICLES (last 10 years)

1. Edwards, D.R. and S. Chattopadhyay. 2017. Evaluation of global climate model suitability for hydrologic and water quality analysis. *Trans. ASABE* (in review).

2. Anderson, K., P. Moore, D. Miller, P. DaLaune, D. Edwards, P. Kleinman, and B. Cade-Menun. 2017. Phosphorus Leaching from Soil Cores from a Twenty Year Study Evaluating Alum-treatment of Poultry Litter. *Journal of Environmental Quality* (in review).

3. Chattopadhyay, S., D.R. Edwards, Y. Yu and A. Hamidisepehr. 2017. Assessment of climate change impacts on future water availability and droughts in the Kentucky River Basin. *Environmental Processes* 4:477-507.

4. Chattopadhyay, S., D.R. Edwards and Y. Yu. 2017. Spatiotemporal variability of extreme precipitation indices in the Kentucky River Basin: Historical and future perspectives. *Water* 9:109 -128

5. Edwards, D.R. 2016. Spatio-temporal variation of runoff curve number for grassed plots in central Kentucky. *Water Resources Management* 31(11):3491-3505.

6. Williams, R.E. and D.R. Edwards. 2016. Effects of biochar treatment of municipal biosolids and horse manure on quality of runoff from fescue plots. *Trans.of the ASABE* 60(2):409-417.

7. Lidong, H., P.A. Moore, Jr., P.J.A. Kleinman, K.R. Elkin, M.C. Savin, D.H. Pote and D.R. Edwards. 2016. Reducing phosphorus runoff and leaching from poultry litter with alum: twenty-year small plot and paired-watershed studies. *Journal of Environmental Quality* 45:1413-1420.

8. Bullock, E.L., D.R. Edwards, P.A. Moore, Jr. and R.S. Gates. 2016. Effects of chemical amendments to swine manure on runoff quality. *Trans. ASABE* 59(6):1651-1660. doi: 10.13031/trans.59.11636

9. Chattopadhyay, S. and D.R. Edwards. 2016. Long-Term Trend Analysis of Precipitation and Air Temperature for Kentucky, United States. *Climate* 4(1): 10-24.

10. Maupin, T.P., C.T. Agouridis, D.R. Edwards, C.D. Barton, R.C. Warner, and M.P. Sama. 2013. Specific Conductivity Sensor Performance: II. Field Evaluation. 2013. *International Journal of Mining, Reclamation & Environment*: 1-21. Published online March 22, 2013.

11. Barnett, J.R., R.C. Warner, C.T. Agouridis, and D.R. Edwards. 2010. Ability of a Weep Berm to Enhance Grass Filter Performance in a Simulated Grazed System: Preliminary Results. *Natural & Environ. Sci.* 1(1): 12-20.

12. Tyagi, P., D.R. Edwards and M.S. Coyne. 2009. Distinguishing between human and animal sources of fecal pollution in waters: A review. *International Journal of Water* 5(1):1-15.

13. Tyagi, P., M.S. Coyne and D.R. Edwards. 2009. Fecal sterol and bile acid biomarkers: Runoff concentrations in animal waste-amended pastures. *Water, Air and Soil Pollution* 198 (1-4): 45-54.

14. Tyagi, P., M.S. Coyne and D.R. Edwards. 2008. Use of sterol and bile acid biomarkers to identify domesticated animal sources of fecal pollution. *Water, Air & Soil Pollution* 187 (1-4): 263-274.

15. Tyagi, P., M.S. Coyne and D.R. Edwards. 2007. Use of selected chemical markers in combination with a multiple regression model to assess the contribution of domesticated animal sources of fecal pollution in the environment. *Chemosphere* 69(10): 1617-1624.

SERVICE AND PROFESSIONAL ACTIVITIES

DEPARTMENTAL SERVICE

(University of Kentucky)

Director of Graduate Studies, 2003 – 2013
Graduate Research Committee, 2013 – present
Undergraduate Curriculum Committee, 2013 – present
Awards Committee, 1995, 1998, 2001-2004. Chair, 1995, 1998
Computers Committee, 1999. Chair, 1999

(University of Arkansas)

Promotion and Tenure Committee, 1993-94
Chair, Faculty Search Committee, 1991-92
Undergraduate Recruiting Committee, 1989-91
Undergraduate Retention Committee, 1990-92
Retreat Organizing Committee, 1990-91

COLLEGE OF AGRICULTURE SERVICE

(University of Kentucky)

Information Technology Review Committee (Chair), 2002-2003
SB-271 Advisory Committee, 1995-2005. Chair, 1999-2005
Turner Leadership Academy, 2009

(University of Arkansas)

Arkansas Farm Research Editorial Board, 1994-1995
Department Head Search Committee, 1992
Water Quality Strategic Planning Committee, 1990

COLLEGE OF ENGINEERING SERVICE

(University of Kentucky)

Engineering Faculty Advisory Committee, 2002-2004
Graduate Research Committee, 2003-2013

(University of Arkansas)

Engineering Cooperatives Committee, 1988-92 (Chair, 1990)
Service Course Committee, 1989-92 (Chair, 1991)

UNIVERSITY OF KENTUCKY SERVICE

Graduate Council Committee on Fellowships and Traineeships, 2016 –.
Kentucky Water Institute Oversight Committee, 1997-2002. Chair, 1999.
Kentucky Water Resources Institute Director Search Committee, 1998
Tracy Farmer Center for the Environment Research Committee, 2003 – 2006.

PROFESSIONAL SERVICE

Editor, Soil and Water Division, *Transactions of the ASABE*, 1997-2000.
Associate Editor, Soil & Water Division, *Transactions of the ASABE*, 1993-7.
Publications Council, ASABE, 2002 – 2006. Chair, 2004 – 2006.
ASABE Young Researcher Award Committee, 2004 – 2006.
Refereed Publications Committee, ASABE, 1997-2006. Chair, 2004-2006.
Soil and Water Division Executive Committee (SW-01), 1998-2000.
Soil and Water Division Steering (SW-02), ASABE, 1997-2000.
Hydrology Group (SW-21), ASABE, 1993-2009.
Publications Review Committee (SW-05), ASABE, 1993-2000.
Precipitation/Runoff Committee, ASABE, 1989-1995. Vice Chair, 1994-1995.
Hydraulic Processes Committee, ASABE, 1989-1995. Vice Chair, 1994-1995.
Regional Research Project S-211, 1989-1991.
Regional Research Project S-249, 1992-1996. Vice Chair, 1992-1993. Chair, 1993-1994.
Regional Research Project S-273, 1997-2001.
Regional Research Project S-1004, 2002-2006.
Regional Research Project S-1042, 2007-2011
Regional Research Project S-1063, 2012 – present.
Reviewer of manuscripts for *Transactions of the ASABE, Journal of the American Water Resources Association, Climate, Water, Energy Sources, Journal of Water, Air, and Soil Pollution, Journal of Environmental Quality, Journal of Environmental Management* and others.

PROFESSIONAL SOCIETIES

American Society of Agricultural and Biological Engineers
American Society of Engineering Education
American Water Resources Association
Arkansas Society of Professional Engineers
National Society of Professional Engineers

HONORARY SOCIETIES

Alpha Epsilon (Honor society of Agricultural Engineering)
Gamma Sigma Delta (Honor society of College of Agriculture graduate students)
Phi Kappa Phi (Honor society for graduate students)

Tau Beta Pi (Honor society for Engineering)

TEACHING AND STUDENT ACTIVITIES

COURSES TAUGHT

University of Kentucky

BAE 343, Fluid Mechanics of Biosystems. This was our "in-house" basic fluids course that covered fluid statics, fluid dynamics, fluid transport systems, pumps, and related topics, and I was fully responsible for its development. Following improvements to similar courses in other engineering departments, we discontinued the course in 2005. Average teaching rating was 3.6±0.3

BAE 437, Land and Water Resources Engineering. Our introductory course for the bioenvironmental specialty, covering precipitation, runoff, erosion, open channel analysis and design, flow control structures, and similar topics. I took over the course in 2010 following the departure of the instructor, after which it has been fully revised. Average teaching rating is 3.4±0.5.

BAE 536, Fluvial Hydraulics. Our advanced/practitioner course in the bioenvironmental area, covering frequency analysis, runoff hydrographs, steady and unsteady open channel flow analysis, erosion and sediment yield with significant exposure to practical software packages in "real world" situations. I fully developed this course, and my average teaching rating is 3.6±0.3.

BAE 662, Stochastic Hydrology. A graduate course drawing from Civil Engineering, Earth Sciences, and Crop and Soil Science departments. The content includes probability theory, Monte Carlo simulation, time series analysis, correlation and regression analysis, Kalman filtering, multivariate analysis and geospatial analysis. I developed the course, and my average teaching rating is 3.5±0.3.

BAE 775, Professional Practices Seminar. This is a two-part course intended to provide our graduate students (all specialties) with the skills and perspectives required to succeed in both their program and their next job. The first (Fall) part is focused on conduct and evaluation of science, budgeting and project management, culminating in the research proposal. The second (Spring) part is highly focused on written and oral communication, emphasizing different media and audiences. I developed both parts of this course, and my average rating is 3.2±0.2.

GRADUATE STUDENT ADVISING

Cara Peterman, Ph.D., 2017 (expected; Co-Chair with Alan Fryar)
Somsubhra Chattopadhyay, Ph.D., 2017 (expected)
Rachel Williams, M.S., 2016.
Carmen Agouridis, Ph.D., 2004.
Sheila Youngblood, M.S., 2001.
Elizabeth Rockaway, M.S., 2000.
Elizabeth Busheé, M.S., 1999.
Mike Williams, Ph.D., 1998 (Co-Chair with Joe Taraba).
Christopher Moss, M.S., 1998.
Teng Lim, M.S., 1997.
Puneet Srivastava, M.S., 1995.
Yang Wang, Ph.D., 1995.
Indrajeet Chaubey, M.S., 1994.
Oswald Marbun, M.S., 1990.

GRADUATE COMMITTEE MEMBERSHIPS

Zhang Xi, Ph.D., Plant and Soil Sciences, 2018 (expected).
Moran Gerlitz, M.S., Biosystems and Agricultural Engineering, 2018 (expected).
Bakkiyalakshmi Palanisamy, Ph.D., Biosystems and Agricultural Engineering, 2010.
Joe Luck, M.S., Biosystems and Agricultural Engineering, 2007.
Mohammad Tufail, Ph.D., Civil Engineering, 2006
Dhandayudhapani Ramalingam, Ph.D., Civil Engineering, 2006
Seth Bradley, M.S., Civil Engineering, 2006
Ken Casey, Ph.D., Biosystems and Agricultural Engineering, 2005.
Joe Pursewell, Ph.D., Biosystems and Agricultural Engineering, 2005.
Sebastian Torrealba, M.S., Biosystems and Agricultural Engineering, 2004.
John Barnett, M.S., Biosystems and Agricultural Engineering, 2004.
Virginia-Bibb Golden, Biosystems and Agricultural Engineering, 2004.
Eric Dawalt, M.S., Biosystems and Agricultural Engineering, 1999.
Jihad Hallany, M.S., Biosystems and Agricultural Engineering, 1999.
Guilleaume Cornilleau, M.S., Biosystems and Agricultural Engineering, 1999.
Brenda Miller, M.S., Biosystems and Agricultural Engineering, 1999.
Adam Reed, M.S., Agronomy, 1996.
David Marshal, M.S., Geology, 1996.
Dan Pote, Ph.D., Agronomy, 1996.
Dan Pote, M.S., Agronomy, 1993.
Patrick Adams, M.S., Agronomy, 1993.
Sharon Townsend, M.S., Home Economics, 1992.
Tyler Dutton, M.S., Civil Engineering, 1993.
Babiker Ibrahim, Ph.D., Agronomy, 1991.

ADDENDUM OF MILITARY/LEADERSHIP EXPERIENCE

RETIRED RANK

Brigadier General, United States Army Reserve, nominated by the President and confirmed by the US Senate in September 2009, retired in September 2014.

SIGNIFICANT FORMAL TRAINING

Infantry Officer Basic Course (Ft Benning)
Infantry Officer Advanced Course (Ft Benning)
Combined Arms and Services Staff School (Ft Leavenworth)
United States Army Command and General Staff College (Ft Leavenworth)
United States Army War College (Carlisle Barracks)
Advanced National Security Studies (Syracuse University)
Senior Leader Development Program (Washington, DC)
Advanced/Executive Leader Development Program (Notre Dame University)

DUTY ASSIGNMENTS

Support Command Deputy Commanding General, November 2012 – Retirement.
Division Commanding General, Rochester, NY, July 2010 – November 2012.
Deputy Commanding General, Charlotte, NC, May 2009 – July 2010.
Deputy Chief of Staff for Training Operations, Richmond, VA, May 2007 – May 2009.
Brigade Commander, Salem, VA, May 2005 – May 2007.
Battalion Commander, Fort Knox, KY, March 2003 – May 2005.
Brigade Operations Officer, Louisville, KY, February 2001 – March 2003.
Battalion Operations Officer, Nashville, TN, March 1996 – February 2001.
Assistant Brigade Operations Officer, Lexington, KY, March 1993 – November 1994.
Company Commander, Fayetteville, AR, March 1993 – November 1994.
Psychological Operations Officer, Fayetteville, AR, August 1988 – March 1993.
Company Commander, Stillwater, OK, October 1986 – August 1988.
Executive Officer, Stillwater, OK, January 1986 – October 1986.
Executive Officer, DeQueen, AR, October 1983 – January 1986.
Heavy Weapons Platoon Leader, Mena, AR, October 1982 – October 1983.
Infantry Platoon Leader, DeQueen, AR, March 1982 – October 1982.

SIGNIFICANT AWARDS

Legion of Merit (two awards). Received for conceiving and implementing metrics-based organizational leadership and physical relocation of a large Army Reserve headquarters, to include relocation of full-time professional staff.

Meritorious Service Medal (six awards). Received for leadership and oversight of geographically-dispersed training centers, development of robust training management policies and processes, increased unit strength and readiness, and other accomplishments.

KEY ASSIGNMENTS DESCRIPTION

The overviews of my last six assignments indicate that, not only was I an individual candidate for a combat zone deployment, I was also heavily engaged in training junior and mid-grade enlisted Soldiers as well as future junior officers for the Army. The assignments are progressive in terms of responsibility and authority, geographic footprint, and numbers of reporting units/personnel. The assignments also represent a continuum of leadership and administrative duties. At lower levels of command, I was commonly involved in direct leadership, planning and oversight. At the higher levels of command, I exercised more indirect leadership with increased focus on strategic vision, organizational direction, and logistical/facilities readiness. The higher-level leadership positions also required heavy emphasis on personnel management, including evaluations, promotions, duty assignment selections, and mentoring. Among those whose careers I helped to guide, 11 became battalion commanders, six became brigade commanders, and three became General Officers.

Deputy Commanding General (99th Regional Support Command, Fort Dix, NJ). The mission of this major Army Reserve Command was to provide facilities, maintenance and personnel support to Army Reserve units and their roughly 50,000 Soldiers in 13-states of the northeastern US. We were heavily involved in the process of constructing, maintaining, servicing and renovating over 300 Army Reserve centers as well as hundreds of auxiliary buildings. Our highly-dispersed maintenance activities provided all levels of service (and often concentrated storage) to all vehicles and major equipment in the supported units' respective inventories. My basic responsibilities were similar to those for my previous Deputy Commanding General assignment. During this assignment, however, I interfaced more with civic organizations, elected leaders, and key civilians, and I became much more highly involved in facilities management, maintenance operations, and the processes and organizational principles required for effectiveness.

Commanding General (98th Training Division, Rochester, NY). This unit was a subordinate to the 108th Training Command with the mission of providing Drill Sergeants to Forts Benning, Leonard Wood and Jackson. The unit

strength was approximately 3,000, with units located throughout the eastern US from Maine to Florida, with a unit also stationed in Puerto Rico. My responsibilities involved the usual command functions but with significantly enhanced authorities with respect to personnel selections, resources and allocation, disciplinary issues, personnel actions, and individual initiatives intended to enhance awareness and build support. Additionally, substantially more time was devoted to interfacing with external audiences such as elected civilian leaders, civic organizations, outside commands, and higher-level Army organizations. I was supported by a staff of approximately 75 officers, enlisted Soldiers and civilians, half of whom were full-time employees. My efforts led to the successful initial training of approximately **5000** new Soldiers as well as **2,500** Soldiers preparing for combat zone deployment.

Deputy Commanding General (108th Training Command, Charlotte, NC). Another major Army Reserve Command with units and responsibilities located throughout the Nation, the primary unit mission was to provide Drill Sergeants to the four Army Training Centers (Forts Benning, Jackson, Sill and Leonard Wood). My responsibility was to act as commander in absence of the Commanding General but also included direct leadership in areas such as major process initiatives, staff processes and products, disciplinary action, leader development, and others as required. My efforts directly facilitated the combat zone deployment training for **3,000** Soldiers and initial entry training for another **10,000** new Soldiers.

Deputy Chief of Staff (80th Training Command, Richmond, VA). The unit was a major Army Reserve Command with the nation-wide mission of conducting all Reserve Component reclassification training in the fields of combat support and combat service support. I was the principal staff officer responsible for all training operations associated with our annual training load of in excess of **30,000** students enrolled in roughly **250** courses across the continental US. More specifically, I was responsible for securing and aligning all required resources (instructors, billets, dining facilities, classrooms, training areas, computing equipment, training supplies, transportation requirements, etc.), staying in communication with supporting units within the Training Command, monitoring and allocating resources, maintaining awareness of issues and following up on corrective actions, site visits and consultation with customer units. My support staff consisted of approximately 30 officers and enlisted Soldiers, half being full-time employees.

Brigade Commander (80th Division, Salem, VA). The unit mission was to conduct advanced training to ROTC cadets (a training load of roughly **5000** cadets over a 12-week period), provide personnel support to reception operations at Army Training Centers (e.g., Ft Benning and Ft Jackson, with incoming loads of **10,000** new Soldiers), and to support other 80th Division training with logistic, maintenance and transportation assets. My responsibilities as commander of the 400 assigned Soldiers were similar to

those stated before (mission accomplishment, strength, morale, welfare, personnel qualification, discipline and compliance), but with overall success increasingly dependent on selection of personnel for key command/staff positions and working with higher commanders and staffs to influence mission, resources and policy. My support staff consisted of approximately 30 officers and enlisted Soldiers with half being full-time employees.

Battalion Commander (100th Division, Fort Knox, KY). The unit mission was to train Army ROTC cadets in basic soldiering and leadership skills. Our training load was approximately **3,000** cadets over a 12-week summer period. As commander of the 150-Soldier unit, I was responsible for all aspects of mission accomplishment (resources forecasting and acquisition, staffing, training and qualification of unit personnel, scheduling, safety, and other others) as well as the unit strength, morale, welfare, discipline, and compliance with Army and higher headquarter policies and regulations. My support staff included roughly 12 officers and enlisted Soldiers, half of whom were full-time employee

Appendix B.

List of Materials Considered

1. Berry, J. 2017. Harvest calendar. Pennsylvania State University, State College. Available online at https://extension.psu.edu/harvest-calendar

2. Haan, C.T., B.J. Barfield and J.C. Hayes. Design hydrology and sedimentology for disturbed watersheds. 588 p. Academic Press. San Diego, California.

3. Historical imagery. Available online at http://maps.psiee.psu.edu/ImageryNavigator/

4. Historical imagery. Available from Google Earth Pro, v. 7.3.0.3832

5. Huffman, R.L., D.D. Fangmeier, W.J. Elliot and S.R. Workman. 2013. Soil and water conservation, 7th Edition. 523 p. ASABE, St. Joseph, MI.

6. Hydrologic Engineering Center. 2015. Hydrologic Modeling System HEC-HMS User's Manual. Version 4.1. US Army Corps of Engineers, Davis, CA. 584 p. Available online at http://www.hec.usace.army.mil/software/hec-hms/documentation.aspx

7. Larson, Z. 2017. Planting date, temperature, spacing, and emergence: What really matters? Pennsylvania State University, State College. Available online at https://extension.psu.edu/planting-date-temperature-spacing-and-emergence-what-really-matters

8. Lake Erie Watershed LiDAR 2015 – DEM. Available online at http://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=3204.

9. Lake Erie Watershed 2015 Orthoimagery – CIR. Available online at http://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=3201.

10. National Hydrography Dataset, NHDFlowline – Erie. 2004. US Geological Survey. Available online at http://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=770.

11. National Land Cover Database. Available online at http://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=3141.

12. National Wetlands Inventory for Pennsylvania. 2009. US Fish and Wildlife Service. Available online at http://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=1457.

13. Natural Resources Conservation Service. 1986. Urban hydrology for small watersheds. Technical Release 55. U.S. Department of Agriculture, Washington, DC. 164 p. Available online at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf

14. Roland, M.A. & Stuckey, M.H. 2008. Regression equations for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania. U.S. Geological Survey Scientific Investigations Report 2008-5102. 57 p. Reston, Virginia.

15. Soil Survey Geographic database. Available online at https://datagateway.nrcs.usda.gov/GDGOrder.aspx.

16. The Pennsylvania State Climatologist. 2017. Data archive – historical. Available online at http://climate.psu.edu/data/

17. United States of America, Plaintiff, v. Robert Brace and Robert Brace Farms, Inc., Defendants, No. 90-cv-229, Defendants' Objections and Answers to Plaintiff's Second Set of Interrogatories Directed to Robert Brace

18. Field notes from site visit on October 16-17, 2017 (attached as Appendix D).

19. Survey notes from site visit on October 16-17, 2017 (attached as Appendix E).

20. Photos of Beaver Dams taken during site visit on October 16-17, 2017 (attached as Appendix F).

21. Materials related to the Sharp Road Culvert provided by William C. Koller, P.E., Commonwealth of Pennsylvania, Department of Transportation (attached as Appendix G).

22. Spreadsheet drafted by Defendants identifying alleged flooded acreage (attached as Appendix H).

23. The following bates-stamped documents produced by the United States in this litigation:

    a. CD-FRC0000156-164

    b. EPA0000368-390

    c. EPA0001238-1266

    d. USACE0000359

Appendix C.

Prior Expert Testimony since December 2013

I have not been deposed or testified at trial as an expert in the past four years.

Current Compensation

I was hired under contract with the United States Department of Justice to provide expert services. I am being compensated at the rate of $250 per hour for preparing my expert report and for deposition and trial testimony. None of my compensation is based on the outcome of my analysis or this case.

Appendix D.

Attorney Work Product – Privileged & Confidential

Dr. Dwayne Edwards Brace Site Visit Notes – Oct. 16-17, 2017

Mon. Oct. 16 - Brace Farm - 9:30 A.M.

- Western Lane Rd. Culvert
  - 70 inch inside diameter
  - Steel Material
  - Photo #1 - Lane Rd. Culvert Outlet
  - Outlet invert appears clear
  - Photo #2 - Same as Photo #1; Lane Rd. Culvert Outlet
  - WSE - 2 feet relative to outlet invert
  - Photo #3 - Lane Rd. Culvert Inlet
  - Photo #4 - Lane Rd. Culvert Inlet
  - WSE - 28 inches relative to inlet invert
- Photo #5 - Flood Debris -16 inches relative to WSE
- Photo #6 - Flood Debris - 28 inches relative to WSE
- Photo #7 - Flood Debris - 36 inches relative to WSE
- Photo #8 - Beaver Dam #1
- Photo #9 - Confluence approx. 50 feet upstream from Beaver Dam #1
- Photo #10 - Corn located ENE of Beaver Dam #1
- Photo #11 - Beaver Dam #1 (Most Upstream)
- Photo #12 - Beaver Dam #2 (Middle)
- Photo #13 - Beaver Dam #2
- Photo #14 - Beaver Dam #3 (Most Downstream)
- Beaver Dam #2 - WSE difference approx. 37 inches
- Beaver Dam #3 - WSE difference approx. 12 inches
- Beaver Dam #1 - WSE difference approx. 12 inches
- Photo #15 - Misplaced wood debris
- Photo #16 - Bog - looking south from uplands near 1st tree (moving south & east)
- Photo #17 - Tree referenced in Photo #16 - looking south from uplands onto bog
- Eastern Lane Rd. Culvert
  - Outlet
    - 2 corrugated plastic pipe culverts outlet (flows south)
    - 24 inch diameter for #1
      - 8 inches of sediment at bottom
      - 8 inches WSE on top of sediment
    - 18 inch diameter for #2
      - outlet clear
      - WSE approx. 1 inch
      - may drain road - enters west
    - Photo #18 - Eastern Lane Rd. Culvert Outlet
    - Photo #19 - Corrugated plastic pipe entering from west
      - 12 inch diameter
      - 2 inches WSE relative to invert

Attorney Work Product – Privileged & Confidential

Dr. Dwayne Edwards Brace Site Visit Notes – Oct. 16-17, 2017

    - Inlet
        - 1 corrugated plastic pipe culvert inlet
        - 5 inches of sediment on bottom
        - 3 inches WSE on top of sediment
        - Photo #20 - Eastern Lane Rd. Culvert Inlet
- Photo #21 - Lane Rd. Western Culvert Benchmark
- Sharp Rd. Culvert
    - CSP culvert
    - Inlet
        - 69 inches from invert to top
        - Max width - 115 inches
        - Water depth - 6 inches
        - WSE 6 inches relative to invert
        - Concrete apron extends approx. 16 feet upstream of inlet
    - Outlet
        - WSE 4 inches relative to invert
        - Concrete apron extends approx. 12 feet downstream of outlet
    - Both outlet & inlet appear clear
    - Photo #22 - Sharp Rd. Culvert Inlet
    - Photo #23 - Sharp. Rd. Culvert Inlet
    - Photo #24 - Sharp. Rd. Culvert Inlet
    - Photo #25 - Upstream view from Inlet - Sharp Road
    - Photo #26 - Sharp Rd. Culvert Outlet
    - Photo #27 - Sharp Rd. Culvert Outlet
    - Photo #28 - Sharp Rd. Culvert Outlet
    - Photo #29 - Downstream view from Sharp. Rd. Culvert Outlet

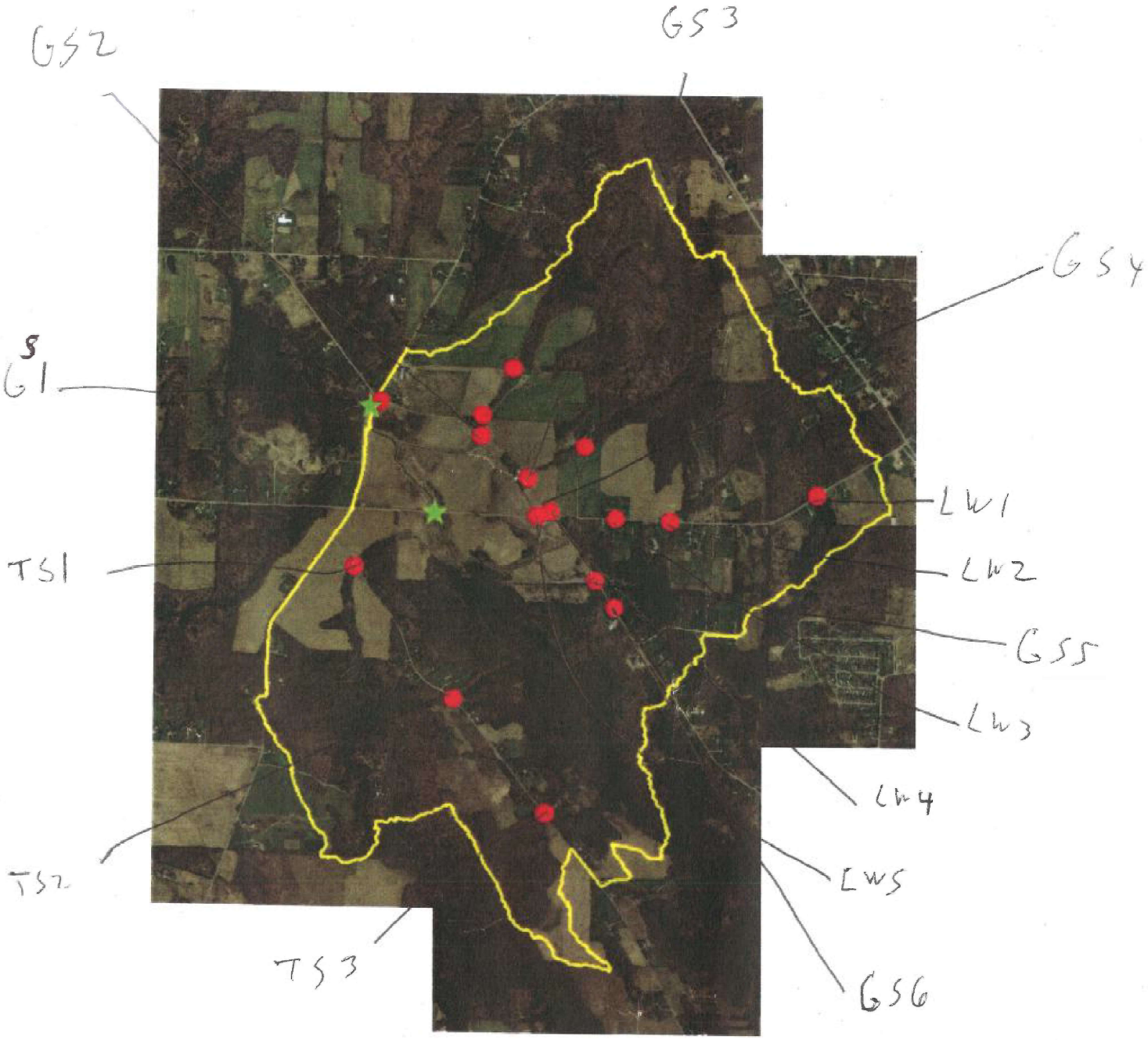
Tues. Oct. 17 - Brace Farm - 9:30 A.M.

- Photo #30 - Location GS1
    - Location as assumed
    - Concrete 18 inch ID
- Photo #31 - Location GS3
    - Location as assumed
    - 2 pipes
        - 24 inch ID
        - 42 inch ID
- Photo #32 - Location GS2
    - Location as assumed
    - 5 foot ID
- Photo #33 - Location LW1
    - Location as assumed
    - 3 foot ID

Attorney Work Product – Privileged & Confidential

Dr. Dwayne Edwards Brace Site Visit Notes – Oct. 16-17, 2017

- Photo #34 - Location LW2
  - Location as assumed
  - 3 foot ID
  - runs diagonally under Lane Road north to south
- Photo #35 - Location LW3
  - Location as assumed
  - 42 inch ID
- Photo #36 - Location LW4
  - Location as assumed
  - 18 inch ID
  - runs directly under Lane Road
- Photo #37 - Location GS4
  - just north of intersection of Lane Road & Greenlee Road
  - runs east to west
  - 18 inch ID
- Photo #38 - Location LW5
  - Location as assumed
  - 42 inch ID
  - runs north to south
- Photo #39 - Location GS5
  - Location as assumed
  - 30 inch ID
- Photo #40 - Location GS6
  - Location as assumed
  - 48 inch ID
- Photo #41 - Location TS1
  - Location as assumed
  - 18 inch ID
  - inlet is 50% obstructed with sediment
- Photo #42 - Location TS2
  - Location as assumed
  - 36 inch ID
- Photo #43 - Location TS3
  - Location as assumed
  - 30 inch ID
- Photo #44 - Hand (End of Notes)



Watershed relative to Sharp Road culvert (green star, northwest edge of boundary).

Red circles: visual verification of drainage network (i.e., where does the water flow).

Green stars: potentially key culverts; need culvert diameters, slopes, elevations, photos.

Appendix E.

Survey Brace Property 16 Oct 2017
Began by surveying Lane Road Culvert.
Benchmark established as per photo -highest corner of western slab of headwall concrete.
Then surveyed Sharp Road Culvert with new instrument setup.
Established turning point midway along Sharp Road toward Lane Road, new setup at intersection of Sharp and Lane Roads.
Closed loop by surveying benchmark from Sharp/Lane intersection setup.

Lane Road Culvert
Aged/rusted steel. Circular, 6' diameter. Manning's n taken as 0.017.

BM ELEV 1000

PtID	Northing	Easting	Elevation	Description	REL TO BM	ELEV			
1	5000.00	5000.00	100.000	BRACE					
2									
3	5038.40	5024.87	98.715	LANE CUL OUT INV	-7.026	992.974	1215.604		
4	5038.67	5024.95	104.767	LANE CUL OUT TOP	-0.974	999.026	1221.656	INLET INVERT	1215.94
5	5034.35	5017.79	101.028	LANE CUL OUT WSE	-4.713	995.287	1217.917	OUTLET INVERT	1215.60
6	5072.45	5033.21	105.265	LANE CUL IN TOP	-0.476	999.524	1222.154	CULVERT LENGTH	34.54
7	5072.94	5032.65	99.047	LANE CUL IN INV	-6.694	993.306	1215.936	CULVERT SLOPE	0.009612
8	5075.25	5028.95	100.861	LANE CUL IN WSE	-4.880	995.120	1217.750	CULVERT HEIGHT	6.14
9	5040.41	5022.53	105.741	LANE CUL OUT BM	0.000	1000.000	1222.630		

Sharp Road Culvert
Corrugated steel, pipe arch, rough concrete bottom.

1	5000.00	5000.00	100.000	BRACEA					
2	4959.56	5004.58	97.552	SHP CUL IN INV		994.653	1217.283	CULVERT LENGTH	32.18005
3	4958.03	4999.65	98.028	SHP CUL IN WSE		995.129	1217.759	CULVERT SLOPE	-0.001678
4	4959.80	5005.23	103.319	SHP CUL IN TOP		1000.420	1223.050	CULVERT HEIGHT	5.6465
5	4991.27	5023.38	103.132	SHP CUL OUT TOP		1000.233	1222.863	INLET FLOW DEPTH	0.476
6	4991.74	5023.90	97.606	SHP CUL OUT INV		994.707	1217.337		
7	4993.83	5028.82	98.034	SHP CUL OUT WSE		995.135	1217.765		
8	5096.39	4519.15	103.944	SHP RD 1					
9	5071.68	4116.13	107.009	SHP RD 2		1004.110	1226.74		
10	5025.36	5725.22	94.072	SHP RD 2 BS		1004.110	1226.740		
11	3772.07	5273.41	89.962	LAN CUL BM		1000.000	1222.630		

Appendix F.

Appendix G.

County ERIE

L.R. 25032 (Pa 86)

Station 450+95

Date 4-26-78

Looking Ahead

Looking Back

Looking Upstream (Rt. Side)

Looking Downstream (Lt. Side)

LOOKING DN. STREAM INTO STRUCTURE, CMP-PA

COUNTY ERIE S. R. 3025 SEG. 0220 OFF. 2157 DATE 3-1-94

LOOKING SEGMENTS AHEAD

LOOKING SEGMENTS BACK

LOOKING @ LEFT SIDE OUTLET

LOOKING @ RIGHT SIDE INLET

COUNTY ERIE S. R. 3025 SEG. 0220 OFF. 2+47 DATE 3/18/96

(L. R. , STA.)

UNDER LOOKING DOWNSTREAM AT SUPPORTS

COUNTY ERIE S. R. 3025 SEG. 0220 OFF. 2147 DATE 3/18/96

(L. R. , STA.)

BEAVER DAM BLOCKING INLET

DERIS & DRIFT COLECTING ON SHOREING

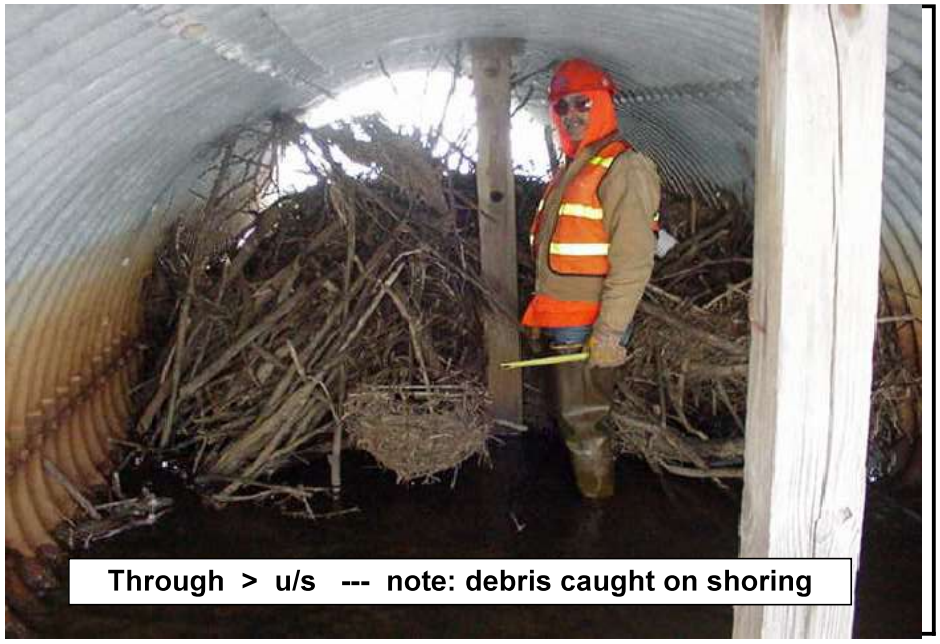
COUNTY ERIE 25 S. R. 3025 SEG. 0220 OFF. 2147 DATE 02/23/00

(L. R. , STA.)

BMS NUMBER:**25-3025-0020-2147**

OVER:**Elk Creek**

DATE:**2/28/2002**



BMS NUMBER: **25-3025-0020-2147**

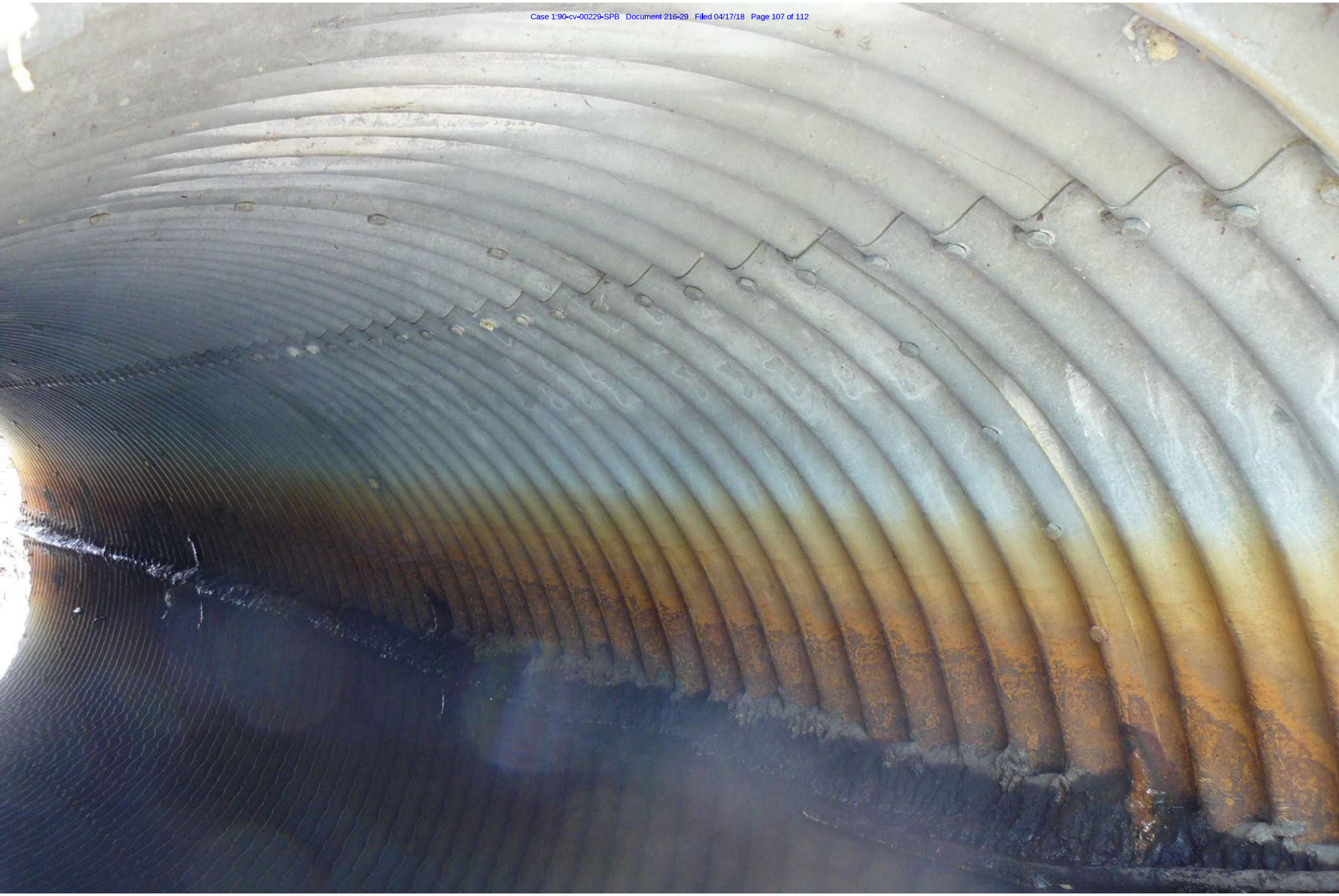
OVER: **Elk Creek**

DATE: **2/28/2002**

BMS NUMBER: **25-3025-0220-2147**

OVER: **Elk Creek**

DATE: **2/17/2004**



Appendix H.

BRACE FARM MURPHY, HOMESTEAD AND MARSH TRACTS
LOST CROP REVENUES FROM 1996 - 2016*
ARISING FROM EPA'S NEGLIGENT AND WRONGFUL
ENFORCEMENT OF THE 1996 DOJ CONSENT DECREE

ALL Data Upon Which This Spreadsheet is Based is USDA Economic Research Service Data
(*Published Internet-Accessible 2016 USDA Figures Not Available at this Time)

Assumption #1: Claimants Robert Brace, Inc. and Robert Brace and Sons, Inc., Would Have Chosen the Most Profitable of the Three More Profitable Crops to Farm on the Portions of Each of the Three Contiguous and Adjacent Tracts Set Forth Below and in the Accompanying Spreadsheets during the years in question.

Assumption #2: The Three More Profitable Crops Grown in Nutrient-Rich Soil of the Type on Brace Farms Include, in Order of Profitability, Onion, Cabbage and Potatoes. The Harvest Revenues for Each Such Crop is Set Forth Below and in the Accompanying Spreadsheets.
Such Data Were Derived From the United States Department of Agriculture's Economic Research Service as Indicated in the Accompanying Spreadsheets.
The Harvest Revenues That Could Have Been Earned, But Were Lost, For Each of Onions, Cabbage and Potatoes are Set Forth Below and in the Accompanying Spreadsheets:

Tract	Acreage Flooded	Period	Crop	Cabbage	Onions	Potatoes
Homestead	14 Acres	1996-2016		$1,034,560.80	$1,430,338.00	$582,851.50
Murphy	32.5 Acres;	1996-2016				
	25.5 Acres for 7 Yrs	2006-2012		$3,147,375.90	$4,380,551.75	$1,730,068.18
Marsh	20 Acres	1996-2012		$1,477,944.00	$2,043,340.00	$832,645.00
				$5,659,880.70	$7,854,229.75	$3,145,564.68

Finding #1: Claimant Robert Brace Will Incur Additional Costs to Repair Each of the Three Flooded Properties to Return them to their Prior Maximum Use for Growing and Harvesting the Crops Identified Above.
The Repair Costs that Will be Incurred as the Result of EPA's Negligent and Wrongful Enforcment of the 1996 Consent Decree Consist of the Following:

Repairing Real Property (Installation Drainage, Ditching)	$217,003.00
Removal/Repair of Check Dam (by Fed'l Gov't)	$0.00
Removal of Beaver Dams (by State Gov't)	$0.00
Removal, Replacement, Cleaning of Culverts (by State Gov't)	$0.00
	$217,003.00

Finding #2: The Total Amount of Claimant(s)' FTCA Claims for **Real Property Damage** Filed Against the EPA, Corps and FWS is: **$217,003.**

Finding #3: The Total Amount of Claimant(s)' FTCA Claims For **Personal Property Damage** Filed Against the EPA, Corps & FWS is **$7,854,229.75**.

Finding #4: The Total Amount of Claimaint(s)' FTCA Claims for **Real Property and Personal Property Damage** Filed Against the EPA, Corps & FWS is: **$8,071,232.75**.