

BEFORE THE OHIO POWER SITING BOARD

**In the Matter of City of Hamilton :
and American Municipal Power, Inc. :
for a Certificate of Environmental :
Compatibility and Public Need for a :
138 kV Transmission Line :
and Substation Project in :
Franklin and Washington Townships, :
Clermont County, Ohio :**

Case No. 10-2440-EL-BTX

Case No. 10-2439-EL-BSB

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DIRECT TESTIMONY OF JEFFREY BOLTZ, PH.D.

1Q: Please state your name and business address.

A: My name is Jeffrey Boltz. My business address is 15 Loveton Circle, Sparks, Maryland, 21152.

2Q: By whom are you employed, and what is your position?

A: I am employed by EA Engineering, Science and Technology, Inc., also known as EA, as Vice President and Water and Natural Resources Program Manager. See Exhibit JB-1.

3Q: Please describe your duties and responsibilities in that position.

A: In my role for EA I have a wide variety of responsibilities ranging from program management, leading the water and natural resources practice, conducting aquatic surveys as well as significant experience with existing and proposed hydroelectric projects. I am experienced in preparing Federal Energy Regulatory Commission licensing documents and in the negotiation of study plans with federal and state natural resource agencies. My licensing experience has included both the relicensing of existing projects and obtaining the original license for proposed projects. I have also managed and conducted a wide variety of site specific environmental studies to support hydroelectric licensing. See Exhibit JB-1.

4Q: Please describe your educational background and professional experience.

A: I have a Bachelor of Science degree in Biology/Aquatic Sciences from Lock Haven State College and a Ph.D. in Ecology/Ichthyology from Pennsylvania State University. I am also a member of the Society of American Military Engineers. I have worked for EA since 1994. See Exhibit JB-1.

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7Q: Are you familiar with Applicants' Applications for Certificates of Environmental Compatibility and Public Need for a 138 kV Transmission Line and Substation in Clermont County, Ohio ("Applications") filed with the Ohio Power Siting Board on May 4, 2011 as supplemented by September 2, 2011 Submittal of Responses to Clarification Questions from OPSB Staff and as supplemented by September 27, 2011 Responses to Additional Clarification Questions from OPSB Staff?

A: Yes.

8Q: Are you familiar with the contents of the Applications?

A: Yes.

9Q: Are you familiar with the selection of the transmission line route and substation site?

A: Yes. EA, along with subcontractors, performed a number of studies supporting the final selection of the transmission line route and substation site. These included a Phase I cultural resources literature review (performed by Ohio Valley Archaeology, Inc.), a cultural-historic survey (performed by Corn Island Archaeology LLC), a Phase I archaeological survey (performed by Ohio Valley Archaeology, Inc.), a stream assessment report (performed by EA), a wetland delineation (performed by EA), a bat species inventory (performed by Jackson Environmental Consulting Services, LLC) and a rare, threatened and endangered plant species survey (performed by EA). EA also assisted MWH in selecting structure locations for the transmission line route.

10Q: Are you familiar with the area of the transmission line route surrounding stream crossing BC-4 (Bear Creek) between pole structures 30 and 31?

A: Yes.

11Q: Why were the particular route and pole site and heights selected as the preferred route in the area surrounding BC-4?

A: The preferred route was selected to avoid two nearby cultural resources, identified as sites 33Ct694 and 33Ct695. It is our understanding that these sites are both eligible for listing on the National Register of Historic Places and have potential archaeological significance. As part of the FERC process, Ohio State Historic Preservation Office had previously concurred with the studies and recommendations to avoid resources 33Ct694 and 33Ct695.

At the two current pole structures 30 and 31 locations, additional ground clearance can only be achieved by increasing the heights of the structures. With the increased heights, the pole structures would have to be enlarged to accommodate the increased structural loadings. Depending upon how much structure 30 would increase in height, it would have to be changed to a steel structure that would require a drilled concrete pier

foundation(s). This would increase the disturbance to the land around the structure and access-way due to increased amount of equipment needed for the installation of the foundation and steel structure versus that which is needed for the direct buried wooden structure.

Additionally, the towers as designed provide adequate protection of the riparian corridor for Bear Creek which was the primary reason for the crossings

12Q: In your view, is it practicable and appropriate to alter either the height or the placement of pole structures 30 and 31 from Applicant's preferred route, as recommended by OPSB Staff in Recommended Condition of Certificate #22?

A: No.

13Q: Are you familiar with the area of the transmission line route between pole structures 12 and 17?

A: Yes. The area of the transmission line route between pole structures 12 and 17 is equivalent to transmission line route Segments 10 and 11.

14Q: Why was the preferred route selected in this area?

A: Segments 10 and 11 of the current preferred route are already shifted from the originally proposed Segments 10 and 11. These segments were shifted to avoid culture resource 33Ct692, which is in the vicinity of the end of Segment 10. This resource is eligible for listing on the National Register of Historic Places. Based upon field studies conducted by EA and subcontractors, it was determined that this area should be avoided. As part of the FERC process, Ohio State Historic Preservation Office had previously concurred with the studies and recommendations to avoid resource 33Ct692.

The shift was also made because the previous preferred route came into relatively close proximity to the driveway and home of an adjacent property owner who had expressed concerns with the route's location. Shifting the preferred route to its current location moved the route away from both the culturally sensitive area and the property owner's area of concern.

15Q: In your view, is it practicable and appropriate to alter the centerline of the preferred route between pole structures 12 and 17 as recommended by OPSB Staff in Recommended Condition of Certificate #23?

A: No. Moving the centerline as recommended by OPSB Staff would bring the preferred route closer to and likely impact the identified cultural area as well as closer to the driveway/home negating both of the reasons why the route was initially shifted. Doing so would bring only minimal, if any, advantages to minimizing forest habitat fragmentation and avoiding degradation of existing headwater streams. The advantages

of complying with the OPSB Staff recommendation would be more than offset by the disadvantages of making this shift.

16Q: Are you familiar with the vegetation maintenance and clearing requirements for the preferred route?

A: Yes.

17Q: Are you aware that OPSB Staff has recommended in Recommended Condition of Certificate #24 that Applicants permanently limit clearing in all riparian areas, specifically within 25 feet from the top of the bank on each side of all streams, and that any vegetation clearing in these areas shall be by selective hand-clearing of taller-growing trees only, leaving all low-growing plant species, particularly woody ones, undisturbed unless otherwise directed by OPSB Staff?

A: Yes.

18Q: In your view, is this condition practicable and appropriate?

A: No, this condition unreasonably increases the maintenance costs to Applicants, and is unnecessary in light of other Conditions related to erosion control and seeding. This Condition will restrict the ability of maintenance and construction vehicles to access the right-of-way and to work on the line and may impede the ability to install culverts or other structures at stream crossings, which are necessary to maintain stream health during construction. This Condition will also interfere with the Applicants' ability to safely maintain the transmission line route to ensure reliability of the transmission line. NERC requires that Applicants maintain the flexibility to clear vegetation in ways that ensure reliability, while simultaneously remaining sufficiently protective of the environment. This condition inappropriately and unnecessarily removes the Applicants' discretion. See Exhibit JB-2.

Additionally, most of these streams are ephemeral and only convey water after storm events or during periods of high runoff and maintaining a vegetated buffer on many of these streams would provide minimal, if any, benefit to water quality.

19Q: Are you aware that OPSB Staff has further recommended in Recommended Condition of Certificate #24 that all stumps be left in place during construction and maintenance of the Project?

A: Yes.

20Q: In your view, is this condition practicable and appropriate?

A: No, leaving stumps in place represents an unreasonable danger to maintenance and construction vehicles necessary for the construction of the preferred route. There is no commensurate benefit associated with leaving stumps in place that cannot be achieved by

the Applicants' compliance with other OPSB Staff recommended conditions related to erosion control and seeding.

21Q: Based on your experience, education, and knowledge of the Applications, and in your opinion, does the Project represent the minimum adverse environmental impact, considering the state of available technology and the nature and economics of various alternatives and other pertinent considerations?

A: Yes.

22Q: Does this conclude your direct testimony?

A: Yes.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing pleading was served upon the following parties of record via U.S. Mail or Electronic Mail on October 6, 2011.

Ohio Attorney General
Chief, Public Utilities Section
180 E. Broad Street
Columbus, Ohio 43215
Attention: Steven Beeler

Thomas J. Ruwe
Attorney for Lee R. Eubanks
211 Columbia Wooster Bldg.
5710 Wooster Road
Cincinnati, Ohio 45227

April R. Batt by MWT
Counsel for Applicants

EXHIBIT JB-1

Jeffrey M. Boltz, Ph.D. Vice President/National Service Line Program Manager

Dr. Boltz is a Senior Aquatic Ecologist with a specialty in fisheries science and aquatic ecology and restoration. He has 26 years of experience, including 18 years of experience managing and performing environmental assessments related to water resource development projects such as hydroelectric power, fossil and nuclear generating plants, and wastewater treatment projects. In addition, Dr. Boltz leads the ecosystem restoration program at EA. As part of these projects and programs, he collaborates with other ecologists, hydrologists, water quality experts, and environmental and engineering professionals in multidisciplinary studies.

Professional Experience

Program Management—Has significant experience managing large multidisciplinary programs for federal, state, and local as well private clients. Programs included large single award contracts for fully funded multi-year projects to federal Indefinite Delivery/Indefinite Quantity task order contracts. Contract types have included cost plus, firm fix price, and time and materials with the contract size from \$5 to \$10 million.

Ecosystem Restoration—Leads the ecosystem restoration practice, resulting in ecosystem restoration experience throughout the eastern half of the United States. Ecosystem restoration projects to date have included tidal and non-tidal wetland restoration, stream restoration, dam removal, lake restoration, and new habitat creation including construction of lost habitat. These projects have been conducted for both government and private clients and often involve site selection, feasibility analysis, and design.

Fish Passage—Significant experience in evaluating upstream and downstream fish passage at old mill dams as well as existing and proposed hydroelectric projects. Upstream fish passage structures have included denial fish ladders and natural step-pool (rough ramp) fish passage technologies. For six hydroelectric sites in the United States, performed downstream fish passage studies and feasibility evaluations involving multidisciplinary teams of engineers and fisheries biologists. Several of the projects involved conceptual design, hydraulic models, construction oversight, and evaluation of the completed facility. Evaluated potential fish passage alternatives, recommended design criteria, conducted agency consultation, prepared plans of study, conducted field studies, and prepared final reports.

Fisheries Science—Conducted numerous fish surveys throughout the eastern United States for utilities, state agencies, and private industry; recognized as an expert on eastern North American fishes and is co-author of a book, *Fishes of West Virginia* (1995). Several of these surveys were directed at identifying the range and population status of state-and-federally listed endangered species. Managed several large 316(b) studies for utilities in Virginia, Maryland, New York, and Wisconsin. Conducted habitat-use studies of warmwater stream fishes and the effects of flow modifications (increase and decrease) on these communities. Co-authored a paper for the U.S. Fish and Wildlife Service addressing the research needs and problems associated with habitat use in regulated warm-water streams. Conducted radiotelemetry studies of the migration paths of Atlantic salmon molts through conventional and pumped storage hydroelectric facilities. Conducted numerous temperature-preference and tolerance studies on a wide variety of fish species. Conducted numerous additional fisheries assignments related to water development projects.

Qualifications

Education

Ph.D.; Pennsylvania State University;
Ecology/Ichthyology; 1988
B.S.; Lock Haven State College;
Biology/Aquatic Sciences; 1983

Registrations/Certifications

National Association of Underwater Instructors
Certified Scuba Diver

Specialized Training

Essentials of Management – Wharton Business
School; 2007
EA Writing Workshop; 1994
Project Management; 1993

Professional Affiliations/Appointments

Society of American Military Engineers

Experience

Years with EA: 17 Total Years: 26

Hydropower—Experienced in preparing Federal Energy Regulatory Commission (FERC) licensing documents and in negotiation of study plans with federal and state natural resource agencies. Licensing experience has included both the relicensing of existing projects and obtaining the original license for proposed projects. Has managed and conducted a wide variety of site specific environmental studies to support hydroelectric licensing including, Instream Flow Incremental Methodology and other minimum flow studies, upstream and downstream fish passage, fish entrainment and mortality, endangered fish and mussel surveys, general baseline data collection, and development of site-specific habitat suitability criteria and recreational fisheries plans.

International—Successfully completed a 20-month assignment in Alexandria, Egypt, under contract with the U.S. Agency for International Development Alexandria Wastewater Project, Phase II. As part of this assignment, provided expertise on a risk-based environmental assessment evaluating the appropriate level of wastewater treatment and effluent disposal alternatives including inland and coastal alternatives. Also provided institutional strengthening support as director of the project biology laboratory that processed a wide variety of biological samples from fresh, brackish, and marine environments. Conducted a large soil sampling program at Howard Air Force Base in Panama, as part of an environmental compliance assessment. Data were compared against U.S. Environmental Protection Agency standards for human health risk. Additional experience related to international studies include describing a new species of fish from Lake Malawi, Africa, and evaluating the effects of mining on a fishery resource in Southeast Asia.

Selected Publications and Presentations

Connelly, R.A., W.J. Rue, J.M. Boltz, and J. Slater. 2006. Wastewater Treatment Plant Effluent Effects on a Cold Water Stream Benthic Community: Is it Temperature? Presented at the North American Benthological Society. Anchorage, Alaska. June.

Rue, W.J. and J.M. Boltz. 2005. How much water do you need to leave behind? Invited presentation on instream flow methods at the Virginia Water Resources Workshop- A Workshop for Local Government Officials. Hosted by McGuire Woods, Richmond, Virginia. 20 September.

Mayhew, D., J. Boltz, P. Derrick, C. Papageorgis, D. Hinckley, A. Walker, and H. Karimi. 2003. Application of Ecological Risk Assessment to Support Habitat Restoration. Presented at the 24th Annual Meeting of SETAC, Austin, Texas. November.

Powell, M.W. S. Koser, and J. Boltz. 2002. A Stormwater Management Model for the Moores Run Watershed in the City of Baltimore. Presented at the 8th Annual Conference of the Maryland Water Monitoring Council (MWMC). Linthicum, Maryland. 16 November.

Powell, M.W. J. Boltz, D. Mayhew, R. Connelly, and W. Stack. 2001. The Urban Reference Index: An Index of Biotic Integrity for Urban Watersheds. Presented at the 7th Annual Conference of the Maryland Water Monitoring Council. Linthicum, Maryland. 16 November.

Boltz, J. M., et al. 2000. Scoping Study on Sedimentation Issues at Hydroelectric Projects. Electric Power Research Institute, Palo Alto, California. TR 114008.

Rue, W.J., J.M. Boltz, J.A. Boraczek, W. Dey, L.D. Jensen, D.A. Mayhew, P.H. Muessig, and E. Perry. 1999. Catalog of Assessment Methods for Evaluating Power Plant Operations on Aquatic Communities. Final Report for the Electric Power Research Institute TR-112013. 299 pp.

Boltz, J.M. and D.A. Hinckley. 1998. Establishing baseline conditions in a highly contaminated lake in the Arab Republic of Egypt. Proceedings WEFTEC 1998. Vol. 4. pp. 85-96.

Kellog, K.A., J.R. Stauffer, Jr., E.S. van Snik, and J.M. Boltz. 1997. Interpopulation variation in darter oocyte production. J. Freshwater Ecology 12:329-337.

- Rue, W.J., J.M. Boltz, P.H. Muessig, D.A. Mayhew, J.A. Boraczek, L.D. Jensen. 1998. Catalog of Aquatic Population Assessment Methods for Evaluation of Power Plant Operations on Aquatic Ecosystems. Proceedings of Electric Power Research Institute's Clean Water Act Section 316(b) Technical Workshop. Coolfont Conference Center, West Virginia. 22-24 September. 23 pgs.
- Boltz, J.M., J.A. Boraczek, L.D. Jensen, D.A. Mayhew, P.H. Muessig, and W.J. Rue. 1998. Catalog of Aquatic Population Assessment Methods for Evaluation of Effects of Power Plant Operations on Aquatic Ecosystems. Presented at Electric Power Research Institute's Water and Ecosystems Area Advisory Meeting. Denver, Colorado. 15-16 June.
- Derrick, P.A. and J.M. Boltz. 1998. Shallow Water Fisheries Habitat: The Importance of a Holistic Approach to Evaluating the Merits of Construction and Restoration Projects. Abstract accepted for Oral Presentation at Fourth Annual Marine and Estuarine Shallow Water Science and Management Conference: Session VIII, Critical Components of Resource Assessment. Atlantic City, New Jersey. 17 March.
- Snik-Gray, E.V., J.M. Boltz, K.A. Kellog, and J.R. Stauffer, Jr. 1997. Food resource partitioning by nine sympatric darter species. *Transactions of the American Fisheries Society*. 126:822-840.
- Stauffer, J.R., J.M. Boltz, K.A. Kellog, and E.S. van Snik. 1996. Micro habitat partitioning in a diverse assemblage of darters in the Allegheny River system. *Environmental Biology of Fishes*. 46:37-44.
- Boltz, J.M., C. Bell, and P. Leonard. 1995. The challenges of developing habitat suitability criteria for a large southeastern river. In *Water Power 95, An International Conference on Hydroelectric Power*. Sponsored by the U.S. Army Corps of Engineers (USACE). pp. 92-101.
- Leonard, P., C. Bell, and J. Boltz. 1995. Habitat modeling in a southeastern alluvial floodplain river. In *Water Power 95, An International Conference on Hydroelectric Power*. Sponsored by the USACE. pp. 102-109.
- Stauffer, J.R., Jr., J.M. Boltz, and L. White. 1995. *The Fishes of West Virginia*. The Philadelphia Academy of Science.
- Boltz, J.M., D.A. Robinson, R.J. Stira, and P. Ruggles. 1993. Evaluation of a louver array/bypass system in bypassing Atlantic salmon smolts from the Holyoke Canal to the Connecticut River. *Engineering Solutions to Environmental Challenges - Thirteenth Annual USCOLD Lecture Series*, Chattanooga, Tennessee.
- Boltz, J.M. and J.R. Stauffer, Jr. 1990. Fish assemblages of Pennsylvania wetlands, in *Wetlands Ecology, Productivity and Values: Emphasis on Pennsylvania* (S.K. Majumdar, F.J. Brenner, R.P. Brooks, and W. Tiner, Jr., eds.). Pennsylvania Academy of Sciences, Philadelphia, Pennsylvania.
- Bain, M.B. and J.M. Boltz. 1989. Regulated stream flow and warm water stream fish communities: A general hypothesis and research plan. U.S. Fish and Wildlife Service Biological Report.
- Stauffer, J.R., Jr., S.E. Boltz, and J.M. Boltz. 1988. Cold shock susceptibility of blue tilapia from the Susquehanna River, Pennsylvania. *N. Amer. J. Fish. Mgmt.* 8:329-332.
- Boltz, J.M. and J.R. Stauffer, Jr. 1993. Variation and systematics in the aphredoderid fish, *Aphredoderus sayanus* (Teleostei: Aphredoderidae). *Copeia* 1:81-98.
- Royer, D. and J.M. Boltz. 1992. Passage routes of radio-tagged Atlantic salmon smolts at the Turners Falls Hydroelectric Project, Massachusetts. *Proc. Atlantic Salmon Smolt Workshop*.
- Raesly, R.L. and J.M. Boltz. 1990. New distributional records for four species of fish in Pennsylvania. *Proc. Pennsylvania Academy of Sciences*.

- Boltz, J.M. and J.R. Stauffer, Jr. 1990. Summer habitat use of eight riffle dwelling fishes from French Creek, Pennsylvania. Invited Paper. Ohio River Biology Symposium, American Fisheries Society.
- Boltz, J.M. and J.R. Stauffer, Jr. 1989. Comparison of spring and summer diet of five species of darters from French Creek, Pennsylvania. American Society of Ichthyologists and Herpetologists Meeting.
- Stauffer, J.R., Jr. and J.M. Boltz. 1989. Description of a rock-dwelling cichlid (Teleostei: Cichlidae) from Lake Malawi, Africa. *Proc. Biol. Soc. Washington* 102(1):8–13.
- Boltz, J.M., J.R. Stauffer, Jr., and S.E. Boltz. 1989. Description of the cyprinid fish hybrid *Clinostomus elongatus* x *Notropis cornutus*. *Bull. Chicago Academy of Sciences* 14(2).
- Stauffer, J.R., Jr., J.M. Boltz, and S.E. Boltz. 1989. Temperature preference of the redbelly tilapia *Oreochromis zilli* (Gervais). *Arch. fur Hydrobio.* 114(3):453–456.
- Boltz, J.M. and J.R. Stauffer, Jr. 1988. Geographic variation of *Aphredoderus sayanus*, the pirate perch. American Society of Ichthyologists and Herpetologists Meeting.
- Stauffer, J.R., Jr., R.L. Raesly, and J.M. Boltz. 1987. Morphological divergence and/or stasis of introduced fish populations. Invited Paper. Introduced Species Symposium: American Society of Ichthyologist and Herpetologist Meeting.
- Boltz, S.E., J.R. Stauffer, Jr., and J.M. Boltz. 1987. Thermal tolerance of the blue tilapia, *Oreochromis aureus*, from the Susquehanna River, Pennsylvania. Northeast Fish and Wildlife Conference.
- Boltz, J.M. and J.R. Stauffer, Jr. 1987. Distribution and population estimates of fishes of undetermined status in the Ohio River drainage, Pennsylvania. Northeast Fish and Wildlife Conference.
- Boltz, J.M., M.J. Siemien, and J.R. Stauffer, Jr. 1987. Influence of starvation on the preferred temperature of *Oreochromis mossambicus* (Peters). *Arch. fur Hydrobiol.* 1:143–146.
- Boltz, J.M. and J.R. Stauffer, Jr. 1986. Branchial brooding in the pirate perch, *Aphredoderus sayanus* (Gilliams). *Copeia* 3:1030–1031.

EA Project Experience

Environmental Resource Documentation Services; Joint Base Andrews, Maryland; USACE-Baltimore District, Planning Division; Program Manager—Managed several tasks associated with the natural resources at Joint Base Andrews and the geographically separated Brandywine Receiver Site. Tasks included an inventory and height determination of trees adjacent to the runways that may pose safety hazards to pilots; wetland delineations; rare, threatened, and endangered plant species surveys, topographic surveys, groundwater monitoring well installation, and groundwater elevation monitoring. The data collected during the wetland delineation were incorporated into the 404/401 wetland permit application prepared by EA for proposed repairs of the West Runway. EA interacted with regulatory agency staff to identify potential wetland mitigation sites for the creation of wetlands to mitigate for impacts to wetland resources associated with the runway repair project. Geotechnical information collected during the installation of the monitoring wells was incorporated into EA's design of the created wetland mitigation site. EA developed draft plans for the created wetland mitigation for agency review.

Project Date: 2010

Project Value – \$344,189; **Contract Type** – Lump Sum; **EA Project No.** – 6213251 and 6213253; **EA Project Manager** – Charles Leasure

RC Byrd Wetland Delineation and Rare, Threatened, and Endangered Surveys; Ohio and West Virginia; American Municipal Power, Inc; Project Manager—Conducted wetland delineations and rare, threatened, and endangered species surveys within the project area for a proposed hydroelectric power plant. The proposed project is located at the R.C. Byrd Locks and Dam in Mason County, West Virginia along the Ohio River at river mile 279.2. The existing dam and associated locks are owned and operated by the USACE-Huntington District. The project involves construction of a powerhouse on the west side of the Dam abutment (Ohio side) and construction of a 138-kV transmission line that travels from the powerhouse to an existing substation in West Virginia. The objectives of the rare, threatened, and endangered plant surveys were to observe habitat types within the proposed project area that may potentially support plant species of interest and determine if rare, threatened, and endangered plant species were likely to be present. The wetland delineation was conducted in accordance with the procedures outlined in the 1987 USACE Wetland Delineation Manual. In Ohio, the Ohio Rapid Assessment Method was used to assign a regulatory wetland category of the wetlands observed. The information collected during the field surveys will be incorporated into a Federal Energy Regulatory Commission licensing document for a proposed hydroelectric project.

Project Date: 2010

Project Value – \$125,000; **Contract Type** – Cost Plus Maximum; **EA Project No.** – 1452805; **EA Project Manager** – Jeff Boltz

Rare, Threatened, and Endangered Species Habitat Survey; Fort Meade, Maryland; Program Manager—Managed the collection of field data for rare, threatened, and endangered species surveys at Fort Meade. The surveys were used to collect baseline plant and bird species information throughout the base. The information was used to support planning level studies at Fort Meade.

Project Date: 2009

Project Value – 40,584; **Contract Type** Lump Sum; **EA Project No** – 6213248; **EA Project Manager** – Charles Leasure

R.C. Byrd Mussel Survey; American Municipal Power; Project Manager—Conducted mussel survey at proposed hydroelectric construction site on the Ohio River in Ohio. The study was requested by U.S. Fish and Wildlife and West Virginia Department of Natural Resources as part of the existing biological conditions assessment to protect state and federally listed mussel species.

Project Date: 2009

Project Value – \$125,000; **Contract Type** – Cost Plus Max; **EA Project No.** – 14528.05; **EA Project Manager** – Jeff Boltz

Willow Island Mussel Survey; American Municipal Power; Project Manager—Conducted mussel survey at proposed hydroelectric construction site on the Ohio River in West Virginia. The study was requested by West Virginia Department of Natural Resources and U.S. Fish and Wildlife as part of the existing biological conditions assessment to protect state and federally listed mussel species. Conducted mussel relocation prior to construction activities.

Project Date: 2007-2010

Project Value – \$160,000; **Contract Type** – Cost Plus Max; **EA Project No.** – 14528.03; **EA Project Manager** – Jeff Boltz

Environmental Impact Statement for McCloud-Pit Project; Federal Energy Regulatory Commission, Washington, D.C.—Program Manager for preparation of an EIS for relicensing of 5 dams and 3 powerhouses on the McCloud and Pit Rivers in California. Deliverables include draft EIS, final EIS, endangered species consultation, and license order articles. Participation in Draft EIS public meeting.

Project Date: 2009-2010

Project Value – \$591,947; **Contract Type** – Cost Plus Maximum - Time and Material w/ an Upset Limit; **EA Project No.** – 14686.03; **EA Project Manager** – J. Elseroad

Cove Point Liquefied Natural Gas Terminal; Dominion Energy, Maryland—Program Manager for preparation of 13 resource reports submitted with Dominion's application to FERC for its Pier Reinforcement Project; preparation of applicant-prepared Environmental Assessment; preparation of all environmental permit applications, consultations, and approvals, including USACE 10-404 permit. Maryland wetlands license, and Maryland critical area approval. Participated in monthly Joint Evaluation meetings with regulatory agencies. Assisted in negotiation of permit conditions and long-term monitoring plan for marsh and beach restoration. Prepared white paper evaluating over 50 dredged material placement options and assisted in selection of preferred alternative. Prepared Implementation Plan and Marine Spill Prevention Plan required by FERC Order.

Project Date: 2008-2010

Project Value – \$623,485; **Contract Type** – Cost Plus Maximum - Time and Material w/ an Upset Limit; **EA**

Project No. – 14566.01; **EA Project Manager** – J. Elseroad

Environmental Impact Statement for Catawba-Wataree Project; Federal Energy Regulatory Commission, Washington, D.C.—Program Manager Prepared the FERC EIS for 11 dams and 13 powerhouses on the Catawba and Wataree Rivers in North Carolina and South Carolina.

Project Date: 2008–2009

Project Value – \$785,000; **Contract Type** – Lump Sum/Fixed Fee; **EA Project No.** – 14573.01; **EA Project Manager** – J. Boltz

Natural Gas Well Abandonment Projects; Dominion Resources, West Virginia, Pennsylvania—Program Manager for preparation of 13 resource reports submitted with Dominion's applications to FERC for plugging and abandonment of two natural gas storage wells in West Virginia and Pennsylvania; site visits and environmental surveys; preparation of consultations letters; preparation of sediment and erosion control plans.

Project Date: 2008–2009

Project Value – \$24,781; **Contract Type** – Cost Plus Maximum - Time and Material w/ an Upset Limit; **EA Project No.** – 14563.01, 14563.02; **EA Project Manager** – J. Elseroad

Compressor Addition, Cove Point Liquefied Natural Gas Terminal; Dominion Resources, Maryland—Program Manager for preparation of 13 resource reports submitted with Dominion's application to FERC for addition of a compressor at the Cove Point Liquefied Natural Gas terminal; preparation of applicant-prepared Environmental Assessment; preparation of sediment and erosion control plans.

Project Date: 2009

Project Value – \$34,925; **Contract Type** – Cost Plus Maximum - Time and Material w/ an Upset Limit; **EA Project No.** – 14566.02; **EA Project Manager** – J. Elseroad

Clean Water Act 316(b) Phase II Field Studies in Pennsylvania and New York: Constellation Generation Group; Project Manager—Managed 316(b) impingement and entrainment studies at Calvert Cliffs, Crane, and Wagner generating stations in Maryland and Nine Mile Point and Ginna in New York. Projects involved hiring of 9 temporary staff to supplement existing staff to collect weekly impingement and entrainment data over an 18-month period. Also prepared special technical studies including white papers to address agency concerns over sampling methods. Prepared annual data reports and are in the process of preparing comprehensive 316(b) reports including analysis of historical data.

Project Date: 2006 – Present

Project Value – \$2,600,000; **Contract Type** – Time and Materials; **EA Project No.** – 14351.01; **EA Project Manager** – Jeffrey Boltz

Anacostia Marsh Restoration Design; National Oceanic and Atmospheric Administration and Maryland State Highway; Project Manager—Interacted with National Oceanic and Atmospheric Administration staff, Maryland-National Capital Park and Planning Commission (landowner) personnel, and the Maryland State Highway Administration to develop plans and detailed engineering designs to restore a tidally influenced marsh along the Anacostia River in Maryland, upstream of the District of Columbia. The restored marsh is part of a larger restoration package to mitigate for permitted wetland impacts associated with the construction of the new Woodrow Wilson Bridge. Developed inundation depth and duration zones for plantings that will resist goose predation. Surveyed other marshes (Kenilworth, Kingman Lake, River Fringe) along the Anacostia River. Interacted with representatives of the Anacostia Watershed Society, D.C. Department of Health, U.S. Geological Survey, and USACE involved with the restoration of wetlands along the Anacostia River. Participated in a tour of marshes in the area and a discussion of various potential alternatives for management of negative goose-induced impacts to the

regional wetlands.

Project Date: 2006 – Present

Project Value – \$420,000; Contract Type – Fixed Price and Time and Materials; EA Project No. – 61905.01; EA Project Manager – Jeffrey Boltz

Clean Water Act 316(b) Phase II Field Studies: Dominion Resources; Project Manager—Managed 316(b) impingement and entrainment studies at 9 generating stations located in Virginia, Wisconsin, and Illinois. Projects involved hiring of 20 temporary staff and establishing local field offices to supplement existing staff to collect impingement and entrainment data over an 18-month period. Prepared annual data reports and are in the process of preparing comprehensive 316(b) reports including analysis of historical data.

Project Date: 2006 – Present

Project Value – \$4,000,000; Contract Type – Fixed Price; EA Project No. – 62003.01-62003.06; EA Project Manager – Jeffrey Boltz

Permitting and Special Technical Studies for the Proposed North Anna No. 3 Nuclear Power Station; Dominion Power; Technical Lead Instream Flow Incremental Methodology—Providing senior technical skills to assist Dominion with many of the environmental permitting activities that are expected to occur with Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries and other local authorities to allow the construction and final permitting for the North Anna No. 3 facility. Project activities have included: Wetland permitting activities on the property; water withdrawal permitting, water protection permits; designing and conducting an Instream Flow Incremental Methodology (minimum instream flow) study for the North Anna River; watershed mapping and hydraulic analyses of the lake and river systems; Virginia Pollutant Discharge Elimination System discharge permitting assistance; regulatory meetings with Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation, USACE staff, and others; watershed studies relating to Lake Anna and the North Anna River; pre-construction stormwater permitting activities; and stream and wetland mitigation studies.

Project Date: 2006 – Present

Project Value – \$1,050,000; Contract Type – Time and Materials; EA Project No. – 14391.01; EA Project Manager – Bill Rue

Cottonwood Management Plan and Environmental Assessment; USACE–Kansas City District, Missouri—Program Manager for preparation of a combined Cottonwood Management Plan and Environmental Assessment for the Missouri River. USACE is required by the Biological Opinion for bald eagles to develop a program to encourage the expansion of cottonwood tree stands on the Missouri River. Project includes organizing stakeholder workshops, integrating habitat research and modeling products from other team members, and preparing the management plan and environmental assessment.

Project Date: 2006 – Present

Project Value – \$174,414; Contract Type – Lump Sum/Fixed Fee; EA Project No. – 62173.01; EA Project Manager – Jeff Elseroad

RFK Stadium Stormwater Management; USACE–Baltimore; Project Manager—Conducted field assessment of 5 stormwater outfalls to the Anacostia river near RFK Stadium. Delineated sewersheds and identified land use types within each sewershed. Provided technology transfer by preparing a feasibility matrix for the selection of stormwater Best Management Practices for the use of D.C. Department of Health Watershed in promoting and planning low impact development. Developed conceptual designs for Best Management Practices for each land use type utilizing the Uniform Stormwater Sizing Criteria methodology in the Maryland stormwater Design Manual. Produced a comprehensive CADD product that serves as an excellent resource for future restoration initiatives in the Anacostia River Basin

Project Date: December 2000 – Present

Project Value – \$50,000; Contract Type – FFP; EA Project No. – XXXXXXXX; EA Project Manager – Jeffrey Boltz

Meldahl Hydroelectric Project Licensing Support; City of Hamilton, Ohio; Project Manager—Assisted the City of Hamilton with all environmental aspects of Licensing, Permitting and construction a 105 MW hydroelectric project at the Meldahl Locks and Dam on the Ohio River. Prepared full Exhibit E—Environmental Report—for application to FERC for a hydropower license, prepared responses to minimal requests for additional information from FERC. Reviewed competing application and prepared environmental sections of Better Adapted Statement. Included public meetings and agency meetings to determine if state and federal resource agencies had any unaddressed concerns with the project. Developed the 404 and 408 permit applications to the USACE–Huntington, and responded to conditions in those permits. Currently leading the project team in siting a new 3-mi power line including a crossing of the Ohio River.

Project Date: 2006 – Present

Project Value – \$1,500,000; Contract Type –Cost Plus Maximum - Time and Material w/ an Upset Limit; EA Project No. – 14384.0, 14697011; EA Project Manager –Jeffrey Boltz

Thermal Discharge Studies of a Small Brown Trout Stream in Maryland— Carroll County, Maryland—Designed, negotiated and conducted large water quality, modeling and fisheries studies to support an Alternate Effluent Limit to support a less stringent thermal discharge limit for a wastewater treatment plant.

Project Date: 2003-2007

Project Value – \$325,000; Contract Type – Time and Materials; EA Project No. – 1418.20; EA Project Manager –Bill Rue

Municipal Separate Storm Sewer System (MS4) Permit Program Management and Technical Assistance: D.C. Water and Sewer Authority; Project Manager—Provide monitoring and coordination of District Agencies responsible for implementing the MS4 permit to ensure compliance with the requirements set forth in the permit, and in 40 CFR 122. Coordinate and assist in preparation of Annual Reports, Implementation Plans, Stormwater Management Plans, and other deliverables required under the District's MS4 Permit. Schedule and coordinate Task Force meetings. Develop/negotiate supplemental agreements between Water and Sewer Authority and appropriate D.C. agencies to ensure adequate long-term planning and funding requirements are in place to meet the goals of the MS4 permit. Task Force agencies included D.C. Water and Sewer Authority, Department of Public Works, Department of Transportation and Department of the Environment. Technical studies conducted for the project included, stormwater sampling and waste load allocation modeling, street sweeper effectiveness study, Best Management Practices database development, and outfall mapping resulting in a Geographic Information System map. Also provided assistance with negotiations with U.S. Environmental Protection Agency, Earth Justice, and the District over new permit language proposed by U.S. Environmental Protection Agency. Developed Stormwater total maximum daily load compliance plans for the Anacostia and Rock Creek watersheds in the District identifying specific measures that could be implemented to demonstrate real progress towards meeting the pollutant reduction goals outlined in the total maximum daily load.

Project Date: 2001-2007

Project Value – \$4,000,000; Contract Type- Cost Plus; EA Project No. – 13945.01-13945.09; EA Project Manager – Jeffrey Boltz

National Pollutant Discharge Elimination System Permit Support and Technical Studies; Upper Potomac River Commission; Project Manager—The Upper Potomac River Commission operates a wastewater treatment plant that discharges to the Potomac River in Maryland. EA provides technical assistance to the Upper Potomac River Commission for all technical issues related to the permit as well as permit negotiation assistance. Studies that have been conducted included annual fisheries and benthic surveys upstream and downstream of the discharge, thermal modeling and mixing zone determination of the discharge, turbidity and sedimentation studies and their impacts to the aquatic community; and a color dilution study. The studies have involved extensive field work including biological sampling and hydraulic and physical data collection including a dye dilution study. An RMA2 model was developed and calibrated to predict the changes from different discharges and flow regimes.

Project Date: 2000-2007

Project Value – \$550,000; Contract Type- Time and Materials; EA Project No. – 11655.31-11655.40; EA Project Manager – Jeffrey Boltz

Mussel Studies and Regulatory Interaction for Hydroelectric Facilities on the Ohio River; AMP-Ohio; Program Manager—Managed three different project site studies for the determination of mussel population, negotiation of study plans with U.S. Fish and Wildlife Service and West Virginia and Kentucky agencies, the development of Biological Assessments as part of federal actions under the Endangered Species Act, and the evaluation of sediment contamination in the vicinity of the construction locations.

Project Date: 2007

Project Value – \$126,000; **Contract Type** – Time and Materials; **EA Project No.** – 14528.01, 14528.03; **EA**

Project Manager – Jeffrey Boltz

Thermal Assessment of a Stormwater Management System on Piney Run; Carroll County, Maryland; Senior Technical Review—As part of a Consent Judgment between Maryland Department of the Environment and Carroll County regarding the Hampstead Wastewater Treatment Plant, a study was designed and conducted to examine the thermal influences of the stormwater management system on Piney Run. Managed and helped conduct the study which included the deployment of 13 thermographs, 2 flowmeters, and a rain gauge. The County's stormwater management system was represented using five subdrainage areas. The study was conducted throughout the warmer summer and fall months and was used to predict the thermal influence on the upstream stormwater management system on the thermal condition of Piney Run. The study was also used to identify and prioritize stormwater retrofit projects that would reduce thermal loads to the Piney Run system.

Project Date: 2007

Project Value – \$68,000; **Contract Type** – Time and Materials; **EA Project No.** – 14182.01; **EA Project Manager**

–Bill Rue

Environmental Impact Statement for Enhanced Use Leasing; U.S. Army Garrison Aberdeen Proving Ground, Maryland—Technical review for internal scoping and preparation of a preliminary draft environmental impact statement for enhanced use leasing of the 1,300-acre Lauderick Creek area of Aberdeen Proving Ground.

Project Date: 2005-2006

Project Value – \$124,566; **Contract Type** –Lump Sum/Fixed Fee; **EA Project No.** – 61917.11; **EA Project Manager** –Jeff Elseroad

Feasibility Assessment, Engineering Design, National Environmental Policy Act, and Environmental Permitting for Dogue Creek Maintenance Dredging Project; U.S. Army Garrison Fort Belvoir; Project Manager—Evaluated various dredging and placement scenarios for the maintenance dredging of a marina and access channel in a tidal tributary to the Potomac River. Assisted with evaluation of on-post versus off-post dredged material placement options/alternatives. Designed and conducted seasonal rare, threatened, and endangered species surveys and performed wetland delineation to support the National Environmental Policy Act process and assessment of proposed placement sites. Developed briefings/presentations and attended agency coordination meetings to introduce the proposed project and to develop consensus among the proponents and the regulatory agencies, including Virginia Department of Environmental Quality, Natural Marine Fisheries Service, USACE, Virginia Marine Resources Commission, U.S. Fish and Wildlife Service, Virginia Department of Conservation and Recreation, Virginia Department of Game and Inland Fisheries, Fairfax County Wetlands Board and other pertinent resource and regulatory agencies. Provided Section 7 Consultation support for the bald eagle and shortnose sturgeon. Assisted with bald eagle surveys and documented the seasonal use of the Fort Belvoir shoreline by bald eagles. Assisted with the development of a biological assessment of the potential impacts to bald eagle possibly associated with the proposed maintenance dredging of the marina and Dogue Creek. Prepared documentation for Coastal Zone Consistency Determination. Prepared National Environmental Policy Act documentation to assess environmental impacts associated with the proposed maintenance dredging project. Conducted investigations for the presence of submerged aquatic vegetation in Dogue Creek to support permit applications for maintenance dredging of the marina and access channel to the Potomac River. Quantified and mapped the location and coverage of the submerged aquatic vegetation, and provided an assessment of the impacts of dredging to submerged aquatic vegetation. Meetings were held with local, state, and federal regulatory personnel to provide initial survey findings and focus future survey efforts. Developed preliminary and final design documents including specifications in accordance with USACE standards. Developed the owners cost estimate for the construction of the project.

Project Date: 2006-2008

Project Value – \$910,000; **Contract Type** – Fixed Price; **EA Project No.** – 61605.02 and 61605.08; **EA Project Manager** –Jeffrey Boltz

Planning and Restoration Services, USACE–Baltimore, Project Manager—Managed numerous environmental

restoration planning projects for Civil Works projects, including:

- **Tom's Creek Restoration Planning**—Conducted an evaluation of existing conditions, and recommended restoration measures.
- **Occoquan River Shoreline Restoration**—Conducted a feasibility study for use of 30,000 yd³ of sand to create shoreline wetlands and breakwaters along Mason Neck National Wildlife Refuge to stabilize banks that were eroding at a rate of approximately 10 ft/year.
- **Anacostia River Ecological Restoration**—Managed evaluation for water quality improvement and environmental restoration at the Anacostia River near RFK Stadium. Resulted in a comprehensive plan to improve water quality and increase habitat diversity.
- **Codorus Creek Restoration**—Developed streambank restoration plans—both structural and non-structural improvements—for the priority sites of the Codorus Creek Watershed.
- **Town of North Beach, Maryland Stormwater and Beach Erosion Study and Wetlands Mitigation**—Managed a feasibility study for the restoration of a 400-acre tidal wetland isolated from the Chesapeake Bay by a state highway. Feasibility study included wetland characterization, hydrodynamic modeling, and 35 percent design for three restoration concepts. Final design is currently underway.
- **Kingman Island Habitat Restoration Planning**—Developed planning alternatives that addressed varying recreational and wildlife habitat concepts for Kingman and Heritage Islands, located in the Anacostia River, Washington, D.C. Developed a management plan for the potential conversion of the site to a habitat and passive recreational facility. Supported ecosystem restoration components including creation of an emergent herbaceous fringe wetland; habitat restoration of the upland areas of Kingman Island; restoration of Heritage Island as a dedicated wildlife refuge incorporating wetland and upland communities.
- **Flood Relief Studies**—Evaluated flood relief alternatives for two streams in Pennsylvania. Both sites included modeling the hydrology and hydraulic conditions at areas that have known flooding problems. Alternatives will be evaluated that will eliminate the flooding or damage resulting from flooding.

Project Date: Ongoing

Project Value – \$500,000; **Contract Type** – Fixed Price; **EA Project No.** – 61625.01-61625.18; **EA Project Manager** – Jeffrey Boltz

Freshwater Mussel Survey and Report Belleville Lock and Dam; American Municipal Power Ohio; Project Manager—Managed a long-term mussel monitoring program downstream of the Belleville Hydroelectric Project on the Ohio River. The study was conducted to comply with a FERC license article to assess the impacts of the newly constructed hydroelectric facility on endangered mussels potentially located downstream of the project. Statistical analysis of a 10-year data set indicated that the decline in mussels was associated with zebra mussel infestation.

Project Date: 2004-2005

Project Value – \$113,000; **Contract Type** – Time and Materials; **EA Project No.** – 61915.01; **EA Project Manager** – Jeffrey Boltz

North Beach Wetland Restoration Project: USACE-Baltimore District; Project Manager—Evaluated the existing conditions of a degraded salt marsh system along the western shore of the Chesapeake Bay. Conducted a vegetation survey of the marsh and the surrounding area and generated vegetation community maps. Identified the data necessary to model existing conditions and proposed restoration scenarios and assisted with the development of a scope of work to acquire the required data. Developed restoration alternatives, preliminary design and cost estimates and drafted the environmental assessment for the restoration project.

Project Date: 2001

Project Value – \$126,000; **Contract Type** – Fixed Price; **EA Project No.** – 61401.33; **EA Project Manager** – Jeffrey Boltz

City of Baltimore Watershed Management Plans, Baltimore City, Maryland; Project Manager—Project Manager for the evaluation of three urbanized watersheds in Baltimore City to determine existing conditions and prepare comprehensive watershed management plans for each of these watersheds. Proposed watershed-wide structural and non-structural Best Management Practices to reduce stormwater input volume to the streams and address pollutant loading in urban runoff. Provided input parameters for watershed modeling, to determine the baseline water quality conditions and project the benefits of specific Best Management Practices proposed for the watersheds. Attended public meeting to present the findings of the baseline and predicted water quality conditions and introduce the design for the proposed stream restoration plan to stake holders.

Project Date: 2000–2001

Blue Plains Fish Tissue Project; Metropolitan Washington Council of Governments; Project Manager—Conducted fish tissue sampling and analysis for mercury and other related parameters. Designed assess levels of mercury in fish tissue collected in the lower Potomac River as well as the Anacostia River. Both predators and bottom feeders are included in the study.

Project Date: 1998–2001

Kingman Island Habitat Restoration Project; USACE–Baltimore District; Project Manager—Kingman Island is located in the Anacostia River in Washington, D.C., and is the target to be restored for wildlife management and passive recreation use. Developed **planning alternatives** that addressed varying recreational and wildlife habitat concepts for Kingman and Heritage Islands, located in the Anacostia River. Used water and land management techniques to identify the environmental, recreational, and socioeconomic impacts associated with creating wildlife habitats and passive recreation use. Developed a management plan for the potential conversion of the site to a habitat and passive recreational facility. Supporting **ecosystem restoration** components including creation of an emergent herbaceous fringe wetland, habitat restoration of the upland areas of Kingman Island, and restoration of Heritage Island as a dedicated wildlife refuge incorporating wetland and upland communities. As part of the assessment the project include the toxicity testing for potential vernal pool locations as well as ecological and human health risk assessments to support the desired end use of the island.

Project Date: 2000

Project Value – \$321,000; Contract Type – Fixed Price; EA Project No. – 61401.35; EA Project Manager – Jeffrey Boltz

Wetlands Mapping Benthic Community Studies; Sediment Analysis; Dog River Alabama; USACE–Mobile District; Task Manager—As task manager, was responsible for wetland mapping and benthic community assessment of a 22,000-acre wetland area in the tidal portion of Dog River. The wetland mapping was based upon satellite imagery and compared to historic photos to determine the extent of wetland lost since 1950. The benthic data were also compared to historic records to detect any changes that may be occurring in this area as a result of ongoing development.

Project Date: 2000

Evaluation of Baltimore City's Biomonitoring Program; City of Baltimore; Project Manager—Developed a fish biomonitoring program in response to the City's stormwater National Pollutant Discharge Elimination System permit. The program was developed to be consistent with ongoing programs in the regions. Also conducted a statistical evaluation of the benthic biomonitoring program to assess methods to increase the power of that program.

Project Date: 2000

Carroll County versus Piney Run Association; Goodell, DeVries, Leech, & Gray, LLP; Expert Witness—Provided expert witness support on behalf of Carroll County relative to the impacts of wastewater discharge into the Piney Run on the trout population and overall biological community.

Project Date: 1999–2000

Borough of Gettysburg Stormwater Evaluation; USACE–Baltimore District; Project Manager—Interpreted data and presented findings to the Borough of Gettysburg. Evaluated the capacity of the storm sewers and the relationship of flooding to the storm sewers and Stevens Run.

Project Date: 1999–2000

Blewett Falls Vegetation and Wildlife Assessment; Carolina Power & Light; Project Manager—Conducted vegetative mapping based on aerial photographs verified using sampling practices to develop a Geographic Information System-based map of the vegetation along Blewett Falls Lake and approximately 40 mi of the Pee Dee River. Wildlife species that inhabit the project area were also determined including rare, threatened, and endangered species.

Project Date: 1999-2000

Potomac River Hydroelectric Facilities; Allegheny Power; Task Leader—Developed information for the licensing of Allegheny Power's hydroelectric facilities at Dam 4 and Dam 5 on the Potomac River. Prepared the Notice of Intent, Initial Consultation Packages and public meetings, which will continue through the licensing period.

Project Date: 1999-2000

Sediment Issues at Hydroelectric Plants; Electric Power Research Institute; Project Manager—Oversight of the preparation of a report identifying current sediment issues as they relate to hydroelectric facilities. Evaluated remediation, beneficial use, sediment management technologies, and land use models that could be adapted to manage sediment issues at hydroelectric facilities.

Project Date: 1999-2000

Gettysburg Stormwater Evaluation; USACE-Baltimore; Project Manager—The Borough of Gettysburg has a flooding problem associated with Stevens Run and the backup of the stormwater system that drains into Stevens Run. This project was designed to map the stormwater system and develop plan and profile diagrams of the system. These data will then be used to look at design alternatives to minimize the flooding through rerouting or resizing the stormwater system.

Project Date: 1999-2000

Town of North Beach Stormwater and Beach Erosion Study; USACE-Baltimore; Project Manager—Conducted public meetings, and executed a study to describe the results of an analysis of flooding in the Town of North Beach as well as potential methods to restore a large wetland that has been isolated from the Chesapeake Bay.

Project Date: 1998-2000

Relicensing of City of Hamilton Small Hydro; City of Hamilton Ohio; Technical Manager—Prepared licensing documents for the relicensing of the City of Hamilton's small hydro. Prepared the Initial Consultation Package and joint agency public meeting. Designed, negotiated, and provided oversight on fisheries, hydrology, and sediment quality sampling programs. The environmental data will be compiled into the Exhibit E of the license document.

Project Date: 1998-2000

Anadromous Fish Study and Bioassessment; Fort Belvoir; Project Manager—Designed and implemented studies to assess the anadromous fish populations that use streams that flow through Fort Belvoir. Field sampling was conducted over a 12-week period corresponding to the migration period of river herring, the target species. Another aspect of the project is a bioassessment of the same creeks as well as smaller tributaries. This task entails seasonal samples of benthic macroinvertebrates and fish. These data are then summarized according to standard bioassessment protocols.

Project Date: 1998-2000

City of Hamilton Ohio Hydroelectric Project Relicensing; City of Hamilton Ohio; Project Manager—Developed the FERC License Application and conducting all studies necessary to meet U.S. Fish and Wildlife Service and Ohio Department of Natural Resources request for additional information. Studies conducted included fisheries assessments upstream and downstream of the project dam, sediment contamination within the power canal, and a hydraulic analysis of project operations.

Project Date: 1998-1999

Stripeback Darter in East Branch of Collington Branch, Maryland; Ryko Development; Expert Witness—

Provided expert opinion and analysis on the impact of the proposed Beachtree Development on the stripeback darter population. The stripeback darter is a Maryland State Endangered species. The development included locating a dam on the East Branch and a high density community to be developed.

Project Date: 1998-1999

Environmental Compliance Assessments; Headquarters Air Combat Command; Task Leader—Oversight of soil sampling and data analysis for an environmental compliance assessment conducted at Howard Air Force Base in Panama. Collected and analyzed more than 100 soil samples for priority pollutants. Analyzed and interpreted data against U.S. Environmental Protection Agency risk based criteria for industrial areas.

Project Date: 1998

Third Party Evaluation of Instream Flow Standards; Department of Natural Resources and Environmental Conservation; Technical Manager—Conducted a third party evaluation of instream flow recommendations for Brandywine Creek and Christina River in New Castle County Delaware. Conducted study to evaluate passby flow at drinking water withdrawals in both piedmont and coastal plain habitats. Evaluated existing hydrology model as well as evaluated biological and water quality data and criteria used to make the existing flow recommendations.

Project Date: 1998

Preparation of Impact Assessment Techniques Methods Manual; Electric Power Research Institute; Task Leader—Developed retrospective methods to evaluate power plant impacts and preparation of a methods manual of fisheries population estimation and impact assessment techniques for the electric power industry. This project involved identification, summarization, and assessment of both predictive and retrospective techniques for the evaluation of aquatic communities in the vicinity of existing and proposed power plants. The manual was meant to build upon and update a similar methods manual developed by EPRI in the late 1970s. The resulting manual will be used by power industry professionals to help assess current power plant operations in the context of changing Section 316 regulations.

Project Date: 1997-1998

Environmental Investigation Pre-Feasibility Study for Upper Bay Island Placement Sites; Maryland Port Administration—Prepared environmental portion of a pre-feasibility study that evaluated natural resource and human environment parameters at five potential dredged-material (island) placement sites in the upper Chesapeake Bay, Maryland. Responsibilities included data acquisition and evaluation, field sampling design, and environmental document preparation. This pre-feasibility study involved development of scoring criteria for various resources of concern in the region and ranking each location based upon the existing condition of the resources. The environmental pre-feasibility information was incorporated into a consolidated report that also outlined the cost and engineering considerations at each site. The consolidated pre-feasibility investigation was presented to the State legislature to assist decision-makers with final site selection.

Project Date: 1997

Upper Bay Feasibility Assessment; Maryland Port Authority; Project Scientist—Conducted an analysis of the fishery resources in the upper Chesapeake Bay relative to potential dredged material placement sites. Analysis considered both deep and shallow water habitats.

Project Date: 1997

Alexandria Wastewater Project-Phase II-Environmental Assessment; U.S. Agency for International Development/Metcalf & Eddy; Task Leader—For Lake Maryout studies and director of project biological laboratory—Conducted major part of a risk-based environmental assessment to evaluate waste water treatment and disposal alternatives for Alexandria, Egypt. Designed, implemented, and analyzed data, and reporting of the Lake Maryout studies. Conducted water and sediment quality evaluations, priority pollutant studies, wetlands evaluation, benthos, phytoplankton, zooplankton, and fish community characterizations. Contributed sections to the environmental assessment, public participation programs, and other associated studies. Oversaw a staff of more than 15 professionals and provided technical guidance and strengthening throughout all areas of laboratory operation.

Project Date: 1995-1997

Estuarine Enhancement Program Monitoring Studies: Work Plan Development; Public Service Electric and

Gas; Project Scientist—Developed detailed study plans to examine the fish communities that would be impacted by restoring wetlands in near Public Service Electric and Gas' nuclear power stations located on the Delaware Estuary. The plans included rationale and supporting documentation for the sampling protocols recommended as well as methods to examine change.

Project Date: 1995

Ecological Evaluation of a Water Reuse Project; San Antonio Water System; Project Manager—Designed and managed a study to determine the water quality, hydrologic, physical habitat, and ecological changes associated with implementing a proposed wastewater re-use project. As part of this plan, flow in some stream segments would be augmented and flow in some stream segments would be reduced. The relationship between flow and cross-sectional area was examined at a number of locations to characterize existing conditions and proposed changes in flow. This evaluation formed the framework for the ecological and physical habitat evaluations. A water-quality model was developed to predict changes in water quality associated with flow changes and the mixing of water from various sources. Of particular interest was the water quality in the San Antonio River in downtown San Antonio.

Project Date: 1995

Restoration of Delaware Bay Wetlands for Enhancing Fish Production; Public Service Electric and Gas; Technical Consultant—Advised and assisted with the development of a tidal marsh restoration monitoring program to evaluate the offset of fish entrainment impacts associated with once-through cooling at a nuclear power generation facility with tidal marsh restoration. The approach is founded on minimizing the need for extensive site modification and re-vegetation in the 10,000 acres required to be restored as a condition of a National Pollutant Discharge Elimination System (Clean Water Act) permit. Specific support was provided in the development of statistically sound biological monitoring work plans of the Delaware Estuary and tributaries to evaluate the success of tidal marsh restoration activities.

Project Date: 1995

Belleville Hydro Project; Omega-JV5; Task Leader—Developed an agency-negotiated Plan of Study for monitoring fish entrainment and mortality at the Belleville Hydro Project on the Ohio River. Negotiated and work with engineering contractor to ascertain that design of the powerhouse accommodates requirements of the mortality study.

Project Date: 1993–1995

Sinclair Hydro Project Relicensing; Georgia Power Company; Task Leader—Developed habitat suitability criteria to represent more than 70 species of fish that occur in the study area. Habitat suitability criteria were predominantly based on data collected through an extensive field effort, because criteria were not available in the literature. Evaluated the results of an Instream Flow Incremental Methodology analysis on the amount of habitat for the 20 fish species that were included in the analyses. Conducted studies to evaluate the relationship between various operating scenarios and the amount of woody debris inundated throughout the 70-mi study area. Woody debris was identified by the resource agencies as an important habitat parameter for both fishes and macro invertebrates.

Project Date: 1993–1995

Seneca Creek Flow Augmentation Study; Greeley and Hansen Engineers; Project Manager—Designed and managed a study to determine the physical and biological impacts of significantly increasing the discharge from a sewage treatment plant on the stream channel and subsequent effects to the fishery. A field study quantified the physical parameters of the stream channel, and HEC 2 was used to predict changes associated with the increased discharge. The physical results were then examined relevant to the fish community resident in the stream.

Project Date: 1994

Clavey River Project; Turlock Irrigation District; Task Leader—Evaluated natural barriers to upstream fish passage of rainbow trout. The evaluation included surveying to characterize the general height and length of the falls at several locations across the stream channel. A literature review was implemented to determine the jumping ability of rainbow trout and identify physical characteristics (such as a clear jumping portal) that might impede the jumping ability of fish. The analyses combined the physical characteristics and jumping ability of trout.

Project Date: 1993

Oconto Falls Hydro; Pacific Hydro Consulting; Task Manager—Compiled and wrote selected sections of Exhibit E, including aquatic and terrestrial resources, endangered and threatened species, water quality, and general

setting.

Project Date: 1993

Other Project Experience

Turners Falls Downstream Fish Passage Studies; Northeast Utilities Service Company; Lead Scientist; 1991–1993—Over a 2-year period for budget, agency consultation, development of study plans, coordination and implementation of field sampling programs, and report preparation. Participated in a multi disciplinary team of biologists and engineers. Evaluated use of an existing sluice modified with a bulkhead and fitted with a wedge-wire screen sampling facility as a possible fish-passage alternative. In addition to the sluice, overflow slots were cut into the power plant above the turbine intakes to bypass fish as they approached the turbines. These facilities were successful in bypassing more than 65 percent of the salmon smolts and more than 75 percent of the juvenile American shad and blueback herring.

Hadley Falls Downstream Fish Passage Studies; Northeast Utilities Service Company; Lead Scientist; 1990–1993—Over a 3-year period responsible for budget, agency consultation, development of study plans, coordination and implementation of field effort, and report preparation. Participated in a multi disciplinary team of biologist and engineers. Participated in a hydraulic model study designed to evaluate, which fish-passage alternatives might best work at this site. Designed studies to test the effectiveness of a 10-ft-deep skirted boom in guiding Atlantic salmon smolts, American shad, and blueback herring.

Holyoke Canal Downstream Fish Passage Studies; Northeast Utilities Service Company; Lead Scientist; 1990–1993—Over 3-year period responsible for budget, agency consultation, development of study plans, coordination and implementation of field effort, and report preparation. Participated in a multi disciplinary team of biologists and engineers. The louver-array bypass facility resulting from these efforts is the most successful facility currently in operation in the Northeast at bypassing Atlantic salmon smolts. The facility also successfully bypasses juvenile American shad and blueback herring.

Downstream Fish Passage on the Connecticut River; Northeast Utilities Service Company; 1991–1992; Project Scientist—Evaluated different biological and physical methods to divert migrating salmon smolts, American shad, and river herring around three hydroelectric developments on the Connecticut River. Conducted large field studies to determine passage routes using nets and radio-telemetry.

Feasibility Study of Upstream Fish Passage Facilities at Chippewa Falls Hydroelectric Facility; NSP–Wisconsin; 1992—Coordinated and developed a feasibility study of three upstream fish-passage alternatives at the Chippewa Falls Hydroelectric Facility, in response to a request by FERC for additional information on the license application. The feasibility study included conceptual designs and several design criteria, such as slope and cubic feet per second, required for attracting water; elevations for the top and bottom entrance/exit invert; and a cost comparison of fish elevator, a denil ladder, and a trap-and-haul program.

Castlerock and Petenwell Relicensing; Wisconsin River Power Company; Lead Aquatic Scientist; 1992—Coordinated the aquatic sections of the Initial Consultation Package. Participated in agency meetings designed to determine their major concerns and issues regarding the relicensing of these two projects located on the Wisconsin River.

Wisconsin River Division Fish Entrainment Study; Consolidated Water Power (Consolidated Paper Company); Lead Scientist; 1991-1992—Negotiated a plan of study with both state and federal resource agencies, identifying a sampling methodology, and assisting in report preparation. A high-profile study because of the dispute resolution process that was conducted by FERC, which consisted of both conventional netting in the tailrace and hydroacoustics. The study plan was designed to be the most cost-effective solution for Consolidated, which was also relicensing other projects on the Wisconsin River. The data obtained from this study, along with other studies on the river, should reduce the potential requirements of additional entrainment studies. Designed a field survey to estimate populations of target species in the impoundment to evaluate the impact of entrainment on the populations of these species.

Rocky Mountain Pumped Storage Project; Oglethorpe Power Company; Lead Fisheries Scientist; 1990-1992—Managed all fisheries issues related to the construction of the Rocky Mountain Pumped Storage Project in Georgia. Conducted a fish survey in Heath Creek to obtain baseline data relevant to a minimum flow release that is stipulated in the license; developed a recreational fisheries plan for two auxiliary impoundments associated with the project. The recreational plan included locating 8 fishing jetties and more than 35 artificial fish attractors. The recreational fisheries plan was coordinated with the Georgia Department of Natural Resources.

Northfield Mountain Pumped Storage Project Biological Assessment; Northeast Utilities Service Company; 1990-1992—Developed a plan to assess the impact of the project on the anadromous fishes in the Connecticut River. The assessment consisted of electrofishing in the lower reservoir to determine the distribution and abundance of juvenile and larval anadromous fish and to estimate the potential for their being entrained. Radiotelemetry was used to determine the migration route and entrainment of Atlantic salmon smolts as they passed the facility. Netting was also conducted in the upper reservoir to estimate entrainment rates of juvenile American shad and blueback herring.

Mississippi Valley Pumped Storage Project; Southern Minnesota Municipal Power Agency; 1990-1992—Conducted a site assessment and fatal-flaw analysis of a potential pumped-storage project located on the Mississippi River in Minnesota. After the site selection was completed, an Initial Consultation Package was prepared according to FERC specifications. Participated in the public meeting after the Initial Consultation Package was distributed to resource agencies and the general public.

Park Mill Fish Entrainment Study; Scott Paper Company (Scott Worldwide); Lead Scientist; 1989-1992—Coordinated and supervised an intensive fish entrainment study at the Park Mill Hydroelectric Facility located on the Menominee River between Wisconsin and Michigan to meet the requirement of a FERC license article. The study used both conventional sampling and hydroacoustics. Netting was conducted 40 hours per week for 9 months and 40 hours per month for 3 months; hydroacoustics was conducted 24 hours per day for a full year.

Employment History – Detailed

Employer—EA Engineering, Science, and Technology, Inc.

Dates of Employment—1993 – Present

Title—Vice President

Employer—Harza Engineering Company

Dates of Employment—1989–1993

Title—Fisheries Scientist

Employer—Auburn University

Dates of Employment—1989

Title—Postdoctoral Fellow

Employer—Pennsylvania State University

Dates of Employment—1988–1989

Title—Research Associate

Employer—Pennsylvania State University

Dates of Employment—1983–1988

Title—Research Assistant

List of Technical Skills and Specializations

- Agency consultation
- Alternative evaluations
- Aquatic ecology/riverine ecology
- Ecosystem restoration
- Endangered species surveys
- Environmental assessments/environmental impact statements
- Estuarine ecology
- Faunal surveys
- Fish passage
- Fisheries science
- Hydroelectric plant studies
- Hydroelectric project licensing
- Power plant studies
- Program management
- Regulatory permitting
- Water resource development projects

Standard FAC-003-1 — Transmission Vegetation Management Program

A. Introduction

1. **Title:** Transmission Vegetation Management Program
2. **Number:** FAC-003-1
3. **Purpose:** To improve the reliability of the electric transmission systems by preventing outages from vegetation located on transmission rights-of-way (ROW) and minimizing outages from vegetation located adjacent to ROW, maintaining clearances between transmission lines and vegetation on and along transmission ROW, and reporting vegetation-related outages of the transmission systems to the respective Regional Reliability Organizations (RRO) and the North American Electric Reliability Council (NERC).
4. **Applicability:**
 - 4.1. Transmission Owner.
 - 4.2. Regional Reliability Organization.
 - 4.3. This standard shall apply to all transmission lines operated at 200 kV and above and to any lower voltage lines designated by the RRO as critical to the reliability of the electric system in the region.
5. **Effective Dates:**
 - 5.1. One calendar year from the date of adoption by the NERC Board of Trustees for Requirements 1 and 2.
 - 5.2. Sixty calendar days from the date of adoption by the NERC Board of Trustees for Requirements 3 and 4.

B. Requirements

- R1. The Transmission Owner shall prepare, and keep current, a formal transmission vegetation management program (TVMP). The TVMP shall include the Transmission Owner's objectives, practices, approved procedures, and work specifications¹.
 - R1.1. The TVMP shall define a schedule for and the type (aerial, ground) of ROW vegetation inspections. This schedule should be flexible enough to adjust for changing conditions. The inspection schedule shall be based on the anticipated growth of vegetation and any other environmental or operational factors that could impact the relationship of vegetation to the Transmission Owner's transmission lines.
 - R1.2. The Transmission Owner, in the TVMP, shall identify and document clearances between vegetation and any overhead, ungrounded supply conductors, taking into consideration transmission line voltage, the effects of ambient temperature on conductor sag under maximum design loading, and the effects of wind velocities on conductor sway. Specifically, the Transmission Owner shall establish clearances to be achieved at the time of vegetation management work identified herein as Clearance 1, and shall also establish and maintain a set of clearances identified herein as Clearance 2 to prevent flashover between vegetation and overhead ungrounded supply conductors.
 - R1.2.1. Clearance 1 — The Transmission Owner shall determine and document appropriate clearance distances to be achieved at the time of transmission vegetation management work based upon local conditions and the expected time frame in which the Transmission Owner plans to return for future

¹ ANSI A300, Tree Care Operations – Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices, while not a requirement of this standard, is considered to be an industry best practice.

vegetation management work. Local conditions may include, but are not limited to: operating voltage, appropriate vegetation management techniques, fire risk, reasonably anticipated tree and conductor movement, species types and growth rates, species failure characteristics, local climate and rainfall patterns, line terrain and elevation, location of the vegetation within the span, and worker approach distance requirements. Clearance 1 distances shall be greater than those defined by Clearance 2 below.

- R1.2.2.** Clearance 2 — The Transmission Owner shall determine and document specific radial clearances to be maintained between vegetation and conductors under all rated electrical operating conditions. These minimum clearance distances are necessary to prevent flashover between vegetation and conductors and will vary due to such factors as altitude and operating voltage. These Transmission Owner-specific minimum clearance distances shall be no less than those set forth in the Institute of Electrical and Electronics Engineers (IEEE) Standard 516-2003 (*Guide for Maintenance Methods on Energized Power Lines*) and as specified in its Section 4.2.2.3, Minimum Air Insulation Distances without Tools in the Air Gap.

R1.2.2.1 Where transmission system transient overvoltage factors are not known, clearances shall be derived from Table 5, IEEE 516-2003, phase-to-ground distances, with appropriate altitude correction factors applied.

R1.2.2.2 Where transmission system transient overvoltage factors are known, clearances shall be derived from Table 7, IEEE 516-2003, phase-to-phase voltages, with appropriate altitude correction factors applied.

- R1.3.** All personnel directly involved in the design and implementation of the TVMP shall hold appropriate qualifications and training, as defined by the Transmission Owner, to perform their duties.
- R1.4.** Each Transmission Owner shall develop mitigation measures to achieve sufficient clearances for the protection of the transmission facilities when it identifies locations on the ROW where the Transmission Owner is restricted from attaining the clearances specified in Requirement 1.2.1.
- R1.5.** Each Transmission Owner shall establish and document a process for the immediate communication of vegetation conditions that present an imminent threat of a transmission line outage. This is so that action (temporary reduction in line rating, switching line out of service, etc.) may be taken until the threat is relieved.
- R2.** The Transmission Owner shall create and implement an annual plan for vegetation management work to ensure the reliability of the system. The plan shall describe the methods used, such as manual clearing, mechanical clearing, herbicide treatment, or other actions. The plan should be flexible enough to adjust to changing conditions, taking into consideration anticipated growth of vegetation and all other environmental factors that may have an impact on the reliability of the transmission systems. Adjustments to the plan shall be documented as they occur. The plan should take into consideration the time required to obtain permissions or permits from landowners or regulatory authorities. Each Transmission Owner shall have systems and procedures for documenting and tracking the planned vegetation management work and ensuring that the vegetation management work was completed according to work specifications.

- R3.** The Transmission Owner shall report quarterly to its RRO, or the RRO's designee, sustained transmission line outages determined by the Transmission Owner to have been caused by vegetation.
- R3.1.** Multiple sustained outages on an individual line, if caused by the same vegetation, shall be reported as one outage regardless of the actual number of outages within a 24-hour period.
- R3.2.** The Transmission Owner is not required to report to the RRO, or the RRO's designee, certain sustained transmission line outages caused by vegetation: (1) Vegetation-related outages that result from vegetation falling into lines from outside the ROW that result from natural disasters shall not be considered reportable (examples of disasters that could create non-reportable outages include, but are not limited to, earthquakes, fires, tornados, hurricanes, landslides, wind shear, major storms as defined either by the Transmission Owner or an applicable regulatory body, ice storms, and floods), and (2) Vegetation-related outages due to human or animal activity shall not be considered reportable (examples of human or animal activity that could cause a non-reportable outage include, but are not limited to, logging, animal severing tree, vehicle contact with tree, arboricultural activities or horticultural or agricultural activities, or removal or digging of vegetation).
- R3.3.** The outage information provided by the Transmission Owner to the RRO, or the RRO's designee, shall include at a minimum: the name of the circuit(s) outaged, the date, time and duration of the outage; a description of the cause of the outage; other pertinent comments; and any countermeasures taken by the Transmission Owner.
- R3.4.** An outage shall be categorized as one of the following:
- R3.4.1.** Category 1 — Grow-ins: Outages caused by vegetation growing into lines from vegetation inside and/or outside of the ROW;
- R3.4.2.** Category 2 — Fall-ins: Outages caused by vegetation falling into lines from inside the ROW;
- R3.4.3.** Category 3 — Fall-ins: Outages caused by vegetation falling into lines from outside the ROW.
- R4.** The RRO shall report the outage information provided to it by Transmission Owner's, as required by Requirement 3, quarterly to NERC, as well as any actions taken by the RRO as a result of any of the reported outages.

C. Measures

- M1.** The Transmission Owner has a documented TVMP, as identified in Requirement 1.
- M1.1.** The Transmission Owner has documentation that the Transmission Owner performed the vegetation inspections as identified in Requirement 1.1.
- M1.2.** The Transmission Owner has documentation that describes the clearances identified in Requirement 1.2.
- M1.3.** The Transmission Owner has documentation that the personnel directly involved in the design and implementation of the Transmission Owner's TVMP hold the qualifications identified by the Transmission Owner as required in Requirement 1.3.
- M1.4.** The Transmission Owner has documentation that it has identified any areas not meeting the Transmission Owner's standard for vegetation management and any mitigating measures the Transmission Owner has taken to address these deficiencies as identified in Requirement 1.4.

- M1.5.** The Transmission Owner has a documented process for the immediate communication of imminent threats by vegetation as identified in Requirement 1.5.
- M2.** The Transmission Owner has documentation that the Transmission Owner implemented the work plan identified in Requirement 2.
- M3.** The Transmission Owner has documentation that it has supplied quarterly outage reports to the RRO, or the RRO's designee, as identified in Requirement 3.
- M4.** The RRO has documentation that it provided quarterly outage reports to NERC as identified in Requirement 4.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

RRO
NERC

1.2. Compliance Monitoring Period and Reset

One calendar Year

1.3. Data Retention

Five Years

1.4. Additional Compliance Information

The Transmission Owner shall demonstrate compliance through self-certification submitted to the compliance monitor (RRO) annually that it meets the requirements of NERC Reliability Standard FAC-003-1. The compliance monitor shall conduct an on-site audit every five years or more frequently as deemed appropriate by the compliance monitor to review documentation related to Reliability Standard FAC-003-1. Field audits of ROW vegetation conditions may be conducted if determined to be necessary by the compliance monitor.

2. Levels of Non-Compliance

2.1. Level 1:

- 2.1.1.** The TVMP was incomplete in one of the requirements specified in any subpart of Requirement 1, or;
- 2.1.2.** Documentation of the annual work plan, as specified in Requirement 2, was incomplete when presented to the Compliance Monitor during an on-site audit, or;
- 2.1.3.** The RRO provided an outage report to NERC that was incomplete and did not contain the information required in Requirement 4.

2.2. Level 2:

- 2.2.1.** The TVMP was incomplete in two of the requirements specified in any subpart of Requirement 1, or;
- 2.2.2.** The Transmission Owner was unable to certify during its annual self-certification that it fully implemented its annual work plan, or documented deviations from, as specified in Requirement 2.
- 2.2.3.** The Transmission Owner reported one Category 2 transmission vegetation-related outage in a calendar year.

2.3. Level 3:

- 2.3.1.** The Transmission Owner reported one Category 1 or multiple Category 2 transmission vegetation-related outages in a calendar year, or;
- 2.3.2.** The Transmission Owner did not maintain a set of clearances (Clearance 2), as defined in Requirement 1.2.2, to prevent flashover between vegetation and overhead ungrounded supply conductors, or;
- 2.3.3.** The TVMP was incomplete in three of the requirements specified in any subpart of Requirement 1.

2.4. Level 4:

- 2.4.1.** The Transmission Owner reported more than one Category 1 transmission vegetation-related outage in a calendar year, or;
- 2.4.2.** The TVMP was incomplete in four or more of the requirements specified in any subpart of Requirement 1.

E. Regional Differences

None Identified.

Version History

Version	Date	Action	Change Tracking
Version 1	TBA	<ul style="list-style-type: none">1. Added "Standard Development Roadmap."2. Changed "60" to "Sixty" in section A, 5.2.3. Added "Proposed Effective Date: April 7, 2006" to footer.4. Added "Draft 3: November 17, 2005" to footer.	01/20/06