Memorandum
Legal Department

To: Randall Tweet, City Manager
Subject: General Liability Claim
Date: August 13, 2021

ROCK ISLAND
ILLINOIS

Expert witness services for two pending lawsuits.

Recommendation:

The Legal Department is seeking approval to retain expert witness services in connection with two pending lawsuits arising from incidents at Steel Dam. Because many issues in the suits are similar, using a single expert for both cases offers economies of scale. The estimate for both cases is attached along with individual CVs.

Vendor: Genterra
Payment Amount: $80,000 (over the course of the litigation).

Fund:	621	Self Insurance
Division:	157133	Insurance
Cost Center:	53602	General Liabilities
Object Class:	0000000	Insurance Claims

Submitted by: David G. Morrison, Legal Department

Approved by: Randall Tweet, City Manager

GENTERRA
CONSULTANTS, INC.
ENGINEERING & GEOTECHNICAL SERVICES

COMPANY PROFILE AND SPECIALIZED CAPABILITIES FOR DAMS AND RESERVOIRS

Founded in 1995, GENTERRA Consultants, Inc. (GENTERRA) is a California corporation with headquarters in Irvine, California and branch offices in Sacramento, California; Tempe, Arizona; Lakewood, Colorado; Arlington, Texas; Jacksonville, Florida; and Harrisburg, Pennsylvania. GENTERRA provides geotechnical engineering services, with specialization in the site investigation, design, evaluation, construction observation and testing, and other consultation for of dams, spillways, levees, channels, reservoirs, and basins used for potable and reclaimed water storage, water conveyance, flood control, debris retention and groundwater recharge facilities in California. The firm is a small business certified by the State of California, the San Diego County Water Authority, the Metropolitan Water District and other agencies.

GENTERRA offers tailored engineering and geotechnical consulting services to clients in the public and private sectors, as well as to engineering and consulting firms in California and other Western states. The firm has specialized capabilities provided by a team of more than thirty professionals with high levels of technical and management expertise and experience in all areas of civil and geotechnical engineering, geology, engineering geology, hydrogeology, water resources engineering, hydrology, groundwater, earthquake engineering, seismology and environmental science. GENTERRA specializes in the site investigation, design, evaluation, construction observation and testing, and other consultation for of dams, spillways, outlet works, levees, channels, reservoirs, and basins used for water storage, water conveyance, flood control, debris retention and groundwater recharge facilities. The firm offers the full range of geotechnical services on these and other types of projects, with emphasis on those involving water storage and conveyance, drainage, flood control, public works and infrastructure. GENTERRA is committed to providing high quality services to develop practical and cost-effective solutions and to provide results that are responsive to the technical, regulatory, time and cost requirements of our clients.

GENTERRA's professional staff has extensive experience in the geotechnical site investigation, design and evaluation of dams, spillways, outlet works, levees, reservoirs, and other water facilities, including earth, rockfill and concrete dams; tank reservoirs and earth levees. Our professional personnel experience was developed through direct responsibility with the State of California Department of Water Resources (DWR), Division of Safety of Dams (DSOD) and with consulting engineering firms specializing in dams. These services have been provided by GENTERRA personnel on the design and evaluation of hundreds of dams, reservoirs and other water storage, water conveyance and flood control facilities, and on special dam safety and levee safety programs for owners and operators of dams, reservoirs, and levees, including water and flood control districts; local, state and federal agencies; lakeowner associations and property owners. Our company President, Joseph J. Kulikowski, P.E., G.E., was employed by the

California Department of Water Resources (DWR), including the DSOD, prior to entering the consulting profession. Mr. Kulikowski worked in both the Design Engineering Branch and the Field Engineering Branch of the DSOD.

With more than 85% of the firm's workload involving engineering for dams, levees, channels, reservoirs, tanks and basins, and with most of our clients being water agencies and public works agencies, GENTERRA fully understands the requirements of current applicable design and construction practices, and those of review agencies, and integrates those requirements into our projects. GENTERRA is aware of the design and construction guidelines and requirements for dams, reservoirs, levees and related facilities issued by the U.S. Army Corps of Engineers, the Federal Emergency Management Agency, the State Division of Safety of Dams, the U.S. Bureau of Reclamation, the Federal Energy Commission, and other Federal, State and local agencies. GENTERRA has an excellent approval record on all submittals to State, Federal and local agencies, and we are currently providing these services to many owners and operators.

Since the firm was founded in 1995, GENTERRA has provided consulting engineering services for dams, reservoirs, levees, and other water storage and conveyance facilities, most of them located in California and under jurisdiction of the DSOD. **These projects included the evaluation of dam safety of more than 180 dams, most of which under the jurisdictional review of the State of California Division of Safety of Dams (DSOD)**, and the geotechnical investigation, design, and preparation of plans, specifications, and construction cost estimates of more than 15 new, enlarged or modified earthfill dams that required applications, review and approval by the California DSOD. The services included geotechnical field and laboratory investigations; evaluation of stability under static and seismic conditions and overall safety; design and development of plans and specifications; construction observation and consultation; design and installation of instrumentation; coordination with State, Federal and local regulatory agencies; performance of dam failure inundation studies; risk assessments; and assisting in preparation of emergency action plans. Key and support project personnel, all of whom are employees of GENTERRA, have worked on more than 500 of these types of facilities in their careers.

A complete list of the more than 180 dams on which GENTERRA has provided services is available upon request. In addition to the services provided on those dams, GENTERRA has also provided engineering services on many miles of levees and water conveyance channels.

Key project personnel of GENTERRA, while at the firm and prior to joining the firm, have performed design reviews and provided consultation on the planning, siting, design, and construction of hundreds of earthfill and rockfill dams in the United States.

The company's personnel, backed by laboratory and field testing capabilities, offer a complete range of geotechnical and water resources services in the planning, investigation, design, construction, consultation and evaluation of dams, embankments and reservoirs. GENTERRA's range of services includes the following:

- Planning, feasibility and preliminary design studies
- Review of alternative sites and site selection
- Field and laboratory investigations for preliminary and final design
- Identification and evaluation of site and borrow materials
- Seismicity and geologic studies
- Static and seismic stability analyses for natural, cut and fill slopes
- Design and evaluation of earth dams and levees, rockfill and concrete dams
- Design and evaluation of spillways and outlet works for dams
- Dam and levee safety inspections and monitoring programs
- Dam failure inundation studies and inundation maps
- Risk assessments
- Assistance in preparation of emergency action plans
- Investigations, analyses and design of remedial measures for dams and levees
- FERC Part 12D hydropower dams licensing inspections
- Static settlement and seismic deformation analyses
- Preliminary and final geotechnical design recommendations
- Hydrologic, hydraulic and seepage studies
- Recommendations and guidelines for earthwork construction
- Geotechnical quality assurance and quality control during construction
- Instrumentation design, installation and monitoring
- Static and seismic evaluation of existing dams, levees and appurtenances
- Vulnerability and security assessments for dams and reservoirs
- Interaction and coordination with regulatory agencies
- Forensic investigations of dam failures

GENTERRA provides observation and testing associated with quality assurance and quality control during construction for earthwork, concrete, soil cement, asphalt and geosynthetic liners. The firm also provides construction consultation by qualified and licensed engineers, geologists and technicians. This consultation can be related to the development of construction plans, specifications and other contract documents for earthwork and grading operations. Observation and testing are generally performed to provide test results and documentation for compliance with approved plans and specifications. The consultation enables review of construction materials and site conditions as exposed during construction and subsequent recommendations for revisions to design and construction due to changed conditions.

GENTERRA has in-house capabilities for performing basic geophysical surveys, and can subcontract to specialized geophysics firms for more complex geophysics requirements. Equipment and operators for drilling and other exploration are arranged through subcontractors, selected on the basis of the type of equipment required, location of the project, experience and references.

HOURS AND COST ESTIMATE - GENTERRA Consultants, Inc.		CONFIDENTIAL											
Steel Dam Two Litigations													
GENTERRA Proposal No. P2623-Steel Dam, JJK 08/05/21draft													
City of Rock island, Ilinois		ESTIMATED HOURS & BILLING RATES (2021 Fee Schedule)											
										Expenses			
	PHASE I - Tasks 1 to 5, Review of Documents and Videos, Report & Deposition	Sr. Principal	Sr. Assoc.	Sr. Assoc.	Staff	CAD	Project	Sub-Total	Sub-Total	Repro	Travel	*Total*	TOTAL
	Two Wrongful Death Cases (One with Boat and one with Canoe)	Proj Mgr.	Engr.	Engr.	Scientist	Designer	Support	Labor	Labor			*Expenses*	COST
Task		JJK	ARB	LM	OW	KMM	TMC	Hours	Costs				
		$300.00	$260.00	$260.00	$170.00	$140.00	$90.00						
1	Review of Documents and Site Videos, Research, Initial Discussons on 2 Cases	8.0	48.0	16.0	8.00	4.0	4.0	88.0		$ 75	$ -	$ 75	
2	Review of Transcipts of Depositions on 2 Cases (Assume 25)	4.0	50.0	0.0	4.00	0.0	0.0	58.0		$ 250	$ -	$ 250	
3	Consultation and Discussion on 2 Cases (Phone, Emails, Team Discussions)	8.0	24.0	4.0	4.00	0.0	0.0	40.0		$ 50	$ -	$ 50	
4	Summarization Reports (2) and Rendering of Opinions on 2 Cases	8.0	32.0	8.0	16.00	12.0	8.0	84.0		$ 100	$ -	$ 100	
5	Depositions (Assume 2 Virtual or in Harrisburg, PA)	4.0	20.0	0.0	4.00	6.0	4.0	38.0		$ 25	$ -	$ 25	
	Phase I Subtotal Tasks 1 through 5 - HOURS	***32.0***	***174.0***	***28.0***	***36.00***	***22.0***	***16.0***	***308.0***					
	Phase I Subtotal Tasks 1 through 5 -COSTS	***$9,600***	***$45,240***	***$7,280***	***6120.00***	***$3,080***	***$1,440***		***$72,760***	*$ 500*		*$ 500*	*$ 73,260*
													$ 80,000 Maximum
Project Personnel:													
JJK - Joseph J. Kulikowski, P.E., G.E. - Principal In Charge/Project Manager/Quality Assurance													
ARB - Andrew R. Blytra, P.E. - Designated Expert													
LM - Leonard Marino, PE - Technical Reviewer													
OW - Olivia Wilbur - Technical Support and Coordination													
KMM - Kristina Mohos - CAD Designer & Illustrator													
TMC - Tanya Cason - Word Processing													

GENTERRA CONSULTANTS, INC.
2021 PROFESSIONAL FEE SCHEDULE
ENGINEERING AND GEOTECHNICAL CONSULTING SERVICES

FEES FOR PROFESSIONAL, TECHNICAL AND SUPPORT STAFF

GENTERRA Consultants, Inc. charges our clients for professional, technical and support services for time directly related to a project. Charges are not made for ordinary secretarial services, office management, accounting, maintenance, or other activities not directly related to a project. Current personnel classifications and rates are summarized below:

PERSONNEL CLASSIFICATION	RATE ($ PER HOUR)
Office Assistant [(1)] (OFC ASST)	70
Word Processor/Typist [(1)] (WORD PROC)	90
Draftsperson/Technical Illustrator [(1)] (TI)	100
Field/Laboratory Technician [(1)] (TECH)	110
Senior Field/Laboratory Technician [(1)] and CAD Designer [(1)] (SR TECH/CAD)	140
Supervisory Technician/Field Operations Manager [(1)] (SUPV TECH)	160
Staff Engineer/Geologist/Scientist [(1)] (STAFF)	170
Senior Staff Engineer/Geologist/Scientist [(1)] (SR STAFF)	190
Project Engineer/Geologist/Scientist (PROJECT)	210
Senior Project Engineer/Geologist/Scientist (SR PROJECT)	230
Associate (ASSOC)	250
Senior Associate (SR ASSOC)	260
Principal (PRINC)	290
Senior Principal (SR PRINC)	310

[(1)] Overtime will be charged at 1.25 times the above listed rates for these personnel classifications. Prevailing wage rates will be applied for field personnel when required based on published rates for the project location. Overtime is defined as time charged to a project in excess of eight (8) hours per day and time worked on weekends and holidays.

Contract technical personnel, if used on a project, may be charged at the hourly rates listed above. Travel time will be charged at regular hourly rates.

Charges for services related to court appearances and for expert witness testimony will be 175% of regular hourly rates, with a minimum daily charge of four (4) hours, plus expenses. Preparation for testimony for all expert and support personnel will be charged at regular hourly rates.

PROJECT-RELATED EXPENSES

Expenses directly related to a project will be billed as follows:

Subcontractors (drilling, trenching, surveying, testing, etc.), travel-related expenses (hotels, meals, vehicle rentals, air travel, etc.) and other project expenses (e.g., aerial photographs, outside reprographics, equipment rental, overnight shipping, project-related expendable supplies, etc.) will be charged at cost plus 15 percent.

Nuclear density gauges used on projects will each be charged at the rate of $90.00 per day. A water level indicator used for wells and piezometers will be charged at the rate of $50.00 per day. Rates for other special field equipment will be provided in advance of use on each project. In-house photocopy/ reproduction will be billed at $0.15 per page for black-and-white copies and $1.50 per page for color copies and color digital photographs, unless shown otherwise in cost proposal.

Mileage for project-related travel will be billed at 2021 Federal Approved Mileage Rate of $0.56 per mile. Field vehicles used for site investigations and during construction are billed at $20.00 per hour plus mileage charges.

Charges for laboratory soils testing are shown on a separate fee schedule.

CHANGES TO FEE SCHEDULE

This fee schedule applies to services rendered in the current year and/or until a new fee schedule is issued. GENTERRA Consultants, Inc. (GENTERRA) reviews and revises our fee schedule periodically. Unless other arrangements have been made, charges for services (including continuing projects initiated in the prior year) will be based on the most recently published fee schedule.

INVOICES

Invoices will be issued monthly, or at other specified intervals for some projects, and will be payable upon receipt unless other arrangements have been agreed upon. Interest of one percent per month (but not exceeding the maximum rate allowed by law) will be payable on accounts not paid within 30 days, unless prior agreement is made for other terms. Any attorney's fees or other costs incurred in collecting any delinquent account shall be paid by the client.

A retainer of 50 percent of the total fee is required for projects with total fees of $10,000 or less, or for projects for which the cost of field studies and/or equipment account for more than 50 percent of the total fee. On projects with total fees of less than $10,000, the balance of payment must be paid at the time the report is released to the client. For legal Clients, we will require a retainer to be established at the time of authorization.

CONDITIONS

GENTERRA warrants that its services are performed, within the limits prescribed by our clients, in accordance with generally accepted standards of care and diligence normally practiced by recognized consulting firms performing services of a similar nature. No other warranty, either express or implied, is included or intended in GENTERRA's proposals, contracts or reports.

DISCLOSURE

On projects involving site investigations and/or evaluations of prior geotechnical reports by others, Client agrees to provide all information in Client's possession pertinent to actual or possible presence of hazardous materials and utilities on the site and agrees to compensate GENTERRA for all costs associated with the unanticipated discovery of hazardous materials or damage to utilities not previously identified by the Client.

GENTERRA
CONSULTANTS, INC.

Len Marino, P.E., C.F.M.

Senior Associate Engineer - Water Resources

1 year with GENTERRA
40 years with other organizations

Education

- *B.S. Environmental Engineering, Syracuse University, 1976*
- *Graduate Studies, Estuarine Hydrodynamics, North Carolina State University, 1977*
- *Graduate, Management Development Program, California Department of Water Resources, 2001*

Professional Registrations

- *California Registered Civil Engineer Certificate # C-52552*
- *California General Building Contractor License # B-547328*
- *Certified Floodplain Manager Certificate # US-19-10946*
- *California Real Estate Broker License # 00852651*

Specialized Expertise

- *Condition assessment and rehabilitation of hydropower systems, dams, reservoirs, spillways, penstocks, and pipelines. Operations & maintenance support*
- *FERC licensing / re-licensing support*
- *Water and energy economic feasibility studies, hydropower & dams system optimization and modernization*
- *Flood control engineering, risk reduction*
- *Water rights amendments and right-of-way acquisition and management*
- *Power contract administration, power marketing, integration of renewable energy resources and optimization*
- *National Flood Insurance Program consulting*
- *USACE Nationwide Permits*
- *California Dept of Water Resources and Central Valley Flood Protection Board - Right-of-Way Encroachment Permits*

Special Attributes & Affiliations

- *Advanced training in State Emergency Management System (Incident Command Center)*
- *Training in Hazardous Waste Operations and Emergency Response Standard "HAZWOPR"*
- *Member, Association of State Dams Safety Officials*
- *Member, Association of State Floodplain Managers, Inc*
- *Member, Floodplain Management Association (CA, NV, HI)*

REPRESENTATIVE EXPERIENCE

Mr. Marino is a Senior Associate Engineer with GENTERRA Consultants, Inc. He has over 40 years of hydropower & dams, water resources, flood control engineering, and project management experience serving the public and private sectors. He is experienced in managing enterprise-wide programs to deliver capital improvements for hydroelectric power systems and flood control infrastructure in need of modernization and rehabilitation. Mr. Marino's experience includes hydroelectric system operation, capacity and energy optimization, equipment condition assessment, power contracts, dam safety, flood risk reduction, erosion control, storm water management, and environmental and regulatory compliance. As the former Hydro Division Manager at El Dorado Irrigation District Mr. Marino possesses the knowledge and experience of all aspects of hydropower and dam operations. He has a strong understanding of the Federal Energy Regulatory Commission's regulations and dam safety program and is skilled at proactively managing regulatory submittals and communicating complex technical information to mixed audiences in controversial situations at public forums.

Senior Engineering Consultant / Hydroelectric Power & Dams + Watershed Services Lead - Advisian Worley Group, Folsom, CA
Consults with new and existing clients on multiple water resources challenges. Conducts life cycle and condition assessments on flood control and water conveyance facilities, dams and power projects. Develops capital improvement plans and provide owner's engineering support for clients with regulatory issues, flood control and flood risk mitigation projects, dam safety, and National Flood Insurance Program compliance issues.
(2017-2020)

Principal Engineer - Provost & Pritchard Consulting Group, Modesto, CA
Assisted agricultural clients and rural water agencies with infrastructure development, project management, financing, and problem solving. Developed storm water resources plan, conducted water rights usage assessments, and assisted clients with technical and regulatory aspects of agricultural water diversions for farms in the San Joaquin Valley. (2016-2017)

Chief Engineer - Central Valley Flood Protection Board, Sacramento, CA
Managed all engineering and related activities for a seven-member, governor-appointed board directing flood control activities for the Sacramento and San Joaquin River Flood Control Systems. Provided technical expertise, leadership, and policy guidance for highly controversial and politically charged project proposals in a boardroom setting. Represented the Board on infrastructure programs including the California Water Fix, San Joaquin River Restoration Program, Delta Protection Plan, Central Valley Flood Protection Plan, Regional Flood Management Planning workgroups, California State Legislature, and the California Central Valley Flood Control Association. Partnered with the U.S. Army Corps of Engineers for periodic levee inspections and assisted reclamation

districts with USACE rehabilitation programs. Provided media briefings, addressed elected officials in large public settings, and collaborated with outside agencies in high-level program management. Directed staff in the production of technical reports, encroachment permit hearings, enforcement proceedings, and negotiating mitigation requirements with regulatory agencies on construction projects. Developed program guidelines, budgets, board resolutions, and updates to the California Code of Regulations, Title 23. Supervised a staff of 21 professional and administrative personnel. (2009-2015).

Supervising Engineer - California Department of Water Resources, Sacramento, CA
Directed the Early Implementation Program, Local Levee Assistance Program, and Yuba Feather Flood Protection Program, as well as USACE construction projects and studies sponsored by the Central Valley Flood Protection Board. Supervised preparation of program guidelines, standard operating procedures, budget change proposals, and funding agreements to implement levee repair projects funded by California State Proposition 1E. Supervised five direct-reporting staff and ten indirect staff persons. (2008-2009)

Manager-Hydroelectric Engineering - El Dorado Irrigation District, Placerville, CA
Managed operation, maintenance, and capital improvement projects for the El Dorado Hydroelectric Project, under a newly-issued FERC Project 184 license. Directed power-marketing, energy sales, day-ahead firm energy scheduling, and load shaping to optimize hydropower generation revenue. Planned, organized, and directed all engineering and construction for improvements and repairs on dams, flumes, tunnels, canals, spillways, siphons, and penstocks, and powerhouse modernization. With a keen interest in safety, he implemented upgrades to boat barriers and warning systems around dams and diversion structures, implementing FERC's regulations. He managed a feasibility study considering renewable energy resources, such as solar, conduit-hydro, and biogas combustion turbines. He supervised four direct-reporting staff and 13 indirect staff persons, as well as providing technical expertise, leadership, and policy guidance for a five-member elected board during public meetings. (2004-2008)

Supervising Engineer - Arroyo Pasajero Flood Control Program; California Department of Water Resources, Sacramento, CA
Managed and directed all activities related to a $20-million, multi-disciplinary, flood control program with goal of attaining 100-year level of flood protection for the California Aqueduct. Supervised hydrologic modeling using HEC-HMS and HEC-RAS to determine flood routing. Directed design, construction, and environmental permitting and reported progress to California State Water Contractors, executive management, and local stakeholders. Developed and monitored program budgets, progress/cost reports, and used fiscal controls to reduce risk to California State Water Project facilities. (2002-2004)

Supervising Hydroelectric Power Utility Engineer - Oroville Facilities Relicensing Program
Project Lead for FERC Project 2100 Oroville Facilities Relicensing Program and contract manager for relicensing consultant team. Served as process spokesperson, technical expert, and relicensing resource for FERC's Alternative Relicensing Procedures. Directed all cost reporting, expenditure tracking, contract invoice reconciliation, and Program budget preparation. Produced written reports used by executive management for distribution to the California State Water Contractors, stakeholders, and FERC. (2001-2002)

Senior Hydroelectric Power Utility Engineer - San Joaquin Field Division
Supervised 14 employees, including civil, electrical, and mechanical engineers, technicians, and environmental scientists. Provided technical support during installation and testing of electrical and mechanical components in hydroelectric plants, coordinated aqueduct repairs and maintenance, issued encroachment permits, established and maintained budgets, coordinated with vendors, wrote engineering reports, and interfaced with regulatory agencies

and water contractors. Projects of note included shallow soil subsidence monitoring, production of grading plans for roadway construction, and engineering surveys for aqueduct hydrology studies. Recruited university engineering graduates for the Department. (1997-2001)

Associate Hydroelectric Power Utility Engineer - Water & Plant Engineering Office
Planned and organized Condition Assessment Program inspections for California State Water Project facilities including canals, tunnels, dams, radial gates, reservoirs, and pipelines. Prepared condition assessment reports for developing facility maintenance schedules and equipment life-cycle management. Managed three FERC hydropower licenses and maintained a compliance monitoring program. Supervised planning, design, and construction of fish passage facilities needed to enhance anadromous fish migration. Coordinated turbine-runner replacement at State Water Project hydroelectric plants. Facilitated start-up and troubleshooting of Accusonic flow meters on hydro units undergoing refurbishment. Developed cost estimates and maintenance budgets for unit outages. Constructed a hydraulic model of Oroville Dam river outlet facility at University of California. Davis Hydraulics Lab. (1988-1997)

Associate Hydroelectric Power Utility Engineer - Energy Division
Prepared and negotiated power contracts for sales and purchases of energy, capacity, power wheeling and transmission agreements with investor-owned electric utilities. Developed cost/benefit analyses, feasibility studies, and economic evaluations for proposed State Water Project hydroelectric facilities. (1985-1988)

Station Engineer - Southern California Edison Company, San Onofre Nuclear Generating Station, San Clemente, CA
Reviewed plant design upgrade plans, prepared as-built drawings of installed mechanical/electrical equipment, wrote installation procedures, and provided technical leadership for craft personnel performing in-plant mechanical, electrical, and civil infrastructure installations. Served as project lead for task force assigned to upgrade the plant radiation monitoring system. (1982-1985)

Mechanical Engineer - Bechtel Field Office, Rancho Seco Nuclear Generating Station, Bechtel Power Corporation, Los Angeles, CA
Wrote specifications for equipment purchases, designed piping systems, pipe supports, and steel connection details. Served as engineering group leader and onsite consultant representative at client facility. Checked calculations, wrote progress reports, monitored billable hours against program budgets, and conducted annual employee evaluations. Made design alternative recommendations and proposals to client company personnel. (1980-1982)

Mechanical Engineer - Bechtel Field Office, San Onofre Nuclear Generating Station, San Clemente, CA
Wrote technical specifications and start-up procedures for mechanical and electrical systems. Reviewed as-delivered equipment shipped from vendors against approved specifications. Diagnosed and recommended repair strategies for steam generator feedwater and reactor cooling water pumps. Performed field-engineering support for craft crews during the installation and testing of underground piping and fire protection. (1979-1980)

Nuclear Environmental Engineer - Bechtel Home Office, Los Angeles, CA
Performed site assessment evaluations, including toxic liquid and airborne release modeling. Developed plume dispersion models for calculating ground level concentrations of sulfur dioxide and oxides of nitrogen. Updated power plant layouts and P&IDs to accommodate plant upgrades. Participated in business development presentations to prospective clients. (1978-1979)

Engineering Student Assistant - Niagara Mohawk Power Corporation, Syracuse, NY

Assisted engineers in site selection studies and preparation of environmental permits for the company's nuclear, hydro, and fossil-fueled power generating stations. (1972-1976)

REPRESENTATIVE PROJECTS

Dam-Break Inundation Studies of Big Tujunga and Pacoima Dams, Los Angeles County, California; Los Angeles County, California
Senior Associate Engineer for GENTERRA for the dam-break flood inundation studies of two dams: Big Tujunga Dam (a 220-ft-high variable radius concrete arch dam), and Pacoima Dam (a 365-ft-high constant angle concrete arch dam). These studies present the results of an assumed hypothetical overtopping-type breach failure of the dam during a sunny day event. Each study complied with regulatory requirements provided in the CCR Title 23, as well as the guidance document FEMA P-946. Mr. Marino reviewed the report for the project and interacted with other team members on technical issues and presentation of the data in this report and in similar reports. His high level of expertise and experience in flood management provided a high level of refinements to be considered for inundation studies and reports. (2019)

Wastewater Diffuser Outfall Rehabilitation - Town of Discovery Bay, CA
Managing the submittal of all federal and State permits to enable the Town to rehabilitate an existing wastewater outfall diffuser in the Old River in Contra Costa County, California. Prepared applications for the US Army Corps of Engineers Nationwide Permit, California Dept of Fish and Wildlife Lake & Streambed Alteration Permit, California Regional Water Quality Control Board Water Quality Certification, and California State Lands Commission State Lands Lease. Led the environmental team in preparing an Initial Study/Mitigated Negative Declaration. Next phase includes design and construction of the rehabilitated structure and installation in the river channel. (2018-2020/In Progress)

Inundation mapping for FERC Project 2101 Hydroelectric Dams - Sacramento Municipal Utility District, Pollock Pines, CA
Worked with modeling team to develop HEC-RAS 2D models, flood inundation maps, and reports for six major hydroelectric dams in the Sierra Nevada Mountains of California. Interfaced and negotiated with California's Division of Safety of Dams, US Bureau of Reclamation, and Placer County Water Agency. Ongoing project requires comment resolution on reports submitted to DSOD and Federal Energy Regulatory Commission. (2018-2020/In Progress)

Pistachio Plant Processing Infrastructure Improvement - ARO Pistachios, Inc, Terra Bella, CA
Brought a multidisciplinary team of engineers to an operating pistachio processing plant to document legacy equipment installations and obtain compliance with county permits to ensure safe operation of equipment. Produced as-built electrical, mechanical, and civil drawings for the existing installation and new drawings capacity upgrades and safety improvements. (2018-2019)

Multiple Canal Crossings for Natural Gas Pipeline Construction - Sunny Gem LLC, Kern County, CA
Prepared design drawings, right-of-way documentation, and Mitigated Negative Declaration supporting encroachments to allow construction of natural gas pipeline crossings beneath the California Aqueduct, Kern River Flood Canal, and Belridge Water Storage District Zone 5 Canal. (2016-2017)

Ag-Water Diversion and Pump Station - Westchester Agriculture Asset Management, Fresno, CA
Developed all technical and right-of-way documentation needed to secure a valid flood control system encroachment permit issued by the Central Valley Flood Protection Board for a water diversion and pump station on Bear Creek in Merced County. (2016-2017)

Kern Storm Water Resource Plan - Kern and Poso Creek Integrated Regional Water Management Planning Groups, Kern County, CA
Led a team of engineers and environmental scientists in the development of a regional plan for storm water and dry weather run-off projects for augmenting surface water supplies, improving water quality, and reducing the need for groundwater pumping. The Plan enables local water storage districts to submit proposals for Proposition 1 grant funding for projects supporting storm water efficiency improvements for storage, conveyance, and groundwater recharge. (2016)

Water Rights Assessment - Calaveras County Water District, San Andreas, CA
Reviewed existing water rights usage and recommended improvements needed to optimize agricultural development in Calaveras County. (2016)

Feasibility study for San Joaquin River Ag-Water Diversion - Diedrich Farms, Fresno, CA
Advised a farm manager on siting and feasibility of installing a pump station to optimize use of the farm's legacy water rights guaranteed by Holding Contracts issued by the US Bureau of Reclamation. (2016)

CONFERENCES & TECHNICAL PAPERS

- Lower American River Watershed Conference – Sacramento, CA (2005): Presenter – The South Fork American River Watershed: Managing a High-Sierra Hydroelectric Project for Multiple Benefits
- Waterpower XV – Chattanooga, TN (2007): Technical Advisory Committee, Symposium Presenter – Life extension: Rehab & Upgrades, sharing experiences and lessons learned
- Waterpower XVI – Spokane, WA (2009): Management Steering Committee, Technical Advisory Committee, Technical Paper Presenter – Hydroelectric Power Development Options for El Dorado County, California
- Article selected by HCI Publications (Hydro Review Magazine) describing catastrophic destruction and rehabilitation of EID's Hydroelectric Project 184 for future publication

MISCELLANEOUS

- Recipient of El Dorado Irrigation District's "Manager of the Season Award", 2007, Board President's "Management Excellence Award", 2006, "Outstanding Technical Achievement Award", 2005
- Expert witness for El Dorado Irrigation District, Mill Creek-to-Bull Creek Tunnel construction litigation, 2006

Andrew R. Blystra, PE, CPESC

Senior Associate Engineer

EDUCATION

- B. S. Civil Engineering, Michigan Technological University, 1972
- M.S. Geotechnical Engineering, University of Illinois at Chicago, 1982
- Doctoral Work, Geotechnical Engineering, University of Illinois at Chicago, 1982-1990
- Doctoral Work, Engineering Geology, Western Michigan University, 1992-2000

PROFESSIONAL REGISTRATIONS AND CERTIFICATIONS

- Professional Engineer, Pennsylvania, #024664-E
- Professional Engineer, Michigan, #35358
- Professional Engineer, Illinois, #069-037698
- Professional Engineer, Indiana, #60018551
- Professional Engineer, Wisconsin, #26491-6
- Professional Engineer, Georgia, #032319
- Certified Professional in Erosion and Sedimentation Control, CPESC Certificate #2100

PROFESSIONAL HISTORY

- GENTERRA Consultants, Inc.; Sr Associate Engineer; Harrisburg, Pennsylvania (2013-Present)
- Andrew R. Blystra, PE; Consulting Engineer; Harrisburg, Pennsylvania (2011-Present)
- Gannett Fleming, Inc.; Senior Geotechnical Engineer; Camp Hill, Pennsylvania (2007-2011)
- Professional Service Industries; Senior Geotechnical Engineer; Kennesaw, Georgia (2006-2007)
- A R Blystra, LLC; President and Principal Engineer; Holland, Michigan (2005-2006)
- A R Blystra Chile SA; President and Principal Engineer; Santiago, Chile and Montevideo, Uruguay (2004-2006)
- Thunder Bay Power Company; Vice President of Operations; Holland, Michigan (1996-2005)
- Midwest Hydraulic Company; President and Principal Engineer; Holland, Michigan (1988-2005)
- A R Blystra & Associates, Ltd.; President and Principal Engineer; Calumet City, Illinois and Holland, Michigan (1985-1996)
- Federal Energy Regulatory Commission; Project Engineer; Chicago, Illinois (1979-1985)
- U S Army Corps of Engineers; Project Manager for National Dam Safety Program in Illinois; Chicago, Illinois (1977-1979)
- Gannett Fleming Corddry and Carpenter; Staff Engineer and Project Engineer; Camp Hill, Pennsylvania (1972-1977)

REPRESENTATIVE EXPERIENCE

Mr. Blystra is an employee of GENTERRA Consultants, Inc. (GENTERRA). He has more than 47 years of progressively responsible engineering and management experience in civil, geotechnical and environmental engineering programs and projects. His major experience and expertise is in civil and geotechnical engineering for the evaluation, operation, and design of dams, reservoirs and their appurtenances. Mr. Blystra has conducted Independent External Peer Reviews of U.S. Army Corps of Engineers projects and conducted third party reviews of Technical Evaluation Reports of several coastal and inland nuclear power plants. He has been Project Manager on many projects involving the inspection, evaluation, design and rehabilitation of Federally, State, and privately-owned dams. He has worked successfully with Federal and State regulatory agencies and consulting engineering firms, and has extensive, specialized experience in hydroelectric project licensing. He has also worked on

transportation facilities, commercial and industrial sites, and environmental studies. Mr. Blystra has project and management expertise related to dams and reservoirs; conventional, pumped storage, and hydrokinetic hydropower projects; water storage, conveyance and flood control facilities; embankments; canals; utilities; tunnels; gates and valves; foundations for structures and buildings; land development; roads; transportation facilities; ports and harbors; nuclear power plants; landslides and seismic hazards.

Mr. Blystra's experience includes most geographical regions of the United States in addition to experience in Canada, Saudi Arabia, and South America. He has worked for private consulting firms, Federal Agencies, and a power company. He has been the owner of a consulting engineering firm and part-owner in a hydropower generating project. He also has taught engineering and construction management courses at the college level and has taught review courses for engineers preparing to take the Fundamentals of Engineering and Professional Engineering Exams.

Mr. Blystra has very strong experience in dam safety evaluations and the design and construction of new and modified dams, including earthfill, hydraulic fill, concrete arch and concrete gravity dams. He has performed dam safety evaluations, reviews and implementation of dam safety monitoring and surveillance programs on more than 500 dams, of which more than 300 dams are in Illinois and were inspected as part of the National Dam Safety Program. He is an approved consultant by the Federal Energy Regulatory Commission for performing Independent Consultant Part 12D inspections and has performed more than 50 of these inspections. Mr. Blystra has evaluated backward erosion piping and designed remedial measures for the piping at the Hardy and Norway Point Dams and several smaller earthen dams, He also has conducted potential failure modes analyses both as a facilitator and team member. The PFMA sessions included preparing risk reduction measures and recommending instrumentation as appropriate.

Mr. Blystra's experience with hydropower projects includes preparing emergency action plans (EAPs) and conducting EAP exercises. He has worked closely with emergency services personnel and law enforcement agencies in conducting the annual review of EAPs and conducting table top and functional exercises. Mr. Blystra's responsibilities have included conducting security evaluations at hydropower dams and implementing measures to improve security.

In addition to Mr. Blystra's experience on dams and hydraulic structures, he has prepared foundation exploration programs for buildings and bridges and has designed shallow and deep foundations. His deep foundation experience includes pile load tests and pressuremeter testing of caisson foundations. Additionally, he has worked on pipeline, tunnel, and highway projects.

REPRESENTATIVE INDEPENDENT EXTERNAL PEER REVIEW PROJECTS AND THIRD-PARTY REVIEW OF TECHNICAL EVALUATION REPORTS OF NUCLEAR PLANTS

GENTERRA Geotechnical Engineer IEPR panel member for the improvements to the New Haven, Connecticut Harbor and the expansion of the Nome, Alaska Port USACE Projects under contract with Battelle. (2018-2019)

Geotechnical Engineer for third party reviews of Technical Evaluation Reports and potential flooding analyses at inland and coastal nuclear power plants. Projects located on or near the Atlantic Coast included Seabrook (NH), Pilgrim (MA), Millstone (CT), Oyster Creek and Salem (NJ), Surry (VA), Brunswick (NC), and St. Lucie and Turkey Point (FL). The Gulf coast project was Waterford (LA). The geotechnical review included stability of breakwaters, dunes, beaches, and project structures during storm surge and coastal erosion and sedimentation potential. Breakwater review was done in accordance with USACE criteria. The review also analyzed long-term sea level rise, effects of wave runup and inundation, and variations of possible hurricane storm tracks. (2015-2016)

REPRESENTATIVE PROJECTS FOR DAMS, RESERVOIRS, LEVEES, WATER STORAGE AND FLOOD CONTROL

NRCS Region 4 West A-E Services for Dam Assessments on Montpelier Creek No. 1 Dam (Bear Lake County, Idaho); Utaba Dam (Weber County, Utah); Vernon Dam (Tooele County, Utah)
Senior Civil Engineer for the project which included tasks of reviewing available prior studies to develop dam assessments for Utaba and Vernon Flood Water Retaining Structures. Included in the study was a determination of the current amount of sedimentation and the remaining available sediment storage. Using the results of existing conditions at these projects and comparing existing conditions with current NRCS and State of Utah Dam Safety Criteria, Mr. Blystra prepared rehabilitation alternatives to bring the existing projects up to current dam safety standards. The rehabilitation alternatives included new and/or enlarged spillways, replacement of undersized outlet conduits, raising the top of dam, and providing stability berms. Mr. Blystra prepared cost estimates for the rehabilitation alternatives and drafted the dam assessment reports. (2019-2020)

IDIQ for A-E Services for Civil Works Projects, USACE, Los Angeles District, South Pacific Division, Contract No. W912PL-09-D-0027 (2014-2016)
Civil Engineer for GENTERRA providing review of documents developed in Task Order No. 1 of this IDIQ, which was for the Santa Ana River Restoration Project.

Final Design of Eagle Canyon Dam and Debris Basin, Riverside County, California (2013)
Civil Engineer, Technical Reviewer for GENTERRA for the final design plans and specifications for the Eagle Canyon Dam and Debris Basin. The project included a 70-foot-high earthfill dam, a large spillway, a Type III USBR Stilling Basin, and outlet facilities to be used for flood control. The dam was founded entirely on alluvium. The foundation design addressed the materials that needed to be removed to prevent liquefaction and excessive deformations during and following a major earthquake. GENTERRA's services included a geotechnical investigation, a seismic hazard analysis, hydrologic and hydraulic analyses, structural design, static and seismic stability analyses, evaluation of liquefaction potential, other design studies, preparation of plans and specifications, estimates of materials quantities, construction cost estimates, initial environmental studies, and coordination of review with the State of California Division of Safety of Dams (DSOD) and other agencies. The plans were prepared using MicroStation version V8i. GENTERRA provided complete hydrologic, hydraulic analyses and design of the large spillway including the lining for the spillway approach channel, control section, discharge channel, lining sub-drains and USBR Type III spillway stilling basin and energy dissipator.

Cuba Lake Dam Evaluation, Cuba Lake, New York (2013-2014)
Civil and Geotechnical Engineer, Technical Reviewer for GENTERRA for the evaluation of a large, earthen dam with a puddle clay base, built in 1856-1858. It is 1700 feet long and about 200 feet wide at the base. The dam is classified as a Class C- High Hazard Dam by the New York State Department of Environmental Conservation (DEC). Services included the performance of a Phase 1 Inspection Report as part of an engineering assessment in compliance with the New York State Department of Environmental Conservation Dam Regulation, Section 673. The services included an inspection and preliminary evaluation of the Cuba Lake Dam, including document review, field inspection, and development of scope and recommendations for the Phase 2 Engineering Assessment. The Phase 2 Engineering Assessment will include a geotechnical investigation, evaluation of the stability of the dam under static and seismic loading conditions, liquefaction potential, seepage analyses, hydrologic and hydraulic analyses of spillway adequacy to prevent overtopping during the maximum design flood inflow, evaluation of the condition of the spillway channel lining, evaluation of the outlet works, and development of recommendations for improvements and any necessary rehabilitation of the dam, spillway or outlet works.

Value Engineering Study for Little Colorado River at Winslow, AZ (2014)
Geotechnical Engineer for GENTERRA, Mr. Blystra provided geotechnical review of improvements proposed for the Winslow Levee along the Little Colorado River at Winslow, Arizona. He made recommendations to replace riprap and grouted riprap with an anchored, high performance turf reinforcement, to perform a preliminary geotechnical investigation to reduce contingencies, and to use the Interstate 40 embankment as a levee. These recommendations represented a potential savings of $ 9.6 million. If riprap is used, it was recommended to use ungrouted riprap only since it had an adequate factor of safety. The savings for this recommendation was $ 1.9 million. For each recommendation, a proposed design and cost estimate were prepared. The advantages and disadvantages were discussed and a justification for each recommendation was provided in a report.

Geotechnical Engineering Services for Levees along the Missouri River- Expert Services, Several States (2016)
As Geotechnical Engineer for GENTERRA, Mr. Blystra provided geotechnical review of levee breaches and repairs. Breaches were the result of flooding, seepage, erosion, and changes made to shorelines and operating procedures.

East Side Dike and North Indio Hydrology and Hydraulics for Coachella Valley Water District (2015)
As Senior Engineer for GENTERRA, Mr. Blystra conducted geotechnical, hydrology, and hydraulic analyses in conjunction with raising the existing levee to provide required 100-year flood level protection.

Preliminary Design of the Silver Creek Pumped Storage Project (2012-2013)
This is a proposed 300-megawatt project in Pennsylvania that includes coal mining to provide the lower reservoir. Principal engineer for conducting the preliminary design of the upper reservoir, penstocks, powerhouse, generating equipment and transmission line. Prepared a preliminary cost estimate to obtain project financing. Contacted federal, state and local agencies to obtain information for filing the pre-application document with the Federal Energy Regulatory Commission. Initial environmental studies included evaluation of acid mine drainage adjacent to the proposed site.

Dam Safety Evaluations for Dams Regulated by State and Federal Programs (1977-2004)
As Program Manager for the National Dam Safety Program in Illinois, inspected and prepared or reviewed inspection reports for over 150 dams. Participated in writing the rules and regulations for dam safety in Illinois. Inspected and prepared inspection reports for over 30 dams as part of the Michigan Dam Safety Program. The inspections in both states included evaluations of stability, spillway capacity, operation, and maintenance. Participated in the U.S. Army Corps of Engineers' Five-Year Periodic Inspection Program of Lockport, Brandon Road, Dresden Island, Starved Rock and Marseilles Lock and Dam Projects on the Illinois Waterway. Evaluated the condition of two existing dams at Toland Quarry in Pennsylvania. Prepared and obtained the permit from the Pennsylvania Department of Environmental Protection for deregulating the two dams. Included in the evaluation was a boring program.

FERC Part 12D Inspections, Potential Failure Modes Analyses, and Supporting Technical Information Documents (1986-2017)
As the FERC approved independent consultant, performed over 50 inspections of existing hydropower projects. A representative sample of projects includes the Ludington Pumped Storage Project in Michigan, The Smith Mountain and Leesville Pumped Storage Project in Virginia, the Hardy Hydropower Project in Michigan, and the Racine Hydropower Project on the Ohio River. Performed the Part 12D Inspection, conducted the Potential Failure Modes Analysis, and prepared the Supporting Technical Information Document for the Belleville, New Martinsville, and Greenup Projects on the Ohio River and the Williams Dam in Indiana and was the facilitator for the PFMA for Taylorville Hydroelectric Project in New York and the Williams Dam Hydroelectric Project in Indiana. Participated in the Potential Failure Modes Analysis as owner of the Hatfield Hydropower Project.

Geotechnical Investigations of Dams (1986-2017)
Representative projects include boring programs, seismic and other non-destructive testing techniques, and material testing. Designed and implemented foundation exploration and materials testing for the proposed Ragged Mountain dam in Virginia. Responsible for the boring program, seismic methods and ground penetrating radar investigations of the earthen embankment of Hardy Dam in Michigan. This dam was constructed using semi-hydraulic fill methods and a timber trestle was left in the dam. Timbers rotted, and voids resulted. Designed a grouting program to fill voids and a continuing investigation program using GPR to monitor future development of voids. Designed and implemented boring programs and material testing at Devils Kitchen Dam in Illinois, the Hatfield Power Canal in Wisconsin, and the Four Mile Dam in Michigan. Conducted pressuremeter testing in soil foundations of pile supported powerhouses and spillways to estimate the amount of load being carried by the piles and the soil foundation. Representative projects include the Croton, Mottville and Kingsford Projects in Michigan. Performed ground penetrating radar (GPR) surveys to detect voids in earth embankments and beneath spillway slabs. GPR surveys of spillways were conducted at Lake Springfield in Illinois, Elkhart Hydroelectric Project in Indiana, and Prairie du Sac Hydroelectric Project in Wisconsin. The GPR survey of the Prairie du Sac Spillway revealed significant voids which were grouted to re-establish contact between the spillway and its foundation soil. Conducted a GPR survey of the upper reservoir asphaltic liner at the Ludington Pumped Storage Project to locate cracks in the lower liner. Investigated the condition of the timber piles supporting the spillway at the Twin Branch Hydropower Project in Indiana. Obtained and evaluated small diameter cores taken from the piles. Characterized the rock foundations of eight existing hydropower dams in Wisconsin and the Upper Peninsula of Michigan. Determined the type of rock and mapped joint patterns and bedding planes for stability analyses. Types of rock included sandstone, basalt, granite and diorite.

Instrumentation Programs for Dams (1986-2016)
Designed instrumentation for monitoring the phreatic surface in the Hatfield Power Canal Embankments and the embankments of the Norway Point Hydropower Project, measuring uplift at the Norway Point and Ninth Street Projects in Michigan, and establishing horizontal and vertical control for structural monitoring at the Edensville and Mottville Projects in Michigan. Established trigger points for instrumentation programs for determining critical actions to take. Evaluated instrumentation data as part of Consultant's Part 12D reports.

Hydropower Feasibility Studies (1990-2013)
Conducted feasibility studies for adding hydropower at the Shenango Diversion Dam in Pennsylvania, the Dock Street Dam in Pennsylvania, and the Ceresco Dam in Michigan. Studies included the evaluation of new low-head turbines such as the Very Low Head (VLH) turbine, the Natel Energy Hydroengine, the Fella Maschinenbau GmbH & Company DIVE-Turbine, and the new Andritz Hydro low head turbines. A feasibility study was conducted for installing a Lucid Energy turbine in a water supply pipeline of the City of Harrisburg, Pennsylvania. Studies were made to increase the generating capacity by 1280 kilowatts at the Hatfield Project in Wisconsin and by 280 kilowatts at the Four Mile Project in Michigan. At both projects, the additional capacity was installed. Conducted feasibility for increasing installed capacity at the Rio Duqueco Project in Chile. Also conducted hydropower feasibility studies for projects located on Rio Cisnes, Rio Pilmaiquen (two projects), Rio Arenas and Rio Blanco in Chile. Responsible for feasibility studies of installing hydropower at potential projects in Nevada, Washington, and Oregon, and responsible for feasibility studies for restoring hydropower generation at 10 existing projects in Quebec, Canada.

REPRESENTATIVE INLAND WATER PROJECTS FOR LOCKS, FISH SCREENS, EROSION AND SCOUR

- Project engineer for FERC on the physical hydraulic model studies at the USACE Cannelton and Meldahl locks and dams on the Ohio River. Project studied the proposed powerhouse discharge effects on erosion and navigation.
- Studied the effect of fish screens at the Columbia, PA water supply intake on the Susquehanna River. The study was part of Columbia Water Company's Pennsylvania Department of Environmental Protection application for a water withdrawal permit.
- Project engineer for fish entrainment and impingement studies at Thunder Bay Power Company's Norway Point, Four Mile, Ninth Street, and Hillman hydroelectric projects. Field studies were conducted for relicensing and the study results became part of EPRI's procedure for future tabletop designs.
- Determined trash rack spacing and approach velocities for fish entrainment and impingement and studied the effects of powerhouse discharge on erosion and navigation at proposed hydroelectric projects at the following USACE locks and dams: Allegheny L&D 2 on the Allegheny River in PA; Emsworth Main Channel L&D, Emsworth Back Channel Dam, and Montgomery L&D on the Ohio River in PA; Charleroi L&D, Maxwell L&D, Grays Landing L&D, and Point Marion L&D on the Monongahela River in PA; Morgantown L&D and Opekiska L&D on the Monongahela River in WV; and Overton L&D on the Red River in LA.
- Determined the effects of proposed powerhouse discharge on erosion at USACE flood storage reservoirs in Mississippi at the Arkabutla Lake, Enid Lake, Grenada Lake, and Sardis Lake projects. Also studied the potential benefits of rock to dissipate energy and add dissolved oxygen in the tailraces of these projects.
- Determined trash rack spacing and approach velocities for fish entrainment and impingement and studied the potential for erosion from powerhouse discharges at the following proposed hydroelectric projects: Kentucky River L&D 11 on the Kentucky River in Kentucky (State owned L&D); Muskingum River State owned projects in Ohio at Philo, Rokeby, Malta, Beverly, Lowell, and Devola; and the Williams State owned project on the East Fork of the White River in Indiana. Studies at the proposed Williams project included the effects of powerhouse discharge on sturgeon rock habitat immediately downstream.
- All the above studies at proposed hydroelectric projects included evaluation of powerhouse discharge and erosion related to impacts on freshwater mussels and recreation facilities.
- Reviewed depositions for the DOJ case involving the USACE and flooding on the Missouri River.
- Expert witness for the case involving erosion and sedimentation related to two operating hydroelectric projects in Montana.

REPRESENTATIVE PROJECT EXPERIENCE FOR SPILLWAY GATES AND VALVES

Mr. Blystra has designed new tainter gates, bascule gates, and vertical lift gates for several projects including Codorus Creek, Emsworth, Emsworth Back Channel, Montgomery, Allegheny Lock and Dam 2, Four Mile, and Grays Landing. Analyses included structural and hydraulic design, and operational and environmental considerations. Conducted structural evaluations of existing tainter gates at the Smithville, Ninth Street, and Hatfield Projects. Restored the operability of the bear trap gates at the Norway Point Project and the large diameter butterfly valve at the Hardy Project. Investigated the binding of tainter gates at the Webber and Ninth Street Projects. Designed new gate seals at the Ninth Street and Hatfield Projects. Included in the inspections conducted for dams regulated by State Dam Safety Programs and the Federal Energy Regulatory Commission is the requirement to observe and evaluate the operability of spillway and outlet works gates and valves. These observations and evaluations have

been made at more than 60 projects. Recommendations were made for operational concerns. (1985-Present)

- Performed over 50 consultant safety inspections of hydroelectric projects. As part of the inspections, a representative number of spillway gates were opened, including the use of standby power if applicable.
- Conducted structural analysis of steel members in tainter gates at the Smithville and Ninth Street Hydroelectric Projects in Michigan and the Hatfield Hydroelectric Project in Wisconsin. Designed repairs for the tainter gate at Smithville and strengthening of steel members for the Ninth Street gates.
- Analyzed and restored the operability of the bear trap spillway gates at the Norway Point Hydroelectric Project in Michigan. The study included a test procedure that prevented sudden lowering of the gates.
- Evaluated the operability of the Stauwerke spillway gates at the Wissota Hydroelectric Project in Wisconsin. The gates were analyzed for various spillway flows.
- Designed repairs and restored to operation the 11-foot diameter butterfly valves at the turbine/spillway bifurcation at the Hardy Hydroelctric Project in Michigan. A failure had occurred in the system when the air vent system for the butterfly valves did not function. The repaired system was tested successfully.
- Investigated the binding of spillway tainter gates at several projects, including the Ninth Street and Webber Hydroelectric Projects in Michigan. Studies included concrete spillway pier condition assessments using non-destructive concrete tests, coring, petrographic analyses and compressive strength determination, and stress analyses of the piers and gate anchors.
- Designed new steel vertical lift spillway gates to replace wooden stoplogs at the Four Mile Hydroelectric Project in Michigan.

Concrete Investigations (1980-2004)
Designed and implemented concrete coring and testing programs for concrete retaining walls, spillways overflow sections and spillway piers, and spillway decks at over 10 projects.

Representative projects include a 40–foot high retaining wall and bear trap spillway piers at the Norway Point Project the spillway ogee and deck at Four Mile and tainter gate at spillway piers at Ninth Street and Webber Hydropower Project in Michigan, Pulse echo testing of the concrete was conducted to select core locations. After coring was completed, compressive strength testing and petrographic analyses were conducted. Concrete investigations included the determination of bond strength between the concrete and rock foundation. Typical projects included the Hondenpyl Project in Michigan and the Hatfield Project in Wisconsin.

Hydropower Maintenance, Operation, and Safety (1988-2005)
Responsible for preparing operating and maintenance manuals for the Hatfield Hydropower Project in Wisconsin and the Thunder Bay Power Projects in Michigan, including Norway Point, Four Mile, Ninth Street, Hillman, Upper South and Hubbard Lake. Also, prepared safety manuals for each project and conducted monthly safety meetings with operating personnel.

Seismic Studies (1977-2013)
Responsible for preparing seismic hazard assessments for the proposed Ragged Mountain Dam in Virginia and the new Lost River 16 Dam in West Virginia. Analyzed the liquefaction and permanent deformation potential of the existing earth embankment and foundation of the Gilboa Dam in New York. Included in this study was the analysis of reservoir silt and its potential to mobilize during a seismic

event. Evaluated nine embankments and foundations of Consumers Energy Hydropower Projects in Michigan for liquefaction and permanent deformation. These embankments were constructed using semi-hydraulic fill methods. As Program Manager for the National Dam Safety Program in Illinois, developed simplified methods for analyzing the seismic stability of dams in Southern Illinois. This area is impacted by the New Madrid and Wabash Valley seismic zones. Seismic evaluations were made as part of all Part 12D inspections.

Construction Inspection (1972-2005)
Performed construction inspection of foundation repairs for the Norway Point Hydropower Project where seepage and soft clay seams in the shale foundation led to stability concerns. Responsible for the construction inspection of the anchoring of the Four Mile overflow spillway with pre-stressed anchors. Also conducted lift-off testing according to a prearranged schedule. Conducted inspection of the repairs to the breached earth power canal embankment and installation of additional generating capacity at the Hatfield Hydropower Project. Responsible for the construction inspection of concrete spillway deck repairs and tainter gate pier replacement at the Ninth Street Project. Conducted construction inspection of spillway repairs to flood damaged spillways at Bear Gap Dam No. 2, Bear Gap Dam No.4, and Bear Gap Dam No.6. Repairs consisted of steel sheet pile and concrete drop structures and baffled chute energy dissipators.

Federal Energy Regulatory Commission Licensing (1988-2018)
Project manager for obtaining the initial license for the Hatfield Project in Wisconsin and the relicensing of the six Thunder Bay Power Projects in Michigan. Prepared the license applications, conducted public meetings, and addressed issues raised by federal, state, and non-governmental agencies. Responsible for field studies regarding fish passage, fish entrainment, water quality, and stream gaging. After the licenses were issued, responsible for implementing all license article requirements. Prepared Preliminary Permit applications for the Ceresco Project in Michigan and the Dock Street Dam Project in Pennsylvania. Prepared the initial agency consultation packages and conducted the agency consultation meetings for the proposed Coffeeville and Demopolis Projects in Alabama.

Prepared several sections of the Supporting Design Report for the Lake Elsinore Pump Storage Project in California. Responded to Additional Information Requests (AIRs) from FERC for the following projects that are now licensed: Williams Dam in Indiana; Kentucky River Lock and Dam 11 in Kentucky; Philo, Rokeby, Malta, Beverly, Lowell, and Devola in Ohio; Allegheny Lock and Dam 2, Emsworth Main Channel Locks and Dam, Emsworth Back Channel Dam, Montgomery Locks and Dam, Charleroi Locks and Dam, Maxwell Lock and Dam, Grays Landing Lock and Dam and Point Marion Lock and Dam in Pennsylvania; Morgantown Lock and Dam and Opekiska Lock and Dam in West Virginia; Arkabutla Lake, Enid Lake, Grenada Lake, and Sardis Lake in Mississippi; and Overton Lock and Dam in Louisiana. Prepared plans to implement FERC license article requirements for operation compliance monitoring, erosion and sedimentation control, recreation resource management, freshwater mussel monitoring, public safety, owner's dam safety programs, sediment testing and disposal, water quality monitoring, avian protection, debris management, and historic properties management for licensed projects.

Prepared the Pre-Application Document (PAD) and conducted public meetings for the proposed hydroelectric projects at Allegheny Lock and Dam 7, Dashields Locks and Dam, and New Cumberland Locks and Dam.

Probable Maximum Flood and Inflow Design Flood Studies (1977-2013)
Probable Maximum Flood (PMF) and Inflow Design Flood (IDF) studies were conducted for all high hazard and significant hazard projects inspected as part of the Illinois and Michigan Dam Safety Programs and Hydropower Projects inspected under the guidelines of Part 12D of the Federal Power Act. Representative projects include the Hardy, Croton, Three Rivers, and Mottville Projects in Michigan,

the Greenup Project in Ohio, and the Smith Mountain and Leesville Pumped Storage Project in Virginia. In addition to PMF and IDF studies for hydroelectric projects, conducted a review of PMF studies for the Three Mile Island and Dresden Nuclear Generating Stations as part of the flood review of nuclear plants following the Fukushima nuclear disaster.

Seepage Investigations (1986-2013)
Principal engineer responsible for conducting seepage investigations at earth and concrete dams and power canals. Used acoustic emission testing to detect seepage where seepage velocities were relatively high. This methodology was used to determine locations where the waterstop failed in the concrete core wall of the Hardy Dam in Michigan. This method was also used to locate the inflow point of seepage in two power canals excavated in rock and the inflow point in the asphaltic liner of the upper reservoir at the Ludington Pumped Storage Plant. Acostic emission testing also was conducted beneath the concrete spillway at the Ninth Street Hydropower Project and in the embankment of the Dam in Missouri. In addition to acoustic emission monitoring, other seepage investigations were made by measuring flows using weirs and monitoring flows from foundation drains. Representative projects include the Norway Point Project in Michigan, the Greenup Project in Ohio, and the Little Grassy Lake Dam in Illinois. Acoustic emission testing, dye testing, and piezometer data were used to evaluate seepage beneath the spillway of the Elkhart Hydropower Project in Indiana.

Sedimentation and Erosion Control (1990-2011)
Responsible for monitoring over 40 erosion sites on the Thunder Bay River in Michigan. These sites were considered to be the result of hydropower operations. Designed and implemented repairs at seven sites including the design and installation of bendway weirs which divert energy of flow water away from the stream bank. Designed the sedimentation and erosion control plan for construction of repairs to the power canal of the Hatfield Hydropower Project. The plan included check dams, a sedimentation basin, and a turbidity curtain in the Black River. Responsible for the review of the tubidity curtain design for repairs to the Gilboa Dam in New York. Conducted a study for the repair of the erosion along the 22-kilometer length of the Rio Duqueco Power Canal in Chile.

Emergency Action Plans and Exercises and Oil Spill Prevention Plans
Responsible for the review of emergency action plans as part of Part 12D inspections of hydropower projects. Prepared the emergency action plan (EAP) for the Hatfield Hydropower Project and conducted the annual table top review with local and state agencies. Conducted two functional exercises. Prepared EAPs for all six of the Thunder Bay Power Company Projects, conducted the annual table top review, and conducted two functional exercises for the Norway Point Project and one functional exercise for the Four Mile Project. Prepared oil spill prevention plans for hydropower projects including the Hatfield Project in Wisconsin and the Norway Point, Four Mile, Ninth Street and Hillman Projects in Michigan.

Public Safety at Dams
Responsible for all public safety features at the four hydropower dams and two water control dams of Thunder Bay Power Company and at the Hatfield Hydropower Project. This included public access, signage, railings, fences, security, and project operation. For example, warning horns were installed to give notice to boaters and anglers that spillway gates would be opened. Signs were installed to explain the warning horns. A standard operating procedure was developed for project operators that emphasized safety of recreationists.

As one of the owners of the Hatfield Hydropower Project, provided 2-1/2 days of depositions in regard to flooding that occurred during and after a major rainfall event. The main focus of the testimony was on project operation.

PIPELINE, TUNNEL AND HIGHWAY PROJECTS

Pipeline Projects

Project engineer for the inspection of Lake Michigan intakes of the Palisades and Cook Nuclear Plants. Prepared design plans and specifications for improvements to the storm water system of Greenwich, Connecticut. Designed the storm water system for three residential developments in Indiana. Designed storm water system improvements for five locations within the City of Chicago.

Tunnel Projects

Designed a concrete plug to seal an access tunnel in Pennsylvania that had significant acid mine drainage. At Gilboa Dam in New York responsible for geotechnical investigations and evaluating tunneling in rock and soil for a new water supply intake. Project engineer for geotechnical investigations associated with tunneling for the Tunnel and Reservoir Plan (TARP) in Chicago.

Highway Projects

Project engineer for geotechnical investigations and foundation design of spread footings and pile foundations for five new bridges in Illinois. Responsible for the design of an 8-foot diameter caisson foundation for a bascule bridge in the City of Chicago. Conducted design of new retaining walls including gravity concrete walls and MSE walls, pavement design, and design of foundations for high mast light standards for the Dan Ryan Expressway in Chicago.

Airport Projects

Conducted a ground penetrating radar survey of the runways at the Gary Airport in Gary, Indiana. The purpose of the survey was to determine the varying concrete thicknesses of the runways. The GPR survey results were verified by concrete coring at select locations.

EXPERT WITNESS CASES

- Expert witness for the State of Illinois for the breaching and removal of a high hazard, unsafe dam. Case was tried in District Court and Appellate Court. Gave depositions and testified in court for both trials.
- Expert witness for American Electric Power Company for two separate drowning cases that occurred at the Berrien Springs Hydropower Project in Michigan. In the first case, a boat with fishermen became trapped in the flow at the toe of the ogee spillway. The boat capsized and the drowning occurred. In the second case, the drowning occurred during a time of heavy runoff when the spillway tainter gates were open. About 2 AM two adults in a power boat attempted to navigate their boat into the tainter gate discharge. The boat capsized, and one person drowned. Gave depositions for both cases and testified in court for both cases.
- Retained as an expert witness for American Electric Power Company for a drowning that occurred at one of their hydropower projects in Virginia. Reviewed materials, conducted engineering analyses, and met with AEP attorneys. The case was settled before it went to trial. Did not provide depositions,
- Provided documentation for a case involving a low head concrete dam in Lykens, Pennsylvania. The dam was damaged during flooding in the 1970's. Repairs were designed and completed. Several years later, floating blocks of ice impacted the dam, resulting in movement and under seepage. The seepage caused a whirlpool in the reservoir. A young boy, who was swimming in the reservoir, became trapped in the whirlpool and was drawn down under the dam. He did not drown but suffered extensive brain damage. Provided a deposition; did not testify in court.
- Expert witness for two homeowners whose homes were destroyed due to erosion of the Lake Michigan bluff. Erosion was caused by runoff from a severe rainfall event. Provided depositions and testified in court.

- Expert witness for a property owner whose home suffered foundation damage due to high hydrostatic uplift pressures. Conducted engineering analyses and met the client's attorney. The case was settled as the trial was beginning. Provided depositions.
- Provided two and one-half days of deposition for the Hatfield Hydropower Project relative to flooding and downstream flood damages. Case was settled out of court.
- Expert witness as a GENTERRA engineer for a case involving a drowning at a dam in Nebraska. The document review, site visit, and report provided sufficient information to settle the case out of court. No depositions were given.
- Expert witness as a GENTERRA engineer for a case involving erosion and sedimentation at two hydroelectric projects in Montana.
- Provided document and deposition review as a GENTERRA engineer for a case involving flooding along the Missouri River.
- Expert witness as a GENTERRA engineer for a case involving erosion and sedimentation on the Sacramento River in California.

PORT AND DREDGING PROJECTS

Port Projects

Principal engineer for the feasibility of two port expansion projects at the Port of Montevideo, Uruguay. Conducted a feasibility study for the construction of a new fishing boat terminal and port in Montevideo. Both feasibility studies were done for the Port Authority. Prepared the preliminary design of a new boat harbor at Punta del Este, Uruguay for a private developer. The design included facilities to accommodate cruise ships. Project engineer for the evaluation of steel sheet pile bulkheads at Naval Academy in Annapolis, Maryland, and project engineer for determining the tip elevation of steel sheet piling along the Lake Michigan shoreline in Chicago. The later project consisted of drilling a boring along the sheet piling and using electrical resistivity techniques to determine tip elevations.

Dredging Projects

Principal engineer for investigations and preparing plans and specifications for three dredging projects. The projects consisted of earth dams forming recreational reservoirs. At one project the material to be dredged contained high levels of contaminants requiring special disposal methods. Responsible for obtaining soundings and preparing a dredging contract for the harbor at New Buffalo, Michigan. The contract was prepared for the U.S. Army Corps of Engineers.

Certified Professional in Erosion and Sedimentation Control, CPESC Certificate #2100

Mr. Blystra's experience in erosion and sedimentation control at USACE projects is limited to the VE study plus preparation and review of erosion and sedimentation control plans for hydropower development at USACE projects, including Overton, L&D 3, L&D 4 and L&D 5 on the Red River in Louisiana. At the Thunder Bay Projects in Michigan he used USACE measures (such as bendway weirs) to control erosion. He has prepared several E&S Plans including repair of the Hatfield power canal, hydropower redevelopment at the Williams Dam in Indiana, hydropower development at Kentucky Lock and Dam 11, and has been responsible for analyzing erosion and sedimentation potential as a result of hydraulic changes due to hydropower installation. This included studying potential changes having environmental impacts on fish, mussels, and macroenvertebrates. Mr. Blystra also has considerable experience on reservoir sedimentation and presented a paper at IECA in 2014 on this topic.

RESIDENTIAL, COMMERCIAL AND INDUSTRIAL BUILDING PROJECTS

Principal and project engineer for foundation exploration and foundation design of spread footing and pile foundations for residential, commercial, and industrial projects in Michigan, Illinois, Indiana, and

Georgia. Responsible for pile load tests for high rise foundation design in Georgia, Michigan and Illinois and pressuremeter testing in soft clays in Chicago.

TEACHING EXPERIENCE

Taught courses in hydraulics, soil mechanics and foundations, surveying, strength of materials, construction scheduling, and construction operations as Adjunct and Assistant Professor at Purdue Calumet (1980-1991) and as Assistant Professor at Western Michigan University (1991-1995). Also taught the review course for the EIT and PE exam in Indiana through the Indiana Society of Professional Engineers (1985-1990).

PROFESSIONAL AFFILIATIONS

- ASDSO-Association of State Dam Safety Officials
- IECA-International Erosion Control Association, previous co-chair of the Surface Water Educational Track Committee
- USSD-United States Society on Dams
- SAME-Society of American Military Engineers

PROFESSIONAL PUBLICATIONS

Authored of over 300 inspection reports on the safety of dams and over 100 reports on feasibility studies, and author or co-author on over 20 professional publications. A sample of these publications follows.

2015 "Hurricane Sandy Two Years Later, Lessons Learned", September 2015 International Erosion Control Association Mid-Atlantic Section Annual Conference, Fort Washington, Pennsylvania.

2014 **"**Hurricane Sandy Impacts on the Atlantic Coast Shoreline", February 2014 International Erosion Control Association Annual Conference, Nashville, Tennessee.

2014 **"**Sedimentation Effects on Reservoir Usage and Water Quality", February 2014 International Erosion Control Association Annual Conference, Nashville, Tennessee.

2013 **"**Pennsylvania's Water Quality Report Card", *Environmental Connection,* October 2013, Volume 7, Issue 4.

2001 "Predicting Erosion Along the Thunder Bay River Using Various Monitoring Techniques", International Symposium on Soil Erosion Research for the 21st Century, Honolulu, Hawaii

1994 "Acoustic Emission of Ground Water Flow", 12th International Acoustic Emission Symposium, Sapporo, Japan.

1992 "Using Acoustic Emission Testing in Seepage Investigations", *Journal of Acoustic Emission,* Acoustic Emission Group, Los Angeles, CA, Vol. 10, Nos. 1-2.

1991 "Public Safety and Recreation at Existing Dams", presented at the 1991 annual conference of the Association of State Dam Safety Officials.

1990 "Applications of Acoustic Emission Testing in Seepage Investigations", International Joint Meeting on Acoustic Emission in Civil Engineering, Kumamoto, Japan.

1990 "The Role of Ground Penetrating Radar in Dam Safety Investigations", Third International Conference on Ground Penetrating Radar, Denver. Colorado.

1990 "Detecting Seepage with Acoustic Emission Tests", *Hydro Review,* May 1990.

1989 "Using Ground Penetrating Radar to Detect Voids", *Hydro Review,* April 1989.

1988 "Electrical Resistivity and Salt Tracing to Identify Seepage", Annual Conference of the Society of Exploration Geophysicists.