

Gary L. Brugger, P.E.
Senior Managing Engineer

Professional Profile

Mr. Gary Brugger is a Senior Managing Engineer in Exponent's Environmental Sciences practice. He has more than 30 years of experience in civil and environmental engineering. His project experience includes "environmental forensics"; environmental insurance technical support; litigation technical support; product stewardship; site investigation, remediation, and closure; water resources and water quality management, including industrial, municipal, and wastewater treatment and management; contaminated site redevelopment; waste management; landfill closure; remedial performance evaluation; and lead paint investigation and abatement. Specific assignments have included compliance auditing; TSCA registration; regulatory affairs and compliance management; CERCLA and RCRA investigations; remedial design and closure plan preparation; hazardous waste cleanup management; emergency response management, planning, and assessment; construction management and monitoring; ecological restoration; and wastewater treatment technology assessment, including failure analysis and prevention. He has also conducted and managed lead-based paint investigations, prepared management and abatement plans, and developed proprietary methods for use of a portable x-ray fluorescence (XRF) analyzer for field screening soils to segregate lead-based paint from other sources of lead. In addition, he has directed the investigation and/or review of numerous NRDA's. Mr. Brugger also has testified as an expert in the areas of environmental compliance (RCRA, CERCLA, TSCA, and CWA), remediation and remedial requirements, environmental forensics, emergency response management, and cost allocation.

At Exponent, Mr. Brugger specializes in solving complex and diverse environmental and related problems for which his broad engineering and environmental background are invaluable. Mr. Brugger frequently works with other engineers and scientists at Exponent to evaluate environmental contributions to process or materials failures, to conduct product and due-diligence evaluations, and to work with clients to improve their product's reliability and limit or eliminate the risk to the environment from the product.

Mr. Brugger's experience as a design engineer, regulator, and consultant allows him to apply a broad approach derived from his understanding of science, engineering, and regulations. With this approach, Mr. Brugger has been able to anticipate environmental issues and integrate their solutions into his clients' routine practices. Since 1988, he has helped to integrate environmental programs into the company cultures of clients in the manufacturing, fabrication, plating, mining, agriculture, pulp and paper, and food processing industries. More recently, he is helping clients assess their greenhouse gas footprint and develop innovative solutions to reducing the footprint or recovering energy. He has developed innovative investigation techniques, remedial measures, and disposal practices that have provided documented cost savings for clients. Where confidentiality has allowed, Mr. Brugger has presented or published the results. Recent presentations have included such diverse topics as innovative investigations, environmental forensics, and redevelopment value analysis.

Academic Credentials and Professional Honors

B.S., Civil Engineering, University of California at Davis, 1970

Association of Washington Businesses: AWB Waste Management Committee, AWB Superfund Committee, and AWB Environmental Executive Committee

Licenses and Certifications

Registered Professional Civil Engineer, Alaska, # 7910
Registered Professional Civil Engineer, Idaho, # 5966
Registered Professional Civil Engineer, Oregon, # 14111PE
Registered Professional Civil Engineer, Washington, # 15170
Registered Professional Engineer, Montana#9770
Registered Professional Engineer, Oklahoma, #24438
Registered Professional Engineer, Michigan, #6201057384
Registered Professional Engineer, Tennessee, #00114829

Presentations

Shields WJ, Ruby MV, Benton L, Sun B, Brugger G. Identification of the sources of lead contamination in surface soils in the vicinity of mines and smelters. Invited presentation, Local Solutions Smart Future Conference and Celebration. Working and Living with Lead, Port Pirie, South Australia, September 28–October 1, 2003.

Brugger G, Lehmicke L. Environmental forensics applied to voluntary restoration. Presentation, AEHS Conference, San Diego, CA, March 19, 2002.

Yost L, Brugger G. Use of conceptual site models for risk communication and remediation. AEHS Conference, San Diego, CA, March 19, 2002.

Brugger G. Guilty by association, innocent by forensics. AEHS Conference, San Diego, CA, March 2001.

Brugger GL, Lehmicke L. Dating a chlorinated solvent release: 1982 or 1994. Platform presentation, Environmental Forensics Session, 10th West Coast Conference of AEHS, San Diego CA, March 22, 2000.

Brugger GL, Perry M, Clem E. RCRA Corrective Action an asset in redeveloping a solvent recycling facility. Poster presentation, 10th West Coast Conference of AEHS, San Diego CA, March 21–23, 2000.

Brugger GL, Murphy S, Rohr W. Use of portable XRF to screen former Inert Target Range for heavy metals, allowing rapid assessment and remediation. Platform presentation, Investigations Section, 9th West Coast Conference of AEHS Oxnard, CA, March 29, 1999.

Brugger GL, Ivers L. Innovative recovery of waste oil by using subfreezing temperatures to allow removal of contaminated water as clean ice. Presentation to the BP Arctic Remediation Conference, Anchorage, AK, and U.S. Air Force Conference, Honolulu, HI, 1995.

Ivers L, Brugger GL. Restoration and recycling of abandoned asphalt plant. Presentation to the BP Arctic Remediation Conference, Anchorage, AK, and U.S. Air Force PACAF Remediation, Recycling and Restoration Conference, Honolulu, HI, March 1995.

Konen B, Brugger GL, Ghofani TG. *Ex situ* bioremediation in interior Alaska. Presentation to the BP Environmental Conference, Anchorage, AK, 1993.

Brugger GL, McKay E. RCRA soil treatment by generators, a study of soil treatment within a "RCRA tank." Presentation, Hazamacon, Spring 1991.

Brugger GL, McKay E, et al. RCRA incineration ash transfer, methodology and control for transfer of incinerator ash to remote sites for disposal. Presentation at the 2nd Annual Northwest Conference for Hazardous Materials Management and Recycling, 1991.

Brugger GL. Impact of MTCA standards on cleanups of sites with chlordane, DDT, and lindane contamination. White paper presented to the AWB Environmental Committee, Seattle, WA, 1990.

Brugger GL. Impact of the Washington State Waste Minimization Regulations on selected industries. White paper presented to the AWB Environmental Committee, Seattle, WA, 1990.

Brugger GL. Design of carbon treatment systems for treatment of groundwater. Presentation to the Kleinfelder Environmental Conference, Sacramento, CA, 1989.

Brugger GL, Hubbard TR. The action team approach to expedited restoration of urban bays. A presentation of the use and success of the interagency action team approach to improved water quality in urban bays. Presentation to the Second Annual National Urban Bay Conference, Seattle, WA. Sponsored by EPA, 1987.

Project Experience

Solid and Hazardous Waste

Landfills

Responsible for engineering controls for landfill cap and stormwater controls for landfill closure and development as a golf course.

Responsible for RCRA Subtitle D audits and needs studies for more than 40 landfills. Studies covered identification of non-complying landfills and preliminary assessment of requirements to close or bring the landfills into compliance, including cost estimates.

Responsible for approval of design and issuance of permit for time-critical landfill expansion. Working in partnership with the landfill consultant, developed the design for the first self-sealing double liner system.

Responsible for approval of design and issuance of permit for time-critical closure of three major landfills. Working in partnership with the City's engineers, developed the first multi-layer closure cap implemented on the West Coast.

Landfill closure plan for Eielson AFB (Alaska) was integrated with the need to treat fuel-contaminated soils excavated during major expansion of base housing and mission support buildings. Land-farming cells were constructed on top of the former landfill using a compacted soil liner. Over the course of the next five summers, the excavated soils were bioremediated on top of the former landfill. Each spring, the soils cleaned during the previous summer were incorporated into the soil liner. At the end of the land-farming project, the treated soils were sufficiently clean to qualify as a RCRA Subtitle D landfill cap. The combining of the two projects saved the USAF over \$7,000,000 budgeted for the landfill cap.

RCRA Subpart X

Responsible engineer for development of the RCRA closure plan for the open-burning, open-detonation facility at Eielson AFB. Tasks included site investigation, closure report, and agency negotiations.

Acted as engineering consultant and technical reviewer of the RCRA closure plan for Egland AFB.

Acted as technical consultant to Eielson AFB's Civil Engineering Squadron audit of Elmendorf OBOD permit.

Acted as consultant to range manager to address RCRA Subpart X monitoring, compliance, environmental controls, and closure issues.

RCRA Permitting and Compliance

Acted as consultant to project manager addressing numerous compliance issues, including RCRA tank certifications and emergency response planning.

Conducted audits of facilities in Washington, Oregon, and Hawaii for major bank client financing expansion of manufacturing and warehouse facilities. Included RCRA and stormwater permitting compliance assessment.

Acted as RCRA compliance consultant regarding waste management, waste segregation, SARA reporting, and emergency response planning.

RCRA compliance and closure consultant to project manager for resolution of environmental issues associated with AST leaks and spills at a chemical manufacturing and repackaging facility.

Retained as a compliance consultant for a restoration project involving land that had previously received heavy-metal sludge from an industrial wastewater treatment facility. Provided research and documentation to establish that the sludge was not currently a regulated waste nor a regulated waste at the time it was placed. Furthermore, removal of the waste would have compromised the planned wetland restoration project.

Retained as a consultant to assess potential RCRA compliance issues associated with the release of chlorinated solvents from an electronics manufacturing facility. Initial assessment indicated that the contaminant plume was the result of historical operations and not related to current operations.

Retained to assess source of groundwater contamination from wood preservatives. Tasks included evaluating RCRA compliance and management practices, as well as stormwater impacts. Assessment concluded that stormwater was mixing with contaminated groundwater from a historical accident. Remediation system modifications were recommended to intercept contaminated groundwater plume.

Retained as a consultant and possible testifying expert to assess whether USTs and ASTs operated by the client were regulated under RCRA. Initial evaluation indicated that these tanks were not regulated under RCRA.

Retained to assist with remediation and disposal of mercury-contaminated rocks from a former industrial trickling filter. Innovations included novel removal and cleaning process that recovered most of the mercury and allowed the majority of the rocks to be disposed as non-hazardous waste.

Environmental Engineering

Remedial Performance Evaluation

Retained to assess the design of, and to install and operate, a bio-pile system for *ex situ* bioremediation of fuels and non-chlorinated solvents. The original design, prepared by a national laboratory, was found to be unnecessarily complex and difficult to construct. Revised the system from vacuum to blower, simplified the monitoring system, and modified the construction plan, resulting in a savings of \$250,000—over half the construction cost. Subsequently, developed and tested a non-mechanical system for use on remote sites, resulting in a savings of 75 percent over the original design estimate.

Retained to assess contractor's proposal to recover oil and hazardous materials from drummed liquids using a gravity separator. Initial review indicated that the process was unreliable, expensive, too time consuming, and would require a RCRA permit. An alternative treatment approach was developed using subfreezing air temperatures to freeze the water in the drums

then remove it as uncontaminated ice. The remaining liquid was field screened for solvents. Solvents were segregated for RCRA disposal, and waste oils were recovered for use as fuel in portable heaters. Cost savings from proposed treatment was more than \$500,000.

Retained by manufacturer to provide technical advice and permitting assistance for onsite micro-encapsulation of arsenic-contaminated soils. Review of competitive proposals and test results from three vendors indicated that tight process controls were necessary if the encapsulated soils were to pass the RCRA hazardous waste designation. Innovations included permitting the treatment process under the “treatment by generators” provisions in RCRA, and designing the treatment-area “tank” to be left in place as a RCRA cap.

Reviewed plans to use an in-well stripping process to remove chlorinated solvents released from a small metal-plating facility. Our analysis indicated that the system was inadequately characterized and too small to meet remedial goals within the project schedule. Additionally, we raised concerns that the proposed system would introduce oxygen to the aquifer, ending the natural biodegradation of the plume. Recommended two-phase in-well stripping approach that used nitrogen in the initial phase to maintain anaerobic conditions in the aquifer, thus supporting natural biodegradation.

Retained to review and comment on proposed remedial technologies to be applied at two locations at the site. Initial review of the steam extraction technology proposed by the regulator indicated that it was nearly six times the cost of containment through conventional means. Furthermore, no studies had been conducted to ensure that the contaminants could be recovered once the steam had mobilized them. Also saved the client substantial costs for soil removal. A soil removal program had been proposed based on two soil samples. Close scrutiny of the data suggested that the contamination was extremely localized and associated with creosote-treated railroad ties left in place when a rail spur was abandoned. Confirmation sampling supported this assumption, saving the client more than \$100,000.

Retained to review a proposed remedial system for a dry cleaner site. The ROD proposed use of Fenton’s Reagent to remove residual PCE from former cesspools suspected to be the current source of contamination, but ignored piping and other potential issues, including the amount of organic carbon present in the system that would react violently with the Fenton’s Reagent. Additional work on this Long Island site includes a natural attenuation assessment, regulatory strategy development, vapor intrusion assessment, and identification of prior investigations conducted by others that breached the natural containment at the site, releasing chlorinated compounds to offsite groundwater.

Wastewater Treatment

Evaluated causes of the digester failure at the City of Spokane wastewater treatment plant, prepared expert report and presented expert testimony regarding the causes of failure and the standard of care associated with a “back-of-the-envelope” engineering design prepared by a professional engineer working a consulting assignment for the City.

Assessed design and operational problems associated with anaerobic digesters being operated for digestion and methane production. Work included assessment, preparation of training materials, and presentation at a seminar. Within 2 months, digesters were not only stable, but performing consistently above the design efficiencies. Problems encountered included highly variable waste stream, limited controls, inconsistent/conflicting direction and advice, equipment not performing as designed, inadequate (or never provided) operation manuals, and inadequate training.

Retained by City of Spokane to conduct forensic analysis of unusual grease problem, to provide suggestions for management, identify source if possible, and provide recommendations for treatment. Work included successful identification of the material, recommendations for inspection and communication with industries that were possible sources, and strategy for identification and appropriate actions should the problem re-occur. Industry communication strategy was successful, and no reoccurrences have been observed.

Retained by Fortune 200 company as an expert and consultant regarding claims of damage to POTW pump stations and sewers from clients' discharges. Multiple projects in multiple states. Provided client with engineering and cost documents to allow negotiation of reasonable settlement of legitimate claims and rejection of excessive charges. Also evaluated pretreatment systems and made recommendations.

Retained by confidential client to assess efficacy of physical chemical system to remove trace contaminants, including pharmaceuticals, from drinking water.

Retained by internationally recognized museum and research facility to solve odor and pretreatment issues. Helped client conduct investigations, assess treatment technologies, and implement solutions.

Conducted blind efficacy testing of chemical treatment technology to enhance and expedite treatment of conventional and other pollutants at existing industrial and municipal treatment facilities. Tests were designed and conducted to verify that the product was, in fact, achieving treatment and not fooling the tests.

Retained by Phoslock International to assess applications of Phoslock technology for phosphorus removal in the United States. Work also included submittal of pre-manufacturing notices and regulatory support for applications.

Retained to determine the operational conditions that led to the failure of the #3 Digester at the Spokane Wastewater Reclamation plant. Personally responsible for operations analyses and interviews of plant and other personnel with knowledge of the digester and/or the event. Interviewed 30 people and resolved conflicts between initially reported observations and recorded and preserved data. All significant observations were verified and accounted for within the data and failure mode.

Retained to develop innovative approach for water and wastewater treatment for the Polar Ice Coring Research facility located in Alaska. Work included development of innovative water

treatment and wastewater treatment technologies that would supply the facility during the summer research season and could be easily protected during the harsh winter months.

Retained by international client to evaluate off-the-shelf integrated treatment plants for potential use at resort facilities in areas with limited power. The proposed technology did not have the flexibility to address weekly fluctuations in flow and loading, because most facilities were occupied from noon on Sunday to noon on Friday, with significant cleaning activities occurring in between. Developed two approaches—one used a lagoon system where land was available, and the other used aerated equalization basin followed by extended aeration activated sludge package plant.

Retained by confidential client to provide efficacy testing of physical chemical treatment system to remove trace contaminants, including trace pharmaceuticals, from drinking water. Work includes identifying a range of parameters for testing, locating representative water supplies, and conducting tests to verify the effectiveness of the process.

Highlights of wastewater projects as a state review and grants engineer:

- Wastewater construction grants for state of Washington – Managed more than \$200,000,000 in projects from 1974 through 1979.
- Technical plan review of nearly \$0.5 billion in wastewater treatment and pretreatment facilities. Review included reliability, operability, and adequacy.
- Expertise in conventional, tertiary, and innovative chemical treatment for industrial wastewater, stormwater, and municipal wastewater.
- Expertise in permitting issues that included nearly 1,000 industrial pretreatment facilities, hundreds of POTWs, and dozens of stormwater treatment facilities.
- Drafted first municipal stormwater permit and first water quality–based permit for major POTW in EPA Region X.

Mining, Smelting, and Finishing

Served as senior engineer for multimillion-dollar demonstration projects to conduct full-scale testing of remedial measures for several major CERCLA sites involving surface mines and smelting operations.

Retained as a consultant to assist client who had purchased a site with metal finishing waste. Assignment included remedial technology assessment and permitting. Permitting strategy included the first use of the RCRA provisions allowing generators to treat their own waste streams under their waste generator permits. These demonstration projects developed cost-effective techniques for remediating soils with various concentrations of heavy metals.

Developed and implemented a recycling plan for flue dust and sandblast wastes contaminated by heavy metals, and conducted a preliminary assessment of long-term impact from the use of this material. Also evaluated heavy metal contribution to adjacent waterway sediments from

coal and mercury mine drainage. Conducted an evaluation, up-river remedial design, and implementation plan for the smelter slag sandblast waste.

Organized PRP group, developed plans, and directed an environmental evaluation and expedited remedial measures for a lead smelter and processor. Contaminated sediments and soils were recovered and recycled, avoiding substantial remediation costs associated with planned disposal.

Conducted preliminary site assessments, including wetlands evaluations of a former industrial site in the Northwest. During the wetlands assessment, found evidence of smelter slag. Discovered that the property had been developed for smelting operations that had ceased nearly 100 years ago. Knowledge of the magnitude of potential liabilities and uncertainties associated with developing a former smelter site allowed the client to assess risks rapidly and make timely business decisions.

Served as project manager and designer for a survey of metals fabrication, handling, and storage facilities. Evaluated potential for recycling surplus metals and qualitatively assessing environmental concerns associated with the operations. Innovations included beta-testing a Niton XRF analyzer that provided real-time analysis of metal alloys to determine approximate salvage value.

Served as project and client manager for site investigation, and as client manager for ecological and toxicological risk assessment of industrial sites. Innovations included the use of field screening techniques and inclusion of an ecologist and a toxicologist on the sampling team, which allowed adjustment of the sampling plan in the field, facilitating collection of the data needed to prepare the risk assessments.

Served as project manager and responsible engineer for series of remedial demonstration projects that included the first large-scale soil incinerator, first large-scale biological treatment system, and also included bioventing, use of power plant boilers to incinerate waste, and landfill closures. Major challenges included reluctant regulators, temperatures to -30°F , management of ultrafine dusts from the incinerator and the power plant ash, and biological hazards (mosquitoes and moose). Innovations included conducting *ex situ* biological treatment on top of a landfill, which saved the client more than \$5,000,000 in soil treatment costs.

Responsible for the design and restoration of the gravel pit and batch plant sites at Elmendorf AFB. Sites covered nearly 10 acres and contained over 100,000 yd³ of soil potentially contaminated with asphalts and heavy metals. Innovations included the recovery and recycling of 100,000 gal of asphalt, 30,000 tons of rock used for roadway ballast, and 15,000 tons of asphalt-coated rock and soil incorporated in roadway and parking lot subgrades. Innovations saved the client nearly \$6,000,000 vs. the cost of a planned and budgeted disposal option.

Manufactured Gas Plants and Other Related Projects

Served as project manager and consultant for RCRA investigation and proposed closure of major wood treatment facility. Contaminants included creosotes and other wood treating

chemicals. Work included cost analysis, cost allocation evaluation, and evaluations of prior investigations, interim removal actions, and treatment systems.

Site manager for Washington State Department of Ecology. Accomplishments included site investigations, interim removal, and disposal plan development (asbestos contaminated with PAH. Demonstrated to EPA that the site should not be listed on the NPL.

Served as project manager for Washington State Department of Ecology for environmental issues associated with the original MGP for the City of Seattle. Although the site had originally been built on a pier, the structure had been torn down and the area filled. Challenges included identification of historical disposal areas, and development of sampling plans and special controls for installation of building piling supports to minimize disturbance of PAHs.

Acted as senior remediation consultant on several restoration and redevelopment projects at MGP sites. Tasks included review of innovative research proposals and results, remedial technology analysis, regulatory analysis, storm water management planning, redevelopment analysis, cost analysis, and senior technical review.

Pesticides

Retained to investigate, remediate, and resolve environmental issues associated with an agricultural chemical warehouse fire. Challenges included addressing contamination and risks from the 181 chemicals in the warehouse at the time of the fire. A risk-based investigation approach was developed, and the project focused on chemicals that were in the warehouse in sufficient quantity to present an environmental or toxicological risk. Laboratory cost savings from this approach was in excess of \$500,000. This was one of the first RI/FS projects accepted and closed by the Oregon Department of Environmental Quality. The project went from work plan preparation through investigation and remedial implementation within 11 months.

Retained to investigate, evaluate, remediate, and resolve environmental issues associated with a fire at a pesticide applicator's warehouse in eastern Oregon. The warehouse had contained nearly 80 tons of aluminum phosphide pellets used for fumigation of grain elevators and ships. Worked with the client to arrange first-responder training for employees and developed an emergency response plan to stabilize the unburned pellets. Worked with the manufacturer to expand the FIFRA registration and licensing for the product to allow use for control of burrowing rodents as an alternative to disposal.

Retained to evaluate contamination and risks associated with fertilizer distribution facility that had also handled some pesticides. The RI/FS had been completed, and the client wished to assess potential remedial measures. Review of the RI/FS indicated that pesticide issues were limited, and although soil concentrations exceeded Washington State MTCA standards, they did not exceed EPA standards, thereby allowing disposal as non-RCRA waste in Idaho. Groundwater contaminated with nitrates and phosphates above drinking-water standards was used for irrigation where the contaminants would be removed as a beneficial component of the water.

Retained as a consultant to assess compliance issues associated with corrosion inhibitors included in products used in large hydraulic systems. Because the corrosion inhibitors included compounds that were biocides, the client needed to know if the products and the manufacturing process were regulated under FIFRA, TSCA, or both. Because the active ingredients in some of the inhibitors are formulated for pesticides, this became a complex assessment to verify that the actual raw materials used in our client's products were manufactured as corrosion inhibitors and were approved for such use under both FIFRA and TSCA.

PCBs

Acted as Washington State Department of Ecology engineering manager for emergency response for recovery and treatment of PCBs from a transformer spill that occurred when a transformer being loaded on a barge broke free and fell into the river. Responsibilities included review and approval of recovered PCBs/water treatment system and disposal.

Served as principal investigator and enforcement officer for a mysterious oil spill containing PCBs. Careful investigation determined that the employees of a machine shop had dumped waste oils without PCBs into a former power plant flume that contained PCB-contaminated sediments. During the brief contact period, the waste oil mobilized the PCBs. A case was developed, and substantial monetary penalties were assessed against the dumpers, including allocation of cleanup costs.

Retained to determine the cause of transformer recontamination of five PCB transformers at a major industrial facility. Transformers had been cleaned and certified to be <50 ppm PCBs, but resampling during an EPA inspection found PCBs in the 500- to 800-ppm range. Thorough investigation of the methods used by the transformer cleaning contractor, and interviews of the client's employees who observed the contractor, enabled us to determine that the cleaning contractor had problems with its oil removal unit and did not remove and recycle the transformer oil either under load or with heated oil as required. Furthermore, the verification sampling was done with the transformer cold and prior to use. Consequently, a relatively substantial amount of PCBs remained trapped within the coils.

Served as project manager for contract to support USAF initiative to remove PCBs from USAF facilities. Project assignments included development of an investigation and management plan, investigation and testing of electrical components, and auditing of prior work involving PCB removal and/or recycling projects. Challenges included differing state standards for PCBs and poorly documented prior work. Two California bases (Vandenberg and Mather) and Williams AFB in Arizona required resampling, because prior contractors had not used the 1-ppm threshold used in California. Consequently, these transformers had to be resampled and re-cleaned or disposed as PCB waste.

Retained as a consultant in a litigation case to investigate the probable source of PCBs found in a storm water retention pond and sediments of an adjacent waterway. Although cutting fluids in the client's machine shop were suspected and alleged by the regulators, the contamination was not consistent with the client's source (location). The investigation focused on a nearby facility with documented spills of hydraulic fluids in the late 1940s through the late 1950s. Investigation

of library and company records indicated that the nearby facility had used surplus aircraft hydraulic oil in their hydraulic systems. Research of the records of the Commemorative Air Force (CAF) and interviews with CAF volunteers produced documentation that the surplus aircraft hydraulic oil used by the nearby facility contained substantial quantities of PCBs.

Product Stewardship

Initially retained in 1987 to address regulatory compliance issues associated with solvent use and disposal. Scope subsequently expanded to include integration of environmental issues within the development, use, and ultimate disposal of products. Within 18 months, the implementation of ideas developed by the Tempress team reduced the defective parts rate to less than 0.001 percent, (from greater than 5 percent). Solvent use was reduced by 98 percent, while product quality, customer satisfaction, and profit margin increased dramatically.

Retained to observe, document, and recover for testing piping components used in fuel dispensing. Additional activities included assessment of the installation, notation of any failures causing environmental impact, and documentation of any near-term potential failures or impacts.

Retained to file Toxic Substances Control Act (TSCA) applications and verify efficacy of proprietary product used in the treatment of waste water and lake restoration. Application was complete and EPA approval to begin manufacturing was received within 60 days.

Retained to review electronic device and associated materials to verify California Prop. 65 compliance, and to certify product stewardship program for client's customers. Work included assessment of device and the extent and nature of subcontractors' stewardship programs, and evaluation of printing and materials used for instructions and CD.

Retained to address environmental hazards and risks associated with green energy systems. Although the systems are completely recyclable, the client needed to assess any potential environmental impacts associated with abandonment, vandalism, landfill disposal, and incineration. Subsequently retained to address other environmental stewardship issues and integrate them with manufacturing and marketing.

Environmental Forensics

TIC v. Quemetco, et al. Case No. BC 012529 in the Superior Court of the State of California, County of Los Angeles. Subject: Release of lead from a secondary smelter with regard to insurance coverage matters. Technical consultant and principal investigator. Client: RSR Corporation (represented by Latham & Watkins).

RSR Corporation et al. v. AIU Insurance Company et al. Cause No. 93-0217 in the 71st Judicial District Court, Harrison County, Texas. Principal investigator and consultant for recovering records and calculating emissions from historical smelter operations at sites in Texas, Washington, and Indiana. Work included identification and documentation of process upsets documented (but not previously identified) during routine ambient monitoring by state and local

air agencies and the recovery and use of other agency documents to validate air dispersion models and expert opinions.

Retained as expert in the practice of automotive recycling, including the nature, extent, and management of waste streams resulting from this process. Provided analysis and documentation that facilitated settlement.

Retained to identify timing of disposal of battery manufacturing wastes found in the crawl space of a large commercial building. Because of multiple ownership of the battery manufacturing operation, it was necessary to ascertain the timing of the release(s) in order to establish responsibility. Innovations included the dating of construction materials and building remodels, dating battery casings, and dating the plates based on alloy content.

Retained to prepare cost allocation of investigation, remediation, and restoration costs for a major industrial facility. Before cost allocation could be prepared, contaminant sources had to be identified, segregated, and dated.

Retained to ascertain the source of mercury contamination found in an industrial wastewater treatment facility. Research of the client's records produced the original design drawings from the 1950s. The design showed a floating mercury bearing. From prior experience with these bearings, we estimated that the original floating bearing would likely have contained approximately 40 pounds of mercury. Having identified the probable source, our client was allowed to proceed with environmental closure of this site, allowing for planned redevelopment.

Served as project manager and principal investigator for drum disposal site for feasibility study and record of decision preparation project. Although four prior consultants and two Navy investigations had failed to produce evidence that the drums placed at the site were in fact "RCRA Clean," convinced the Navy to try once more. Investigation demonstrated the total quantity of materials released was consistent with washed drums and found documents and managers not previously found who confirmed that the drums had in fact been cleaned in accordance with RCRA. Site closed under MTCA (state standards) at a savings of more than \$500,000 in disposal costs. Project team received a Navy commendation for outstanding performance for actions on this project.

Litigation Technical Support

David Michael v Denbeste Transportation. Case Number VC038131. Retained to assess the environmental controls, site management, and regulatory compliance and non-compliance with EPA and California laws and guidance regarding decontamination and site safety at a state Superfund site. Additionally asked to assess how such compliance or non-compliance would have contributed to the injury of Mr. Michael, who was working at the site.

Angel Good, et al. v. Fluor Daniel Corporation, et al. U.S. District Court, Eastern District of Washington Case No. CT-00-5021-EFS. Retained as expert to evaluate the emergency response to an event at the plutonium finishing plant at Hanford, including expert report. Also retained to assist with preparation of a technical report evaluating the improper use of ISO 9000 and ISO

14000 (Gap Analysis) processes to evaluate emergency response activities. The same issues were addressed in a separate case, *Arthur Aylsworth, et al. v. Fluor Daniel Corporation, et al.* U.S. District Court, Eastern District of Washington Case No. CY-00-3038-EFS.

Grove Investment Company v. United States Testing Company and Grove Investment Company vs. Collins Radio Company, et al. Case Number SA CV 00-1076 DOC (EEx) (Lead Case) Consolidated with Case Number SA CV 01-646 DOC (EEx). Retained as expert to assess process solvent usage by the electronics and metal finishing industries in the 1960s and 1970s. Deposition has not been scheduled. Client: Weston Benshoof.

Union Station Associates, LLC v. Puget Sound Energy, Inc. Case No. C01-289P in the U.S. District Court, Western District of Washington at Seattle. Subject: Sources of polycyclic aromatic hydrocarbons at a site of former iron foundry, railroad terminal, manufactured gas plant, wood treatment facility, and power plant. Deposition: 2002. Client: Riddell Williams (representing Travelers Insurance, insurance carrier for Puget Sound Energy).

Seattle City Light v. Lloyds et al. Review of claims and assessment of costs related to water transport of contaminants; assessment of claims and costs prepared by opposition experts. Case dismissed prior to deposition. Client: Lane Powell Spears Lubersky for Lloyds.

Massoud v. Sparky's Towing et al. Retained by defendant for evaluation of contaminant sources at site owned by plaintiff. Developed scientific evidence presented at deposition and trial to demonstrate that automotive fluids from vehicles handled at Sparky's could not have produced the contamination found at the plaintiff's site. Evidence developed included a forensic analysis of automotive wastes and fluids, including analysis of trace metals and alloys used in automobiles. The jury did not award the plaintiff any environmental damages. Client: Phil Welshman of Friese and Welshman representing Sparky's.

Andalex v. D.A. Stuart et al. Retained to address Toxic Substances Control Act compliance issues associated with products manufactured by D.A. Stuart regarding product liability claims and allocation of responsibilities. Deposition: 2002. Client: Richards, Brandt, Miller, Nelson representing D.A. Stuart on behalf of AIG.

City of Ridgefield v. SAFECO, AIG, et al. Retained to analyze and document the City of Ridgefield's contributions related to impacts from the lease of City property to Pacific Wood Treating. Initial assignments have included evaluation of remedial technologies, property acquisition, and redevelopment opportunities. Deposition: Not yet scheduled. Client: Merrick, Hofstedt & Lindsey, representing the City of Ridgefield's interests on behalf of its insurers AIG and SAFECO.

Todd Shipyards v. Lloyds. Retained by counsel for Todd Shipyards as an expert on shipyard best-management practices, environmental compliance, and waste management practices. Deposition: 2001. Client: Corr Cronin representing Todd Shipyards.

Fentron Building v. American Motorist et al. Evaluation of remedial technologies, facility compliance issues, and cost assessment and allocation for site restoration related to third-party

claims. Clients held not liable; case dismissed prior to deposition. Clients: Merrick, Hofstedt & Lindsey, representing Westport Insurance Company; Soha & Lang, representing Central National of Omaha and Highlands Insurance; Forsberg & Umlauf, representing First State and INSCO insurance companies.

Lilyblad Petroleum et al. v. Industrial Indemnity et al. Evaluated remedial technology, facility compliance issues, cost assessment, and cost allocation for site restoration related to third-party claims. Deposition: March and April 1999. Client: Forsberg & Umlauf, representing Old Republic.

J.I. Case & Co. v. Jones Stevedoring. Assessed level of environmental controls required and processing equipment and associated costs necessary to bring the facility into compliance; also evaluated appropriateness of actions by regulators. Deposition: May 1998. Settled out of court. Client: Williams, Kastner & Gibbs, representing Jones Stevedoring.

Esterline Technologies Corporation and Midcon Cable v. Highland Insurance Company et al. Evaluated remedial technology and cost assessment for site restoration related to RCRA compliance issues and to third-party claims. Case dismissed before deposition (October 1998). Client: Merrick, Hofstedt & Lindsey, representing Highlands Insurance.

King County v. Sunset Demolition. Subject: Improper handling and disposal of solid waste and the associated impacts on public health and the environment. Deposition and expert witness testimony: 1985. Client: King County (Washington) Prosecutor's Office.

U.S. EPA v. Western Processing. Subject: Presentation of investigation methods and results demonstrating that the actions by the owner and operator of the facility presented a substantial risk to public health and environment. Depositions: 1982, 1983. Client: U.S. Environmental Protection Agency.

Insurance Technical Support

Retained to assess and document the state of RCRA compliance requirements that were related to and may have contributed to the release of hazardous materials. Initial review identified that first responders, who did not follow emergency response plans provided by the insured industry, contributed to the extent of property damage from the event.

Retained to evaluate plans, costs, and schedule for remediation of a major Superfund site. Responsible for remedial technology assessment, including the risk of failure, schedule for performance, and associated costs. Work was completed within a 10-day period to allow client to prepare a proposal to the site owner for cost cap insurance.

Retained to assess nature and cause of contamination at a school district maintenance facility. An accident involving the fuel dispensers, a turbine failure, and a leaking vent pipe were thought to be the cause of the majority of the contamination. However, an environmental forensic evaluation of the nature and extent of the contamination and the precise location of the failed equipment suggested that overfilling of the UST was the primary source of

contamination. Research of maintenance records produced memos documenting two significant incidents when the tank was overfilled. Client: AIG Environmental Claims.

Retained by the insurance company funding cleanup of a contaminated property to provide technical support for review and approval of investigation plans, remedial technology assessments, treatability studies, remediation plans, and associated schedules and budgets. Saved client \$300,000 by eliminating unnecessary studies and sampling costs.

Retained by insurance company to assess interim remedial measures (IRMs) and remedial technology to contain cost for which the insured was potentially responsible. Project successes included scoping of the IRMs to reduce costs and eliminate future liability, and termination of a plan to use expensive and risky IRMs that could have cost the insured and the client millions of dollars.

Retained to assess remedial failure of a soil-vapor extraction (SVE) and groundwater recovery system and develop closure strategy for a large service station complex in central Washington. Initial review of the site plans identified two large cisterns (that were part of the storm water control measures) located upgradient and laterally from the original spill site. Surface spills during fuel dispensing were being released to these cisterns, and heavy rainfall events would flood the cisterns, initially changing the direction of near-surface groundwater flow and resulting in recontamination of the site. Client was advised that the site would never reach cleanup goals without revising the storm water management.

Remedial Cost Analysis

Prepared expert analysis and testified at trial regarding past and future remediation costs that Raybestos had incurred as the result of a breach of agreement with the State of Indiana. Trial held in Indiana Superior Court September 2006. Cost projection analysis used proprietary cost model developed with Mark Johns of Exponent. The model and results were presented at trial, and the judge accepted the model, calculations, and analysis, and subsequently awarded our client 100% of claimed prior and future costs.

Prepared cost analysis for remediation/removal of lead-contaminated soil at the Roberts' Ranch in San Diego County as part of negotiating a purchase and sale agreement. This assignment included not only the remedial cost analysis but also working closely with our client (counsel to the seller) to draft technical requirements, and to establish conditions of the purchase and sale agreement that would allow the seller reasonable control of the removal process, to protect their liabilities and cost.

Redevelopment, Closure, and Brownfields

Served as project manager to address environmental issues associated with former 40-acre waste disposal site being redeveloped for residential use. Environmental issues included metals and nitrates. Used simple hydraulic models and natural attenuation analysis to demonstrate that the site could be safely redeveloped without requiring further measures to protect nearby water supplies. This information was communicated via a simple site model used to facilitate the

regulatory understanding of the miniscule risks that the site presented. Client savings from avoiding additional investigation and long-term monitoring were estimated at more than \$300,000.

Served as project manager for closure of site and resolution of environmental issues necessary to facilitate sale and redevelopment of a large shopping center in suburban Maryland. Contaminants included multiple solvents (chlorinated and non-chlorinated) and heavy metals. Potentially affected areas included residential areas, schools, and a major wetland. Used available data and conceptual site models to demonstrate that ecological and health risks associated with the site would be eliminated by the natural attenuation processes already at work at the site. Evaluation also included an assessment of remedial failure that could be caused by changes in site conditions, and addressed concerns that the natural bioremediation would halt before reaching acceptable levels. Although solvent and metals concentrations in groundwater exceeded MCLs, client received a no-further-action letter based on our analysis. Net client savings included \$200,000 in additional investigation costs and potentially \$1,000,000 in long-term monitoring costs.

Served as project manager and consultant for restoration and proposed redevelopment of a portion of a major wood treatment facility that was on City property, located between residential areas and the national wildlife refuge. Contaminants included creosotes and other wood-treating chemicals. Work included cost analysis, EDA and EPA grant application support, interim removal action evaluation, and remedial failure analysis. Analysis allowed site re-development to proceed, with limited risk to the City. In turn, the lead PRP at the site was able to use more than \$2,500,000 in remedial action from the City's redevelopment project to obtain matching cleanup grants.

Served as project manager for large solvent and fuel distribution facility and former solvent recycling facility. Tasks included failure analysis of various remedial actions proposed by site owner's consultant. Also conducted risk failure analysis of existing operations and liabilities associated with the site that could affect future redevelopment or sale. Analyses demonstrated that current operations were susceptible to routine failures that could prevent the site from ever achieving agency cleanup goals. Conversely, the near-surface geology and hydrogeology, along with the existing monitoring system, actually were an asset if the site were to be used for any operations that could accidentally release solvents, because natural containment, biological remediation equipment, and monitoring systems were in place and operational.

Retained by counsel for secondary insurers to evaluate site conditions and potential failure of proposed remedial measures. Initial evaluation indicated that the environmental issues associated with the site could be resolved within the limits of the underlying policies, and that further action or evaluation was not necessary.

Retained by major re-insurer to evaluate remedial actions and costs associated with a major Superfund site. Evaluated proposed remedial actions with regard to adequacy, cost, and failure potential, as well as proposed budgets and schedules. Project was initiated and completed within 2 weeks.

Retained by USAF ACC to conduct audits and assessments of Superfund sites at all 22 USAF ACC bases in the United States. Evaluated both the implemented and planned remediation for potential failures leading to unacceptable environmental or health risks. Project encompassed more than 50 Superfund sites with more than 200 remediation systems. Identified sites where remediation was no longer necessary as well, and reduced proposed sampling and extent of long-term monitoring.

Retained as a regulatory, closure, and remedial technology evaluator to address environmental engineering challenges associated with the closure or expansion of military installations in the three rounds of BRAC. Specific assignments included evaluation of risks of remediation failure or inadequacy to protect future uses of facilities. Such uses included schools and residential facilities, as well as commercial and industrial complexes. Evaluated remedial technology and schedule to ensure that remedial requirements would not interfere with the expansion of base facilities (industrial repair complexes) as well as support services such as child development centers and schools. Work was performed for USAF, U.S. Army, U.S. Navy, and Marines. California bases included Castle, Mather, Fort Ord, Twenty-Nine Palms, China Lake, Vandenberg, Davis Well Field, Stockton Army Depot, Sharp Army Depot, and Travis.

Supported an economic stability and redevelopment project in South Stockton, California. Provided an analysis and preliminary plan for required facilities, utilities, and zoning changes needed to develop undeveloped and underutilized properties for business purposes in support of economic growth and stability of the South Stockton neighborhood. 1970 graduate-level class and community support project through University of California at Davis.

Lead-Based Paint Investigation and Management

Retained as a technical expert to assess the nature, extent, and significance of lead paint investigations conducted at six school districts in Texas. Also retained to investigate and evaluate the restoration plans and costs associated with lead-based paint at these facilities.

Served as project manager for a study that included lead-based paint surveys of base schools, child development centers, hospital, recreational facilities, day care centers, day care homes, and representative military family housing. Survey data were analyzed and used to develop a lead-based paint management program plan. Project challenges included the need to manage lead-based paint on and in buildings listed on the national historic register that required maintenance of the original look and color of the buildings.

Acted as program and project manager for \$4,000,000 lead-based paint investigation and management planning/consulting project that covered 200,000 military family housing units worldwide, as well as more than 4,000 schools, hospitals, child development centers, day care facilities, and other Air Force facilities used by military families. Recommended abatement procedures, revision of existing military housing renovation guidance to reduce potential releases of lead-based paint, in-place lead-paint management planning, evaluation of lead-based paint renovation debris, and options for disposal.

Served as project manager for investigation of lead-based paint and asbestos at historical command and aide residences. Showed staff how to interpret existing management plans and prior reports, eliminating the need for further investigation and management.

Served as project manager for lead investigation project. Developed screening methods to allow U.S. Army staff to segregate soil contaminated with lead-based paint from soil contaminated with bullet lead containing arsenic, using proprietary XRF soil screening methods. Soil in an area between an indoor shooting range and Post support buildings painted with lead-based paint had become contaminated with lead. However, because the bullet lead contained potentially leachable arsenic, the areas contaminated with bullet lead needed to be segregated from the areas contaminated with lead-based paint. XRF screening methods were employed, and the Army successfully segregated and remediated the soils contaminated by the different sources of lead.

Water Resources and Water Quality Management

Retained as project manager to support appeal of proposed permit requirements for NPDES permit. Although the proposed permit limits appeared to be required to meet Great Lakes Water Quality Standards for discharges, the analyses (by the regulator who drafted the permit) were flawed. Although the analyses' flaws were minor in nature, cumulatively they resulted in proposed permit effluent limits that would be expensive to meet, could not be met under routine adverse conditions, and provided no measurable benefit to water quality. Exponent prepared a rebuttal report pointing out the flaws—which included failure to address natural groundwater discharges with elevated contaminant concentrations, calculation errors, and use of unreliable sample data—and also provided documented studies showing that the minimal effects level for the contaminants was well above the proposed limit.

Served as project manager for design of restoration project to restore former disposal site on Hood Canal. Developed innovative design that provided nesting and perching structures for eagles and osprey, improved shoreline habitat for surf smelt, protected the small boat launch, and used native plants to revegetate the 3-acre site. The native plants specified provided much-needed food and cover, eliminated the need to provide nutrients and water during the first summer, and were less costly than traditional regrading and reseeded. U.S. Navy received regional recognition for use of native plants.

Served as project manager for restoration of a gravel pit, as required by Section 404, under direction of the U.S. Army Corps of Engineers. Innovations included the construction of nesting habitat, forage areas, and safety islands to attract geese away from the runways. Eielson AFB natural resources manager received USAF award for the success of this project.

Served as project manager and principle designer for expansion of storm water treatment facility to accommodate revised mission for Fairchild AFB. Innovations included expansion and re-configuration of the ponds to increase contact with vegetation and thereby improve metals removal, long-term maintenance plan to ensure continued compliance with permits, and revised vegetation to eliminate use by ducks and other water fowl that were accessing the current ponds located near the flight lines.

Acted as design engineer for vegetation restoration to improve spawning habitat for salmon. Innovations included use of limestone to improve water chemistry and introduction of plants formerly native to the area, to provide summer shading and reduce water temperatures.

Served as an internal consultant for implementation and limitation issues for water quality testing to detect water contamination from terrorist activities. Using experience and knowledge of water collection, treatment, and distribution facilities, identified sampling locations, assessed analytical methods, and evaluated the effectiveness of certain compounds.

Developed an innovative process to recycle 1,000,000 gal per day of the process wastewater that was being discharged to the POTW, while advising a client on process management of an industrial pre-treatment system. The payback from savings on water and sewer bills would be met within 8 years. However, the development of nearby properties was being delayed because of inadequate sewer capacity and water supplies. The right to the unneeded water and sewer capacity could be sold to the developers for more than the cost of recycling.

Professional Affiliations

- Sponsor Member, Washington State Defense Trial Lawyers Association

Deposition and Trial Testimony

Available on request.