

# Statement of Qualifications

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## Water Resources Services 2009



Engineering Analytics, Inc.

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# Statement of Qualifications-Water Resources

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## Company Overview

Engineering Analytics, Inc. (EA) is a civil and environmental engineering firm specializing in providing turnkey engineering services to both the public and private sectors. The staff includes approximately 10 engineers specializing in geotechnical, hydrologic, hydrogeologic, and reclamation engineering. Our technical staff forms an exceptionally well qualified and experienced team capable of dealing with the most demanding technical and scientific problems related to site characterization, operations, remediation, reclamation, and closure. EA has recognized expertise in many areas of geotechnical and reclamation engineering. Our staff is experienced, technically outstanding, and conscientious about budgetary constraints, regulatory issues, and client priorities. Our approach to every project is basic: we employ excellent technical personnel who work with our clients to understand their needs and efficiently solve their technical problems. We emphasize common sense and practical approaches, bringing in more sophisticated methodologies only as required. Our expertise, experience and services include:

- Geotechnical Engineering
- Geoenvironmental Engineering
- Site Investigation and Remediation
- Surface Water and Groundwater Hydrology
- Water Resources Evaluation and Development
- Engineering Design and Construction Management
- Computer Modeling
- Geographic Information Systems (GIS)
- Regulatory Assistance



EA provides management consulting and technical services in four principal business areas: Mining Design and Reclamation, Water Resources, Environmental Engineering and Forensic Investigations. EA provides professional engineering and environmental consulting services to private and public clients. Our expertise for dam related projects includes design of lined and unlined impoundments; geotechnical stability analyses; hydrologic and hydraulic analysis and design; design of erosion control measures; regulatory and permitting support; watershed impact and management; ecological issues, and design of water treatment and contaminated effluent mitigation measures.

## **WATER RESOURCES ENGINEERING QUALIFICATIONS**

EA has an experienced staff in geotechnical engineering, hydraulic engineering, geohydrology and regulatory and permitting support. We routinely work on projects involving:

- Permitting, Design and Modification of Dams and Embankments
- Geotechnical Characterization and Analysis, including Settlement, Consolidation, Seepage, Seismicity and Slope Stability
- Design of Lined and Unlined Impoundments
- Flood Frequency Analysis and Hydrograph Development
- Surface Water Runoff and Routing Evaluation
- Design of Water Diversion and Routing Structures, including Impoundment Spillways
- Sediment Modeling and Design of Erosion Protection Measures
- Regulatory Analysis and Permitting Support
- Integrated Reclamation and Remediation Planning and Designs

Based on our best professional judgment, we evaluate technical issues using a variety of tools that range from common sense assessment to simple analytical solutions and complex models. Our application of technical tools is tempered by a thorough practical knowledge, extensive field and construction experience, experience in communicating with regulatory agencies and an appreciation of our client's need for cost-effectiveness. Our technical philosophy is to perform initial evaluations using simpler analytical tools and then raise the sophistication only to the level required to answer the technical questions at hand. For more complex technical issues, EA has the capability and experience to perform geotechnical, surface water and groundwater modeling using state-of-the-art computer codes.

EA's experience in all phases of dam design and construction allows us to provide integrated engineering and environmental services for our clients. We routinely solve environmental problems that require the concerted expertise of these various professionals to cost-effectively meet our clients' needs.

### ***Feasibility and Conceptual Design***

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EA has experience in evaluating the feasibility of a proposed project and performing a conceptual design and cost estimate. EA's approach to feasibility and conceptual design projects involves the following tasks:

- Review of Existing Data
- Initial Exploration
- Alternatives Development
- Design Concept Short-List
- Conceptual Level Cost Estimates
- Selection of Design Concept

The EA engineering staff has extensive experience in geotechnical design of civil earthen structures such as embankment dams, impoundments and flood routing structures. Over 80 percent of our engineers hold advanced degrees and an average of over 20 years of experience. Our personnel have performed embankment design, modification, crest raise design, spillway design and stability and safety review at a number of project sites. Important factors considered by EA engineers during design include regulatory requirements, site climatic evaluations, geologic/seismic and available construction materials.

Our technical staff has extensive experience in stability analysis of earthen structures using the SLOPE/W and PCSTABL models. EA staff has performed stability analysis for dams, process and mine waste piles, excavations and mine pit walls and natural slopes. Staff members are experienced with saturated and unsaturated flow models and in assessing the impact of water on slope stability. We use SEEP/W to predict the behavior of the phreatic surface.

### ***Hydraulic and Surface Water Hydrologic Engineering***

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EA engineers are experienced in surface water hydrologic analyses, design of erosion protection measures, prediction of sedimentation rates from natural and impacted watersheds and design of open channel systems to control surface water flows.

Our hydraulic and hydrologic engineers are experienced with probabilistic techniques for prediction of extreme rainfall/runoff events and the use of hydrologic models to predict storm runoff. Models ranging from the rational method to more complicated watershed network and routing models, such as HEC-1, are used to predict peak flow rates and storm runoff volumes, which are then used in sizing channels and storage ponds, or for reservoir routing and design of spillways. Our engineers use meteorological data for gaged watersheds and predictive tools for ungaged watersheds to develop inputs to hydrologic models.

We have extensive expertise in analysis of surface water flow and soil conditions to evaluate erosion potential of cover soils, natural slopes and open channel boundaries. Erosion protection consisting of both vegetated and rock layers are

regularly used depending on the specific constraints of the site. Analyses and designs have been prepared for non-concentrated flow over covers and embankment faces and for channels under both flat and steep-slope, high turbulence conditions.

EA engineers use sediment models to predict single-storm and long-term sedimentation impacts to developed and reclaimed lands. We are experienced with the use of the Unified Soil Loss Equation (USLE), MUSLE, SEDCAD and MULTSED models to predict either average annual or storm-based sedimentation rates. Model results have been used to assess long-term sediment build-up in diversion channels. We are also experienced with various models, such as HEC-6, to predict the transport and deposition of sediment within diversion channels and natural river systems.

Numerous open channel systems to collect and route runoff from developed or disturbed sites, or to convey flood events through spillway structures, have been analyzed and designed by EA engineers. Designs include unlined, grass-lined and rock-lined diversion and spillway channels. Our engineers design riprap bed and bank protection using a variety of standard design methodologies. EA personnel assess the hydraulic performance of open channels under extreme flood conditions, such as the Probable Maximum Flood and annual flow conditions.

### ***Hydrogeology and Groundwater Engineering***

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EA's hydrogeologists excel in groundwater flow modeling, hydrology and unsaturated flow in impoundments. EA staff have conducted design of groundwater and surface water monitoring networks, installation of monitoring wells and gauging stations, water sampling, single and multiple-borehole aquifer tests and tracer tests.

EA staff are experienced in using complex numerical flow models such as MODEFLOW, TWODAN, SEEP/W, SUTRA/SATRA and HYDRUS. EA staff are knowledgeable in modeling unsaturated flow, interpreting laboratory measurements of unsaturated flow properties and installing vadose zone instrumentation. Our modeling experience includes the use of published and unpublished analytical solutions, and numerical models such as UNSAST2, HYDRUS-2D and TARGET. We are knowledgeable in the theory, practical application and limitations of infiltration/seepage codes.

We have conducted field investigations to provide the data needed for dewatering assessments, performed analytical and numerical modeling to predict inflow rates, developed dewatering cost estimates for feasibility studies and completed engineering designs for dewatering systems.

EA field personnel are highly trained in cost analysis, drill rig supervision, well installation and the performance of single and multiple-well pumping tests. We

have experience with most drilling methods, know how to communicate and negotiate with drilling contractors and understand the problems that can arise during well installation. Personnel have supervised the installation of shallow and deep monitoring wells, hydrologic test holes, dewatering wells and water supply wells. Our well testing experience includes slug tests, single and multiple-borehole pumping tests, injection/recovery tests, packer tests, drill-stem tests and tracer tests.

### ***Design Services-Plans and Specifications***

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EA's experience in preparing final designs plan and specification packages is shown through our long standing relationships with numerous clients and our ongoing work with these clients on a wide range of design projects. We are well versed in the preparation of plans and specifications suitable for bidding purposes.

The preparation of construction drawings and technical specifications will follow completion of the design analyses and reports. As the design progresses, progress reports at the 60 percent, 90 percent and 100 percent design levels are typically submitted to both the client and the State Engineer's Office (where appropriate) for review and comment. When significant design changes are required, as is often the case, we will notify all parties involved. This communication is crucial in keeping the design process on schedule and minimizing changes during the formal review process.

With the completion of the construction drawings and technical specifications, a design report will be prepared in accordance with the State Engineer's Office, or similar regulating office. This report serves as the application to construct the required facility and typically contains the following information:

- Application Form
- Construction Plans
- Construction Specifications
- Classification Report
- Hydrology Report
- Geotechnical Report
- Design Report
- Instrumentation Plan
- Environmental Mitigation Plan
- Cost Estimate

### ***Permitting***

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In today's regulatory driven world, the ability to successfully permit any portion of a project is crucial in keeping schedules and budgets on track. EA's staff have a long history of helping our clients meet their permitting needs through open communication with regulatory agencies and a distinct knowledge of the permitting process. Our permitting skills encompass a wide range of applications, which include:

- Permit Planning
- Land Use Permits
- Construction Permits
- Environmental Permits

### ***Construction Management***

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With the completion of the final design, mitigation of the environmental issues, permitting, bid solicitation and construction management is the next crucial component to the successful completion of any project. EA is well experienced in helping our clients identify potential contractors, advertise the bid, coordinate any pre-bid meetings and site visits, offer any technical assistance to prospective bidders, issue addenda, evaluate received bids, check bidders references, bond ratings, insurance coverage and select a qualified contractor to perform the work.

With a contractor selected and in place, we are frequently asked by our clients to help during the construction phase of a project by acting as construction managers, construction oversight and construction QC/QA. When acting as construction managers, our responsibilities include managing a staff of field engineers with specific responsibilities ensuring the project is built to contract specifications and to the intent of the design, on-site construction management and administration and monitoring of schedule and costs. This on-site construction management will include the following duties:

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| ▪ Lead Pre-Construction Meetings  | ▪ Evaluate Change Order  |
| ▪ On-Site Document Management   | ▪ Complete As-Built Drawings   |
| ▪ Review Formal Submittals & Contract Documents                             | ▪ Review Applications for Payment  |
| ▪ Contract Administration, Inspection, QA Coordination and Field Management | ▪ Provide Engineering Services during the Dams First Filling or the Structures First Use |
| ▪ Review of Contractor's Quality Control Program                            | ▪ Prepare Operation and Maintenance Manual   |
| ▪ Regular Meeting Coordination with the Client and Contract Personnel       | ▪ Regular Construction Progress Report Preparation and Distribution                      |
| ▪ Prepare Final Construction Report   | ▪ Perform Warranty Inspection and Project Close out                                      |

## KEY PERSONNEL

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EA has found that our clients return for additional work primarily because of our excellent staff and its reputation for providing what the client wants in a manner that also meets the client's specific project needs. Brief summaries of selected staff members are presented below.

- John D. Nelson, Ph.D., P.E., Principal Engineer
- Daniel D. Overton, P.E., Principal Engineer
- Erik J. Nelson, P.E., Senior Engineer
- Kuo-Chieh (Geoff) Chao, Ph.D., P.E., Senior Engineer
- Michael Malusis, Ph.D., P.E., Senior Engineer
- Adam Hoffman, P.E., Senior Engineer
- Eileen Dornfest, M.S., P.G., C.E.G., Senior Engineering Geologist
- Jason Andrews, P.E., Staff Engineer
- Robert Schaut, P.E., Staff Engineer
- Jong Beom Kang, Ph.D., Staff Engineer
- Denise Weinkauf, Staff Geologist
- Jesse Dunham-Friel, Staff Engineer
- Kristle Hawkins, Staff Engineer
- Keith Morse, Staff Engineer

### **John D. Nelson, Ph.D., P.E., Principal Engineer**

Dr. Nelson was responsible for the development of the Geotechnical Engineering Program, and was formerly the Head of the Civil Engineering Department at Colorado State University. He provides technical direction and senior level review on dam projects. He has worked on numerous dam projects involving safety inspections, geotechnical investigations, raises and repairs. He was involved in many dam design and review projects. Dr. Nelson has also taught graduate level courses and continuing education courses on dam design and operation and maintenance for the past 25 years.

### **Daniel D. Overton, P.E., Principal Engineer**

Mr. Overton has over 23 years of geotechnical and reclamation engineering experience on a diversity of projects. Mr. Overton has served as the project engineer or project manager for many dams and tailings impoundments. Technical specialties include cover design, tailings consolidation, seepage and groundwater analyses, stability analyses, infiltration modeling and determining grading plans, quantities and costs. Mr. Overton has also served as the project engineer or project manager for facilities design of heap leach pads, process solution ponds and waste rock disposal sites. Mr. Overton also has experience in forensic studies, expert witness consultation, expansive soils design, public works projects, foundations for commercial and mid-rise buildings, residential and master planned communities and geotechnical instrumentation.

### **Erik J. Nelson, P.E., Senior Engineer**

Mr. Nelson has over 22 years of experience in site assessment, remediation design and implementation, and geotechnical engineering. He has designed water retention dams and tailings dams for coal, uranium, and copper mine tailings, designed and tested deep foundations for multi-story buildings and grain elevators, been responsible for the design, construction and operation of remediation systems for the treatment of soil and groundwater contamination. He has prepared numerous permit applications including: construction permits, aquifer protection permits, solid waste landfill permits, and environmental resource protection permits. He has also prepared backflow prevention and potable water studies for mines and industrial facilities, prepared remedial investigations, feasibility studies, and remedial designs as well as implementing remedial actions for EPA Superfund sites, and provided construction management services for the construction of large scale remediation systems. In addition, he has provided oversight for large scale grading projects for both commercial and residential projects involving the excavation and placement of up to 44 million cubic yards of soil and the stabilization of large landslide complexes.

### **Kuo-Chieh (Geoff) Chao, Ph.D., P.E., Senior Engineer**

Dr. Chao has over 10 years of geotechnical and reclamation engineering experience on a diversity of projects. Dr. Chao has served as a geotechnical engineer for many dams and tailings impoundments. Technical specialties, including cover design, infiltration modeling, seepage and groundwater analyses, slope stability analyses, tailings settlement/consolidation and liquefaction analyses, hydrologic analyses and other general aspects of geotechnical engineering. Dr. Chao has experience in forensic studies, expert witness consultation, expansive soils design, geotechnical instrumentation and laboratory testing.

### **Michael Malusis, Ph.D., P.E., Senior Engineer**

Dr. Malusis has 15 years of experience in geotechnical/geoenvironmental engineering consulting and research and has specific expertise in the design and performance of geoenvironmental containment systems, including landfill/impoundment liner and cover systems, *in-situ* vertical barriers, and geosynthetic barriers. His expertise includes waste-soil interactions, chemical compatibility testing, clay behavior, contaminant transport through soil and geosynthetic barriers, flow in saturated and unsaturated soil systems, and alternative earthen final covers. Currently, Dr. Malusis is a professor of civil engineering at Bucknell University (Lewisburg, PA) and is a part-time employee for EA. Dr. Malusis previously worked as a project manager and senior engineer for numerous projects involving design, construction, and/or performance analysis of landfills, tailings impoundments, soil-bentonite cutoff walls, and evapotranspirative covers.

### **Adam Hoffman, P.E., Senior Engineer**

Mr. Hoffman has over 20 years of engineering experience. He has specific expertise in site characterization and remediation. Other areas of work experience include engineering design, regulatory negotiations, budgeting, client communications, hiring and management of staff. Mr. Hoffman's areas of study include civil and ground water engineering, as well as environmental law.

### **Eileen Dornfest, M.S., P.G., C.E.G., Senior Engineering Geologist**

Ms. Dornfest has over 8 years of experience in engineering geology and geoenvironmental engineering on a diversity of projects. She has served as senior engineering geologist and project manager for mine reclamation projects, dams, forensic investigations, commercial/industrial development, and residential repair projects. Investigations performed include seepage and slope stability analyses, settlement/consolidation analyses, and other general engineering geologic investigations related to dams, mining, and development.

### **Jason Andrews, P.E., Staff Engineer**

Mr. Andrews has a Masters Degree in Engineering from Colorado State University. He has experience in geotechnical engineering pertaining to mine site remediation, exploratory borings, construction defect litigation, and quality assurance and quality control oversight relating to geotechnical and environmental projects. His areas of emphasis and study include slope stability, laboratory testing, mining projects, settlement analyses, and other aspects of geotechnical engineering.

### **Robert Schaut, P.E., Staff Engineer**

Mr. Schaut has several years of consulting and construction experience in geological engineering as applied to expansive soils, ground water hydrology, characterization of mine and mine waste facilities, and development of mine reclamation plans. His experience includes expansive soil evaluations, slope stability analysis, site investigation and characterization, geologic mapping, field collection of water and soil samples, geotechnical instrumentation, and other general aspects of geotechnical engineering.

### **Jong Beom Kang, Ph.D., Staff Engineer**

Dr. Kang has geo-environmental research experience involved to membrane behavior of GCL with containment system to waste disposal/contaminant transport. He has geotechnical experience including laboratory testing, piping/seepage analyses of embankment, slope stability analyses of soils/rock slope, consolidation/settlement evaluation in soft clayey soils, and expansive soils evaluation related to unsaturated flow/frost modeling, heave predictions, and wetting front migration for surface grading and groundwater mitigation.

**Denise Weinkauf, Staff Geologist**

Ms. Weinkauf has a Masters Degree in Earth and Atmospheric Science from Purdue University. She has multiple years of research experience in environmental geology, water quality assessment, and natural resource management. She has engineering geology experience relating to exploratory borings, construction defect litigation, and foundation remediation.

**Jesse Dunham-Friel, Staff Engineer**

Mr. Dunham recently completed his Masters Degree in Civil Engineering with a Geotechnical concentration in expansive soils. He has performed subsurface exploration, monitoring of geotechnical instrumentation, laboratory testing, dam inspection, report writing, and topographical surveys.

**Kristle Hawkins, Staff Engineer**

Ms. Hawkins is currently completing her Masters Degree in Geoenvironmental Engineering at Colorado State University. She has performed geotechnical laboratory testing, site easement documentation, cost estimating, and budgeting.

**Keith Morse, Staff Engineer**

Mr. Morse is currently completing his Masters Degree in Civil Engineering at Colorado State University. He brings experience in surveying, field work, and CAD to his position with Engineering Analytics, Inc.

## SELECT PROJECT EXPERIENCE

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EA engineers and other technical staff have designed embankment structures, storage impoundments and have evaluated the geotechnical and erosional stability of numerous civil structures. Short descriptions of representative projects are listed below by the technical disciplines involved.

### **Miners Lake Dam, Wellington, Colorado**-*North Poudre Irrigation Company*

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In order to remove a restriction placed by the Colorado State Engineer's Office at Miners Lake Dam, improvements were made in regards to the downstream slope to 3H:1V (horizontal:vertical), install erosion protection on the upstream face and replace the outlet works of the dam. EA staff performed the seepage and stability analyses in conjunction with these improvements for review by the State Engineer's Office.

### **Sandborn Lake Dam, Greeley, Colorado**-*City of Greeley, Colorado*

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Wind and wave erosion on the unprotected upstream face caused a vertical scarp, several feet high in many places, to form at the Sandborn Lake Dam. The dam is located within the city limits of Greeley, and the Colorado State Engineer's Office is concerned that, if left unchecked, this erosion may affect the stability of the dam. EA staff designed regrading and riprap protection for the upstream face of the dam to repair the deficiencies.

### **Ancho Canyon Dam, New Mexico**-*Pittsburgh and Midway Coal Co*

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Design of a 35-foot high dam for control of storm flow near Raton, New Mexico. The design included analyses of seepage, slope stability of embankment and foundation material and settlement/consolidation analyses of the foundation materials.

### **Stractor Dam, Arkansas**-*Umetco Minerals Corporation*

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Design and construction of the reclamation and raise of a 125-foot-high dam near Hot Springs, Arkansas. The project involved laying back the downstream face of the dam to a prescribed angle and concurrently raising and improving the dam for future operations. Work included geotechnical characterization of the earthfill material, design of dam raise, reclamation plan and construction management.

### **York Canyon Dams No's 1 and 2, New Mexico**-*Pittsburgh and Midway Coal Co*

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Stability analysis and landslide review of Dam No. 2; hydrology review for reclamation of Dam No. 1.

### **York Canyon Dam No. 3, New Mexico-Pittsburgh and Midway Coal Co**

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Review of the design of Phase 1, and the design engineer for Phases 2 and 3. Seepage and stability analyses, hydrologic analysis, riprap, filter and drain design and seismic analysis were performed.

### **Third Party Review of Dam, Bunker, Missouri**

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Third party review of a proposed 20-foot-raise to a 120-foot-high earthen embankment in Bunker, Missouri. The review was performed to identify areas of potential risk associated with the raise, and included hydrology slope stability, settlement/deformation and construction issues.

### **Third Party Review of Arizona Dams, Hayden, Arizona**

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Geotechnical analyses and risk assessment for a 700-acre, 610-foot-high earthfill dam near Hayden, Arizona, two additional earthfill dams near Hayden, Arizona and eight earthfill dams near Tucson, Arizona. Areas of analyses included hydrology, slope stability, settlement/deformation, consultation issues and conformance with regulations.

### **Olympic Dam, Australia**

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Alternative study of the Olympic Dam earthfill dam. These dams are approximately 100 feet high, covered 77 acres and were being considered for expansion to 291 acres.