REQUEST FOR PROPOSALS
(RFP)

RFP # 12-06-PJ

Issue Date:	March 2, 2012
Title:	Uranium Study
Commodity Code:	91843
Issuing Agency:	Commonwealth of Virginia Department of Environmental Quality Attn: Patsy Jones, Contract Officer P. O. Box 1105 Richmond, VA 23218
Using Agency And/Or Location Where Work Will Be Performed:	Department of Environmental Quality Department of Mines, Minerals and Energy

Initial Period Of Contract: From Date of Award Through November 30, 2012.

Sealed Proposals Will Be Received Until 2:00 p.m. on April 3, 2012 For Furnishing The Services Described Herein.

All Inquiries For Information Should Be Directed To: Patsy Jones, Contract Officer, Phone: (804) 698-4335 or E-mail: Patricia.Jones@deq.virginia.gov. **Questions will be accepted until close of business on March 12, 2012.**

IF PROPOSALS ARE MAILED, SEND DIRECTLY TO THE ISSUING AGENCY SHOWN ABOVE. IF PROPOSALS ARE DELIVERED BY COURIER OR HAND DELIVERED, DELIVER TO: 1st Floor Receptionist Desk, Department of Environmental Quality, Attn: Patsy Jones, Contract Officer, 629 East Main Street, Richmond, VA, 23219.

In Compliance With This Request For Proposals And To All The Conditions Imposed Therein And Hereby Incorporated By Reference, The Undersigned Offers And Agrees To Furnish The Services In Accordance With The Attached Signed Proposal Or As Mutually Agreed Upon By Subsequent Negotiation.

Name And Address Of Firm:
Wright Environmental Services Inc.
201 Linden St.
Suite 301
Fort Collins, Colorado Zip Code: 80524
eVA Vendor ID or DUNS Number: VS0000087802
Fax Number: (___) (970) 689-3486
E-mail Address: wrightenv@gmail.com

Date: March 30, 2012
By: L M Wright
(Signature In Ink)
Name: Leonard (Toby) Wright
(Please Print)
Title: President
Telephone Number: (___) (970) 231-1160

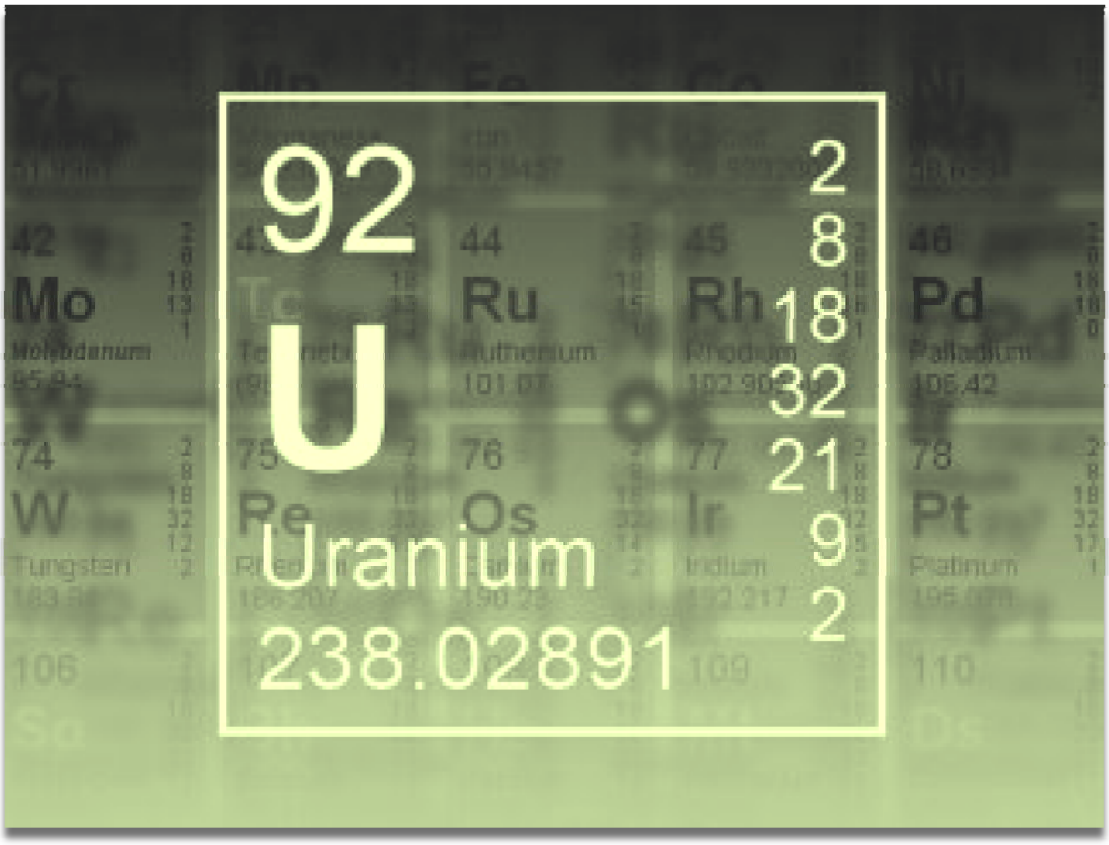
PREPROPOSAL CONFERENCE: A mandatory preproposal conference will be held at 9:30 a.m. on March 13, 2012 at the Department of Environmental Quality, 629 East Main Street, Richmond, VA, 23219. Reference: Section VII herein. NO ONE WILL BE ADMITTED AFTER 9:40 a.m. If special ADA accommodations are needed, please contact Patsy Jones at 804-698-4335 by March 9, 2012.

Note: This public body does not discriminate against faith-based organizations in accordance with the *Code of Virginia*, § 2.2-4343.1 or against an offeror because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.

Proposal
Commonwealth of Virginia
Department of Environmental Quality

P.O. Box 1105
Richmond, Virginia 23218

Date: April 3, 2012
RFP No.: 12-06-PJ
RFP Title: Uranium Study



Wright Environmental Services, Inc.

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1.0 Introduction

Wright Environmental Services Inc. is please to present this proposal to the Commonwealth of Virginia to support their ongoing efforts assessing the potential environmental, public health and regulatory impacts of uranium mining and milling.

1.1 Purpose and Objective

The purpose of this submittal is to propose a technical approach and team of experts to provide information and expert analysis of uranium mining and milling issues within the Commonwealth of Virginia. The work will be relevant to the statutory jurisdictions of the Department of Environmental Quality (DEQ) and the Department of Mines, Minerals and Energy (DMME) in response to RFP #12-06-Pl. The objective of this proposal is to demonstrate that our technical approach and the exceptional qualifications of the proposed team will provide the Commonwealth with the best possible resources to meet its needs.

2.0 Project Organization and Team Member Experience

Wright Environmental Services Inc. has assembled a team comprised of some of the nation's top experts to advise the Commonwealth's Uranium Workgroup. Our focus will be on developing recommendations concerning gaps in the existing Commonwealth regulatory framework, requirements and standards that would need to be filled should it lift the moratorium on uranium mining. This team's experience and expertise encompasses all aspects of uranium mining and milling including design, environmental compliance, operations, reclamation and remediation. The Team members have decades of experience with academia and with State and Federal regulatory agencies directly responsible for the oversight of uranium mining and milling projects. The diversity and depth of experience of this proposed team that will provide the Virginia Department of Environmental Quality (DEQ) and Department of Mines, Minerals and Energy (DMME) with detailed, accurate and insightful support in an efficient and timely manner.

The following sections outline our proposed organization and briefly summarizes the experience and qualifications of each team member. A detailed curriculum vitae (CV) for each team member is provided in Attachment D. Attachment E presents relevant publications from selected team members to highlight their individual experience and to provide initial technical resources relevant to the ongoing study of uranium mining and milling issues.

2.1 Project Organization

Figure 1 illustrates our proposed organizational chart. The Project Manager will be the primary point of contact for this contract. Individual Technical Leads have been assigned to specific subject matter areas to ensure accountability and clear communication during the project. The proposed project structure is relatively flat to facilitate free and frequent exchange of information between the Commonwealth staff and our subject matter experts. We envision a collaborative process with the Workgroup with open and frequent communication to ensure that the study stays on task, on schedule and to ensure the Commonwealth's needs are met.

In addition to the individual Technical Leads and subject matter experts, we have a significant number of highly qualified staff with decades of experience across a wide range of disciplines to proved lower costs support of this effort. We propose to rely on the expertise of our subject matter experts but leverage the lower costs resources to provide cost effective application resources in developing work products for the Commonwealth.

2.1.1 Project Management

Mr. Toby Wright (M.S., P.G.)

Mr. Wright is proposed as the Project Manager for the DEQ/DMME Uranium Study. In this role, Mr. Wright will be the primary point of contact for the Commonwealth, coordinating contractual matters, communications, meetings, and development and submittal of deliverables, and ensuring work product quality control and adherence to schedule. Mr. Wright, a registered professional geologist with training as a geotechnical engineer, has over 20 years of experience in managing technical studies and investigations related to protection of public health, safety and the environment, most of which relate to uranium mining or uranium milling (see Attachment D). Mr. Wright has successfully managed many technical teams for complex projects on short time frames, including management of over 40 personnel for the Department of Energy related to reclamation and closure of the Moab Uranium Mill Tailings Remedial Action (UMTRA) project.

In addition, Mr. Wright has designed radon and erosion barriers for uranium mill tailings disposal cells, successfully developed Alternative Concentrations Limit applications for U.S. Nuclear Regulatory Commission (USNRC) approval, and managed the development radioactive materials license applications and amendments for uranium recovery facilities in Wyoming and Utah. In his previous role as Environmental Manager of conventional mining operations for a U.S. based uranium mining company, Mr. Wright was responsible for health and safety, regulatory compliance, licensing and permitting for one of the few remaining uranium mills in the U.S. He brings both a broad technical background in uranium mining and milling and extensive management expertise to the Team with a consistent record of strong communication and organizational skills.

2.1.2 Radiation Health Physics and Radioecology

Wright Environmental Services Inc. has assembled a group of extremely knowledgeable professionals in the fields of radiation health physics and radioecology to ensure that the Commonwealth has the best possible resources for assessing its existing programs and regulatory framework. These individuals bring more than 140 years of combined expertise in these disciplines, spanning applications in the Federal, State and private sectors including permitting, operations and reclamation phases of uranium mining and milling.

Dr. Janet A. Johnson (Ph.D., Certified Health Physicist; Certified Industrial Hygienist)

Dr. Janet A. Johnson is the President of Sopris Environmental. She has expertise in health physics, radiation risk assessment, and environmental health. Dr. Johnson holds advanced degrees in Radiological Physics Microbiology (Environmental Health). She is a Certified Industrial Hygienist and a Certified Health Physicist. She is currently a member of the Colorado Radiation Advisory Committee. Dr. Johnson's current consulting work is centered around the mining industry with emphasis on uranium recovery facilities. She is the Radiation Safety Officer of record for a uranium recovery facility. She was involved in developing technical basis documents for NIOSH dose reconstruction project under the Energy Employees Occupational Illness Compensation Program Act. Dr. Johnson is a former chair of the EPA Science Advisory Board, Radiation Advisory Committee.

Dr. Robert Meyer (Ph.D., Radiation Health Physics)

Dr. Robert Meyer's holds advanced degrees are in physics, radiation protection and radiation biology. He has 36 years of experience in radiation protection and measurements, with the majority of those years focused on uranium-chain radiation protection, uranium mill remedial action and new uranium facility licensing. Dr. Meyers also severed as a U.S. Navy Officer. Dr. Meyer currently consults for the International Atomic Energy Agency on uranium-related issues, in addition to serving as the Radiation Safety Officer (RSO) of Record on three uranium mill tailing remedial action sites in Wyoming and Texas. Dr. Meyer presently instructs uranium facility RSO's in radiation protection. Dr. Meyers ran the low-level radioactive waste disposal siting project for the Commonwealth of Pennsylvania. Dr. Meyer's career includes research at the Oak Ridge National Laboratory, independent human health risk assessments at U.S. nuclear weapons facilities, uranium remedial action and new uranium facility licensing activities, and health physics programs for the public and workers at 22 U.S. uranium mill tailings sites.

Dr. Craig Little (Ph.D., Radiation Health Physics and Radioecology)

Dr. Craig Little has more than 35 years of experience in radioecology and radiation protection. During his career, Dr. Little has worked on radiological issues for the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, the U.S. Department of Defense and the National Institute for Occupational Safety and Health. He established the ORNL office in Grand Junction, CO in support of the DOE Uranium Mill

Tailings Remedial Action project and led that office for 18 years. He is currently focused on occupational and environmental dose modeling, licensing of new uranium production facilities, training of radiation workers, and oversight of remedial action projects for a variety of private clients. He is an expert on the computer code MILDOS. Dr. Little serves as Editor-in-Chief of *Operational Radiation Safety*, a publication of the Health Physics Society and is also an associate editor of the journal Health Physics.

2.1.3 Mining

Wright Environmental Services Inc. has assembled a group of top experts in mining and milling operations in both the Eastern and Western half of the United States. The mining team is led by Mr. Rick Chancellor. In this role, Mr. Chancellor will lead the team in reviewing, analyzing, and consolidating pertinent regulatory components applicable to uranium mining in Virginia. and will collaborate with Potesta and Associates of West Virginia. These combined resources will afford the Commonwealth with a robust set of resources to effectively and efficiently assess the Commonwealth's existing policies, regulations and programs with respect to potential uranium mining and milling activities.

Rick Chancellor (PE)

Mr. Chancellor will serve as the lead for the mining programs for this project. Mr. Chancellor is the former Director of the Land Quality Division in the Wyoming Department of Environmental Quality. He has over 25 years of experience in the regulatory environment, 13 of these years as the head of Wyoming's Mining Regulatory Program. Mr. Chancellor supervised the permitting and oversight of all types of mining and reclamation operations in Wyoming, including uranium. Wyoming has numerous uranium mines including surface, underground, and in situ mines; many with milling operations and resultant mill tailings impoundments. Mr. Chancellor ensured that adequate reclamation activities continued for sites in Wyoming that entered into bond forfeiture. Mr. Chancellor currently works as an engineering consultant primarily involved in uranium regulatory review projects and is intimately involved with the review and rewrite of Wyoming's in-situ uranium mining guidance.

Bill Drinkard (M.S., P.E.)

Mr. Drinkard has 36 years of Appalachian Region mining experience, primarily in the coal industry. As a professional engineer, Mr. Drinkard managed industry construction projects, prepared environmental and health permits for national and regional coal companies. His primary focus has been as a coal industry construction project manager, as manager in the preparation of routine permit reporting requirements. Mr. Drinkard was also the responsible professional engineer for five coal refuse facilities.

2.1.4 Geotechnical Engineering

The geotechnical engineering expertise related to uranium mining and milling assembled by Wright Environmental Services Inc. is among the best in the country, with decades of academic and applied experience related to the isolation and stabilization of mine wastes and Byproduct Material.

John D. Nelson (Ph.D., P.E.)

Dr. Nelson has over 45 years of experience in the area of geotechnical engineering and construction in the mining industry. Dr. Nelson served on the faculty of Colorado State University for 39 years where he was responsible for the developed ment of the Geotechnical Engineering Program and headed, and was formerly the Head of the Civil Engineering Department at Colorado State University.. He was on the faculty of Colorado State University for 39 years. He is currently a Principal and owner of Engineering Analytics, Inc. Dr. Nelson has experience in the areas of consulting engineering, research, teaching, and construction,. His has a broad range of experience dealing with evaluation of tailing dam failure, design of dams, mill tailings management, expansive soils, compacted fills, soft soils, seepage and water movement in soils. He is the author of more than 100 technical papers and reports. He has served as a consultant to the USNRC through a technical assistance contract at Colorado State University, developing several NUREGs and source documents on long-term stability of reclaimed uranium mill tailings impoundments. Dr. Nelson has been involved in the design of several uranium mill tailings closure plans since the 1980's including the Union Miniere uranium tailings impoundment in Olen, Belgium, and several Title I uranium mill tailings sites in the United States such as Uravan, Colorado; Gas Hills, Wyoming; and Maybell, Colorado. Dr. Nelson developed a well-known research program at Colorado State University to conduct research on uranium mill tailings. Research was performed for both the USNRC and the US DOEDepartment of Energy as part of the Uranium Mill Tailings Remedial Action Project (UMTRA.)

Dan Gillen (M.S.)

Mr. Gillen holds a Masters Degree in Geotechnical Engineering. He has 39 years of experience, including a 31-year career with the USNRC. His USNRC work included geotechnical design review of nuclear power plants, uranium recovery facilities, and mill tailings impoundments; project management of nuclear facility license applications and decommissioning actions; policy review as technical assistant to the Chairman of the Nuclear Regulatory Commission; and oversight as a Senior Executive Service Manager of several nuclear program areas including Uranium Recovery Facilities, Fuel Cycle Facilities, and Reactor and Material Site Decommissioning. A major part of his USNRC career was in managing the uranium recovery program. After retiring from the USNRC, Mr. Gillen's recent international work has included preparation of IAEA guidance documents, development and conduct of several USNRC-

sponsored workshops for developing nations on uranium recovery regulation, and participation in IAEA-sponsored workshops on uranium recovery activities.

Daniel D. Overton (M.S., P.E.)
Mr. Overton has over 25 years of geotechnical and reclamation engineering experience on a diversity of mining and uranium related projects. His technical specialties include cover design, tailings consolidation, seepage and groundwater analyses, slope stability analyses, infiltration modeling and determining grading plans, quantities and costs. Mr. Overton served as a facilities project engineer/manager for the design of heap leach pads, process solution ponds and waste rock disposal sites. Mr. Overton is experienced in forensic studies, expert witness consultation, and the design of uranium mine and mill facilities in Uravan, CO; Gas Hills, WY; Maybell, CO; Canon City CO; Nunn, CO: Ticaboo, UT: and Olympic Dam, Australia.

2.1.5 Groundwater and Surface Water

We have assembled a highly talented and experienced group of water resource specialists with extensive expertise in addressing characterization, design and compliance issues for environmental protection of uranium mining and milling projects. In addition to the expertise summarized below, our group has senior geochemists with extensive expertise and applied experience related to the study and mitigation of acid mine drainage.

Christopher Lidstone (PG)
Mr. Lidstone is founder and president of the engineering, geology and water resource consulting firm Lidstone and Associates, Inc. (LA). His professional experience covers a wide range of individual, yet interrelated fields of study, which include geology; geochemistry; fluvial geomorphology; surface and ground water hydrology; and environmental regulation. Mr. Lidstone has been actively involved in mining and mining related studies since 1974. As a regulator for the Wyoming Department of Environmental Quality, Land quality Division (DEQ/LQD) he served as the state's liaison with the USNRC responsible for negotiating interim stabilization and final closure of uranium mines and mill tailings in the Gas Hills, Powder River Basin, and Shirley Basin. As a consultant he has completed uranium mining and reclamation studies including final closure and clean-up design and construction for over 20 Wyoming abandoned uranium mine land reclamation projects the Wyoming Abandoned Mine Land program in Wyoming. Since 1986 he has completed numerous mining-related and mine permitting studies in 17 states and internationally. He co-authored the Wyoming DEQ/LQD Guideline 8 (Hydrology) and has authored the Mine Drainage Handbook for the State of Maryland as well as other guidance documents for the State of Wyoming. In 1993 he was awarded Reclamation of the Year award for his design and construction of the Little Medicine Bow River Restoration project.

Kate Laudon (PE, PG)

Ms. Laudon is Vice President of Lidstone Associates and a registered professional engineer and professional geologist. Ms. Laudon has over 25 years of experience in the design, installation, and operation of ground water supply wells, aquifer testing, geophysical logging, water quality monitoring, hydrogeologic investigations and contaminant transport. Ms. Laudon is currently the lead groundwater hydrologist under contract to the State of Colorado to review commercial uranium mine permit applications, and to the state of Wyoming to research and develop guidelines for commercial scale underground coal gasification (UCG). She has completed mine permit and NRC license applications for both uranium and ISR mines, and conventional uranium mines. She experienced in has overseen the installation and operation of ground water monitoring systems, ground water quality monitoring, hydrogeologic investigations, ground water development and supply, computer modeling, and geophysical investigations. Currently Ms. Laudon is the lead groundwater hydrologist under contract to the State of Colorado to review uranium mine permit applications, and to the state of Wyoming to review a Research and Development permit application for an underground coal gasification (UCG) project. For the Wyoming project she is tasked with assisting the state in the development of guidelines for commercial scale UCG permitting. Ms. Laudon recently served as a technical editor for several chapters of the Society for Mining, Metallurgy and Exploration (SME) Mining Engineering Handbook, Third Edition, ed. (Peter Darling, 2011).

2.1.6 Regulatory

Several of our team members have expertise spanning several disciplines, as illustrated in Figure 1. For example, Mr.s Chancellor, Lidstone, Meyer and Wright have extensive experience with the regulatory aspects of uranium mining and milling that will be applied to this project. However, their qualifications are not repeated for the sake of brevity.

Dr. L. Eli McCoy (Ph.D.)

Dr. Eli McCoy holds advanced degrees in received his Bachelor of Science degree in zoology and Master of Science degree in biological sciences from Marshall University before completing doctoral studies and in aquatic ecology at the University of Louisville, Kentucky. He began a career in state government as a biologist with theserved as Deputy Chief of the Office of Water Resources West Virginia Department of Natural Resources and eventually became the state's chief environmental regulator as Director of the West Virginia Department of Environmental where, by 1985, he rose to the position of Deputy Chief of the Office of Water Resources. He eventually became the state's chief environmental regulator as Director of the West Virginia Department of Environmental Protection. In 1997, he left state government to become Environmental Vice President with Potesta & Associates, Inc., a Charleston, WV engineering and environmental consulting firm. His areas of specialization include permit negotiations, enforcement negotiations, environmental compliance, state and federal regulatory agency

operations, and aquatic ecology. Dr. McCoy has served as President of the West Virginia Water Pollution Control Association, as Chairman of the Ohio River Basin Commission, as a board member for National Institute for Chemical Studies, on the West Virginia Infrastructure Council, as a member of U.S. EPA's Common Sense Initiative, Iron and Steel Sector, and as a commissioner of the Ohio River Valley Water Sanitation Commission.

George Patterson (Ph.D.)

Dr. Patterson has more than 30 years experience in regulatory oversight of mining and uranium recovery operations in Canada, serving in a variety of roles including Director of Mineral Policy for the Government of the Northwest Territories, Executive Director of Exploration and Geological Services for the Government of Saskatchewan, and Executive Director of Major Projects for the Government of Saskatchewan. His regulatory expertise and experience with mining and exploration in the Canadian regulatory environment will provide an excellent resource to the Commonwealth in assessing international and emerging regulatory standards and programs for uranium mining and milling.

Paul Hildenbrand (P.G., R.G.)

Paul Hildenbrand has more than 40 years of mining related experience, with approximately 30 years' experience in uranium geology, production and regulatory permitting within the United States and overseas. is a registered professional geologist in the states of Oregon and Wyoming and has more than 40 years of mining related experience, with approximately 30 years experience in uranium geology, production and regulatory permitting within the United States and overseas. Heaving been served as a Project Manager within the U.S. Nuclear Regulatory Commission's (NRC) Uranium Recovery Branch, and he has a unique understanding of the NRC's Commission's rules and regulations pertaining to uranium mining. He is also very familiar with the State of Wyoming's mining regulations as they pertain to conventional mining and in-situ recovery of uranium. He is currently assisting a major U.S. uranium producer with the renewal of their NRC license as well as updates of several of their State of Wyoming mining permits. He also assisted in the development of an NRC license application for a proposed conventional mine and heap leach uranium operation within Wyoming.

James Bernard

James F. Bernard brings over 20 years of professional experience to this contract as a State of Virginia Regulator (as a solid waste groundwater geologist and Voluntary Remediation Program [VRP] case manager) and environmental consultant. Mr. Bernard presently serves as a senior marketing manager, project manager, risk assessor and senior geologist on a wide spectrum of projects including Brownfield's, the VRP, solid waste, unpermitted landfill characterizations and closures, open dump sites, UST investigations, remedial actions and closures, RCRA permitting of hazardous and non-hazardous waste sites, VPDES and NPDES Phase I and Phase II investigations. His specific areas of expertise include Virginia Statutes and Regulations,

business development; public speaking; Recognizing Impaired, Underused, and Devalued Property; Human Health Risk Assessments using IRIS and REBCA; Risk Based Corrective Actions; Field Work Plan Development and Implementation; Waste Characterization and Disposal; and staff mentoring.

3.0 Technical Approach To RFP Work Tasks:

Wright Environmental Services Inc. has assembled a team whose expertise spans not only the Commonwealth's regulations, but other State, Federal and International regulatory structures as well. Wright Environmental Services has selected subject matter experts with impeccable credentials, to ensure that the highest quality of expertise is available to the Commonwealth. This diverse and extensive knowledge base, combined with effective project management, will provide efficient treatment of the requested tasks utilizing a broad and experience-based perspective.

Section III of the RFP (*Statement of Needs*) identifies two Work Tasks (A and B) for which the Commonwealth seeks advice and technical support. The Work Tasks are subdivided in to specific subtasks and subtask items. This proposal has assigned sequential numbers to each task and subtask, paralleling the Statement of Needs. Our proposed approach to each item, reproduced from the RFP in italics, is presented directly following each subtask. The description of the deliverable for each Work Task and commitments to meet the requested schedule for delivery are outlined at the end of the proposal for each Work Task. Mr. Wright's experience managing large groups of technical experts across wide areas of study will be brought to bear to ensure coordinated and efficient application of resources so that all work products are of a high quality and are delivered on time.

3.1 RFP Section III, Work Task A (Initial Literature Analysis and Recommendations)

Section III, Work Task A of the RFP identifies three subtasks for which the State seeks a written report.

3.1.1 Work Task A, Subtask 1(Virginia & Other Relevant Studies)

Virginia & Other Relevant Studies: Utilizes summaries prepared by the Workgroup of existing Virginia uranium mining studies (National Academy of Sciences/National Academies Press [NASINAP], Virginia Beach, Fairfax, Roanoke River Basin Association, Chmura Economics and Analytics, and RTI International, and the 1984 Senes Assessment of Risk and associated Uranium Task Force Report), as well as other relevant studies, and makes recommendations

concerning findings of these studies that are relevant to Virginia's existing regulatory framework that would apply to uranium mining and milling.

Within the three week time-frame following contract award, the Project Team will screen and segregate by subject matter and relevance the summaries of existing Virginia mining studies, other relevant studies initially prepared by the Workgroup and additional materials suggested by the Workgroup and Commonwealth staff. Other targeted studies not listed above to be considered by the Project Team will include but are not limited to:

- Report Of The Virginia Energy Coal And Commission To The Governor And The General Assembly Of Virginia (1985)
  [Work Task A, Subtask 1(Virginia & Other Relevant Studies) continued]

- Socioeconomic Impacts of the Proposed Coles Hill Uranium Mine and Mill (Danville Regional Foundation)
- Predicting Water Quality Problems at Hard Rock Mines (Earthworks, 2006)
- Reports by Cameco Resources concerning recent uranium solubility studies
- Health effects evaluations for Kazakhstan uranium mine/mill workers
- Grants New Mexico uranium miner potentially increased mortality
- Attempts to develop statistically defensible studies of Saskatchewan uranium miners
- Native American uranium miner potential increased risk of nonmalignant respiratory disease
- Recent models developed to assist in determining transport and effects characterization of lung damage.

The Project Team will review and summarize the topics/materials by assigning specific team members with expertise in the targeted subject matter, thereby employing a time-efficient division of labor to quickly digest the content of these materials. All work will be coordinated using a system such as SharePoint™ to minimize the potential for simultaneous work on individual report sections. In addition, the team will draw on member and Workgroup resources with expertise within the existing Commonwealth regulatory framework. This will allow the Team to efficiently assess key elements identified in the studies within the context of the Commonwealth's regulatory framework, so that appropriate recommendations applicable to uranium mining and milling can be made.

3.1.2 Work Task A, Subtask 2 (Existing Regulatory Programs)

Existing Regulatory Programs: Compares existing uranium mining and milling regulatory programs including Nuclear Regulatory Commission (USNRC), any agreement state programs, and international programs (such as Australia, Canada and France), and recommends

provisions from within those regulatory programs that are relevant to the Commonwealth and would be effective in Virginia.

The team will satisfy this subtask by reviewing federal uranium regulatory programs from the USNRC, EPA, DOE and MSHA as well as states with a history of uranium mining and milling. State programs which may be reviewed include, but are not limited to, Colorado, Utah, New Mexico, Wyoming, and Texas. The team will focus on domestic regulations but will also review selected international regulatory requirements, which may have applicability to the Commonwealth. These international entities may include but are not limited to the International Atomic Energy Agency (IAEA), Australia, Canada, France, and Argentina. A best practices matrix will be developed to guide the team in presenting recommendations to the Commonwealth. The matrix will include an analysis of the various programs reviewed. Specifically, the analysis will show how the various program requirements are or are not relevant to the Commonwealth. The analysis also will also include why those elements would or would not be effective for the Commonwealth's purposes.

3.1.3 Work Task A, Subtask 3 (International Emerging Standards)

International Emerging Standards: Summarizes pertinent information and studies from such groups as the International Atomic Energy Agency, the World Nuclear Association, etc. and provides recommendations based on this review that are relevant to the Commonwealth's regulation of the life span of uranium mining and milling including recommendations regarding modem best international practices and other emerging standards and technologies. Identify internationally accepted best practices that can be implemented to mitigate the risk of radioactive releases, discussing technologies available to reduce emissions and maintain a focus on pollution prevention and reduction.

Understanding and summarizing the most current set of emerging international standards represents an evolving target, difficult to capture in regulation, but important nonetheless. Our team includes Dr. Janet A. Johnson, Dr. Craig Little, Dr. George Patterson and Dr. Robert Meyer, who offer as a group more than 140 years of national and international experience in radiation protection, with most of that experience focused on uranium-related field work and regulation. The following discussion, identifying some avenues we will examine to assess emerging international standards, is based on that experience. We offer a few initial examples of innovations we can bring to this project.

[Work Task A, Subtask 3 (International Emerging Standards) continued]

Canada

Because uranium mining in the U.S. has been very limited in scope over the past few decades the USNRC and Agreement State regulations are only now being revised and linked to current technology and health effects studies. However, the Canadian regulatory system has been maintained and updated regularly, as regulators deal with very rich uranium deposits with significant worker and environmental health risk potential.

The Canadian mining and milling regulatory structure is driven by its Nuclear Safety and Control Act. The licensing process is divided into tighter segments than the current U.S. system, encouraging a clear focus on each step. Our team members have first-hand experience with the Canadian regulatory system both from within the Canadian Regulatory Community and via interactions including presentations on licensing characterization technology and regulatory systems at Canadian technical conferences. For example, Dr. Patterson has extensive experience in the Canadian system, most currently as Executive Director of Major Projects (mining), Government of Saskatchewan, Regina. His detailed knowledge of the currently changing Canadian Regulatory Standard S-296 (Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills) is an example of knowledge that will provide the Commonwealth with efficiency and accuracy during the project's rapid enumeration of key emergent international uranium recovery regulatory policies and programs. In addition, Dr. Meyer and Dr. Johnson have presented technical papers based on their experience with licensing programs at Canadian technical sessions such as the Canadian Uranium 2010 Conference in Saskatoon.

International Atomic Energy Agency

Our team's breadth and depth of experience allows not only efficient characterization of emerging international standards, but also the development of suggestions enabling the Commonwealth's regulatory staff to link emerging work to the State (we use state and commonwealth interchangeably throughout the document, is that ok?) regulatory system. For example, one way to ensure that the most up to date standards are being considered during mine/mill licensing is to take advantage of the Uranium Production Site Appraisal Team (UPSAT) process offered by the IAEA. The IAEA website (IAEA.org) states that:

"An UPSAT mission is a peer review of one or more phases of a uranium production cycle by a team of selected international experts having direct experience in the technical areas specific to that operation. The review is a technical exchange of experience and work practices aimed at strengthening the programs and procedures and their implementation at the subject facility. The benefit of such a review for the requesting member State or organization is to obtain

[Work Task A, Subtask 3 (International Emerging Standards) continued]

independent, international expert opinion and advice on proposed or ongoing resource development programs and their implementation; on upgrading present and future safety programs; and on regulatory matters. An UPSAT mission may also be useful in improving communication with the community." (*Extracted/condensed*)

While the UPSAT process was designed to review an operating facility, a central goal of the IAEA is the safe use of nuclear power; applying expert review to development of new regulatory programs is the most powerful way to focus on best, most current practices. Our Team members (Dr.s Meyer, Johnson, Patterson and Little) experience in working with the IAEA, the National Academy of Sciences Board on Radioactive Waste Management, the National Council on Radiation Protection and Measurement, and the USEPA's Science Advisory Board will allow the Commonwealth efficient access and concise assessment of the IAEA and other programs.

World Nuclear Organization (WNA)

Emerging standards may also be tracked by periodically reviewing information published by the WNA. The WNA is dedicated to providing industry leadership associated with the risks of radon in uranium mining, achievement of widespread agreement on indicators that demonstrate adherence to strong sustainable development performance, and promoting universal adherence to the WNA policy document on uranium mining standards through communication with stakeholders (industry, government and external) and promoting the use of common indicators to encourage compliance. Our team members routinely perform radiation protection training for staff within these organizations, providing a route of useful access to concepts and emerging thought within the WNA.

International Commission on Radiation Protection

The ICRP develops detailed reports prepared by expert committees; the reports often become the bases for radiation protection regulations. Through decades of participation in the Health Physics Society's meetings and journals, and as active participants in national and international work, committees, conferences and specialized groups, our team members maintain up-to-date awareness of the activities and plans of the ICRP. Dr. Little, for example, is the long-time editor of our Society's Operational Radiation Safety journal, identifying and reviewing new work from throughout the world. The ICRP's recent "Lung Cancer Risk from Radon and Progeny, and Statement on Radon", ICRP Publication 115, is of particular interest in the context of this proposed project.

Other international opportunities

Our team works regularly with key staff in the major global organizations involved in regulation and research concerning uranium mining and milling. For example, Dr. Meyer has attended and

[Work Task A, Subtask 3 (International Emerging Standards) continued]

presented papers at conferences in Germany, Belgium and Canada. Dr. Johnson has worked in uranium mine licensing locations as distant as Kazakhstan. Our team will use its global base of experience and knowledge to make insightful recommendations leveraging existing and developing international programs.

3.1.4 DELIVERABLE: (Initial Report)

Initial Report - Due: three (3) weeks after contract award date. The contractor shall provide one (1) copy of the report electronically and six (6) hard copies.

Wright Environmental Services Inc. will provide one (1) electronic copy and six (6) hard copies of the initial report within three weeks of contract award. The initial report will compare the Commonwealths' programs with existing uranium mining and milling regulatory programs and requirements including USNRC, selected USNRC agreement state programs, and international programs (such as Australia, Canada and France). In addition, the initial report will summarize pertinent information and studies from such groups as the IAEA and WNA.

Based on the assessments identified above, the initial report will make recommendations:

- regarding findings of the summaries prepared by the Workgroup of existing Virginia uranium mining studies (and other relevant studies) that are relevant to the Commonwealth's existing regulatory framework that would apply to uranium mining and milling;
- regarding provisions from within the reviewed regulatory programs that are relevant to the Commonwealth and would be effective in Virginia; and
- that are relevant to the Commonwealth's regulation of the life span of uranium mining and milling including recommendations regarding modern best international practices and other emerging standards and technologies.

This document will present the program summary information in tabular format to provide for efficient and effective comparison of the requested information supplemented by narrative in a parallel structure. Recommendations will be structured according to regulatory topics (i.e., Environmental Protection, Engineering Controls, Public Health, etc.) and will address policy, statutory and technical issues.

3.2 RFP Section III, Work Task B (Ongoing Technical to Uranium Workgroup)

RFP Section III, Work Task B identifies two subtasks with multiple activities under each subtask for which the Commonwealth seeks monthly progress reports/interim analyses of issues, and the development of a final written report. The RFP Statement of Needs for each work task and subtask are repeated below followed directly by the proposed technical approach for addressing each subtask. The description of the deliverable and the commitment to meet the requested schedule for delivery are outlined at the end of the proposal for each work task.

3.2.1 Work Task B, Subtask 1 (Coordinate with Uranium Workgroup)

The Department of Environmental Quality and the Department of Mines, Minerals and Energy are requesting the contractor accomplish the following tasks between the contract award date and October 15,2012 (specific interim due dates/or issues analyses as directed by the Contract Administrator):

1. Coordinate with the Workgroup through at least monthly progress meetings to develop analyses of the following items and to develop and provide a final report. The contractor must be available to meet with the Workgroup, either face-to-face or via conference calls, as needed to develop interim deliverables and the final report that:

a. Compares recommendations in the initial report (referenced in A. above) to the statutory jurisdictions of the DEQ and DMME;

The initial report makes recommendations concerning findings of previous studies and summaries that are relevant to the Commonwealth's existing regulatory framework that would apply to uranium mining and milling. Leveraging our team members' intimate knowledge of the current State regulations (Environmental Alliance and Potesta & Associates) as well as those of the USNRC, specific Agreement States and international programs, the Team can efficiently and effectively compare those regulatory framework areas that have been recommended for modification or development to the respective jurisdictions of DEQ and DMME, or other departments (i.e., The Department of Health), as appropriate.

Different States have assigned jurisdictions over licensed materials (Source Material and Byproduct Material) to different agencies, according to the statutory structure of that State. For example, Washington State has delegated jurisdiction over radioactive materials to the Washington Department of Health while Utah has delegated this jurisdiction to the Department of Environmental Quality's Division of Radiation Control. As of March 31, 2009, the Virginia Department of Health's Division of Radiological Health (DRH) has regulatory authority over

[Work Task B, Subtask 1 (Coordinate with Uranium Workgroup) continued]

most radioactive materials used in the state (special nuclear material, naturally occurring or accelerator-produced radioactive material, source material).

The Team will review the statutory basis of the existing regulations and segregate the recommendations developed in the initial report for each agency to which that jurisdiction has been delegated. This comparison will be presented in both tabular and narrative form for easy assessment by the Workgroup.

b. Identifies areas where regulatory coverage might need to be created, modified or expanded to ensure protection of public health and the environment with respect to the lifespan of mining and milling projects in Virginia and long-term site monitoring requirements;

The Commonwealths has a multitude of existing statutes, policies and programs that address a broad range of mining issues and the associated protection of public health, safety and the environment. However, the Commonwealth recognizes that uranium mining and milling present additional challenges to the regulatory community with which the Commonwealth has little previous experience. Due to the different characteristics and issues unique to uranium mining and milling adoption of entirely new regulatory frameworks and programs or modification of existing programs may be required. Developing an integrated regulatory framework to effectively and efficiently manage regulation of these activities is fundamental to the Commonwealths obligations to its constituents.

Based on their extensive experience with uranium mining and milling regulation, the Team will use the information developed in Work Task A to develop a detailed summary of areas where regulatory coverage may need to be created, modified or expanded. This summary will focus on the Commonwealth's policy objectives for protection of public health, safety and environment and the existing and emerging policies and programs of other State, Federal and international regulatory programs. The form, structure and content of the individual summaries will be developed in close collaboration with the Uranium Workgroup to ensure clear and concise materials are provided.

c. Recommends changes (including statutory changes) to meet these needs.

Under the current statutory framework the Virginia Division of Radiation Health (DRH) within the Department of Health has assumed regulatory jurisdiction over certain licensed radiological materials though the Commonwealth has not assumed jurisdiction over Byproduct Material associated with uranium milling wastes under the USNRC Agreement State Program. However, jurisdiction over other standards (i.e., water quality, soils, etc.) are currently regulated by other agencies, (i.e., DEQ). Other States such as Utah, which became an Agreement State in the early

[Work Task B, Subtask 1 (Coordinate with Uranium Workgroup) continued]

1990's, consolidated through rulemaking its regulatory program for licensing radionuclides, under the Department of Environmental Quality, which had authority for other critical and related systems (i.e., groundwater and surface water). Mining regulation remained under the Department of Natural Resources, Division of Oil, Gas and Mining. This was an extensive, costly and at times painful process that the State undertook due to the large inventory of potential uranium mining and milling projects and the existing private low level radioactive waste disposal facility in the State.

On the other hand, States with smaller uranium mining and milling project inventories have elected to allow the USNRC to retain regulatory jurisdiction over licensing of Byproduct Material due the USNRC's extensive experience, existing staff and systems and due to the large cost to the State of developing regulations and the internal resources to manage that type of program.

Out Team will focus its extensive and diverse regulatory background and expertise on the information developed in Work Task A and will layout a robust series of detailed recommendations from regulatory and statutory changes that are in-line with the Commonwealth's policy objectives as identified by the Uranium Workgroup. The recommendations will be organized in a manner consistent with the agencies for which changes are proposed. The recommendations will be tiered from the framework level to the level of specific regulations. In the process of developing these recommendations, the Team will discuss detailed issues including policies on milling of alternate feeds, aquifer exemptions for ISR projects and integrated approaches to operational and reclamation criteria.

3.2.1.1 Work Task B, Subtask 2 (Assist the Workgroup in preparing Reports)

The contractor will assist the Workgroup in preparing information for a maximum of six (6) meetings of the Uranium Mining Subcommittee of Coal and Energy Commission to be held between the contract award date and November 30, 2012. Address those issues listed below, as well as any other issues identified by the contractor as being necessary and relevant for an effective regulatory framework for the life cycle of uranium mining and milling in Virginia. Assist the Workgroup in the development of a draft conceptual regulatory framework.

The Commonwealth's regulatory framework should be a reflection and manifestation of it's vision and policies for serving its constituents. Our Team is committed to supporting the Workgroup and the Commonwealth as a whole in developing a robust set of data and information upon which it may base future policy, statutory and regulatory decisions.

[Work Task B, Subtask 2 (Assist Uranium Workgroup in Preparing Reports) continued]

The sections below describe the team's approach to supporting the Workgroup and developing the requisite information for its meetings with the Uranium Mining Subcommittee of the Coal and Energy Commission. Our discussion of approach to the individual issues identified in the sections below will establish the technical basis from which we will assist the Workgroup in developing a conceptual regulatory framework. We believe that the conceptual regulatory framework must be a reflection and manifestation of it's vision and policies.

3.2.1.2 Work Task B, Subtask 2, Item a (Water Quality Monitoring Plan for Surface Waters)

a. Water Quality Monitoring Plan for surface waters, including but not limited to:
(1) Ecological risks associated with radiological toxicity and radiation exposure;
(2) Impacts of mine dewatering activities;
(3) Tracking and minimizing the impacts of elevated concentrations of trace elements;
(4) Impacts of land disturbance activities and surface water run-off; and,
(5) Potential for long-term water quality degradation.

The team will review existing Commonwealth surface water programs and their associated regulations to assess what, if any, additional regulations or guidance may need to be developed to prevent potential impacts to the surface waters of the Commonwealth from uranium mining and milling. The team will evaluate and provide recommendations on the best management practices currently used in the uranium mining industry for prevention of surface water runoff from areas disturbed by mining, milling and tailings disposal areas from degrading surface waters. Using specific examples from our evaluation, the team will provide the Commonwealth with practical and forward looking recommendations to shape existing surface water monitoring programs as they relate to uranium mining and milling. These recommendations will include current requirements and possibly new designs for hydrologic systems characterization and monitoring, analytical programs and hydrologic controls.

Members of the project team are experienced in surface water studies and have assisted in drafting regulatory guidance for Virginia, West Virginia, Pennsylvania, Maryland, Missouri, Oregon and Wyoming mining regulatory programs, as well as the Office of Surface Mining (OSM). This work has included short courses for the regulatory program, a surface drainage handbook (Maryland), OSM Diversion Manual, SME Mining Engineering Handbook (Water and Sediment Control),Western States Reclamation Handbook (OSM), and various hydrology and geomorphology guidelines for the state mining programs (Oregon and Wyoming).

[Work Task B, Subtask 2, Item a continued]

The team will assist the Commonwealth in developing a Water Quality Monitoring Plan for the protection of surface waters potentially impacted by uranium mining and milling activities. The plan will include, but not be limited to:

(1) Ecological risks associated with radiological toxicity and radiation exposure
Monitoring requirements adequate to establish baseline concentrations, track the impacts of elevated concentrations of radiological constituents, and evaluate potential risks associated with those constituents will be identified. The risk assessment typically addresses, potential contaminants, exposure pathways and provides for mitigation measures if risk thresholds are exceeded. Examples of requirements for risk assessments typically included as part of the permitting process will be researched and provided to the Workgroup.

(2) Impacts of mine dewatering activities
Regulations addressing mine dewatering have been developed to ensure that there are no adverse impacts to water quality or quantity in receiving streams, including base flows or overbank flooding. Regulations and guidance should address not only water quality (NPDES), but also the impacts of dewatering on the geomorphic stability of the receiving waters. Requirements to minimize impacts associated with mine dewatering will be evaluated and presented to the Workgroup.

(3) Tracking and minimizing the impacts of elevated concentrations of trace elements
Surface water monitoring requirements must also be adequate to establish baseline concentrations, track the impacts of elevated concentrations of trace elements and radionuclides, and evaluate potential risks associated with an elevation (or any change to) of these constituents. The risk assessment developed as part of the mine permitting process would address trace elements and radionuclides.

(4) Impacts of land disturbance activities and surface water run-off
To monitor and minimize potential impacts of land disturbance activities, mine plans must address design of culverts, impoundments, temporary diversions, hydrologic control structures, spill prevention and mitigation, and discharge permitting. Existing regulations will be evaluated for adequacy in establishing pre-operational baseline surface water runoff, stream flow and watershed characteristics, and existing surface water users. Water control at a site is essential to protect not only the mine and processing facilities, but even more importantly at potential points of exposure such as downstream facilities, nearby users and other environmental receptor points. Design criteria must meet acceptable engineering practices including stability of any rock protection, flood probability, freeboard requirements and geotechnical stability.

[Work Task B, Subtask 2, Item a continued]

(5) Potential for long-term water quality degradation
Long-term water quality degradation can result from several sources including excessive sedimentation, acid mine drainage (this is not a term commonly used in this area, the acidic materials come a variety of materials), failure of tailings ponds, and mobilization of trace elements and radionuclides. Reclamation requirements must address construction of post mining topography (geomorphic stability of the final landform), watershed design, stream channel reconstruction, and construction of permanent impoundments and diversions. Reclamation monitoring should be required to evaluate the potential for long-term water quality impacts.

Examples of regulations and guidance documents pertaining to surface water quality monitoring will be assembled, summarized and provided to the Workgroup. The information will be presented in a format suitable for presentation to the Uranium Mining Subcommittee of the Coal and Energy Commission. Additional subjects identified by the project team and the Workgroup will be addressed during this investigative phase. Based upon feedback from the Uranium Subcommittee, the project team will assist the Workgroup in the development of a draft conceptual regulatory framework addressing surface water monitoring associated with uranium mining and milling in the Commonwealth.

3.2.1.3 Work Task B, Subtask 2, Item b (Water Quality Monitoring Plan for Groundwater)

b. Water Quality Monitoring plan for groundwater, including but not limited to:
(1) The potential impacts on groundwater associated with the construction, operation and decommissioning of a mine, mill and tailings facility;
(2) The threats to groundwater quality related to failure of structures designed to limit movement of contaminants from the tailings into surrounding groundwater and issues associated with inadequate hydraulic isolation in below grade disposal facilities;
(3) Effects of mine dewatering on groundwater quality and quantity;
(4) Effects of mine flooding on groundwater quality and quantity; and,
(5) Effects of exploratory bore holes on groundwater quality.

The team will assess existing Commonwealth groundwater programs and assess areas vital to a producing a competent groundwater monitoring plan including requirements for background characterization, operational and reclamation monitoring, and mitigation of impacts to nearby groundwater users. The assessment will focus on potential groundwater impacts associated with the life cycle of a uranium mining and milling operation from construction through decommissioning, reduction of groundwater impacts due to a tailings impoundment failure or inadequate hydraulic isolation of the tailings, and potential groundwater quantity and quality

[Work Task B, Subtask 2, Item b continued]

impacts caused by exploratory drilling, mine dewatering and mine flooding. Using specific examples from our evaluation, the team will provide the Commonwealth with suggestions for improving existing monitoring programs as they relate to uranium mining and milling. Members of the project team have completed groundwater studies and provided regulatory guidance to Oregon, Utah and Wyoming (DEQ/LQD) mining regulatory programs. They have assisted state regulatory bodies in addressing groundwater interference, impacts to springs, groundwater contamination and the impacts of groundwater discharge from mining to surface water bodies (North Fork of the Potomac River). Members of the project team are currently working on an Underground Coal Gasification (ground water and burn cavity) guidance document for the State of Wyoming and the Office of Surface Mining (OSM).

The team will assist the Commonwealth in developing a Groundwater Quality Monitoring Plan for the protection of groundwater potentially impacted by uranium mining and milling activities. The plan will include, but not limited to:

(1) The potential impacts on groundwater associated with the construction, operation and decommissioning of a mine, mill and tailings facility.

Both state and federal regulations (Agreement of Non-Agreement) should address such impacts. The project team will evaluate the adequacy of the Commonwealth's current regulations and guidance to establish pre-operational baseline groundwater conditions, operational monitoring, and the mitigation of potential impacts to groundwater quantity and quality. It is essential that this effort be defined through reclamation and project closure. The project team will review guidance for the characterization of the geology, potentially impacted formations and aquifers. The project team will assist the Commonwealth in the determination of general, if not site-specific, requirements that might dictate the number of wells and the amount of groundwater data required to adequately characterize baseline groundwater conditions.

(2) The threats to groundwater quality related to failure of structures designed to limit movement of contaminants from the tailings into surrounding groundwater and issues associated with inadequate hydraulic isolation in below grade disposal facilities;

To assess potential impacts to groundwater associated with the construction, operation and decommissioning of a mill and tailings facility, permit applications should include plans for a monitoring network, sufficient to adequately characterize the hydrogeology of the facility and surrounding area. Leak detection systems, liner stability analysis and unsaturated zone monitoring are among the design components that may need to be required. The applicant may be required to address aquifer characteristics near or adjacent to the waste disposal facility including aquifer thickness, velocity and direction of groundwater movement, storage

[Work Task B, Subtask 2, Item b continued]

coefficients or specific yields, transmissivity or hydraulic conductivity and the direction(s) of groundwater flow, and proximity of groundwater users. Requirements for impact assessments and mitigation of below grade disposal facilities have been developed by other states and federal agencies. Regulations from other states and federal entities concerning engineering controls and monitoring of tailings ponds, heap leaches, and process facilities will be reviewed and compared to existing Commonwealth requirements.

(3) Effects of mine dewatering on groundwater quality and quantity;
To assess the potential hydrologic impacts resulting from mine dewatering and flooding, baseline characterization as discussed above is important. The magnitude and timeframe associated with dewatering should be quantified and incorporated into the permit application. Requirements for conceptual and numeric ground water modeling from other regulatory authorities will be reviewed and provided to the Workgroup.

(4) Effects of mine flooding on groundwater quality and quantity;
Evaluation of potential hydrologic impacts resulting from flooding of dewatered mine voids should also address the potential impacts on groundwater quantity and quality. Impacts associated with the re-saturation of the mine voids (and changes in the oxidation state of trace metals) are an important consideration in the modeling effort. The magnitude and timeframe associated with flooding of the voids should also be quantified and incorporated into the permit requirements. Requirements for conceptual and numeric ground water modeling from other regulatory authorities will be reviewed and provided to the Workgroup.

(5) Effects of exploratory bore holes on groundwater quality.
Many states require mapping and proper abandonment of exploratory boreholes to ensure that no cross communication between aquifers takes place. Historic borehole information may be somewhat sketchy and require special efforts by the applicant and review by the regulatory agency. In addition to known exploratory boreholes, lists and maps of all permitted groundwater users and oil and gas drilling activity within and adjacent to the mine permit area should be required. Requirements for the documentation and abandonment of exploratory boreholes will be presented to the Workgroup.

In summary, examples of regulations and guidance documents pertaining to groundwater quality monitoring will be assembled, summarized and provided to the Workgroup. The information will be presented in a format suitable for presentation to the Uranium Mining Subcommittee of the Coal and Energy Commission. Additional subjects identified by the project team and the Workgroup will be addressed during this investigation phase. Based upon feedback from the

[Work Task B, Subtask 2, Item b continued]

Uranium Subcommittee, the project team will assist the Workgroup in the development of a draft conceptual regulatory framework addressing groundwater monitoring associated with uranium mining and milling in the Commonwealth.

3.2.1.4 Work Task B, Subtask 2, Item c (Air Quality Monitoring Plan)

c. Air Quality Monitoring Plan, including but not limited to:
(1) Evaluation of technologies;
(2) Release of particulate matter from wind erosion of ore stockpiles, waste rock, mine tailings, processing facilities, and mine blasting;
(3) Mobilization of contaminants;
(4) Adequacy of the U.S. Environmental Protection Agency's National Emissions Standards for Hazardous Air Pollutants (NESHAP) for radon;
(5) The emission of radon from waste rock piles, ore stockpiles and windblown particulates;
(6) The potential for the release of radon from evaporation ponds and tailings impoundments; and,
(7) The release of radon during dewatering activities.

(1) Evaluation of technologies;
The proposed team has considerable experience designing and operating radiation detection and air monitoring systems to meet NRC and EPA requirements for accuracy and minimum detectable radionuclide activities. The data collected by these systems has become part of most of the recently submitted uranium recovery facility license applications. The team is also highly experienced in assessing air quality data for potential impacts on human and ecological health. For example, Dr. Robert Meyer has designed specialized air monitoring systems for proposed and operating uranium projects at remote sites, focused on assessment of airborne particulate radionuclides to meet the standards identified in USNRC regulatory Guide 4.14.

The proposed team also has experience with the monitoring and assessment of non-radiological airborne contaminants, including hazardous air pollutants (HAPs) and fugitive dust (PM_{10} and $PM_{2.5}$) associated with mining and milling projects. The State of Virginia is within USEPA's Region 3; according to the 2006 National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$, the entire state is currently designated as an "unclassifiable/attainment" area. This indicates an overall high level of air quality for fine particulates. We understand that it is critical to the Commonwealth that the appropriate regulatory requirements are in place to ensure future uranium mining and milling projects preserve the high quality air conditions within the State.

The team will support the Workgroup to develop appropriate and high quality information materials for use in making presentations to the Uranium Mining Subcommittee of the Coal and

[Work Task B, Subtask 2, Item c continued]

Energy Commission. Though the precise nature and scope of the information materials the Workgroup will require is not yet known, we anticipate the reviews will summarize current national and international practices encompassing technologies designed with NRC, EPA, Canadian, IAEA and other air quality guidance in mind.

(2) Release of particulate matter from wind erosion of ore stockpiles, waste rock, mine tailings, processing facilities, and mine blasting;

Our team members have extensive experience in calculating soil erosion losses and atmospheric suspended material loading from mining operations. For example, we frequently use EPA calculations and air emissions factors for crushed stone processing operations as a method of assessing the release of particulate matter from ore stockpiles, waste rock, mine blasting, mill tailings, processing facilities and heap leach pads. This method estimates total particulate matter, as well as the proportion of particulates in the PM_{10} and $PM_{2.5}$ size range. These equations can be applied to various components of mineral processing (i.e., primary, secondary and tertiary crushing, screening, conveyor transport, truck loading, etc.). However, other approaches and methods are also available for this type of assessment.

The team will develop appropriate summary materials, with references for more detailed evaluation by the Commonwealth at the direction of the Workgroup. We anticipate that this review will summarize a range of methods for estimating airborne particulates and their associated assumptions for application. In addition, we assume that this summary will assess the relative strengths and weaknesses of each method. The assessment will also include an assessment of the Commonwealth's existing methods for estimating releases of particulates form mining and milling operations, and will make appropriate recommendations for modification or expansion of the current regulatory framework.

(3) Mobilization of contaminants;

Contaminants, including radionuclides, HAPs and fugitive dust, may become mobilized during mining and milling processes through a variety of mechanisms including wind transport, volatilization, underground mine venting, equipment tailpipe and mill stack emissions. Understanding the meteorological conditions under which these contaminants become mobilized and move through the environment is essential to assessing their potential to impact public health and the environment. Members of our team have dozens of years of experience in modeling the release and environmental transport of radioactive materials. These materials includes radon, its decay products and particulate matter through the air, water and soil systems to human and ecosystem receptors. We perform this modeling work through our responsibilities as radioactive materials license Radiation Safety Officers, as Health Physicists overseeing new site licensing, active site monitoring/modeling and remedial action site worker and environmental protection, and as consultants to State, Federal and international agencies. As an example, Dr. Meyer is the

[Work Task B, Subtask 2, Item c continued]

co-editor of the hardcover textbook, "Radiological Assessment", a widely-used reference for all aspects of such work. Our team's combination of practical field work combined with research and agency committee efforts offers an unusually competent approach to assisting in the development of state of the art standards for Virginia in this discipline.

(4) Adequacy of the U.S. Environmental Protection Agency's National Emissions Standards for Hazardous Air Pollutants (NESHAP) for radon;
Radon emissions from uranium mining and milling can pose significant occupational and public radiological exposures if not adequately characterized, monitored and mitigated. 40 CFR Part 61, Subpart B (underground uranium mines) and Subpart W (operating uranium mills) provide the current Federal radon emissions standards for various aspects of uranium mining and milling. In accordance with the Clean Air Act Amendments of 1990, EPA recently formed a workgroup to review and revise the Subpart W standards. The EPA has indicated that the draft rulemaking will be available for public comment in April of 2012, though final rulemaking will not be released for many months.

Several of our team members have been tracking this issue closely and have participated in regional meetings and quarterly EPA public conference calls with EPA's technical advisory panel. It is anticipated that EPA will revise the current requirements of Subpart W to encompass aspects of uranium mining and milling not previously contemplated by the regulations (i.e., heap leach pads, liquid process and waste retention ponds, etc.), though the nature of these revisions is not known at this time. The Team's radiation health physicists are eminently qualified to assess and comment on the adequacy of the current and developing standards, and will not only summarize the current standards for the Workgroup but also will evaluate the draft rulemaking materials when they are published.

(5) The emission of radon from waste rock piles, ore stockpiles and windblown particulates;
Waste rock piles and ore stockpiles, while still on the mine site and not yet placed within the mill area, are considered to be Technically Enhanced Naturally Occurring Radioactive Materials (TENORM). These materials are not considered hazardous wastes or licensed materials under current U.S. regulatory frameworks, and radon flux from these materials is not currently regulated as part of the mine reclamation process though some operators are starting to address radon flux proactively in the context of their reclamation plan designs. Once uranium ores enter a licensed area for processing, they become classified as source material (when $\geq$ 0.05percent uranium). When they become a waste product of the uranium recovery process, they are classified as Byproduct Material as defined in Section 11e.(2) of the Atomic Energy Act, as amended. Windblown particulates are similarly classified but have less potential to emit

[Work Task B, Subtask 2, Item c continued]

substantial amounts of radon unless they accumulate in significant concentrations. However, wind transport of particulates containing radium and other radionuclides is a significant concern for protection of public health, safety and the environment.

Regardless of their regulatory classification, these materials emit radon if they contain radium. The equations and computer codes used to estimate radon emanation from these materials under different geotechnical conditions are well known to the team's experts, many of whom have practical experience in their application during decades of field and consulting work. Description of the methods for estimating radon flux, the underlying assumptions, and the limitations of the primary estimation methods will be summarized, and recommendations for their appropriate application will be made as we develop information materials for the Workgroup.

(6) The potential for the release of radon from evaporation ponds and tailings impoundments;
The emanation of radon from uranium tailings has been studied and modeled for many decades, while the radon flux from evaporation ponds and liquid process ponds, though historically discounted as negligible, has received much recent attention. The U.S. Nuclear Regulatory Commission (NRC) uses work by Rogers et al. (1984) in their Regulatory Guide 3.64 on radon attenuation by earthen tailings covers (NRC, 1989). Radon emanation calculations from cover systems are frequently performed using the RADON model (Rogers at al., 1984; NRC, 1989), a one-dimensional model that calculates radon flux from decay of a radium-226 source (such as uranium tailings). Key input parameters to the model include the radium-226 activity concentration, the coefficient of diffusion of radon through the cover materials, and the density and moisture content values for the cover materials, affecting the diffusion of radon.

Evaporation ponds, though they may possess substantial concentrations of dissolved radium, typically do not emit substantial levels of radon because of the very low diffusion rates of radon through water. The diffusion of radon through water-covered tailings and from the liquids in ponds has been argued to be effectively zero (e.g. Chambers 2009). Recent studies attempting to measure radon flux from uranium mill evaporation ponds (e.g.: Baker and Cox, NRC/NMA 2010 Uranium Recovery Workshop) have indicated a very low radon flux on the order of 1 pCi/m^2-s per 100 pCi/L of dissolved radon. However, EPA is re-assessing its policy of not requiring measurement of radon flux from certain evaporation ponds, and will likely address this issue in its draft rulemaking for 40 CFR Part 61, subpart W, discussed above.

The Team has extensive experience performing annual radon flux measurements on active tailings impoundments to comply with annual NESHAP reporting requirements, and with assessing these data for compliance with the NESHAP standards. This experience, combined

[Work Task B, Subtask 2, Item c continued]

with decades of assessing individual and public radiation exposure data, provides the Commonwealth Workgroup with an excellent resource for meeting their information needs for presentations to the Uranium Mining Subcommittee of Coal and Energy Commission. Our team will ensure that the presentations are accurate and up-to-date.

(7) The release of radon during dewatering activities;
During the dewatering of underground mining operations, ore zones become exposed and de-saturated, and radon flux can increase significantly. The radon emissions standards for underground mines are currently promulgated under 40 CFR Part 61, Subpart B. These standards relate to public exposure from radon emissions from underground uranium mines. Operators must ensure that no member of the public receives an effective dose equivalent of more than 10 mrem/year under this standard. Compliance is typically shown through use of the EPA computer code COMPLY-R, although other models may be used if they meet certain conditions.

Our team of radiation health physicists have employed COMPLY-R within many projects and are familiar with its technical basis and appropriate applications. The team will support the Workgroup in understanding this tool, its strengths and limitations, and its adequacy in the context of ensuring the protection of public health.

3.2.1.5 Work Task B, Subtask 2, Item d (Adequacy of Virginia's Water Quality Standards)

d. Adequacy of Virginia's Water Quality Standards for groundwater and surface waters, including but not limited to address:
(1) Water-soluable radionuclides or absorbed chemicals;
(2) The potential for the increase in radioactivity concentrations in a river/reservoir system and the exceedance of the Maximum Contaminant Level (MCL) established for radiological contaminants for drinking water, recreational use, irrigation, agricultural use, and other non-potable uses;
(3) A sampling protocol and regulatory oversight for radiological contaminants in surface water and groundwater;
(4) The potential for undiluted tailings liquids to exceed existing Safe Drinking Water Act standards for uranium; and,
(5) Identify additional water quality criteria if needed.

The team will review the Commonwealths' existing water quality standards for groundwater and surface water. The review will focus on both radioactive and non-radioactive constituents associated with uranium mining and milling. The team will provide guidance focused on

[Work Task B, Subtask 2, Item d continued]

ensuring the protection of nearby aquifers from mine and milling operations. This guidance may include monitoring well construction standards, inspection and maintenance requirements, minimum sampling requirements, additions to the existing constituent lists, frequency/seasonality of data collection, number of samples required to establish a statistical background determination. Using specific examples from our evaluation, the team will provide the Commonwealth with recommendations to ensure their standards provide adequate surface and groundwater protection, both on and off-site.

Examples of regulations and guidance documents pertaining to water quality standards for groundwater and surface water will be assembled, summarized and provided to the Workgroup. The information will be presented in a format suitable for presentation to the Uranium Mining Subcommittee of the Coal and Energy Commission. Additional subjects identified by the project team and the Workgroup will be addressed during this investigative phase. Based upon feedback from the Uranium Subcommittee, the project team will assist the Workgroup in the development of a draft conceptual regulatory framework addressing ground water and surface water standards applicable to uranium mining and milling in the Commonwealth.

3.2.1.6 Work Task B, Subtask 2, Item e (Standards for the Safe Disposal of Mine Waste)

e. Standards for the safe disposal of mine waste, including but not limited to:
(1) The potential of serious environmental problems resulting from acid mine drainage or other leachate from mine waste;
(2) Segregation and safe disposal of sub-ore grade waste rock;
(3) The safe control and disposal of uranium tailings;
(4) Mitigation of contaminants from existing sources (e.g., tailings, ore stock piles and waste rock piles) to both groundwater and surface water; and,
(5) To address on-site workers health and safety.

Our team has many years of experience in the analysis and mitigation of potential impacts from acid mine drainage and in the design of operational and long-term Byproduct Material storage facilities. In particular, the team has extensive direct experience with design, construction, and regulatory review of uranium mill tailings storage and disposal facilities. We will review and summarize the best available practices for the measurement of the acid generating potential (AGP) and methods for mitigating acid mine drainage. We also will review and summarize USNRC and agreement state regulations, guidance and other best practices for the safe disposal of uranium mining and processing waste. Our review specifically will include:

[Work Task B, Subtask 2, Item e continued]

- the potential for and mitigation of environmental problems resulting from acid mine drainage or other leachate;
- the segregation and safe disposal of sub-ore grade waste rock;
- the safe control and disposal of uranium tailings;
- the mitigation of contaminants from existing sources to both groundwater and surface water; and
- the health and safety of on-site workers health and safety.

The team will combine the results of the literature review with our professional knowledge to provide the Commonwealth with written guidance for developing regulations for uranium mining and milling waste disposal.

3.2.1.7 Work Task B, Subtask 2, Item f (Engineering Designs and Best Management Practices Designed to Prevent the Release of Radionuclides and other Contaminants from Mining)

f. Engineering designs and best management practices designed to prevent the release of radionuclides and other contaminants from mining into ground or surface waters, including but not limited to:
(1) Minimizing the ecological risks from the loading and transportation of the uranium product and chemicals used in the processing operation;
(2) Minimizing the impacts of accidents or natural disasters or management oversight failures that impair the normal operations of the mining, processing, tailings management, or water treatment facilities;
(3) Minimizing the exposures to humans and populations of aquatic and terrestrial biota to elevated levels of radionuclides and other hazardous substances;
(4) Minimizing the exposures of the public to elevated levels of radio nuclides and other hazardous substances; and,
(5) Determining if an effective hydrogeological model is available for use at potential sites.

Our project team is experienced in the design and analyses of long-term storage of uranium mining and milling wastes. Our team members have been involved in extensive research, design, construction, and regulatory oversight of uranium mining and milling facilities to minimize the risk of impact to human health and the environment. We will apply our professional knowledge to the review of the current regulatory standards, to provide recommendations for development of a regulatory framework to the Workgroup. Our recommendations and review will address the following:

[Work Task B, Subtask 2, Item f continued]

(1) Minimizing the ecological risks from loading and transporting of the uranium product and chemicals.

The project team will address ecological risks from the transport of contaminants related to the entire mining and milling life cycle, including:

- Fuel transport and maintenance activities.
- Chemicals utilized in milling
- Chemicals utilized during mining, including blasting agents.
- Handling of uranium product, and byproduct material.

(2) Minimizing the impact of accidents or natural disasters or management of oversight failures that impair the normal operations of the mining, processing, tailing management, or water treatment facilities.

Minimizing Impacts of accidents or natural disasters can be accomplished through adequate site characterization, design of robust engineering controls, and good management practices. The critical issue is to correctly identify and design for the maximum event for which the design is mean to withstand. Engineering controls can consist of riprap, covers, liners and other physical barriers. Management practices include proper storage of wastes to minimize the impacts of natural disasters. We will provide recommendations for design standards including which events represent appropriate design criteria associated analyses to minimize potential impacts resulting from a natural disasters or accidents. We will also provide guidance for the development of emergency response plans for spills, tailing dam breaches, or other failures.

(3) Minimizing the exposures to humans, and populations of aquatic and terrestrial biota, to elevated levels of radionuclides and other hazardous substances

Our team will provide recommendations for reducing radiation exposures to humans and aquatic and terrestrial biota, through management, engineering and institutional controls including best practice in the context of ALARA. A radiation protection and monitoring program, under the control of the site Radiation Safety Officer, will target the minimization of radiation exposure within the context of ALARA. Establishing high quality baseline data including soil, water, air and inventory of ecological resources will allow for better long term monitoring and assessment of potential and actual impacts to surrounding populations.

(4) Minimizing the exposures of the public to elevated levels of radionuclides and other hazardous substances

Public radiation exposure associated with operation of a uranium facility is typically managed through the radiation protection program, under the control of the site Radiation Safety Officer. This program includes both engineering and institutional controls. Minimizing public exposure

[Work Task B, Subtask 2, Item f continued]

is the primary function of an effective ALARA program and associated monitoring. During facility operations, air, soil, and water sampling will be conducted to assess the impact to the public. Environmental transport monitoring, utilizing models such as MILDOS supported by the regulatory community and Argonne National Laboratory, may be used in conjunction with site-specific long-term meteorological data, to estimate public exposures and supplement the results of instrument-based monitoring. Our team will summarize appropriate guidance for effective methods and processes for minimizing public exposure to elevated level of radionuclides.

(5) Determining if an effective hydrogeological model is available for use at potential sites. We will review the current hydrogeological models, and provide recommendations related to the adequacy of the current analyses methods and models to address specific site constraints. Our team includes members who are both expert and experienced in the selection and application of such models, allowing us to quickly and reliably consider model shortcomings and advantages in the context of Virginia's surface and subsurface conditions, recommending the most appropriate model systems for specific regions of the Commonwealth

3.2.1.8 Work Task B, Subtask 2, Item g (Components of a Full Environmental Impact Analysis)

g. Necessary components of a full environmental impact analysis, including but not limited to:
(1) Timing of the environmental impact analysis;
(2) Required components, including baseline and characterization data needed; and,
(3) Legal requirements.

The environmental impact analysis requirements for Federal agencies is set out in the National Environmental Policy Act (NEPA). The implementing regulations for individual Federal agencies (i.e., USNRC, Bureau of Land Management, US Forest Service, etc.) are set out in regulations specific to each agency as their statutory differ. A key component to this federal environmental policy is transparency and public comment. Many States have similar policies and programs, some of which are required when delegated federal authority over specific regulatory programs (i.e., Clean Air Act, Clean Water Act, Underground Injection Control Permits, Agreement State Status for specified radioactive materials, etc.).

Our Team members have extensive experience developing environmental and radiological baseline study programs for permitting and licensing of uranium mining and milling projects. Mr.s Wright, Lidstone, Meyer, Little have all managed and/or developed environmental and radiological monitoring programs for permitting, licensing, operations and reclamation of

[Work Task B, Subtask 2, Item g continued]

uranium mining and milling projects throughout the U.S. and the world. Additionally, Mr.s Chancellor, Gillen, McCoy, and Patterson have extensive experience assessing the adequacy and appropriateness of these data and programs for permitting and licensing of new projects. The breadth and depth of experience will be applied to the items identified in the Statement of Needs as described below.

1) Timing of the environmental impact analysis;
The basis for any impact analysis consists of two primary elements, the proposed action and the baseline environmental characterization. The scope of the baseline characterization cannot be fully determined with a firm understanding of the scope of the proposed action and assessing the adequacy of an environmental assessment is in part ensuring that the scope and approach of data collection as well as the precision and accuracy are commensurate with the proposed action and regulatory requirements.

Licensees and permittees must develop their characterization of baseline conditions and description of proposed action before an assessment of the potential impacts, potential mitigations or potential alternatives can be assessed. The Team will develop a generic schedule for the timing of project scoping, environment baseline data collection and environmental assessment to illustrate the interrelation of factors that influence the timing of environmental impact analyses.

(2) Required components, including baseline and characterization data needed; and,
The standard components of Environmental Impact Statements (EIS) and Environmental Assessments (EA) are well known and are not reproduced for this proposal. These assessments include evaluation of impacts from catastrophic failures and management systems performance under extreme environmental conditions over long timeframes. The proposed Team have successfully scoped, designed and implemented robust environmental impact analysis. For example, Mr. Wright and Dr.s Meyer, Little and Johnson have designed and managed all or parts of several environmental baseline and impacts studies for licensing, operation and reclamation of numerous private (Atomic Energy Act Title I) and Federal (Atomic Energy Act Title II) uranium mill projects throughout the U.S. In addition, Mr.s Chancellor, Gillen and Patterson have extensive experience assessing the adequacy of such studies and have insights into issues related to system failures and project scoping. We will focus this expertise into developing a summary of required environmental impact assessment components with recommendations for expanded areas of assessment or suggestions for regulatory specificity.

[Work Task B, Subtask 2, Item g continued]

(3) Legal requirements.
Though the proposed Team is not qualified to provide legal counsel, the team does have extensive experience interpreting and implementing the statutory requirements of State and Federal environmental rules and regulations. The team will identify the governing legal requirements and relevant guidance documents related to environmental impact assessment of uranium mining and milling projects, which include but are not limited to the items identified in Table 1.

3.2.1.9 Work Task B, Subtask 2, Item h (Methods for Incorporating ALARA)

h. Methods for incorporating "As Low As Reasonably Achievable" (ALARA) standards into Commonwealth regulations of uranium mining and milling.

The ALARA concept is derived from the radiation protection principles originally put forth by the International Commission on Radiological Protection (ICRP) in its 1977 Recommendations: Justification Optimization, and Limitation. Optimization, or the ALARA concept, provides for the use of radiation and radioactive material for the benefit of mankind while keeping radiation doses as low as reasonably achievable ***below*** the standards established to limit radiation doses.

The international radiation protection community has embraced these three principles and the ALARA concept. ICRP and IAEA guidance and most regulatory authorities have incorporated ALARA. The same essential concept is expressed by the American Conference of Governmental Hygienists (ACGIH) as maintaining concentrations "As Low As Practicable".

The evolution and implementation of ALARA in international guidance such as the recommendations in ICRP Publication 103 and IAEA Safety Standard No. SF-1 as well as state, national and international regulations will be summarized and specific recommendations developed to guide the Commonwealth in incorporating ALARA into the applicable regulations. The team includes individuals with professional credentials in both industrial hygiene (Certified Industrial Hygienist) and radiation protection (Certified Health Physicist) as well as extensive experience in working with and applying the ALARA principles. For example, Dr. Janet Johnson applied the ALARA concept and regulatory requirements in development and augmentation of Radiation Safety Manuals for the Molycorp Mountain Pass rare earth facility and the Dawn Mining Company uranium mill site. IN the 1990s,she reviewed the "total quality" programs, including implementation of ALARA, for Westinghouse Government-owned, Contractor-operated (GOCO) facilities, such as portions of the Hanford and Savannah River

[Work Task B, Subtask 2, Item h continued]

laboratories, as a member of the Westinghouse Nuclear Safety and Environmental Oversight Committee.

3.2.1.10 Work Task B, Subtask 2, Item i (Methods for Addressing Risk of Catastrophic Events)

i. Methods for addressing risk of catastrophic events into the Commonwealth's uranium mining and milling regulations and the Commonwealth of Virginia's Disaster Preparedness Plan, including but not limited to:
(1) Assessment of risks;
(2) Vulnerability Analysis for security events;
(3) Risk Analysis for natural disasters (including extreme weather events such as tornadoes, hurricanes, etc.);
(4) Minimization of both long-term and short-term environmental effects of the failure of a waste containment facility or a temporary storage area;
(5) The potential for extreme flooding events;
(6) The potential for landslides and debris flows;
(7) The potential for seismic events; and,
(8) Addressing the potential impact of failures of on-site storage facilities or accidents in the loading and transportation of chemicals on groundwater quality.

(1) Assessment of risks;
Risk assessment for catastrophic failures is an important consideration for the Commonwealth. Should failure not jeopardize human health and safety a higher probability of occurrence may be appropriate. In the event that failure may result in the need or demand for a high degree of protection, design must address a lower probability of occurrence. The project team will assess risks based on certain considerations including:

- the facility itself (materials stored or contained);
- impacts downstream (airborne, water borne, solifluction);
- the degree to which failures may jeopardize human health and safety;
- impacts to the environment; and
- legal and financial liabilities.

(2) Vulnerability Analysis for security events;
A vulnerability analysis would address the potential for and mitigation of the following:

- terrorism;
- vandalism; and

[Work Task B, Subtask 2, Item i continued]

- trespass.

(3) Risk Analysis for natural disasters (including extreme weather events such as tornadoes, hurricanes, etc.)
The team will review and provide basic and acceptable procedures for (a) identifying the type of extreme weather events; (b) addressing engineering probability of the occurrence of those events and (c) establishing design procedures for ensuring the degree of protection quantified following the assessment of risks.

(4) Minimization of both long-term and short-term environmental effects of the failure of a waste containment facility or a temporary storage area

It is critical to define not only the degree of failure, but that failure's impact on adjacent and down gradient lands. Within this analysis the project team will address both the long-term and short- impacts of failure.

(5) The potential for extreme flooding events
The team will review and provide basic and acceptable procedures for (a) identifying the type of extreme flooding events; (b) addressing engineering probability of the occurrence of those events and (c) establishing design procedures for ensuring the degree of protection quantified following the assessment of risks. In most cases, the applicant may be required to complete an engineered diversion around the facility to ensure that no licensed materials are released. For permanent or a post mine/processing the structure design and protection needs to be essentially maintenance free.

(6) The potential for landslides and debris flows
The team will provide basic and acceptable procedures for (a) identifying the potential for landslides and debris flows; (b) quantification of the factor of safety (i.e. addressing engineering probability of the occurrence of those events) and (c) establishing design procedures for ensuring the degree of protection quantified following the assessment of risks. In some cases, the applicant may be required to complete rapid drawdown analysis, analyses of the effects of the PMP event, seismic analyses etc. Geotechnical studies must not only address fill but foundation material and adjacent native slopes. To some degree, failure of the structure may be permissible (i.e. allowable maintenance during operational phase). For permanent or post mine/processing facilities the design and protection needs to be essentially maintenance free.

[Work Task B, Subtask 2, Item i continued]

(7) The potential for seismic events
The team will address basic and acceptable procedures for (a) identifying the potential for seismic events; (b) quantification of the seismic coefficient of the site and the potential for liquefaction of tailings or foundation materials.

(8) Addressing the potential impact of failures of on-site storage facilities or accidents in the loading and transportation of chemicals on groundwater quality
Loading, off-loading and transportation related accidents must be addressed. The team will review the hazardous materials handling rules and regulations of the Commonwealth and other applicable regulations. This is a probability based analysis and should not only address the probability of failure, but should also look at emergency spill prevention, training, emergency response and clean up.

3.2.1.11 Work Task B, Subtask 2, Item j (Financial Assurance Mechanisms)

J. Identification and analysis of life span financial assurance mechanisms, including but not limited to:
(1) Providing for modern mining practices for continuous rehabilitation during the life of the mining and milling operation;
(2) Ensuring that life cycle costs as well as long-term stewardship are reflected in the type of and amount of financial surety;
(3) Providing for minimization of long-term impacts to water resources
(4) The potential financial impact on municipal and critical infrastructure related to catastrophic or operational events; and,
(5) Liability provisions for catastrophic events.

(1) Providing for modern mining practices for continuous rehabilitation during the life of the mining and milling operation:
The team will evaluate the Commonwealth's mining and financial assurance regulations to determine if their regulations are adequate to ensure that mine pits, declines and other infrastructure are reclaimed contemporaneously as mining advances and not postponed until the end of the project. Contemporaneous reclamation is a major factor in minimizing the reclamation liability for both the Commonwealth and the operator. The team also will review the Commonwealth's financial assurance regulations and requirements for covering contemporaneous reclamation costs and annual financial assurance updates. Annual financial assurance updates are crucial to maintain adequate coverage of reclamation and

[Work Task B, Subtask 2, Item j continued]

decommissioning liabilities. The USNRC requirements and NUREG-1757 will be reviewed and compared to the Commonwealth's requirements as they relate to mine, mill and mill tailings closure and decommissioning.

Canadian practices, which are slightly different from those of the U.S. and Australia, will also be assessed. For example, new uranium mines in Canada automatically trigger a full Canadian Environmental Assessment Act (CEAA) panel review; the highest level of environmental review process under federal legislation. The Saskatchewan government's review process is also triggered. To reduce administrative overlap, the federal and provincial governments have agreements that allow a joint review to be conducted. In practice, the provincial and federal governments have somewhat different mandates and the joint review will focus on those different aspects of their respective mandates. The joint panel is mandated on the federal side by the Canadian Environmental Assessment Act and Nuclear Safety Act.

Completion of the Canadian environmental review process allows a series of permits to be issued. The authority for these permits and licenses is under at least twenty different Acts and Regulations that cover transportation of hazardous goods, impact of fisheries, safety, air quality, etc.

(2) Ensuring that life cycle costs as well as long-term stewardship are reflected in the type of and amount of financial surety:

Surety companies have been reluctant to provide financial surety services where the end result is not clear – no clear bond release standard or process. Long-term financial assurance for acid mine drainage has been evaluated in detail for other types of mining, specifically coal, copper and gold mining. Long-term stewardship has to be defined as well as the standards and processes for terminating jurisdiction and the release of liability. The team will review the Commonwealth's existing mining regulations and financial assurance guidance as well as that of the USNRC, Canada and other international entities and determine if additional language is needed to guarantee that these long-term post closure issues are covered.

Long-term stewardship of uranium mill tailings and 11e.(2) byproduct material, under USNRC authority, would be managed in perpetuity by assigning these materials to DOE under a general license after closure unless the Commonwealth chooses to take on that responsibility. The process is well established under the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978. The Commonwealth's statutes and regulations will be reviewed to ensure there are no impediments or gaps to effect these transfers. In addition, recommendations will be made regarding changes to the Commonwealth's policies, statutes and regulations should it wish to assume responsibility for long-term stewardship of these licensed materials.

[Work Task B, Subtask 2, Item j continued]

The proposed project team has personal hands-on and in-depth experience assessing life cycle and long-term stewardship costs in compliance with State (Wyoming, Utah, Colorado), Federal (USNRC, USDOE) and international (Canada and IAEA) policies and requirements. This personal experience will provide the Commonwealth with the expertise necessary to fully understand the existing and emerging standards and practices used elsewhere in the context of the Commonwealth's existing regulatory framework. The team will work closely with the Working Group to efficiently develop robust, clear and concise summaries of the requested information to present to the Uranium Mining Subcommittee of the Coal and Energy Commission.

(3) Providing for minimization of long-term impacts to water resources:
The team will consider both potential groundwater and surface water impacts that could result from mining and milling uranium ore, including but not limited to surface storage of mine waste as well as potential loss of tailings or ISR fluids to the environment. The team will identify all possible impacts and describe how they will be addressed during the project review and analysis process. This will be accomplished by a review of the Commonwealth's existing regulations and recommending revisions as necessary based on existing State, USNRC, EPA, IAEA, other international programs and best management practices. The Commonwealth's policies will be reviewed to assess their adequacy to cover necessary clean up actions for potential water resource impacts that could reasonably occur. Recommendations for additional Commonwealth policies, rules and regulations will be made to ensure that the Commonwealth has sufficient safeguards to protect its public, environment and infrastructure from the costs and impacts of unanticipated events.

(4) The potential financial impact on municipal and critical infrastructure related to catastrophic or operational events;

The financial sureties required for prospective mining and milling operations are typically addressed in the permitting and licensing phase of a project and do not usually encompass costs for mitigation of catastrophic failures. Rather, the emphasis is typically put on rigorous preventative design; financial sureties encompass the normally expected costs of decommissioning and reclamation and are adjusted annually. It is during the annual updates that sureties are adjusted for increased scopes of operations and environmental impacts. The team will review the Commonwealth's permitting programs and determine if adequate consideration is given to those potential impacts.

We are aware of the numerous previous studies that relate directly and indirectly to the issue of catastrophic failure and impacts to public and municipal facilities (i.e., two phase study

[Work Task B, Subtask 2, Item j continued]

performed by the City of Virginia Beach, US Department of Energy Uranium Mill Tailings Remedial Action Project costs). The team will consider available previous studies in providing the Commonwealth with an assessment of and recommendations for addressing potential financial impacts on municipal and critical infrastructure related to catastrophic or operational events.

(5) Liability provisions for catastrophic events.
Financial coverage for liability is different than the reclamation performance bonds typically required for mining and milling operations. The reclamation performance bond covers impacts determined through a permit review process, and regulatory requirements are designed to minimize and control those impacts to a defined and acceptable level. Catastrophic events are those that are not planned and therefore, not covered by the reclamation performance bond. The team will use the information gained from subtask (4) above to determine the size of possible liability obligations. In addition, the team will review the Commonwealth's existing liability requirements and make recommendations if needed. We would encourage a close and collaborative dialog with Commonwealth Department staff to draw on their expertise in assessing existing policy and regulatory programs and in developing related recommendations if that is considered effective and appropriate by the Working Group.

3.2.1.12 Work Task B, Subtask 2, Item k (Evaluation of Virginia Uranium, Inc. Data Validity and Reliability)

k. Evaluation of validity and reliability of site-specific data provided by Virginia Uranium, Inc. and its contractors, and analysis of these baseline conditions at the Coles Hill site with regard to the air, water, soil, ore and waste rock, and biota issues that the Commonwealth's uranium mining and milling regulations should be expected to address. Gap analysis of site-specific data available and what is necessary for overall understanding of issues related to statutory and regulatory framework for the protection of human health and the environment.

The Virginia Uranium Inc. Cole's Hill site baseline data and analyses, provided by the Workgroup, will be assessed using the results of the Work Task A effort. The identified State, federal and international standards identified and considered in Work Task A will be reviewed with the Workgroup, identifying the criteria by which the Cole's Hill Site data is to be assessed. The Team will review the design and description of the proposed Virginia Uranium action and evaluate the scope and approach of the baseline characterization data in that context. In addition, the precision, accuracy and quality of the baseline data will be assess with respect to the

[Work Task B, Subtask 2, Item k continued]

adequacy of their sampling and analysis programs and their adherence to those programs. Based on this assessment, the Team will develop a summary of data gaps, if any.

3.2.1.13 Deliverable: (Interim Analysis of Issues)

DELIVERABLE: *Interim Analyses of Issues - Due: As needed for meetings with the Workgroup.*

Though the scope, approach and nature and schedule of the deliverables for the interim analysis of issues is not clearly defined in the Statement of Needs, we assume the interim analyses of issues will address the 11 topics identified above, as well as related items that emerge through the course of this assessment and from discussion with the Workgroup. For the purposes of this proposal it is assumed that six summaries with appropriate materials (i.e., slide presentations, summary technical memoranda with graphs and tables) addressing interim analysis of issues will be developed for the following issue categories.

- Groundwater and surface water monitoring plans, adequacy of water quality standards (subtask items a, b, d).
- Air quality monitoring plan, ALARA (subtask items c, h).
- Standards for the safe disposal of mine waste, engineering designs and best management practices (subtask items e, f).
- Necessary components of full environmental impact analyses, methods for addressing catastrophic events (subtask items g, i).
- Assessment of financial assurance mechanisms (subtask j).
- evaluation of validity and reliability of site-specific data provided by Virginia Uranium, Inc. (subtask k).

3.2.1.14 Deliverable: (Final Report)

DELIVERABLE: *Final Report - Due: October 15,2012. The contractor shall provide one (1) copy of the report electronically and six (6) hard copies.*

Wright Environmental Services Inc. will provide one (1) electronic copy and six (6) hard copies of the final report by October 15, 2012, unless an exception is received from the Commonwealth in writing. The detailed format, structure and content of the final report will be developed through discussions with the Workgroup. For the purposes of this proposal, the final report is assumed to

[Work Task B, Deliverable continued]

present the results of Work Task A and B activities; interim analysis of issues materials will be summarized and presented as attachments to the report.

4.0 Cost Proposal

The proposed cost for this project is $517,600.

Table 2 summarizes the cost basis by Work Task and Subtask. Many assumptions regarding scope, the due date and form of deliverables and interim analyses of issues and the associated level of effort to respond to the Statement of Needs have been made in developing this cost proposal. The following presents the assumptions upon which this cost estimate is based. Should the work awarded deviate from these assumptions we would appreciate the opportunity to revisit the project budget with the Commonwealth.

Assumptions:

- General
  - The Commonwealth provides all necessary guidance and materials in a timely manner that does not impact the contractor's ability to complete the scope of work and deliverables in a timely manner.
- Work Task A
  - The Project Manager and three Technical Leads travel to Richmond, Virginia for a one day meeting to initiate the project.
  - The Project Manager and three Technical Leads travel to Richmond, Virginia for a one day meeting to present the Initial Report and associated findings.
  - No substantial additional issues or items requiring substantial additional labor effort or schedule than those identified in the RFP are requested or required.
- Wok Task B.1
  - No more than six (6) Interim Analysis of Issues Reports are required and that the scopes of these reports are within the scopes and level of effort contemplated by this proposal.
- Work Task B.2
  - Actual and complete Surface Water, Groundwater and Air Monitoring Plans are ***not*** required but rather assessment of the existing surface water, groundwater and air programs and data gap analyses and recommendations.
  - The final report is a synthesis of Work Task A and B efforts with no substantial additions in topics or materials to be addressed.

Table 1 Applicable Regulations and Guidance Documents

Federal Regulations	
AEA	U.S. Atomic Energy Act of 1954, as amended
CAA	Clean Air Act of 1970, as amended
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act, Federal Water Pollution Control Amendments of 1972, as amended
ESA	Endangered Species Act
NEPA	National Environmental Policy Act of 1970, as amended
NHPA	National Historic Preservation Act
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act of 1974, as amended
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978, as amended

Code of Federal Regulations	
6 CFR 27	Chemical Facility Anti-Terrorism Standards
10 CFR 2	Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders
10 CFR 20	Standards for Protection Against Radiation
10 CFR 40	Domestic Licensing of Source Material
10 CFR 51	Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions
29 CFR 1910	Occupational Safety and Health Standards
36 CFR 800	Protection of Historic Properties
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 52	Approval and Promulgation of Implementation Plans
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System
40 CFR 131	Water Quality Standards
40 CFR 141	National Primary Drinking Water Regulations
40 CFR 190	Environmental Radiation Protection Standards for Nuclear Power Operations
40 CFR 192	Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 355	Emergency Planning and Notification

Code of Federal Regulations	
40 CFR 440	Ore Mining and Dressing Point Source Category
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
50 CFR 402	Interagency Cooperation--Endangered Species Act of 1973, As Amended

NRC Guidance Documents	
NUREG-0706	Generic Environmental Impact Statement on Uranium Milling
NUREG-1569	Standard Review Plan for In Situ Leach Uranium Extraction License Applications
NUREG-1620	Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978
NUREG-1623	Design of Erosion Protection for Long-Term Stabilization
NUREG-1748	Environmental Review Guidance for Licensing Actions associated with NMSS Programs
NUREG-5849	Manual for Conducting Radiological Surveys in Support of License Termination

NRC Regulatory Guides	
RG-1.86	Termination of Operating Licenses for Nuclear Reactors
RG-3.5	Standard Format and Content of License applications For Uranium Mills
RG-3.8	Preparation Of Environmental Reports For Uranium Mills
RG-3.11	Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities
RG-3.11.1	Operational Inspection And Surveillance Of Embankment Retention Systems For Uranium Mill Tailings
RG-3.46	Standard Format and Content of License Applications, Including Environmental Reports, for In Situ Uranium Solution Mining
RG-3.5 (Nov., 1977)	Standard Format And Content of License Applications For Uranium Mills
RG-3.56	General Guidance For Designing, Testing, Operating, And Maintaining Emission Control Devices At Uranium Mills
RG-3.59	Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Operations
RG-3.63	Onsite Meteorological Measurements Program for Uranium Recovery Facilities--Data Acquisition and Reporting
RG-4.14	Radiological Effluent and Environmental Monitoring at Uranium Mills
RG-4.15	Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment
RG-8.10	Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable

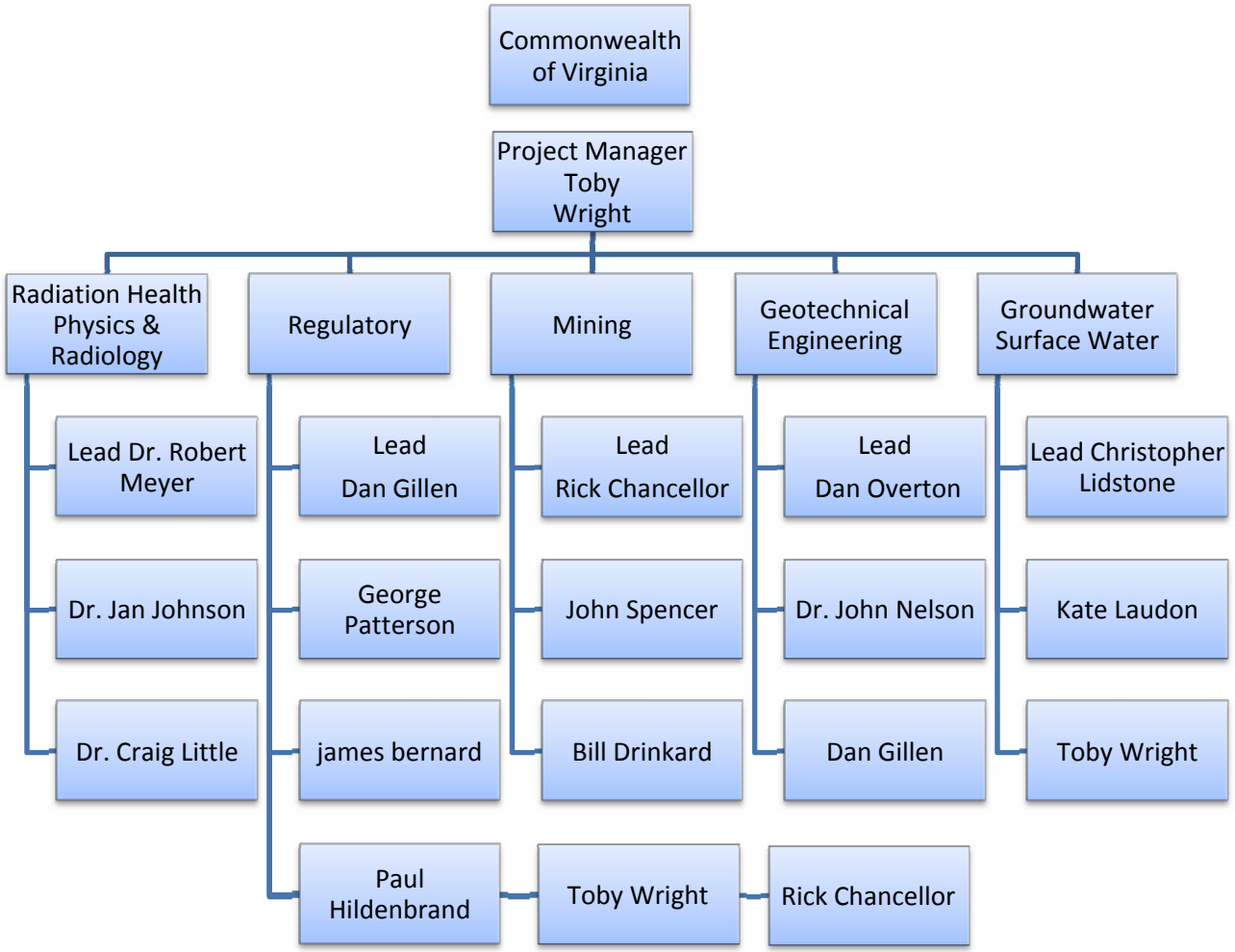
NRC Regulatory Guides	
RG-8.22	Bioassay at Uranium Mills
RG-8.25	Air Sampling in the Workplace
RG-8.30	Health Physics Surveys in Uranium Recovery Facilities
RG-8.31	Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities Will Be as Low as is Reasonably Achievable
RG-8.34	Monitoring Criteria and Methods to Calculate Occupational Radiation Doses

Table 2 Cost Proposal Summary

RFP Section III

Work Task A: Initial Literature Review & Reccomnedations			**Total**		
Subtask 1	Virginia & Other Relevant Studies	$	58,880		
Subtask 2	Existing Regulatory Programs	$	65,680		
Subtask 3	International Emerging Standards	$	29,280		
Travel		$	6,150		
Deliverable	Initial Report	$	300		
				$ 160,290	**Task Total**
Work Task B: Assist Workgroup in Preparing Reports			**Total**		
Subtask 1	Monthly Progress Meetings	$	41,400		
Subtask 1.a	Compare Initial recommendations with Statutory Jurisdiction	$	41,840		
Subtask 1.b	ID areas for new/modified/expanded regulatory coverage	$	33,840		
Subtask 1.c	Recommend Stutory Changes as needed	$	24,820		
Deliverable	Interim Analysis of Issues (6 individual Analyses, one for each meeting)	$	21,420		
				$ 163,320	**Task Total**
Subtask 2	Assist Working Group in Preparing Reports				
Subtask 2.a	Water Quality Monitoring Plan for surface waters	$	14,500		
Subtask 2.b	Water Quality Monitoring plan for groundwater	$	12,880		
Subtask 2.c	Air Quality Monitoring Plan	$	20,300		
Subtask 2.d	Adequacy of Virginia's Water Quality Standards for groundwater and surface waters	$	11,900		
Subtask 2.e	Standards for the safe disposal of mine waste	$	20,940		
Subtask 2.f	Engineering designs and best management practices	$	27,492		
Subtask 2.g	Necessary components of a full environmental impact analysis	$	11,880		
Subtask 2.h	Methods for incorporating ALARA	$	16,780		
Subtask 2.i	Methods for addressing risk of catastrophic events	$	11,692		
Subtask 2.j	Identification and analysis of life span financial assurance mechanisms	$	21,040		
Subtask 2.k	Evaluation of validity and reliability of site-specific data provided by Virginia Uranium, Inc.	$	24,600		
Deliverable	Final Report				
				$ 194,004	**Task Total**
				$ 517,614	**Total**

Figure 1 Proposed Project Organization



APPENDIX A

Offeror Data Sheet

ATTACHMENT A

OFFEROR DATA SHEET

Note: The following information is required as part of your response to this solicitation. Failure to complete and provide this sheet may result in your proposal being scored lower.

1. Qualification: The vendor must have the capability and capacity in all respects to satisfy fully all of the contractual requirements.

2. Vendor's Primary Contact:

   Name: Leonard (Toby) Wright Phone: (970) 231-1160

3. Years in Business: Indicate the length of time you have been in business providing this type of good or service:

   2 Years 0 Months

4. Vendor Information:

   eVA Vendor ID or DUNS Number: VS0000087802 (eVA Vendor Number)

5. Indicate below a listing of at least four (4) current or recent accounts, either commercial or governmental, that your company is servicing, has serviced, or has provided similar goods. Include the length of service and the name, address, and telephone number of the point of contact.

   A. Company: Cameco Resources Contact: Scott Bakken
   Phone: (307) 316-7586 Fax: (307) 635-9949
   Project: Smith Ranch-Highland CLI
   Dates of Service: 1/7/11 - Current $ Value: $253,000.00

   B. Company Titan Uranium USA Inc. Contact: Frank Filas
   Phone: (303) 974-2146 Fax: (303) 974-2141
   Project: Sheep Mountain Project Licensing
   Dates of Service: 3/10/10 - Current $ Value: $255,000.00

   C. Company: Uranium One Americas Contact: Norman Schwab
   Phone: (303) 325-2379 Fax: (303) 325-0110
   Project: Conventional Mining Regulatory Assistance
   Dates of Service: 3/31/10 - Current $ Value: $45,000

   D. Company: Cotter Corporation Contact: John Hamrick
   Phone: (719) 275-7413 Fax: (719) 275-1669
   Project: Remedial Action Program Manager
   Dates of Service: 10/1/2011 - current $ Value: $100,000.00

I certify the accuracy of this information.

Signed: _____ Title: President Date: 3/30/12

APPENDIX B

DMBE Small Business Certification

ATTACHMENT B

Small Business Subcontracting Plan

Definitions

Small Business: "Small business " means a business, independently owned or operated by one or more persons who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, which, together with affiliates, has 250 or fewer employees, or average annual gross receipts of $10 million or less averaged over the previous three years.

Women-Owned Business: Women-owned business means a business concern that is at least 51% owned by one or more women who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, or in the case of a corporation, partnership or limited liability company or other entity, at least 51% of the equity ownership interest is owned by one or more women who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, and both the management and daily business operations are controlled by one or more women who are citizens of the United States or non-citizens who are in full compliance with the United States immigration law.

Minority-Owned Business: Minority-owned business means a business concern that is at least 51% owned by one or more minority individuals or in the case of a corporation, partnership or limited liability company or other entity, at least 51% of the equity ownership interest in the corporation, partnership, or limited liability company or other entity is owned by one or more minority individuals and both the management and daily business operations are controlled by one or more minority individuals.

All small businesses must be certified by the Commonwealth of Virginia, Department of Minority Business Enterprise (DMBE) by the due date of the solicitation to participate in the SWAM program. Certification applications are available through DMBE online at www.dmbe.virginia.gov (Customer Service).

Offeror Name: Wright Environmental Services Inc.

Preparer Name: Leonard (Toby) Wright **Date:** 3/30/12

Instructions

A. If you are certified by the Department of Minority Business Enterprise (DMBE) as a small business, complete only Section A of this form. This shall not exclude DMBE-certified women-owned and minority-owned businesses when they have received DMBE small business certification.

B. If you are not a DMBE-certified small business, complete Section B of this form. For the proposal to be considered and the offeror to be declared responsive, the offeror shall identify the portions of the contract that will be subcontracted to DMBE-certified small business in Section B.

Section A

If your firm is certified by the Department of Minority Business Enterprise (DMBE), are you certified as a (**check only one below**):

X Small Business

_____ Small and Women-owned Business

_____ Small and Minority-owned Business

Certification number: 699614 Certification Date: 3/22/12

APPENDIX C

State Corporate Commission Form

ATTACHMENT C

STATE CORPORATION COMMISSION FORM

Virginia State Corporation Commission (SCC) registration information. The offeror:

☐ is a corporation or other business entity with the following SCC identification number: _____ **-OR-**

☐ is not a corporation, limited liability company, limited partnership, registered limited liability partnership, or business trust **-OR-**

☒ is an out-of-state business entity that does not regularly and continuously maintain as part of its ordinary and customary business any employees, agents, offices, facilities, or inventories in Virginia (not counting any employees or agents in Virginia who merely solicit orders that require acceptance outside Virginia before they become contracts, and not counting any incidental presence of the offeror in Virginia that is needed in order to assemble, maintain, and repair goods in accordance with the contracts by which such goods were sold and shipped into Virginia from offeror's out-of-state location) **-OR-**

☐ is an out-of-state business entity that is including with this offer an opinion of legal counsel which accurately and completely discloses the undersigned offeror's current contacts with Virginia and describes why those contacts do not constitute the transaction of business in Virginia within the meaning of § 13.1-757 or other similar provisions in Titles 13.1 or 50 of the Code of Virginia.

****NOTE**** >> Check the following box if you have not completed any of the foregoing options but currently have pending before the SCC an application for authority to transact business in the Commonwealth of Virginia and wish to be considered for a waiver to allow you to submit the SCC identification number after the due date for offers (the Commonwealth reserves the right to determine in its sole discretion whether to allow such waiver): ☐

APPENDIX D

Team Member Resumes

LEONARD (TOBY) M. WRIGHT, III

Principal Owner\Senior Engineer and Hydrogeologist

EDUCATION

MS, Civil/Geotechnical Engineering, Colorado State University, 1999
BS, Geology, University of Arizona, 1985

REGISTRATIONS

Professional Geologist: Wyoming (#PG-3241)

EXPERIENCE SUMMARY

Mr. Wright formed his own consulting firm, Wright Environmental Services Inc. in March of 2010 to service mining clients throughout the western United States. Mr. Wright is a registered professional geologist with a masters degree in geotechnical engineering and decades of experience in applied hydrology related to mining and milling projects. He also has extensive experience in project and program management for mining related environmental and regulatory programs.

Since forming his own company Mr. Wright has been responsible for new licensing of a uranium mine and recovery site in Wyoming, supporting a radioactive materials license application amendment for a conventional mill to accept alternate feed materials, supported an Alternate Concentration Limit (ACL) application for a reclaimed uranium recovery project, and acting as the Remedial Action Program Manager for a uranium mill undergoing remedial action under CERCLA.

Mr. Wright served as the Environmental Manager for the Conventional Mining Group of Uranium One Americas from March of 2007 through March of 2010. In this role he was responsible for all permitting, environmental compliance and H&S activities for Uranium One's conventional mining and mill operations in the United States. In addition to his responsibilities for staff management, environmental monitoring and regulatory compliance he also assisted company environmental and regulatory due diligence reviews of potential acquisitions.

Mr. Wright also has over 20 years of experience in environmental consulting. For 12 years since 1994, Mr. Wright focused almost exclusively on management of reclamation and remediation projects for uranium mill tailings sites. From 2002 through 2005, Mr. Wright served as the US Department of Energy's Technical Assistance Contract Project Manager for the Moab UMTRA Project. In this capacity Mr. Wright managed a multi-million dollar annual budget with a technical staff of over 40 personnel and a diverse array of programs including operation and maintenance of inactive uranium mill sites, the site health and safety programs, design and implementation of ground water remedial actions, site environmental monitoring and development of a major Environmental Impact Statement. Mr. Wright has also managed or supported several uranium mill tailings reclamation projects in Texas, Utah, Washington and Wyoming.

KEY PROJECT EXPERIENCE

- ***Remedial Action Program (RAP) Manager, Confidential Client, (September 2011-Current).*** Mr. Wright is the contract RAP Program Manager for the remedial actions associated with decommissioning of a uranium mill under the US EPA Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Mr. Wright's responsibilities include development of RAP investigation work plans, technical data reports, remedial action design reports as well as supporting the client with regulatory compliance.

- ***Environmental Manager, Uranium One Americas, Conventional Mining Group (March 2007- March 2010).*** Manager for all environmental, permitting and H&S for the conventional mining group activities in the United States. Key responsibilities included development of an application for amending the Shootaring Canyon Uranium Mill Radioactive Materials License for return to full operations, permitting of various hard rock mining projects in Utah and Wyoming, performing as the Corporate Radiation Safety Officer for the Utah projects and oversight of all conventional group environmental and regulatory compliance obligations. Mr. Wright managed and administrated the Mill personnel and the associated operational budgets.

- ***Reclamation Program Manager, Department of Energy (DOE); Technical Assistance Contract Program, Colorado (June 2002- June 2005).*** Moab Program Manager for the Technical Assistance Contract with DOE Legacy Management office in Grand Junction, Colorado. Mr. Wright was managed all reclamation activities of the uranium mill tailings facilities in Moab and Monticello, Utah. Mr. Wright was also the DOE contract Project Manager for the Monticello Mill Tailings Site CERCLA cleanup. For the Moab Project, Mr. Wright was responsible for managing all aspects of this program including staff, budget as well as the development of an Environmental Impact Statement, operation and maintenance of the site, and construction of interim ground water remedial actions.

- ***Groundwater and Surface Water Characterization, Moab Uranium Tailings Facility, Utah***. Project Manager for a yearlong $1million groundwater and surface water characterization program at the Moab uranium tailings facility. As part of this project Mr. Wright lead technical discussions with the Moab groundwater technical advisory group which consisted of members from the Grand Junction DOE office, EPA, the Park Service, the Fish and Wildlife Service, Utah DEQ, Grand County and the Grand Canyon Trust. Technical issues that he managed included characterization of surface water quality, characterization of groundwater flow and transport, ecological risk assessment (including an assessment of the impact on the endangered species – Colorado Pikeminnow) and evaluation of remedial action alternatives.

- ***Groundwater Characterization, Split Rock Uranium Tailings Facility, Wyoming.*** Managed a multi-year $12 million groundwater characterization and evaluation for a uranium mill tailings impoundment. This evaluation included the installation of more than 100 wells and at its peak included the management of more than 30 staff and multiple contractors. The program resulted in an application to the NRC for alternative concentration limits (ACL) for the site. The NRC is currently evaluating this application and Mr. Wright is managing the response effort to the NRC. A critical part of the application for ACLs is the use of institutional controls. The proposal included some innovative institutional controls. Mr. Wright has been involved with discussion with the Grand Junction DOE office regarding these controls. The Grand Junction DOE office is involved since the site will be in their LTSP program.

- ***Groundwater Characterization, Sequoyah Fuels, Oklahoma***. Mr. Wright managed a groundwater characterization study for the Sequoyah Fuels uranium fuel fabricating facility in Gore, Oklahoma. This project included the characterization of the hydrogeologic and geochemical conditions at the site to predict the transport of key constituents in the groundwater system.

- ***Surface Reclamation and Groundwater Evaluation, Sherwood Uranium Tailings Facility, Washington***. Mr. Wright served as the task leader for surface reclamation and groundwater evaluation for the Sherwood uranium reclamation project. This facility was successfully reclaimed and the license terminated. This facility was transferred to the Grand Junction DOE office as part of the LTSP program and was the first UMTRCA Title II site in an Agreement State to be transferred.

- ***Environmental Management, Batu Hijau Gold-Copper Mine, Indonesia***. Mr. Wright served as the Site Environmental Manager during the permitting and development of this $1.8 billion gold-copper mining project in Sumbawa, Indonesia. For over nine months he resided in Sumbawa, Indonesia and was responsible for all site environmental activities including developing groundwater and surface water monitoring programs, developing and implementing associate QA/QC programs, coordinating off-site consultants developing the Indonesian Environmental Impact Statement and mine permit (ANDAL), management of environmental staff consisting entirely of indigenous personnel.

PUBLICATIONS

Davis, M., Abshire, M., Overton, D., Strachan, C., and **Wright, T.**, 2009. “Best Available Technology Design for a Uranium Tailings Storage Facility.” Proceedings of the Tailings and Mine Waste ’09, Banff, Alberta Canada, November.

Malusis, M., Davis, M., Overton, .M, Castelbaum, D., **Wright, T.**, 2009. “Laboratory Evaluation For Design Of A Mixed Clay/Sand Tailings Impoundment Liner.” Proceedings of the Tailings and Mine Waste ’09, Banff, Alberta Canada, November.

Kaback, D., B. Looney, J. Corey, **L.M. Wright**, and J. Steele. 1989. "Horizontal Wells For In-situ Remediation of Groundwater and Soils." Proceedings of the NWWA 3rd National Outdoor Action Conference on Aquifer Restoration, Groundwater Monitoring and Geophysical Methods, Orlando, Florida, May.

Wright, L.M. and C.D. Shackelford. 1995. "Compatibility of Soil Admixed With Fly Ash to Acetic Acid." Proceedings of the ASCE Specialty Conference Geoenvironment 2000, New Orleans, Louisiana, February.

Wright, L.M. 2001. "Groundwater Characterization and Alternative Evaluation for the Split Rock Uranium Mill Tailings Project." Proceedings of the Tailings and Mine Waste '01, Fort Collins, Colorado, January.

Kirk, Alan R., Kirk, Lisa B., **Wright, Toby**. 2007. "Risk Based Management in Uranium Mine and Mill Design and Operations". Proceedings of the U2007: Global Uranium Symposium, Corpus Christi, Texas, May.

PROFESSIONAL EMPLOYMENT HISTORY

Principal Owner, Engineer & Hydrogeologist, Wright Environmental Services Inc. March 2010 to present
Environmental Manager, Uranium One USA, March 2007 to March 2010
Senior Engineer\Project Manager, Tetra Tech, September 2001 to February 2007
Senior Engineer\Project Manager, Shepherd Miller, Inc., June 1992 to September 2001
Hydrogeologist, Brierley & Lyman Inc., 1990
Hydrogeologist, Sirrine Environmental Consultants Inc., 1986 to 1989
Field Geologist, CRS Sirrine Inc., 1986
Geologist, Arizona Hillside Mining Co., 1983

JANET A. JOHNSON, PHD, CHP, CIH

President, Sopris Environmental, Inc.

EDUCATION

PhD, Microbiology / Environmental Health, Colorado State University, 1986
MS, Health Physics, AEC Health Physics Fellow, University of Rochester, 1959
BS, Chemistry, University of Massachusetts, 1958

REGISTRATIONS/CERTIFICATIONS

Certified in the Comprehensive Practice of Health Physics, American Board of Health Physics since 1976
Certified Industrial Hygienist (Radiological Aspects) since 1986

EXPERIENCE SUMMARY

Dr. Johnson has extensive experience in radiation health physics including radiation worker training, NRC and Agreement State radioactive materials license applications; uranium recovery facility environmental and occupational radiation protection; radiation safety for naturally occurring radioactive materials; Radiation Safety Officer (RSO) training; radiation risk assessment; radon measurements and radon risk assessment; radiological site surveys Including MARSSIM-based characterization and RESRAD dose analyses.

Dr. Johnson has evaluated radiation dose and risk from facilities with residual radioactive materials from both licensed activities and from naturally occurring radioactive materials, with a primary focus for the last seventeen years on uranium recovery facilities and mine remediation. She has developed and implemented radiation safety training programs for workers and radiation safety officers. Dr. Johnson taught in the Department of Radiological Health Sciences at Colorado State University for fourteen years, and is a member of the Department's Advisory Board (currently the Department of Environmental and Radiological Health Sciences). She is working on radiological aspects of the reclamation plans for several uranium mills and has performed risk assessments for a variety of uranium recovery facilities. She is the Radiation Safety Officer of record for the Dawn Mining Company Millsite.

Dr. Johnson was a member of the Environmental Protection Agency Science Advisory Board (SAB) Radiation Advisory Committee (RAC) from 1995 to 2003. She chaired the RAC from 1999 through 2003. During her tenure on the committee the RAC reviewed the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and the Multi-Agency Radiation Laboratory Analytical Protocols Manual (MARLAP) as well as the EPA's approach to diffuse NORM. She was also on the EPA SAB panel that reviewed the Multi-Agency Survey and Assessment of Materials and Equipment Manual (MARSAME). In 2011 she served on an EPA SAB Panel providing advice to the Multi-Agency work group on revisions to MARSSIM.

Dr. Johnson is a member of Scientific Committee 64-22 of the National Council on Radiation Protection and Measurements (NCRP) updating the NCRP Report on Environmental Surveillance. She is currently a member of ANSI N 13.8 Committee redeveloping standards for the protection of uranium miners. She is part of a team that annually presents refresher training classes for uranium recovery facility RSOs. In 2011 the team presented a four weeks of uranium-specific training for the Texas Commission on Environmental Quality (TCEQ).

Dr. Johnson managed the environmental health and safety program at Colorado State University from 1993 to 1995. The program included industrial hygiene, radiation protection, hazardous waste management, and biosafety. Dr. Johnson served on the Westinghouse Government Operations Nuclear Safety and Environmental Oversight Committee. In that capacity she visited six of the major facilities for which Westinghouse was a contractor during the late 1980s and early 1990s.

REPRESENTATIVE PROJECT EXPERIENCE

- ***Radiological Site Assessment.*** Background radiation measurement and assessment of impacts of uranium recovery operations in regard to the reclamation plan.

- ***MARSSIM Site Characterization.*** Preparation and oversight of site characterization based on MARSSIM.

- ***Risk Assessment for Uranium Mill Reclamation Plans.*** Preparation of dose/risk assessment under routine operating conditions and potential accident scenarios for a reclamation plan.

- ***Uranium Mill Tailings Remedial Action Program Health and Safety Audit.*** Industrial hygiene and radiation protection.

- ***Westinghouse Government Operations Nuclear Safety and Environmental Oversight Committee.*** Review of safety and environmental programs at DOE sites managed and operated by Westinghouse, including evaluation of Total Quality Management programs as they pertained to environmental protection and safety.

- ***Health Risk Assessment Panel Subcommittee.*** Preparation of toxicity profiles and radiation risk assessment (Cotter Corporation Canon City Uranium Mill)

- ***Radiation Training.*** Development and presentation of Radiation Safety Training and Hazardous Waste Operations Training, including training and regulatory compliance for radioactive materials licensees.

- ***NORM Risk Assessment.*** Risk assessment for Naturally Occurring Radioactive Materials (NORM).

- ***University Environmental Health and Safety Program.*** Managed the environmental health and safety program for Colorado State University including routine operations, strategic planning, budgeting and personnel.

- ***University Hazardous Waste Program.*** Managed hazardous waste program for Colorado State University including routine disposal, environmental restoration and emergency response.

- ***Industrial Hygiene Course.*** Taught basic industrial hygiene course.

- ***Radiation Courses.*** Taught radiation physics and radiochemistry laboratories and radiation chemistry course.

- ***Occupational Health and Safety Review.*** Occupational health and safety review for a gold mine in Peru.

- ***Radiological Survey.*** Baseline radiological survey for an in situ uranium recovery operation in Kazakhstan.

- ***Radiation Safety Officer Course.*** Taught and developed a training manual for a 40-hour radiation safety officer (RSO) training class for NORM and Uranium facilities.

SUMMARY OF CURRENT AND PREVIOUS PROFESSIONAL AFFILIATIONS

American Industrial Hygiene Association

American Academy of Health Physics

American Academy of Industrial Hygiene

Colorado Radiation Advisory Committee, 1988-present

Colorado Hazardous Waste Commission, 1993-1997

EPA Science Advisory Board, Radiation Advisory Committee, 1994-2003 (Chair 1999-2003)
EPA Science Advisory Board, Executive Committee, 1999 – 2003

Governor's Rocky Flats Scientific Panel on Monitoring, 1989-1992.
Chair, Radiation Committee

Health Physics Society
Fellow
Chair, Nominating Committee, 1990
Chair, Public Education Committee, 1992-1995
Board of Directors, 2000
Secretary-Treasurer, Radon Section, 1996
President, Environmental/Radon Section, 2009-2010
Chair, Ad Hoc Committee, HPS Position Statement on Indoor Radon
2009 Summer School on NORM, faculty and co-author of the text chapter on uranium recovery

National Academy of Sciences Committee on Low-Level Radioactive Waste Siting, New York State, 1993-1996

NCRP Scientific Committee 64-22 (Environmental Measurements)

REPRESENTATIVE JOURNAL PUBLICATIONS AND PROCEEDINGS

Johnson, J.A. Riding the RCRA Roller Coaster - Adventures in closing a micro-mixed waste site. Managing Radioactive and Mixed Waste, *Proceedings of the Twenty-seventh Midyear Topical Meeting of the Health Physics Society.* February 1994.

Johnson, J.A., R.M. Buchan and J.S. Reif. Effect of waste anesthetic gas and vapor exposure on reproductive outcome in veterinary personnel. *American Industrial Hygiene Association Journal* 48(1): 62-66, 1987.

Johnson, J.E. and J.A. Johnson: Radioactivity and detection limit problems of environmental surveillance at a gas-cooled reactor. *ACS symposium Series 361, detection in Analytical Chemistry, Importance, Theory, and Practice.* American Chemical Society, Washington, DC, 1988.

Borak, T.B., J.A. Johnson and K.J. Schiager. A comparison of radioactivity and silica standards for limiting dust exposures in uranium mines. In *Radiation Hazards in Mining: Control, Measurement and Medical Aspects*, M. Gomez, ed. Society of Mining Engineers. New York, NY, 1981.

Borak, T.B., E. Franko, K.J. Schiager, J.A. Johnson and R.F. Holub. Evaluation of recent developments in radon progeny measurements. In *Radiation Hazards in Mining: Control, Measurement and Medial Aspects,* M. Gomez, ed. Society of Mining Engineers, New York, NY, 1981.

Johnson, J.A., K.J. Schiager, T.B. Borak. Contribution of human errors to uncertainties in radiation measurements and implications for training. In Radiation *Hazards in Mining: Control, Measurement and Medical Aspects,* M. Gomez, ed. Society of Mining Engineers, New York, NY, 1981.

Schiager, J.J., J.A. Johnson and T.B. Borak. Radiation monitoring priorities for uranium miners. In *Radiation Hazards in Mining: Control, Measurement and Medical Aspects*, M. Gomez, ed. Society of Mining Engineers, New York, NY, 1981.

Johnson, J.A. "Basic Radiation Protection for Use of Radionuclides in Laboratories," 1991. Teaching manual for forty-hour course.

REPORTS

Hersloff, J., J.A. Johnson and S. Ibrahim. *Radiological Risk Assessment of Abandoned Mine Lands, Radium Land Clean-up Standard*. Wyoming Department of Environmental Quality, 1988.

Borak, T.B. and J.A. Johnson. *Estimating the Risk of Lung cancer from Inhalation of Radon Daughters Indoors: Review and Evaluation.* Colorado State University for USEPA, 1988.

Schiager, K.J., T.B. Borak and J.A. Johnson*. Radiation Monitoring for Uranium Miners: Evaluation and Optimization.* U.S. Department of the Interior, Bureau of Mines. Final Report on contract.

TECHNICAL PRESENTATIONS

Dr. Johnson has presented numerous technical papers at Health Physics Society Annual Meetings, Mid-year Symposia, Mill Tailings Conferences, American Industrial Hygiene Association Conferences, and a meeting of the American Veterinary Medicine Association. In addition she presented an oral paper and a poster at a conference on uranium in groundwater in Frieburg Germany (1998) and presented an invited paper on uranium mining at a SCOPE Radsite meeting in Munich in September 2000. Dr. Johnson presented an invited paper on the effects of radon and smoking at the American Radiation Safety Conference and Exposition in San Diego in June 2003.

H. ROBERT MEYER, Ph.D.

EDUCATION

Ph.D., Radiation Biology, Colorado State University, 1977

M.S., Health Physics, CSU, 1973

Graduate, U.S. Navy Officer Candidate School, Newport, Rhode Island, 1969

B.A., Physics, St. Olaf College, 1967

CERTIFICATIONS/CLEARANCES

RESRAD risk assessment certified, Argonne National Laboratory

ASTM Phase 1 Site Assessment Professional, certified via ASTM course

Accreditation Board for Engineering and Technology, Certified University Health Physics Program Evaluator

Commissioned Line Officer, U.S. Naval Reserve (1969-72 active shipboard duty)

Security Clearance: U.S. DOE Q (inactive); U.S. Navy Secret (inactive)

SUMMARY OF 35 YEARS EXPERIENCE IN RADIATION PROTECTION AND MEASUREMENTS

- Seven years on the research staff at Oak Ridge National Laboratory. Environmental assessment research: nuclear fuel cycle human health risk assessment, alternative energy source risk assessment.
- Seven years managing uranium-related remedial action radiation protection, measurement and environmental modeling on the Uranium Mill Tailings Remedial Action Project. Responsible for worker and environmental radiation protection, and verification of cleanup.
- Radiation protection and measurement expertise including development of RTRAK, a patented environmental radiation gamma scanning mobile data collection system.
- Vice President and Project Manager, Low Level Radioactive Waste siting and design contract from the Commonwealth of Pennsylvania – project included development of 88-layer GIS-linked mapped database describing key geotechnical and other features of the Commonwealth.
- Researcher and project spokesman, Environmental Dose Reconstruction projects for the USCDC at Savannah River National Laboratory, and for the State of Colorado at the Rocky Flats Plant.
- Researcher and subcontract manager – NIOSH-funded worker dose reconstruction and compensation project. Subcontracted to Oak Ridge Associated Universities, Cincinnati.
- Uranium mill site license-designated Radiation Safety Officer for remedial actions at Conquista and Felder Ray Point sites in Texas, and Highlands site in Wyoming.
- Licensing consultant: new uranium mine facilities in Wyoming, specializing in regulatory compliance and site characterization.
- Public involvement experience including some 150 public meeting presentations on radioactive materials cleanup and protection.
- Instructor:
  - Radiation Safety Officer 40-hour training - annual courses presented to practicing RSO's during the last 10 years;
  - Radiation protection and measurements short course presented to California regulatory authorities;
  - Texas license-required 240 hour training program in byproduct uranium-related materials and low-level radioactive waste management, for Waste Control Specialists, Andrews TX;
  - 240-hour course on radiation protection and measurements for Texas Commission on Environmental Quality staff and uranium facility licensees, in Austin TX;
  - Radiation protection and safety annual training instructor for ExxonMobil, ConocoPhillips and Rio Tinto corporations at facilities in Texas and Wyoming
- Co-editor and co-author, "Radiological Assessment", USNRC, USDOE-sponsored 900 page graduate hardcover textbook on radioactive materials environmental transport, modeling, uptake and human health risk assessment.

Examples of Specific Projects:

UMTRA Project. Managed all radiation worker and environmental protection and measurements from startup for 7 years, 20 remedial action sites, up to 138 HP staff, total of some 2000 workers.

Savannah River National Laboratory, Rocky Flats Plant, Idaho National Laboratory. Environmental dose reconstruction projects, research staff member and project spokesman for 7 years.

AATA/JV Inkai. Developed and performed portions of radiation environmental assessment for proposed in situ leach uranium mine in central Kazakhstan.

Cotter Corporation. State license application assistance, radiation protection consulting, annual report MILDOS operation evaluations, management consulting.

MolyCorp Inc. State license application assistance, remedial action consulting. Cost-effectiveness evaluation of remedial action project underway in Pennsylvania.

City of Fallon, NV. Health risk assessment, assistance in coordination with State and Federal agencies.

EMC2, Phelps Dodge Corporation. Developed and performed NORM site scanning and sampling project, performing health risk assessment to evaluate need for remedial action.

B. Thomas Cook Esq. Health risk evaluation for confidential client related to uranium mine/mill operations.

Cogema Inc. ASTM Phase I pre-purchase property evaluations, including radiation health risk.

Accreditation Board for Engineering and Technology. Review of five University health physics programs (undergraduate and graduate) for ABET accreditation.

ConocoPhillips and ExxonMobil. Remedial action planning, execution, radiation protection, measurements, regulatory compliance. RSO-of-Record on Conoco-Phillips license at facilities completing remedial actions in Texas and Wyoming.

Uranium ISL facility licensing assistance for Ur-Energy, Uranium One, Energy Metals, STRATA, Titan Uranium, AUC Inc.. Site characterization and environmental assessment work supporting license applications.

PROFESSIONAL AFFILIATIONS

Health Physics Society

National Council on Radiation Protection and Measurements (committee member)

US EPA Science Advisory Board, Radiation Advisory Committee

National Academy of Sciences, Board on Radioactive Waste Management

National Academy of Sciences, Subcommittees: Review of the New York State Low Level Waste Siting Project; DOE Site Decommissioning; The National Low Level Radioactive Waste Problem

International Atomic Energy Agency, Consultant: Uranium mill tailings characterization systems; Response methods for nuclear accidents.

TRAINING AND CONSULTING ACTIVITIES

High intensity training: “Dealing with the Media”, 1-week course directed by Dr. Leonard Roller, 1989.

Consultant, International Atomic Energy Agency. Co-authored IAEA Technical Report STI/DOC/10/327, “Planning for Cleanup of Large Areas Contaminated as a Result of a Nuclear Accident,” 1988.

Consultant to the USEPA Science Advisory Board, technical review of National Emissions Standards for Hazardous Air Pollutants, 1988.

Consultant to the Centers for Disease Control, Fernald Dose Assessment Project, 1987.

Invited participant, “European Seminar on the Risks from Tritium Exposure,” Mol, Belgium, November 1982.

Invited participant, “Light Water Reactor Accident Mitigation Workshop,” West Germany, April 1981.

Faculty Affiliate, Colorado State University, Ph.D. committee member, 1980 to 1982.

Governor's Planning Committee for the Management of Radioactive and Hazardous Wastes for the State of Tennessee, 1979 to 1980.

SELECTED PUBLICATIONS

Coffman, J., **H.R. Meyer**, and D. Skinner. 1984. “Radiological Measurements to Support Remedial Action on Uranium Mill Tailings.” Proceedings of the American Nuclear Society Annual Meeting.

Meyer, H.R., D. Skinner, J. Coffman, and J. Arthur. 1984. "Environmental Protection in the UMTRA Project." Proceedings of the Fifth U.S. Department of Energy Environmental Protection Information Meeting. CONF-841187, Volume 2. November.

Meyer, H.R and J. Purvis. 1985. "Development of an Interference-Corrected Soil Radium Measurement System." Proceedings of the American Nuclear Society Annual Meeting. San Francisco, California. November. 184–186.

Meyer, H.R, D. Skinner, and J. Coffman. 1985. "Environmental Monitoring in the UMTRA Project." Proceedings of the Health Physics Society Midyear Symposium on Environmental Radioactivity. Colorado Springs, Colorado. January.

Skinner, D. and **H.R. Meyer**. 1985. "Demonstration of 10CFR20 Air Particulate Compliance Requirements on the UMTRA Project." Proceedings of the Health Physics Society Midyear Symposium on Environmental Radioactivity. Colorado Springs, Colorado. January.

Meyer, H.R and D. Skinner. 1986. "Public Information Experience in the UMTRA Project." Proceedings of the Health Physics Society Midyear Symposium. Knoxville, Tennessee. February.

Skinner, D., **H.R. Meyer**, and L.G. Hoffman. 1986. "Environmental Monitoring Requirements During Remedial Action and Stabilization of the Uranium Mill Tailings Project." Proceedings of the Health Physics Society Midyear Symposium. Knoxville, Tennessee. February.

Meyer, H.R. 1987. "Hazardous and Radioactive Wastes: Public Health Issues and Concerns." Proceedings of the American Institute of Chemical Engineers Meeting. Houston, Texas. March.

Meyer, H.R. and C. Daily. 1987. "QA Verification Procedures in Uranium Mill Tailings Processing Site Remedial Action." Proceedings of the American Society for Quality Control, Second Topical Conference on Nuclear Waste Management Quality Assurance. Las Vegas, Nevada, February 9-11, 1987.

Meyer, H.R., C. Begley, and C. Daily. 1987. "Field Instruments Developed for Use on the UMTRA Project." Proceedings of the Waste Management 1987 Annual Meeting. University of Arizona, Tucson. March.

Reith, C.H., R. Richey, M. Matthews, **H.R. Meyer**, C. Daily, F. Petelka, W. Glover, D. Lechel, and J.E. Till. 1988. "Characterization and Remedial Planning for Non-Radiological Toxicants at UMTRA Project Sites." In Waste Management 88. Edited by R.G. Post and M.E. Wacks. Tucson, Arizona: University of Arizona Press.

J.A. Johnson, **H.R. Meyer**, and M. Vidyasagar, "Characterization of Surface Soils at a Former Uranium Mill. Operational Radiation Safety," Supplement to Health Physics, Vol. 90, (February, 2006).

H.R. Meyer, M. Shields, and S. Green, "A GPS-based system for preliminary or remedial action gamma scanning," American Nuclear Society Topical Meeting on Decommissioning, Decontamination, & Reutilization. Denver, Colorado, (August 7-11, 2005).

H.R. Meyer, M. Shields, S. Green, and J. Johnson, "A GPS-based system for radium/uranium contamination gamma scanning. Uranium Mining and Hydrogeology IV. Broder J. Merkel, Andrea Hasche-Berger (Editors). Uranium in the Environment, conference proceedings, Freiberg, Germany (September 2005).

H.R. Meyer, "Parallel Universes: GPS-Based Radiation Mapping for Both Pre-Licensing and License Termination, Proceedings," WM2010, Phoenix (March 2010).

Meyer, H.R., and J.E. Till. 1978. "Global/Generic Studies." In HTGR Fuel Recycle Development Program Annual Report. ORNL-5423. Oak Ridge National Laboratory.

Meyer, H.R., J.E. Till, E.A. Bondietti, D.E. Dunning, C.S. Fore, C.T. Garten, Jr., and S.V. Kaye. 1978. Nonproliferative Alternative Systems Assessment Program - Preliminary Environmental Assessment of Thorium/Uranium Fuel Cycle Systems. ORNL/TM-6069. Oak Ridge National Laboratory. June.

Meyer, H.R., and J.E. Till. 1978. "Radiological Hazards of Denatured U-233 Fuel." In Interim Assessment of the Denatured U Fuel Cycle. Edited by L.S. Abbott, D.E. Bartine and T.J. Burns. ORNL-5388. Oak Ridge National Laboratory. December.

Tennery, V.J., E.S. Bomar, W.D. Bond, L.E. Morse, **H.R. Meyer** and J.E. Till. 1978. Environmental Assessment of Alternate FBR Fuels: Radiological Assessment of Reprocessing and Refabrication of Thorium/Uranium Carbide Fuels. ORNL/TM-6493. Oak Ridge National Laboratory. August.

Tennery, V.J., E.S. Bomar, W.D. Bond, L.E. Morse, **H.R. Meyer**, J.E. Till and M.G. Yalcintas. 1978. Environmental Assessment of Advanced FBR Fuels: Radiological Assessment of Airborne Releases from Thorium Mining and Milling. ORNL/TM-6474. Oak Ridge National Laboratory. October.

Faust, R.A., C.S. Fore, M.V. Cone, **H.R. Meyer** and J.E. Till. 1979. Biomedical and Environmental Aspects of the Thorium Fuel Cycle. ORNL/EIS-111. Oak Ridge National Laboratory. July.

Meyer, H.R. and J.E. Till. 1979. "Anticipated Radiological Impacts of the Mining and Milling of Thorium for the Nonproliferative Fuels." Proceedings of the Symposium–Radioactivity and Environment. Edited by W. Feldt. German-Swiss Society for Radiation Protection, Norderney, Federal Republic of Germany, October 2–6, 1978, IRPA.

Meyer, H.R, C.A. Little, J.P. Witherspoon and J.E. Till. 1979. "A Comparison of Potential Radiological Impacts of U-233 and Pu-239 Fuel Cycles." Transactions of the American Nuclear Society, Winter Meeting, November 12–16, 1979.

Meyer, H.R, J.E. Till, E.S. Bomar, W.D. Bond, L.E. Morse, V.J. Tennery, and M.G. Yalcintas. 1979. "Radiological Impacts of Thorium Mining and Milling." Nuclear Safety 20 (3). June.

Meyer, H.R, D.E. Dunning, D.C. Kocher and K.K. Kanak. 1980. "Dose Conversion Factors." In Recommendations Concerning Models and Parameters Best Suited to Breeder Reactor Environmental Radiological Assessments. Edited by C.W. Miller. ORNL-5529. Oak Ridge National Laboratory. May.

Tennery, V.J., E.S. Bomar, W.D. Bond, **H.R. Meyer**, L.E. Morse, J.E. Till and M.G. Yalcintas. 1980. Summary of the Radiological Assessment of the Fuel Cycle for a Thorium-Uranium Carbide-Fueled Fast Breeder Reactor. ORNL/TM-6953. Oak Ridge National Laboratory. January.

Till, J.E., **H.R. Meyer**, V.J. Tennery, E.S. Bomar, M.G. Yalcintas, L.E. Morse, and W.D. Bond. 1980. "Reprocessing Nuclear Fuels of the Future: A Radiological Assessment of Advanced (Th, U) Carbide Fuel." Nuclear Technology 48 (1). April.

Travis, C.C., **H.R. Meyer**, and C.S. Dudney. 1980. "Health and Environmental Effects of Residential Wood Heat." Proceedings of the National Conference on Renewable Energy Technologies. Honolulu, Hawaii, December 7–11, 1980.

Meyer, H.R. 1981. "Radiological Assessment of an Alternate Breeder Reactor Fuel Cycle." In Symposium on Intermediate Range Atmospheric Transport Processes and Technology Assessment. Edited by C.W. Miller, S.J. Cotter and S.R. Hanna. U.S. Department of Energy CONF-801064. October.

Meyer, H.R. 1982. "Health and Environmental Effects." In Life Sciences Synthetic Fuels Semi-Annual Progress Report. Edited by K.E. Cowser. ORNL/TM-8229. Oak Ridge National Laboratory. May.

Meyer, H.R., J.P. Witherspoon, J.P. McBride, and E.J. Frederick. 1982. Comparison of the Radiological Impacts of Thorium and Uranium Nuclear Fuel Cycles. NUREG/CR-2184. U.S. Nuclear Regulatory Commission. April.

Smith, W.J., F.W. Whicker, and **H.R. Meyer**. 1982. "A Review and Categorization of Saltation, Suspension, and Resuspension Models." Nuclear Safety 23 (6). November–December.

DesRosiers, A.E., **H.R. Meyer**, R.E. Swaja, and K. Brusserman. 1983. "Emergency Planning for Accident Mitigation." In Report of the Workshop on the Evaluation and Mitigation of the Consequences of Accidental Releases of Radioactivity: Identification of Uncertainties. Bad Munstereifel, Federal Republic of Germany.

Killough, G.G., **H.R. Meyer**, and D.E. Dunning. "Radionuclide Dosimetry." In Models and Parameters for Environmental Radiological Assessments. Edited by C.W. Miller. U.S. Department of Energy Critical Review Series.

Meyer, H.R, and G. Holton, "Modeling the Potential Public Health Impacts of Airborne Releases." In Proceedings of the Health and Environmental Risk Analysis Workshop. Brookhaven National Laboratory, Upton, New York.

Meyer, H.R., C.W. Miller, A.E. DesRosiers, G. Stoetzel, D. Strenge, and R.E. Swaja. 1983. "Assessment of Accidental Releases of Radionuclides." In Radiological Assessment: A Textbook on Environmental Dose Analysis. Chapter 14. Edited by J.E. Till and H.R. Meyer. NUREG/CR-3332, ORNL-5968. U.S. Nuclear Regulatory Commission.

Faraday, M.A., B. Legrand, and **H.R. Meyer**. 1991. Planning for Cleanup of Large Areas Contaminated as a Result of a Nuclear Accident. IAEA STI/DOC/10/327. Vienna.

Wiltshire, S., R. Ahrens, G. Anderson, C. Baskerville, R. Bassett, L. Brothers, H. Brown, G. Cederberg, J. Croes, W. Dornsife, J. Ebel, W. Freudenburg, R. Hatcher, C. Hornibrook, J. Johnson, L. Lehman, **H.R. Meyer**, D. Roy, M. Salamon, L. Slosky, and A. Socolow. 1996. Review of New York State Low-Level Radioactive

Waste Siting Process. National Research Council, National Academy of Sciences. Washington, D.C.: National Academy Press.

Till, J.E., A.S. Rood, P.G. Voillequé, P.D. McGavran, K.R. Meyer, H.A. Grogan, W.K. Sinclair, J.W. Aanenson, **H.R. Meyer**, S.K. Rope, and M.J. Case. 2002. Risks to the public from historical releases of radionuclides and chemicals at the Rocky Flats Nuclear Weapons Plant. Journal of Exposure Analysis and Epidemiology 12(5): 355-372.

Chen, Shih-Yew, D.J. Strom, J.G. Yusko, A. LaMastra, **H.R. Meyer**, D.W. Moeller. 2002. Managing potentially radioactive scrap metal. National Council on Radiation Protection and Measurements Report No. 141. November.

SELECTED PRESENTATIONS

Meyer, H.R. 1984. "Environmental Assessment in the UMTRA Project." Health Physics Society Annual Meeting, New Orleans, Louisiana, June.

Meyer, H.R. 1984. "Relative Risks Associated with the Uranium Mill Tailings Remedial Action (UMTRA) Program." Series of public meetings held in Canonsburg, Pennsylvania, before cleanup of the uranium mill tailings site. August 21–24.

Meyer, H.R. 1984. "Environmental Protection in the UMTRA Project." Fifth U.S. Department of Energy Environmental Protection Information Meeting, Albuquerque, New Mexico, November.

Meyer, H.R. 1985. "Analysis of Radon and Air Particulate Data in the UMTRA Project." Health Physics Society Midyear Symposium on Environmental Radioactivity, Colorado Springs, Colorado, January.

Meyer, H.R. 1985. "The UMTRA Project Health Physics Program." Presented to the U.S. Department of Energy Policy, Safety and Environment Appraisal Team, C. Welty, Chair, Albuquerque, New Mexico, April.

Meyer, H.R. 1985. "Relative Risks Associated with the Uranium Mill Tailings Remedial Action (UMTRA) Program." Presented in a series of public meetings held in Tuba City, Window Rock, and Moenkopi, Arizona, before the cleanup of mill tailings sites, October 8–9.

Meyer, H.R. and J. Purvis. 1985. "Development of an Interference-Corrected Soil Radium Measurement System." American Nuclear Society Annual Meeting (invited paper), San Francisco, California, November.

Meyer, H.R. 1986. "Review of Uranium Mill Tailings Remedial Action Project." Presented at the U.S. Department of Energy Remedial Action Contractors Annual Meeting, Oak Ridge, Tennessee, May 5–6.

Meyer, H.R. 1986. "Relative Risks Associated with the Uranium Mill Tailings Remedial Action (UMTRA) Program." Presented at a public meeting to explain the UMTRAP radiation protection program before cleanup work began. Lakeview, Oregon, May 20.

Meyer, H.R. 1986. "Health Risk Experience on the UMTRA Project." Presented at a U.S. Dept. of Energy Seminar on Concerns of Insurance Companies Regarding Remedial Action Risk, Denver CO, November.

Meyer, H.R. 1987. "Instrumentation and Quality Control Techniques for Mill Tailings Remedial Action." Invited presentation at a U.S. Nuclear Regulatory Commission Workshop for Mill Owners, Denver, Colorado, June 3.

Meyer, H.R. 1987. "Relative Risks Associated with the Uranium Mill Tailings Remedial Action (UMTRA) Program." A series of public meetings held to discuss the UMTRA Project radiation protection program before cleanup began. Held in Durango, Colorado, January 20; Rifle, Colorado, May 21; Gunnison, Colorado, July 7; and Mexican Hat, Utah, July 14.

Meyer, H.R. et al. 1978. "Thorium Mining and Milling—An Analysis of Radiological Impacts." Health Physics Society Annual Meeting, Minneapolis, Minnesota, June.

Meyer, H.R. 1979. "An Overview of the Radiological Risks Associated with Thorium Mining in the Lemhi Pass Region." Department of Radiology and Radiation Biology Seminar Series, Colorado State University, Fort Collins, Colorado, May.

Meyer, H.R., C.A. Little, J.P. Witherspoon, and J.E. Till. 1979. "A Comparison of Potential Radiological Impacts of 233U and 239Pu Fuel Cycles." American Nuclear Society Winter Meeting, San Francisco, California, November.

Meyer, H.R. et al. 1979. "Recycle of Thorium-Uranium Fuels—A Radiological Assessment." Health Physics Society Annual Meeting, July.

Meyer, H.R. 1980. "Radiological Assessment of an Alternate Breeder Reactor Fuel Cycle." Presented at the Symposium on Intermediate Range Atmospheric Transport Processes and Technology Assessment, Gatlinburg, Tennessee, October 1–3.

Meyer, H.R. 1982. "Reactor Emergency Planning—Analysis of Key Uncertainties." Presented at the Annual Health Physics Society Meeting, Las Vegas, Nevada, June 30.

Meyer, H.R. 1982. "Long Range Transport and Effects Modeling." Invited presentation at the U.S. Department of Energy Workshop on Risk Assessment Modeling, Airlie House, Virginia, August 2–4.

Meyer, H.R. 1982. "Assessment of Dose from Tritium Releases—Application of Environmental Transport Models" and "Tritium Source Terms." Invited presentations at the European Seminar on the Risks from Tritium Exposure. Sponsored jointly by CEC, CEN/SCK, Mol, Belgium, November 22.

Meyer, H.R. 1989. "Risk Assessment—Disposal in Arid Lands." American Association for the Advancement of Science, Southwest Chapter, topical meeting, Las Cruces, New Mexico, April 6.

Meyer, H.R. 1989. "Proposed LLRW Facility Contract Status and Schedule, Site Screening and Characterization, Design and Operation." Invited presentation, Penn State University, State College, Pennsylvania, November 4.

Meyer, H.R. 1989. "Site Screening and Characterization, Facility Design, Contract Status." Invited presentation, Sierra Club, Pennsylvania PA Chapter, and Environmental Coalition on Nuclear Power joint meeting, State College, Pennsylvania, November 18.

Meyer, H.R., V.J. Barnhart, and M.T. Ryan. 1989. "Developing a Low Level Radioactive Waste Site for the Commonwealth." A series of seven public presentations throughout Pennsylvania, January–February.

Meyer, H.R. 1990. "Political, Administrative and Public Information Aspects." Invited lecture, Management and Disposal of Radioactive Wastes, Harvard School of Public Health, Boston, Massachusetts, July 18.

Meyer, H.R. 1991. "Siting a Low-Level Radioactive Waste Facility for the Commonwealth." Invited presentation, Three Mile Island Alert Annual Meeting, Harrisburg, Pennsylvania, March 28.

Meyer, H.R. 1991. "The Pennsylvania Low-Level Radioactive Waste Facility Siting Process; Host Community Benefits." Invited presentation, North West Planning Commission, Franklin, Pennsylvania, May 3.

Meyer, H.R. 1991. "Low Level Radioactive Waste." Invited presentation, Pennsylvania League of Women Voters Annual Meeting, Ligonier, Pennsylvania, May 11.

Meyer, H.R. 1991. "Political, Administrative and Public Information Aspects." Invited lecture in "Management and Disposal of Radioactive Wastes." Harvard School of Public Health, Boston, Massachusetts, July 17.

Meyer, H.R. 1991. "Siting a Low Level Radioactive Waste Facility in Pennsylvania—Risk Communication in the Correct Direction." Opening invited paper, Plenary Session, Risk Communication for the 90's, Annual Health Physics Society National Meeting, Washington, D.C. July 22.

Meyer, H.R. 1991. "Risk Communication in the Right Direction." Invited presentation, joint meeting, American Nuclear Society Northern Ohio Section and Health Physics Society Northern Ohio Section, Independence, Ohio, September 11.

Meyer, H.R. 1994. "Windblown Suspension of Plutonium from the Rocky Flats Plant." Public workshop, Boulder, Colorado, June.

Meyer, H.R. 1998. Instructor, Risk Assessment Modeling, RAC-sponsored public course in Radiological Risk Assessment, Seattle, Washington.

PROFESSIONAL EMPLOYMENT HISTORY

Vice President, Keystone Scientific, Inc., 1992 to present

Senior Scientist/Project Manager, Tetra Tech Inc., 2001 to 2011

Vice President, Chem-Nuclear Systems, Inc., 1990 to 1992

Executive Director, Chem-Nuclear Systems, Inc., 1983 to 1990

Research Staff Member, Oak Ridge National Laboratory, 1976 to 1983

Line Officer, U.S. Naval Reserve, 1969 to 1972

AWARDS

Society for Technical Communications 1985 Award for “Radiological Assessment – A Textbook on Environmental Dose Analysis," edited by John E. Till and **H. Robert Meyer**, NUREG/CR-3332.

Society for Technical Communications 1980 Award for “Radiological Impact of Thorium Mining and Milling,” H.R. Meyer et al., Nuclear Safety 20 (3).

American Nuclear Society's P.W. Jacoe Award–outstanding nuclear science student, 1976.

Phi Kappa Phi Graduate Honor Society, 1976.

Distinguished Naval Graduate, Officer Candidate School, 1969.

NASA Summer Fellowship, 1966.

PATENT

RTRAK auto-locating mobile gamma scanning system, U.S. Patent #5,025,150, J. Oldham, **H.R. Meyer**, C. Begley, C. Spencer, 1991.

CRAIG A. LITTLE

896 Overview Rd.

Grand Junction, Colorado 81506

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twolines@bresnan.net

PROFESSIONAL EXPERIENCE

Dec 2006 - pres	Principal, Two Lines, Inc. Conduct radiation dose and risk assessments, historical dose reconstructions, field surveys and radiation safety audits for a variety of clients. Involved in baseline environmental surveys and licensing for new uranium processing facilities. Conduct ALARA audits for facilities using radioactive materials. Teach radiation safety officer training courses.
2002 - 2006	Sr. Scientist, MFG, Inc. Served as leader of the Natural Resources and Environmental Assessment Group. Conducted radiation risk assessments, dose calculations and field assessments of radioactivity for a variety of clients nationwide. Developed project proposals, work plans and cost estimates. Produced site investigation reports and monthly reports. Managed projects.
2000 - 2001	Manager, Western Operations, Advanced Infrastructure Management Technologies, a division of the Department of Energy's Y-12 National Security Complex, Oak Ridge, Tennessee. Responsible for twenty-five project managers in offices in Grand Junction, Colorado; Sacramento, California; and Lancaster, California. Projects included a variety of site assessment, risk analysis, and infrastructure improvements at numerous federal facilities nationwide. Projects were funded by Dept. of Energy, Dept. of Defense, Environmental Protection Agency, and others.
1983 - 2000	Leader, Environmental Technology Section (ETS), Life Sciences Division, Oak Ridge National Laboratory located in Grand Junction. Established the group to support USDOE Uranium Mill Tailings Remedial Action Project (UMTRAP). Staff also developed and applied innovative technologies and methodologies to remedy chemical and radiological pollution at numerous locations nationwide. Projects were funded by Dept. of Defense, Dept. of Energy, and other agencies.
1987 - 1998	Adjunct Professor, Department of Radiological Health Sciences, Colorado State University. Served on graduate research committees.
Fall 1979	Guest scientist, Federal Health Office, Munich, Federal Republic of Germany. Assisted in planning and implementing a monitoring system for actinides released from nuclear power plants in the Federal Republic.
1976 - 1982	Research Staff, Health and Safety Research Division, ORNL. Developed and applied computer codes to predict transport of nuclear and non-nuclear pollutants through the environment and subsequent impacts on ecosystems and human systems. Conducted research to assess the accuracy of environmental transport models.
Fall 1976	Environmental Research Assistant, Department of Radiology and Radiation Biology, Colorado State University. Collected environmental samples of plutonium for analysis; analyzed, reduced and summarized subsequent data for publication.

EDUCATION AND TRAINING

1976	Ph.D., Radioecology. Department of Radiology and Radiation Biology, Colorado State University, Ft. Collins, CO. Dissertation title: *Plutonium in a Grassland Ecosystem*.
1971	M.S., Radiation Biology/Health Physics. Department of Radiology and Radiation Biology, Colorado State University, Ft. Collins, CO.
1970	B. A., Biology. McPherson College, McPherson, KS.
1993	The Effective Executive. American Management Association, New York, NY
1989	Strategic Planning. American Management Association, New York, NY. Senior Project Management. American Management Association, New Your, NY.
1986	Cost and Schedule Control Systems Criteria (C/SCSC). Humphreys and Associates, Santa Clara, CA. Included project planning, work breakdown structures, and control systems.
1986	The Management Course. American Management Association, New York, NY. Four-week course covering all aspects of management including financial analysis of businesses, human resource management, and business simulation.

SELECTED PROJECTS

- Molycorp Minerals LLC. 2011. Performed audit of radiation safety program for Mountain Pass rare earth mine, Mountain Pass, California.
- Texas Commission for Environmental Quality. 2011. With two others, developed and delivered 160-hr radiological protection course to satisfy requirements of State of Texas for Waste Control Specialists by-product and low-level waste disposal facility.
- Bureau of Land Management. 2010. Served as advisor to third party oversight contractor for cleanup of abandoned uranium mines in Utah.
- Sandia National Laboratories. Member of 2010 – 2011 advisory committee for Global Threat Reduction Initiative at Sandia National Laboratories, Albuquerque, NM.
- U.S. Forest Service. 2010. Conducted radiological characterization and verification surveys at abandoned uranium mines on US Forest Service land in North Cave Hills area of South Dakota.
- Energy Fuels Resources, Inc. 2010. Modeled potential dose to members of the public for the proposed Pinon Ridge Uranium Milling Facility, Paradox CO. Energy Fuels Resources was awarded a license for the first commercial uranium milling facility in 30 yrs.
- UR Energy, Inc. 2010. Developed public dose estimates to support application for Nuclear Regulator Commission license for Lost Creek In Situ Uranium Recovery Facility, Wyoming.
- Cotter Corp. Annually. Develop estimates of potential public dose from uranium mill operations for Canon City Milling Facility.
- Annually, team-teach Radiation Safety Officer courses for uranium workers for a variety of facilities in western US.
- Los Alamos National Laboratory. 2009. Conducted audit of Rad-NESHAPS program at Los Alamos National Laboratory, Los Alamos, NM.
- Exxon/Mobil. Conducted ALARA audits of 2005 – 2009 radiation safety programs for the Highlands, Wyoming and Felder, Texas uranium recovery facilities.
- Cotter Corp, 2009. Developed 3-dimensional estimate of potential contamination using surface gamma scanning and bore hole sampling to support revision of financial surety bond.
- Energy Employee Occupational Illness Compensation Act Dose Reconstruction Project/Oak Ridge Associated Universities (ORAU), Cincinnati, Ohio. 2006 – 2009. Research, review and document
  technical bases for worker radiation exposure at former weapons manufacturing facilities. Development of Technical Basis Documents, Site Profiles and User's Guides for use in estimating historic worker exposure.
- Chamokane Creek Ecological and Human Health Risk Assessment, Washington. 2005. Conducted a human health risk assessment of potentially contaminated water seeping into a publicly accessible stream.
- Sequoyah Fuels Corporation, Oklahoma. 2005. Performed a human health risk assessment of uranium and heavy metal-bearing materials leaching from a former uranium concentration facility.
- Rocky Flats Environmental Technology Site (RFETS). 2004. Conducted a review of potential radiation
  doses and dose limits to terrestrial biota resident on the site. Compared existing dose limits in use at the site with approaches published for other facilities.
- Water Remediation Technology, Arvada, Colorado. Developed spreadsheet-based dose estimation software to calculate radiation exposure and dose to municipal employees from radium-bearing materials in water treatment tanks.
- Remedial Technology Evaluation, Department of Defense, Environmental Protection Agency. Evaluated a variety of novel remedial technologies to cleanup chemical and radiological pollutants in soil and groundwater at dozens of federal facilities nationwide.
- Uranium Mill Tailings Remedial Action Program (UMTRAP), Department of Energy. Conducted on-site radiation surveys on over 12,000 private and public properties in 10 states. Developed project schedule and allocated resources on this $40M effort.

OTHER ACTIVITIES

2005 - present	Editor-in-Chief, *Operational Radiation Safety* a quarterly supplement to *Health Physics,* the radiation protection journal published by Lippincott Williams and Wilkins for the Health Physics Society.
1999 – present	Member, Board of Trustees. McPherson College, McPherson, Kansas. Currently board chair.
1991 – present	Associate Editor, *Health Physics*, the radiation protection journal published by Lippincott Williams and Wilkins for the Health Physics Society.
2003 - 2009	Member, Board of Directors Marillac Clinic. Provides low-cost medical, dental and vision care to uninsured, low-income patients. Previously served as board president.
2000 - 2003	Member, Board of Director Health Physics Society.
1994 - 1996	Member, Board of Directors, Environmental Radiation Section, Health Physics Society.
1998 - 2001	Member, Board of Directors, Joint Utilization Commission and Riverview Technology Corp.; groups founded to negotiate and receive the DOE/Grand Junction property into private, non-for-profit ownership.

PUBLICATIONS AND PRESENTATIONS

Author or co-author of over 90 papers, publications and reports on a variety of topics. Presented numerous papers at professional meetings, as both contributing and invited speaker. Served on speaker's bureau of Oak Ridge Associated Universities for several different terms.

Richard A. Chancellor

Professional Associate

TECHNICAL EXPERTISE

- ✓ *Environmental Regulation Compliance*
- ✓ *Abandoned Mine Lands Reclamation*
- ✓ *Uranium In situ Permitting*
- ✓ *Uranium Mill Tailings Closures*

Education

M.S. in Mining Engineering, South Dakota School of Mines and Technology, Rapid City, SD (1981)

B.S. in Mining Engineering, South Dakota School of Mines and Technology, Rapid City, SD (1975)

Registrations & Licenses

Registered Professional Engineer in Wyoming (Certificate No. 4835)

Professional Memberships

Member, International Society of Explosive Engineers

Certifications & Training

Omit if none

Work History

RESPEC (2010–Present)

Wyoming Dept. of Environmental Quality; Abandoned Mine Land Division

2007-2010 Administrator

Wyoming Dept. of Environmental Quality; Land Quality Division

1994-2010 Administrator

1985-1994 Engineering Supervisor

1980-1984 District Supervisor

United States Army – Corps of Engineers 1975-1979

OVERVIEW OF EXPERIENCE

Mr. Chancellor has over 30 years' experience in environmental management specializing in mine permitting, reclamation, and compliance. As administrator of the division of Wyoming state government, he was responsible for the regulation of mining and reclamation activities, including Uranium mining, milling and reclamation. Mr. Chancellor directed a staff of scientist and engineers in the review, inspection and compliance of all aspects of mining activities. This direction included writing and interpretation of regulations and the establishment of policies and procedures. It also involved the review of staff technical comments concerning mine permit applications. Mr. Chancellor was also active in the coordination of activities with the following federal agencies:

- Nuclear Regulatory Commission
  - Coordinated permitting, inspection and reclamation bond activities for Uranium mining.
- Office of Surface Mining Reclamation and Enforcement, Department of Interior
  - Implemented the federal coal program.
  - Instituted revised regulations to stay as effective as new federal regulations.
  - Provided documentation of National Environmental Policy Act (NEPA) compliance for new or revised coal mine permits.
  - Provided NEPA documentation to gain approval of expenditure of funds for abandoned mine reclamation.
- Bureau of Land Management, Department of Interior
  - Cooperating Agency for NEPA compliance for federal coal leasing activities.
  - Coordinated permitting and inspection activities for federal noncoal minerals.
  - Entered into cooperative agreements for reclaiming abandoned mines on federal land.
- Forest Service, Department of Agriculture
  - Coordinated permitting, inspection, and compliance of mining operations on Forest Service Lands.
- U.S. Environmental Protection Agency (EPA)
  - Developed new and revised state regulations to comply with EPA's underground Injection Control Program as related to uranium in situ mines.
  - Provided documentation to request aquifer exemptions under the Underground Injection Control Program in association with the permitting of uranium in situ mines.

- Department of Energy (DOE)
  - Coordinated with the Department concerning the disposition of the Riverton Mill uranium mill tailings.
  - Participated in the review of uranium companies' proposals to transfer mill tailings sites to the DOE for long term surveillance and maintenance.

SPECIFIC PROJECT EXPERIENCE

Currently Mr. Chancellor, working with RESPEC under contract with the State of Wyoming, is working on a project reviewing and rewriting Wyoming's in-situ uranium mining guidance document. Also as part of that contract, he is the lead reviewer of a new uranium in situ mine for the Wyoming DEQ.

SELECTED PUBLICATIONS & PRESENTATIONS

Uranium Activity and Wyoming Land Quality Division; NMA/NRC Uranium Recovery Workshop, Denver, Colorado 05/16/2007

WILLIAM F. DRINKARD, III, P. E.

Senior Engineer I

PROFESSIONAL REGISTRATION

Professional Engineer - West Virginia
Professional Surveyor - West Virginia

CERTIFICATIONS

Nuclear Density Gauge Operator
Foreman Certification - Coal
Coal Refuse Impoundment Inspector and Instructor
Certified Welder

EDUCATION

M. S. Environmental Engineering, Marshall University, 2003

M.B.A. Masters Business Administration, 1981, Marshall University

B. S. Mining Engineering, 1980 Virginia Tech

EMPLOYMENT HISTORY

2000-Present Potesta & Associates, Inc.
1995-2000 Massey Coal Company
Marfork Coal Company
Massey Coal Services
Elk Run Coal Company
1994-1995 Mingo Logan Coal Company
1975-1994 Westmoreland Coal Company

AREAS OF SPECIALIZATION

Environmental permitting, hydrologic and hydraulic analysis, project management, impoundment design, site development, storm water management and surveying.

PROFESSIONAL EXPERIENCE

INDUSTRY:

- Coal industry construction project management experience:
  - Project manager for 15 deep mine face-up projects varying in size from 10,000 cubic yards to 500,000 cubic yards.
  - Major coal preparation plant upgrade: railroad loadout, railroad yard upgrade, coal preparation plant upgrade, two coal silo construction projects, coal screening and handling facility and conveyor belt system additions.
  - Approximately 20 pond construction projects.
  - Mine facility utility installations: power lines, water supply and treatment systems, sewage treatment systems, and communications.
  - Fifteen years experience as supervisor of construction crews and contractors working on field implementation of the following projects: surface drainage system construction and maintenance, numerous landslide remediation projects, mine subsidence remediation, surface mine reclamation, and road construction.
  - Start-up of the Brushy Fork Coal Refuse Impoundment.
- Management and preparation of environmental and health permits and responsibility for routine permit reporting requirements.
  - Hampton Division, Westmoreland Coal Company
  - Mingo Logan Coal Company
  - Marfork Coal Company, Massey Coal Company
  - Elk Run Coal Company, Massey Coal Company
- Responsible professional engineer for five coal refuse facilities.
  - Bean Hollow Refuse Facility, Westmoreland Coal Company
  - Ben Creek Slurry Impoundment, Mingo Logan Coal Company
  - Low Gap Refuse Facility, Marfork Coal Company
  - Brushy Fork Impoundment, Marfork Coal Company
  - Elk Run Coal Refuse Impoundment, Elk Run Coal Company

- Twenty years of coal industry experience in development of construction drawings, technical specifications, contractor's bid sheet, and engineer's cost estimate for a variety of construction projects, including all aspects of refuse impoundment facilities, pond construction, access and haul roads. Coal refuse related activities include: daily refuse placement, installation of internal drainage systems, haulroad construction and maintenance, surface drainage system construction and maintenance, contact for governmental regulatory agents, regulatory compliance activities, including paperwork and "on the ground" compliance. Responsible for management of daily surface surveying activities for coal industry engineering office.

- Responsible for daily supervision of work activities of Environmental Construction Crew, Westmoreland Coal Company. The Environmental Construction Crew completed all work associated with pond construction, road maintenance, drainage structure construction and maintenance, and a coal refuse disposal facility.

- Prepared for hearings and served as principal witness for two West Virginia Surface Mine Board hearings.

- Five years industrial engineering experience. This work included performance of underground and surface operation time studies, equipment downtime records and reporting, comprehensive underground mining operation evaluations, and preparation of in-depth capital improvement economic justifications.

- Participated in the Cooperative Education program while attending Virginia Tech. This work included working for Westmoreland Coal Company from 1975 through 1978 as an underground coal miner in the positions of general laborer and equipment operator. Upon graduation from Marshall University in 1981, I worked for twelve months as an underground Scoop Operator on an underground pillar section.

CONSULTING:

- Oversight of compaction compliance and permitting activities for the New West Hollow Coal Refuse Impoundment, Kanawha Eagle Coal Co.

- Oversight for the Elkem Metals Company L.P., Jarrett Branch Landfill. Responsibilities included preparation of permit modification, preparation of construction bid documents, and quality control monitoring and certification for a new cell installation.

- Oversight of routine maintenance for municipal landfill, Nicholas County Landfill, Nicholas County, West Virginia.

- Preparation of plans, specifications, and permits for site development for Trap Hill Middle School, Raleigh County, West Virginia.

- Preparation and review of Spill Prevention, Control and Countermeasure Plans (SPCC) for numerous coal industry sites, Go Mart, Inc., Columbia Gas Transmission Corporation, Flexsys America L.P. and BASF Corporation.
- Preparation of Phase I Environmental Site Assessment for Peabody Coal Company and Greer Limestone.
- Preparation of Environmental Site Assessment for the 6,000 acre Chicopee Coal Company operation and for an underground injection well installation for Plum Creek Land Company.
- Preparation of a Risk Management Program plan for an ammonia tank installation.
- Expert witness for dispute regarding excessive sedimentation of a farm pond.

JOHN D. NELSON, Ph.D., P.E.
Principal Geotechnical Engineer

EXPERTISE

Dr. John Nelson is a Principal and owner of Engineering Analytics, Inc. In that capacity he provides technical review and expert witness testimony on a variety of projects. Dr. Nelson has over 45 years of experience in the area of foundation engineering and construction. He was on the faculty of Colorado State University for 39 years. During that time he was also an original shareholder in Shepherd Miller, Inc. and served as a corporate consultant at Tetra Tech, Inc. for 7 years.

Dr. Nelson is the senior author of the book, "Expansive Soils: Problems and Practices in Foundation and Pavement Engineering." He has experience in the areas of consulting engineering, research, teaching, and construction. He has a broad range of experience dealing with expansive soils, landslides and slope stability, compacted fills, soft soils, seepage and water movement in soils, design of embankment dams, and mill tailings management. Since 1974 he has been actively engaged in research and practice dealing with foundations on expansive soils, and also tailings management.

In the area of expansive soils, he was the principal investigator on several major research projects to investigate water movement in expansive soils and developed methods of heave prediction beneath slabs. He is also conducting research on full-scale piers in expansive soils. Dr. Nelson has developed a method for the design of stiffened slabs-on-grade and has provided professional litigation support dealing with slabs and foundations on expansive and collapsing soils.

Dr. Nelson has extensive experience in the area of slope stability and creep movement of slopes. He has published several technical papers on this subject as stated in his resume. He has taught several undergraduate and graduate level courses at Colorado State University in which this subject has been part of the curriculum. He has served as a consultant and expert witness on several projects dealing with slope stability both as landslides and as a part of the design and analyses of dams.

In the area of dams and mill tailings management, he served as chief technical reviewer for the USNRC for the Church Rock tailings dam failure and reviewed almost all of the Title II tailings management license applications. He is the engineer of record for the design of raises of tailings dams in Arkansas and New Mexico. He served as an expert witness on litigation involving failure of a tailings dam in Idaho, and on litigation involving seepage from large tailings impoundments in Arizona. He has also served as senior reviewer on several projects dealing with groundwater contamination from, and reclamation of, tailings impoundments. He taught a graduate course on Design of Dams at Colorado State University for over 30 years.

He is the author of more than 100 technical papers and reports.

EDUCATION

B.S. (1960), Civil Engineering – Illinois Institute of Technology
M.S. (1962), Civil Engineering – Illinois Institute of Technology
Ph.D. (1967), Civil Engineering – Illinois Institute of Technology

CERTIFICATION

Arkansas P.E.
Colorado P.E.
Illinois P.E.
Minnesota P.E.
New Mexico P.E.
Wyoming P.E.

PROJECT EXPERIENCE

The following present examples of selected projects on which Dr. Nelson has contributed.

EXPANSIVE SOILS

- Author of Book, EXPANSIVE SOILS: Problems and Practices in Foundation and Pavement Engineering.

- Woodward Governor Building, Loveland, CO – Heave of foundation piers in amounts up to 12 inches. Consultant to determine causes and remediation plan.

- Johannesburg, South Africa – Designed stiffened mat foundations on expansive soil for a 3-story masonry dormitory at a gold mine near Welkom, South Africa

- Federal Aviation Administration, TRACON Building, Denver International Airport, Denver, CO – Heave of foundation piers in amounts up to 6 inches and slab-on-grade floor in amounts up to 8 inches. Consultant to determine causes and remediation plans. He also served as an expert witness in litigation.

- Peterson et al., v. Mission Viejo, Highlands Ranch, CO – Class action lawsuit involving 981 houses experiencing distress due to expansive soil. Expert witness in litigation.

- Denver International Airport, Denver, CO – Pavement heave in amounts over 2 feet due to formation of Ettringite after addition of lime for subgrade stabilization. Consultant to determine causes of heave.

- Volunteers of America Building, Montrose, CO – Foundation heave due to Ettringite formation and other factors. Consultant to determine causes of movement.

- Winner Regional Health Care Center, Winner, SD – Building distress due to heave of floor and foundation elements. Consultant to determine extent and cause of distress.

- Litigation Support – Expert witness on over 100 cases involving foundation and slab movement in residential and commercial buildings due to heave of expansive soils.

COLLAPSIBLE SOIL

- Rangely High School, Rangely, CO – Settlement of Pier Foundation due to collapse of collapsible soils. Consultant to determine cause and review repair plan. Also, monitored repair by compaction grouting.

- Terraces Condominiums, Glenwood Springs, CO – Settlement of Shallow Foundations due to collapsible soils. Expert Witness to testify regarding extent and cause of distress, and recommend remedial action. Compaction grouting was accomplished.

- New Castle, CO, - Settlement of several houses constructed on collapsible soils, due to wetting from an irrigation ditch. Expert Witness to testify regarding causes, and model ground water infiltration.

- Tanoan Heights Subdivision, Albuquerque, NM – Settlement of several houses in subdivision adjacent to golf course. Wetting of collapsible soils caused settlement. Expert witness to testify regarding cause and extent of distress.

SLOPE AND RETAINING WALL INSTABILITY

- Colorado Springs, CO – Expert Witness, Large rock slope failure in limestone quarry.

- Aspen, CO, Residences at Little Nell – Expert Witness, Slope movement as a result of high retaining structure. The case involves continuing movement and damage to house above the wall.

- Denver, CO, Sixth Avenue Estates – Expert Witness, Large Slope failure involving approximately 10 high value houses constructed on landslide.

- Cedar Heights, Colorado Springs, CO – Expert Witness, Failure of several large embankments supporting roads across small canyons.

- Redlands Parkway, Grand Junction, CO – Expert Witness, Landslide of bluff overlooking the Colorado River. Landslide damaged house constructed at top of bluff.

- Vancouver, BC, Canada – Expert Witness, failure of Stress-Wall patented retaining wall along roadside.

- York Canyon Tailings Dam #2, - Consultant on slope failure near abutment.

- Nchanga Copper Mine, Zambia, Africa – Review consultant on 1,000 ft high open pit high-wall that was undergoing creep movement.

- Fort Collins, CO Joe Wright Reservoir – Consultant on monitoring slope movement at dam abutment.

TAILINGS AND WATER RESOURCE DAMS

Conducted Seepage and Stability Analyses and Design of Dams. Selected cases include:

- Tailings Dam #3, Pittsburg & Midway, York Canyon Mine, NM - Review Consultant for initial construction.

- Tailings Dam #3, Pittsburg & Midway, York Canyon Mine, NM – Engineer of Record for design of raise of dam.

- Hot Springs Tailings Dam, Umetco Corp., Hot Springs, Arkansas – Design of record for raise and reclamation of tailings dam.

- Doe Run Resources, Idaho – Expert Witness, Overtopping failure of abandoned gold tailings dam.

- Church Rock Tailings Dam, Church Rock, NM – Chief Technical Reviewer for the USNRC, regarding failure of the Church Rock Tailings Dams.

- Church Rock Tailings Dam, Expert Witness for Sphere Insurance Co. regarding claims due to failure.

- UM/MNO, Olen, Belgium - Design of Reclamation for Uranium Tailings.

- Pinal Creek, Globe/Miami, AZ, - Expert Witness regarding seepage from a number of large tailings impoundments.

- Standley Lake Dam, Denver, CO – Member of Review Panel regarding upgrading of dam.

- Royal Commission of Inquiry, Vancouver, BC, Canada – Consulting Expert, prepared report on seepage from tailings dam and testified at Commission Hearings.

- Chief Technical Reviewer, Uranium Mill License Applications, USNRC – Technical support contract to review tailings dam issues as part of license applications.

OTHER CASES

- Pipe Line Failure, Idaho – Expert Witness regarding irrigation pipe line failure due to overloading by trucks passing over pipeline route.

- Blasting Damage, Colorado Springs, CO – Expert Witness regarding damage of foundation due to nearby blasting.

- Blasting Damage, Cripple Creek, CO - Expert Witness regarding damage of foundation due to nearby blasting.

- Drop Forge Hammer Foundation, Colorado Springs, CO – Design of foundation for Drop Forge at factory.

- Post Tensioned Bridge Foundation, Vereeniging, South Africa – Design of foundations for bridge piers.

PROFESSIONAL EMPLOYMENT HISTORY

ACADEMIC EXPERIENCE

- May 2007 – Present, Professor Emeritus, Colorado State University

- Sept. 1973 – May 2007, Faculty Member, Civil Engineering Department Colorado State University, Currently Professor Emeritus; during the period when I was on the faculty, I served in the following capacities.

    - *Nov. 1993 - May 1995*, Director for Southeast Asia; National Technological University; Developed NTU – Thailand

    - *Sept. 1986 -Aug. 1991*, Head, Civil Engineering Department, Colorado State University

    - *Sept. 1985 - June, 1986,* Visiting Specialist, Steffen, Robertson & Kirsten, Inc., Johannesburg, S. A. Review consultant for projects dealing with expansive and collapsing soils, embankments on soft clay, slope stability in mine pits, and seepage and stability of mine tailings.

    - *Sept. 1973 - Sept. 1985*, Program Leader of Geotechnical Engineering Program, Colorado State University. Developed the Geotechnical Engineering Program, and graduate level course work for the program.

- July 1968 - Sept. 1973, Associate Professor (Assistant Professor 1968-1970) Asian Institute of Technology, Bangkok, Thailand, Developed soil dynamics and field operations programs. Director of Drill Rig and Field Instrumentation. Research areas included field instrumentation in clay, shear strength and dilatation of clay, and vibrations of foundations.

- August 1962 - July 1968, IIT Research Institute, Chicago, Illinois, Research Engineer. Major research areas included Lunar Soil Mechanics, response of LEM footpads for Apollo Mission, penetrometer data from the Surveyor Mission. Also conducted preliminary work on stress wave testing of caissons.

CONSULTING ENGINEERING EXPERIENCE

- 2008 – Present, Engineering Analytics, Inc., CEO and Principal
- 2001 – 2008, Tetra Tech, Inc., Principal Geotechnical Engineer
- 1990 – 2001, Shepherd Miller, Inc., Shareholder and Corporate Consultant
- 1978 – 1990, Water Waste and Land, Inc., Shareholder and Corporate Consultant

HONORS and AWARDS

- **Award for Excellence,** 2010, U.S. Army, Presented by Major General Steven R. Abt, Deputy Commanding General, United States Army Accessions Command.
- **Honorary Award**, 2007, presented by Colorado State University in recognition of serving as Chairman of the Tailings and Mine Waste Conference since 1978.
- **Hometown Hero,** 2001, Fort Collins Coloradoan (for Organizing Tailings and Mine Waste Conferences)
- **Abell Faculty Teaching Award,** 1992, College of Engineering, Colorado State University
- **Engineer of the Year Award**, 1990, Professional Engineers of Colorado
- **Meritorious Service Award**, 1989, Professional Engineers of Colorado
- **Certificate of Honor**, 1987, Colorado Engineering Council, Engineering Education and Geotechnical Engineering
- **Gold Medal**, 1987, Presented by HRH Princess Maha Chakri Sirindhorn for Contributions to Geotechnical Engineering from the Southeast Asian Geotechnical Society
- **Chapter Honor Member**, 1984, Chi Epsilon
- **Outstanding Service Award**, 1983, Professional Engineers of Colorado
- **Outstanding Professor Award**, 1976, Chi Epsilon, Colorado State University

- **Honorary Member**, 1973, Southeast Asian Society of Soil Engineering
- **Associate Membership Award**, 1960, Illinois Section, American Society of Civil Engineers

PROFESSIONAL AFFILIATIONS

Fellow, American Society of Civil Engineers

Honorary Member, Southeast Asian Society of Geotechnical Engineering

Member, International Society for Soil Mechanics and Geotechnical Engineering

Member, Society of Mining Engineers (AIME)

Sigma Xi

Tau Beta Pi

Chi Epsilon

PROFESSIONAL ACTIVITIES

1975-Present	Reviewer, Journal of Geotechnical and Geoenvironmental Engineering, American Society of Civil Engineers
1978 - 2007	Chairman, Annual Symposia on Mill Tailings Management, Colorado State University (Tailings & Mine Waste)
1994 - 2006	Organizer and Lecturer of short course on Design of Foundations on Expansive Soil, Colorado State University
1995	Chairman, First International Conference on Environmental Geotechnics, Edmonton, AB, CANADA
1993 - 1995	Chairman, Committee on Environmental Geotechnics, ISSMGE
1991 - 1994	Governor's Council on Colorado Natural Hazards Mitigation
1990 - 1994	Chairman, Technical Committee, TC5, Environmental Control, International Society for Soil Mechanics and Foundation Engineering
1990 - 1993	Engineering Accreditation Commission, ABET, Member
1990 - 1991	Chairman, ASCE Department Heads Council (Vice-Chairman in 1989-1990)

1986 - 1988	Chairman, ASCE Geotechnical Specialty Conference Hydraulic Fill Structures, Fort Collins, August 1988
1981 - 1991	Member, PE/PAC, Political Action Committee, Professional Engineers of Colorado (Chairman 1982, 1985)
1983 - 1985	Chairman, JE/PAC, Joint Engineers, Political Action Committee
1980 - 1983	Chairman, ASCE Committee on Embankment Dams and Slopes. (Member from 1974-1980)
1978 - 1983	Member, Expansive Soils Research Council, ASCE
1978 - 1981	Organizer and Lecturer of annual short courses on Design and Construction of Tailings Impoundments, Colorado State University
1976 - 1988	Chairman, Geotechnical Engineering Div., Colorado Sect., ASCE
1975 - 1976	Vice-Chairman, Geotechnical Engineering Div., Colorado Section, ASCE
1971 - 1973	Executive Committee, International Society for Soil Mechanics and Foundation Engineering
1968 - 1973	Secretary, Southeast Asian Society of Soil Engineering
1971	Secretary, Fourth Asian Regional Conference of the ISSMFE, Bangkok, July 1971
1970	Organizing Committee, Second Southeast Asian Conference on Soil Engineering, Singapore, June 1970
1967 - 1977	Reviewer, Applied Mechanics Review
1963 - 1967	Committee on Continuing Education, Illinois Section, ASCE. Chairman in 1966 when Design and Construction Structures to Resist Earth Pressures was published.

PUBLICATIONS

BOOKS

NELSON, J. D. and MILLER, D. J., Expansive Soils: Problems and Practice in Foundation and Pavement Design, John Wiley and Sons, New York, NY, (1992).

NELSON, J. D., CHAPTER 9 – SOIL SUCTION, in Foundations on Expansive Soils, by Fu Hua Chen, Elsevier Science Publishers, 1988.

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NELSON, J. D. and VEY, E. (1964), Bearing Capacity of the Lunar Soil, ASME Paper No. 64 - WA/AV-13, December, pp. 1-8.

VEY, E. and NELSON, J. D. (1965), Engineering Properties of Simulated Lunar Soils, Journal of Soil Mech. & Found. Div., ASCE, Vol. 91, SM1, January, pp. 25-52.

NELSON, J. D. and VEY, E. (1968), Relative Cleanliness as a Measure of Lunar Soil Strength, Journal of Geophysical Research, Vol. 73, No. 12, June, pp. 3747- 3764.

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NELSON, J. D. and SIU, K. L. (1971), "The Influence of Structure on The Dilation of Clay," Proc. First Australia-New Zealand Conference on Geomechanics, Melbourne, Australia, August.

NELSON, J. D. (1971), Discussion on Paper "Apollo 11 Soil Mechanics Results" by N. C. Costes, W. D. Carrier, J. K. Mitchell, and R. F. Scott, Journal of Soil Mech. & Found. Div. ASCE, Vol. 97, No. SM10, October, pp. 1497-1499.

NELSON, J. D. and VIRANUVUT, S. (1973), Traffic Induced Vibrations at Wat Po, Bangkok, Geotechnical Engineering, Vol. 4, No. 1, June, pp. 15-30.

NELSON, J. D. and THOMPSON, E. G. (1977), A Theory of Creep Failure in Overconsolidated Clay, J. Geotechnical Engineering Division, ASCE, Vol. 103, No. GT11, November, pp. 1281-1293.

McWHORTER, D. B. and NELSON, J. D. (1979), "Unsaturated Flow Beneath Tailings Impoundments," J. Geotechnical Engineering Division, ASCE, Vol. 105, No. GT11, November, pp. 1317-1334.

McWHORTER, D. B. and NELSON, J. D., "Seepage in the Partially Saturated Zone Beneath Tailings Impoundments," Mining Engineering, J. AIME, April 1980, pp. 432-439.

MANSOURI, T. A., NELSON, J. D., and THOMPSON, E. G. (1983), "Dynamic Response and Liquefaction of Earth Dams," J. Geotechnical Engineering Division, ASCE, Vol. 109 No. 1, January, pp. 89-100.

MOH, Z. C. and BRAND, E. W. and NELSON, J. D. (1972), "Pore Pressure Under a Bund on Soft Fissured Clay, "Proc. Specialty Conference on Performance of Earth and Earth-Supported Structures, ASCE, Lafayette, Indiana, June.

NELSON, J. D. (1973), "Influence of Clay Fabric on Bonds and Dilatation," Proc. Int'l Symposium on Soil Structure, Gothenburg, Sweden, August.

NELSON, J. D., MOH, Z. C. and BRAND, E. W. (1973), "Laboratory and Field Consolidation of Soft Clay," Proc. VIII International Conference on Soil Mechanics and Foundation Engineering, Moscow, U.S.S.R., August.

PENG, S. M. and NELSON, J. D. (1973), "Ground Motion of Surface Waves," Specialty Session No. 8 - Soil Dynamics and Seismic Effects on Foundations, Proc. VIII International Conference on Soil Mechanics and Foundation Engineering, Moscow, U.S.S.R., August.

NELSON, J. D., SHEPHERD, T. A. and CHARLIE, W. A. (1977), "Parameters Affecting Stability of Tailings Dams," Proc. Geotechnical Practice for Disposal of Solid Waste Materials, ASCE Specialty Conference, Ann Arbor, Michigan, June.

PORTER, A. and NELSON, J. D. (1980), "Strain Controlled Testing of Soils," Proc. of 4th Int'l Conference on Expansive Soils, ASCE and Int'l. Soc. Soil Mech. & Found. Engrg., June, 15 pp.

WARDWELL. R. E. and NELSON, J. D. (1981), "Settlement of Sludge Landfills with Fiber Decomposition, "Proc. X International Conference on Soil Mechanics and Foundation Engineering, Stockholm, Sweden, June.

McWHORTER, D. B., NELSON, J. D., SHEPHERD, T. A. and WARDWELL, R. E. (1982), "Role of Partially Saturated Soil in Liner Design for Hazardous Waste Disposal Sites," Role of Unsaturated Zone in Radioactive and Hazardous Waste Disposal, American Geophysical Union Publication, 23 pp.

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MARCUSON, W. F., DOBRY, R., NELSON, J. D., WOODS, RICHARD, D., and YOUD, T. L. (1991), "Issues in Geotechnical Engineering Education," Journal of Professional Issues in Engineering and Practice, ASCE, Vol. 117, No. 1, pp. 1-9, January, 1991

EDGAR, T.V., and NELSON, J.D., (1992), "Flow Equations in Three Dimensional Finite Strain," Proc 7th Intl. Conf. on Expansive Soils, ASCE & ISSMFE, Dallas, Texas, August, pp 109-113.

MILLER, D.J., and NELSON, J.D., (1992), "Osmotic Suction as a Valid Stress State Variable in Unsaturated Soils," Proc 7th Intl. Conf. on Expansive Soils, ASCE & ISSMFE, Dallas, Texas, August, pp 179-184.

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PERKO, H.A., THOMPSON, R.W., and NELSON, J.D., (2000), "Suction Compression Index Based on CLOD Test Results", Advances in Unsaturated Geotechnics, ed. Shackelford et al., ASCE Press Reston VA, pp393-408.

PERKO, H.A., NELSON, J.D., and SADEH, W.Z., (2001), "Surface Cleanliness Effect on Lunar Soil Shear Strength", J. Geotechnical and Geoenvironmental Engrg, ASCE, p.1.

NELSON, JOHN D., DANIEL D. OVERTON, and DEAN B. DURKEE, (2001), "Depth of Wetting and the Active Zone", Expansive Clay Soils and Vegetative Influence on Shallow Foundations, proceedings of the conference, ASCE, Oct. 10-13, pp 95-109.

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OVERTON, D.D., CHAO, K.C., and NELSON, J.D., (2006), "Time Rate of Heave Prediction in Expansive Soils," GeoCongress 2006 Conference, Atlanta. February.

CHAO, K.C., OVERTON, D.D., and NELSON, J.D., (2006), "The Effects of Site Conditions on the Predicted Time Rate of Heave." Proceedings of the Fourth International Conference on Unsaturated Soils. Carefree, Arizona. April.

NELSON, J.D., CHAO, K.C., and OVERTON, D.D., (2006), "Design Parameters for Slab-on-Grade Foundations." Proceedings of the Fourth International Conference on Unsaturated Soils. Carefree, Arizona. April.

NELSON, J.D., REICHLER, D.K., and CUMBERS, J.M., (2006), "Parameters for Heave Prediction by Oedometer Tests." Proceedings of the Fourth International Conference on Unsaturated Soils. Carefree, Arizona. April.

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PERKO, H.A., NELSON, J.D., and GREEN, J.R., (2006), "Mars Soil Mechanical Properties and Suitability of Mars Soil Simulants." Journal of Aerospace Engineering, ASCE, Vol. 19, No. 3. July. pp. 169-176.

CHAO, K.C., OVERTON, D.D., and NELSON, J.D., (2006), "Design and Installation of Deep Benchmarks in Expansive Soil." Journal of Surveying Engineering, ASCE, Vol. 132, No. 3. August. pp. 124-131.

NELSON, J.D., OVERTON, D.D., and, CHAO, K.C., (2006), "Evolution of Foundation Design for Expansive Soils." Proceedings of the 2006 Biennial Geotechnical Seminar, Geo-Volution 2006 Conference, Denver, Colorado. November.

NELSON, J.D., CHAO, K.C., and OVERTON, D.D. (2007), "Development of Compressive Pier Force in Expansive Soils." Proceedings of the Geo-Denver 2007 Conference, Denver, Colorado. February.

OVERTON, D.D., CHAO, K.C., and NELSON, J.D. (2007), "Heave Distress of a Manufacturing Building." Proceedings of the Geo-Denver 2007 Conference, Denver, Colorado. February.

NELSON, J.D., CHAO, K.C., and OVERTON, D.D. (2007), "Definition of Expansion Potential for Expansive Soil." Proceedings of the 3rd Asian Conference on Unsaturated Soils, Nanjing, China. April.

CHAO, K.C., OVERTON, D.D., and NELSON, J.D. (2007), "Case History of a Reactivation of a Landslide Due to Irrigation on Unsaturated Soil." Proceedings of the 3rd Asian Conference on Unsaturated Soils, Nanjing, China. April.

DORNFEST, E.M., NELSON, J.D., and OVERTON, D.D. (2007), "Case History and Causes of a Progressive Block Failure in Gently Dipping Bedrock", Proceedings of the First North American Landslide Conference, June 3-8, Vail, Colorado.

NELSON, J.D., CHAO, K.C., and OVERTON, D.D. (2008), "Modeling Vadose Zone Water Migration Based on Downhole Nuclear Gauge Data." Proceedings of the 3rd International Conference on Site Characterization ISC'3, Taipei, Taiwan. April 1-4.

CUMBERS, J.M., NELSON, J.D., CHAO, K.C., and OVERTON, D.D. (2008). "An Evaluation of Soil Suction Measurements Using the Filter Paper Method and Their Use in Volume Change Prediction." Proceedings of the 1st European Conference on Unsaturated Soils, Durham, UK. July.

CHAO, K.C., NELSON, J.D., OVERTON, D.D., and CUMBERS, J.M. (2008). "Soil Water Retention Curves for Remolded Expansive Soils." Proceedings of the 1st European Conference on Unsaturated Soils, Durham, UK. July.

OVERTON, D.D., NELSON, J.D., and CHAO, K.C. (2009). "Analyses of Frost-Migration Under Post-Tensioned Slabs." The 14th Conference on Cold Region Engineering, Duluth, MN, USA. August.

NELSON, J.D. and CHAO, K.C. (2010). "Depth of Investigation for Foundation Soils." The 17th Southeast Asian Geotechnical Conference, Taipei, Taiwan. May.

NELSON, J.D., OVERTON, D.D., and CHAO, K.C. (2010). "An Empirical Method for Predicting Foundation Heave Rate in Expansive Soil." The GeoShanghai 2010 International Conference, Shanghai, China. June.

CHAO, K.C., OVERTON, D.D., and NELSON, J.D. (2010). "Effect of Water Sources on Water Migration in the Vadose Zone." The GeoShanghai 2010 International Conference, Shanghai, China. June.

CHAO, K.C., NELSON, J.D., OVERTON, D.D., and NELSON, E.J. (2010), "Commentaries on the Consolidation-Swell Test." Proceedings of the 5th International Conference on Unsaturated Soils, Barcelona, Spain. September.

OVERTON, D.D., CHAO, K.C., and NELSON, J.D. (2010), "Water Content Profiles for Design of Foundations on Expansive Soils." Proceedings of the 5th International Conference on Unsaturated Soils, Barcelona, Spain. September.

NELSON, J.D., HATTON, C.N., and CHAO, K.C. (2010), "A Constitutive Relationship for Collapsible Soils in terms of Stress State Variables." Proceedings of the 5th International Conference on Unsaturated Soils, Barcelona, Spain. September.

NELSON, J.D., CHAO, K.C., OVERTON, D.D., and DUNHAM-FRIEL, J.S. (2011). "Evaluation of Level of Risk for Structural Movement Using Expansion Potential." The Geo-Frontiers Conference, Dallas, Texas, USA. March.

CHAO, K.C., NELSON, J.D., and OVERTON, D.D. (2011). "Factors Influencing Design of Deep Foundations on Expansive Soils." The Fifth Asia-Pacific Conference on Unsaturated Soils, Pattaya, Thailand. November.

NELSON, E.J., NELSON, J.D., CHAO, K.C., and KANG, J.B. (2011). "Influence of Surface Grading on Infiltration." The Fifth Asia-Pacific Conference on Unsaturated Soils, Pattaya, Thailand. November.

NELSON, J.D., THOMPSON, E.G., SCHAUT, R.W., CHAO, K.C., OVERTON, D.D., DUNHAM-FRIEL, J.S. (2011). "Design Procedure and Considerations for Piers in Expansive Soils." Journal of Geotechnical and Geoenvironmental Engineering, ASCE.

NELSON, J.D., CHAO, K.C., OVERTON, D.D., and SCHAUT, R.W. (2012). "Calculation of Heave of Deep Pier Foundations." The Geotechnical Engineering Journal of the Southeast Asian Geotechnical Society and Association of Geotechnical Societies in Southeast Asia. March.

KEYNOTE SPEAKER

NELSON, J. D. (1983), "Potash Tailings Management," Keynote Speaker, Potash 83 (International Conference on Potash Mining) Saskatoon, Saskatchewan.

NELSON, JOHN D. (1985), "Foundation Engineering on Expansive Soils," Invited Keynote Speaker, 33rd Annual Conference on Soil Mechanics and Foundation Engineering, University of Minnesota, Minneapolis, MN.

NELSON, JOHN D. (1985), "Constitutive Relationships and Testing of Unsaturated Soils," Invited keynote paper presented at XI International Conference on Soil Mechanics and Foundation Engineering, San Francisco.

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Summary

Accomplished Geotechnical Engineer/Manager with significant experience in the Nuclear Industry. Background includes: geotechnical design review of nuclear power plants, uranium recovery facilities, and mill tailings impoundments; project management of nuclear facility license applications and decommissioning actions; policy review as technical assistant to the Chairman of the Nuclear Regulatory Commission; and oversight as a Senior Executive Service Manager of several nuclear program areas including Uranium Recovery Facilities, Fuel Cycle Facilities, and Reactor and Material Site Decommissioning. Thirty-six years of nuclear regulatory experience includes policy and guidance development, rulemaking, and significant interaction with State, Federal, and International agencies, industry groups, Congressional staff, and members of the public.

Experience

Consulting (Post Retirement 2006-present)

Provides regulatory and geotechnical consultation to the U.S. Nuclear Regulatory Commission, the International Atomic Energy Agency, and others. Conducted several international uranium recovery regulatory workshops for developing nations. Consulted on early aspects of the potential development of uranium mining and milling in the State of Virginia.

Management (1990-2006)

Supervisor and Senior Executive Service Manager
U.S. Nuclear Regulatory Commission, Washington, DC 20555
Managed several programs, including Uranium Recovery, Fuel Cycle Licensing, and Decommissioning. Established policy, guidance, and regulations. Determined program direction and formulated budgets. Accomplishments include: successful completion of the Uranium Mill Tailings Remedial Action Project; rotation as technical assistant to the Chairman of the NRC; consolidation of the NRC decommissioning program and successful and timely decommissioning of many reactor and materials sites.

Project Management (1982-1990)

Project Manager
U.S. Nuclear Regulatory Commission, Washington, DC 20555
Managed significant sites and projects in the NRC's Uranium Recovery, Low-Level Waste, and High-Level Waste Programs.

Geotechnical Engineering Review (1976-1986)

Geotechnical Engineer
U.S. Nuclear Regulatory Commission, Washington, DC 20555
Conducted geotechnical engineering reviews of nuclear facilities, including several nuclear power plants, many uranium recovery facilities, and various nuclear waste disposal facilities.

Civil/Geotechnical Engineering Consulting (1973-1976)

Geotechnical Engineer
Halpert, Neyer, and Tiseo; Farmington, Michigan
Conducted geotechnical engineering design, field investigations, and construction oversight for many significant engineering projects throughout the U.S., including the Pontiac Dome in Detroit, Michigan.

Education

Bishop Kearney High School, Rochester, NY
National Science Foundation Mathematics Summer grant to Ohio State University

Manhattan College, Bronx, NY
Bachelor of Civil Engineering, 1971

University of Notre Dame, South Bend, Indiana
Masters of Civil Engineering (Geotechnical), 1973
Thesis: Rate Process Parameter Determination with Unconfined Compression Tests

Many additional technical and management training courses, including completion of the management training of the Federal Executive Institute, and the Senior Executive Service Development Program.

References

References available on request

DANIEL D. OVERTON, M.S., P.E.
President, Principal Geotechnical Engineer

EXPERTISE

Mr. Overton is a Principal Geotechnical Engineer for Engineering Analytics, Inc. He has over 25 years of geotechnical and reclamation engineering experience on a diversity of projects. Mr. Overton has served as the Project Engineer or Project Manager for public works projects, expansive soils design, forensic studies, commercial and mid-rise buildings, residential and master planned communities, and geotechnical instrumentation. Mr. Overton has also served as the Project Engineer or Project Manager for reclamation design, including cover design, tailings consolidation, seepage and groundwater analyses, stability analyses, hydrologic analyses, hydraulic design and rip rap sizing, infiltration modeling, grading plan design, and for determining construction quantities, and costs. Mr. Overton has experience in facilities design of tailings impoundments, heap leach pads, process solution ponds, and waste rock disposal sites.

CERTIFICATION

Registered Professional Engineer: Arizona, Arkansas, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming

Registered Civil and Geotechnical Engineer, California

PROJECT EXPERIENCE

MINE FACILITIES OPERATIONS AND RECLAMATION

- **Design and Construction for Tailings Dam Reclamation, Hot Springs, Arkansas.** Engineer of Record for design and construction of the reclamation a tailings dam near Hot Springs, Arkansas. The design included contouring of the tailings surface, design and placement of a multi-layer cover system, design of diversion channels and detention ponds, design of a spillway, and design for final vegetation of the reclaimed surface.
- **Shootaring Canyon Tailings Dam, Ticaboo, Utah.** Engineer of Record for the design of the Tailings Impoundment Reclamation Provided geotechnical engineering for the Tailings Storage Facility Design Report. Both of these documents were prepared for submittal to the Utah Department of Environmental Quality in support of the permit application.
- **Canon City Milling Facility, Canon City, Colorado.** Provided engineering support for development of corrective measures. Prepared costs for various remediation alternatives. These documents were prepared for submittal to the Colorado Department of Public Health and Environment.
- **Gravel Quarry Expansion, Hunt East, Orland, California**. Conducted geotechnical investigation that included drilling and geotechnical laboratory testing to determine material properties. Performed slope stability analyses of final pit slopes and provided slope stability responses to the county for the gravel pit expansion.

- **Pit Wall Stability Investigation, Mesquite Mine, Brawley, Californi**a. Performed anisotropic slope stability analyses of failed pit wall slopes, provided recommendations for future mining operations and closure buttresses of the pit walls. The analyses included developing geologic cross-sections from geologic mapping, performing additional strength testing for pit slope material, and analyzing historic and current geotechnical test results.
- **Reclamation and Closure Plan, Red Dirt Pile, Empire Mine State Park, Grass Valley, California**. Engineer of Record for the reclamation design and construction QA of the Red Dirt Pile in the Empire Mine State Historic Park in Grass Valley, California. The Red Dirt Pile consisted of highly weathered rock that historically had a sulfide tailings stockpile during the mine operations from 1850 to 1956. The Red dirt Pile was reclaimed and the reclamation design included development of a Storm Water Pollution Prevention Plan, regrading of the Pile, design of a multi-layer cover system, design of diversion channels, design of a parking lot, and construction QA services.

- **Gas Hills Uranium Mine and Mill Site, Gas Hills, Wyoming.** Project Manager for Reclamation Plans of a Uranium Mine and Mill Site at Gas Hills, Wyoming. These plans were presented to the U.S. Nuclear Regulatory Commission for review and include a cover system and reclamation plan for an above-ground tailings impoundment, a below grade tailings repository, two evaporation ponds, and four mined ore pits. The geotechnical work included complete field investigation, installation of stand-pipe and multi-stage pneumatic piezometers, and laboratory testing, and design including stability, seepage, deformation, settlement, radon attenuation, and infiltration analyses. A site-wide hydrology study was also performed which included surface water hydrology, hydraulic analyses, erosional analyses, riprap design, and bank stabilization of a creek adjacent to the above-grade tailings impoundment. A groundwater and geochemistry characterization study was performed, as well as radiological risk assessments, and gamma surveys.

- **Uravan Uranium Mine and Mill Site, Uravan, Colorado.** Project Manager and Geotechnical Engineer for Reclamation Plans for a uranium mine and mill at Uravan, Colorado. Services include 1) evaluation and investigation of a reclaimed tailing dam, including review of historical reports, evaluation of settlement, lateral movement, and piezometric data, and evaluation of previously performed laboratory tests and analyses. The field investigation consisted of ten geotechnical borings and installation of nine slope inclinometers, three stand-pipe piezometers and seven multi-stage pneumatic piezometers. Geotechnical laboratory testing was performed, and seepage, stability, and deformation analyses were conducted; 2) geotechnical investigation of a proposed waste repository included slope stability analyses, immedia5e and long-term (creep) settlement, and analyses of horizontal strains and movement related to potential cracking of a design cover; 3) mitigation design of an inoperative spray field of radioactive raffinate included two options, a cover and an evaporative system; 4) Human Health Risk Assessmen6 of mill wastes along a county road; 5) design of a cover for a hazardous radioactive waste repository included routing of storm run-off around the repository and design of the diversions.

- **Uranium Heap Leach Facility, Maybell, Colorado.** Project Manager for a Closure Design of a Reclaimed Heap Leach Facility at Maybell, Colorado. The reclamation plan was submitted to the State of Colorado Department of Public Health and Environment and included infiltration, seepage, and stability analyses, as well as development of a grouting plan for final closure.

- **Tailings Embankment Raise, Bunker, Missouri.** Project Manager for a third party review of a proposed 20-foot-raise of a 120-foot-high tailings 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.

- **Characterization of Tailings Disposal Facility, Owens Lake, California.** Project Manager and Geotechnical Engineer for the characterization of a sodium sulfate solid waste (tailings) disposal facility in Owens Lake, California. The characterization included studies of pile stability (geotechnical studies and ground penetrating radar), geochemical characterization, hydrology studies, geohydraulic analyses (involving installation of 45 piezometers and monitoring wells), and chemical transport modeling.

- **Design and Construction for Tailings Dam Raise, Hot Springs, Arkansas.** Project Manager and Geotechnical Engineer for design and construction of the reclamation and raise of a 125-foot-high tailings 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.

- **Instrumentation of Tailings Dam, Raton, New Mexico.** Project Manager and Geotechnical Engineer for design and installation of instrumentation to monitor the performance of a 200-foot-high tailings dam near Raton, New Mexico. Design of the spillway for the impoundment was also performed.

- **Waste Rock Disposal Plan, Santa Maria, California.** Project Manager and Geotechnical Engineer for the design of waste rock disposal for a dimension stone quarry near Santa Maria, California. Also provided assistance with renewal of a permit with the United States Forest Service for the quarry.

- **Tailings Impoundment Review, Hayden and Mission, Arizona.** Project Manager and Geotechnical Engineer for a third party review of Asarco properties in Arizona consisting of a 460-foot-high tailings dam at the Ray Mine, three tailings impoundments at the Hayden smelter, and eight tailings dams at the Mission complex. The review was performed to identify areas of potential risk associated with the operation of the facilities.

- **Olympic Dam, South Australia.** Project Manager for a study of closure alternatives of uranium tailings near Olympic Dam, South Australia. Various cover alternatives and costs were considered and human health and environmental risks were determined for the alternatives.

- **Detention Dam Design, Raton, New Mexico.** Project Manager and Geotechnical Engineer for design of a 35-foot-high dam for control of storm flow near Raton, New Mexico. The design included analyses of seepage slope stabilities of embankment and foundation materials and settlement/consolidation analyses of the foundation materials.

- **Review of Tailings and Waste Piles, Mantaro Valley, Peru.** Project Manager for a study of six mining sites in the Mantaro Valley of Peru. The study involved presenting options for minimizing environmental effects from the mining operations.

- **Iron Mine Landfill Conversion, Chuckwalla Valley, California.** Geotechnical third party reviews of the Environmental Impact Report for conversion of Kaiser Steel's Eagle Mountain Iron Ore Mine into a landfill for non-hazardous materials. Eagle Mountain is a two mile-long open pit mine located in the Chuckwalla Valley in Riverside County, California.

- **Heap Leach Pad Design, Moab, Utah.** Project Engineer for the Geotechnical aspects of a 266-acre heap leach pad for a copper mine near Moab, Utah.

- **Reclamation Alternative Analyses, Campo Seco, California.** Project Engineer for determination of clean-up alternatives and a preferred approach alternative matrix for mitigation of acid-rock drainage from a waste rock dump at an abandoned copper mine near Campo Seco, California.

- **Heap Leach Pad Design, Cyclopic Mine, Dolan Springs, Arizona.** Project Engineer for the geotechnical exploration and design of a 25-acre heap leach pad and related facilities for a gold mine near Nelson, Nevada.

- **Heap Leach Pad Design, Yarnell, Arizona.** Project Engineer for the geotechnical exploration of a 30-acre heap leach pad for a gold mine near Yarnell, Arizona.

- **Reclamation Plan Design, Battle Mountain, Nevada.** Project Engineer for the geotechnical aspects of a reclamation plan for a proposed gold mine at Mule Canyon, near Battle Mountain, Nevada.

- **Ore Pad Design, Battle Mountain, Nevada.** Project Engineer for the geotechnical design of a 20-acre ore stockpile pad for a gold mine near Battle Mountain, Nevada.

FORENSIC STUDIES

- **Pinal Creek Contaminant Assessment, Globe/Miami, Arizona.** Project Manager for investigation of seepage from Copper Mine Tailings to the groundwater. Analyses included seepage analyses, calculation of water balance, identification of seepage sources, and cost allocation for groundwater remediation.

- **Talache Tailings Dam Failure, near Atlanta, Idaho.** Project Manager and Senior Geotechnical Engineer for technical evaluation of the causes of the Talache tailings dam failure. Work included hydrologic, seepage and water balance modeling, and stability analyses for the tailing impoundment. It also included a review of historic records of mill operations and evaluating and preparing cost estimates for measures that could have been implemented to avoid failure.

- **Montery Mine Cover Failure, Albers, Illinois.** Principal Geotechnical Engineer for the investigation of the failure of the cover of the reclaimed refuse pile at the Montery Number 2 Coal mine. Analyses of the excessive surface bulges and cover failure was performed. Issues involved the pore-pressure of the refuse materials, the rate at which the cover was place, and the drainage provisions in the cover design.

- **Cache Creek Landslide Dam, Spring Valley, California.** Project Manager and Senior Geotechnical Engineer for the study of the Cache Creek landslide funded by the Army Corps. Of Engineers, Sacramento, California office. The study was conducted to determine the potential for activation of a landslide and the consequent

creation of a landslide dam across the North Fork of Cache Creek, in Clear Lake County, California. The study included site exploration, surveying of the landslide, laboratory testing, determination of the local geology and landslide characteristics, determination of possible mechanics of landslide movement, seepage and slope stability analyses, estimation of landslide movement for various precipitation events, and estimation of a resulting landslide dam. The results of the study were used to eliminate a flood event from a potential breach of a landslide dam.

- **Landslide Mitigation Plan, Colorado Springs, Colorado.** Project Manager and Senior Geotechnical Engineer for a geotechnical investigation and developed a mitigation plan for the stabilization of a 175-acre landslide at a golf course in Colorado Springs, Colorado. Several geotechnical borings were drilled to characterize the landslide, and pneumatic piezometers, stand-pipe piezometers, and inclinometers were installed. Historic piezometric levels, and discharge rates from horizontal wells were reviewed. Surface water, vegetation, and infiltration aspects were studied in detail. Thorough ground water, geological, seepage, and geotechnical analyses were performed of the landslide and several mitigation scenarios were analyzed. A proposed mitigation plan was recommended that consisted of extensive surface water and ground water controls.
- **Landslide Causation Study, The Redlands, Grand Junction, Colorado.** Project Manager and Senior Geotechnical Engineer for a study to determine the cause of a landslide in the Redlands area of Grand Junction, Colorado. The landslide is located south of the Colorado River, and has caused one residence and one lot to be condemned. The study included site exploration, surveying of the landslide, laboratory testing, determination of the local geology, determination of the effects of the river, and review of history land usage and grading. The geotechnical investigation included excavation of two borings and instrumenting the borings with pneumatic piezometers, stand-pipe piezometers, and slope inclinometers. The failure plane was identified from the slope inclinometer data, and potential causes of failure were identified.
- **Landslide Causation and Mitigation Plan, 6th Avenue Estates, Jefferson County, Colorado,** Project Manager and Senior Geotechnical Engineer for a forensic study into the causes of a landslide on the north facing slope of Green Mountain in Jefferson County, Colorado. An investigation included drilling and sampling six borings for characterization of the landslide was performed. The borings were instrumented with slope inclinometers for monitoring of the landslide movement, and determination of the failure plane. The landslide traversed two streets and caused damage to six residences. Several of the residences were condemned and demolished. A technical review was performed of the proposed mitigation plan, which consisted of horizontal drains, and three rows of tie-back anchors.
- **Big Rock Mesa Landslide, Malibu, California.** Expert witness services, testimony, and geotechnical consultant was provided to the attorneys for the homeowners on the Big Rock Mesa landslide in Malibu, California. The Big Rock Mesa landslide covered several hundred acres, and had over 300 homes located on the landslide mass. The landslide plane was at a depth of approximately 250 feet. Services included review of extensive geotechnical information on the subject site, review of movement and slope inclinometer data, geotechnical analyses of the stability under various groundwater and seismic conditions, analyses of proposed repairs, documentation of distress to residences, trial preparation, and trial testimony on the case.

- **Retaining Wall Failure, Port Moody, British Columbia.** Expert witness services consisting of analysis of the failure of a 35-foot-high stress wall retaining system in Port Moody, British Columbia, Canada.
- **Mission Bay Landfill, San Diego, California.** Expert witness services consisting of geotechnical review of available geotechnical data and consultation to the Office of the Attorney of the City of San Diego regarding construction claims for the Mission Bay Park and Landfill.
- **Tailings Pile Stability, Soledad Canyon, California.** Expert witness services and testimony of the geotechnical performance of a tailings pile for a rock quarry in Soledad Canyon, California.

PUBLIC WORKS PROJECTS

- **Lake Maloya, Raton Water Works, Raton, New Mexico**. Engineer of Record for the investigation of seepage in the earth embankment dam. Lake Maloya is the water supply for the town of Raton, New Mexico. Provided engineering design for the seepage investigation and design of a remediation plan.
- **Springer Dams, Town of Springer, New Mexico.** Engineer of Record for an investigation to examine the condition of two existing, earthfill, municipal water storage dams near the town of Springer, New Mexico. The project included a full range of geotechnical sampling, subsurface instrumentation, laboratory testing and seepage and stability modeling of the dams using the GeoStudio 2007 software. Global seepage analyses were conducted to provide an estimate of the location of the phreatic surface for use in geotechnical analyses of global slope stability. Two-dimensional flow was analyzed for steady-state and long term conditions. Slope stability modeling for each dam included static, pseudo-static, and static rapid drawdown upstream and downstream of the dam. Based on the results of the modeling, design and construction recommendations for rehabilitation of the dams were provided. A vegetation survey was also performed at the site to evaluate and control an invasive rodent problem affecting the embankments. Studies were submitted to and approved by the New Mexico Office of the State Engineer (NMOSE).
- **Dawson Dam, Feasibility Study, Dawson Ranch, New Mexico**. Engineer of Record for feasibility study for selection of off-stream dam sites and cost comparison between an earthfill design and a smaller roller compacted concrete (RCC) dam. Potential dam locations were identified based on the topography of the ranch and river. Maps were prepared outlining the ranch property and detailing the locations of eight additional dam sites and their areas of inundation. In addition, a preliminary design was prepared for an off-stream dam located east of the Vermejo River, with a conveyance pipeline to provide water to the reservoir.
- **Roadway Analyses and Stabilization Plans, Colorado Springs, Colorado.** Geotechnical Engineering Project Manager for a distress investigation to the roadways of a large private housing development in Colorado Springs, Colorado. A majority of the distress was determined to be from settlement of soils due to inadequate construction, and inadequate compaction of fill soils. Additionally the development had 23 active landslides on the site, and two of the landslides were causing major distress to the roadways. Shepherd Miller investigated and analyzed the settlement of the roadways due to the poor construction and compaction and

investigated and analyzed the two landslides. The investigation included geologic mapping, review of aerial photographs, excavation of borings, and laboratory testing. The borings were instrumented with piezometers and slope inclinometers, and movement has been recorded over the last several years. Shepherd Miller prepared plans and specifications for repair of nine areas including one of the landslides. Additionally Shepherd Miller prepared plans and specifications for instrumentation of the other landslide to provide real-time monitoring of movement to allow warning of future landslide movement. Construction will be performed during the summer of 2002 to complete the repairs and instrumentation that were designed by Shepherd Miller.

- **California Department of Corrections, Lancaster Prison, Lancaster, California.** Geotechnical Engineer and Project Manager for the geotechnical construction, testing, and observation of the California Department of Corrections (CDC) Lancaster Prison. The prison occupies one-half of a square mile southwest of Lancaster, California. An on-site testing facility was set up to perform the testing required by the CDC specifications.
- **Sheldon East Reservoir, Pasadena, California.** Geotechnical Engineer and Project Manager for the Sheldon East Reservoir for the City of Pasadena. The project required siting of the reservoir for geotechnical and seismic concerns and providing recommendations for seismic design of the reservoir to withstand fault displacement.
- **Porter Ranch Drainage Crossing, Granada Hills, California.** Geotechnical Engineer responsible for engineering investigation and analysis of a 105-foot-long by 65-foot-wide box culvert crossing of a six-lane roadway over an intermittent wash.
- **Limekiln Canyon Bridge, Granada Hills, California.** Geotechnical Engineer responsible for investigation and analysis of a 4-lane bridge crossing of Limekiln Canyon in Porter Ranch, California. The bridge consisted of three spans and traversed a canyon approximately 125 feet deep. Slope stability and drainage were geotechnical issues for the end abutments, while bearing capacity and scouring were issues for the center supports.
- **Moonshine Canyon Bridge, Granada Hills, California.** Geotechnical Engineer responsible for investigation and analysis of a 100-foot-wide bridge for the crossing of Moonshine Canyon in Porter Ranch, California. The bridge and abutments were designed and constructed for four lanes of traffic for a secondary road in a housing tract.
- **Water Line Replacement, Palmdale, California.** Geotechnical Engineer for numerous water line replacement projects for the Palmdale Water District. Duties included construction consultation and supervision of testing form many miles of water lines in the Palmdale area.
- **Equipment Yard, Mammoth Lakes, California.** Geotechnical engineering investigation including field exploration, laboratory testing, and engineering and pavement analysis for the City of Mammoth Lakes equipment yard. This analysis included consideration of cold weather effects combined with long-term creep performance of the asphalt due to storage of heavy equipment.
- **Road Re-Routing, Calabasas, California.** Geotechnical engineering analysis and investigation of the various options of the re-routing of a road in Calabasas, California. Options compared the advantages and disadvantages of alignments through bedrock cuts and filling over very soft and compressible river deposits.

PROFESSIONAL EMPLOYMENT HISTORY

- Principal Geotechnical Engineer, President, Engineering Analytics, Inc., Fort Collins, Colorado (February 2008 - Present)
- Principal Geotechnical Engineer, Geotechnical Group Manager, Vice-President TetraTech/MFG, Inc., Fort Collins, Colorado (2001-February 2008)
- Senior Geotechnical Engineer, Staff Manager, Shepherd Miller, Fort Collins, Colorado (1994–2001)
- Field Technician, Engineering Assistant, Staff Engineer, Project Engineer, Principal Geotechnical Engineer, Vice-President, Geosoils, Inc., California (1984, 1986–1994)
- Junior Engineer, Empire Laboratories, Fort Collins, Colorado (1985–1986)

EDUCATION

M.S., Civil Engineering (Geotechnical Engineering), University of California, Los Angeles (1988)

B.S., Civil Engineering, Minor in Mathematics, Colorado State University, Fort Collins (1985)

PROFESSIONAL AFFILIATIONS

Fellow - American Society of Civil Engineers
- Northern Colorado Branch Past-President
- Past-Colorado Representative, District 16
- 150th Anniversary, Large Branch Award, Windsor Skate Park
- Public Service Award, Webelos Engineering Badge Day
- Outstanding Service Award

Adjunct Professor, Colorado State University
Tailings and Mine Waste Conference, Organizing Committee Chair, Colorado State University
Post-Tensioning Institute, DC-10B Slab-on-Ground, Geotechnical Subcommittee
Colorado Association of Geotechnical Engineers
Colorado Mining Association
Chi-Epsilon
Order of the Engineer

PUBLICATIONS

Schaut, R. W., J. D. Nelson, D. D. Overton, J. A. H. Carraro, Z. P. Fox, 2011, "Interface Testing for the Design of Micropiles in Expansive Soils" Proceedings of the 36th Annual Conference on Deep Foundations, Boston, Massachusetts, October 18 – 21.

Nelson, J. D., K. C. Chao, D. D. Overton, J. Dunham-Friel, 2011, "Evaluation of Level of Risk for Structural Movement Using Expansion Potential" Proceedings of the ASCE GeoFrontiers Conference, Dallas, Texas, March 13 – 16.

Overton, D. D., K. C. Chao, J. D. Nelson, 2010, "Water Content Profiles for Design of Foundations on Expansive Soils" Proceedings of the 5th International Conference on Unsaturated Soils, Barcelona Spain, September 6 – 8.

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Cumbers, J. M., E. M. Dornfest, D. D. Overton, J. Harris, 2009, "Optimization of Compaction Grouting in Collapsible Soils", Proceedings of the 5th Congress on Forensic Engineering, Washington, D.C., November 10 – 15.

Malusis, M., M. Davis, D. Overton, D. Castelbaum, T. Wright, 2009, "Development of Material and Compaction Requirements for a Mixed Clay/Sand Tailings Impoundment Liner", Proceedings of the Thirteenth International Conference on Tailings and Mine Waste, Banff, Alberta, Canada, November 2–4.

Davis, M., M. Abshire, D. Overton, C. Strachan, T. Wright, 2009, "Best Available Technology Design for a Uranium Tailings Storage Facility", Proceedings of the Thirteenth International Conference on Tailings and Mine Waste, Banff, Alberta, Canada, November 2–4.

Andrews, J. S., D. D. Overton, N Legere, 2009, "Optimization of Removal of Overburden Material for an Open Pit Gold Mine", Proceedings of the Thirteenth International Conference on Tailings and Mine Waste, Banff, Alberta, Canada, November 2–4.

Overton, D. O., J. D. Nelson, K. C. Chao, 2009, "Analyses of Frost-Migration Under Post-Tensioned Slabs", Proceedings of the 14th Conference on Cold Regions Engineering, September.

Chao, K.C., J.D. Nelson, D. D. Overton, 2008, "An Evaluation of Soil Suction Measurements using the Filter Paper Method and Their Use in Volume Change Prediction", First European Conference on Unsaturated Soils, Durham, United Kingdom, July 2-4.

Chao, K.C., J.D. Nelson, D. D. Overton, 2008, "Soil Water Retention Curves for Remolded Expansive Soils", First European Conference on Unsaturated Soils, Durham, United Kingdom, July 2-4.

Nelson, J.D., K.C. Chao, D. D. Overton, 2008, "Modeling Vadose Zone Water Migration Based on Downhole Nuclear Gauge Data", The 3rd International Conference on Site Characterization, Taipei, Taiwan, April 1-4.

Dornfest, E. M., J. D. Nelson, D. D. Overton, 2007, "Case History and Causes of a Progressive Block Failure in Gently Dipping Bedrock", Proceedings of the 1st North American Landslide Conference, Vail, Colorado, AEG Special Publication No. 23, June.

Nelson, J. D., K. C. Chao, D. D. Overton, 2007, "Design of Pier Foundations on Expansive Soils", Proceedings of the 3rd Asian Conference on Unsaturated Soils, April.

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Chao, K.C., D. D. Overton, J. D. Nelson, 2006, "Design and Installation of Deep Benchmarks in Expansive Soil", ASCE Journal of Surveying Engineering, August.

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Chao, K. C., D. D. Overton, J. D. Nelson, 2006, "The Effects of Site Conditions on the Predicted Time Rate of Heave", American Society of Civil Engineers, Special Publication 147, UnSaturated Soils 2006.

Nelson, J. D., K. C. Chao, D. D. Overton, 2006, "Design Parameters for Slab-on-Grade Foundations", American Society of Civil Engineers, Special Publication 147, UnSaturated Soils 2006.

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Overton, D.D., R.W. Schaut, M.K. Lusk, 2004, "Landslide Monitoring and Emergency Notification System, Cedar Heights Subdivision, Colorado Springs, Colorado", American Society of Civil Engineers, Special Publication No. 126, Geotechnical Engineering for Transportation Projects.

Nelson, J.D., D.D. Overton, K.C. Chao, 2003, "Design of Foundations for Light Structures on Expansive Soils", California Geotechnical Engineers Association, 2002-2003 Annual Conference, Carmel, California, April.

Nelson, J.D., D.D. Overton, D.B. Durkee, 2001, "Depth of Wetting and the Active Zone", ASCE Geotechnical Special Publication 115, Expansive Clay Soils and Vegetative Influence on Shallow Foundations.

Overton, D.D., D. B. Durkee, K.C. Chao, T. Gieck, 2001, "Evaluation of Historic and Future Performance of a Partially Reclaimed Tailing Impoundment, Uravan, Colorado", Proceedings of the Eighth International Conference on Tailings and Mine Waste, January.

Durkee, D.B., D. D. Overton, K.C. Chao, T.E. Gieck, 2000, "Prediction of Long-Term Settlement of Uranium Tailings Impoundments, Gas Hills, Wyoming," January.

Durkee, D.B., J.D. Nelson, and D. D. Overton, 1999, "Settlement Analyses of Uranium Tailings Using Traditional Large Strain Consolidation Methods," presented at the 1999 SME Annual Meeting and Exhibit, Orlando, Florida, March 9-11, (No Proceedings Published).

Overton, Daniel D., K.C. Chao, J.D. Nelson, C.O. Sealy, and J.C. Moore, 1998, "History, Current Status, and Physical Stability of Sodium Sulfate Disposal Facility, Owens Lake, California," Proceedings of the Fifth International Conference on Tailings and Mine Waste, January.

Overton, Daniel D., Charles D. Schackelford, Janet A. Johnson, et.al., 1998, "Short Course: Technical Considerations in Tailings Covers," Fifth International Conference on Tailings and Mine Waste, January.

Strachan, Clinton L., Daniel D. Overton, Barry L. Carlson, 1998, "Heap Leach Facility Design - Comparison of Four Case Histories in the Southwestern United States," Third International Gold Symposium, Lima Peru, May.

Gieck, Thomas E., Curtis O. Sealy, John D. Nelson, Dean B. Durkee, and Daniel D. Overton, 1997, "Case History: Tailings Dam Reclamation Plan and Improvements, Hot Springs, Arkansas," Proceedings of the Fourth International Conference on Tailings and Mine Waste, January.

Nelson, John D., Curtis O. Sealy, and Daniel D. Overton, 1997, "Characterization of Waste Disposal Site, Owens Lake, California, Second International Conference on Mining & Industrial Waste," Johannesburg, South Africa, June.

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Yoakum, Delmar, Boris Korin, Daniel D. Overton, et. al., 1991, "Suggested Guidelines for Fabricated Subdrain Systems," ASCE Geotechnical Group, Los Angeles Section Special Paper, December.

Lade, Paul V., and Daniel D. Overton, 1989, "Cementation Effects in Frictional Materials," ASCE Geotechnical Journal, October.

CHRISTOPHER D. LIDSTONE
President

Education

Cornell University
B.A. in Geology and Classics, 1977

Colorado State University
M.S. in Fluvial Geomorphology, 1981

Registration

Professional Geologist - Wyoming
Certified Professional Geological Scientist- AIPG

Experience Summary

Mr. Lidstone is founder and president of the engineering, geology and water resource consulting firm Lidstone and Associates, Inc. (LA). His professional experience covers a wide range of individual, yet interrelated fields including geology; geochemistry; fluvial geomorphology; surface and ground water hydrology; river mechanics; erosion and sedimentation; environmental studies and wetland assessments; and, environmental regulation. Mr. Lidstone has been actively involved in mining and mining related studies since 1974, first as an exploration geologist and later as a hydrologic consultant. He began his uranium geological career in the Beaverlodge District of the Northwest Territories (Canada) in 1975 and was involved in both surface and subsurface exploration. He completed tenure as a mine geologist underground at the El Dorado Mine near Uranium City, Saskatchewan. He was contracted to explore for epigenetic uranium deposits in the Elkhead Range, northwestern Colorado and hard rock deposits in southeast Alaska. As a regulator (Wyoming DEQ/LQD) and a member of the Technical Support Group, he served as a liaison with the NRC and addressed interim stabilizations and final closure of uranium mines and mill tailings in the Gas Hills, Powder River Basin and Shirley Basin. As a consultant he completed uranium mining and mine reclamation studies, including design and construction for the Wyoming Abandoned Mine Land (AML) program in Wyoming in 1988 and was responsible for final closure and clean-up of over 20 Wyoming abandoned uranium mine reclamation projects. In 1993 he was awarded Reclamation of the Year award for his design and construction of the Little Medicine Bow River Restoration project. His corporate uranium mining clients have included Power Resources, Inc., now Cameco Resources, Umetco Minerals, Pathfinder Mines and Titan Uranium, USA. He has completed ground and surface water studies, mine permitting, geochemistry and tailings closures studies for these entities since 1994.

Since 1986 he has completed numerous mining-related and mine permitting studies in 17 states and internationally. Besides his work in the Rocky Mountains and Pacific Northwest, he has completed surface water, water quality, and geomorphic stability studies in Alabama, Florida, Georgia, Indiana, Maryland, including the North Fork of the Potomac River, and West Virginia. His regulatory guidance experience has included a Mine Drainage Handbook for the State of Maryland, Geomorphic Guidance Documents for the State of Wyoming, short courses to the Missouri DNR and Oregon DOGAMI and most recently is responsible for the preparation of guidance document for Underground Coal Gasification for the State of Wyoming and Office of Surface Mining.

Abandoned Mined Land Reclamation

Mr. Lidstone has been the project manager for over 40 Wyoming AML reclamation projects, including: the $15M Day Loma Mine Reclamation Project; the $5M Little Medicine Bow River Channel Relocation Project; the $1M AML Statewide Inventory, the $5M Sagebrush Tablestakes Mine Reclamation Project; the $600,000 Carissa Tailings Reclamation Project and the $1.5M Statewide Non-Coal Mine Closure Project. He has completed AML coal related reclamation projects in nine Wyoming counties. His most recent work addressed surface subsidence, coal waste isolation and clean-up, and the closure of the immediate hazards associated with open portals, collapsed adits and tunnels, and partially open ventilation shafts. His non coal AML reclamation experience includes the preparation of reclamation plans and final hydrologic restoration designs for over 40 bentonite pits, 20 uranium mines, eight gravel mines, four gold mines, lead-zinc, copper and molybdenum underground and surface mine disturbances.

Mr. Lidstone has provided the Wyoming AML program with specialty expertise in fluvial geomorphology, in particular the development of a stable land surface and surface drainages. He has developed geochemical protocol, which has been used by AML to address post reclamation water quality and surface reclamation including acid base accounting.

Permitting for Active and Proposed Mines

Mr. Lidstone has been the lead scientist and project manager for Kennecott Corporation, Umetco Minerals, Cloud Peak, Rio Tinto, Cameco Corporation, Umetco Minerals, Mobil Coal Producing Inc., Amax Coal, Caballo Rojo, Inc., JTL Corp. and Lafarge within the State of Wyoming. He has completed mine plan hydrology, design of diversions and sediment control and final reclamation plans for major coal producers in the Powder River Basin. He has also worked extensively on mine permitting projects for the in-situ recovery uranium industry in the Gas Hills and southern Powder River Basin. He is currently involved in mine permitting, environmental evaluation and environmental assessment efforts for Cameco. He has been extensively involved in mine permitting through both federal and state agencies for sand and gravel and hard rock mines throughout the United States. Since 1981, Mr. Lidstone has worked extensively with the mine regulatory programs in Colorado, Oregon, Utah, and Wyoming and the federal programs administered by the Office of Surface Mining, Environmental Protection Agency, US Army Corps of Engineers and the National Marine Fisheries. He has completed due diligence investigations in 14 states for MDU Resources and has addressed environmental liabilities associated with mining under these various state programs. Additional consulting work has included mine permitting efforts for placer and hardrock gold, industrial minerals, basalt, coal and other uranium mines in the western United States. He served as an advisor to the Indonesian National Coal Industry (PTBA) on erosion and sediment control and developed a program for the elimination of environmental liabilities associated with their state-owned coal program.

Channel Stability Analysis and River Construction

Mr. Lidstone has performed numerous channel stability analyses on rivers and streams in Arizona, California, Colorado, Florida, Idaho, Maryland, Missouri, Nevada, Oregon, Utah, West Virginia, and Wyoming. These studies have included evaluations of the geomorphic stability, hydrology, hydraulics and sediment transport characteristics of rivers affected by mining (Belle Fourche River, Wyoming), by dredging to sustain navigation (Apalachicola River, Florida), by channel encroachments such as highways and bridges, by diking and by local development along rivers banks . A number of these projects have led to final design, permitting and construction. Mr. Lidstone managed the restoration construction of 3.5 miles of the Little Medicine Bow River, planning and design of 14 miles of the Provo River (Utah), three construction phases of the Rogue River Restoration Project, river stabilization projects along the Bear, Salt, and Little Snake rivers in Wyoming.

Geochemistry and Water Quality Evaluations

Mr. Lidstone is well versed in geochemistry, water quality and adverse quality discharge issues throughout the United States. His geochemical studies have included salt and phosphate loading to both surface and ground water systems, kinetics and thermodynamics of geothermal systems, and long-term water quality changes for both hard rock and uranium-mined aqueous systems. His uranium transport studies have included bench scale modeling, thermodynamic predictions and transport evaluations of seepage from uranium mill tailings as well as the impacts of the backfill of uranium spoils into the ground water table. Acid mine drainage mitigation and wetland designs have been completed for coal, uranium, bentonite, copper and gold mines. He has testified on the impacts of salt loading to perennial, intermittent and ephemeral streams in Wyoming.

He has completed unsaturated flow studies for landfills, tailings, waste disposal projects, and waste water lagoons throughout the western United States. This work has included the installation of lysimeters, monitor wells and horizontal drains and collection systems associated with tailings and waste disposal sites. He has provided expert witness testimony on water quality impacts related to Coal Bed Methane discharges within Wildcat Creek Basin in northeast Wyoming and addressed rule making for water quality standards as they apply to perennial stream flow versus ephemeral stream flow. His testimony addressed the concept of washover, initial flush and recessional flow water quality.

Reserve Evaluation and Geological Mapping

Mr. Lidstone has completed reserve evaluations, geologic mapping and due diligence investigations for the mining industry and development interests. This involvement has included geologic exploration, geologic mapping, mine

planning, fatal flaw analysis and mine permitting throughout the United States. These studies have been supported by surface and subsurface exploration programs, geophysical and remote sensing techniques.

Mr. Lidstone has geologically mapped over 250 square miles in the U.S., Canada, and Mexico and has been involved in mining consulting from the exploration, production, reclamation and environmental point of view. His field experience involved the geologic mapping and interpretation of igneous, metamorphic and sedimentary deposits in Alaska, Arkansas, California, Colorado, Idaho, Iowa, Minnesota, Montana, New York, Oregon, Tennessee, Texas, Utah, Wyoming, northern Saskatchewan, Canada, and Mexico. This work has included: oil shale, trona and industrial mineral investigations for mine plan development; exploration for base and precious metal deposits in structurally complex terrain; exploration for heavy mineral placers; sedimentologic and petrologic studies of oil shale, coal and epigenetic uranium deposits; hydrogeologic studies; analysis of environments of deposition and ore reserve evaluation. His master's thesis involved the development of an exploration model for placer gold deposits, which related sediment transport processes to river dynamics.

As a geologist Mr. Lidstone has logged over 13,000 feet of diamond drill core and cuttings for both exploration geology and ground water evaluation projects. His drilling projects have included studies in Carbon, Fremont, Hot Springs, Laramie, Natrona, Sweetwater, and Teton Counties, Wyoming; Oneida and Washington County, Idaho and Summit County, Colorado.

Ground Water Investigations

As a principal hydrogeologist for LA, Mr. Lidstone has been involved in complex ground water studies since 1982 and has served as an expert witness on ground water-related projects in Wyoming, Oregon and Nebraska. His expert witness testimony has addressed well interference, ground water contamination, source supply availability, ground water and surface water interaction in Nebraska, Oregon, and Wyoming. Planning projects include the Platte River Water Basin Planning and the Wind Big Horn River Basin projects, which involved a technical assessment of ground water availability for domestic, municipal, and recreational water use. He has also supervised Wyoming ground water supply investigations for the towns of Bairoil, Cheyenne, Dixon, Greybull, Hawk Springs, Hyattville, Pine Bluffs, Ten Sleep, and Thermopolis, Wyoming; the Shoshone Utility Organization; and Umetco Minerals, Inc. Finally he has served as principal in charge of ground water studies associated with uranium ISR mine permitting efforts, including water level and water quality monitoring, aquifer testing and impact analysis. He has completed ground water modeling studies for Mobil Coal, Amax Coal, the States of Wyoming and Oregon, Rogue Aggregates, Teichert Sand and Gravel, and the Public Service Company of Colorado.

Environmental Permitting and Expert Witness

Mr. Lidstone's experience has made him familiar with federal, state and county permitting procedures and regulations. His expert witness services have included appearance before US District Court, Wyoming State Board of Control, Wyoming Environmental Quality Council, Nebraska State Engineer and numerous County Land Use Hearings in Oregon. He has served as an expert witness on gold, gravel, rock quarry, construction, water storage and coal-mining related projects throughout the western United States. He has worked extensively with federal agencies including the US Army Corps of Engineers, US Fish and Wildlife Service, Office of Surface Mining, Environmental Protection Agency and the Nuclear Regulatory Commission and the permitting requirements of state and local environmental agencies in most of the western states.

TECHNICAL SOCIETIES

Geological Society of America

Society of Mining Engineers

National Water Well Association

American Water Resources Association

American Society of Surface Mining and Reclamation

PUBLICATIONS AND TECHNICAL PAPERS

Lidstone, C.D., 1981. "Geomorphic and Hydraulic Controls Associated with the Development of Alluvial Placer Deposits." Technical paper presented to the USGS Branch of Exploration Research, Lakewood, Colorado.

Lidstone, C.D., 1982. "Stream Channel Reconstruction and Drainage Basin Stability." Technical paper presented at the AIME/GAGMO (Gillette Area Groundwater Monitoring Organization) Symposium, Gillette, Wyoming.

Lidstone, C.D., and P.M. Schmittdeil, 1984. "Geomorphology and Depth of Potential Downcutting, Green River Basin, Wyoming." Open-file report, Wyoming Department of Environmental Quality, Land Quality Division, Cheyenne, Wyoming.

Lidstone, C.D., 1987. "Stream Channel and Wetland Reconstruction Techniques." Paper presented at the Eighth Annual Meeting of the Society of Wetland Scientists, Seattle, Washington.

Lidstone, C.D., and B.A. Anderson, 1989. "Considerations in the Design of Erosionally Stable channels on Reclaimed Lands." Paper presented at the Evolution of Abandoned Mine Land Technologies Symposium in Riverton, Wyoming.

Lidstone, C.D., 1991. "Design Concepts in Hillslope Morphology." Paper presented at the 13th Annual Abandoned Mined Land Conference, Lake Ozark, Missouri.

Lidstone, C.D., and C.M. Jones, 1993. "Hydrologic Considerations in the Design of Wetlands." Paper presented at the 15th Annual Abandoned Mined Land Conference, Jackson, Wyoming.

Jones, C.M., and C.D. Lidstone, 1996. "Drop Structures" in *Handbook of Western Reclamation Techniques*, F.K. Ferris, ed., USDI Office of Surface Mining, Washington, D.C., pp. II-21 - 32.

Lidstone, C.D., and C.M. Jones, 1996. "Hillslope Shaping and Morphology" in *Handbook of Western Reclamation Techniques*, F.K. Ferris, ed., USDI Office of Surface Mining, Washington, D.C., pp. III-3 - 12.

Ferris, F.K., C.D. Lidstone, and C.M. Jones, 1996. "Small Drainage Waterway Construction" in *Handbook of Western Reclamation Techniques*, F.K. Ferris, ed., USDI Office of Surface Mining, Washington, D.C., pp. II-67 - 74.

Gibbens, G.A., Hyde, B., Thompson, K., and, Lidstone, C.D., 2002. "River Restoration Planning for the Rio Grande Headwaters, Colorado." Paper presented at the Rio Grande Restoration Vision Workshop hosted by the World Wildlife Fund and Alliance for the Rio Grande Heritage, Albuquerque, New Mexico.

Lidstone, C.D., and M. Pole, 2006. "In-Stream Mining: The Trial and Tribulations of the Federal Permitting Process: A Case Study: Umpqua River Navigation." Paper presented at the 2006 SME Annual Meeting, St. Louis, Missouri.

Wampler, P., E. Schnitzer, D. Cramer, and C. Lidstone, 2006. "A Meander Cutoff into a Gravel Extraction Pond, Clackamas River, Oregon: Instream and Floodplain Mining Implications." Paper presented at the 2006 SME Annual Meeting, St. Louis, Missouri.

Lidstone, Christopher D., 2006. "Applied Geomorphology: Hydrologic Design Considerations to the Stabilization and Reclamation of Mining Disturbed Lands." Keynote Presentation. OSM Conference, National Interactive Forum on Geomorphic Reclamation. Farmington, NM. September 12-14, 2006.

Lidstone, Christopher D. and Abby Korte, 2011. "Water and Sediment Control Systems" (Chapter 16.4) in SME Mining Engineering Handbook, Third Edition, ed. Peter Darling, Society for Mining, Metallurgy and Exploration, Inc., Littleton CO.

KATHERINE J. LAUDON
Principal Engineer/Vice President

Education

University of Wisconsin, Oshkosh
B.S. Geology, 1979

Washington State University
M.S. Geologic Engineering, 1983

Registration

Professional Engineer – Colorado, Wyoming
Professional Geologist - Wyoming

Experience Summary

Ms. Laudon combines over 30 years of consulting, regulatory, and educational experience in groundwater hydrogeology and geological engineering including the design, installation, and operation of groundwater monitoring systems, groundwater quality monitoring, hydrogeologic investigations, groundwater supply and development, computer modeling, and geophysical investigations. While designing water supply wells, preparing environmental permit applications and conducting hydrogeologic investigations for clients throughout the western United States, Ms. Laudon has become familiar with the state and local regulatory agencies, as well as the regulatory requirements of the EPA, BLM, and NRC.

Environmental Permitting

Ms. Laudon has been involved with all aspects of the environmental permitting and regulation process with respect to groundwater issues. As a groundwater engineer with the Wyoming Department of Environmental Quality, she reviewed applications for waste disposal permits for mining, industrial, utility, and domestic facilities and prepared permits for groundwater monitoring systems and underground injection wells. As a consultant she has implemented groundwater monitoring programs in which she was responsible for the contracting of drillers and laboratories, the permitting and construction of monitoring wells, aquifer testing, the collection of water quality and soil samples, and the analysis and reporting of data. While preparing a permit application for the Cameco in-situ recovery (ISR) uranium mine in the Gas Hills, Wyoming, Ms. Laudon supervised field data collection of aquifer hydraulic properties and water quality data, then combined this information with existing historical data to establish baseline conditions and to predict potential impacts to the aquifer resulting from past mining activities and the proposed in-situ operation. Ms. Laudon prepared Plans of Operations for the Gas Hills and Buss Pit sites that were quickly approved by the BLM. She completed the Probable Hydrologic Impact sections of Source Material Licenses submitted to the NRC for the Titan Uranium Sheep Mountain Project and the Smith Ranch License Renewal Project. She has evaluated the interactions between surface water and groundwater and the potential impacts to wetlands associated with aggregate mining in Colorado, Minnesota and Oregon. Currently Ms. Laudon is under contract with both the states of Colorado and Wyoming and to provide permit review services and develop guidelines related to groundwater issues. The combination of regulatory and consulting experience has helped Ms. Laudon gain valuable insight into the technical, economic, environmental, and regulatory issues that often accompany groundwater and waste disposal projects.

Ground Water Development and Supply

Ms. Laudon has been actively involved in municipal groundwater supply investigations for the towns of Greeley, Colorado; Norway, Michigan; and Cheyenne, Dixon, Greybull and Pine Bluffs, Wyoming. She was the Project Manager for several Cheyenne Board of Public Utilities (BOPU) Well Rehabilitation Projects, and the Pine Bluffs Groundwater Exploration Grant; responsible for test hole drilling, well completion and aquifer testing and analysis. For the Town of Greybull she worked with the Wyoming Department of Environmental Quality/Water Quality Division to resolve NPDES permitting issues associated with the discharge of water from the new well after treatment by acid fracing. Ms. Laudon has supervised the drilling and installation of domestic water supply wells at the Giberson Preserve near Frisco, Colorado, and the Squaw Creek Subdivision near Jackson, Wyoming. Ms. Laudon has provided technical oversight to other LA hydrologists and engineers on the Belvoir Ranch, Bairoil, Hot Springs County, Lander, Sand Draw and Shoshone, Wyoming water supply projects; the Linn Grove Cemetery project in

Greeley, Colorado; and on impacts to water supply users associated with uranium mining in Wyoming, and aggregate mining in Minnesota, Oregon and Wyoming.

Geohydrologic Investigations

Geohydrologic investigations conducted by Ms. Laudon include the evaluation of impacts associated with large capacity water supply and irrigation wells completed in the Arikaree Aquifer in the Prairie Center Groundwater Control Area north of Torrington, and along Horse Creek, in Wyoming; exploratory drilling and evaluation of municipal water supply wells for the BOPU; the evaluation of water levels in the alluvial aquifer adjacent to the Yampa River near Steamboat Springs, Colorado to determine potential impacts to wetlands; a regional evaluation of the hydrogeology and water rights of the Gas Hills Uranium Mining District in Wyoming; more detailed investigations of the groundwater impacts associated with reclamation activities in the East Gas Hills and the Day Loma area; the mitigation of seepage from wastewater ponds at large livestock facilities in southeastern Wyoming; unsaturated zone monitoring beneath domestic wastewater disposal systems in Colorado; and investigations of the nature and extent of hydrocarbon contamination of RCRA facilities and underground storage tank sites in Colorado, Wyoming and other western states. For her Master's thesis, she utilized geophysical methods to investigate groundwater recharge and discharge areas associated with glacial terrace deposits adjacent to the Okanogan River in Washington State. She has designed and sampled monitoring systems at uranium mines, power plants, municipal landfills, refineries, domestic and agricultural waste disposal sites, and leaking underground storage sites in several different states.

Groundwater Engineering

As a professional engineer and a professional geologist, Ms. Laudon brings expertise in both disciplines to the design of water supply wells, and to wastewater or other facilities with the potential to impact groundwater. She has designed, contracted drilling, and supervised the construction of numerous water supply and monitoring wells. For the Gas Hills, Smith Ranch, North Butte, and Ruby Ranch ISR uranium projects, she worked closely with the operating engineers to design injection, production and monitoring wells which will optimize uranium production and minimize potential environmental impacts to the adjacent aquifers. She has designed a leak detection system for a wastewater collection sump at a livestock facility near Albin, Wyoming, and infiltration galleries in the alluvium of the Little Snake River for the Town of Dixon water supply, and beneath the Big Horn River to provide cooling water to facilities at Hot Springs State Park. She has calculated design inflows and prepared conceptual designs for an underdrain system for a commercial development in Breckenridge, Colorado. For the North Platte River groundwater investigation she prepared conceptual designs for a Paleozoic wellfield and transmission line to provide replacement water to the North Platte River in Wyoming. In 2010 Ms. Laudon served as a technical editor of several chapters of the 3rd Edition of the Society of Mining Engineers Mine Engineers Handbook dealing with solution mining, dewatering, waste piles, and waste management.

Technical Societies

Association of Groundwater Scientists and Engineers

American Council of Engineering Companies

Publications and Technical Papers

Laudon, K.J., Contributing Editor, 2011. SME Mining Engineering Handbook. Third Edition, Principal Editor Peter Darling, Society for Mining, Metallurgy and Exploration, Inc., Littleton, CO.

Laudon, K.J., D. Erskine, and C.O. Seely, 1999. "Degradation of Ground Water Quality Caused by Surface Reclamation of Open Pit Mines, Gas Hills, Wyoming," Abstract of a technical paper presented at the 1999 SME Annual Meeting and Exhibit, Denver, Colorado.

Underwood, J.E., K.J. Laudon, and T.S. Laudon, 1984. "Seismic and Resistivity Investigations Near Norway, Michigan," Ground Water Monitoring Review, Vol. 4, No. 4, pp. 86-91.

Laudon, K.J., 1984. "Geophysical Investigation of the Duck Lake Ground-Water Subarea near Omak, Washington," Proceedings for the Third National Symposium and Exposition on Aquifer Restoration and Ground-Water Monitoring, Columbus, Ohio, pp. 223-230.

Laudon, K.J., R. Lennox, and P. Pucle, 1983. “Proposed Well Construction Standards in Wyoming,” Abstract of a technical paper presented at the 13th Annual Rocky Mountain Ground-Water Conference, Billings, Montana.

LAIDLEY ELI MCCOY

Vice President

EDUCATIONAL BACKGROUND

Ph.D.	Aquatic Ecology, 1981 University of Louisville
M.S.	Biological Sciences, 1974 Marshall University
B.S.	Zoology, 1972 Marshall University

EMPLOYMENT HISTORY

1997-Present	Potesta & Associates, Inc.
1995-1997	West Virginia Division of Environmental Protection - Director
1993-1995	West Virginia Division of Environmental Protection - Deputy Director
1989-1993	West Virginia Division of Environmental Protection - Chief, Office of Water Resources
1985-1989	West Virginia Department of Natural Resources - Deputy Chief, Office of Water Resources
1983-1985	West Virginia Department of Natural Resources - Assistant Chief, Office of Water Resources
1980-1983	West Virginia Department of Natural Resources - Manager, Biology Unit
1979-1980	West Virginia Department of Natural Resources - Biologist, Office of Water Resources
1977-1979	University of Louisville - Graduate Research Assistant
1976-1977	University of Louisville - Graduate Teaching Assistant

AREAS OF SPECIALIZATION

Aquatic ecology, permit negotiation, enforcement negotiations, environmental compliance, general state and federal regulatory agency operation, US EPA operation and function and negotiations with them, and the function and operation of the three basin commissions operating in the state.

PROFESSIONAL EXPERIENCE

- As Director of DEP, was responsible for the solid waste program for the entire state of West Virginia, including inspection, permitting and enforcement, which gave a working knowledge of program requirements and needed permits.
- Managed the inspectors for the water and waste programs in the state.
- As Chief of the Office of Water Resources, was responsible for the management of industrial solid waste for the state, including inspection, permitting and enforcement.
- As Deputy Director of DEP, was responsible for management of the air, solid waste, and water programs.
- As Chief of the Office of Water Resources and Director of the Division of Environmental Protection reviewed FONSIs required by NEPA which were prepared by the Construction Grants unit for the construction of sewage treatment systems funded in part by federal money.
- Reviewed NEPA documents submitted to the agency for comments or concurrence.
- Past President of West Virginia Water Pollution Control Association.
- Past Chairman of Ohio River Basin Commission.
- Have held following positions in Ohio River Valley Water Sanitation Commission:
  - Member of Biological Subcommittee
  - Member of Monitoring Subcommittee
  - Chairman of Monitoring Subcommittee
  - Member of Technical Committee
  - Commissioner
  - Currently Member of Research Committee

- Developed and implemented the first blackfly control project for the New, Bluestone, and Greenbrier Rivers.
- Chaired a diverse group of agency and industry members to develop the first general permit used in the state of West Virginia for the oil and gas industry.
- Coordinated state enforcement activities in environmental programs.
- Developed case referral strategies and referred cases to federal agencies such as OSM, EPA, FBI, and US Attorney's Office.
- Expert testimony in and before court for various boards regarding compliance, enforcement, and other functions of the state environmental agency.
- Served on National Institute for Chemical Studies Board.
- Served on West Virginia Infrastructure Council.
- Extensive experience representing issues to West Virginia State Legislature.
- Managed wetlands delineation work.
- Managed wetlands mitigation replacement.
- Negotiated 404 permit condition; and 401 certification agreements.

RESUME
GEORGE C. PATTERSON

GENERAL INFORMATION

NAME:	George Cameron Patterson
ADDRESS:	200 Summit Ave Thunder Bay ON P7B 3P6
PHONE NUMBER:	(807) 768 8649
E-MAIL:	george.patterson@tbaytel.net
HIGHEST EDUCATION:	Ph.D., Geology (1980) Carleton University, Ottawa
OTHER EDUCATION:	Classes towards an MBA (mid to late 1980's) Lakehead University, Thunder Bay M.Sc., Geology (1976) University of Toronto B.Sc.(Hons), Geology (1974) University of Toronto
OTHER TRAINING:	Professional Geoscientist Saskatchewan and Professional Geologist of Ontario Windows Microsoft Office (Word, Excel, Outlook, Access) Microsoft Project, Photoshop CS4 training Explorer GIS Photography (Saskatchewan Institute of Applied Science and Technology - SIAST) Ontario Drivers License

RESUME
GEORGE C. PATTERSON

EMPLOYMENT HISTORY

- April 2011- Current:
  Contractor with Ovalbay Geological Consulting: Logging Core
  Contractor with Derrik Murray Consulting on Potash Mining and Mining Development
- Sept 2010-April 2011
  Executive Director of Major Projects, Government of Saskatchewan, Regina
- 1994-2010
  Executive Director of Exploration and Geological Services, Government of Saskatchewan, Regina
- 1988-1994
  Director Mineral Policy, Government of the NWT, Yellowknife
- 1982-1988
  Resident Geologist, Government of Ontario, Thunder Bay
- 1981-1982
  Office Manager, Denison Mines Limited, Thunder Bay, ON
- 1980-1981
  Project Geologist, Ontario Geological Survey, Toronto, ON
- 1973-1979
  Geophysical Assistant to Project Manager, UMEX Corporation, Pickle Lake, ON

BOARDS AND COMMITTEES

- Saskatchewan representative for the Intergovernmental Working Group (IGWG) on the mining industry reporting to the Energy and Mines Ministers Council.
- Co-chair of the IGWG Working Group on Regulatory Efficiency.
- Member of IGWG Committee on Mining Social Responsibility.
- Member of IGWG Aboriginal Involvement in Mining Industry.
- Technical Representative on the Saskatchewan Mineral Sector Team (economic development team for the mineral industry.)
- Board member on the Canadian Mining Innovation Council (CMIC.)
- Member of the International Mining Innovation Institute (IMII) steering committee.
- Member of the Association of Professional Engineers and Geologists of Saskatchewan (APEGS) Education Committee.
- Member of three major land claims negotiation team for the NWT – TFN, Dena Métis, and Sahto.
- Co-chair of the NWT Environmental Impact Review Board for Commissioner's Land.
- Member of 20 different committees conducting land-use plans in Ontario, NWT and Saskatchewan.

- Member of 20 different committees conducting land-use plans in Ontario, NWT and Saskatchewan

ADDITIONAL INFORMATION

- Born and raised in Toronto, Ontario.
- Married to Marie with two children, Grégoire and Gabrielle.
- Recipient of the Government of Saskatchewan Premier's Award for Excellence for the development of the Saskatchewan Mineral Strategy and Associated Incentive Programs.
- Recipient of the Association of Professional Engineers and Geologists of Saskatchewan (APEGS) Environmental Award for "Best Management Guidelines for Mineral Exploration."
- Extensive media experience including over 100 interviews with CBC's noon hour shows in Thunder Bay (on mining history and activities) and 30 to 40 newspaper and TV interviews in Saskatchewan.
- Straugh Distinguished Guest Lecturer (eight talks to eastern Canadian universities on the Hemlo gold deposit.)
- Has written over 1000 briefing notes.
- Extensive knowledge of the diamond industry gained from tours of sorting facilities in the NWT and London, England; diamond cutting facilities in Belgium, Israel, and Australia.
- Technical Advisor for Saskatchewan Uranium Development Committee

RESUME
GEORGE C. PATTERSON

REFERENCES

Kent Campbell: Deputy Minister of Energy and Resources
Government of Saskatchewan
(306) 787-9580
2103 11th Avenue, 11th Floor
Regina SK S4S 3Z8

Pam Schwann: Executive Director
Saskatchewan Mining Association (SMA)
(306) 757-9505
1500-2002 Victoria Ave
Regina SK S4P 0R7

Engin Ozberk: Vice-president, Innovation and Research
Cameco
(306) 956-8093
Operation Center
1131 Ave S
Saskatoon, SK, S7M 4E8

Tony Baumgartner: Vice-president, Enterprise Saskatchewan
(306) 787-9580
11th Avenue
Regina SK S4S 3Z8

Eric Cline: Vice-president, Corporate Affairs, Shore Gold Incorporated
(Former Minister of Industry and Resources, Government of Saskatchewan)
(306) 664.2202
300-224 4th Avenue South
Saskatoon SK S7K 5M5

Christine Kaszychi: Assistant Deputy Minister, Ontario Northern Development and Mines
Government of Ontario
(705) 670-5877
Willet Green Miller Center
833 Ramsey Lake Road, 6th Floor
Sudbury ON P3E 0B0

(Global Permission to contact additional references)

PAUL R. HILDENBRAND
Project Manager/Senior Geologist

Education

Portland State University, B.S. in Geology, 1969

Registration

Professional Geologist – Wyoming
Registered Geologist – Oregon

Experience Summary

Mr. Hildenbrand is a senior geologist and project manager with over 40 years of mining related experience with more than 30 years experience in uranium mining and regulation. His experience covers a wide range of individual, yet interrelated areas of expertise, which include: ground water hydrology; geology; project management; mine development and production; mine permitting, involving environmental studies and assessments and development of state and federal permits and licenses; mined-land reclamation and ground water restoration; environmental compliance and industrial health and safety, including radiation safety oversight at uranium mining facilities; waste management, handling and cleanup of hazardous and radioactive materials and wastes; and environmental regulation at the state and federal level. His experience as both a permittee/licensee and a regulator, first with the U.S. Nuclear Regulatory Commission (NRC) and then with the State of Wyoming, provides him with a unique understanding of uranium mining/milling regulations at both the state and federal level. In his current position, he provides advice and assistance to uranium mining companies who are developing new or renewal applications for NRC and/or state permits and licenses.

Mining/Management

Mr. Hildenbrand's mining experience includes mine production and development geology, mine production/management and environmental/safety management and licensing/permitting. His mining geology experience has included reserve evaluations; geologic mapping and sampling in igneous, metamorphic and sedimentary geologic environments; due diligence investigations; ore reserve evaluations: mine planning; aquifer analysis and evaluation, exploration, development and production drilling program planning and implementation; logging and sampling of chip and core samples and down-hole geophysical logging. He has been a project geologist on coal, industrial minerals (sand, gravel and rock), gold, copper, silver, and uranium mining projects in Idaho, Oregon, Texas, Wyoming, southern Africa and South Australia. Mr. Hildenbrand's mine management experience includes direct oversight of all production activities at uranium in ISR facilities in Wyoming and South Australia. His experience involved all aspects of project development and operation, project planning and budgeting, reserves estimation, state permit and federal license compliance, NRC radiation protection and U.S. Mine Safety and Health Administration industrial safety programs, and ground water restoration and surface reclamation.

Additional mining experience includes five years as a Project Geologist investigating coal projects in the Powder River Basin of Montana and Wyoming. During this time he supervised coal development drilling programs, performed geological mapping and logging of bore holes, down-hole geophysical logging, core sampling and sample preparation of coal and overburden, coal reserve estimations for mine applications, and installation and sampling of ground water monitoring wells at the former Dave Johnston Mine and the Antelope Mine in Converse County, Wyoming; and the Spring Creek Mine near Decker, Montana. Additionally, he was the Project Geologist on the Wyoming Abandoned Mine Lands (AML 17-F) Project where he supervised the pre-design evaluation of the Swigart Coal Mine Project in Natrona County, Wyoming. He supervised the auger drilling and sampling to confirm the extent of existing underground workings, to define the competency of the roof sandstone and provide essential design information, which would allow a cost effective reclamation of the surface hazards associated with the underground workings at the site. He was an underground mining geologist for five years at a silver mine in northern Idaho and a copper mine in Zambia, Africa where he performed stope orebody and structural mapping, sampling and ore reserve calculations.

Environmental Compliance/Permitting

Mr. Hildenbrand has more than 20 years of uranium mining environmental and compliance experience, having had full responsibility for all federal and state mining permits/licenses, including the development and implementation of baseline environmental studies and compliance monitoring programs. His specific experience in this area includes preparation, submittal and obtaining approval of all state and federal permits and licenses associated with uranium ISR operations. He has performed numerous compliance audits and inspections at uranium in situ facilities. He is familiar with the ISR regulations in Colorado, Nebraska, Texas, and Wyoming, as well as the licensing requirements of the NRC. He is currently assisting a major uranium company in the development of a NRC license renewal as well as updates to several of their State of Wyoming mining permits.

Regulatory

Mr. Hildenbrand was employed for five years as a Project Manager with the NRC during which time he conducted licensing reviews and compliance inspections at conventional and ISR uranium facilities and assisted in the pre-licensing technical and regulatory review of a high level nuclear waste repository near Hanford, Washington. While a Project Manager within the Uranium Recovery Branch of the NRC, Mr. Hildenbrand performed license application reviews of proposed conventional and ISR uranium production facilities. Additionally he performed compliance inspections at active and inactive uranium recovery facilities located in the western United States. He also assisted in the development of policies and regulatory guidance related to uranium recovery facilities. As a Project Manager with the NRC's High Level Waste Program, he managed the NRC's oversight and technical review of the U.S. Department of Energy's (DOE) high level waste pilot project at DOE's Hanford, Washington site. Additionally, Mr. Hildenbrand was employed with the State of Wyoming, Department of Environmental Quality STP for six years during which time he conducted compliance and construction inspections at retail petroleum installations, supervised the reclamation of soil and ground water at petroleum contaminated sites, and assisted in the development of revised regulations and guidance documents in an effort to enhance and support the existing regulatory program.

Ground Water Investigations

Mr. Hildenbrand has performed numerous geologic evaluations, hydrogeologic and water quality studies and evaluations, and has supervised construction and final testing of ground water wells for both public and private entities. For the Town of Pine Bluffs, Wyoming, he supervised the installation of a Lance/Fox Hills Aquifer test well to determine the hydrogeologic potential of the formation for providing additional municipal water supplies. For the Town of Burns, Wyoming, he performed a hydrogeologic investigation and quantity/quality testing of an existing municipal water well to evaluate the status of existing wells and to assist in determining the need for additional evaluation and potentially the need for an additional water supply well. Near the City of Medford, Oregon, he performed hydrogeologic investigations, well installation, aquifer testing and water quality testing of alluvial aquifer wells to determine potential impacts of a gravel quarry dewatering on neighboring domestic wells. During his employment with the State of Wyoming, Mr. Hildenbrand performed hydrogeologic investigations as well as installation, testing and sampling of monitor and production wells at numerous locations within southeastern Wyoming for the purpose of removing free phase and dissolved hydrocarbons from shallow ground water and subsurface soils. He has also performed geological and hydrological studies, including well installation, aquifer testing and water quality sampling of the Wind River and Fort Union Formations of Wyoming for the purpose of permitting uranium and coal mines. Most recently, he supervised the design and installation of coal bed methane (CBM) water storage reservoir monitoring wells for a CBM operator in Johnson County, Wyoming.

Ground Water Remediation

Mr. Hildenbrand is experienced in the removal of radioactive materials and hydrocarbons from ground water. He has administered ground water remediation activities at in-situ recovery (ISR) facilities utilizing reverse osmosis, electro-dialysis and reversal, ground water sweep, bacterial injection, and other techniques to remove radioactive and other hazardous materials from ground water. As a district supervisor with the Storage Tank Program (STP) with the Solid and Hazardous Waste Division of the Wyoming Department of Environmental Quality, he administered ground water remediation programs to remove hydrocarbons and heavy metals from ground water under and around former and active retail fuel stations. He is familiar with air stripping, soil venting, dual phase, biological injection, oxidation and other techniques used to remove hydrocarbons and heavy metals from ground water. Additionally, he was Acting STP Manager for four months during which time he was responsible for all STP projects, budgets and activities statewide.

Resource Evaluation, Due Diligence and Aggregate Mining

Mr. Hildenbrand has completed geological exploration projects for major mining companies throughout his career including studies in South Africa, Australia and the United States. During his career as a project and development geologist, Mr. Hildenbrand has performed numerous mining property due diligence evaluations and reserve analyses across the western United States, including at least 13 aggregate mining properties in California, Oregon, and Wyoming. Other mining project due diligence evaluations includes gold, silver, coal, and uranium properties in Idaho, Montana and Wyoming. Most recently he has completed drilling, exploration and materials testing studies for several corporations including Knife River Materials, Baker Rock, Dalton Rock, Rogue Aggregate and Baldwin Sand and Gravel. These studies were conducted as a pre-purchase reserve evaluation to ascertain if a sufficient quantity and quality of construction materials were available on site to meet the corporate needs and where applicable the promulgated standards of the US Securities and Exchange Commission. The due diligence investigations included hard rock quarries, upland and floodplain sand and gravel reserves. Each study included project planning, geologic investigations, project supervision, drilling and testing, sample collection, and data analysis.

James F. Bernard
Senior Geologist

Environmental Alliance, Inc.

Areas of Specialization

- Project and personnel management
- Regulatory (Federal and State) interaction
- Risk Assessment and Risk Analysis
- Remedial Techniques with Risk Assessment
- Drilling methodology applications and well construction design
- Site characterization and remedial investigation methodologies
- Remedial action assessment to achieve site closure
- Remedial system design, construction and operation
- Underground storage tank (UST) assessment and closure
- Hazardous waste removal, treatment and disposal methodologies
- Geo-technical QA/QC of earthwork construction and geo-membrane liner systems
- Proposal and grant writing
- Sales and marketing

Qualifications

- Twenty plus years of progressively responsible positions as a Geologist/Project Manager/Risk Assessor/ Office Manager in the environmental resources and waste fields.

- Management of Federal and State oversight projects in the Mid-Atlantic Region and the U.S.

- Working knowledge of RCRA, CERCLA and state regulations (Virginia) for implementation of site characterization, remedial investigation, remedial design, remedial action implementation and site closure.

Professional Experience

- **Senior Project Geologist/ Project Manager/Sales Manager Environmental Alliance, Inc.–** Primarily responsible for the profitability of the Virginia office. Target market includes VA, NC, SC, PA, and MD. Includes target market research, initial client contact, knowledge and research of clients challenges, proposal draft and cost estimate, project set up, delegate to project manager. Other responsibilities include management of solid waste, petroleum VRP, RCRA, and CERCLA projects with budgets in the $100,000 to $10,000 range. Additional tasks include coordination and supervision of field and office staff production of sample analysis plans for dredging and

disposal of sediments, technical 3rd party review of; RCRA Phase I and/or II Remedial Feasibility Investigations, ASTM 1527-05 ESAs, client and regulator letter generation, and regulation interpretation for all purposes. Tasks include marketing environmental services, invoicing, budgeting, project status reports, and communication with Team Leader. Regularly relied upon to provide expert advice to environmental and geological staff concerning regulations, lab analysis, QA/QC, detection, qualifiers and limits of quantification, sampling regimes, sampling protocols, hydrogeology, well placement, SOPs, and most other aspects of RCRA, CERCLA, and VRP, or Brownfield's projects. Keep current and regularly meet to discuss current policy and regulations with DEQ staff from solid waste groundwater, VRP, RCRA, solid waste permitting, and Federal Facility's. Effectively communicate policy changes to other marketing staff as well as to office management in verbal or written media. Stay current on latest Waste Division regulatory updates and revisions Virginia. Maintain working knowledge and understanding of most of Virginia's regulatory programs within the DEQ. Working knowledge and understanding of and can accomplish tasks such as site characterizations including sampling of materials, remedial systems design, groundwater sampling and monitoring, and solid waste permitting in accordance with EPA and State of Virginia regulations.

- **Senior Project Geologist -** Draper Aden Associates. Primarily responsible for VRP related work, risk assessments, site characterization reports, public notice, deed research, and delivery of Certificates. Additional tasks include coordination and supervision of field and office staff production of sample analysis plans for dredging and disposal of sediments, technical 3rd party review of; RCRA Phase I and/or II Remedial Feasibility Investigations, ASTM 1527-05 ESAs, client and regulator letter generation, and regulation interpretation for all purposes. Tasks include marketing environmental services, invoicing, budgeting, project status reports, and communication with Team Leader. Regularly relied upon to provide expert advise to environmental and geological staff concerning regulations, lab analysis, QA/QC, detection, qualifiers and limits of quantification, sampling regimes, sampling protocols, hydrogeology, well placement, SOPs, and most other aspects of RCRA, CERCLA, and VRP, or Brownfield's projects. Keep current and regularly meet to discuss current policy and regulations with DEQ staff from solid waste groundwater, VRP, RCRA, solid waste permitting, and Federal Facility's. Effectively communicate policy changes to other marketing staff as well as to office management in verbal or written media. Stay current on latest Waste Division regulatory updates and revisions Virginia. Maintain working knowledge and understanding of most of Virginia's regulatory programs within the DEQ. Working knowledge and understanding of and can accomplish tasks such as site characterizations including sampling of materials, remedial systems design, groundwater sampling and monitoring, and solid waste permitting in accordance with EPA and State of Virginia regulations. Active member of Association of Engineering Geologists (AEG). Presented passive sampling technology to AEG members in a one-hour PowerPoint lecture. For the same AEG venue invited and arranged lectures on risk assessments by the DEQ and Unexploded ordinance by a local professional.

- **Remediation Project Officer –** Virginia DEQ, Voluntary Remediation Program. Duties entailed the review of characterization/assessment reports, i.e.: work plan, site characterization, risk assessment, remedial plan, and general correspondence to determine compliance with regulations. Completed remedial projects involving ISCO, pugmill treatment of soils, PCB removal action with TSCA, and lead stabilization using TSP technology. Continually kept

abreast of cutting edge remediation techniques in order to educated participants and understand the proposed remedial efforts. State Point of Contract (POC) for the Interstate Technology Regulatory Council (ITRC). Provided innovative solutions to the regulated community within the regulatory framework provided. Designed and oversaw the installation of the first sub-slab vapor mitigation system in Virginia for mitigation of vapors in a dry cleaning operation. The sub-slab mitigation system is now part of Virginia's regulatory guidance.

- **Environmental Engineer II –** Virginia DEQ, Solid Waste Division. Duties included regulatory compliance review of 55 of the 235 current facility permits, issue minor and major amendments, arrange public hearings, and perform as public hearing officer. Review groundwater monitoring plans, annual/semi-annual reports, facility requests and Department memos for completeness, issue compliance/non-compliance letters.

- **Senior Project Professional –** Law/Gibb Group. Inspector for Wal-Mart prime and subs completing cinder block wall construction, roof support steel, plumbing, concrete slab, and other misc. aspects during construction of a Super Wal-Mart store in Woodstock, VA. Field Manager for geological subsurface investigation for Dept. of Federal Prisons-involved three contractors, 2 bulldozers, and five drill rigs on a 600-acre wooded property in WV. Received high approval remarks from the Atlantic Regional Director of Federal Prisons for timely completion, thoroughness, and attention to detail in both the field work and final submittal. Field-tested/designed combination air sparge and vacuum extraction remediation system for petroleum release. Conducted indoor air quality assessments for private and state clients. Procured and completed asbestos surveys.

- **Project Manager –** UTTS/E. Completed UST investigations/remediation in the $20,000 to $100,000 ranges. Responsibilities included remediation system construction/operation, maintenance (electrical, plumbing, pneumatic), site investigation, and report generation from initial incident report to corrective action, quarterly monitoring and final closure of incident, in the removal of hydrocarbon from groundwater/soil. Started and managed the Asbestos Division.

- **CERCLA Principle Site Geologist –** ACCI. Completed a groundwater remediation contract with the Army Corps of Engineers. System involved 32 groundwater extraction/injection wells on the Ogden Defense Depot, Ogden, UT. Supervised installation of wells, installed pumps and metering in wells and conducted three stage pump tests and three stage infiltration tests on the 32 wells for flow rate and capacity. Designed, built, and implemented the metering apparatus necessary for accurate flow control measurements in conjunction with Hermit Data Logger during the three stage tests. Operated and assisted in construction of the treatment plant. Gained experience in start-up procedures, system controls, system balancing, emergency procedures, system cleaning, chemical addition, compliance sampling, and QA/QC procedures.

- **Well Site Geologist –** Engineering Science (Parsons) on CERCLA site supervising the installation of monitoring wells on the Department of Energy's Hanford Nuclear Reservation in Washington State. Received extensive training in nuclear safety, management, disposal, and properties.

- **Field Team Leader –** Engineering - Science (Parsons) during a CERCLA Phase II RFI contract

at the Department of Defense's Dugway Proving Grounds. Responsible for completion of magnetometer surveys, monitoring well installation, soil gas surveys, soil borings, and hand auger borings. Environmental hazards included chemical warfare agents, UXO, bombs, warheads, explosives, PCBs pesticides, organic, and petroleum products. Received extensive training in chemical warfare and UXO safety. Project Manager for logistics portion of DPG project i.e. secured DPG remote office and housing, vehicles, instruments, PPE, supplies, and gear for four companies involving 20 people.

- **Project Manager –** Engineering Science (Parsons). Investigate underground storage tank releases for the State of Utah Dept. of Administrative Services. Remedial Investigations, tank removal, groundwater investigation, and subsequent remediation were included as well as reports for each stage.

- **Asbestos Inspector/Air Monitor Specialist –** Intron Laboratories supervising contractors in the removal of asbestos from HVAC systems at Wright Patterson Air Force Base, Dayton, OH. Laboratory QA/QC Coordinator. Analyzed asbestos bulk samples and air samples for asbestos utilizing the phase contrast and polarized light microscopes.

- **Inspector –** Intron Laboratories and UTTS. Inspect residential, commercial, and governmental buildings for the presence of asbestos containing building materials (ACBM) in North Carolina, Virginia, South Carolina, Maryland, and Ohio.

- **Staff Geologist –** Bowser-Morner, Assoc. Completed phase I, II site assessments, sighting and subsurface fieldwork for new and additions to landfills. Served as soils Technician on construction of coal slurry dam.

- **Machinist –** Green Machine Tool and Die. Four years part-time (college) and one year full time employed as a machinist in tool and die shop. Fabricated from aluminum and steel; plastic injection molds, stamping dies, diaper production machines, and precision tooling. Learned blueprint reading, CNC configuration, and project layout. Required excellent math skills.

Education

- B.S., Geology, Wright State University, 1987

March 30, 2012

Patsy Jones
Contract Officer
1st Floor Reception Desk
Department of Environmental Quality
629 East main St.
Richmond, Virginia 23219

Re: RFP 12-06-PJ, Uranium Study. Proposal submittal by Wright Environmental Services, Inc.

Dear Ms. Jones;

Please find enclosed our proposal for the referenced RFP. Specifically, enclosed are:

- The signed RFP cover sheet.
- 1 original and 5 hard copies our proposal, which includes:
  - a signed Offeror Data Sheet (Appendix A);
  - the DMBE Small Business Certification (Appendix B);
  - a completed State Corporate Commission Form (Appendix C); and
  - resumes of staff to be assigned to the project (Appendix D).
- 1 disc with an electronic copy of our proposal.

We appreciate the opportunity to propose this team for the requested scope of work and look forward hearing from you.

Please let me know if you have any questions.

Sincerely,

Toby Wright
Project Manager
wrightenv@gmail.com
(970) 231-1160

201 Linden St., Suite 301
Fort Collins, Colorado 805254
(970) 231-1160
WrightEnv@gmail.com

May 4, 2012

Patricia Jones
Contract Officer
1st Floor Reception Desk
Department of Environmental Quality
629 East Main St.
Richmond, Virginia 23219

Re: RFP 12-06-PJ, Uranium Study. Proposal addendum submittal by Wright Environmental Services, Inc.

Dear Ms. Jones;

This letter provides a summary of contract negotiations conducted with the Virginia Department of Environmental Quality (VDEQ) and Wright Environmental Services Inc. (WES) regarding Procurement No. 12-06-PJ (Uranium Study). These negotiations were conducted in your offices on Wednesday April 25th, 2012 and via a conference call on Thursday May 3, 2012. The VDEQ requested specific modifications to the request for proposal (RFP) scope, which necessitates revisions to the WES technical proposal (Section 3) and the cost proposal (Section 4 and Table 2). This letter proposes specific revisions to the March 2012 Wright Environmental Services Inc. proposal (the proposal) to address VDEQ's modified scope. Attached to this letter are the revised Cost Proposal summary (Table 2) and a comparison table, showing the revised cost summary with respect to the original cost proposal summary and the bases for the revisions. The following summarizes the VDEQ changes in requested scope and the proposed changes to the proposal.

Work Task A:

- VDEQ determined that WES attendance at a kickoff meeting in Richmond, Virginia would not be required. Rather, this kickoff meeting will be performed via conference call with the proposed Project Manager and the 5 Technical Leads. The cost proposal in Table 2 has been modified to reflect this change.

- VDEQ requested that WES submit a project schedule for VDEQ review and concurrence outlining specific Uranium Study deliverables and milestones. WES commits to providing a draft schedule to VDEQ within 3 business days of contract award. All schedule dates will be dependent on VDEQ meeting the schedule elements and timeframes within their control. The schedule will address the following items.

    - Kickoff Meeting via conference call.

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- Draft Initial Report & Final Initial Report as required by Task A and Summary of Work Task B.2.g (Necessary Components of a Full Environmental Impact Analysis) within 3 weeks of contract award (Meeting #1).
- Draft and final interim deliverable materials in support of four public input meetings (tentatively June 18, August, October, November 2012). Draft interim materials will be provided at least 2 weeks before the scheduled public meetings. It is assumed that the contractor will receive the meeting schedule at least three weeks before the interim deliverable materials are due (i.e., 5 weeks before the public meeting date) (Work Task B).
- Planned Interim Analysis of Issues Reports and presentation meetings required by Task B (Meetings #2, 3, and 4).
- Draft Final Report due by October 15, 2012, and Final Report required by Task B (Meeting #5).

- The scope of Work Task A.1 (Initial Literature Analysis and Recommendations: Virginia and other Studies) will be limited to the studies identified below, as well as other relevant studies identified at the discretion of the Wright Environmental Services Inc. Team. This limited scope is consistent with the original Wright Environmental Services Inc. proposal cost assumptions; therefore, no adjustments to the cost proposal have been made. Section 3.1.1 of the proposal is modified as follows:

  Within the three week time-frame following contract award, the Project Team will screen and segregate by subject matter and relevance the summaries of existing Virginia mining studies, listed below, as well as other relevant studies identified at the discretion of the Wright Environmental Services Inc. Team.

  - *National Academy of Sciences /National Academies Press [NAS/NAP].*
  - *Virginia Beach.*
  - *Fairfax.*
  - *Roanoke River Basin Association.*
  - *Chmura Economics and Analytics.*
  - *Socioeconomic Impacts of the Proposed Coles Hill Uranium Mine and Mill (Danville Regional Foundation), RTI International.*

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- *1984 SENES Assessment of Risk and associated Uranium Task Force Report.*

The Project Team will review and summarize the topics/materials by assigning specific team members with expertise in the targeted subject matter, thereby employing a time-efficient division of labor to quickly digest the content of these materials. All work will be coordinated using a system such as SharePoint™ to minimize the potential for simultaneous work on individual report sections. In addition, the team will draw on member and Workgroup resources with expertise within the existing Commonwealth regulatory framework. This will allow the Team to efficiently assess key elements identified in the studies within the context of the Commonwealth's regulatory framework, so that appropriate recommendations applicable to uranium mining and milling can be made.

- The Work Task B.2.g (Necessary Components of a Full Environmental Impact Analysis) Interim Analysis of Issues Report and associated presentation materials will be provided within 3 weeks of contract award. This summary will be provided at Meeting #1 with the presentation of the Initial Report.

Work Task B:

- VDEQ determined that the monthly progress meetings proposed as part of Task B.1 will be replaced by 5 face-to-face meetings in Richmond (1 for Presentation of Initial Report & Preparation for 1st Subcommittee Meeting, 3 Interim Analyses of Issues Meetings, and 1 Meeting after Final Report Submission). The proposed Project Manager and three technical leads, to be determined with VDEQ based on the subject matter focus of the respective meetings, will travel to Richmond for these meetings. The revised cost proposal in Table 2 has been adjusted to reflect this change. In addition to the 5 face-to-face meetings in Richmond, WES will be available as needed for meetings via conference call. The proposal is modified as follows:

    - Section 3.2.1.13 Deliverable (Interim Analysis of Issues) is to be replaced in its entirety by the following:

      Though the scope, approach and nature and schedule of the deliverables for the interim analysis of issues is not clearly defined in the Statement of Needs, we assume the interim analyses of issues will address the 11 topics identified above, as well as related items that emerge through the course of this assessment and from discussion with the Workgroup. For the purposes of this proposal it is assumed that four Interim Analysis of Issues Reports will be developed for the issue categories as grouped below. It is also assumed that presentation materials (i.e., PowerPoint slides with figures and tables and supporting talking points, as appropriate) will be developed in an order corresponding to their need in support of public comment meetings. Based on a

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tentatively scheduled public comment meeting on June18, 2012, the draft Interim Analysis of Issues Report addressing the necessary components of full environmental impact analyses will be prepared by Monday June 4, 2012. It is assumed that the order and priority of the Interim Analysis of Issues Report topics and related presentation materials will be provided to Wright Environmental Services Inc. at least 3 weeks before the draft materials are due to VDEQ.

- *Necessary components of full environmental impact analyses, (subtask item g).*
- *Groundwater and surface water monitoring plans, adequacy of water quality standards, Air quality monitoring plan, ALARA (subtask items a, b, c, d, h).*
- *Standards for the safe disposal of mine waste, engineering designs and best management practices, methods for addressing catastrophic events (subtask items e, f, i).*
- *Assessment of financial assurance mechanisms, evaluation of validity and reliability of site-specific data provided by Virginia Uranium, Inc. (subtask j, k).*

- The cost assumptions for Work Task B.1 of Section 4 of the Proposal (cost Proposal) will be correspondingly modified as follows. Table 2 is correspondingly modified, as indicated below.

  Work Task B.1
  - *No more than four (4) Interim Analysis of Issues Reports are required and the scopes of these reports are within the scopes and level of effort contemplated by this proposal.*

- VDEQ determined that the scope of Work Task B.2.k (Evaluation of Virginia Uranium, Inc. Data Validity and Reliability) will be restricted to review of the data made available by VDEQ/VDMME for evidence of anomalous constituent values or site conditions. Such anomalies or site conditions may indicate additional scrutiny is warranted or may influence recommendations regarding the regulatory framework. The cost estimate in Table 2 for Work Task B.2.k has been reduced to reflect the lower labor effort for this modified scope. The proposal section 3.2.1.12 (Work Task B, Subtask 2, Item k) is modified in its entirety as follows:

  Because Virginia Uranium Inc. has only applied for limited activities at the Cole's Hill site (i.e., exploration drilling) the existing site environmental data is correspondingly limited. Though additional site environmental data would presumably be necessary for expansion of site activities, the scope of review for these existing data will be restricted to reviewing the data provided by the VDEQ to identify anomalous constituent values or site conditions which may warrant additional

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scrutiny or influence recommendations on regulatory framework. Various state, federal and international standards identified in Work Task A will be considered in this review.

Basis for Changes to Cost Proposal (see revised Table 2 for adjusted costs):

- Work Task A: Travel.
    - As requested by VDEQ, travel costs are reduced by eliminating the $6,150 for WES travel to Richmond for a kickoff meeting. The original cost included ground transportation, airfare, lodging, meals and parking costs but did not include labor hours for travel or meeting attendance. These costs were inadvertently omitted from the original proposal. The original travel costs are replaced by adding $2,024 in labor costs for a 2 hour Kickoff conference call for the proposed Project Manager and 5 Technical Leads.
    - Initial Report & Interim Analysis of Issues Report for Work Task Item B.2.g presentation meeting: $15,925 is added to the Cost Proposal for travel of the proposed Project Manager and 3 Technical Leads to Richmond for presentation of the Initial Report and the Interim Analysis of Issue Reports for Work Task B.2.g to the VDEQ. As mentioned above, the original estimate inadvertently omitted labor costs for travel and meetings. It is assumed that travel will take 8 hours round trip and 8 hours for the materials presentation and discussions with VDEQ staff. Typically, round trip travel from Colorado to Richmond would take 16 hours. However, due to our previous omission of travel costs, we are reducing this assumption to 8 hours for round trip travel as a good-will concession. The net change in cost for this item is an increase of $11,799.
    - Travel costs were slightly modified by increasing the cost of assumed air travel from $450/flight to $650/flight to account for increased seasonal airfare based on recent flight costs to Richmond from Denver.
- Work Task B.1:
    - Monthly Meetings: At the request of VDEQ, this cost line item was eliminated as monthly meetings are replaced by Interim Analysis of Issues presentation meetings (see Task B.2). The cost proposal is reduced by $41,400.
    - Interim Analysis of Issues: At the request of VDEQ, this cost, for production labor associated with developing 6 Interim Analysis of Issues Reports, is eliminated, reducing the cost proposal by $21,420. We will assume this cost is covered within the existing individual subtask budgets.

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- Work Task B.2, Subtask k:
    - Evaluation of the validity and reliability of site-specific data provided by Virginia Uranium, Inc.: VDEQ requested that this subtask limit the review of data provided by VDEQ to only anomalous constituent values or unusual site conditions that may warrant additional scrutiny or that may influence recommendations for the regulatory framework. Therefore, the proposed costs for this effort is reduced from $24,600 to $6,840 to reflect the lower labor effort, as indicated in the revised Table 2.
    - Travel costs for presentation of 3 Interim Analysis of Issues reports and materials as well as the Final Report (Meetings #2, 3, 4, and 5) were added to this task. It is assumed that the proposed Project Manager and 3 Technical Leads will travel to Richmond for 4 meetings. Round-trip travel is assumed to take 8 hours and the presentation meetings with VDEQ staff will take 8 hours. As stated above, we are reducing this assumption to 8 hours for round trip travel as a good will concession due to our previous omission of travel costs. This change results in an increase in task costs of $46,540 as the original estimate inadvertently omitted these travel costs.

Based on the VDEQ requested scope revisions and subsequent cost adjustments, Wright Environmental Services, Inc. is pleased to reduce our proposal cost by approximately $4,500. We sincerely regret the omission of appropriate travel costs in the original proposal, and we greatly appreciate the opportunity the VDEQ has offered this team. We would be glad to discuss the scope and cost changes using GoToMeeting or similar applications if doing so would be of assistance. Please contact me at your convenience if you have any questions.

Sincerely,

Toby Wright
Project Manager
wrightenv@gmail.com
(970) 231-1160

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VDEQ/DMME Uranium Study Cost Proposal Summary
RFP # No. 12-06-PJ
Wright Environmental Services, Inc.
Amendment dated May 4, 2012

TABLE 2

RFP Section III

Work Task A: Initial Literature Review & Recommendations		**Total**
Subtask 1	Virginia & Other Relevant Studies	$ 58,880
Subtask 2	Existing Regulatory Programs	$ 65,680
Subtask 3	International Emerging Standards	$ 29,280
•	Kickoff Meeting Conference Call (Labor- PM + 5 Leads)	$2,024
•	Project Schedule (Timeline)	$ -0-
•	Presentation of Initial Report (Meeting #1 Labor- PM + 3 Leads)	$ 6,000
•	Travel (Meeting #1 Labor- PM + 3 Leads)	$ 12,000
•	Travel (transfer, parking, airfare, lodging, meals for 4)	$ 3,925
•	Deliverable: Initial Report	$ 300
		$ 178,098

Work Task B: Assist Workgroup in Preparing Reports		**Total**
Subtask 1	Monthly Progress Meetings	$ -0-
Subtask 1.a	Compare Initial recommendations with Statutory Jurisdiction	$ 41,840
Subtask 1.b	ID areas for new/modified/expanded regulatory coverage	$ 33,840
Subtask 1.c	Recommend Statutory Changes as needed	$ 24,820
		$ 100,500
Subtask 2	Assist Working Group in Preparing Reports	
Subtask 2.a	Water Quality Monitoring Plan for surface waters	$ 14,500
Subtask 2.b	Water Quality Monitoring plan for groundwater	$ 12,880
Subtask 2.c	Air Quality Monitoring Plan	$ 20,300
Subtask 2.d	Adequacy of Virginia's Water Quality Standards	$ 11,900
Subtask 2.e	Standards for the safe disposal of mine waste	$ 20,940
Subtask 2.f	Engineering designs and best management practices	$ 27,492
Subtask 2.g	Necessary components of a full environmental impact analysis (Meeting #1 with Initial Report)	$ 11,880
Subtask 2.h	Methods for incorporating ALARA	$ 16,780
Subtask 2.i	Methods for addressing risk of catastrophic events	$ 11,692
Subtask 2.j	Identification and analysis of life span financial assurance	$ 21,040
Subtask2.k	Evaluation of validity and reliability of site-specific data	$ 6,840
•	Travel (Meetings #2, 3, 4, and 5; Labor - PM + 3 Leads, 8 hrs/each for Round Trip)	$ 24,000
•	Presentation of 3 Initial Analyses of Issues Reports and Final Report (Meetings #2, 3, 3, 5; Labor - PM + 3 Leads, Four 8 hr meetings)	$ 24,000
•	Travel (Meetings #2, 3, 4, and 5; transfer, parking, airfare, lodging, meals for 4)	$ 15,700
•	Deliverable: Interim Analysis of Issues (3 Reports, production cost)	$ 300
•	Deliverable: Draft Final Report and Final Report (production cost)	$ 300
		$240,544

GRAND TOTAL **$513,133**

VDEQ/DMME Uranium Study Cost Proposal Summary
RFP # No. 12-06-PJ
Wright Environmental Services, Inc.
Amendment dated May 4, 2012

ORIGINAL ESTIMATE

RFP Section III

		Total		
Work Task A: Initial Literature Review & Reccomnedations				
Subtask 1	Virginia & Other Relevant Studies	$ 58,880		
Subtask 2	Existing Regulatory Programs	$ 65,680		
Subtask 3	International Emerging Standards	$ 29,280		
Travel	(Kick off Meeting & Initial Report Meeting, ($3,075 for each trip for 4 persons, travel ODC only	$ 6,150	omitted labor costs for travel/meeting	
Deliverable	Initial Report	$ 300		
			$	**160,290 Task Total**
Work Task B: Assist Workgroup in Preparing Reports		**Total**		
Subtask 1	Monthly Progress Meetings	$ 41,400		
Subtask 1.a	Compare Initial recommendations with Statutory Jurisdiction	$ 41,840		
Subtask 1.b	ID areas for new/modified/expanded regulatory coverage	$ 33,840		
Subtask 1.c	Recommend Stutory Changes as needed	$ 24,820		
Deliverable	Interim Analysis of Issues (6 individual Analyses, one for each meeting)	$ 21,420	document production labor for 6 reports	
			$	**163,320 Task Total**
Subtask 2	Assist Working Group in Preparing Reports			
Subtask 2.a	Water Quality Monitoring Plan for surface waters	$ 14,500		
Subtask 2.b	Water Quality Monitoring plan for groundwater	$ 12,880		
Subtask 2.c	Air Quality Monitoring Plan	$ 20,300		
Subtask 2.d	Adequacy of Virginia's Water Quality Standards for groundwater and surface waters	$ 11,900		
Subtask 2.e	Standards for the safe disposal of mine waste	$ 20,940		
Subtask 2.f	Engineering designs and best management practices	$ 27,492		
Subtask 2.g	Necessary components of a full environmental impact analysis	$ 11,880		
Subtask 2.h	Methods for incorporating ALARA	$ 16,780		
Subtask 2.i	Methods for addressing risk of catastrophic events	$ 11,692		
Subtask 2.j	Identification and analysis of life span financial assurance mechanisms	$ 21,040		
Subtask 2.k	Evaluation of validity and reliability of site-specific data provided by Virginia Uranium, Inc.	$ 24,600		
Deliverable	Final Report			
	No previous costs for travel ODC, travel labor hrs or labor hrs for meetings or report productior			
			$	**194,004 Task Total**
	ORIGINAL GRAND TOTAL	$	**517,614**	

REVISED ESTIMATE

		Total		**Change From Original**	
Work Task A: Initial Literature Review & Recommendations					
Subtask 1 Virginia & Other Relevant Studies		$ 58,880.00		$0.00	
Subtask 2 Existing Regulatory Programs		$ 65,680.00		$0.00	
Subtask 3 International Emerging Standards		$ 29,280.00		$0.00	
Kickoff Meeting Conference Call (Labor-2 hrs for PM + 5 Leads)		$ 2,024.00		$ 2,024.00	increased due to added conf. call labor hrs, erroneously omitted in original
Project Schedule		$ -		$0.00	
Presentation of Initial Report Meeting #1 (Labor ; PM + 3 Leads, 8 hrs each)		$ 6,000.00		$ 6,000.00	increased due to inclusion of labor hrs for presentation, erronuosly omitted in orgina
Travel Meeting #1 (Labor - PM + 3 Leads; 8 hrs each)		$ 6,000.00		$ 6,000.00	increased due to inclusion of labor hrs for travel, erronuosly omitted in original
Travel Meetings #1 (Labor - PM + 3 Leads; ground trnsprt, parking, airfare, lodging, meals)		$ 3,925.00		($2,225.00)	decreased due to only 1 trip, not 2, minor adjustment in cost assumptions for air trave
Deliverable: Initial Report (report materials)		$ 300.00		$0.00	
		Task Total:	**$ 172,089.00**	**$11,799.00**	increased due to labor cost omitted from original estimate
Monthly Progress Meetings		$ -		($41,400.00)	deleted due to elimination of monthly calls, replaced my meetings #1, 2, 3, 4, 5) see Task B.2
Compare Initial recommendations with Statutory Jurisdiction		$ 41,840		$0.00	
ID areas for new/modified/expanded regulatory coverage		$ 33,840		$0.00	
Recommend Stutory Changes as needed		$ 24,820		$0.00	
Interim Analysis of Issues (report production)		$ -		($21,420.00)	deleted, assumed costs are covered by previously budgeted task labor
			$ 100,500	**($62,820.00)**	decreased due to elimination of monthly meetings and development of interim Analysis of Issues Reports
Water Quality Monitoring Plan for surface waters		$14,500		$0.00	
Water Quality Monitoring plan for groundwater		$12,880		$0.00	
Air Quality Monitoring Plan		$20,300		$0.00	
Adequacy of Virginia's Water Quality Standards		$11,900		$0.00	
Standards for the safe disposal of mine waste		$20,940		$0.00	
Engineering designs and best management practices		$27,492		$0.00	
Necessary components of a full environmental impact analysis		$11,880		$0.00	
Methods for incorporating ALARA		$16,780		$0.00	
Methods for addressing risk of catastrophic events		$11,692		$0.00	
Identification and analysis of life span financial assurance		$21,040		$0.00	
Evaluation of validity and reliability of site-specific data		$6,840		($17,760.00)	decreased due to reduction in data assessment scope
Travel Meetings #2,3,4,5 (Labor - PM + 3 Leads)		$24,000		$24,000.00	increased due to addition of labor for travel, erronuosly omitted in orginal
Travel Meetings #2,3,4,5 (ground trnsprt, parking, airfare, lodging, meals; PM + 3 Leads		$ 15,700.00		$15,700.00	increased due to addition of travel Direct Costs, erronuosly omitted in orginal
Presentation Meetings #2,3,4,5 (Labor - PM + 3 Leads, 8 hrs each person/meeting		$24,000		$24,000.00	increased due to addition of labor hours for meetings, erronuosly omitted in original
Deliverable: Interim Analyses (report materials)		$300		$300.00	increased for actual production cost, previously omitted, erronuously omitted in orgina
Deliverable: Draft Final Report and Final Report (report materials)		$300		$300.00	increased for actual production cost, previously omitted, erronuously omitted in orgina
		Task Total	**$240,544**	**$46,540.00**	increased due to labor & Doc production cost omitted from original estimate
			$ 513,133	**REVISED GRAND TOTAL**	
			$ (4,481)	Net decrease from original estimate	