WESTERN MINING ACTION PROJECT

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NON CONFIDENTIAL

NOV 1

November 18, 2009

Allen Sorenson
Div. of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, CO 80203

**RE: Powertech (USA) Inc. Baseline Characterization File No. P-2009-012; Centennial Uranium Project, Weld County, Colorado**

Dear Mr. Sorenson:

This letter is submitted on behalf of **Coloradoans Against Resource Destruction (CARD)**, **Environment Colorado**, **Clean Water Action,** and **Information Network for Responsible Mining (INFORM)** regarding the Division's consideration of Powertech (USA) Inc.'s proposed Centennial Project Baseline Characterization, File No. P-2009-012. These comments are intended to aid in the Division's ongoing technical and legal review of the baseline characterization plan.

It is our understanding that the Division is currently in the process of identifying potential third party experts to review and oversee the proposed baseline characterization plan and associated activities in accordance with the Mined Land Reclamation Act (MLRA). Should additional technical information become available, including any additional information submitted by Powertech or the third party expert, commenters reserve the right to update these comments as warranted.

Overall, Powertech's proposed baseline plan fails to provide a "thorough" baseline site characterization and monitoring plan as required by the MLRA. In particular, the proposed plan neglects to address the geologic and hydrologic characteristics of the proposed mining area, and lacks a plan for gathering such information. The proposed monitoring plan also does not contain adequate information on long-term groundwater monitoring necessary to ensure the effectiveness of reclamation plans. This is despite the fact that the MLRA requires such information to be included in the baseline review.

Further, the methodology and techniques for conducting baseline sampling for those aspects of the baseline site characterization that are included do not meet the MLRA's requirement that the characterization plan be "scientifically defensible." Many of the deficiencies in the proposed methodology are described in detail in the attached letter from Dr. Richard Abitz. As demonstrated by his attached professional resume, Dr. Abitz possesses considerable expertise with respect to proper methodology for determining the baseline characteristics of site proposed for in-situ leach uranium mining.

The Mined Land Reclamation Act (MLRA) was recently amended to address the serious concerns raised by in situ leach (ISL) mining. The Powertech project presents the first application of the amended MLRA to a specific ISL mining proposal. Because implementing regulations are currently being considered, analyzing the direct impacts of the Powertech proposal should be done with great care due the potential precedent that may be set by acting upon the Powertech application in advance of the final promulgation of regulations.

Nonetheless, the MLRA does provide sufficient authority to guide the DRMS review of the baseline plan. The MLRA requires that:

> Prior to submitting an application, a prospective applicant for in situ leach mining shall design and conduct a scientifically defensible ground water, surface water, and environmental baseline characterization and monitoring plan for the proposed mining operation. This plan shall be designed in such a manner as to:
> (I) Thoroughly characterize premining site conditions;
> (II) Detect any subsurface excursions of ground water containing chemicals used in or mobilized by in situ leach mining during the mining operations; and
> (III) Evaluate the effectiveness of postmining reclamation and ground water reclamation plans.

C.R.S. § 32-34-112.5(5)(b). Unfortunately, the materials submitted by Powertech do not satisfy the statutory requirements.

The proposed baseline site characterization plan submitted by Powertech fails to provide for a thorough characterization of premining site conditions, as required by the MLRA. The gaps in the plan relate particularly to the lack of a methodology designed to characterize the hydrological and geological conditions of the site. A sound methodology for characterizing these conditions is necessary to detect and prevent excursions as well as evaluate the effectiveness of ground water reclamation plans. At minimum, the information that must be gathered via a site characterization plan includes geological and hydrological data evidencing the extent and nature of local subsurface water flows, including identification of any fractures, fissures, or other pathways for communication among and between aquifers. In the case of the Centennial site, this characterization must also thoroughly account for prior activity in the area, including historic and more recent past exploration drilling and aquifer pump test activity that could affect groundwater conditions, including quality or quantity. Any plan lacking such information is legally deficient.

It appears from the Division's files that some of this information may already have been gathered via Powertech's Notice of Intent to Conduct Prospecting File No. P-2007-015. For instance, in a recently submitted document associated with Powertech's Notice of Intent to Conduct Prospecting File No. P-2008-043, Powertech concedes that submittals in File No. P-2007-015 relating to previous aquifer pumping tests contain "evidence of subsurface geology and hydrogeology at the proposed [site]." "Response to Division of Reclamation, Mining, and Safety, September 25, 2009, Letter" NOI File No. 2007-043 (October 28, 2009) at 2. To date, it does not appear that any such data has been considered in regard to the site characterization plan, despite the fact that Powertech admits its existence and relevance. While the methodology and accuracy involved in the collection of this data must be reviewed, the Division should require that all such data be placed in the site characterization file for review by the DRMS, its experts and the public. To the extent such data is deemed scientifically defensible and reliably gathered, it should be incorporated into the design of the site characterization plan. Any failure to consider and use existing information to ensure the effectiveness and integrity of the site characterization plan in the future not procedurally or scientifically defensible.

Also absent from the proposed plan submitted by Powertech is discussion of a monitoring plan designed to "evaluate the effectiveness of postmining reclamation and ground water reclamation plans" as required by the MLRB. Such a plan is necessary for protection of groundwater and for compliance with the MLRA. The need for long-term groundwater monitoring of in-situ leach uranium mining sites to ensure full reclamation in accord with the explicit standards in the MLRA cannot be overstated. Indeed, as recently described by the U.S. Geological Survey, "**to date, no remediation of an ISR operation in the US has successfully returned the aquifer to baseline conditions. Often at the end of monitoring, contaminants continue to increase by reoxidation and resolubilation of species reduced during remediation.**" J.K. Otton, S. Hall, "In-situ recovery uranium mining in the United States: Overview of production and remediation issues," U.S. Geological Survey, 2009 (IAEA-CN-175/87)(emphasis added). Similar post-mining increases in contamination levels in impacted aquifers are described in more detail in other USGS publications. See Hall, S. "Groundwater Restoration at Uranium In-Situ Recovery Mines, South Texas Coastal Plain," USGS Open File Report 2009-1143 (2009).

The baseline characterization plan that was submitted by Powertech does not provide a "scientifically defensible" method for a thorough characterization of baseline site conditions. As detailed by Dr. Abitz in the attached report, the currently proposed methodology is neither legally nor scientifically sufficient. In short, a much more comprehensive and rigorous analysis of the baseline for the site area is necessary for an accurate baseline study. This includes water quality information throughout the vertical extent of the affected aquifers and a spatially representative sampling protocol to provide the necessary information on ground water characteristics outside of the proposed mining zone, to accurately characterize site conditions. Lastly, as noted by Dr. Abitz, the proposed methodology seeks to average site conditions, which results in a baseline plan which is inappropriately skewed toward demonstrating a lower overall water quality. Such an approach could exaggerate the true extent of any naturally diminished water quality resulting from the presence of uranium and other heavy metals in the aquifer region.

Overall, based on the above and the attached report, Powertech has not provided the information and has not set forth methodologies necessary to meet the legal standards set forth in the Mined Land Reclamation Act. We look forward to continuing a review of the DRMS efforts to consider the first application of the new provisions of the MLRA, and submitting additional comments thereon, as it is updated and supplemented by the applicant.

We look forward to your prompt attention on this matter. Please do not hesitate to contact me directly with any questions.

Sincerely,

Jeffrey C. Parsons, Esq.
On behalf of
CARD, Environment Colorado, Clean Water Action, and INFORM

Enclosure

Geochemical Consulting Services, LLC
Solubility, Speciation, and Reaction-Path Modeling
Groundwater and Soil Geochemistry
Environmental Assessment
Risk Assessment

October 31, 2009

Coloradoans Against Resource Destruction (CARD)
PO Box 143
Wellington, CO 80549

Members of CARD:

Geochemical Consulting Services, LLC (GCS) is submitting the following comments on Powertech's proposed Baseline Plan (R Squared, 2009). The comments are based on best-industry practice, sound scientific analysis, and over 20-years of GCS experience in the fields of environmental investigations, sampling and analysis plans, groundwater monitoring, and remediation of contaminated groundwater and soil.

**Comment 1. Section 2.1 Groundwater Monitoring**

The importance of groundwater sampling procedures and the collection of 8 representative samples from each well is noted. However, the discussion fails to recognize the importance of using valid statistical methods for locating the wells (e.g., systematic grid or random selection; Gilbert, 1987; EPA, 2002; Matzke et al., 2007) to ensure representative samples are collected from the aquifer. EPA (2002, p. 8) notes that *"A well-planned sampling design is intended to ensure that resulting data are adequately representative of the target population and defensible for their intended use."*

The ore zone is a very small fraction of the total aquifer volume in the proposed exemption zone. The frequency of wells placed in the ore zone should reflect a very small percentage of the wells sampled for baseline water quality of the aquifer (e.g., less than 5 percent of the wells should be placed in the ore zone, or 1 in 20 wells can be in the ore zone). This small percentage of wells in the ore body is accounted for by using a valid statistical method for locating the wells, such as a systematic grid placed over the proposed aquifer exemption zone. For a systematic grid, a 400-by-400 foot grid should be placed over the proposed aquifer exemption area to ensure that a minimum of one well is placed in every 4 acres (NRC, 2003; p. 5-39).

The importance of sampling all horizons of the aquifer is also omitted from the discussion of representative samples. If screened intervals are limited to 20 ft (SOP 5, Section 5.2.1.1, bullet #5), nested wells must be used to obtain water samples from screened intervals throughout the entire aquifer thickness. A sample from a single 20 ft interval (e.g., the ore zone) of a much thicker aquifer is not a representative sample. This situation

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is well described by EPA (2002, p. 8) *"In this case, the sampling units are defined by the investigator and need to be appropriate for selecting a representative sample of material from the medium of interest."* Well completion logs are necessary to determine if the collected samples are representative of the various sand horizons in the aquifer, but do not appear to have been provided for previously drilled wells.

**Comment 2. Section 2.1 Groundwater Monitoring**

The last paragraph describes the field parameters that will be measured prior to sample collection. Standard Operating Procedure 8, Section 5.2.3 and 5.2.4 note that dissolved oxygen and Eh will be measured in the sampling container. This procedure is problematic in that it introduces oxygen from the atmosphere into the groundwater being measured, which yields a non-representative measurement of the indicated parameters.

Additionally, there is no mention of turbidity measurements in Section 2.1. Standard Operating Procedure 8, Section 5.2.5 states that turbidity may be measured at the time of sample collection. However, the applicant provides no basis for omitting the required turbidity measurement. Proper well development is needed to remove the sediment and contamination prior to collecting the first round of water-quality samples (EPA, 1992b; p. 6-46), and the nephelometric turbidity unit (NTU) should be below 5 NTU prior to sample collection (EPA, 1992b; p. 6-48).

Section 5.3.1 of Standard Operating Procedure 8 describes the acceptance criteria for Quality Control ("QC") checks on field measurements. The QC checks are a standard practice. However, they should not serve as an illusion that fulfillment of the criteria means the measurement is representative of the media sampled. For example, turbidity measurements of 28 NTU and 30 NTU are within 10% (the acceptance criterion), but they indicate significant suspended material in the sample, which may bias analytical results to high levels. Also, meeting the acceptance criteria for DO and Eh measurements is meaningless when the measurements are made on groundwater contacting the atmosphere, as the sample does not represent conditions in the aquifer.

**Comment 3. Section 2.4.2 Monitoring of Particulates in Air**

Monitoring should be performed around the vacuum dryer and drum loading facility, as a release here could result in significant exposure to workers. Without active monitoring, there is no way to recreate the dose that a worker receives during a release. (Note: this may be covered under an operations plan)

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**Comment 4. Section 2.4.3 Monitoring of Radionuclides in Air**

In general, high-volume air sampling stations should be placed N, NE, E, SE, S, SW, W, and NW of the property or facility center point. Winds can be highly variable during storms and two stations in the primary down wind direction are inadequate to capture the true distribution of wind-blown particulate. It is unclear why such monitoring is not proposed, as it is an insignificant cost relative to the cost of operations.

**Comment 5. Section 2.4.4 Radon in Air**

Monitoring should be performed around the ion exchange columns or other equipment that receives pregnant lixiviant. Without active monitoring, there is no way to recreate the dose that a worker receives during a release. (Note: this may be covered under an operations plan)

**Comment 6. Section 3.1**

DQOs are briefly discussed, but Powertech does not address how the selected well locations fulfill the objective to obtain representative groundwater samples from the Fox Hills aquifer. In general, the boundary of the project needs to be defined and representative samples must be collected from the proposed aquifer exemption zone (See Comment 1).

**Comment 7.**

There is no discussion in the plan on an acceptable statistical methodology which will be used to generate baseline values. Guidance on statistical analysis of groundwater data is readily available. (EPA, 1989; EPA 1992a; ASTM, 1998). These widely used standards make it clear that the use of the mean (or average) and standard deviation to establish baseline water quality are only applicable if it can be demonstrated that the data are representative of the media (Comments 1 and 2) and the data set follows a normal or lognormal distribution. However, Powertech relies on the mean and standard deviation to develop the baseline values without the proper testing of data distributions.

The first test that must be performed on a data set is a test to determine if the data follow a normal or lognormal distribution. Statistical tests for normality are widely available through spreadsheet programs (e.g., Microsoft Excel with Analyse It), and the Shapiro-Wilk Test is generally the most robust test for demonstrating that data follow a normal distribution (Shapiro and Wilk, 1965; Shapiro, Wilk and Chen, 1968; Madansky, 1988).

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The probability statistic, *p*, returned by the Shapiro-Wilk Test determines whether the data follow a normal distribution for the stated confidence interval. For a stated confidence level of 95 percent, *p* must be greater than 0.05 to accept the null hypothesis that the data follow a normal distribution. If the data do not follow a normal distribution, the data may be log transformed (using the natural logarithim) and re-run to determine if the log-transformed data follow a lognormal distribution. If neither the original data nor log-transformed data pass the Shapiro-Wilk Test (i.e., *p* less than 0.05), then it must be concluded that the data do not follow a normal or lognormal distribution. When the data do not follow a normal or lognormal distribution, the mean and standard deviation are meaningless because these parameters are defined ONLY for a normal or lognormal distribution.

Data sets that do not follow a normal or lognormal distribution generally include those sets that have a large number of results at or near the detection limit or some results at very high values (i.e., an asymmetrical distribution). This type of data set is a non-normal data set, and it's sample distribution must be analyzed with nonparametric techniques (Gilbert, 1987; Madansky, 1988) to define the median, quantiles, and inter-quantile range (IQR), provided the results at the detection limit do not exceed approximately 75 percent of the data points. The non-normal data sets are ordered, from lowest to highest values, and the median is the central value in the ordered data set, while the 0.25, 0.5 and 0.75 quantiles are the values such that 25%, 50% and 75% of all values fall below that value. The IQR is the difference between the 0.75 and 0.25 quantiles. Median and IQR are better indicators of the distribution in a non-normal, asymmetric distribution, because these statistical quantities are influenced less, relative to the mean and standard deviation, by very large or very small values.

Powertech should describe the valid statistical methods that will be used to develop the baseline values in accordance with accepted guidance.

**References**

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Sincerely,

Richard J. Abitz, PhD
Principal Geochemist/Owner

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# *Richard J. Abitz* 513 226-5329

***Professional Qualifications***

Dr. Abitz is a geochemist with over twenty years of experience in the environmental services sector of private and government organizations. His broad experience encompasses project and personnel management, analysis of chemical and radiological data, modeling of soil/water systems and radioactive waste streams with experimental methods and geochemical computer codes, risk assessment, and development of remedial work plans for CERCLA and RCRA sites. His technical expertise includes the application of geochemical principles, experimental methods, and computer models to problems involving the solubility and mobility of hazardous and radioactive elements in the environment, evaluation of environmental and human risk associated with exposure to contaminants in air, soil and water media, remediation techniques for waters and soil contaminated by hazardous and radioactive wastes, and the design and treatment of mixed and radioactive waste streams.

As an environmental consultant, Dr. Abitz has used his management and project skills and knowledge of geochemical processes to perform and complete project work on a number of high profile milestones. At the DOE Savannah River Site, he supported the prime contract transition and assisted with the preparation of the $1.6 billion baseline spending package for the American Recovery and Reinvestment Act (ARRA). As an EPA subcontractor supporting the Bluewater Valley Downstream Alliance, he provides geochemical expertise on groundwater remediation at the Homestake uranium tailings site north of Milan, NM. For the Navajo and Sioux Nations, and the Goliad County Groundwater Conservation District (Texas), he serves as a technical expert and has evaluated the impact of proposed *in situ* uranium mining on the community groundwater supply.

At the Fernald, Ohio superfund site, Dr. Abitz was the site geochemist responsible for the integration of technical tasks associated with preparing remediation work plans, collecting soil, water and air samples, data validation, data analysis and modeling, *in situ* measurements for $^{226}Ra$, $^{232}Th$, and $^{238}U$ activity using sodium iodide and high-purity germanium detectors, developing an estimate of the Curie inventory for the on-site disposal cell (OSDF), and preparation of the residual risk assessment and soil certification reports. He also served the Fernald site as a senior consultant to the DOE Technology Development Program and managed active research projects at several universities. These projects included laboratory studies on the mobilization and removal of contaminants from soil/water systems, such as passive removal of uranium from groundwater using inorganic and organic media.

Dr Abitz also has extensive experience at other DOE sites. At Los Alamos National Laboratory (LANL), he developed waste analysis and radioactive material management plans for transuranic and low-level mixed wastes generated, treated, and stored on site. For the Idaho National Engineering Laboratory (INEL), Dr. Abitz evaluated the waste characterization program for high-level radioactive and hazardous waste processed at the Idaho Chemical Processing Plant (ICPP). Dr. Abitz also directed geochemical studies at the Waste Isolation Pilot Plant (WIPP) that evaluated the composition and origin of saline groundwater and brine in the repository strata.

***Education and Training***

B.A., Geology, Humboldt State University, Arcata, California; 1981
M.S., Geology, University of New Mexico, Albuquerque; 1984
Ph.D., Geology, University of New Mexico, Albuquerque; 1989
Environmental Risk Assessment Communication and Application Workshop, INEL

Oversight Program, Boise, Idaho; 1992
OSHA HAZWOP Training, 29 CFR 1910.120 (40 hours, IT Corporation, 1994)

***Experience and Background***

2006 - present

***Principal Geochemist/Owner, Geochemical Consulting Services, Blue Ash, Ohio***

***Technical Support to the Savannah River Site***

- Dr. Abitz supported the contract transition team for Savannah River Nuclear Solutions (SRNS). He reviewed RCRA and CERCLA groundwater remedial systems (electrical resistivity heating with soil vapor extraction, chemical reactive barrier, and tritium phytoremediation), project controls and management systems used to status the remediation work, and regulatory milestones to assess the status of the Area Closure Projects and SRNS readiness to perform the work scope. He also supports SRNS in the preparation of the ARRA baseline estimate for the Solid Waste Management Project.

***NESHAP Report for the Fernald Preserve, Cincinnati, Ohio***

- For the Fernald Annual Sitewide Environmental Report, Dr. Abitz prepares the chapters on air emissions (particulate with uranium, thorium and radium isotopes, and radon), population dose, and the NESHAP annual report.

***Geochemical Expert for the Navajo & Sioux Nations and the Goliad County Groundwater Conservation District***

- Dr. Abitz provides legal testimony, technical review, geochemical modeling, and geological analysis for work associated with the proposed *in situ* uranium leach mines in the vicinity of Church Rock and Crownpoint, New Mexico and Goliad, Texas, and the expansion of the Crow Butte mine in Nebraska.

***Risk Assessment for the Fernald Closure Project (FCP), Cincinnati, Ohio***

- Tasked with the responsibility to develop and author the Interim Residual Risk Assessment for the Fernald site, Dr. Abitz evaluated the risk to visitors and workers exposed to residual contaminants in air, soil and surface-water pathways. Risk scenarios showed the incremental lifetime cancer risk to the receptors was below the recommended EPA maximum of 0.0001.

2003 – 2006

***Manager of the Environmental Services Group and Senior Consultant, Fluor Fernald, Inc., Cincinnati Ohio***

- As the manager for the Environmental Services Group (ESG), Dr. Abitz oversaw the work of over 50 scientists and technicians. Personnel in the ESG performed water, soil and air sampling and monitoring; analytical services for radionuclides, metals

and organic compounds; data verification, validation, reduction and reporting; and *in situ* soil activity measurements for $^{226}Ra$, $^{232}Th$, and $^{238}U$ via the site's real-time instrument measurement program (RTIMP).

- As the site geochemist, he prepared an estimate of the curie inventory for the OSDF to provide a baseline value to DOE legacy management. The scope of this task was to develop the estimate using information from the Ohio Field Office Recycled Uranium Project Report, OU3 and OU5 RI/FS documents, the Fernald Dosimetry Reconstruction Project, remedial operation records, historic records, active monitoring data, interviews with technical personnel who supervised plant operations from the early 1960's through production shut down in 1989, and analytical results on soil placed in the OSDF.

- Dr. Abitz also served as senior consultant to the FCP on the long-term remediation strategy for the Great Miami aquifer. In this capacity, he coordinated laboratory and microscopy studies on the form of uranium present on aquifer sediments. The laboratory and microscopy studies examined the amount of uranium that is fixed to the sediments via chemical adsorption and overgrowth rims versus the mobile fraction that is readily desorbed from the aquifer matrix. These key studies identified and addressed the kinetics of uranium reactions to determine the time constraints associated with achieving the EPA's drinking water standard for uranium.

1998 - 2003 ***Environmental Science Manager/Project Manager/Senior Consultant, Fluor Fernald, Inc., Cincinnati, Ohio.***

- In his role as environmental science manager, Dr. Abitz directed the RTIMP, which provided *in situ* soil activity measurements for $^{226}Ra$, $^{232}Th$, and $^{238}U$ in live time. This program supports excavation and D&D work by scanning soil to confirm U contamination is below the waste acceptance criteria for Fernald's on-site disposal facility (OSDF). Prior to the release of remediated land, the RTIMP performs *in situ* activity measurements to demonstrate that the soil is below the final remediation levels established for $^{226}Ra$, $^{232}Th$, and $^{238}U$.

- As a project manager, Dr. Abitz managed a remediation budget of six million dollars for Title I/II design work for D&D of structures and removal of all contaminated soil and subgrade structures within the former Production Area. Dr. Abitz lead a team of engineers and scientists who integrated the remedial design with regulatory issues, sampling and analysis plans, waste management operations, demolition and construction activities, health and safety issues, radiological controls, and quality assurance protocols.

- Dr. Abitz served as a senior consultant to the DOE Technology Development Program, where he performed technical oversight of several university studies dealing with the mobilization of uranium and its removal from groundwater. He was

active with laboratory investigations that examine the distribution of uranium phases in soil and aquifer sediment, the leaching behavior of the uranium phases, the treatment of contaminated soil with phosphate, and the geochemical properties of aggregate materials used to construct liners in the OSDF. The research established important baseline information on the distribution of uranium in the aquifer and in OSDF construction materials, while treatment studies evaluated the effectiveness of phosphate in reducing the solubility and mobility of uranium in the disposal cell.

- As a participant in research that evaluated the natural attenuation of uranium using a combination of passive inorganic and organic systems, Dr. Abitz was involved with work groups from industry, academia and DOE laboratories. The inorganic systems that were investigated include rip-rap channels constructed with rock containing iron oxyhydroxide phases (e.g., goethite and hematite) or phosphate minerals (e.g., apatite) and flow-through cells using zero-valent iron. Organic systems that showed potential promise include sulfate-reducing bacteria, microbial mats, lichen, and phytoextraction. A combination of these systems may prove to be practical and cost effective in the treatment of low leachate volumes generated by the OSDF after its closure.

1997 - 1998

***President/Owner, Geochemical Consulting Services, Albuquerque, New Mexico.***
Dr. Abitz served as a geochemical consultant to the Fernald Environmental Management Program (FEMP) and the WIPP Project.

- Dr. Abitz performed confidential work for the Navajo Nation on the proposed *in situ* uranium leach mines in the vicinity of Church Rock and Crownpoint, New Mexico.

- At FEMP, he evaluated the efficiency of selected alternatives for soil and groundwater remediation, including soil washing and *in situ* uranium leaching methods. This effort involved supervising the technical team, assisting in the negotiation of clean-up levels with DOE and EPA, developing soil-treatment protocols, and interacting with public-interest groups.

- At the WIPP site, Dr. Abitz provided the operating contractor with expertise in the area of brine geochemistry. He was responsible for oversight of laboratory analyses and QA/QC, data analysis, and geochemical interpretation of the composition and origin of fluids in the vicinity of underground operations. Dr. Abitz also evaluated the solubility of transuranic elements in sodium-chloride brine and in brine containing organic-complexing agents such as citric acid, oxalic acid, and EDTA.

1994 - 1997

***Project Manager/Senior Staff Consultant, IT Corporation, Albuquerque, New Mexico.***
Dr. Abitz served as project scientist/manager on geochemical tasks associated with the WIPP Project, Norton AFB Groundwater Study, FEMP Operable Units 5 and 3 RI/FS, and Navajo EPA. Specific activities include:

- Conducted a rerun of the chemical compatibility analysis of TRU waste forms and container materials for Appendix C1 of the WIPP RCRA Part B permit. The chemical compatibility analysis was carried out with all defense generated, contact-handled (CH) and remote-handled (RH) transuranic-mixed waste streams reported in the 1995 WIPP Transuranic Waste Baseline Inventory Report (WTWBIR). Chemicals reported by the generator sites were classified into reaction groups as defined by the U.S. Environmental Protection Agency (EPA) document "A Method for Determining the Compatibility of Hazardous Wastes." The list of potential chemical incompatibilities reported by the program was hand checked using the EPA document as a reference to assure proper functioning of the program. All potential chemical incompatibilities were then evaluated on a case-by-case basis to identify which of the reactions could occur, given the nature of the waste, its chemical constituents, and final waste form.

- Assisted in evaluating the geochemical performance of backfill configurations proposed in the WIPP Compliance Certification Application. Modeled the interaction of Salado Formation brine with MgO placed in the backfill to estimate the quantity of MgO required to buffer the pH of the indigenous brine between 8 and 9. This pH range is desirable for minimizing the solubility of plutonium and neptunium contained within the waste forms, and lowers the solubility of uranium and americium relative to lower pH values found in Salado Formation brine.

- Project scientist responsible for developing the background groundwater report for Norton AFB This report established background radionuclide concentrations in local and regional groundwater and provided a robust scientific model to explain the presence of elevated levels of naturally-occurring uranium. The task required coordination of scientific and support staff to produce a principal milestone document that was delivered to the client one week ahead of schedule.

- Project manager and scientist on the FEMP OU5 FS task to evaluate aqueous reactions of metal and radionuclide complexes in proposed injection zones of the Great Miami Aquifer. Responsible for oversight of technical tasks, budget, schedule, and final technical report.

- Project scientist tasked with supporting the Navajo EPA on the evaluation of groundwater contamination from the mill tailings at the UNC Church Rock, New Mexico site. Radionuclide, sulfate and nitrate concentrations were evaluated to discriminate between contamination originating from the mill tailings and natural salts present in the valley alluvium.

- Project manager and scientist on the FEMP OU3 RI/FS task to evaluate the release of radionuclides and metals from the proposed on-site disposal facility. Responsible for oversight of technical tasks, budget, schedule, and final technical report.

1989 - 1994 ***Senior Geochemist, IT Corporation, Albuquerque, New Mexico*** Dr. Abitz evaluated the radiochemistry of transuranic elements in sodium-chloride brine for the WIPP Project and served as the project geochemist for four operable units on the FEMP RI/FS. He was also active setting up the LANL RMMA concept and provided radiochemistry support to INEL in developing a No Migration Variance Petition (NMVP) for the INEL calcine facility.

- Developed solubility database for the WIPP EATF. Evaluated the solubility of thorium, uranium, neptunium, plutonium, and americium in sodium-chloride brine and in the presence of organic complexing agents, such as EDTA and citric acid. Prepared solubility charts of the radionuclides over the pH range of 2 to 12.

- Authored white paper on geochemistry of FEMP site for OU 5 RI/FS. This paper discusses leaching, dissolution, and desorption processes that release uranium and its progeny from surface sources, adsorption and aqueous complexation of the solubilized uranium and progeny with subsurface soils and groundwater, and predicts secondary uranium phases that may form in the soils.

- Conducted site-surveys and interviewed LANL personnel on radiation practices associated with the handling, packaging, labeling, storage, transport, and disposal of transuranic materials. Information was used to develop LANL RMMA concept, where each RMMA is held accountable for all radiaoactive materials that enter and exit the area.

- Developed waste analysis plans for transuranic and low-level mixed wastes present at LANL. This activity was conducted to complete RCRA Part B permits and ensure regulatory compliance to DOE orders for all LANL facilities that generate, store, or dispose of mixed waste.

- Managed and had technical oversight on geochemical program associated with FEMP RI/FS. Program tasks include the characterization of soil mineralogy by polarized light microscopy and x-ray diffraction studies, design and implementation of laboratory tests to characterize the composition of leachate derived from cemented and vitrified waste samples, evaluation of contaminant adsorption ratios, data validation, and tracking of labor and material costs.

- Designed laboratory experiments for FEMP RI/FS to measure adsorption ratios of radionuclides and metals and implemented ANSI/ANS-16.1 leach tests to evaluate the performance of cemented waste forms. Results were used to evaluate the most effective alternative for immobilizing radionuclides and metals from a near surface disposal cell.

- Led INEL waste characterization program on calcined solid waste. Responsible for evaluating radiochemistry data on uranium fission products and transuranic elements

in aqueous and calcined waste forms. Provided assistance in the development of EPA approved sampling and analytical plans to support a draft no migration variance petition for the radioactive calcined waste stored at the ICPP.

***Professional Affiliations***

Geological Society of America
International Association of Geochemistry and Cosmochemistry

***Publications***

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