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Michael Moran Associates, L.L.C.
Water Quality/Hydrogeology/Geochemistry
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EDUCATION

University of Texas, Austin: Ph.D., Geological Sciences, 1974
San Francisco State College: B.A., Zoology, 1966

PROFESSIONAL HISTORY

Michael-Moran Associates, LLC, Partner, 2003 to present
Woodward-Clyde Consultants, Senior Consulting Geochemist, 1992 to 1996
Moran and Associates, President, 1983 to 1992; 1996 to 2003
Gibbs and Hill, Inc., Senior Hydrogeologist, 1981 to 1983
Envirologic Systems, Inc., Senior Hydrogeologist / Geochemist, 1980 to 1981
Tetra Tech Intl./ Sultanate of Oman, Senior Hydrogeologist, 1979 to 1980
Science Applications, Inc., Geochemist / Hydrologist, 1978 to 1979
U.S. Geological Survey, Water Resources Div., Hydrologist / Geochemist, 1972 to 1978
Texas Bureau of Economic Geology, Research Scientist Assistant, summers:1970 & 1971

REPRESENTATIVE EXPERIENCE

Dr. Moran has more than 45 years of domestic and international experience in conducting and managing water quality, geochemical and hydrogeologic work for private investors, industrial clients, tribal and citizens groups, non-governmental organizations, law firms, and governmental agencies at all levels. His experience includes the following representative project assignments.

2003 to Present: Michael-Moran Associates, LLC:

- Sierra Club Wisconsin; Wisconsin Resources Protection Council; Deer Tail Press, Wisconsin, U.S.A. Review of hydrogeology and water quality activities at the reclaimed Flambeau Mine with respect to State sulfide mine legislation.
- Dakota Resources Council, Bismarck, North Dakota, U.S.A. Review of environmental and regulatory issues relating to disposal of naturally-radioactive oilfield wastes; testimony before the N.D. Health Council.
- Asamblea of Jáchal and the Ministry of Environment of Argentina; Veladero Mine, Argentina. Conducted expert review of hydrogeological and geochemical issues at the mine following a cyanide spill; presented opinions, written & oral, to federal judge and members of the Argentine Senate Comisión on Environment, federal ministries, and to San Juan Provincial authorities (2016).

- Netherlands Parliament, The Hague, Netherlands.
Presentations on Colombian coal mining-water impacts to selected ministers of Parliament and representatives of EU power generating companies on behalf of Dutch ngo, PAX (Utrecht, Netherlands). (2015)
- New York University Law School, Global Justice Clinic, Haiti.
Provide training in water quality sampling and project development for NYU law students, faculty and Haitian citizens in areas impacted by mining activities.
- Tallahassee Area Community, Inc. Colorado, U.S.A. (2015)
Testimony before Colo. Mined Land Reclamation Board on likely impacts from a proposed uranium operation using underground borehole mining.
- Oglala Sioux Tribe and the Consolidated Interveners, South Dakota.
Expert opinions and testimony before the U.S. Nuclear Regulatory Commission's Atomic Safety and Licensing Board regarding the proposed Dewey-Burdock in-situ uranium operations.
- Contraloría General de la República & IKV Pax Christi, Bogota, Colombia.
Provide assistance and training to the independent auditing arm of the Colombian government on mining & environmental audits and legislation.
- The Black Hills Wild Horse Sanctuary, and Bangs, McCullen, South Dakota.
Expert opinions submitted to State regulatory agencies regarding Large-Scale Mine and Water Use permits for the proposed Dewey-Burdock in-situ uranium operations. Deposition testimony provided.
- Sims Murray Ltd. and the Town of Florence, Arizona. Review of Town nuisance ordinance related to proposed in-situ mining and aquifer impacts. Expert opinions for litigation.
- Wild Salmon Center & World Wildlife Federation (Russia), Moscow, Russia.
Elaboration and presentation of mining and water-related issues to members of Russian government, industry and the environmental communities.
- Citizens of Cañon City / Colorado Citizens Against Toxic Waste, Inc. (CCAT); Cañon City, Colorado. Technical assistance to citizen's group on hydrogeologic and geochemical issues related to contamination from disposal of radioactive, etc. materials at the Cotter uranium mill site.
- Environmental Defender Law Center and GRUFIDES (NGO), Cajamarca, Peru.
Review of Environmental documents relating to the Conga Mine; site visit; report preparation.
- Roanoke River Basin Association; Virginia. Assistance on technical issues related to proposed uranium mine and processing facilities; presentations to public and regulators; participation in government planning meetings.
- Human Development Center "Tree of Life" and Kyrgyz government; Bishkek, Kyrgyzstan. Review of operations at Kumtor Gold Mine and preparation of report, using funds from Bankwatch, Kiev, Ukraine.

- Za Zemiata (Sofia) and the University Autònoma de Barcelona; Krumovgrad, Bulgaria. Review of the EIS for a proposed gold mine; municipal / public meeting presentations; prepare report using E.U. funds.
- Powder River Basin Resource Council; Oshoto, Wyoming. Review of Strata Energy NRC License Application to operate an in-situ leach uranium operation; provide technical opinions.
- Pro Patrimònio (the National Trust of Romania); Brussels, Belgium. Presentation to members of European Union Parliament regarding environmental aspects associated with the proposed Rosia Montana Mine, Romania.
- Trustees for Alaska. Prepared expert report on hydrogeologic and water quality impacts from exploration activities at the Pebble Mine site. Opinions prepared for litigation in Alaska Superior Court on behalf of *Nunamta Aulukestai, et. al. v. State of Alaska, et. al.* (Pebble Limited Partners); deposition and trial testimony.
- Bank Information Center and Earthworks, Washington, D.C. Report on hydrogeologic and geochemical impacts at the proposed Weda Bay, Indonesia, cobalt-nickel mine; delivered to Multilateral Investment Guarantee Agency.
- IKV Pax Christi (Netherlands), Bogota, Colombia. Prepare mining-environmental best practices report for presentation to Colombian Ministry of Environmental Affairs.
- Oglala Sioux Tribe, Western Mining Action Project, Gonzalez Law Firm, South Dakota. Review of Powertech License Application, EIS and provide expert opinions: Dewey-Burdock In Situ Uranium Project.
- Comisión de Gestión Integral de Aguas de Bolivia (Commission for the Integrated Management of Bolivian Waters) and Federación Regional Única de los Trabajadores Campesinos del Altiplano Sud (Regional Farmers Federation of the Southern Altiplano), Bolivia. Review of present mining activities and documents related to the San Cristobal Mine. Activities funded by the Municipality of Colcha K (Potosí, Bolivia), the Centro de Estudios de la Universidad de San Simón, Cochabamba, and Global Green Grants Fund.
- Shute, Mihaly & Weinberger / San Diego State University Research Foundation. Review of hydrogeologic / environmental impacts associated with quarry construction near a university wildlife refuge.
- Sarah Vogel Law Firm, North Dakota. Litigation support and evaluation of environmental impacts resulting from a release of oilfield waters onto livestock lands and waters.
- IKV Pax Christi (Netherlands), Tolima, Colombia. Technical review of proposed La Colosa gold project (Anglo Gold Ashanti); interaction with regulators, civil society and company; prepare recommendations & report.
- Thompson Divide Coalition, Western Colorado. Technical assistance to a consortium of environmental groups in designing and conducting a baseline

- water sampling program in anticipation of gas drilling activities. Preparation of summary report.
- Global Green Grants / Nature's Own, Papua New Guinea. Prepare technical / policy papers on marine disposal of mining wastes.
 - SAVIA, School of Ecological Thought / Comision Pastoral Paz y Ecologia, Guatemala. Presentations on ecological aspects of resource legislation to Guatemalan government ministries, high-level officials, and educational institutions. Conduct water quality training classes; assist with development of laboratory capabilities.
 - Astrella & Rice, Colorado, U.S.A. Technical assistance in preparing litigation arguments for citizen lawsuit involving alleged drinking water contamination by oil and gas activities.
 - Office of the Prime Minister, Iraqi Kurdistan. Development of information infrastructure and management training for numerous ministries in Northern Iraq; done in partnership with faculty of American University, Washington, D.C. Headed an audit team for the Regional Statistics Organization.
 - Southwest Research and Information Center / Buryat Regional Organization on Baikal / Mongolia Nature Protection Coalition; Buryatia, Siberia, Russia and northern Mongolia. Technical information exchanges with local NGOs, government officials and mining company staffs.
 - Rulison Citizens Group / Public Counsel of the Rockies. Colorado. Development of technical arguments and potential litigation support intended to define environmental issues related to gas development near the Rulison underground nuclear test site. CO Oil & Gas Commission, Hearing testimony.
 - The Nature Conservancy, Trout Unlimited, Alaska Conservation Foundation, Trustees for Alaska and Renewable Resources Coalition, Alaska. Presentations to public interest groups and development of technical issues and papers relating to construction of the Pebble copper-molybdenum-gold mine, proposed for operation above the largest sockeye salmon fishery in the world.
 - Wild Salmon Center, Alaska. Technical evaluation of hydrogeological and chemical issues that may impact fisheries near the proposed Pebble Mine.
 - Miller, Axline & Sawyer / Meyers, Nave, Riback, Silver & Wilson / City of Grass Valley, California. Technical and litigation support in a suit alleging contamination by Newmont Mining Corporation; deposition testimony.
 - Latin American Water Tribunal. San Salvador, El Salvador. Prepare presentations and conduct workshops on water and water quality. Funding: Heinrich Boll Foundation.
 - Alburnus Maior, Rosia Montana, Romania. Evaluation of EIA and preparation of summary report on a proposed gold mine in Transylvania. Funded by the Staples Trust, U.K. and the Open Society Foundation, Romania.
 - Asociacion de Desarrollo Social Santa Marta (ADES), El Salvador. Evaluate EIA and related documents, El Dorado Mine; technical presentation at

- national forum; prepare review report. Funded by DIAKONIA, Swedish Ecumenical Action.
- Alburnus Maior, Romania. Review documents and prepare comments related to development of proposed Rosia Montana Mine for a Romanian NGO.
 - La Lumiere, Senegal and WACAM, Ghana. Conducted water quality training sessions for NGO and government staffs, as related to mining and other development activities. Funded by Oxfam America.
 - ESRI (Environmental Systems Research Institute). Provide technical assistance to several Iraqi Ministries to define information management needs, deploy map- based systems (GIS), and establish a Middle East-based Center of Excellence to support these ministries. Performed in conjunction with National Geospatial Intelligence Agency (NGA).
 - Colectivo Madre Selva, Guatemala. Evaluation of Marlin Mine site, review of EIA and preparation of report; attendance at national and indigenous mining forums; conducted water quality training; review of CAO / IFC documents. Funded partly by Misereor, Catholic Bishops' Development Organization, Germany.

1996 to 2003: Moran and Associates, Inc.:

- International Union for Conservation of Nature and Natural Resources (IUCN, Switzerland). Review of the Mining and Metals Supplement of the Global Reporting Initiative (GRI).
- World Bank, Extractive Industry Review. Member of Advisory Group assisting WB in evaluating extractive industry practices; London, Lisbon.
- Nishnawbe Aski and other Ontario First Nation bands---Ontario, Canada. Review of environmental documents relating to Montcalm Mine, a proposed copper-nickel facility. Activities paid for by Falconbridge Limited.
- Kazakh Institute of Physics and Technology / ISTC---Almaty, Kazakhstan. Technical oversight of environmental program, evaluating migration of radionuclides at the Semipalatinsk Nuclear Test site.
- Greenpeace Argentina / Mineral Policy Center---Esquel, Argentina. Review of EIA (water, environ. issues) and conditions at proposed mine in Patagonia.
- Oxfam America / Sahel Development Foundation: Syama Mine, Southern Mali. Review of environmental conditions and documents related to an IFC-funded gold mine (2003); conduct technical workshops and policy meetings with Mali government and press (2004).
- Kivalina Relocation Planning Committee---Alaska. Litigation support to Center on Race, Poverty & the Environment regarding water quality issues, Red Dog Mine. Deposition testimony.

- Asociation de Organismos No Gubernamentales—Santa Rosa de Copan, Honduras. Independent review of water / environmental issues at San Andres mine; funded by Dan Church Aid (Danish government and NGOs) and Christian Aid (English NGO).
- Oxfam America / Friends of the Earth Int'l. / Global Green Grants---Quellaveco, Peru. Independent review of mining, water and environmental issues at request of Asociacion Civil "Labor", Lima.
- Oxfam America / Mineral Policy Center / Environmental Mining Council of B. C.: Tambogrande, Peru. Independent review of mining water and environmental issues. Includes numerous public presentations to citizens and governmental groups, including members of the Peruvian Congress.
- New Mexico Environment Department---New Mexico. Review of cost estimates for water treatment systems for closure plans / bonding calculations, Chino and Tyrone Mines.
- International Institute for Environment and Development—London, U.K. Consultant to MMSD project on sustainable development / mining issues.
- Technical Chamber of Greece---Thrace, Greece. Technical assistance to advisory arm of the Greek government and citizens groups regarding gold mining / environmental issues.
- Malerah-Wahlbul Native Title Claimants / Friends of the Earth—Sydney, Australia. Review of water quality issues related to cyanide leach gold operations on aboriginal lands, and testimony at Land and Environment Court.
- Loeb Aron & Co.---London, U.K. Preparation of report evaluating the Baia Mare, Romania waste spill for an investment banking firm.
- Centro de Investigacion y Planificacion del Medio Ambiental (CIPMA) / World Resources Institute / International Development Research Centre---Chile. Evaluation of environmental costs associated with copper mining in Chile.
- Carl Duisberg Gesellschaft / Univ. of Witwatersrand / United Nations---South Africa. Training in cyanide and environmental technology assessment issues.
- Dogrib Nation / Pape and Salter---Yellowknife, Canada. Geochemical consulting and testimony regarding the proposed Diavik diamond mine.
- Soros Foundation Kyrgyzstan---Bishkek, Kyrgyzstan. Water quality instruction to regulators and NGOs regarding mining, sampling, laboratory procedures, and general environmental issues. Review laboratory.
- General Chemical / Sierra Club---Piceance Basin, Colorado. Review of water quality, treatment, legal and policy issues regarding the proposed Yankee Gulch soda ash mine; hearing testimony.
- Sierra Club Legal Defense Fund / Okanogan Highlands Alliance----Crown Jewel Mine, Washington. Litigation support on water quality, geochemistry, treatment issues to groups opposing proposed gold operation; test case on federal mining law; deposition testimony.

- National Wildlife Federation---Carlota Mine, Arizona. Litigation support for challenge of EPA regarding water quality/ treatment issues at copper mine. Review of TMDL issues related to Pinto Creek for NWF and local citizens.
- International Rivers Network---Review of proposed dam project and associated mine water quality issues at the San Roque site, Philippines.
- Mineral Policy Center---Preparation of technical documents on the environmental behavior, analysis and toxicity of cyanides.
- Holnam Industries---Penrose, Colorado. Ground water quality/ geochemistry study for cement operation.
- World Resources Institute---mining water quality/ geochemistry assistance on Venezuelan forestry / mining environmental regulations, and environmental economics of copper mining practices, Chile.
- U.S. EPA / American Geological Services---French Gulch, Colo. Geochemical / treatment /remediation support at an abandoned mine site; negotiated Superfund issues.
- Stoel Rives / Richmond Hill Mine, So. Dakota. Review water quality treatment and geochemistry issues at a closed gold mine site with discharge violations.
- Nacho Nyak Dun First Nation / Pape and Salter—Yukon, Canada. Evaluation of proposed heap-leach gold mining facilities and practices for native group and barristers.

1992—1996: Woodward-Clyde Consultants, Inc.

-Molycorp / Unocal—Questa, New Mexico. Review of water quality, geochemical, & aquatic biology issues at a molybdenum mine / mill site.

-Minera Escondida Ltda.---Chile. Review of geochemical data for copper mine.

-Homestake Mining---Lead, South Dakota, U.S.A. Review of water quality and geochemical problems and waste rock storage and tailings stability issues.

-U.S. Bureau of Land Management / Summo Minerals—Lisbon Valley, Utah. Review of water quality and geochemistry, and assistance in preparation of an EIS at a proposed copper mining and recovery site.

-Southern Peru Copper Corp.--Toquepala, Peru. Design and oversight of water quality, geochemistry, and remediation issues at an open-pit copper mine, mill, and waste facilities.

-Cortez Mining/ Placer Dome / U.S. Bureau of Land Management - Pipeline Project, Nevada. Review of water quality and geochemistry and preparation of EIS-related reports at this proposed open pit gold site.

-Kennecott Utah Copper. Interacted with the law firm of Bogle and Gates to assist an active metal mining company in defending against a CERCLA listing. Activities

involved interpreting water quality/geochemical and other environmental data within the Hazardous Ranking System (HRS) context.

-ASARCO - Leadville, Colorado. Oversight of water quality and geochemical activities at a historic metal mining and processing site where the client is involved in CERCLA negotiations. Interaction with State and EPA representatives and legal staff.

-Cambior Minerals - Metates Mine, Mexico. Water quality and geochemistry evaluation of a new gold property.

-Fraser Stryker and the Lindsey Chemical Co. - Nebraska. Technical support to legal staff involved in negotiations regarding a Superfund industrial processing site.

-W.R. Grace - Motorwheel Site, Michigan. Technical assistance to Grace legal staff involved in CERCLA negotiations at a hazardous waste site.

-Zortman Mining Co. / U.S. Bureau of Land Management. Technical and management responsibilities for water resources and geochemistry tasks in preparation of revised EIS at a gold-cyanide leach site with existing acid drainage problems.

-Echo Bay Mining, Lamefoot Mine, Republic, Washington. Responsible for geochemistry and water quality aspects of a supplemental EIS at a new gold mine site. Development of monitoring, testing and remedial recommendations to the BLM.

-Angelina Farms, Louisiana. Technical support to legal staff of oil production companies accused of contaminating groundwaters with brines.

-Amax Gold / Haile Mining, South Carolina. Water quality consulting at a gold mining site with existing acid drainage problems.

-Chino Mines, New Mexico. Technical evaluation of water quality and geochemical issues associated with leaching operations at an operating copper facility.

1983 to 1992: Moran and Associates, Inc.:

-Shea and Gardner / Rockwell--Rocky Flats Nuclear Plant, Colorado. Reviewed and evaluated geochemical studies; proposed future activities in preparation of potential environmental-criminal litigation.

-Saunders, Snyder, Ross and Dickson / American Water Development, Inc. - San Luis Valley, Colorado. Coordinated water quality and geochemistry activities in support of water rights litigation. Oversaw water quality sampling, evaluated water quality and remote sensing data, assisted attorneys in technical strategy development and opponents' depositions; supplied deposition testimony.

-Arnold and Porter / Keystone Ski Corporation - Keystone, Colorado. Designed water quality and geochemical sampling program for ski area expansion in a previously mined area. Evaluated data and proposed remediation activities.

-Advanced Sciences, Inc. / EG&G - Rocky Flats Nuclear Plant, Colorado. Evaluated existing water quality and geochemical sampling programs; prepared document on non-facility related sources of chemical constituents and background.

-City of Brighton - Brighton, Colorado. Evaluated existing surface and groundwater quality data and suggested remedial activities to deal with excessive manganese and dissolved organic concentrations. Provided testimony to City Council.

-Chadwick & Associates, Inc. / Newmont Mining - Telluride, Red Mountain, Colorado. Provided diverse water quality and geochemical consulting relating to remediation of acid mine drainage problems.

-Intergraph Corp. - Reston, Virginia. Assisted in technical development and marketing of a new environmental data management / GIS product.

-U.S. Forest Service - Salmon, Idaho. Geochemical / water quality consultant at the Beartrack mine site, a proposed cyanide-leach gold project.

-Earth Satellite Corporation / Navajo Nation / Patton, Boggs, and Blow - Window Rock, Arizona. Conducted a preliminary reconnaissance of water resources on the joint-use area of the Navajo/Hopi reservations using satellite imagery.

-Mission-Viejo / Morrison and Forester - Denver Basin, Colorado. Acted as a geochemical consultant in a groundwater rights dispute.

-Bunker Hill Corporation / Dames and Moore - Kellogg, Idaho. Reviewed field and laboratory water quality procedures at a CERCLA metal-mining and processing facility. Audited proposed laboratory.

-Saunders, Snyder, Ross, and Dickson / Adolph Coors Company - Golden, Colorado. Water quality consultant; reviewed data from Central City/Blackhawk, CERCLA site, and determined potential impact to the Coors water treatment plant. Provided testimony at stream classification hearings, Colorado Water Quality Control Commission.

-Colorado Water Resources and Power Authority - San Luis Valley, Colorado. Conducted water quality/geochemical and Landsat evaluations of deep groundwater to aid in development decisions.

-Armstrong, Teasdale, Kramer, Vaughan, and Schlafly / Anschutz Corp.-- Fredricktown, Missouri. Supervised technical activities of a CERCLA / SARA-related lawsuit; acted as a technical liaison with attorneys and regulators; managed consultants; authored reports; deposition testimony.

-Holland and Hart / White and Jankowski / Weller, Friedrich, Ward and Andrew / Breckenridge Ski Corporation - Breckenridge, Colorado. Technical supervision of water quality-related issues in a private lawsuit against Breckenridge Ski Corporation. Managed sampling and data interpretation; interacted with attorneys on strategy and assisted at depositions; authored reports; expert witness.

-Dames and Moore / Hecla Mining Corporation - Leadville, Colorado. Acted as hydrogeological/geochemistry consultant to Hecla on a natural resources damage suit; interacted with attorneys at Davis, Graham and Stubbs.

-Dames and Moore / Davis, Graham and Stubbs - Eagle Mine, Colorado. Supervised water quality/hydrogeology activities in preparation of a legal defense of Gulf and Western Corporation versus the State of Colorado in a natural resources damage suit; supervised and participated in all sampling; QA activities and report preparation; interacted with attorneys and regulators; assisted at depositions; deposition testimony; testified before Colorado Water Quality Control Commission on appropriateness of proposed metals standards.

-Jacobs Engineering - Albuquerque, New Mexico. Prepared policy documents on water quality/geochemistry procedures associated with the Uranium Mill Tailings Remedial Actions Project (UMTRA).

-University of Wisconsin. Designed a proposed groundwater exploration program for Gambia, West Africa, in conjunction with Earth Satellite Corporation.

-Harza Engineering Company / University of Michigan - Senegal, Guinea, and Gambia, West Africa. Evaluated potential impacts of new dam construction within the Gambia River basin. Reviewed local hydrogeology, mining production and exploration data; interacted with local officials.

-Engineering-Science, Inc. Faisalabad, Pakistan. Assisted in design of a well field for a groundwater supply in the central Punjab where high salinity and TDS were major problems; negotiated with local officials; prepared reports for Asian Development Bank.

1981-1983: Gibbs & Hill, Inc.

-Holme Roberts and Owen - Canon City, Colorado. Reviewed and interpreted existing hydrogeology and water quality data at the Cotter uranium mill and tailings; proposed future activities; interpreted background concepts, prepared position papers for attorneys in negotiations with State of Colorado.

-Earth Satellite Corporation - Sultanate of Oman. Conducted an interpretive study of regional groundwater potential in Oman, with the staff of Earth Satellite Corporation. Activities included interpretation of existing geology and Landsat imagery combined with conventional low altitude flight and ground reconnaissance. Prepared reports for government of Oman.

-Anschutz Mining Corporation - Fredericktown, Missouri. Managed water resource-related activities for environmental baseline studies at a proposed cobalt/ nickel mine. Designed sampling programs, oversaw sampling, data interpretation, and report preparation.

-Kemmerer Coal Company - Frontier, Wyoming. Managed and conducted hydrogeologic and water quality studies at a proposed open-pit coal mine.

Supervised well installation, aquifer testing, sampling, report preparation; interacted with state regulators.

-Anaconda Copper Company - Rico, Colorado. Conducted an investigation of hydrology, water chemistry, and aquatic biology at a complex-ore mining district.

-Union Carbide Corporation - Uravan, Colorado. Managed and conducted a water quality monitoring program for a proposed uranium tailings disposal area and effluent evaporation basin. Assisted in design of geochemical testing program to evaluate potential leachate quality.

-Anschutz, Mining Corporation - Laredo, Texas. Managed and conducted an investigation of groundwater hydrology and soils geochemistry and associated hazardous wastes at a metal ore handling and reagent storage facility. Designed sampling protocol; prepared reports; negotiated with state regulators; interacted with attorneys at Baker, Botts.

-Snowmass Coal Company - Carbondale, Colorado. Managed and conducted hydrogeology investigation of an underground coal mine with steeply dipping seams.

-Marline Uranium Corporation / Union Carbide Corporation - Danville, Virginia. Managed water resources portion of a baseline investigation at a proposed hard-rock uranium mine site. Oversaw well installation monitoring programs and dewatering investigations.

-Southern Pacific Petroleum - Means, Kentucky. Conducted baseline hydrogeological/geochemical investigations at a proposed oil shale mine and retort facility.

1980-1981: *Envirologic Systems, Inc.*

-Central Arizona Association of Governments - Globe/Miami, Arizona. Conducted study to determine hydrogeologic/geochemical impact of long-term copper mining and processing facility. Designed monitoring programs; interacted with federal, state, local and tribal officials; prepared numerous reports.

-United Nuclear - Homestake Partners - Milan, New Mexico. Conducted hydrogeological/geochemical evaluation of an existing monitoring program for a uranium milling and waste-disposal facility.

-Homestake Uranium - Marshall Pass, Colorado. Hydrogeological / geochemical evaluation of a proposed, hardrock, open-pit uranium mine.

1979-1980: *Sultanate of Oman / Tetra Tech International* - Muscat, Oman. Member of Water Resources Council Staff, Sultanate of Oman, based in Muscat, Oman. The Water Resources Council was an inter-ministerial body intended to coordinate all water-related activities within the Sultanate. Duties involved planning and design of surface and groundwater projects (both exploration and utilization) for the Omani government; development of water resources policy for the government; hydrogeological field work on both exploration and resource characterization

projects - aquifer testing, borehole geophysics, water quality sampling, hydrogeologic mapping; review of work performed (or planned) by other consultants to the government, published reports on water resources of Oman.

1978-1979: Science Applications Inc.:

-EG&G - Idaho National Engineering Laboratory, Idaho Falls, Idaho. Managed a hydrologic investigation of transuranic nuclide migration in groundwater. Contributed geochemical expertise to evaluation of waste isolation and transport modeling.

-Kerr-McGee Corporation - Grants, New Mexico. Conducted investigation into geochemistry of selenium associated with uranium mining / milling.

1972—1978: U.S. Geological Survey Water Resources Division; responsible for the design, management, and implementation of the following hydrogeological / geochemical studies:

-Metal-Mine Drainage - Colorado. Study of impacts of mining activities (metals, uranium, coal) on the quality of streams in all major Colorado mining districts.

-Selenium in Groundwater - Golden, Colorado. Hydrogeological / geochemical investigation of selenium, uranium and associated constituents at the margins of the Rocky Flats nuclear plant.

-Geothermal Resources - Colorado. Reconnaissance investigation of potential geothermal resources throughout Colorado.

-Underground Coal Mine Water Quality - Colorado. Evaluation of existing and potential water quality problems from underground coal mines.

-In Situ Uranium Leaching - Grover, Colorado. Study of geochemical and hydrologic processes associated with in situ uranium mining and reinjection of waste products.

-Alluvial Metal Transport - Telluride, Colorado. Investigation of metal (especially chromium) movement from tailings ponds into alluvium.

-Southwest Colorado Groundwater - Colorado. Study to determine availability and quality of groundwater in southwestern Colorado.

-Oil Shale Waters - Piceance Basin Colorado. Evaluation of disposal of saline groundwater discharged to the surface during oil shale development.

-Grace Coal Site - Axial Basin, Colorado. Hydrogeological / water quality study of proposed open-pit coal site.

1970, 1971, Summers: Texas Bureau of Economic Geology. Evaluation of the aqueous geochemistry and biochemistry of Gulf Coastal sedimentary sulfur and uranium deposits and their relationships with hydrocarbons: interpretation of geologic and geophysical logs, water quality data.

PUBLICATIONS, REPORTS AND PRESENTATIONS

Moran, R.E. 1974. Trace element content of a stream affected by metal-mine drainage, Bonanza, Colorado. University of Texas at Austin. Ph.D. dissertation. 168 pp.

Moran, R.E. and D.A. Wentz, 1974. Effects of metal-mine drainage on water quality in selected areas of Colorado, 1972-1973. Colorado Water Conservation Board. Water Resources Circular No. 25, 250 pp.

<http://co.water.usgs.gov/publications/pubsnonusgs.html>

<http://uppergunnisonwaterdocs.com/documents/Water%20Quality-%20Mining/Water%20Quality-%20Mining-03.pdf>

Moran, R.E. and D.A. Wentz, 1974. Thermodynamic constraints on Metal Solubilities in a stream affected by mine drainage, Bonanza, Colorado. pp. 54-64, in *Water Resources Problems Related to Mining*. Hadley, R.F. and D.T. Snow (eds.). American Water Resources Association. Minneapolis, Minnesota. 236 pp.

Moran, R.E. and D.A. Wentz, 1974. Trace element content of a stream affected by metal-mine drainage, Bonanza, Colorado pp. 84-91 IN: International Symposium on Water-Rock Interaction Proc. Cadek, J. and T. Paces (eds.). Prague, Czechoslovakia. September 9-19, 1974. Geological Survey, Prague. 464 pp.

Moran, R.E., 1976. Geochemistry of Selenium in Groundwater near Golden, Jefferson County, Colorado. Abstracts with Programs, Geological Society of America. 1976 Annual Meeting. November 8-11, 1976. 8(6):1018.

Moran, R.E. 1978. Migration of Transuranic Nuclides in the Snake River Plain Aquifer, Idaho National Engineering Laboratory, Southeastern Idaho. Submitted to EG&G Idaho.

Moran, R.E. 1979. Available and Potential Water Resources of Oman. Submitted to Water Resources Council, Sultanate of Oman.

Moran, R.E. and J.V. Rouse, 1981. Procedures for Collection of Water Quality Samples and Data. Envirollogic Systems, Inc. Denver, Colorado. 61 pp. Prepared for the Central Arizona Assoc. of Gov'ts.

Moran, R.E. 1984. Impacts of Proposed Mining and Hydrogeological Activities on Development within the Gambia River basin, Senegal, Guinea and Gambia. Submitted to Harza Engineering.

Moran, R.E. 1984. Preliminary Design Report, Groundwater Supply, Faisalabad, Pakistan. Submitted to Engineering Science, Inc.

Harlan, R.L. and R.E. Moran, 1986. Closure of Metal Mining Sites: Hydrologic, Environmental and Legal Issues. Abstracts from Society of Mining Engineers Meeting, September 7-10, 1986, St. Louis, Missouri.

HRS Water Consultants and R.E. Moran, 1987. San Luis Valley Confined Aquifer Study. Three reports prepared for the Colorado Water Resources and Power Development Authority.

https://www.google.com/search?q=HRS+Water+Consultants+and+R.E.+Moran%2C+1987.+San+Luis+Valley+Confined+Aquifer&oq=HRS+Water+Consultants+and+R.E.+Moran%2C+1987.+San+Luis+Valley+Confined+Aquifer&aqs=chrome..69i57.1466j0j7&sourceid=chrome&es_sm=91&ie=UTF-8

<https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=HRS+Water+Consultants+and+R.E.+Moran%2C+1987.+San+Luis+Valley+Confined+Aquifer>

Straskraba, V. and R.E. Moran, 1990. Environmental Occurrence and Impacts of Arsenic at Gold Mining Sites in the Western United States: Proceedings, International Symposium on Acid Mine Water in Pyritic Environments, Lisbon, Portugal. September 16-19, 1990; *in* Mine Water and the Environment, Volume 9, Numbers 1-4 / March, 1990, Springer Berlin / Heidelberg; available at: http://www.imwa.info/bibliographie/09_14_181-191.pdf ; <http://www.springerlink.com/content/m1721074878301j4/> [abstract]. <http://link.springer.com/article/10.1007%2FBF02503691>

Moran, R.E., 1990. Environmental Constituents in the Rocky Flats Area - Non-Facility Related Sources Pertinent to Water Quality. Prepared for Advanced Sciences Inc., December 10, 1990.

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