

Arthur S. Rood
K-Spar, Inc

Education

1987 – COLORADO STATE UNIVERSITY, M.S. in Health Physics, Radioecology
1982 – MESA STATE COLLEGE, Grand Junction, Colorado, B.S. in Geology
1978 – SANTA MONICA COLLEGE, Santa Monica, California, AA in Mathematics

Professional Experience

Private Consultant, President, K-Spar Inc. Rigby, Idaho (7/94 - to present)

Develop and implement mathematical and computer models for assessment of multimedia transport of contaminants (radionuclides and other) in the environment. Quantify uncertainty and sensitivity of model predictions using Monte Carlo sampling techniques. Validate models using environmental monitoring data and compute health risk associated with predicted environmental media concentrations. Specific projects include atmospheric transport of radionuclides and chemicals at the Rocky Flats Plant for the Historical Public Exposures Studies at Rocky Flats, fluvial transport of radionuclides at the Hanford Reservations, development of radionuclide soil action levels at the Rocky Flats Plant, analysis of release and dispersion of radionuclides and chemicals in the air during the Cerro Grande fire at Los Alamos, and Monte Carlo analysis of radionuclide transport in vadose zone and aquifer at the U.S. Ecology low-level waste site in Richland Washington.

Idaho National Engineering and Environmental Laboratory (INEEL) (5/94 to present) Idaho Falls, Idaho 83415

Advisory Engineer/Scientist (part time)-

Research, develop, and apply state-of-the-art techniques for assessment of environmental transport and impacts associated with release of radioactive material and hazardous chemicals. Specific modeling expertise includes chronic and accident air dispersion, food-chain transport, groundwater flow and transport, dose and risk assessment, thermodynamic chemical vapor models, and first order kinetic models. Recent efforts have been directed toward low-level waste performance assessment and long-range atmospheric dispersion calculations for evaluation of toxic pollutants emitted to the air from INEEL facilities.

Provide lead technical guidance and funding management for INEEL and DOE-wide programs requiring complex environmental assessments and safety analyses. Provide technical guidance for an international study on uncertainty estimates in reactor consequence code evaluation. Assist the National Low-Level Waste program in providing technical assistance to waste compact states and foreign countries. Instructor for the University of Idaho graduate-level course, Environmental Modeling (INTER 504) from 1991 to present.

Principal Investigator for a national survey of naturally occurring radioactive material (NORM) in oil and gas production equipment. Member of the Health Physics Society/ANSI working group on NORM.

Adjunct Faculty, University of Idaho (1991 to present)

Instructor for the University of Idaho graduate-level course, *Environmental Modeling* (INTER 504) from 1991 to 2000.

Senior Scientist (5/90-5-94), Idaho National Laboratory

Provide lead technical guidance and funding management for Idaho National Engineering Laboratory (INEL) and DOE-wide programs requiring complex environmental assessments and safety analyses. Developed groundwater transport models and computer codes (GWSCREEN) for assessment of CERCLA sites and performance assessment of low level waste disposal facilities at the INEL. Performed the groundwater modeling and dose assessment section for the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory. Co-author of the food-chain model (COMIDA) for the MAACS reactor consequence code, an internationally-recognized reactor accident assessment code.

Participated in four "AIRDOS/CAP-88" radiological assessment courses for another DOE laboratory, INEL contractor, and state personnel. Conducted Performance Assessment Workshops and provided technical assistance to the low level waste compact states for the National Low-Level Waste Management Program.

UNC Geotech (8/89 to 5/90) Grand Junction, Colorado, 81502***Staff Scientist, Radon Laboratory***

Performed indoor radon assessments and developed instrumentation for measurement of radon progeny using alpha and beta spectroscopy. Conducted quality control experiments of radon measuring devices and wrote software for data acquisition systems and computer controlled instrumentation.

Idaho National Engineering and Environmental Laboratory (9/87 to 5/90) Idaho Falls, Idaho 83415***Scientist - Environmental Sciences and Engineering***

Research, develop, and apply state-of-the-art techniques assessing the environmental transport and impacts associated with release of radioactive material and hazardous chemicals. Specific modeling experience includes chronic and accident air dispersion, food-chain transport, groundwater contaminant transport, and dose and risk assessment.

Oak Ridge National Laboratory (11/84 to 9/86) Grand Junction, Colorado office, 81502***Senior Health Physics Technician***

Coordinated gamma spectroscopy laboratory for gamma spectral analysis of soil samples contaminated with uranium mill tailings. Wrote and implemented spectral analysis algorithms, multichannel analyzer control programs and data base software. Designed, constructed, and calibrated an activated charcoal radon measurement device. Developed and implemented laboratory quality control procedures.

Plateau Resources LTD (8/82 to 12/83)***Mine Geologist***

Supervised mine longhole drilling program for ore body fringe development and preparation for full scale production. Evaluated drilling results for ore trend production and ore reserve calculations.

Bendix Field Engineering (1/81 to 7/82) Grand Junction, Colorado, 81502***Geoscientist***

Assisted in researching uranium ore body development and exploration indicators and writing results published in Department of Energy reports. Tasks included interpretation of electric drill hole logs and generation of isopleth maps and cross sections from the data.

U. S. Department of Energy (5/80 to 9/80) Grand Junction, Colorado, 81502

Assisted staff geologist in reviewing resource maps and assessment data for the 1980 National Uranium Resource Evaluation Report.

Peer-Reviewed Publications

- Grogan, H.A., J.W. Aanenson,, P.D. McGavran, K.R. Meyer, H.J. Mohler, S.S. Mohler, J.R. Rocco, **A.S. Rood**, J.E. Till, and L.H. Wilson, 2006. "Modeling of the Cerro Grande Fire at Los Alamos: An Independent Analysis of Exposure, Health Risk, and Communication with the Public" In: *Applied Modeling and Computations in Nuclear Science*. ACS Symposium Series 945. American Chemical Society, Washington DC.
- Rood, A.S.**, 2004. "A Mixing-Cell Model for Assessment of Contaminant Transport in the Unsaturated Zone Under Steady-State and Transient Flow Conditions." *Environmental Engineering Science*, 21(6).
- Rood, A.S.**, H.A. Grogan, and J.E. Till, 2002. "A Model for a Comprehensive Assessment of Exposure and Lifetime Cancer Incidence Risk from Plutonium Released from the Rocky Flats Plant, 1953–1989." *Health Physics* 82(2) 198–212.
- 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, H.J. Mohler, S.K. Rope, and M.J. Case, 2002. "Risk to the Public from Historical Release of Radionuclides and Chemicals at the Rocky Flats Environmental Technology Site" *Journal of Exposure Analysis and Environmental Epidemiology*, 12, 355–372.
- Abbott, M.L., D.D. Susong, D.P. Krabbenhoft, and **A.S. Rood**, 2002. "Mercury Deposition in Snow near an Industrial Emission Source in the Western U.S. and Comparison to ISC3 Model Predictions." *Water, Air, and Soil Pollution*, 139. 95–114.
- Rood, A.S.**, P.D. McGavran, J. Aanenson, 2001. "Stochastic Estimates of Carcinogenic Risk with Uncertainty from Carbon Tetrachloride Released from the Rocky Flats Plant." *Risk Analysis* 21(4) 675–695.
- White, G.J., and **A.S. Rood**, 2001. "Radon Emanation from NORM-Contaminated Pipe Scale and Soil at Petroleum Industry Sites." *Journal of Environmental Radioactivity*, 54. 401–413.
- McGavran, P.D., **A.S. Rood**, J. E. Till, 1999. "Chronic Beryllium Disease and Cancer Risk Estimates with Uncertainty for Beryllium Released to the Air from the Rocky Flats Plant." *Environmental Health Perspectives* 107(8): 731-744.

- Rood, A. S.**, G.G. Killough, J.E. Till, 1999 “Evaluation of Atmospheric Transport Models for use in Phase II of the Historical Public Exposure Studies at the Rocky Flats Plant.” *Risk Analysis* 19(4) 559-576.
- Rood, A.S.**, G.J. White, and D.T. Kendrick, 1998. “Measurement of ^{222}Rn Flux, ^{222}Rn Emanation, and ^{226}Ra Concentration from Injection Well Pipe Scale” *Health Physics* 75(2): 187-192.
- Rood, A.S.**, 1994, “GWSCREEN: A Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination”, *The Environmental Professional*, 16(3):196-210.
- Nguyen, H.D., S. Paik, **A.S. Rood**, 1994, “Effects of Thermally Generated Convection on the Migration of Radionuclides in Saturated Geologic Formations” *International Journal Engineering Science*, 32(10):1605-1614.
- Abbott, M.L. and **A.S. Rood**, 1994 “COMIDA: A Radionuclide Food-Chain Model for Acute Fallout Deposition”, *Health Physics*, 66(1):17-29.
- Martz, D.E., **A.S. Rood**, J.L. George, M.D. Pearson, G.H. Langner, 1991, “Year-to-Year Variations in Annual Average Indoor ^{222}Rn Concentrations”. *Health Physics*, 61(3): 409-413.
- Walton, J.C., **A.S. Rood**, R.G. Baca and M.D. Otis, 1989, “Model for Estimation of Chlorinated Solvent Releases from Waste Disposal Sites”, *Journal of Hazardous Materials*, Vol 21, pp 15-34.

Technical Publications

- Rood, A.S.** 2005. Mixing Cell Model: A One-Dimensional Numerical Model for Assessment of Water Flow and Contaminant Transport in the Unsaturated Zone. ICP/EXT-05-00748, Idaho National Laboratory, Idaho Falls, ID. March .
- Rood, A.S.**, J.W. Aanenson, S.S. Mohler, P.D. McGavran, H.J. Mohler, H.A. Grogan, 2002. Analysis of Exposure and Risks to the Public from Radionuclides and Chemicals Released by the Cerro Grande Fire at Los Alamos: Task 1.7, Estimated Risks from Releases to the Air. 3-NMED-2002. Risk Assessment Corporation, Neeses, South Carolina.
- White, G.J. and **A.S. Rood**, 1999. Radon Emanation from NORM-Contaminated Pipe Scale, Soil, and Sediment at Petroleum Industry Sites. DOE/ID/13223-2. National Petroleum Technology Office, U.S. Department of Energy, Tulsa Oklahoma.
- Case, M.J., **A.S. Rood**, J.M. McCarthy, S.O. Magnuson, B.H. Becker, T.K. Honeycutt, 2000. Technical Revision of the Radioactive Waste Management Complex Low-Level Waste Radiological Performance Assessment for Calendar Year 2000. INEEL/EXT-2000-01089. Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho.
- Rood, A.S.**, H.A. Grogan, 1999. Estimated Exposure and Lifetime Cancer Incidence Risk from Plutonium Released from the 1969 Fire at the Rocky Flats Plant. 07-CDPHE-RFP-1999, Radiological Assessments Corporation, Neeses, South Carolina. August.
- Rood, A. S.**, H. A. Grogan, 1999. Comprehensive Assessment of Exposure and Lifetime Cancer Incidence Risk from Plutonium Released from the Rocky Flats Plant. 13-CDPHE-RFP-1999, Radiological Assessments Corporation, Neeses, South Carolina. September.
- Rood, A. S.**, H. A. Grogan, 1999. Estimated Exposure and Lifetime Cancer Incidence Risk from Plutonium Released from the 1957 Fire at the Rocky Flats Plant. 02-CDPHE-RFP-1999, Radiological Assessments Corporation, Neeses, South Carolina. August.
- Rood, A. S.**, H. A. Grogan, 1999. Estimated Exposure and Lifetime Cancer Incidence Risk from 903 Area Plutonium Releases at the Rocky Flats Plant. 01-CDPHE-RFP-1999, Radiological Assessments Corporation, Neeses, South Carolina. August.
- Rood, A. S.**, 1999. Performance Evaluation of Atmospheric Transport Models. 3-CDPHE-RFP-1996 (Rev. 1), Radiological Assessments Corporation, Neeses, South Carolina. August.

- Rood, A. S.**, 1999. Estimated Exposure and Lifetime Cancer Incidence Risk from Routine Plutonium Releases at the Rocky Flats Plant. 08-CDPHE-RFP-1997 (Rev. 1), Radiological Assessments Corporation, Neeses, South Carolina. August.
- Grogan, H. A., P. D. McGavran, K. R. Meyer, H. R. Meyer, J. Mohler, **A. S. Rood**, W. K. Sinclair, P. G. Voillequé, J. M. Weber, 1999. Technical Summary Report of the Historical Public Exposures Studies for Rocky Flats Phase II. 14-CDPHE-RFP-1999-DRAFT, Radiological Assessments Corporation, Neeses, South Carolina. August.
- McGavran, P.D., **A. S. Rood**, 1999. Estimated Exposure and Cancer Risk from Beryllium Released to the Air from the Rocky Flats Plant. 02-CDPHE-RFP-1997 (Rev. 1), Radiological Assessments Corporation, Neeses, South Carolina. August.
- McGavran, P.D., **A. S. Rood**, 1999. Estimated Exposure and Cancer Risk from Carbon Tetrachloride Released to the Air from the Rocky Flats Plant. 04-CDPHE-RFP-1997 (Rev. 1), Radiological Assessments Corporation, Neeses, South Carolina. August.
- Weber, J.M., **A.S. Rood**, H. R. Meyer, 1999. Development of the Rocky Flats Plant 903 Area Plutonium Source Term. 08-CDPHE-RFP-1998 (Rev. 1), Radiological Assessments Corporation, Neeses, South Carolina. August.
- Brown, J., M. L. H. J. Goossens, B. C. P. Kraan, R. M. Cooke, J. A. Jones, F. T. Harper, F. E. Haskin, M. L. Abbott, M. L. Young, S. C. Hora, **A. S. Rood**, 1997. Probabilistic Accident Consequence Uncertainty Analysis: Food Chain Uncertainty Assessment. NUREG/CR-6523 U.S. Nuclear Regulatory Commission, Washington D.C.
- Abbott, M. L. and **A. S. Rood**, 1996. Source Group Optimization Program (SGOP): A Program that Groups Emission Sources for Input into Air Dispersion Models INEL-96/0376 Idaho National Engineering Laboratory, Idaho Falls, Idaho.
- Maheras, S.J. **A.S. Rood**, S. O. Magnuson, M. E. Sussman, R. N. Bhatt, 1994. Radioactive Waste Management Complex Low-Level Waste Radiological Performance Assessment. EGG-WM-8773, Idaho National Engineering Laboratory, May.
- Rood, A.S.**, 1994. GWSCREEN: A Semi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination: Theory and Users Manual Version 2.0, EGG-GEO-10797, Revision 2, Idaho National Engineering Laboratory, June.
- Abbott M.L. and **A.S. Rood**, 1993. COMIDA: A Radionuclide Food-Chain Model for Acute Fallout Deposition, EGG-GEO-10367, Idaho National Engineering Laboratory, November.
- Abbott, M.L. S.L. Harms, **A.S. Rood**, 1993. Dose Calculations for Accidental Airborne Releases of ITER Activation Products, EGG-EEL-10994, Idaho National Engineering Laboratory, December.
- Rood, A.S.** and M.L. Abbott, 1991. Comparison of Dose and Dose-rate Conversion Factors from the Soviet Union, United Kingdom, U.S. Department of Energy and the Idaho National Engineering Laboratory Fusion Safety Program, EGG-FSP-9865, Idaho National Engineering Laboratory, December.
- Seitz, R.R., **A.S. Rood**, G.A. Harris, S.J. Maheras, M. Kotecki, 1991. Sample Application of Sensitivity/Uncertainty Analysis Techniques to a Groundwater Problem, DOE/LLW-108, U. S. Department of Energy, National Low Level Waste Program, June.
- Rood, A.S.** Assessment of Impacts at the Advanced Test Reactor as a Result of Chemical Releases at the Idaho Chemical Processing Plant, EGG-EST-9523, Idaho National Engineering Laboratory, February, 1991.
- Abbott, M.L. and **A.S. Rood**, 1990. Concentration Factors for Fusion-Related Radionuclides Calculated Using the Food-Chain Model FUSEMOD, EGG-EST-9223, Idaho National Engineering Laboratory, September.
- Rood, A.S.**, J.L. George, G.H. Langner, 1990. Variation in the Annual Average Radon Concentration Measured in Homes in Mesa County, Colorado, DOE/ID/12584-57 UNC/GJ-50(TMC), U. S. Department of Energy, Grand Junction, Colorado, April.

- Rood, A.S.**, R.C. Arnett, J. Barraclough, 1989. Contaminant Transport in the Snake River Plain Aquifer: Phase 1, Part 1: Simple Analytical Model of Individual Plumes, EGG-ER-8623, Idaho National Engineering Laboratory, May.
- Rood, A.S.**, 1988. Environmental Transport Concentration Factors for the FUSECRAC Fusion Reactor Safety Code, EGG-ESE-8033, Idaho National Engineering Laboratory, May.