



SOUTHWEST RESEARCH INSTITUTE



# Environmental Exposure Pathway and Dose Modeling

Complex environmental systems present challenges for evaluating the safety of contaminated sites and waste disposal facilities over long periods. Southwest Research Institute® (SwRI®) Center for Nuclear Waste Regulatory Analyses (CNWRA®) staff members have well-established technical expertise and experience developing and applying computer models to support long-term safety and environmental impact analyses of contaminated sites and disposal facilities.

## SwRI BDOSE Model

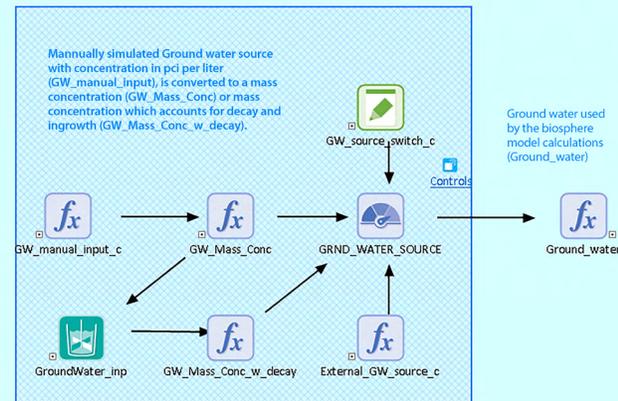
CNWRA scientists and engineers have developed and implemented the radiological dose model BDOSE to calculate probabilistic radiation doses to humans in a biosphere. The model evaluates hypothetical scenarios that reflect human behaviors and site characteristics that could facilitate release of and exposure to radionuclides. Recently, CNWRA staff developed a proof-of-concept radon gas transport model that implements an inhalation dose calculation applicable to buried radioactive wastes. Ongoing effort at CNWRA is focused on integrating this radon modeling capability into BDOSE.

## Features

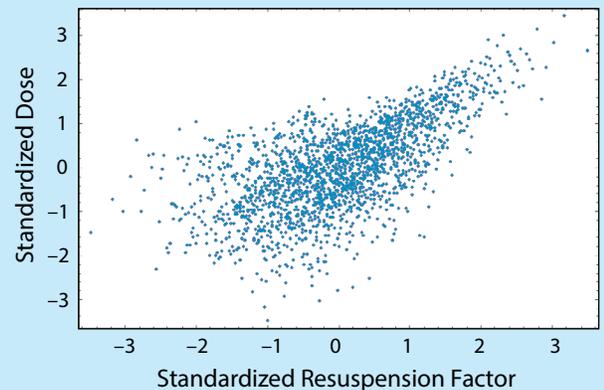
- Doses from direct radiation, inhalation, and ingestion of contaminated water and food products are calculated considering typical scenarios involving inadvertent intrusion into a waste facility, farming, gardening, and recreational activities
- Inventory of 49 radionuclides can be tracked in the modeled biosphere
- Full control of input parameters and data allows users to conform analyses to site-specific conditions
- Stochastic modeling capabilities support detailed sensitivity and uncertainty analyses to identify risk-significant variables
- Modular and flexible design allows customized enhancements to meet client needs, including execution of external models, integration into a larger total-system performance assessment model, and additional chemical pathways and exposures

## Applications

- Disposal facility performance assessment modeling (e.g., radioactive wastes or uranium mill tailings)
- Pathway dose calculations for sites with radioactive contamination in soil, groundwater, or surface water
- Indoor and outdoor radon inhalation dose calculations considering a subsurface radium source



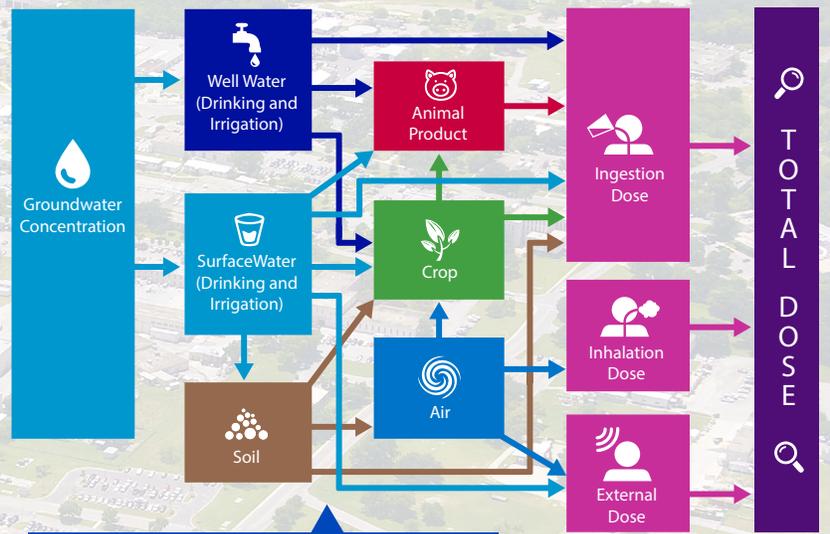
BDOSE utilizes objects to implement calculations and show information flow while on-screen text assists users.



Scatterplot analysis of BDOSE output shows how variation in a sampled input parameter affects the calculated dose.

## Benefits

- State-of-the-art modeling capabilities and flexibility to intuitively evaluate a variety of site-specific biosphere pathway and dose assessment scenarios
- Stochastic modeling and analysis capabilities that support assessments of significant dose contributors
- Quality assurance testing of other codes (e.g., benchmarking analyses)
- Complete biosphere model that reduces the development effort for a site-specific performance assessment model



Detailed biosphere pathway modeling capabilities in BDOSE address a complex suite of environmental features and processes.

We welcome your inquiries.  
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