RESidual RADioactivity

RESRAD,
a computer code for evaluating radioactively contaminated sites

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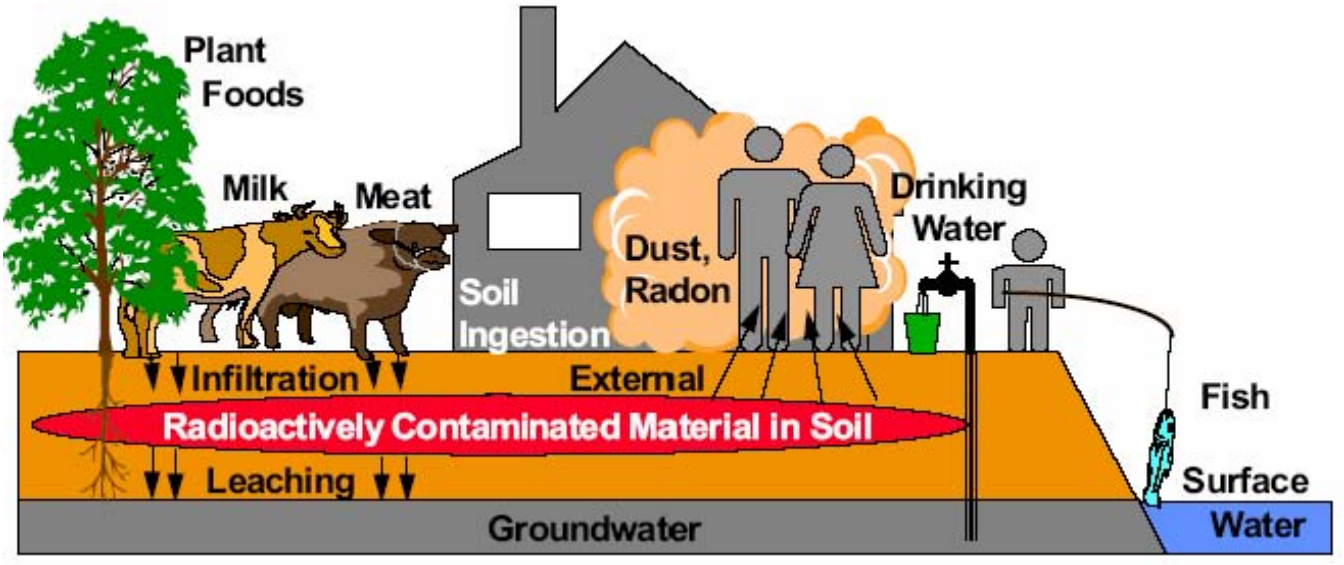
What is RESRAD?

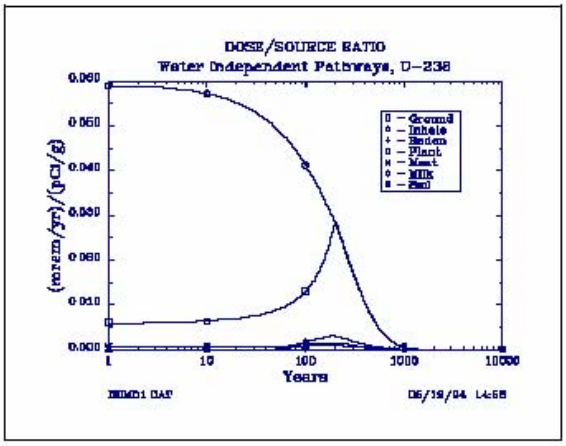
RESRAD is a computer code developed at Argonne National Laboratory for the U.S. Department of Energy to calculate site-specific RESidual RADioactive material guidelines as well as radiation dose and excess lifetime cancer risk to a chronically exposed on-site resident.

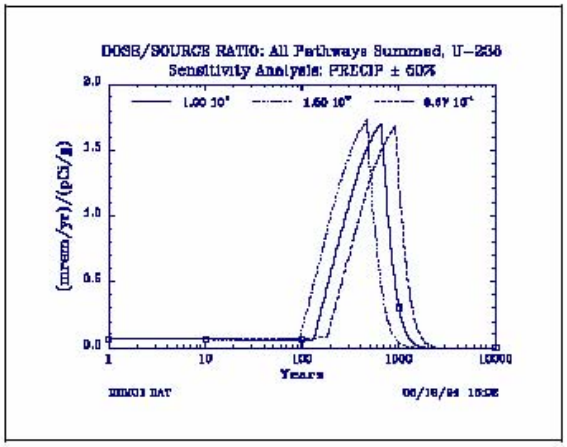
A soil guideline is defined as the radionuclide concentration in soil that is acceptable if the site is to be used without radiological restrictions. Soil is defined as unconsolidated earth material, including rubble and debris that might be present. These guidelines are based on the following principles: (1) the annual radiation dose received by a member of the critical population group from the residual radioactive material -- predicted by a realistic but reasonably conservative analysis and calculated as committed effective dose equivalent -- should not exceed 100 mrem/yr, and (2) doses should be kept as low as reasonably achievable, a concept commonly known as ALARA.

What pathways are considered in RESRAD?

Nine environmental pathways are considered: direct exposure, inhalation of particulates and radon, and ingestion of plant foods, meat, milk, aquatic foods, water, and soil.







What are the main features of the RESRAD code?

Installation is simple, in part, because of self-extracting files. The code is very user friendly, incorporating internal interactive help files and information on input and output data. The main menu and its submenus allow the user to easily change titles, select pathways, access and modify input data, run the program, change screen colors and view text or graphic output.

Default values are provided for most of the parameters used by the code. Different exposure scenarios can be specified by adding or suppressing pathways and by modifying usage and occupancy parameters.

Four output reports are generated following each run, providing a listing of all input parameters, the maximum dose and the minimum soil guidelines. For each user-specified time, the reports list doses by nuclide and pathway, soil guidelines, radionuclide intakes, health risks, and media concentration.

The user can plot soil guidelines, doses, or media concentrations as a function of time (see figure above left). In preparing the plots, the user may specify individual radionuclides or their sum, and contributions from individual pathways or all pathways summed.

A number of popular printers, plotters, and graphic file formats are supported by RESRAD. A sensitivity analysis feature (see figure above right) allows the user to investigate the effect of input parameter variability on the calculated output.

What is the method of analysis?

RESRAD uses a pathway analysis method in which the relation between radionuclide concentrations in soil and the dose to a member of a critical population group is expressed as a pathway sum, which is the sum of products of "pathway factors". Pathway factors correspond to pathway segments connecting compartments in the environment between which radionuclides can be transported or radiation emitted. Radiation doses, health risks, soil guidelines and media concentrations are calculated over user-specified time intervals. The source is adjusted over time to account for radioactive decay and ingrowth, leaching, erosion, and mixing. RESRAD uses a one-dimensional groundwater model that accounts for differential transport of parent and daughter radionuclides with different distribution coefficients.

What are the computer requirements?

The code runs on Windows 2000 or later and requires 16 MB of hard drive space.

Who can provide additional information?

Contact Dr. Charley Yu, Argonne National Laboratory, (630) 252-5589, send FAX to (630) 252-4624 or send an email message to resrad@anl.gov. Home page: http://www.evs.anl.gov/resrad.