

CERCLA Radiation Risk Assessment Policy and Guidance

Stuart Walker

U.S. Environmental Protection Agency
Office of Superfund Remediation
and Technology Innovation (OSRTI)
Science and Policy Branch

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Purpose

- ◆ Provide overview of CERCLA remedy selection and risk assessment approach to radionuclides
- ◆ Provide overview of EPA CERCLA risk assessment guidance and tools that specifically address radionuclides
- ◆ Provide overview of EPA CERCLA radiation products under development
 - » Covers products with potential for completion during the next year

Radioactive Contamination

- ◆ All radionuclides are carcinogens
 - » Uranium also has noncancer toxicity effects
- ◆ Radionuclides are addressed in the same framework as chemical contamination
- ◆ Radioactive contamination exposure pathways include (in addition to soil ingestion and dust inhalation)
 - » Gamma radiation
 - » Produce consumption



CERCLA Cleanup Levels

- ◆ ARARs often determine cleanup levels
- ◆ Where ARARs are not available or protective, EPA sets site-specific cleanup levels that:
 - » For carcinogens, represent an increased cancer risk of 1×10^{-6} to 1×10^{-4}
 - 10^{-6} used as “point of departure”
 - PRGs are established at 1×10^{-6}
 - » For non-carcinogens, will not result in adverse effects to human health (hazard index (HI) <1)
- ◆ Address ecological concerns

CERCLA Cleanup Levels Are NOT Based On:

- ◆ NRC decommissioning requirements (e.g., 25, 100 mrem/yr dose limits) 10 CFR 20 Subpart E;
 - » If an ARAR, 10^{-6} still used as point departure, and 10^{-4} to 10^{-6} risk range must be met
- ◆ Guidance outside risk range and/or if expressed as a dose (# mrem/yr) includes:
 - » DOE orders, NRC guidance (e.g., NUREGs), ICRP guidance, NCRP guidance, ANSI/HPS guidance, EPA/DHS PAGs, and Federal guidance

Risk-Based Cleanup Levels for Radioactive Contamination

- ◆ Radiation cleanup levels expressed as risk levels, *not* mrem
- ◆ Superfund uses “slope factors” in HEAST instead of dose conversation tables to estimate cancer risk from radioactive contaminants
 - » HEAST has been updated with new information from Federal Guidance 13
 - Based on information in ICRP 72
- ◆ Cancer risk from chemicals and radionuclides are summed

Guidance: Risk Assessment Q&A

◆ “Radiation Risk Assessment at CERCLA Sites: Q&A” (12/99) OSWER Directive 9200.4-31P

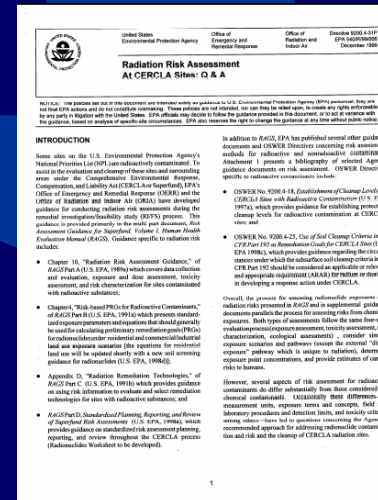
◆ Provides overview of current EPA guidance for radiation risk assessment

◆ Adds some new guidance:

» Dose assessment only for ARAR compliance

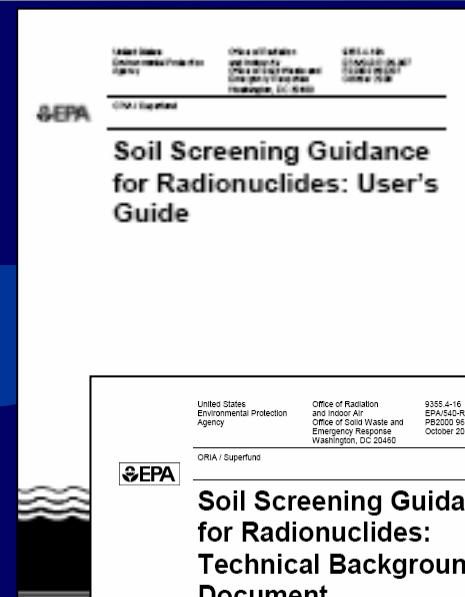
» No dose-based TBCs

» Direct exposure rate may supplement sampling



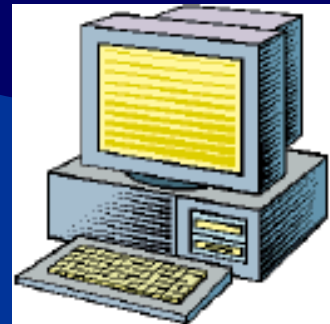
Guidance: Rad SSG

- ◆ Soil Screening Guidance for Radionuclides [rad SSG] documents (10/00) OSWER Directives 9355.4-16A and 9355.4-16
 - » User Guide
 - » Technical Background Document
- ◆ Guidance to screen out areas, pathways, and/or radionuclides early in the process
- ◆ Consistent with 1996 chemical SSG
 - » 1×10^{-6} and MCLs (leaching from soil)
 - » Residential land use
 - » Survey procedures for site characterization
 - » Evaluates 5 soil to groundwater models
 - » Accounts for technical differences of radiation



Guidance: Rad PRG Calculator

- ◆ Calculator to establish PRGs, when:
 - » ARAR is either not available or sufficiently protective (e.g., 25 mrem/yr or more)
- ◆ Electronic equations (risk and leaching to groundwater) also are on Internet
 - » 1×10^{-6} and MCLs (leaching from soil)
 - » Accounts for technical differences of radiation (e.g., gamma, plant uptake)



Guidance: Rad PRG Calculator (continued)

◆ Seven scenarios/land uses available

1. Residential
2. Agricultural
3. Indoor workers
4. Outdoor workers
5. Fish ingestion
6. Tap water
7. Soil to groundwater



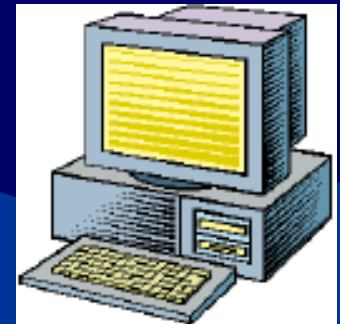
Guidance: ARAR Dose Calculator

◆ Calculator to establish Dose Compliance Concentrations (DCC) for single dose limit ARARs requiring a dose assessment

◆ Six scenarios/land uses available

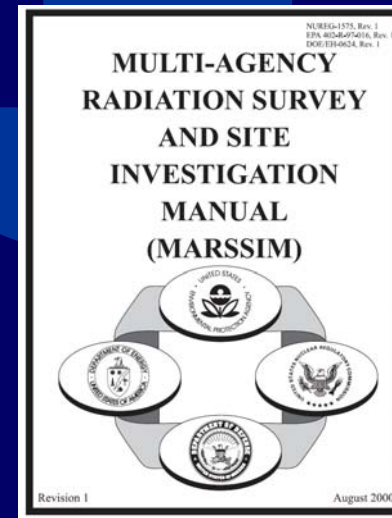
- | | |
|-------------------|--------------------|
| 1. Residential | 4. Outdoor workers |
| 2. Agricultural | 5. Fish ingestion |
| 3. Indoor workers | 6. Tap water |

◆ Equations similar to those used for PRG calculator, except dose conversion factors used instead of slope factors



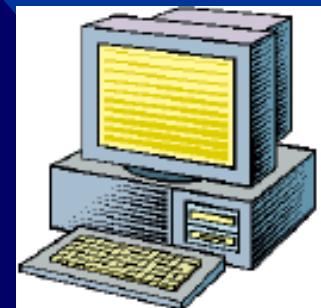
ORIA Tech Guide: MARSSIM

- ◆ **Not** a CERCLA recommended approach, but may be useful
- ◆ Provides an approach for surveys of rad contaminated surface soil and building surfaces
 - » MARSSIM intended for final status survey (post-remediation)
 - » Rad SSG provides EPA recommended approach for CERCLA site characterization



EPA/ITRC Online Training on Radiation Risk Assessment

- ◆ 6 Live Internet rad risk Training sessions have been conducted
 - » 754 persons have taken live course
 - » July 29, 2003 was first session
- ◆ An archived version of the August 5, 2005 is on the internet at:
http://www.clu-in.org/conf/itrc/rads_080504/
- ◆ Next live session is August 10, 2006



Scope of Rad Risk Training

- ◆ Four modules provide:
 1. Overview of reg requirements for rad cleanup and discuss ITRC case studies document
 2. Clarify differences between risk and dose assessment
 3. Explain how to use EPA rad PRG and ARAR dose calculators
 4. Case study application of rad PRG calculator

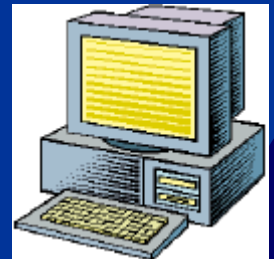
Risk Tools under development

- ◆ Three risk assessment tools:
 1. Building PRG calculator
 2. Outside Surfaces PRG calculator
 3. Radionuclide Ecological Benchmark calculator



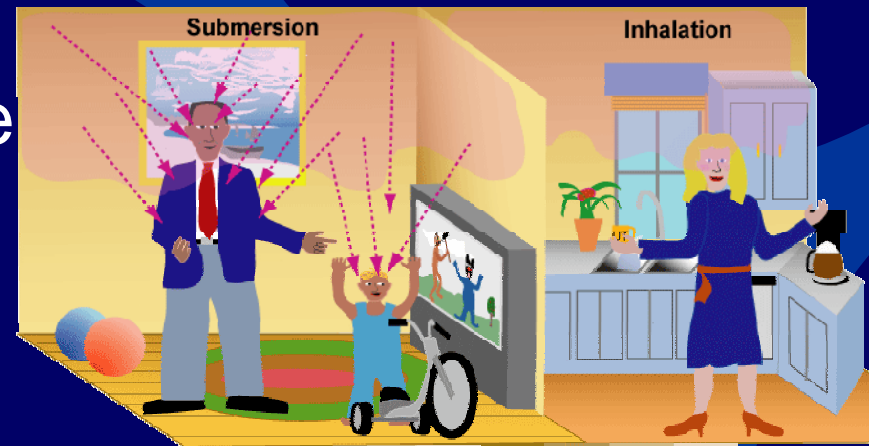
Building PRG (BPRG) Calculator

- ◆ Establish 1×10^{-6} risk based PRGs for radioactively contaminated buildings
- ◆ Equations and parameters are derived from latest EPA chemical methodology (e.g., assessment at World Trade Center)
 - » Adjusted to account for technical differences posed by radiation



BPRG Exposure scenarios

- ◆ BPRG calculator includes 2 land use scenarios
 - » Residential
 - » Indoor worker
- ◆ Both land uses include 3 exposure routes
 - » Settled dust
 - » Ambient air
 - » Direct external exposure
 - Surface
 - Volumetric



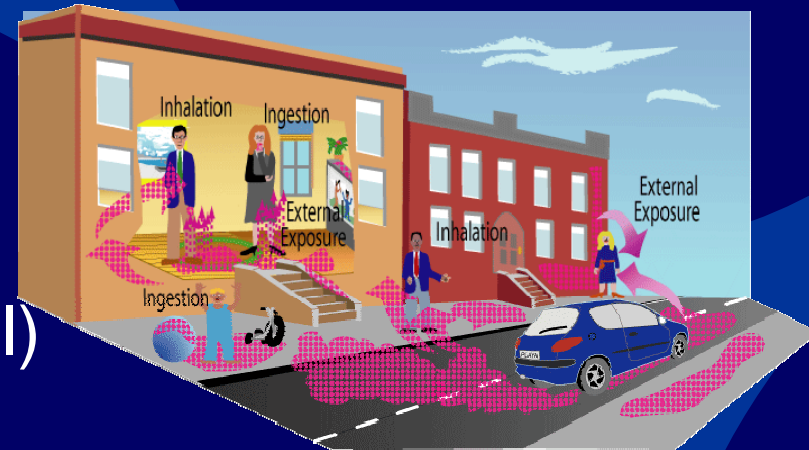
Surfaces PRG (SPRG) Calculator

- ◆ Establish 1×10^{-6} risk based PRGs for radioactively contaminated outside hard surfaces (e.g., slabs, pavement, sidewalks, sides of buildings)
- ◆ Derived from rad PRG and BPRG calculators



SPRG Exposure Scenarios

- ◆ SPRG includes 3 land use scenarios
 - » Residential
 - » Indoor Worker
 - » Outdoor Worker
- ◆ 3 land uses include 3 exposure routes
 - » Settled dust (street level)
 - » Direct External (street level)
 - Surface and Volumetric
 - » Direct External (rooftop level)
 - Surface and Volumetric

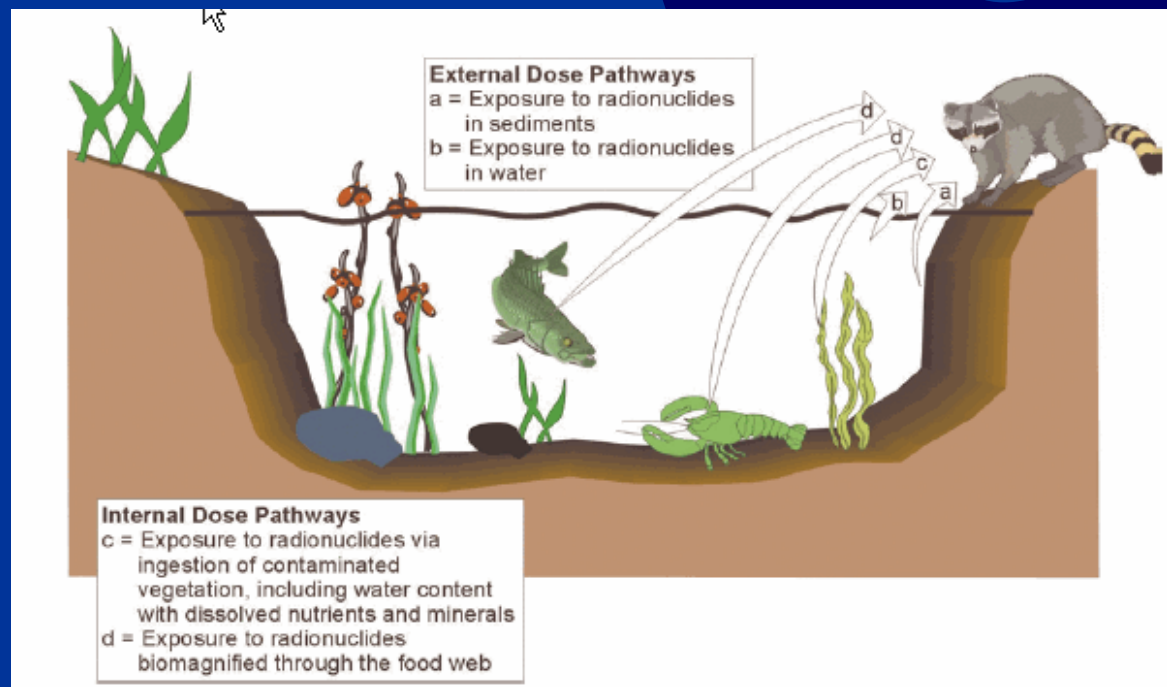


Radionuclide Ecological Benchmark (REB) Calculator

- ◆ Establish risk-based Biota Concentration guides (BCGs), or ecological benchmarks, for radioactively contaminated sites
- ◆ Derived from DOE Graded Approach guidance
 - » Includes same dose levels for tissue death
 - » Strong recommendation to look at chemical eco effects

REB Exposure Scenarios

- ◆ Includes 9 animal or plant benchmark scenarios
 - » 4 generic composite only
 - » 5 species-specific/site-specific



For More Copies or Information

- ◆ Guidance documents, tools, and training are on Superfund Radiation Risk Assessment Webpage:
<http://www.epa.gov/superfund/resources/radiation/radrisk.htm>

- ◆ Guidance for overall remedial radiation policies are on Superfund Radiation Webpage:
<http://www.epa.gov/superfund/resources/radiation/index.htm>

- ◆ For further information or questions:
 - » Stuart Walker
 - Phone: (703) 603-8748
 - Fax: (703) 603-9133
 - Email: Walker.Stuart@epa.gov

Questions

