ST. LOUIS FUSRAP OVERSIGHT COMMITTEE
c/o 111 So. Meramec
Clayton, MO 63105
314.615.1635
Ric_Cavanagh@Stlouisco.com

MEMORANDUM

TO: Oversight Committee Members
Other Interested Parties

FROM: Richard R. Cavanagh, CHE
Chairperson

RE: Next Meeting

The next meeting of the St. Louis FUSRAP Oversight Committee will be held on Friday, January 11, 2002, at 11:30 am, in the trailers on Latty Ave.

Committee Members who cannot attend should contact the chairperson at the above numbers to be excused.

Happy New Year!

:RRC

ST. LOUIS FUSRAP OVERSIGHT COMMITTEE
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Summary of Meeting
December 13, 2001

Committee Members Present: Tom Binz, Ric Cavanagh, Jim Grant, Bill Brandes, Jan Titus, Sally Price

Committee Members Excused: Anna Ginsberg

Other Interested Parties: Sharon Cotner, Larry Erickson, Eric Gilstrap, Bob Geller, Mike Zlatic, Lou Dell'Orco, Jacqui Mattingly, Jack Frauenhoffer

The following comments are in addition to the information provided in the handouts from USACE (see attached).

Sharon Cotner provided an abbreviated report in order to allow time for a conference call with Dan Wall of EPA in Kansas City.

Page 5 - GIFREHC - contractor has suspended work until spring.

Page 6 - VP's are basically on hold due to limited dollars allocated to them.

Page 7 - Plant 1 - discussions continuing with Mallinckrodt re: moving a fence (a DEA area). Note: the contractor (IT) is having financial problems, is being closely monitored.

Page 8 - North County ROD public hearing still not scheduled because of conflict with CX. Worst case scenario would be shutting down the project, losing staff, if it doesn't get approved soon.

Next Meeting: January 11, 2002.

A conference call was then placed to Dan Wall, EPA, to discuss clean up standards and long term stewardship issues. (These were some of the short-term issues/objectives that were identified at the special Committee meeting in November.) The following summarizes several key points that he made.

Long Term Stewardship (LTS) -

EPA is placing a stronger emphasis on LTS and institutional controls. In a ROD, they are looking for clear, conceptual commitments for specific land use after clean up. This is to

be accomplished by establishing viable mechanisms to achieve the objectives of the ROD.

Clean-up Standards -

The 5/15/50 standard really depends on site-specific situations. The measure of success is not 5/15/50 itself, but rather the evaluation of the post clean-up status of a site. Unrestricted use therefore means that the site falls within acceptable risk parameters for residential use. The tool for the evaluation is a health risk appraisal. The ultimate proof is in the PRAR.

EPA ultimately has the final decision as to the clean-up status of a site. The five-year review of a cleaned up site is effectively an institutional control.

In summary, the Committee's focus should be on unrestricted use per the health risk appraisal, not the numbers per se.

USACE staff pointed out that there is an inherent dilemma with the overall process since there are competing criteria: each federal agency has its own numbers and uses its own language.

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Gateway to Excellence

St. Louis
Oversight Committee Meeting
Corps Update

14 DECEMBER 01

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Agenda

Gateway to Excellence

- Mississippi Valley Division
- Progress Report
- Community Interactions
- Taskers
- Questions

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Mississippi Valley Division

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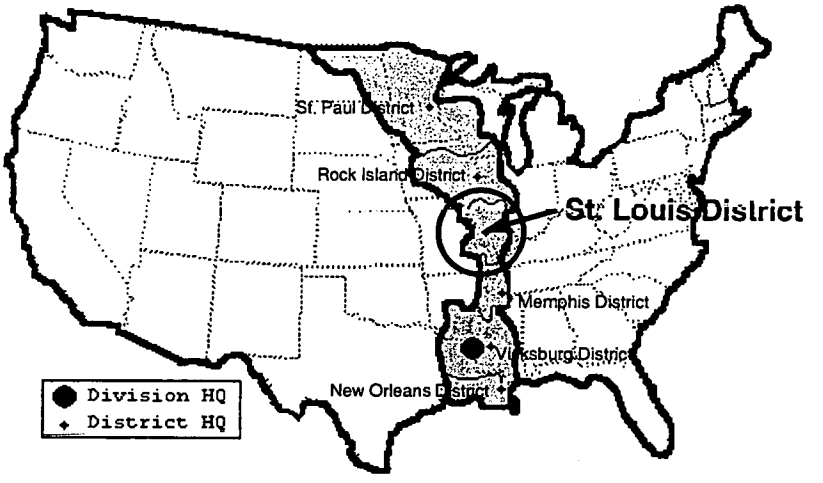

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Progress Report
St. Louis Airport Site (SLAPS)

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- **Remedial Design**
  - **Pre Design Investigation for Phases 4 / 5/ 6** - Published 31 OCT
    - Addendum 1 for portion of Coldwater Creek (adjacent to Phases 4/5) - Due mid JAN
  - **Design Basis Memorandum for Phases 4 / 5 / 6 (IA1 / 6)** - Submitted 15 NOV
  - **Work Description for Phases 4 / 5** - 60% due in FEB

- **Removal Actions**
  - **Began Phase I (IA5) excavation 10 DEC** - 43,000 cyds expected
  - **East End - Excavation is substantially complete** - 58,044 cyds removed
    - The contractor is currently excavating small areas at Survey Unit (SU) 10 and backfilling other SU's.
      - Two SU's, adjacent to the Radium Pits, will remain and be addressed in Phase 1 (IA5) next summer
  - **Status of water treatment system** - Next Bench test scheduled for mid JAN
    - System is being modified / equipment being changed to ensure it meets contractual specifications
      - High organic content is suspected of fouling the filter on the first test.
  - **Rail Shipments off SLAPS**
      - 18,133 cyds shipped to date / 50,000 planned.

December 2001

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Progress Report
Hazelwood Interim Storage Site (HISS)/Latty Avenue

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- **Remedial Design** - None at this time
- **Removal Actions - None at this time**
  - **GIFREHC**
    - **Roof Replacement**
      - MVS is supporting a GIFREHC roofing contractor by conducting radiological support, transportation and disposal associated with the roof removal.
      - MVS Support will resume in spring 8 of 63 areas removed and replaced to date.
      - 4,000 cyds are expected. 222 removed to date
    - **Utility Support**
      - Conducted utility support in GIFREHC maintenance bay - 2 cyds removed.
    - **Entrance Pad Assessment**
      - USACE took samples under the entrance pad to GIFREHC in anticipation of upcoming removal and replacement - no concentrations found above background.
  - **Rail Shipments off HISS**
    - 3223 cyds shipped to date / 5,000 cyds planned

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Progress Report
SLAPS Vicinity Properties

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- **Data Evaluation**
  - Assessment of the 30 DoE remediated properties.
    - Regulator review comments received. Currently working responses.
- **Characterization Surveys / Remedial Design - No Change**
  - **Designs are on hold, expected to be completed this winter**
    - 56/57/58/59/1C & Pershall & I-270 ROW(@2,000 cyds) - 60% design on hold
    - 9/10/11/12 & Hotspots in the ballfields and IA 10 - 90% design submitted - on hold
- **Working with MoDOT for work to be done at Pershall / I-170**
  - Received archived samples for analysis
- **Supporting proposed property improvements at VP24.**
  - Sample results are pending.
- **Remedial Action - None to date**
  - **Rail Shipments of VP soils (Shipped from HISS)**
    - 700 cyds planned; however, based on funding / utility work, the number could increase

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Progress Report
St. Louis Downtown Site (SLDS)

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- **No remediation letters** - Working for Thomas and Proetz (DT-10) / Burlington Northern (DT-12)
- **Remedial Investigation** - USACE assembling data for Groundwater Remedial Action Alternatives Assessment due to high levels of U in well at Plant 6W - Draft expected in FEB.
  - Site Wide Sewer Study underway
- **Remedial Design**
  - **Pre Design Investigation** - Mallinckrodt West, Plant 7N/7S, Christiana, Star Bedding and Thomas / Proetz Lumber are currently pending or under review
    - Currently re-evaluating PDI on properties to ensure proper sampling depths were attained
  - **Work Descriptions - REV 1's may be issued after PDI re-evaluation**
    - PSC Metals, Heintz Steel complete. McKinley Bridge, Gunther Salt working.
- **Remedial Action**
  - **Plant 2 PRAR regulator review comments received. Finalizing responses.**
  - **Plant 1 continues (@3,650 cyds) - 3,599 cyds remediated to date**
    - Current completion date is FEB 02. 1 small area remains (30-40 cyds)
  - **Plant 6E / 6E1/2 (15,000 cyds) began 3 DEC 00 - 12,751 cyds remediated to date**
    - Phase I excavation continues. Completion date is MAY 02 due to Plant 1 delays.
  - **VP's - Midwest Waste (1,500 cyds)** - 3,220 cyds removed to date. 95% complete.
  - **Rail Shipments off SLDS**
    - 4,007 cyds shipped / 15,000 planned

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Progress Report
Other Issues

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- **North County Feasibility Study/ Proposed Plan**
  - USACE comments, including OC in the HTRW-CX, have been received and the responses are being finalized.
  - FS/PP regulator review is the next step.
- **Long Term Stewardship - Next meeting is 24 JAN**
  - LTS Meeting held 25 OCT. LTS document development is ongoing.
  - Oversight Committee held meeting which included LTS On 28 NOV
- **DoE Program POC's Interactions -**
  - None during this timeframe
- **The Army Audit Agency continues their audits - No new information**
  - No new status on either audit.

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FY 02 Volume Shipped Using Environmental Documents

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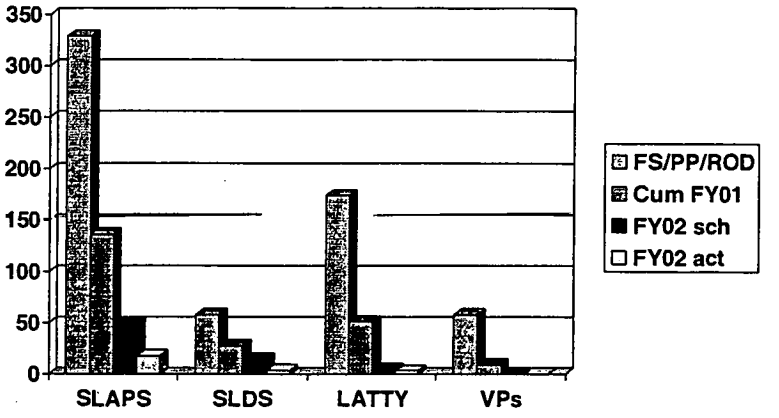

Note 1. North County volumes are based on the North County F3/PP
Note 2. All volumes are exsitu. Exsitu volume = Insitu volume plus 20% for excavation and 25% for swell prior to Transportation and Disposal
Note 3. SLDS volumes do not include inaccessibles

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Community Interactions

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- **Recent Events**
  - Presentation and Display at Rockwood School Science Expo - 4 DEC
  - USACE District Engineers Site Brief and Tour was held 26 NOV
- **Upcoming Events**
  - Publish Newsletter - FEB 02

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Taskers

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- **Old Taskers**
  - Put the updated maps of the Phases of SLAPS and properties at SLDS in the next newsletter (Working)
  - The Oversight Committee will meet to discuss how to increase public awareness on clean up standards and LTS (Ongoing - Meeting held)
  - Provide the Oversight Committee a briefing on the FS/PP when appropriate (Working)
- **New Taskers**

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Questions

Gateway to Excellence

December 13, 2001

To: Ric Cavanagh, Chair of St. Louis FUSRAP Task Force
From: Jim Werner, Missouri Department of Natural Resources

Re: Background Information on Soil Radiation Standards

As Bob Geller indicated, during our meeting last FUSRAP Task Force meeting, that the 5/15 picocuries per gram (pCi/g) of soil were never intended to allow for unrestricted land use. Attached is a copy of documents that may be helpful as background for this issue. You may wish to distribute these to the Task Force members as a reference document to help explain the standard and their derivation.

Some terms used in these documents deserve a little explanation. First there are three types of "standards" that are mentioned: (1) soil concentration standards (e.g., 5/15 pCi/g); (2) risk standards e.g., 10^{-4} (i.e., 1/10,000) cancer risk; and dose standard (e.g., 10 millirem). Essentially, most environmental standards in the U.S. seek to begin cleanup if risks exceed 10^{-4}, and perform clean up until the risk has been reduced to 10^{-6} (one in a million). All three of these standards can be aligned, depending on what assumptions are made about future land use and exposure. That's where the discussion will likely occur.

Second, I recall that the term "unrestricted use" was used by DOE to refer to something other than the vernacular use of the words. DOE asserted that "unrestricted use" meant that there would be no exposure above 10^{-4} if the soil remains undisturbed – i.e., nobody dug a hole deeper than six inches. I have spoken with DOE's former technical field staff about this interpretation and they were very uncomfortable with this interpretation, he confirmed that that this is how DOE used the terms.

The broader issue may be what level of soil cleanup is appropriate given the reasonably anticipated land use and DOE assurances of long-term stewardship. If "5/15" is not adequately protective to allow for unrestricted land use, then one might ask if there a significantly different land use afforded by a 50 pCi/g standard, which may be provided for at a significantly lower cost, but comparable land use restrictions, as a practical matter. Given that this is a cost to federal government not to the County, the issue of cost may not enter into your deliberations. However, additional funds could be set aside for research into health effects, and community/worker health and exposure monitoring, and for a more robust environmental response system to identify and respond to additional contaminated sites that almost inevitably may arise.

Attached: OSWER Directive and OSWER guidance 9200: 4-25

Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

Signed 2/12/98

Directive no. 9200.4-25

MEMORANDUM

SUBJECT: Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites

FROM: Stephen D. Luftig, Director
Office of Emergency and Remedial Response

Larry Weinstock, Acting Director
Office of Radiation and Indoor Air

TO: Addressees

PURPOSE

This memorandum addresses the use of the soil cleanup criteria in 40 CFR Part 192 when setting remediation goals at CERCLA sites with radioactive contamination. In particular, it clarifies the intent of 40 CFR Part 192 in setting remediation levels for subsurface soil. It does not address the applicability or intent of other standards contained in 40 CFR Part 192, nor does it address setting remediation goals for contaminated media other than soil. This document provides guidance to EPA staff. It also provides guidance to the public and to the regulated community on how EPA intends that the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) be implemented. The guidance is designed to describe EPA's national policy on these issues. The document does not, however, substitute for EPA's statutes or regulations, nor is it a regulation itself. Thus, it cannot impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA may change this guidance in the future, as appropriate.

BACKGROUND

All remedial actions at CERCLA sites must be protective of human health and the environment and comply with applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified. Cleanup levels for response actions under CERCLA are developed based on site-specific risk assessments, ARARs, and/or to-be-considered materials (TBCs). The determination of whether a requirement is applicable, or relevant and appropriate, must be made on a site-specific basis (see 40 CFR Part 300.400(g)).

On January 5, 1983, EPA promulgated in Subpart B of 40 CFR Part 192 (48 FR 590 to 606) *Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites.* These standards were developed pursuant to Section 275 of the Atomic Energy Act (42 U.S.C. 2022), as amended by Section 206 of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. 7918).

These standards were developed specifically for the cleanup of uranium mill tailings at 24 sites designated under Section 102(a)(1) of UMTRCA (Title I sites). The purpose of these standards was to limit the risk from inhalation of radon decay products in houses built on land contaminated with tailings, and to limit gamma radiation exposure of people using contaminated land (see 48 FR 600). The list of 24 Title I sites is a closed set chosen in 1979 that cannot be added to. It includes the so-called "vicinity" sites at which cleanup of specified off-site properties for unrestricted use is authorized.

Subpart B of 40 CFR Part 192 contains two different soil standards. The concentration criterion for surface soil (5 pCi/g of radium-226) is a health-based standard. The relevant source of health risk for surface soil is exposure to gamma radiation, which is the basis for this standard. This basis is noted in the preamble to the final rule (see 48 FR 600) and is discussed in greater detail in the Final Environmental Impact Statement (FEIS) which was conducted as part of the rulemaking process (see the FEIS at pp. 57, 111-112, and 134-137). This standard for a single radioisotope (radium-226) was developed to control the hazard from gamma radiation.

The concentration criterion for subsurface soil in Subpart B (15 pCi/g of radium-226) is not a health-based standard, but rather was developed for use in limited circumstances, explained below, to allow the use of field measurements rather than laboratory analyses to determine when buried tailings had been detected. The basis for this criterion is documented in the materials accompanying the promulgation of Subpart B (see 48 FR 600, the FEIS at pp. 134-137 and D-51 to D-52, and *Findings of an Ad Hoc Technical Group on Cleanup of Open Land Contaminated with Uranium Mill Tailings, EPA, 1981, Docket A-79-25*).

The criterion for subsurface soil was derived as a tool for use in locating and remediating discrete deposits of high activity tailings (typically 300-1,000 pCi/g) in subsurface locations at mill sites or at vicinity properties. The criterion for subsurface soil in Subpart B was originally proposed as 5 pCi/g (46 FR 2562). The criterion in the final rule was changed, not because of a reassessment of the level of contamination that would present a threat to health, but rather in order to reduce the cost to DOE of locating buried tailings; EPA's analysis found that by cleaning up this highly active waste, located using the 15 pCi/g finding tool, DOE would achieve essentially the same degree of cleanup that would result at the Title I sites as originally proposed under the 5 pCi/g criterion (see 48 FR 600 and FEIS p. D-51).

When examining the costs and benefits of alternative standards ranging from 5 to 30 pCi/g, the analysis for the final rulemaking found that the amount of buried tailings to be removed varies only slightly with the limit selected (see 48 FR 600). This indicates that there was expected to be little subsurface contamination ranging from 5 to 30 pCi/g at the Title I sites regulated under this rule. The rule was not developed for situations where significant quantities of contamination exist between 5 and 30 pCi/g. EPA considered significant residual contamination of up to 15 pCi/g of radium-226 to generally be hazardous to build on, but concluded that there would be very little contamination in this range at Title I sites. A concentration of 15 pCi/g was considered likely to occur only in thin layers at the edges of more concentrated deposits that would be cleaned up under a 15 pCi/g criterion (see FEIS p. 136-137). EPA's analysis for the rule determined that a 5 pCi/g, rather than 15 pCi/g, criterion for subsurface soil "would require more skill and training of personnel, and greater use of expensive measuring techniques, but cleanup would only be marginally more complete" (see FEIS p. 136). The 15 pCi/g criterion is therefore only suitable for use, as a cost effective tool to locate and remediate radioactive waste, when most or all subsurface contamination is at a level greater than 30 pCi/g and is not expected to be significantly admixed with clean soil. In this situation, removing all subsurface contamination detected at 15 pCi/g or above will reduce residual contamination to nearly zero.

The 5 pCi/g and 15 pCi/g standards were initially developed for a single radioisotope (radium-226) to control the hazard from radiation. In Subpart E of 40 CFR Part 192 (48 FR 45947) *Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended,* EPA determined that these standards were suitable for remediation of radium-228 at Title II sites (see 48 FR 45944 and the FEIS for *Standards for the*

Control of Byproduct Materials from Uranium or Processing (40 CFR 192) Volume I, Appendix G: Thorium Mill Tailings).

Attainment of the 5 pCi/g and 15 pCi/g UMTRCA standards was intended to signify that a Title I site had been cleaned up to a level suitable for unrestricted use. However, in Subpart C of 40 CFR Part 192, alternative site-specific standards may be established under some special circumstances that allow the selection and performance of remedial actions that come as close as reasonably achievable to meeting the UMTRCA standards. In general, these "supplemental standards" were not expected to be used often. They were designed for situations in which worker safety would be adversely impacted or clearly greater environmental harm would result from the remedial action necessary to attain the standards, for situations in which the materials do not pose a clear present or future hazard and improvements could be achieved only at unreasonably high cost, or where concentrations of other radionuclides are sufficiently high to constitute a significant radiation hazard.

OBJECTIVE

The objective of this memorandum is to provide guidance regarding the circumstances under which the soil cleanup criteria in 40 CFR Part 192 should be considered an ARAR in developing a response action under CERCLA.

IMPLEMENTATION

The following subsections will clarify the use of 40 CFR Part 192 in setting remediation levels for subsurface soil.

UMTRCA as an Applicable Requirement

The standards contained within Subpart B of 40 CFR Part 192 are potentially applicable requirements only for the Title I sites designated under Section 102(a)(1) of UMTRCA. The standards contained within Subparts D and E of 40 CFR Part 192 are potentially applicable requirements only for the Title II sites designated under Section 206 of UMTRCA.

UMTRCA as a Relevant and Appropriate Requirement

If the contaminants at a site are the same (i.e., radium-226, radium-228, and/or thorium) and the distribution of contamination is similar to that existing at Title I sites as described in 40 CFR Part 192 (i.e., little subsurface contamination from 5 to 30 pCi/g), then the 15 pCi/g standard is a potentially relevant and appropriate requirement for the site. As explained above, under these circumstances the 15 pCi/g standard would be expected to achieve an actual subsurface cleanup level of below 5 pCi/g in practice.

If it is determined, either in the course of further study, or even during remedial action, that subsurface contamination exists at a level between 5 pCi/g to 15 pCi/g averaged over areas of 100 square meters (the averaging areas provided for in the Part 192 rules), this indicates that conditions at the site are probably not sufficiently similar to an UMTRCA site to consider the subsurface contamination standard under 40 CFR Part 192 a relevant and appropriate requirement. If such a finding had been made, the ARAR determination should be reconsidered and a cleanup level for the subsurface contamination may have to be established based on a site-specific risk assessment.

For the same reasons, the 15 pCi/g standard should not generally be considered relevant and appropriate as a standard for backfill material. Since EPA's expectation in promulgating Part 192 was that cleanups of subsurface soil contamination would, in practice, achieve a protective level of 5 pCi/g under the circumstances presented at UMTRCA sites, it would not generally be appropriate to allow backfilling with material with concentrations higher than 5 pCi/g.

Where UMTRCA is not an ARAR

If the radioactive contamination at the site is unlike that at the uranium mill tailings sites regulated under 40 CFR 192, in that significant subsurface contamination exists at a level between 5 pCi/g to 30 pCi/g, the use of the 15 pCi/g standard is not generally appropriate.

In this situation, we recommend 5 pCi/g as a suitable cleanup level for subsurface contamination, if a site-specific risk assessment demonstrates that 5 pCi/g is protective 2, on the basis that the preamble to 40 CFR 192 indicates that even with a standard of 15 pCi/g, almost all contamination was expected to be remediated to a level of 5 pCi/g. The level of 5 pCi/g was the actual health-based level that was expected to be achieved when implementing 40 CFR 192.

Where RADIUM-226, RADIUM-228, and/or THORIUM are Commingled

Because the risk from uranium and thorium byproducts is additive, and because the 5 pCi/g and 15 pCi/g standards are based on total acceptable risk, whenever the 5 pCi/g and/or 15 pCi/g standards are used as relevant and appropriate requirements (or TBC's) at CERCLA sites with some combination of radium-226 and radium 228, these soil standards should apply to the combined level of contamination of radium-226 and radium-228.

It should be noted that to meet a permanent clean-up objective for radium -226 and radium-228 of 5 pCi/g, there needs to be reasonable assurance that the preceding radionuclides in the series will not be left behind at levels that will permit the combined radium activity to build-up to levels exceeding 5 pCi/g after completion of the response action. At a minimum, this would generally mean that thorium-230 (the parent of radium-226) and thorium-232 (the parent of radium-228) should be cleaned up to the same concentrations as their radium progeny. Therefore, whenever the 5 pCi/g and/or 15 pCi/g standards are used as relevant and appropriate requirements (or TBC's) at CERCLA sites with some combination of thorium-230 and thorium-232, these soil standards should apply to the combined level of contamination of thorium-230 and thorium-232.

Supplemental Standards

If supplemental standards in 40 CFR Part 192, Subpart C, are used in conjunction with the above standards for the remediation of soil, institutional controls should generally be included as a component of cleanup alternatives in order to ensure the response will be protective over time. The requirement for 5-year reviews (see 40 CFR 300.430(f)(4)(ii)) would apply if the use of supplemental standards were to result in waste being left on-site at levels that would require limited use and restricted exposure to ensure protectiveness.

FURTHER INFORMATION

The subject matter specialists for this directive are Stuart Walker of OERR (703-603-8748) and John Karhnak of ORIA (202-564-9280). General questions about this directive, should be directed to 1-800-424-9346.

Addressees
National Superfund Policy Managers
Superfund Branch Chiefs (Regions I-X)
Superfund Branch Chiefs, Office of Regional Counsel (Regions I-X)
Radiation Program Managers (Regions I, IV, V, VI, VII, X)
Radiation Branch Chief (Region II)
Residential Domain Section Chief (Region III)
Radiation and Indoor Air Program Branch Chief (Region VIII)
Radiation and Indoor Office Director (Region IX)
Federal Facilities Leadership Council
OERR Center Directors

CC:
Jim Woolford, FFRRO
Elizabeth Cotsworth, OSW
Craig Hooks, FFEO
Barry Breen, OSRE
Joanna Gibson, HOSC/OERR
Earl Salo, OGC

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1 To-be-considered material (TBCs) are non-promulgated advisories or guidance issued by Federal or State governments that are not legally binding and do not have the status of potential ARARs. However, TBCs will be considered along with ARARs as part of the site risk assessment and may be used in determining the necessary level of cleanup for protection of health and the environment.

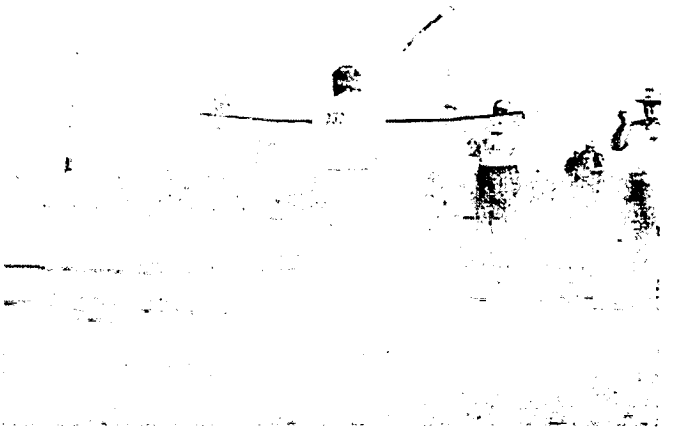
2 For further information regarding protective cleanups at CERCLA sites, see the memo from Stephen Luftig and Larry Weinstock to the Regions; "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (OSWER Directive 9200.4-18), August 22, 1997.

3 For further information regarding protective cleanups at CERCLA sites, see the memo from Stephen Luftig and Larry Weinstock to the Regions; "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (OSWER Directive 9200.4-18), August 22, 1997.

Coccidioidomycosis — Continued

Coccidioidomycosis is diagnosed by culture, histopathology, or serology. Serologic criteria for diagnosis include detection of coccidioidal IgM by immunodiffusion, enzyme immunoassay (EIA), latex agglutination, or tube precipitation, or by detection of rising IgG titers by immunodiffusion, EIA, or complement fixation.

FIGURE 1. Persons attending the world championship of model airplane flying — Lost Hills, California, October 2001



Photographed by: Joe Mekina

Coccidioidomycosis should be considered in the differential diagnosis for persons with a clinically compatible illness and with a history of travel to this event. Persons who attended this event and who acquire symptoms should seek appropriate medical care. Clinical evaluation should include a serum specimen for IgG and IgM titers and appropriate cultures if evidence of disseminated disease exists.

Health-care providers or championship participants and spectators from California are encouraged to contact the California Department of Health Services at 619-692-8664 or knm6@cdc.gov to discuss the need for testing. Other participants, spectators, or health-care providers in the United States or abroad may contact CDC's Mycotic Diseases Branch at 404-639-1299 or tnc4@cdc.gov.

Reported by: A Nicoll, B Evans, N Asgari, S Hahne, E Johnson, Public Health Laboratory Svc, United Kingdom. BA Jinadu, R Talbot, Kern County Dept of Health, Bakersfield; SB Werner, D Vugia, California Dept of Health Svcs. Mycotic Diseases Br, Div of Bacterial and Mycotic Diseases, National Center for Infectious Diseases; and EIS officers, CDC.

References

1. CDC. Coccidioidomycosis in workers at an archeologic site—Dinosaur National Monument, Utah, June–July 2001. MMWR 2001;50:1005–8.
2. Galgiani JN, Ampel NM, Catanzaro A, Johnson RH, Stevens DA, Williams PL. Practice guidelines for the treatment of coccidioidomycosis. Clin Infect Dis 2000;30:659–61.

Cigarette Smoking in 99 Metropolitan Areas — United States, 2000

Geographic variation in the prevalence of cigarette smoking contributes to differences in the mortality patterns of smoking-related diseases such as lung cancer, chronic obstructive lung disease, and coronary heart disease (*1*). National and state-specific data on cigarette smoking are available but may be limited in their usefulness in guiding local or county smoking-related health interventions. CDC's Behavioral Risk Factor Surveillance System (BRFSS) is an annual, state-based survey that includes questions about tobacco use and has sufficiently large samples to permit analyses of risk factor data for many metropolitan statistical areas (MSAs). This report summarizes estimates of smoking behavior for the 99 MSAs with ≥300 respondents (maximum: 7,264) in the 2000

99 Metropolitan Areas — Continued

BRFSS. The prevalence of smoking among the 99 MSAs ranged from 13.0% to 31.2% (median: 22.7%), and the percentage of daily smokers who quit for ≥1 day ranged from 33.0% to 62.2% (median: 50.3%). The findings in this report indicate that BRFSS can provide baseline data for monitoring local programs and a benchmark for comparing data from local surveys.

In 2000, BRFSS was conducted in 50 states, the District of Columbia, and Puerto Rico; randomly selected noninstitutionalized persons aged ≥18 years were interviewed by telephone. The median response rate was 53.2% (range: 35.5%–77.7%) (*2*). BRFSS response rates for MSAs are not available. Estimates are poststratified by age and sex and for some states by race/ethnicity to adjust for nonresponses. MSAs were identified using the standard definitions from the U.S. Bureau of the Census (*3*).

In the 2000 BRFSS, respondents were asked, "Have you smoked at least 100 cigarettes in your entire life?" and "Do you now smoke cigarettes every day, some days, or not at all?" Current smokers were persons who reported having smoked ≥100 cigarettes during their lifetimes and who currently smoked every day or some days. Respondents who smoked every day were asked, "During the past 12 months, have you quit smoking for a day or longer?" Data were weighted to each MSA based on age, sex, and race/ethnicity; 95% confidence intervals for point estimates were calculated using SUDAAN. Statistical significance was determined on the basis of nonoverlapping confidence intervals.

The median adult prevalence of current smoking for the 99 MSAs was 22.7% (range: 13.0%–31.2%) (Table 1). The five MSAs with the highest prevalence of current smoking (Toledo, Ohio; Knoxville, Tennessee; Indianapolis, Indiana; Cleveland-Lorain-Elyria, Ohio; and Huntington-Ashland, West Virginia) differed significantly from the five MSAs with the lowest prevalence (Orange County, California; Salt Lake City-Ogden, Utah; San Diego, California; Miami, Florida; Bergen-Passaic, New Jersey; and Las Cruces, New Mexico) (Table 1). By region, median prevalence was highest in the Midwest (23.7%), followed by the South (23.2%), Northeast (20.8%), and West (20.6%). Prevalence was higher for men than women in 73 of 99 MSAs; the difference by sex was significant in six (Los Angeles, California; Honolulu, Hawaii; Wichita, Kansas; New Orleans, Louisiana; Charlotte, North Carolina; and Dallas, Texas).

Among daily smokers, the median percentage that had quit for ≥1 day during the 12 months preceding the survey was 50.3% (range: 33.0%–62.2%). The two MSAs with the lowest percentage (Charleston, West Virginia, and Toledo, Ohio) differed significantly from the two MSAs with the highest percentage (Fort Worth-Arlington, Texas, and Detroit, Michigan). The percentage was highest in the West (52.1%) followed by the Northeast (51.5%), South (50.4%), and Midwest (49.1%).

Reported by: D Nelson, S Marcus, National Cancer Institute, Bethesda, Maryland. H Wells, G Laird, J Dever, Research Triangle Institute, North Carolina. The following BRFSS coordinators: S Reese, Alabama; P Owen, Alaska; R Weyant, Arizona; B Woodson, Arkansas; B Davis, California; D Brand, Colorado; M Adams, Connecticut; F Breukelman, Delaware; J Davies-Cole, District of Columbia; S Oba, Florida; L Martin, Georgia; F Reyes-Salvail, Hawaii; J Aydelotte, Idaho; B Steiner, Illinois; L Stemnock, Indiana; D Shepard, Iowa; CM Arnold, Kansas; T Sparks, Kentucky; B Bates, Louisiana; J Graber, Maine; H Lopez, Maryland; Z Zhang, Massachusetts; H McGee, Michigan; N Salem, Minnesota; D Johnson, Mississippi; J Jackson, Missouri; P Feigley, Montana; L Andelt, Nebraska; E DeJan, Nevada; J Porter, New Hampshire; G Boeselager, New Jersey; W Honey, New Mexico; C Baker, New York; Z Gizlice, North Carolina; L Shireley, North Dakota; P Coss, Ohio; K Baker, Oklahoma; K Picklo, Orogon; L Mann, Pennsylvania; Y Cintron, Puerto Rico; J Hesser, Rhode Island; M Wu, South Carolina; M Gildemaster, South Dakota; D Ridings, Tennessee; K Condon, Texas; K Marti, Utah; R McCormick, Vermont;

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TABLE 1. Prevalence of current cigarette smoking* among adults, by region, metropolitan statistical area (MSA), sex, and the percentage of daily smokers who quit for ≥1 day during the 12 months preceding the survey — Behavioral Risk Factor Surveillance System, United States, 2000

Region and MSA	Men % (95% CI†)	Women % (95% CI)	Total % (95% CI)	Quit smoking ≥1 day % (95% CI)
Northeast				
Bergen-Passaic	17.5 (± 5.5)	16.9 (± 4.4)	17.2 (±3.5)	56.0 (±12.7)
Boston-Worcester-Lawrence-Lowell-Brockton	21.0 (± 1.8)	19.8 (± 1.4)	20.4 (±1.1)	57.0 (± 3.5)
Burlington	17.4 (± 3.9)	20.0 (± 3.6)	18.7 (±2.7)	51.5 (± 8.5)
Hartford	21.1 (± 4.1)	20.5 (± 3.2)	20.8 (±2.6)	52.6 (± 8.2)
Lewiston-Auburn	25.4 (± 7.3)	27.3 (± 6.6)	26.4 (±4.9)	56.9 (±11.7)
Middlesex-Somerset-Hunterdon	20.8 (± 6.5)	15.9 (± 4.5)	18.3 (±3.9)	45.5 (±14.5)
Monmouth-Ocean	24.1 (± 7.1)	24.5 (± 5.6)	24.3 (±4.5)	57.2 (±12.6)
Nassau-Suffolk	16.4 (± 6.1)	21.0 (± 5.5)	18.7 (±4.1)	45.6 (±13.0)
Newark	22.7 (± 5.3)	19.1 (± 3.9)	20.8 (±3.2)	52.5 (±10.0)
New Haven-Bridgeport-Stamford-Waterbury-Danbury	18.7 (± 3.5)	19.5 (± 2.6)	19.1 (±2.2)	55.4 (± 7.1)
New London-Norwich	26.1 (± 8.2)	21.5 (± 6.9)	23.8 (±5.4)	40.5 (±14.9)
New York	21.7 (± 4.2)	16.9 (± 2.9)	19.1 (±2.5)	52.5 (± 9.0)
Philadelphia	25.7 (± 4.2)	22.0 (± 3.1)	23.7 (±2.6)	48.4 (± 7.1)
Pittsburgh	25.5 (± 6.0)	22.7 (± 4.3)	24.0 (±3.6)	45.1 (± 9.5)
Portland	17.3 (± 6.6)	23.2 (± 6.5)	20.4 (±4.6)	48.6 (±14.7)
Providence-Warwick-Pawtucket	23.3 (± 2.7)	23.4 (± 2.2)	23.3 (±1.7)	48.1 (± 4.8)
Springfield	23.0 (± 5.0)	23.0 (± 4.2)	23.0 (±3.3)	50.6 (± 8.9)
Median	*21.7*	*21.0*	*20.8*	*51.5*
Range	*16.4–26.1*	*15.9–27.3*	*17.2–26.4*	*40.5–57.2*
Midwest				
Akron	27.9 (± 8.2)	24.6 (± 6.4)	26.2 (±5.1)	51.1 (±12.2)
Chicago	22.0 (± 3.0)	20.1 (± 2.5)	21.0 (±2.0)	49.9 (± 6.1)
Cincinnati	21.1 (± 7.4)	21.8 (± 6.3)	21.5 (±4.8)	46.8 (±13.4)
Cleveland-Lorain-Elyria	33.0 (± 9.0)	27.1 (± 7.5)	29.8 (±5.8)	34.8 (±11.9)
Dayton-Springfield	17.8 (± 7.0)	28.1 (± 8.2)	23.2 (±5.6)	56.6 (±15.2)
Des Moines	28.9 (± 7.0)	18.4 (± 4.6)	23.4 (±4.1)	50.0 (±11.1)
Detroit	25.2 (± 4.6)	23.5 (± 4.5)	24.3 (±3.2)	62.0 (± 8.3)
Fargo-Moorhead	23.7 (± 9.1)	21.5 (± 7.1)	22.6 (±6.0)	49.2 (±18.1)
Indianapolis	34.5 (± 5.9)	26.5 (± 5.0)	30.3 (±3.9)	45.8 (± 8.3)
Kansas City	27.9 (± 4.5)	21.8 (± 3.6)	24.7 (±2.8)	49.0 (± 7.5)
Lincoln	20.8 (± 5.4)	18.3 (± 4.8)	19.5 (±3.6)	41.8 (±11.5)
Milwaukee-Waukesha	25.3 (± 6.3)	19.6 (± 4.3)	22.3 (±3.8)	52.0 (±10.6)
Minneapolis-St. Paul	20.4 (± 3.3)	18.6 (± 3.0)	19.5 (±2.2)	43.8 (± 7.0)
Omaha	25.3 (± 4.7)	24.8 (± 4.1)	25.0 (±3.1)	48.9 (± 8.0)
Rapid City	27.5 (± 6.5)	19.9 (± 4.6)	23.6 (±4.0)	49.6 (±10.8)
Sioux Falls	22.4 (± 4.4)	24.9 (± 3.8)	23.7 (±2.9)	48.4 (± 8.1)
St. Louis	29.0 (± 5.9)	22.2 (± 3.9)	25.5 (±3.5)	46.1 (± 8.9)
Toledo	34.3 (±10.4)	28.4 (± 7.5)	31.2 (±6.4)	34.1 (±14.5)
Wichita	28.9 (± 5.8)	17.3 (± 3.7)	22.9 (±3.4)	50.5 (± 9.2)
Youngstown-Warren	29.8 (±12.8)	27.1 (±12.5)	28.3 (±8.9)	53.7 (±19.2)
Median	*26.4*	*22.0*	*23.7*	*49.1*
Range	*17.8–34.5*	*17.3–28.4*	*19.5–31.2*	*34.1–62.0*
South				
Atlanta	23.3 (± 4.7)	18.1 (± 3.2)	20.6 (±2.8)	53.3 (± 8.8)
Austin-San Marcos	29.5 (± 7.9)	16.7 (± 6.1)	23.1 (±5.0)	59.5 (±14.6)

*Persons aged ≥18 years who reported having smoked ≥100 cigarettes during their lifetimes and who currently smoked every day or some days.
† Confidence interval.

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TABLE 1. Prevalence of current cigarette smoking* among adults, by region, metropolitan statistical area (MSA), sex, and the percentage of daily smokers who quit for ≥1 day during the 12 months preceding the survey — Behavioral Risk Factor Surveillance System, United States, 2000 — Continued

Region and MSA	Men		Women		Total		Quit smoking ≥1 day	
	%	(95% CI†)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Baltimore	23.6	(± 3.9)	22.0	(±3.0)	22.8	(±2.5)	52.9	(± 7.0)
Baton Rouge	24.8	(± 6.1)	24.6	(±4.8)	24.7	(±3.8)	52.8	(±10.6)
Birmingham	25.1	(± 7.1)	18.4	(±4.9)	21.5	(±4.3)	58.4	(±12.8)
Charleston-North Charleston, SC	30.4	(± 7.4)	20.5	(±5.3)	25.4	(±4.6)	51.1	(±12.1)
Charleston, WV	27.8	(± 8.9)	26.6	(±6.8)	27.1	(±5.6)	33.0	(±11.5)
Charlotte-Gastonia-Rock Hill	28.2	(± 6.6)	16.8	(±4.7)	22.3	(±4.0)	56.6	(±11.4)
Columbia	22.6	(± 6.5)	20.6	(±5.1)	21.5	(±4.1)	50.8	(±12.6)
Dallas	24.2	(± 5.2)	14.5	(±3.3)	19.3	(±3.1)	51.4	(± 9.9)
District of Columbia	20.1	(± 3.0)	15.6	(±2.1)	17.8	(±1.8)	52.4	(± 6.2)
Dover	30.3	(± 5.3)	22.1	(±3.8)	26.1	(±3.3)	48.0	(± 7.9)
Fayetteville-Springdale-Rogers	22.3	(± 7.8)	25.4	(±7.6)	23.9	(±5.5)	40.4	(±16.1)
Fort Lauderdale	20.8	(± 6.4)	22.6	(±6.0)	21.7	(±4.4)	46.9	(±13.5)
Fort Worth-Arlington	27.3	(± 7.6)	19.6	(±5.5)	23.4	(±4.7)	62.2	(±13.0)
Greensboro-Winston-Salem-High Point	32.4	(± 7.9)	26.4	(±6.1)	29.2	(±5.0)	45.7	(±11.5)
Greenville-Spartanburg-Anderson	23.3	(± 6.4)	23.8	(±4.6)	23.6	(±3.9)	45.4	(±11.2)
Houston	23.9	(± 5.4)	18.1	(±3.7)	21.0	(±3.3)	51.8	(±10.3)
Huntington-Ashland	31.9	(±14.6)	27.9	(±8.3)	29.8	(±8.2)	42.3	(±18.9)
Jackson	17.2	(± 7.8)	23.8	(±6.7)	20.7	(±5.1)	—§	
Jacksonville	19.8	(± 5.9)	21.0	(±5.0)	20.4	(±3.9)	50.4	(±11.4)
Knoxville	31.6	(± 9.4)	29.4	(±6.9)	30.5	(±5.7)	47.9	(±12.2)
Lafayette	27.3	(± 8.0)	21.8	(±5.7)	24.4	(±4.8)	49.3	(±13.6)
Lexington	29.2	(± 8.5)	23.9	(±6.4)	26.4	(±5.2)	56.4	(±12.4)
Little Rock-North Little Rock	25.3	(± 5.7)	21.4	(±4.6)	23.3	(±3.6)	44.4	(± 9.8)
Louisville	27.4	(± 6.9)	27.6	(±5.5)	27.5	(±4.4)	49.8	(± 9.9)
Memphis	20.6	(± 6.7)	17.9	(±4.9)	19.2	(±4.1)	50.5	(±14.0)
Miami	17.6	(± 5.2)	15.6	(±4.1)	16.6	(±3.3)	57.8	(±13.5)
Nashville	26.9	(± 6.8)	23.7	(±4.6)	25.3	(±4.0)	40.3	(±10.4)
New Orleans	26.3	(± 4.3)	17.4	(±2.9)	21.6	(±2.5)	57.7	(± 7.3)
Norfolk-Virginia Beach-Newport News	29.2	(± 8.3)	23.8	(±6.0)	26.4	(±5.1)	40.0	(±12.3)
Oklahoma City	23.1	(± 4.1)	22.7	(±3.7)	22.9	(±2.7)	46.3	(± 7.6)
Orlando	24.0	(± 7.6)	26.0	(±5.9)	25.0	(±4.8)	42.7	(±11.9)
Raleigh-Durham-Chapel Hill	18.2	(± 6.5)	21.2	(±5.9)	19.8	(±4.4)	59.3	(±13.3)
San Antonio	21.2	(± 8.0)	21.1	(±6.4)	21.2	(±5.1)	—	
Shreveport-Bossier City	26.4	(± 6.8)	25.9	(±5.7)	26.1	(±4.4)	51.1	(±11.3)
Tampa-St. Petersburg-Clearwater	28.4	(± 5.9)	24.2	(±4.7)	26.2	(±3.8)	49.7	(± 9.7)
Tulsa	25.5	(± 5.0)	22.3	(±4.4)	23.8	(±3.3)	48.2	(± 8.4)
West Palm Beach-Boca Raton	25.8	(± 9.0)	17.8	(±5.9)	21.6	(±5.3)	53.6	(±16.5)
Wilmington-Newark	24.0	(± 4.6)	20.0	(±3.4)	21.9	(±2.8)	49.6	(± 8.2)
Median	*25.2*		*21.9*		*23.2*		*50.4*	
Range	*17.2–32.4*		*14.5–29.4*		*16.6–30.5*		*33.0–62.2*	
West								
Albuquerque	25.0	(± 4.3)	22.7	(±3.6)	23.8	(±2.8)	51.9	(± 8.0)
Boise City	22.7	(± 4.4)	24.2	(±3.8)	23.5	(±2.9)	49.7	(± 8.1)
Casper	33.4	(± 9.4)	25.4	(±6.4)	29.2	(±5.6)	52.2	(±12.3)
Cheyenne	25.8	(± 7.1)	31.3	(±7.0)	28.6	(±5.0)	44.2	(±11.9)
Denver	18.1	(± 4.3)	19.7	(±3.8)	18.9	(±2.9)	56.3	(± 9.3)
Eugene-Springfield	25.7	(± 8.5)	18.3	(±7.5)	21.9	(±5.6)	—	

*Persons aged ≥18 years who reported having smoked ≥100 cigarettes during their lifetimes and who currently smoked every day or some days.
† Confidence interval.
§ Insufficient data.

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TABLE 1. Prevalence of current cigarette smoking* among adults, by region, metropolitan statistical area (MSA), sex, and the percentage of daily smokers who quit for ≥1 day during the 12 months preceding the survey — Behavioral Risk Factor Surveillance System, United States, 2000 — Continued

Region and MSA	Men % (95% CI†)	Women % (95% CI)	Total % (95% CI)	Quit smoking ≥1 day % (95% CI)
Honolulu	22.9 (± 2.9)	15.5 (±2.2)	**19.3 (±1.8)**	57.7 (± 6.0)
Las Cruces	17.6 (± 6.6)	16.9 (±6.5)	**17.2 (±4.6)**	—§
Las Vegas	30.3 (± 4.6)	29.2 (±5.3)	**29.7 (±3.6)**	40.9 (± 8.2)
Los Angeles-Long Beach	22.4 (± 4.7)	13.8 (±3.2)	**18.1 (±2.9)**	55.7 (±10.1)
Orange County	13.8 (± 6.7)	12.3 (±4.9)	**13.0 (±4.2)**	—
Phoenix-Mesa	15.6 (± 5.4)	19.2 (±7.2)	**17.4 (±4.6)**	57.9 (±14.2)
Pocatello	16.9 (± 6.3)	24.5 (±6.7)	**20.8 (±4.6)**	52.0 (±14.1)
Portland-Vancouver	19.0 (± 3.2)	18.7 (±2.7)	**18.8 (±2.1)**	52.8 (± 7.1)
Reno	27.0 (± 5.9)	27.2 (±5.5)	**27.1 (±4.0)**	49.7 (± 9.5)
Riverside-San Bernardino	22.6 (± 9.6)	18.7 (±5.8)	**20.6 (±5.6)**	50.2 (±18.3)
Salem	26.4 (± 8.1)	16.5 (±5.1)	**21.3 (±4.7)**	54.8 (±14.5)
Salt Lake City-Ogden	16.2 (± 3.5)	13.2 (±3.0)	**14.7 (±2.3)**	52.9 (±10.1)
San Diego	17.6 (± 8.6)	12.8 (±5.1)	**15.2 (±5.1)**	—
Santa Fe	22.4 (± 7.9)	20.4 (±8.0)	**21.4 (±5.6)**	—
Seattle-Bellevue-Everett	20.1 (± 3.6)	19.4 (±3.0)	**19.8 (±2.3)**	48.1 (± 7.8)
Tucson	18.2 (± 5.1)	21.0 (±8.7)	**19.6 (±5.2)**	40.2 (±16.5)
Tacoma	22.9 (± 6.8)	22.0 (±6.2)	**22.4 (±4.6)**	56.7 (±12.8)
Median	*22.4*	*19.4*	*20.6*	*52.1*
Range	*13.8–33.4*	*12.3–31.3*	*13.0–29.7*	*40.2–57.9*
National median	**24.0**	**21.4**	**22.7**	**50.3**
Range	**13.8–34.5**	**12.3–31.3**	**13.0–31.2**	**33.0–62.2**

* Persons aged ≥18 years who reported having smoked ≥100 cigarettes during their lifetimes and who currently smoked every day or some days.
† Confidence interval.
§ Insufficient data.

G Seifen, Virginia; K Wynkoop-Simmons, Washington; F King, West Virginia; K Pearson, Wisconsin; M Futa, Wyoming. Behavioral Surveillance Br, Div of Adult and Community Health; and Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, CDC.

Editorial Note: This is the first report using consistent methodology to examine variations in smoking prevalence across U.S. MSAs. The findings demonstrated an approximately twofold difference, with the lowest prevalence for MSAs in California and Utah and the highest for MSAs in Ohio, Indiana, and Tennessee. Only three (Orange County and San Diego, California, and Salt Lake City, Utah) of the 99 MSAs met the national health objective for 2000 of ≤15% for prevalence of current smoking (objective 3.4) (*4*). The proportion of smokers who quit for ≥1day also varied substantially across communities and was highest in the West and lowest in the Midwest. The proportion of smokers who quit for ≥1 day during the 12 months preceding the survey is an indicator of success in cessation initiatives and may reflect implementation of programs or policies at the individual, health-care provider, or community level (e.g., although clean indoor air policies are in place nationwide, their implementation varies substantially across the country and may account for some of the variation observed) (*5*).

The findings in this report are subject to at least five limitations. First, although the median response was relatively low, BRFSS estimates are similar to estimates from other surveys with higher response rates such as the National Health Interview Survey (NHIS) (*6*). Nationwide smoking estimates from BRFSS and NHIS for 1997 were 23.1%

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and 24.7%, respectively. BRFSS and NHIS estimates for smoking among population subgroups differed by 0.4% to 4.1% (E. Powell-Griner, Ph.D., CDC, personal communication, August 2001). Second, the data are self-reported. Third, institutionalized persons or persons residing in households without a telephone were not eligible for interviews. Fourth, the precision of estimates varied across MSAs because of different sample sizes. Finally, smoking estimates may differ markedly within an MSA (e.g., between inner cities and suburbs).

To control the use of tobacco requires an approach that includes successful activities such as increases in the cigarette excise tax, mass media education, counteradvertising, comprehensive school-based programs, policies on clean indoor air, telephone quit lines, reducing out-of-pocket costs for cessation services and products, and increasing cessation interventions in the health-care setting (*5,7*). Many communities have instituted local tobacco-control programs that have reduced the availability of tobacco products, lowered exposure to environmental tobacco smoke, and increased cessation activities (*5*). In California, state-based programs with a strong community focus have contributed to reductions in tobacco-related mortality (*8*).

The National Association of County and City Health Officials (NACCHO) has published *Program and Funding Guidelines for Comprehensive Local Tobacco Prevention and Control Program* (*9*). With funds from state tobacco programs, routine and consistent tracking of smoking prevalence within MSAs can provide the tools to assess the impact of tobacco-control activities. States and local areas should implement aggressive and comprehensive programs at the community level that follow the NACCHO guidelines and recommendations from the CDC *Best Practices for Comprehensive Tobacco Control Programs* (*10*), *Reducing Tobacco Use: A Report of the Surgeon General* (*5*), and *The Guide to Community Preventive Services: Tobacco Use Prevention and Control* (*7*). Effective local tobacco control will be essential for reaching the 2010 national adult smoking prevalence goal of <12%.

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Progress Toward Poliomyelitis Eradication — Eastern Mediterranean Region, January 2000–September 2001

The World Health Assembly resolved to eradicate poliomyelitis in 1988, and the goal of the regional committee for the Eastern Mediterranean Region (EMR)* of the World Health Organization (WHO) was to eradicate polio from that region by 2000. This report summarizes EMR polio eradication activity during January 2000–September 2001; poliovirus transmission has been interrupted in 18 of the 23 EMR countries and has become localized in the remaining five. Despite these achievements, the countries of EMR must overcome many challenges to interrupt virus transmission by the end of 2002.

During 2000, 79% of infants received 3 doses of oral poliovirus vaccine (OPV) through routine vaccination. Coverage of <80% was reported from Afghanistan (32%), Djibouti (46%), Pakistan (74%), Somalia (18%, northern regions only), Sudan (65%), and Yemen (76%). These countries represent approximately half the regional population (estimated 2000 population: 488 million)†.

During 1999–mid-2001, supplemental vaccination activities were conducted in all EMR countries except Cyprus, Oman, and the United Arab Emirates. Intensified activities were conducted in countries where polio is endemic. Four national immunization days (NIDs)§ and subnational campaigns took place in Egypt, Iraq, and Sudan (including warring sections of southern Sudan). Afghanistan and Pakistan conducted four rounds of intensified NIDs, and Somalia conducted subnational campaigns and three rounds of NIDs. By the end of 2001, each of the six countries (Afghanistan, Egypt, Iraq, Pakistan, Somalia, and Sudan) will have conducted four to five NID rounds, subnational, or mopping-up (i.e., local mass campaigns in high-risk areas) campaigns. Some polio-free countries have reduced the scope of activities from national to subnational, targeting low vaccination coverage provinces or areas at high risk for poliovirus importation. Coordination and synchronization of NIDs within EMR countries and among its neighbors have been highly successful.

All EMR countries have established acute flaccid paralysis (AFP) surveillance and have implemented surveillance in countries affected by war and in areas with rudimentary or nearly nonexistent health-care services (e.g., Afghanistan, Somalia, and southern Sudan). During 2000, a total of 16 countries (Afghanistan, Bahrain, Egypt, Iran, Iraq,

*Djibouti, Egypt, Libya, Morocco, Somalia, Sudan, and Tunisia in northern and eastern Africa; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen in the Arabian peninsula; Cyrus, Iraq, Jordan, Lebanon, Syria, and the Palestinian National Authority in the Middle East; Afghanistan and Iran.

† U.S. Bureau of the Census.

§ Mass campaigns over a short period (days) in which 2 doses of OPV are administered to all children in the target age group (usually aged <5 years) regardless of vaccination history with an interval of 4–6 weeks between doses.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 22 1997

OSWER No. 9200.4-18

MEMORANDUM

SUBJECT: Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination

FROM: Stephen D. Luftig, Director
Office of Emergency and Remedial Response

Larry Weinstock, Acting Director
Office of Radiation and Indoor Air

TO: Addressees

PURPOSE

This memorandum presents clarifying guidance for establishing protective cleanup levels[1] for radioactive contamination at Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) sites. The policies stated in this memorandum are inclusive of all radioactive contaminants of concern at a site including radon.[2] The directive is limited to providing guidance regarding the protection of human health and does not address levels necessary to protect ecological receptors.

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[1]This directive provides guidance on cleanup levels expressed as a risk, exposure, or dose level and not as a soil concentration level. The concentration level for various media, such as soil, that corresponds to a given risk level should be determined on a site-specific basis, based on factors such as the assumed land use and the physical characteristics (e.g., important surface features, soils, geology, hydro geology, meteorology, and ecology) at the site. This guidance does not alter the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) expectations regarding treatment of principal threat waste and the use of containment and institutional controls for low level threat waste.

[2]Since radon is not covered in some Federal radiation regulations it is important to note that the cleanup guidance clarifications in this memorandum include radon. Attachment A is a listing of standards for radionuclides (including radon) that may be applicable or relevant and appropriate requirements (ARARs) for Superfund sites.

This document provides guidance to EPA staff. It also provides guidance to the public and to the regulated community on how EPA intends that the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) be implemented. The guidance is designed to describe EPA's national policy on these issues. The document does not, however, substitute for EPA's statutes or regulations, nor is it a regulation itself. Thus, it cannot impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA may change this guidance in the future, as appropriate.

BACKGROUND

All remedial actions at CERCLA sites must be protective of human health and the environment and comply with Applicable or Relevant and Appropriate Requirements (ARARs) unless a waiver is justified. Cleanup levels for response actions under CERCLA are developed based on site-specific risk assessments, ARARs, and/or to-be-considered material[3] (TBCs).

A listing is attached of radiation standards that are likely to be used as ARARs to establish cleanup levels or to conduct remedial actions. Cleanup standards have been under development by EPA under the Atomic Energy Act (AEA) and will be ARARs under certain circumstances if issued.

ARARs are often the determining factor in establishing cleanup levels at CERCLA sites. However, where ARARs are not available or are not sufficiently protective, EPA generally sets site-specific remediation levels for: 1) carcinogens at a level that represents an excess upper bound lifetime cancer risk to an individual of between 10^{-4} to 10^{-6}; and for 2) non-carcinogens such that the cumulative risks from exposure will not result in adverse effects to human populations (including sensitive sub-populations) that may be exposed during a lifetime or part of a lifetime, incorporating an adequate margin of safety. (See 40 CFR 300.430(e)(2)(i)(A)(2).) Since all radionuclides are carcinogens, this guidance addresses carcinogenic risk. If non-carcinogenic risks are posed by specific radionuclides, those risks should be taken into account in establishing cleanup levels or suitable remedial actions. The site-specific level of cleanup is determined using the nine criteria specified in Section 300.430(e)(9)(iii) of the NCP.

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[3]To-be-considered material (TBCs) are non-promulgated advisories or guidance issued by Federal or State governments that are not legally binding and do not have the status of potential ARARs. However, TBCs will be considered along with ARARs as part of the site risk assessment and may be used in determining the necessary level of cleanup for protection of health and the environment.

It is important to note that a new potential ARAR was recently promulgated : NRC's Radiological Criteria for License Termination (See 62 FR 39058, July 21, 1997). We expect that NRC's implementation of the rule for License Termination (decommissioning rule) will result in cleanups within the Superfund risk range at the vast majority of NRC sites. However, EPA has determined that the dose limits established in this rule as promulgated generally will not provide a protective basis for establishing preliminary remediation goals (PRGs) under CERCLA.[4] The NRC rule set an allowable cleanup level of 25 millirem per year (equivalent to approximately 5×10^{-4} increased lifetime risk) as the primary standard with exemptions allowing dose limits of up to 100 millirem per year (equivalent to approximately 2×10^{-3} increased lifetime risk). Accordingly, while the NRC rule standard must be met (or waived) at sites where it is applicable or relevant and appropriate, cleanups at these sites will typically have to be more stringent than required by the NRC dose limits in order to meet the CERCLA and NCP requirement to be protective.[5] Guidance that provides for cleanups outside the risk range (in general, cleanup levels exceeding 15 millirem per year which equates to approximately 3×10^{-4} increased lifetime risk) is similarly not protective under CERCLA and generally should not be used to establish cleanup levels.

The lack of a protective comprehensive set of regulatory cleanup levels for radiation, together with the possibility of confusion as to the status of other Federal Agency regulations and guidance as ARARs or TBCs, may cause uncertainty as to the cleanup levels deemed protective under CERCLA. Until a protective comprehensive radiation cleanup rule is available, this guidance clarifies the Agency's position on CERCLA cleanup levels for radiation.

OBJECTIVE

This guidance clarifies that cleanups of radionuclides are governed by the risk range for all carcinogens established in the NCP when ARARs are not available or are not sufficiently protective. This is to say, such cleanups should generally achieve risk levels in the 10^{-4} to 10^{-6} range. EPA has a consistent methodology for assessing cancer risks and determining PRGs at CERCLA sites no matter the type of contamination.[6]

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[4]See letter, Carol Browner, Administrator, EPA, to Shirley Jackson, Chairman, Nuclear Regulatory Commission, February 7, 1997.

[5]See attachment B for a detailed discussion of the basis for the conclusion that the dose limits in the NRC rule are not adequately protective.

[6]U.S. EPA, "Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final," EPA//540/1-89/002, December 1989. U.S. EPA, "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals", EPA/540/R-92/003, December 1991.

Cancer risks for radionuclides should generally be estimated using the slope factor approach identified in this methodology. Slope factors were developed by EPA for more than 300 radionuclides in the *Health Effects Assessment Summary Tables* (HEAST).[7] Cleanup levels for radioactive contamination at CERCLA sites should be established as they would for any chemical that poses an unacceptable risk and the risks should be characterized in standard Agency risk language consistent with CERCLA guidance.

Historically, radiation exposure and cleanup levels have often been expressed in units unique to radiation (e.g., millirem or picoCuries). It is important for the purposes of clarity that a consistent set of existing risk-based units (i.e., # $x10^{-\#}$) for cleanups generally be used. This will also allow for ease and clarity of presenting cumulative risk for all contaminants, an objective consistent with EPA's policy on risk characterization.[8]

Cancer risk from both radiological and non-radiological contaminants should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants. Although these risks initially may be tabulated separately, risk estimates contained in proposed and final site decision documents (e.g., proposed plans, Record of Decisions (RODs), Action Memos, ROD Amendments, Explanation of Significant Differences (ESDs)) should be summed to provide an estimate of the combined risk to individuals presented by **all** carcinogenic contaminants.

IMPLEMENTATION

The approach in this guidance should be considered at current and future CERCLA sites for which response decisions have not been made.

Overall Exposure Limit:

Cleanup should generally achieve a level of risk within the 10^{-4} to 10^{-6} carcinogenic risk range based on the reasonable maximum exposure for an individual. The cleanup levels to be specified include exposures from all potential pathways, and through all media (e.g., soil, ground water, surface water, sediment, air, structures,

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[7]U.S. EPA, "Health Effects Assessment Summary Tables FY-1995 Annual," EPA/540/R-95/036, May 1995; and U.S. EPA, "Health Effects Assessment Summary Tables FY-1995 Supplement," EPA/540/R-95/142, Nov. 1995.

[8]For further discussion of EPA's policy, see memorandum from EPA Administrator Carol Browner entitled: "EPA Risk Characterization Program," March 21, 1995.

biota). As noted in previous policy, "the upper boundary of the risk range is not a discrete line at 1 x 10^{-4}, although EPA generally uses 1 x 10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions".[9]

If a dose assessment is conducted at the site[10] then 15 millirem per year (mrem/yr) effective dose equivalent (EDE) should generally be the maximum dose limit for humans. This level equates to approximately 3 x 10^{-4} increased lifetime risk and is consistent with levels generally considered protective in other governmental actions, particularly regulations and guidance developed by EPA in other radiation control programs.[11]

Background Contamination:

Background radiation levels will generally be determined as background levels are determined for other contaminants, on a site-specific basis. In some cases, the same constituents are found in on-site samples as well as in background samples. The levels of each constituent are compared to background to determine its impact, if any, on site-related activities. Background is generally measured only for those radionuclides that are contaminants of concern and is compared on a contaminant specific basis to cleanup level. For example, background levels for radium-226 and radon-222 would generally not be evaluated at a site if those radionuclides were not site-related contaminants.

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[9]Memo from Assistant Administrator Don Clay to the Regions; "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions'" OSWER Directive 9355.0-30; April 22, 1991.

[10]Cleanup levels not based on ARARs should be expressed as risk, although levels may at the same time be expressed in millirem.

[11]Further discussion and analysis of the basis for this recommendation is contained in the materials in the docket for the AEA standard under development by EPA, which is available at the following address: U.S. EPA, 401 M Street, S.W., Room M1500, Air Docket No. A-93-27, Washington D.C. 20460. The material is also available via computer modem through the Cleanup Regulation Electronic Bulletin Board (800-700-7837 outside the Washington area and 703-790-0825 locally), or on-line through the Radiation Site Cleanup Regulation HomePage (http://www.epa.gov/radiation/cleanup/). Cleanup levels based on some older ARARs that use a 25/75/25 mrem/yr standard (i.e., 25 mrem/yr to the whole body, 75 mrem/yr to the thyroid, and 25 mrem/yr to any other critical organ) may appear to permit greater risk than those based on 15 mrem EDE but on average correspond to approximately 10 mrem/yr EDE, using current risk methodologies. Similarly, ARARs based on a 25/75 mrem/yr standard used as an ARAR (i.e., 25 mrem/yr to whole body and 75 mrem/yr to any critical organ) would on average correspond to those cleanups based on 15 mrem/yr EDE. (See also "Comparison of Critical Organ and EDE Radiation Dose Rate Limits for Situations Involving Contaminated Land;" Office of Radiation and Indoor Air, April 1997.) See also Attachment B.

In certain situations background levels of a site-related contaminant may equal or exceed PRGs established for a site. In these situations background and site-related levels of radiation will be addressed as they are for other contaminants at CERCLA sites.[12]

Land Use and Institutional Controls:

The concentration levels for various media that correspond to the acceptable risk level established for cleanup will depend in part on land use at the site. Land uses that will be available following completion of a response action are determined as part of the remedy selection process considering the reasonably anticipated land use or uses along with other factors.[13] Institutional controls (ICs) generally should be included as a component of cleanup alternatives that would require restricted land use in order to ensure the response will be protective over time. The institutional controls should prevent an unanticipated change in land use that could result in unacceptable exposures to residual contamination, or at a minimum, alert future users to the residual risks and monitor for any changes in use.

Future Changes in Land Use:

Where waste is left on-site at levels that would require limited use and restricted exposure to ensure protectiveness, EPA will conduct reviews at least once every five years to monitor the site for any changes including changes in land use. Such reviews should analyze the implementation and effectiveness of any ICs with the same degree of care as other parts of the remedy. Should land use change in spite of land use

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[12]For further information regarding EPA's approach for addressing background at CERCLA sites see: National Oil and Hazardous Substances Pollution Contingency Plan, 55 FR 8717-8718, March 8, 1990; U.S. EPA "Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites," EPA/540/G-88/003, December 1988, pg. 4-9; U.S. EPA "Soil Screening Guidance: User's Guide," EPA/540/R-96/018, April 1996, pg. 8; and U.S. EPA "Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)," EPA/540/1-89/02, December 1989, pp. 4-5 to 4-10 and 5-18 to 5-19. It should be noted that certain ARARs specifically address how to factor background into cleanup levels. For example, some radiation ARAR levels are established as increments above background concentrations. (See attached chart for a listing of radiation standards that are likely to be used as ARARs.) In these circumstances, rather then follow the general guidance cited above, background should be addressed in the manner prescribed by the ARAR ARARs, such as 40 CFR 192, are available to establish cleanup levels for those naturally occurring radionuclides that pose the most risk (such as radium-226 or Thorium in soil, and indoor radon) when those radionuclides are site related contaminants.

[13]In developing Land use assumptions, decision makers should consult the guidance provided in the memorandum from Elliott Laws A.A., OSWER entitled: "Land Use in the CERCLA Remedy Selection Process" (OSWER Directive No. 9355.7-04), May 25, 1995.

restrictions, it will be necessary to evaluate the implications of that change for the selected remedy, and whether the remedy remains protective (e.g., a greater volume of soil may need to be removed or managed to achieve an acceptable level of risk for a less restrictive land use).

Ground Water Levels:

Consistent with CERCLA and the NCP, response actions for contaminated ground water at radiation sites must attain (or waive as appropriate) the Maximum Contaminant Levels (MCLs) or non-zero Maximum Contaminant Level Goals (MCLGs) established under the Safe Drinking Water Act, where the MCLs or MCLGs are relevant and appropriate for the site. This will typically be the case where ground waters are a current or potential source of drinking water.[14] The ARARs should generally be attained throughout the plume (i.e., in the aquifer).

Modeling Assessment of Future Exposures:

Risk levels, ground water cleanup, and dose limits should be predicted using appropriate models to examine the estimated future threats posed by residual radioactive material following the completion of the response action.[15] The modeling assessment should: (1) assume that the current physical characteristics (e.g., important surface features, soils, geology, hydrogeology, meteorology, and ecology) will continue to exist at the site; (2) take into account for each particular radionuclide that is a site-related contaminant, the following factors:

- radioactive decay and the ingrowth of radioactive decay products when assessing risk levels;
- the year of peak concentration in the ground water when assessing protection (e.g., remediating previous contamination and preventing future contamination) of ground water, and;
- the year of peak dose when assessing dose limits; and,

(3) model the expected movement of radioactive material at the site both within media (i.e., soil, ground water, surface water, sediment, structures, air, biota) and to other media.

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[14]In making decisions on ground water protection, decision makers should consult the guidance provided in "Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites" (OSWER Directive No. 9355.7-04) October 1996.

[15]For further information regarding the basis for this recommendation, see U.S. EPA, "Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final," EPA//540/1-89/002, December 1989, pp. 10-22 and 10-24.

FURTHER INFORMATION

The subject matter specialists for this directive are Jeffrey Phillips of OERR and John Karhnak of ORIA. General questions about this directive, should be directed to 1-800-424-9346.

Attachments

Addressees

National Superfund Policy Managers
Superfund Branch Chiefs (Regions I-X)
Superfund Branch Chiefs, Office of Regional Counsel (Regions I-X)
Radiation Program Managers (Regions I, IV, V, VI, VII, X)
Radiation Branch Chief (Region II)
Residential Domain Section Chief (Region III)
Radiation and Indoor Air Program Branch Chief (Region VIII)
Radiation and Indoor Office Director (Region IX)
Federal Facilities Leadership Council
OERR Center Directors

CC:

Jim Woolford, FFRRO
Elizabeth Cotsworth, OSW
Craig Hooks, FFEO
Barry Breen, OSRE
Joanna Gibson, HOSC/OERR
Earl Salo, OGC

Attachment A:

Likely Federal Radiation Applicable or Relevant and Appropriate Requirements (ARARs)

The attached draft table of Federal standards is a listing of Federal radiation regulations that may be "Applicable or Relevant and Appropriate Requirements" (ARARs) for Superfund response actions. This list is not a comprehensive list of Federal radiation standards. It must also be cautioned that the selection of ARARs is site-specific and those site-specific determinations may differ from the attached analysis for some of the following ARARs.

Likely Federal Radiation (AEA, UMTRCA, CAA, CWA, SDWA) ARARs			
Standard	**Citation**	**When is standard Applicable (Conduct/Operation or Level of Cleanup[1])**	**When is standard potentially a Relevant and Appropriate Requirement**
Maximum contaminant levels (MCLs). Drinking water regulations designed to protect human health from the potential adverse effects of drinking water contaminants.	40 CFR 141	*Rarely:* At the tap where water will be provided directly to 25 or more people or will be supplied to 15 or more service connections.	Where ground or surface water is considered a potential or current source of drinking water
Concentration limits for liquid effluents from facilities that extract and process uranium, radium, and vanadium ores.	40 CFR 440 Subpart C	*Very Unlikely:* Applies to surface water discharges from certain kinds of mines and mills	Discharges to surface waters of some kinds of radioactive waste.

Likely Federal Radiation (AEA, UMTRCA, CAA, CWA, SDWA) ARARs			
Standard	**Citation**	**When is standard Applicable (Conduct/Operation or Level of Cleanup[1])**	**When is standard potentially a Relevant and Appropriate Requirement**
Federal Water Quality Criteria (FWQC) and State Water Quality Standards (WQS). Criteria/standards for protection of aquatic life and/or human health depending upon the designated water use.	Water Quality Criteria; Report of the National Technical Advisory Committee to the Secretary of the Interior; April 1, 1968.	Discharge from a CERCLA site to surface water. (C/O)	Restoration of contaminated surface water. (LC)
Concentration limits for cleanup of radium-226, radium-228, and thorium in soil at inactive uranium processing sites designated for remedial action.[2]	40 CFR 192.12(a), 192.32(b)(2), and 192.41	*Never*: Standards are applicable only to UMTRCA sites that are exempt from CERCLA	Sites with soil contaminated with radium-226, radium-228, and/or thorium

[2]For further information, see OSWER directive entitled "Use of Soil Cleanup Criteria in Subpart B of 40 CFR Part 192 as Remediation Goals for CERCLA sites."

Likely Federal Radiation (AEA, UMTRCA, CAA, CWA, SDWA) ARARs			
Standard	**Citation**	**When is standard Applicable (Conduct/Operation or Level of Cleanup[1])**	**When is standard potentially a Relevant and Appropriate Requirement**
Combined exposure limits for cleanup of radon decay products in buildings at inactive uranium processing sites designated for remedial action	40 CFR 192.12(b)(1) and 192.41(b)	*Never*: Standards are applicable only to UMTRCA sites that are exempt from CERCLA	Sites with radioactive contamination that is currently, or may potentially, result in radon that is caused by site related contamination migrating from the soil into buildings
Concentration limits for cleanup of gamma radiation in buildings at inactive uranium processing sites designated for remedial action	40 CFR 192.12(b)(2)	*Never*: Standards are applicable only to UMTRCA sites that are exempt from CERCLA	Sites with radioactive contamination that is currently, or may potentially, emit gamma radiation
Design requirements for remedial actions that involve disposal for controlling combined releases of radon-220 and radon-222 to the atmosphere at inactive uranium processing sites designated for remedial action	40 CFR 192.02	*Never*: Standards are applicable only to UMTRCA sites that are exempt from CERCLA	Sites with radon-220 or radon-222 as contaminants which will be disposed of on-site.

Likely Federal Radiation (AEA, UMTRCA, CAA, CWA, SDWA) ARARs			
Standard	**Citation**	**When is standard Applicable (Conduct/Operation or Level of Cleanup[1])**	**When is standard potentially a Relevant and Appropriate Requirement**
Performance objectives for the land disposal of low level radioactive waste (LLW).	10 CFR 61.41	*Unlikely:* Existing licensed LLW disposal sites at the time of license renewal. (LC) *Unlikely that this would occur.*	Previously closed sites containing LLW if the waste will be permanently left on site.
National Emission Standards for Hazardous Air Pollutants (NESHAPs) under the Clean Air Act, that apply to radionuclides.	40 CFR 61 Subparts H and I	Airborne emissions during the cleanup of Federal Facilities and licensed NRC facilities. (CO)	Cleanup of other sites with radioactive contamination.
Radiological criteria for license termination.	10 CFR 20 Subpart E	Existing licensed sites at the time of license termination. (LC)	Previously closed sites.

1.Conduct/operation (C/O) refers to those standards which are typically ARARs for the conduct or operation of the remedial action. Level of Cleanup (L/C) refers to those standards which are typically ARARs for determining the final level of cleanup.

August 20, 1997

Attachment B:

Analysis of what Radiation Dose Limit is Protective of Human Health at CERCLA Sites (Including Review of Dose Limits in NRC Decommissioning Rule)

Introduction

The Nuclear Regulatory Commission ("NRC") has finalized a rule titled "Radiological Criteria for License Termination" (see 62 FR 39058, July 21, 1997). EPA has determined that the dose limits established in this rule generally will not provide a protective basis for establishing preliminary remediation goals ("PRGs")under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA").[1] The NRC rule sets an allowable cleanup level of 25 millirem per year effective dose equivalent (EDE) (equivalent to approximately 5 x 10^{-4} lifetime cancer risk) as the primary standard with exemptions allowing cleanup levels of up to 100 millirem per year (mrem/yr) EDE (equivalent to approximately 2 x 10^{-3} lifetime risk).[2] While the NRC standards must be met (or waived) at sites where it is applicable or relevant and appropriate, cleanups at these sites will typically have to be more protective than required by the NRC rule dose limits in order to meet the requirement to be protective established in CERCLA and the 1990 revisions to the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP").[3]

Protectiveness for carcinogens under CERCLA is generally determined with reference to a cancer risk range of 10^{-4} to 10^{-6} deemed acceptable by EPA. Consistent with this risk range, EPA has considered cancer risk from radiation in a number of different contexts, and has consistently concluded that levels of 15 mrem/yr EDE (which

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[1] See letter, Carol Browner, Administrator, EPA, to Shirley Jackson, Chairman, Nuclear Regulatory Commission, February 7, 1997.

[2] Throughout this analysis risk estimates for dose levels were derived using a risk assessment methodology consistent with CERCLA guidance for assessing risks.

[3] Similarly, guidance that provides for radiation cleanups outside the risk range is generally not protective and should not be used to establish preliminary remediation goals.

equate to approximately a 3 x 10^{-4} cancer risk) or less are protective and achievable.[4] EPA has explicitly rejected levels above 15 mrem/yr EDE as being not sufficiently protective.

The dose levels established in the NRC Decommissioning rule, however, are not based on this risk range or on an analysis of other achievable protective cleanup levels used for radiation and other carcinogenic standards. Rather, they are based on a different framework for risk management recommended by the International Commission on Radiation Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP). NRC's application of this framework starts with the premise that exposure to radiation from all man-made sources, excluding medical and natural background exposures, of up to 100 mrem/yr., which equates to a cancer risk of 2 x 10^{-3}, is acceptable. Based on that premise, it concludes that exposure from decommissioned facilities of 25 mrem/yr, which equates to a cancer risk of approximately 5 x 10^{-4}, is acceptable, and allows the granting of exceptions in certain instances permitting exposure up to the full dosage of 100 mrem/yr from these facilities. EPA has carefully reviewed the basis for the NRC dose levels and does not believe they are generally protective within the framework of CERCLA and the NCP. Simply put, NRC has provided, and EPA is aware of, no technical, policy, or legal rationale for treating radiation risks differently from other risks addressed under CERCLA and for allowing radiation risks so far beyond the bounds of the CERCLA risk range.

[4]It should be noted that 15 mrem/yr is a dose level, not a media remediation level. Accordingly, this level could be achieved at CERCLA sites through appropriate site-specific combinations of active remediation and land-use restrictions to ensure no unacceptable exposures.

1. Rationale for 15 mrem/yr as Minimally Acceptable Dose Limit

To determine an acceptable residual level of risk from residual radioactive materials following a response action that would be protective of human health, EPA examined the precedents established by EPA for acceptable exposures to radiation in regulations and site-specific cleanup decisions in light of the CERCLA risk range for carcinogens. EPA's conclusion is that to be considered protective under CERCLA, remedial actions should generally attain dose levels of no more than 15 mrem/yr EDE for those sites at which a dose assessment is conducted. This dose level corresponds to an excess lifetime cancer risk of approximately 3×10^{-4}.

1.1 The CERCLA risk range

Under CERCLA, all remedies are required to attain cleanup levels that "at a minimum. . . assure protection of human health and the environment." CERCLA §121(d)(1). The NCP provides that, for carcinogens, preliminary remediation goals should generally be set at levels that represent an upper-bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}. 40 CFR § 300.430(e)(2)(I)(A)(1). This regulatory level was set based on EPA's conclusion that the CERCLA protectiveness mandate is complied with "when the amount of exposure is reduced so that the risk posed by contaminants is very small, i.e., at an acceptable level. EPA's risk range of 10^{-4} to 10^{-6} represents EPA's opinion on what are generally acceptable levels." 55 Fed. Reg. at 8716 (March 8, 1990). EPA's adoption of this risk range was sustained in judicial review of the NCP. State of Ohio v. EPA, 997 F.2d 1520, 1533 (D.C. Cir. 1993).

Under appropriate circumstances, risks of greater than 1×10^{-4} may be acceptable. CERCLA guidance states that "the upper boundary of the risk range is not a discrete line at 1×10^{-4}, although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions."[5] Other EPA regulatory programs have developed a similar approach to determining acceptable levels of cancer risk. For example, in a Clean Air Act rulemaking establishing NESHAPs for NRC licensees, Department of Energy facilities, and many other kinds of sites, EPA concluded that a risk level of "3×10^{-4} is essentially equivalent to the presumptively safe level of 1×10^{-4}." 54 Fed. Reg. at 51677 and 51682 (December 15, 1989). EPA explicitly rejected a risk level of 5.7×10^{-4} as not being equivalent to the presumptively safe level of 1×10^{-4} (in the case of elemental phosphorus plants) in this rulemaking. 54 Fed. Reg. at 51670.

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[5] "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" from EPA Assistant Administrator Don R. Clay, April 22, 1991.

1.2 Prior rulemaking decisions

EPA has examined the protectiveness of various radiation levels on a number of occasions. In each case, EPA's determination of what constitutes an adequate level of protection was reached in a manner consistent with EPA's regulation of other carcinogens. The conclusions from these efforts support the determination that 15 mrem/yr EDE should generally be the maximum dose level allowed at CERCLA sites. For example, EPA's Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes ("High-Level Waste Rule," 40 CFR Part 191) sets a dose limit of 15 mrem/yr EDE for all pathways.

In addition, EPA set an effective dose equivalent of 10 mrem/yr EDE (excluding radon-222) for air emissions of radionuclides from federal facilities, NRC licensees, and uranium fuel cycle facilities under the National Emissions Standards for Hazardous Air Pollutants (NESHAP, 40 CFR Part 61). This lower limit included all air pathways, but excluded releases to surface and ground waters.

Not all EPA rules apply the current dose methodology of effective dose equivalent (EDE). A dose limit of 15 mrem/yr EDE is also consistent with the dose levels allowed under older multi-media standards that were based on the critical organ approach to dose limitation. Critical organ standards developed by EPA and NRC consist of a combination of whole body and critical organ dose limits. Three of these critical organ standards (EPA's uranium fuel cycle rule, 40 CFR 190.10(a), developed for NRC licensees; NRC's low level waste rule, 10 CFR 61.41; and EPA's management and storage of high level waste by NRC and agreement states rule, 40 CFR 191.03(a)), referred to here as '25/75/25 mrem/yr' dose limits, are expressed as 25 mrem/yr to the whole body, 75 mrem/yr to the thyroid, and 25 mrem/yr to any critical organ other than the thyroid. One standard (EPA's management and storage of high level waste by DOE rule, 40 CFR 191.03(b)), referred to here as a "25/75 mrem/yr" dose limit, is expressed as 25 mrem/yr to the whole body and 75 mrem/yr to any critical organ (including the thyroid). To compare the dose level allowed under standards expressed in terms of EDE with the dose levels allowed under the critical organ approach to dose limitation, EPA has analyzed the estimated effective dose equivalent levels that would result if sites were cleaned up to the numerical dose limits used in these standards.[6] The analysis indicates that if sites were cleaned up under a 25/75/25 mrem/yr dose limit, the residual contamination would correspond to approximately 10 mrem/yr EDE. For sites cleaned up under a 25/75 mrem/yr dose limit, the residual contamination would correspond to approximately 15

[6] "Comparison of Critical Organ and EDE Radiation Dose Rate Limits for Situations Involving Contaminated Land" Office of Radiation and Indoor Air; April 1997.

mrem/yr EDE. These findings are similar to those mentioned in the preamble to the high-level waste rule (40 CFR Part 191; December 20, 1993; 58 FR 66402). In that rulemaking, EPA noted that the dose limit of 25 mrem/yr to the whole body or 75 mrem/yr to any critical organ, which was used in a previous high-level waste rule (September 19, 1985; 50 FR 38066) corresponds to the same level of risk as that associated with a 15 mrem/yr EDE. A cleanup level of 15 mrem/yr EDE is thus generally consistent with all of these other standards, although there are minor differences.

Finally, standards for the cleanup of certain radioactively contaminated sites have been issued under the Uranium Mill Tailings Radiation Control Act (UMTRCA), P.L. 95-604. Those standards are codified at 40 CFR Part 192. Among other provisions, the UMTRCA standards limit the concentration of radium-226, radium-228, thorium-230 and thorium-232, within 15 centimeters (cm) of the surface to no more than 5 picoCuries per gram (pCi/g) over background. They also limit the concentration of these radionuclides below the surface to no more than 15 pCi/g over background. Since these standards were developed for the specific conditions found at the mill sites to which they apply (for example, all mill sites are required by law to remain in federal control), correlating these concentrations to dose requires a site-specific determination considering both the distribution and nature of contaminants at the site and the selected land use. Therefore, those standards are less relevant for determining if 15 mrem/yr EDE is consistent. However, analysis indicates that the cleanup of UMTRCA sites is consistent with the minimally acceptable dose limit of 15 mrem/yr EDE under a residential exposure scenario for radium-226, radium-228, and thorium-232, and is much more stringent for thorium-230.[7] For land uses other than residential (e.g., commercial/industrial, recreational) the UMTRCA cleanup standards are more stringent for all four radionuclides.[8]

1.3 Site-Specific Decisions

EPA has examined the cleanup decisions made under Superfund to address sites contaminated with radioactive wastes. Many of these cleanup actions used the UMTRCA

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[7] *Reassessment of Radium and Thorium Soil Concentrations and Annual Dose Rates*. Office of Radiation and Indoor Air, July 22, 1996.

[8] A level of 15 mrem/yr is also supported by EPA's draft Federal Radiation Protection Guidance for Exposure of the General Public (59 FR 66414, December 23, 1994). The draft guidance recommends that the maximum dose to individuals from specific sources or categories of sources be established as small fractions of a 100 mrem/yr upper bound on doses from all current and potential future sources combined, and cites the regulations that are discussed in Section 1.2 of this paper as appropriate implementation of this recommendation. All of the regulatory examples cited support the selection of cleanup levels at 15 mrem/yr or less. However, because this guidance is in draft form and is subject to continued review within EPA prior to finalization, it should not be used as a basis for establishing acceptable cleanup levels.

cleanup standard (40 CFR Part 192) as an ARAR. Some of the sites used State regulations as ARARs. For a number of major DOE cleanup actions such as those at the Hanford reservation and Rocky Flats, a 15 mrem/yr EDE cleanup level has been decided upon or proposed. In other cases of CERCLA radiation cleanup actions that are not based on ARARs, cleanup levels between 1×10^{-5} and 1×10^{-6} have been selected (Bomark, NJ; Fernald, OH; Charleston Naval Shipyard, SC; and Mare Island Naval Shipyard, CA). Overall EPA finds that a 15 mrem/yr EDE level (with a risk of 3×10^{-4}) is at the upper end of remediation levels that have generally been selected at radioactively contaminated CERCLA sites.

2.0 Dose Limits in NRC's Rule are not Protective

EPA reviewed the dose limits that are contained in NRC's Radiological Criteria for License Termination (see 62 FR 39058, July 21, 1997). The NRC rule allows a cleanup level of 25 mrem/yr EDE (equivalent to approximately 5×10^{-4} lifetime risk) with exemptions allowing cleanup levels of up to 100 mrem/yr EDE (equivalent to approximately 2×10^{-3} lifetime risk). These limits are beyond the upper bound of the risk range generally considered protective under CERCLA. In addition, they present risks that are higher than levels EPA has found to be protective for carcinogens in general and for radiation, in particular, in other contexts. EPA has no technical or policy basis to conclude that these levels are protective under CERCLA.

The risk levels corresponding to the 25 to 100 mrem/yr EDE range allowed by the NRC rule (5×10^{-4} to 2×10^{-3}) are unacceptably high relative to 1×10^{-4}, which is the risk level generally used as the upper boundary of the CERCLA risk range for making risk management decisions at CERCLA sites. This determination is consistent with EPA's explicit rejection of a risk level of 5.7×10^{-4} for elemental phosphorus plants in the preamble for a NESHAP rulemaking (54 FR 51670). In the same preamble, EPA stated that a risk level of "3×10^{-4} is essentially equivalent to the presumptively safe level of 1×10^{-4}" (54 FR 51677). It was during this same NESHAP rulemaking that NCRP first recommended to EPA its regulatory scheme (a dose limit of 25 mrem/yr EDE for a single source that if met would not require analyzing other sources, otherwise a dose limit of 100 mrem/yr EDE from all sources combined) that NRC cites as a source for the regulatory approach taken in its decommissioning rule.[9] EPA rejected NCRP's recommended regulatory scheme, and promulgated dose limits of no more than 10 mrem/yr EDE in its NESHAP rulemaking for radionuclides, while concluding that "individual dose levels greater than 10 mrem/y ede are inconsistent with the requirements of section 112" of the Clean Air Act. 54 Fed. Reg. at 51686.

The documentation and analysis supporting the NRC rule dose levels provide no basis for such a significant departure from the CERCLA risk range. Indeed, as discussed above, EPA's past analyses and experience have demonstrated that exposures of 15 mrem/yr EDE or less are attainable and that such a departure is unwarranted. A dose limit of 25 mrem/yr EDE represents almost a doubling of the allowable risk from previous radiation rulemakings; the risk represented by a dose limit of 100 mrem/yr EDE is seven times as high as previously allowed. As note in Section 1.2, a dose limit of 25 mrem/yr effective dose equivalent is inconsistent with the dose levels allowed under older

[9] "Control of Air Emissions of Radionuclides" NCRP Position Statement No. 6. The report cited by NRC, NCRP No. 116, merely references this previous NCRP position statement.

standards using a previous dose methodology (multi-media standards that were based on the critical organ approach to dose limitation). If these older dose standards were to be applied to the cleanup of contaminated sites, the average dose level would correspond to approximately 10 or 15 mrem/yr EDE on average.[10] Also, analysis indicates that the cleanup of UMTRCA sites using the 5 pCi/g and 15 pCi/g soil standards under 40 CFR 192 is consistent with an upper bound of 15 mrem/yr EDE under a rural residential exposure scenario for radium-226, radium-228, and thorium-232, and is much more stringent for thorium-230.[11] For land uses other than residential (e.g., commercial/industrial, recreational) the UMTRCA cleanup standards are more stringent for all four radionuclides.

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[10] "Comparison of Critical Organ and EDE Radiation Dose Rate Limits for Situations Involving Contaminated Land" Office of Radiation and Indoor Air; April 1997.

[11] *Reassessment of Radium and Thorium Soil Concentrations and Annual Dose Rates*. Office of Radiation and Indoor Air, July 22, 1996.

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